

DEFENDANT NANOCELLECT'S INVALIDITY CONTENTIONS

EXHIBIT D: Anticipation/Obviousness of U.S. Patent No. 9,011,797

As described in the following claim chart, claims 1-19 of U.S. Patent No. 9,011,797 (“the ’797 patent”) are invalid in view of the following prior art references, alone or in combination with one or more references identified in NanoCollect’s Initial Invalidity Contentions. To the extent any of these references is found not to anticipate one or more of the asserted claims of the ’797 patent, the claims are obvious over any such reference alone or in view of any of the other prior art references disclosed in NanoCollect’s Initial Invalidity Contentions and this claim chart.

The below chart provides examples of prior art that establish that the asserted claims of the ’797 patent are anticipated and/or rendered obvious over the prior art. This case is in the early stages, with most discovery still upcoming, and the close of fact discovery still nine months away on June 26, 2020. The Court has not construed any claims, and expert reports are not due until sometime after the Court’s claim construction order. Further, Plaintiff has only recently disclosed their infringement contentions, but may seek leave to amend their contentions in the future. As a result, NanoCollect reserves the right to supplement and/or amend these charts in response to positions taken by Plaintiff with additional selections from the cited prior art, as well as with additional prior art references. NanoCollect also incorporates by reference the accompanying Invalidity Contentions with respect to the anticipation and obviousness of the other patents in suit, including the prior art descriptions and citations, exemplary prior art combinations, exemplary obviousness rationales and motivations to combine, and commentary on potential objective indicia of nonobviousness described therein. Additionally, NanoCollect incorporates by reference the arguments made in the accompanying Invalidity Contentions with respect to the invalidity of certain of the following claim limitations under 35 U.S.C. §§ 101, 102, 103, and 112.

To the extent that NanoCollect’s Invalidity Contentions rely on or otherwise imply particular constructions of terms or phrases in the asserted claims, NanoCollect is not proposing any such constructions as proper constructions of those terms or phrases. Various positions put forth in this document are predicated on Plaintiff’s incorrect and overly broad interpretation of the asserted claims as evidenced by its initial claim charts, dated August 7, 2019. Those positions are not intended to and do not necessarily reflect NanoCollect’s interpretation of the true and proper scope of the asserted claims, and NanoCollect reserves the right to adopt claim construction positions that differ from, or even conflict with, various positions put forth in this document.

U.S. Patent No. 3,791,517 (“Friedman”) was filed on March 5, 1973, and issued on February 12, 1974. Friedman is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

U.S. Patent No. 4,175,662 (“Zöld 662”) was filed on March 22, 1978, and issued on November 27, 1979. Zöld 662 is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

U.S. Patent No. 4,676,274 (“Brown”) was filed on February 28, 1985, and issued on June 30, 1987. Brown is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

U.S. Patent No. 4,936,465 (“Zöld”) was filed on September 15, 1989, and issued on June 26, 1990. Zöld is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

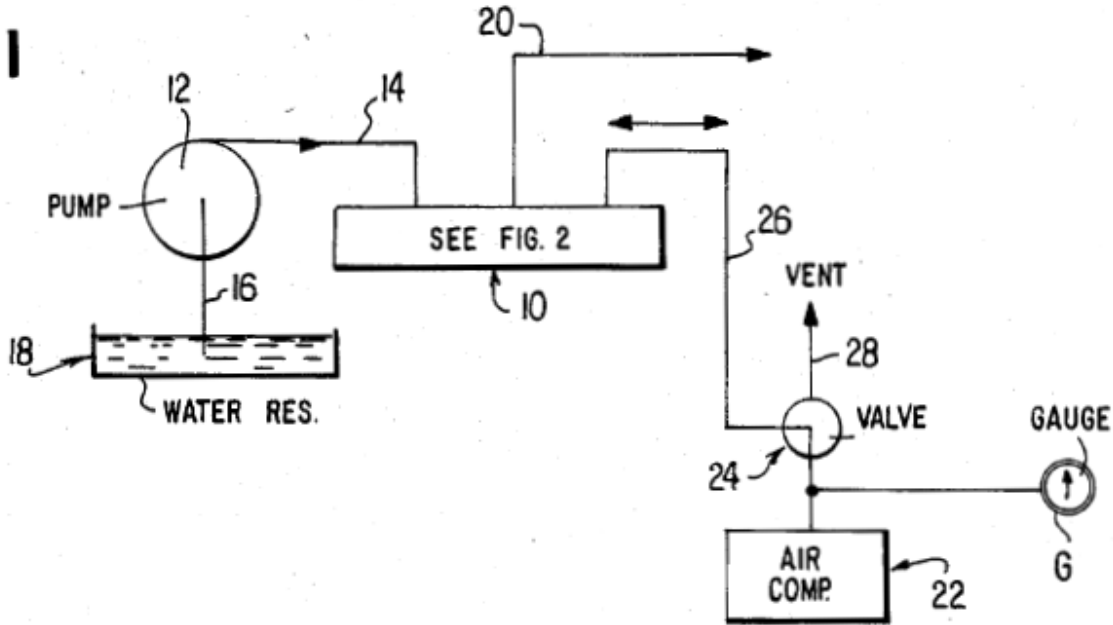
U.S. Patent No. 5,101,978 (“Marcus”) was filed on November 27, 1989, and issued on April 7, 1992. Marcus is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

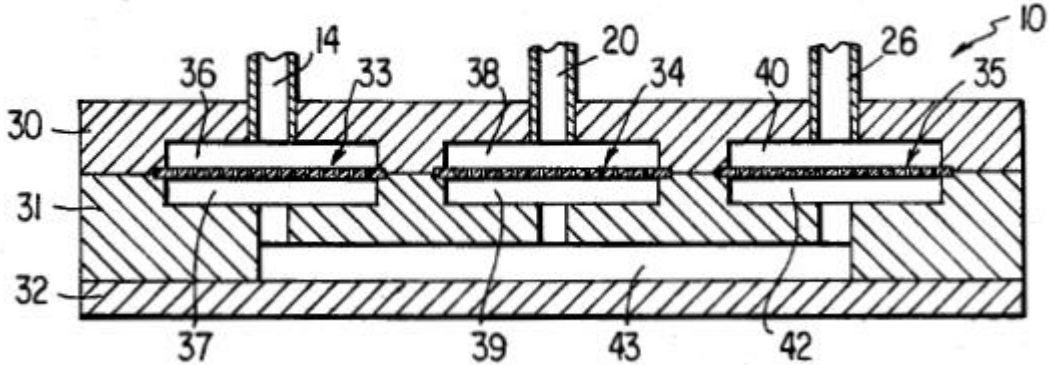
U.S. Patent No. 5,777,649 (“Otsuka”) was filed on August 19, 1996, and issued on July 7, 1998. Otsuka is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

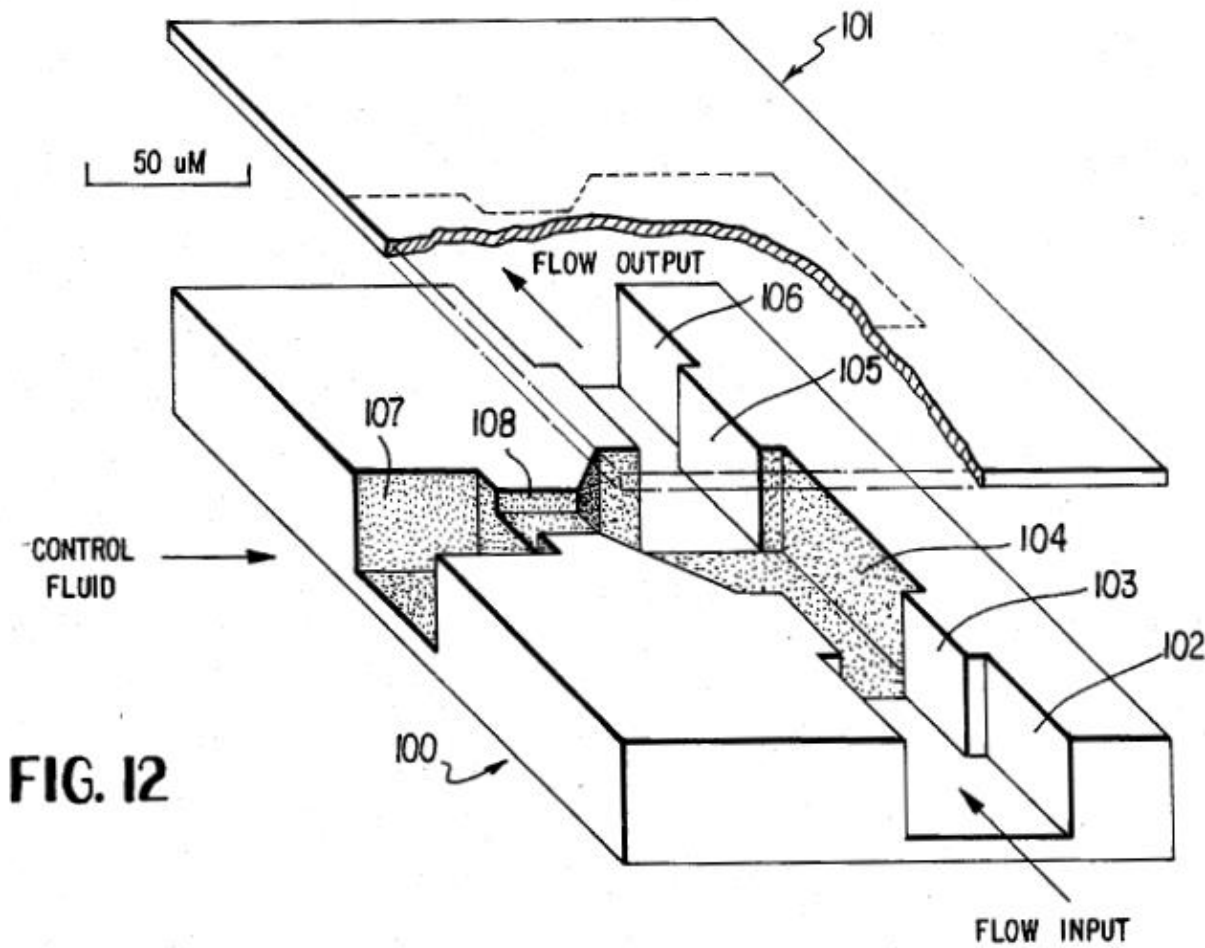
PCT Publication No. WO 00/70080 (“Wada”) was filed on May 11, 2000, and published on November 23, 2000. Wada is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

PCT Publication No. WO 02/29106 (“Chou”) was filed on October 2, 2001, and published on April 11, 2002. Chou is prior art under 35 U.S.C. §§ 102(a), (b), and/or (e).

Asserted Claim Element	Exemplary Prior Art Disclosures
[1] A method for facilitating analysis or processing of a sample, the method comprising:	To the extent the preamble of the independent claims are found to be limiting, the following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Brown

Asserted Claim Element	Exemplary Prior Art Disclosures
	Brown discloses a microfluidic device as shown in Figs. 1 and 2 below. FIG. 1 

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 2  “A practical version of a micro flow control valve according to the present invention is illustrated in FIG. 12. In this Figure, the capillary passages involved are formed by suitable etching or other processes in a glass 2 substrate 100 which is provided with the glass cover plate 101. The substrate 100 with its cover plate 101 may form a microscope slide on which an entire controlled flow system for manipulating cells may be formed, as hereinafter more particularly described.” Brown, at 9:22-30; <i>see also</i> Fig. 12 below.

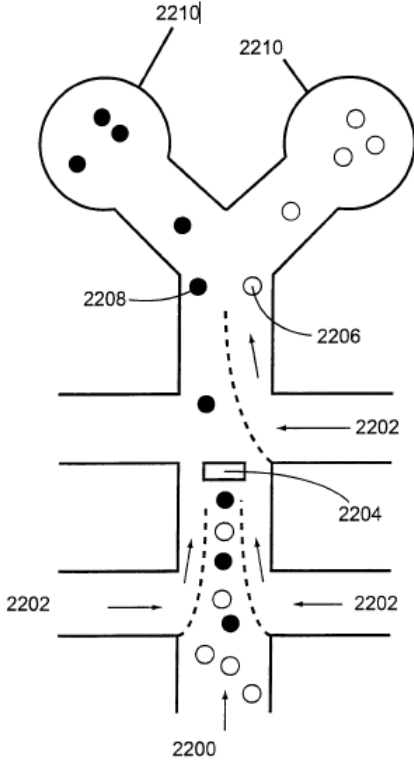
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 12 Chou “An embodiment of a microfluidic device in accordance with the present invention comprises pumps, valves, and fluid oscillation dampers.” Chou, at 2:23-24.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel.” Chou, at 3:1-4. Wada “The present invention relates to methods of focusing particles in microchannels, e.g., to improve assay throughput, to sort particles, to count particles, or the like.” Wada, at 3:13-15. “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity. Prior to performing the flowing step, the particles are optionally sampled with at least one capillary element, e.g., by dipping the capillary element into a well containing, the particles on a microwell plate and drawing the particles into, e.g., reservoirs, microchannels, or other chambers of the device. The particles (e.g., a cell, a set of cells, a microbead, a set of microbeads, a functionalized microbead, a set of functionalized microbeads, a molecule, a set of molecules, etc.) are optionally focused horizontally and/or vertically in the first microchannel to provide substantially uniform flow velocity to the particles in the first microchannel. Particles are optionally focused using one or more fluid direction components (e.g., a fluid pressure force modulator, an electrokinetic force modulator, a capillary force modulator, a fluid wicking element, or the like). Additional options include sorting, detecting or otherwise manipulating the focused particles.” Wada, at 3:22-4:5. Zöld “The subject invention pertains to the dispensing of fluids gases or aerosols in accordance with a preselected program, or the sorting or individual particles, such as cells, of a suspension in accordance with some of their individual physio-chemical properties, such as particle size, DNA and/or protein-content of a cell. Such a method and apparatus, therefore, is useful in cytology, for

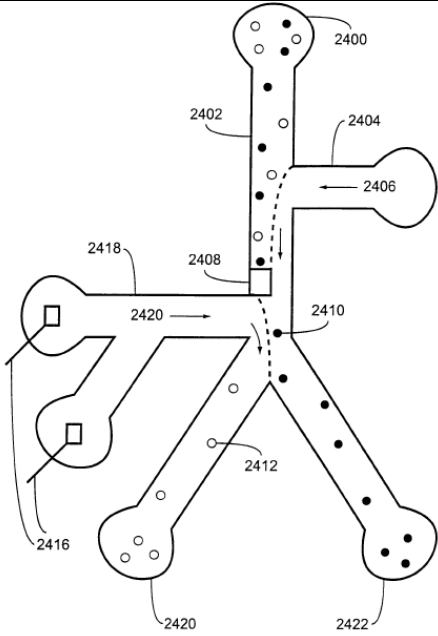
Asserted Claim Element	Exemplary Prior Art Disclosures
	cell sorting and analysis, i.e., for example, in cancer research or for the dispensing of any fluids and/or gases.” Zöld, at 1:15-24. Zöld 662 “This invention is concerned with a method and device for the control of motion and especially for the sorting of particles of an electrolytic suspension, where the input flow path can be split up into several output channels leading to respective receptacles. This invention furthermore, is concerned with a sorting device in which by the production of gas particles or cells can be sorted out in accordance with their physical and/or chemical properties such as, particle (cell) size, DNA and/or content.” Zöld 662, at 1:5-14. Marcus “The present invention relates to a fluidic sorting device for the separation of two or more different materials or particles which are suspended in a fluid. The materials or particles to be separated may differ based on shape, texture, color, or any other visually distinctive characteristics. The particles may additionally differ in their visual reaction to an externally applied force, for example an electrostatic or magnetic field. The sorting device of the present invention comprises a fluidic logic element and a machine vision apparatus.” Marcus, at 1:12-22. Friedman “In carrying out the invention there is provided apparatus for sorting small particles such as biological cells while the particles are suspended in a liquid comprising a housing defining a detection chamber, means for moving the particle suspending liquid through said housing in a stream to convey the particles through the stream. A detection means is associated with said detection chamber for detecting differences in particle characteristics and operable to provide electrical signals which vary in accordance with said differences in particle characteristics. A digital fluidic amplifier is provided having an inlet connected to the outlet of said chamber to

Asserted Claim Element	Exemplary Prior Art Disclosures
	receive the particle stream, said fluidic amplifier having a switching chamber communicating with said inlet and at least two different outlet ports communicating with said switching chamber, with an electrical transducer coupled to receive electrical signals from said detection means and operable to provide control signals to said fluidic amplifier. Said fluidic amplifier is operable in response to said control signals to switch the liquid particle carrying stream entering the inlet thereof from a first outlet port to a second selected outlet port in response to a predetermined particle characteristic control signal from said transducer.” Friedman, at 1:61-2:16.
(i) flowing a sample through a microfluidic flow channel formed in a substrate;	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity.” Wada, at 3:22-26. “Fluid flow streams are optionally "pinched" or "focused" into a narrow region of a microchannel to facilitate single particle or narrow streamline detection using a variety of optical detection schemes (discussed further, below). In one embodiment, particle focusing is achieved electrostatically (see also, Ramsey et al., "Apparatus and Method for Performing Electrodynamic Focusing on a Microchip." U.S. Pat. No. 5,858,187, issued January 12, 1999). In other preferred embodiments, pressure, Joule heating, and/or other fluid movement methods are used to focus cells or other particles.” Wada, at 12:7-14. “As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of

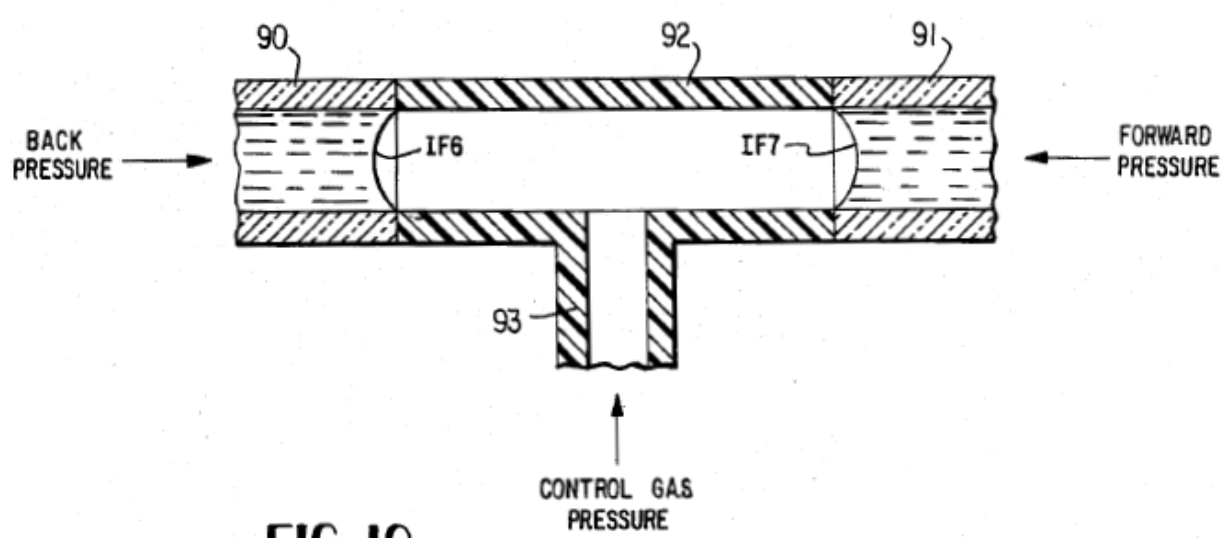
Asserted Claim Element	Exemplary Prior Art Disclosures
	opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above . . . [a] second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one hydrodynamic flow 2202 so as to direct selected cells 2208 (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210.” Wada, at 19:24-20:2; <i>see also</i> Fig. 22 below.

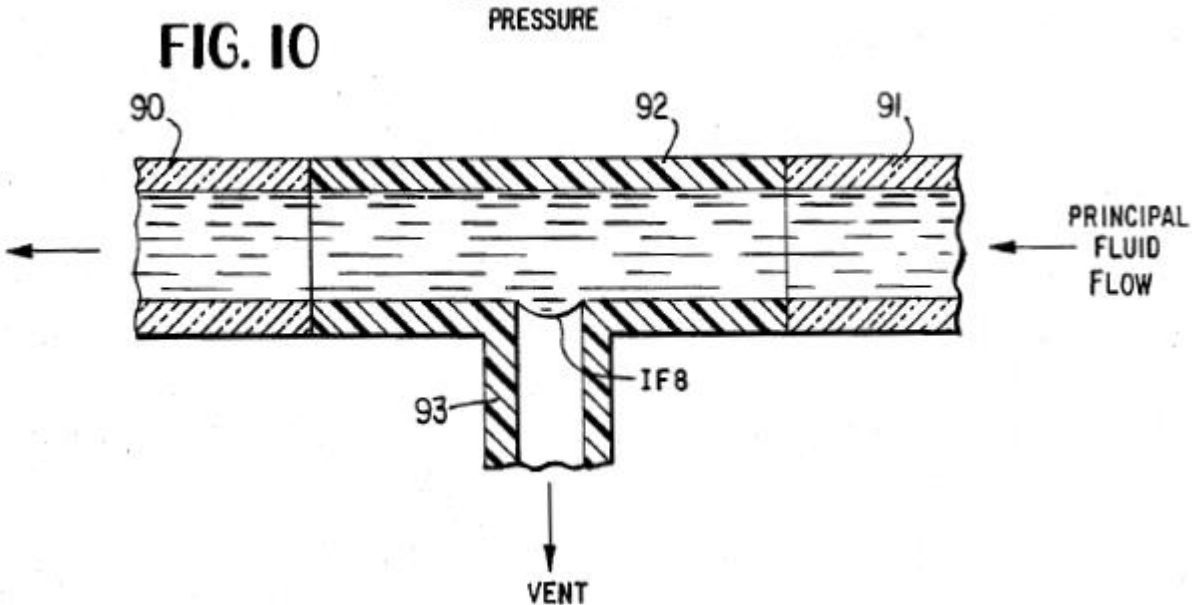
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 22 “In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304.” Wada, at 20:4-6; <i>see also</i> Fig. 23 below.

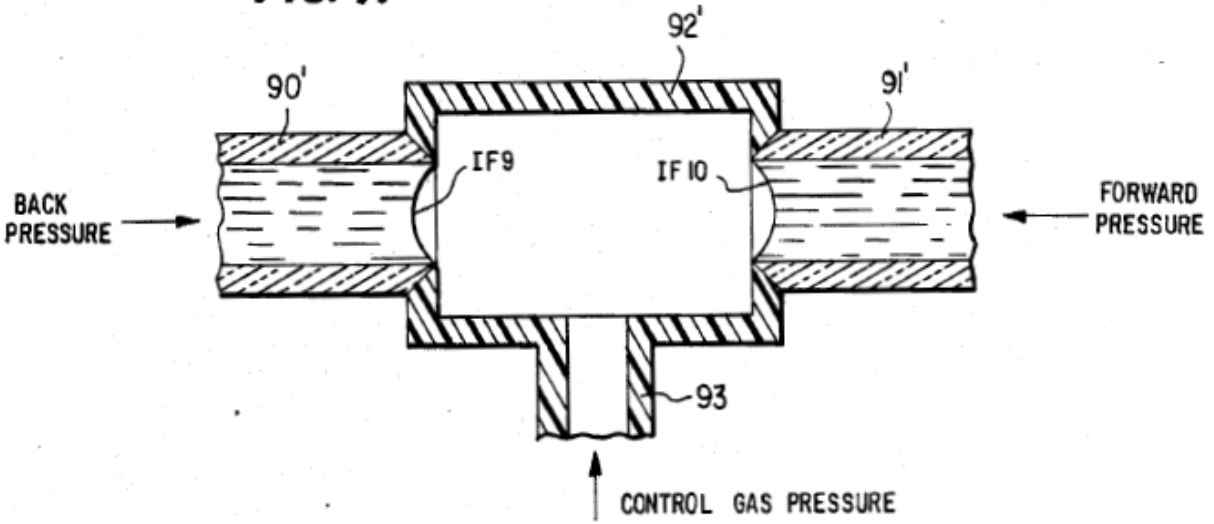
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

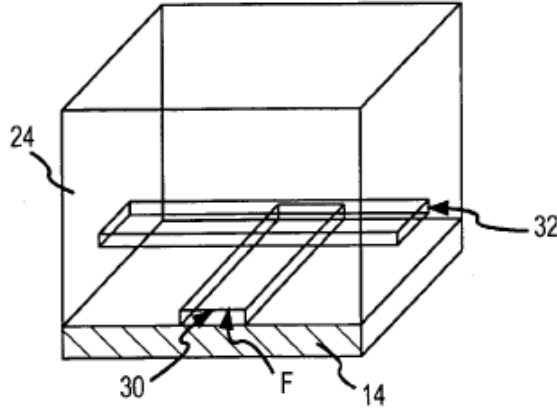
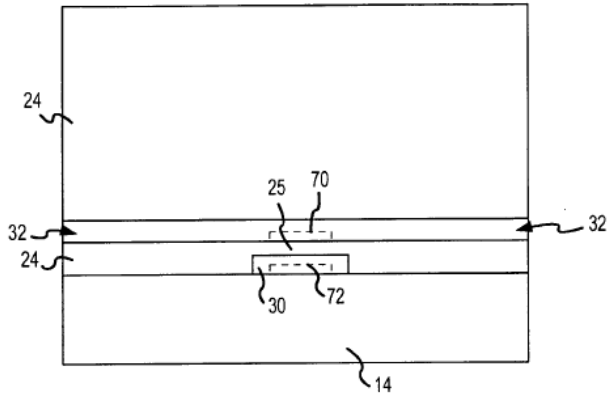
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control Port and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36; <i>see also</i> Fig. 1 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	member 14, the two members being sealed together by a liquid-tight annular seal 18. The liquid 19 containing the particles to be observed enters the apparatus through a tube 20 centrally disposed within the funnel-shaped entrance portion 24 of the cylindrical central bore 26 of the member 10. Another liquid 23 also enters the mouth 24 of the central bore 26 and forms a sheath of liquid for the liquid 19 containing the particles.” Friedman, at 2:30-41; <i>see also</i> Fig. 1 below. FIG. 1 Brown Brown shows a microfluidic device comprising a microchannel (label 90 in Figs. 9-11) having an interior bounded by a sidewall (label 90). <i>See</i> Brown, Figs. 9-11 below.

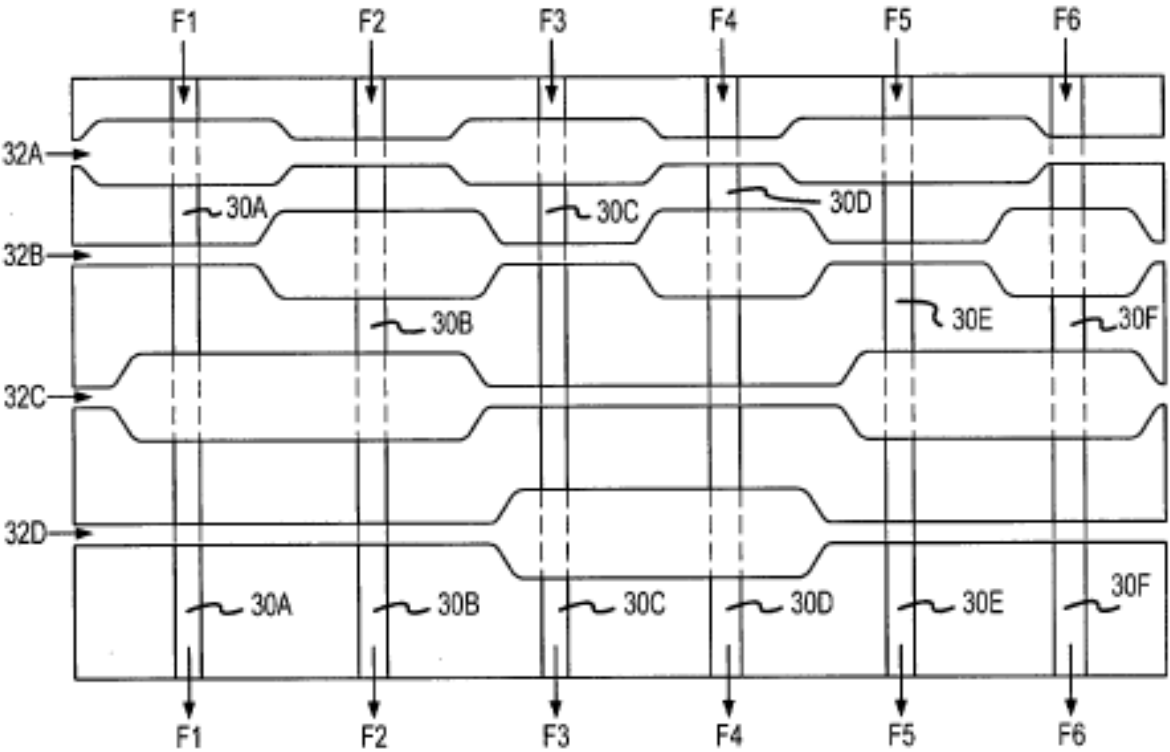
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 9  The diagram shows a cross-section of a device with a central horizontal channel. The channel is bounded by a top wall (90) and a bottom wall (92). The left end of the channel is labeled 90, and the right end is labeled 91. Inside the channel, there are two curved, shaded regions labeled IF6 and IF7. To the left of the channel, an arrow labeled 'BACK PRESSURE' points towards the channel. To the right of the channel, an arrow labeled 'FORWARD PRESSURE' points away from the channel. Below the channel, there is a vertical port (93) that leads to a lower chamber. An arrow labeled 'CONTROL GAS PRESSURE' points upwards into this lower chamber. The entire device is shown in a cross-sectional view with hatching indicating different materials or sections.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 10  The diagram, labeled FIG. 10, shows a cross-section of a device. A central horizontal channel is defined by upper wall 90 and lower wall 91. The interior of this channel is labeled 92. A side vent is formed by a lower wall 93 that extends downwards from the main channel. The interior of this vent is labeled IF8. An arrow labeled 'PRESSURE' points into the channel from the right. An arrow labeled 'PRINCIPAL FLUID FLOW' points to the left, indicating the direction of flow through the channel. An arrow labeled 'VENT' points downwards from the bottom of the vent IF8.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 11  “In a particular embodiment of the invention, a device relates to capillary flow control and in particular to controlling such flow with respect to extremely small volumes of a principal fluid. By extremely small volumes of principal fluid, as used herein, is meant volumes which may be as small as in the order of one picoliter.” Brown, at 3:45-50. “FIGS. 9 and 10 show a control valve construction which is functionally equivalent to those shown in FIGS. 1-6, although, the principal fluid flow rate in this case is extremely small because all of the passages illustrated in FIGS. 9 and 10 are of capillary size.” Brown, at 8:33-37. Chou “An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said

Asserted Claim Element	Exemplary Prior Art Disclosures
	flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel. An embodiment of a microfluidic sorting device comprises a first flow channel formed in a first layer of elastomer material, a first end of the first flow channel in fluid communication with a collection pool and a second end of the first flow channel in fluid communication with a waste pool.” Chou, at 3:1-8; <i>see also</i> Figs. 7A and 7B below.   FIG.7A “As will be explained, the preferred method of Figs. 1 to 7B involves using pre-cured elastomer layers which are assembled and bonded. In an alternative method, each layer of elastomer may be cured "in place". In the following description "channel" refers to a recess in the elastomeric structure which can contain a flow of fluid or gas.” Chou, at 8:18-21. “As can be seen in Fig. 7A and 7B, flow channels 30 and 32 are preferably disposed at an angle to one another with a small membrane 25 of substrate 24 separating the top of flow channel 30 from the bottom of flow channel 32.” Chou, at 9:20-22. “Figs. 7B and 7H together show the closing of a first flow channel by pressurizing a second flow channel, with Fig. 7B (a front sectional view cutting through flow channel 32 in corresponding FIG.7B

Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig. 7A), showing an open first flow channel 30; with Fig. 7H showing first flow channel 30 closed by pressurization of the second flow channel 32. Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position)." Chou, at 19:1-16; <i>see also</i> Fig. 16 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 16 Zöld “These partial streams are delimited by the two physically real sides of the transporting channel, which is the combination of the connecting channel 8 and of the delay channel 11, and partly by the virtual planes, imagined to be laid on the stream lines from 30a to 30d and are directed

Asserted Claim Element	Exemplary Prior Art Disclosures
	perpendicularly to the bottom of the transporting channel, i.e., to the sheet of the paper of FIG. 2. The extreme side streams 6a and 6b flow into the left and right only control channels 17 and 16, respectively. The amount of the electrolyte, that flows in these two streams, has to be as large as possible because through these two streams is achieved the generation of the already described asymmetry of the flow in the channel branching volume 12, shown in FIG. 1, and hence, the deflection of the center stream 5, and that of the particles too, into one of the only-dispenser channels 14 or 15. The middle side streams 6c and 6d, delimited by the vertical planes laid on the stream lines 30a and 30c, and 30b and 30d, respectively, flow into the side exit only-dispenser channels 15 and 14, flowing at first against the slightly pointed ends of the separating wall pair 33 and being deflected thereby into these channels.” Zöld, at 18:4-26. “It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels.” Zöld, at 23:66-24:7. Zöld 662 “The operation of the known method and device is as follows: In a flow chamber with a capillary exit of very small diameter a very thin (cca. 25 micron diameter) stream of the suspension is produced.” Zöld 662, at 1:24-28. “Therefore, it is one object of the invention to provide a method and a device for controlling the flow of an electrolyte in closed channels of capillary size in order to make possible the sorting of at least one but rather two kinds of particles (cells) from a mixture . . . this problem is solved in such a manner that the electrolyte flowing in a channel can be split into at least two side channels and that the thin suspension stream can be deflected completely into at least one of the side channels from the entrance channel or middle channel by producing a sudden and short electrolysis gas impulse in that side channel lying opposite to the side channel in which the

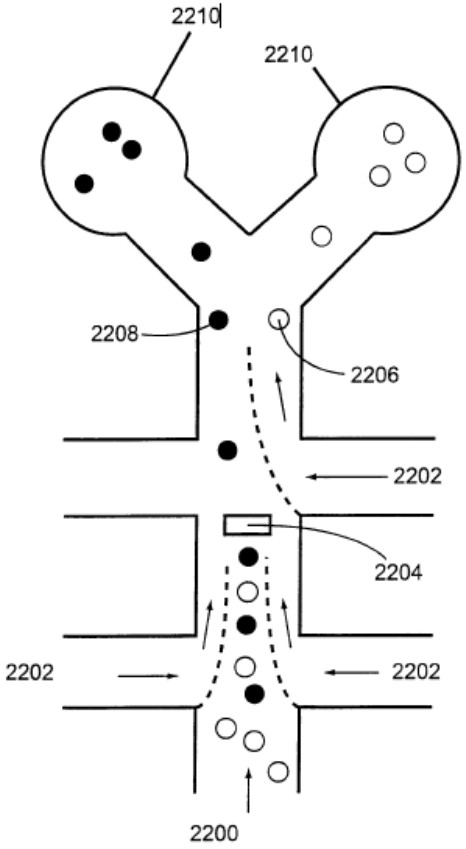
Asserted Claim Element	Exemplary Prior Art Disclosures
	suspension stream is to be deflected. This method of sorting is based on the direct changing of the electrolyte flow path while the suspended particles are deflected only indirectly by this change of the electrolyte flow.” Zöld 662, at 1:57-2:8. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20.

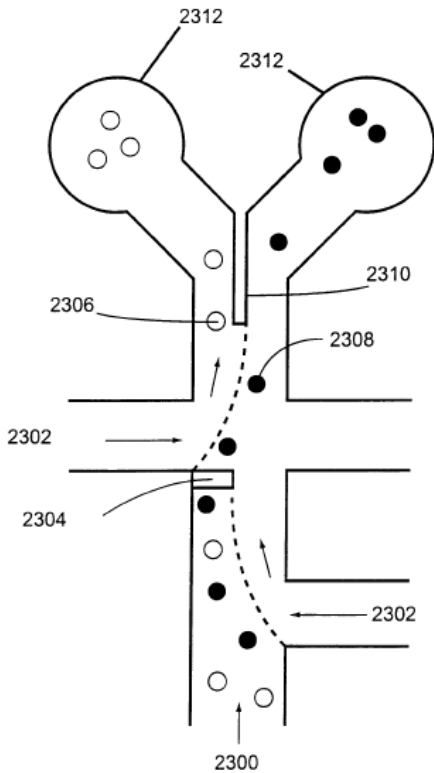
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into

Asserted Claim Element	Exemplary Prior Art Disclosures
	another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1, that the suspension flowing from container 38 through the entrance channel 34 and the orifice 28 continues to flow in the relatively narrow capillary exit channel 12 after mixing with pure electrolyte from container 40 and another entrance channel 36, thus making possible the lining-up of the particles for further analysis or sorting.” Zöld 662, at 7:2-8. “The operation of the T-sorter is as follows: Under the suction effect of the pump (not shown) connected to the tube 26 suspension and pure electrolyte flow from containers 38 and 40 through the entrance channels 34 and 36, respectively, towards the orifice 28 into the exit channel 12 and then through the side channels 14 and 16 into the containers 22 and 24, respectively.” Zöld 662, at 7:33-39.

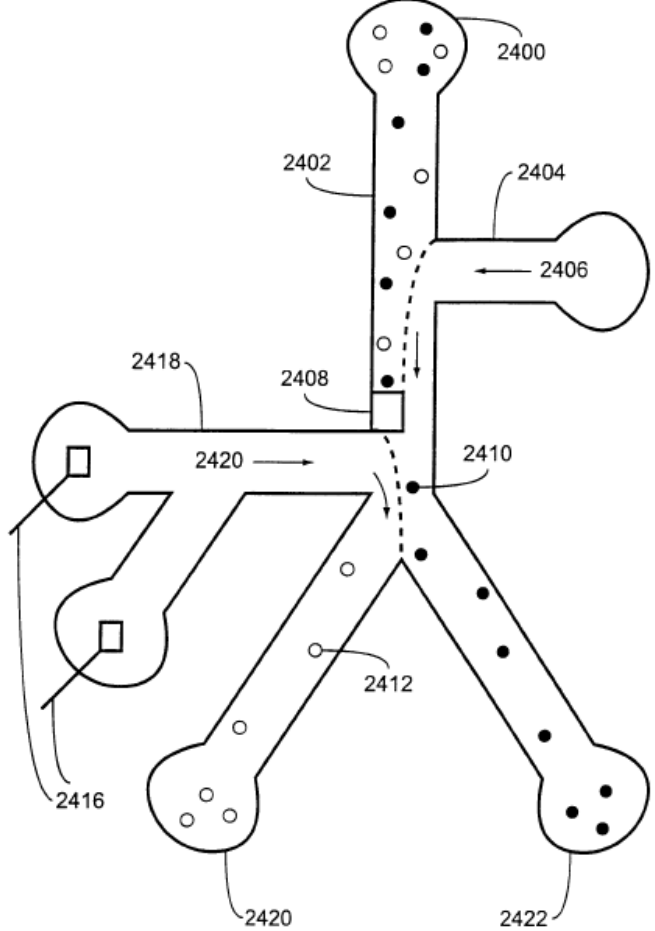
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In this version, as can be seen in FIG. 2, the suspension is injected into the counter through a very thin capillary tube 44 which ends in a nozzle 46 and is located substantially coaxially inside the entrance channel 42; the pure electrolyte flowing in the entrance channel 42 focuses the suspension into a very thin stream at the upstream side of the orifice 28 concentrically with the orifice from where the suspension further flows into the exit channel or middle channel 50 of the sorter device. Adjacent the orifice 28 pure electrolyte enters laminarly at both sides of the suspension stream 60 through the side entrance channels 36 and 37 to keep the suspension stream 60 at the center of the middle channel 50 and to direct the suspension and thus, the particles, right against the tip 56 of the branching of the middle channel 50 into the two side channels 52 and 54. The pairs 18 and 20 of control electrodes are provided at a small distance before the branching of the middle channel 50 on the inner side walls of the middle channel. Alternatively, the pairs of control electrodes can also be provided in the side channels 52 and 54 in the manner shown in FIG. 1. The deflection of the suspension stream 60 into one side channel, say into channel 52, is achieved by producing a sufficiently large amount of gas by the control electrodes 18; the control electrodes 20 would, clearly, produce the deflection of the suspension stream into the side channel 54. It is an advantage of this embodiment that the deflection of the very thin suspension stream 60 is simpler and faster than in the T-sorter and as a result faster operation can be achieved with the Y-sorter than with the T-sorter.” Zöld 662, at 8:14-46. “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively. The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels

Asserted Claim Element	Exemplary Prior Art Disclosures
(ii) propagating a pressure pulse across the microfluidic flow channel in a crosswise direction; and	should be zero when a particle passes these channels.” Zöld 662, at 9:1-22. The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity.” Wada, at 3:22-26. “As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above . . . [a] second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one hydrodynamic flow 2202 so as to direct selected cells 2208 (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210.” Wada, at 19:24-20:2; <i>see also</i> Fig. 22 below.

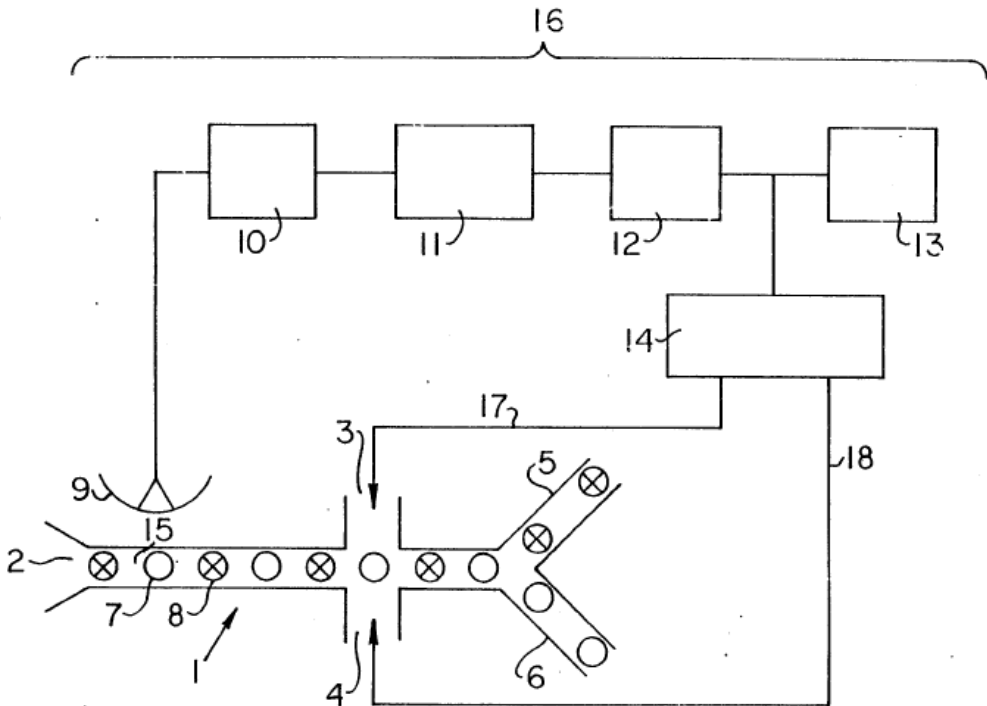
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 22 “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting

Asserted Claim Element	Exemplary Prior Art Disclosures
	microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below. 

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting

Asserted Claim Element	Exemplary Prior Art Disclosures
	microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control Port and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “To said fluidic logic element 1, is connected a machine vision apparatus which is set forth broadly at 16. The machine vision apparatus 16 consists of a machine vision camera lens 9, an image capture device 10, an image interpretation device 11, and a decision control device 12. Said machine vision apparatus may further comprise an optional, conventional counter device 13. Connected to the decision control device 12 is a fluidic controller device 14 which transmits using leads 17 and 18 the input signal from the control decision device 12 to the fluidic element control ports 3 and 4. The input signal instructs the control ports 3 and 4 as to how the particulate materials 7 and 8 should be sorted.” Marcus, at 3:36-48; <i>see also</i> Fig. 1 below.

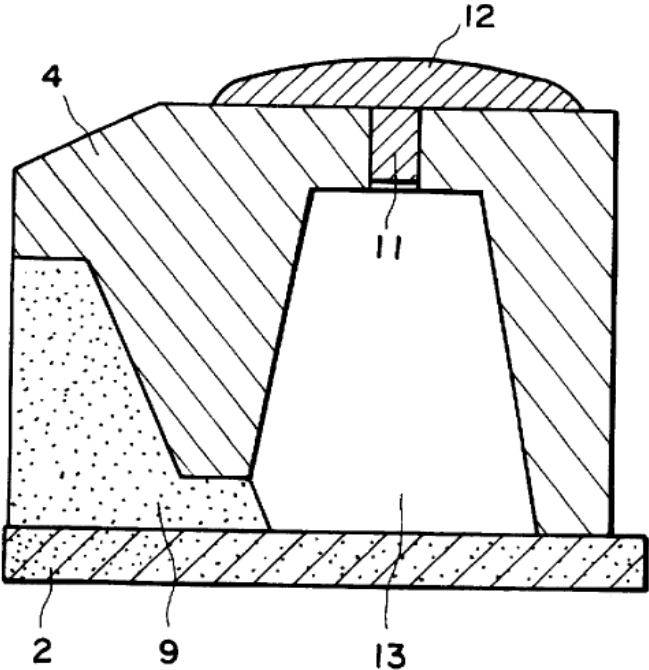
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at

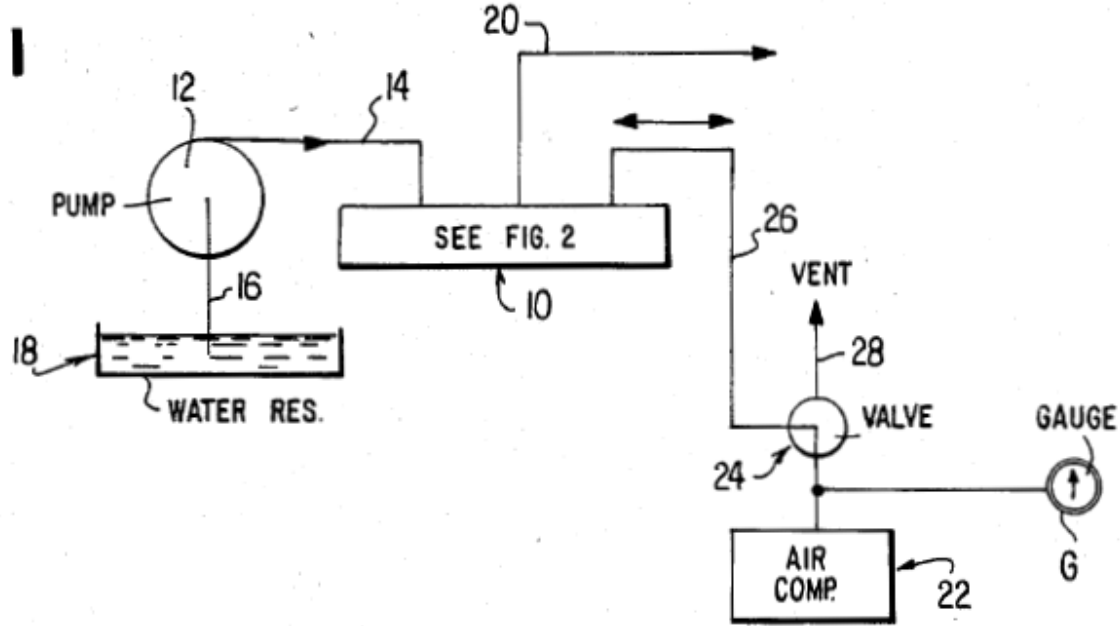
Asserted Claim Element	Exemplary Prior Art Disclosures
	3:49-62. Friedman “For instance, in FIG. 2, three outlet ports are provided from the switching chamber and it will be understood that photoelectric sort detectors, such as elements 69 and 83, may be employed for each of those three outlet ports. FIG. 2 illustrates an alternative embodiment of the invention in which the switching chamber 60 is modified as shown at 60A, in a modified fluidic amplifier housing 14A, to provide an additional outlet port 70 and added control ports 72 and 74. A control fluid under pressure may be supplied to the switching chamber 60A through the control ports 72 and 74 through the respective supply lines 76 and 78 under the control of electromagnetically operated valves 80 and 82.” Friedman, at 8:53-67; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“As illustrated in the drawing, the opposite walls 68 and 69 of the switching chamber 60A are essentially equidistant from the nozzle formed by the inlet 66. Accordingly, they are equally capable of displaying the wall attachment effect in the presence of turbulence in the liquid stream, as previously described above. Thus, just as the wall attachment effect to wall 68 directs the liquid stream to outlet port 64, the wall attachment effect at wall 69 leads the fluid stream to the outlet port 70. Once established at one wall, the wall attachment effect will be maintained and will hold the stream to one of these two walls, and thus direct the stream to one of these two outlet ports, as long as turbulence continues. In order to determine which direction the stream will take, a signal must be supplied from one of the control ports 72 or 74. If the signal takes the form of a supply of control fluid under pressure, it has the effect of shifting the stream away from the wall adjacent to the control port and over to the opposite wall. Thus, if control fluid is supplied to the switching chamber 68 through the control port 74, the supply of fluid destroys the low pressure bubble at the wall 69, causing the stream to shift to the opposite wall 68. A similar, but opposite effect is available if a vacuum is applied at the control port 74. This reduces the pressure at the wall 69, tending to increase the wall attachment at the wall 69 and to switch the device so that the liquid stream is pulled away from the wall 68 and to the wall 69 and to the port 70. The embodiment of FIG. 2 is capable of several different alternative modes of operation. For instance, if the switching chamber 60A is fabricated in an asymmetrical form such that the wall 68 is substantially closer to the nozzle formed by the inlet 66 than the wall 69, then without any control signals at the control ports 72 and 74, the switching action will be identical to that described above for the embodiment of FIG. 1. Thus, if a signal is supplied to the transducer 58, the resulting turbulence will cause the stream to attach to the wall 68 and to be directed to port 64. In the absence of a signal at transducer 58, the laminar flow will continue, and the stream will be directed through the outlet port 62.” Friedman, at 9:3-45. “The switching fluid used at the ports 72 and 74 should be compatible with the liquid in the main stream, but it need not be identical to that liquid. Thus, where the liquid in the main stream is water, the switching fluid may be water, or air, or some other compatible fluid.” Friedman, at 10:45-50. “As illustrated in the simplified schematic diagram of FIG. 3, additional fluidic amplifier switches may be employed downstream from the fluidic amplifier switch of the system of FIG. 1, or in that of FIG. 2. This provides the possibility of still further sorting and segregation of particles on a single pass through the apparatus. The downstream fluidic amplifiers may also be connected to receive control signals from circuits 46. FIG. 3, at the left side, illustrates in simplified schematic form an

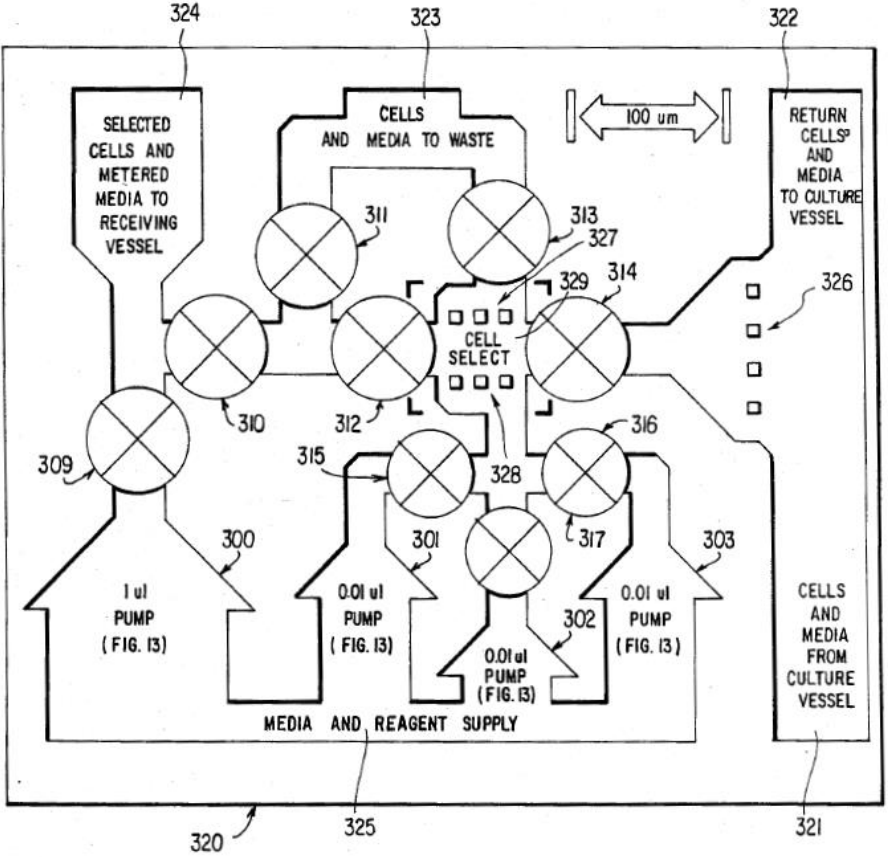
Asserted Claim Element	Exemplary Prior Art Disclosures
	apparatus corresponding to the apparatus of FIG. 2, with corresponding parts correspondingly numbered. The main stream outlet port 62 is connected to a second fluidic amplifier switch housing 114 which may correspond exactly in structure and operation with the fluidic switch contained within the housing 14 and described above in connection with FIG. 1. The fluidic switch 114 responds to a signal from circuits 46 on a connection indicated at 146 through a delay circuit 149 and a gate circuit 151 to control a signal from an oscillator 153 to a transducer within the switch housing 114. By this means, particles which were not sorted and segregated in the first fluidic amplifier within housing 14, and diverted to the outlet port 64, continue on through the port connection 62, through the switch 114, and may be sorted and segregated according to a second particle characteristic into an outlet port 164. If the particles are not so segregated, they continue on in the main stream outlet port 162 from the housing 114. Thus, FIG. 3 illustrates the principle that a plurality of fluidic amplifier switches may be controlled to accomplish several sorting operations based on signals obtained from a single optical chamber 10.” Friedman, at 11:33-65; <i>see also</i> Fig. 3 below. FIG. 3 Otsuka

Asserted Claim Element	Exemplary Prior Art Disclosures
	“[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57. “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 Brown “Thus, in this case, water is the principal fluid and its flow is controlled by the valve 10 by air acting as the control fluid so that at the discharge flow passage conduit 20, there is a flow or no flow condition dependent upon the condition of the valve 10 which will be described with greater particularity hereinbelow. The system also includes a variable pressure air compressor 22 discharging through a manually controlled valve 24 to the air line 26 connected with the valve 10. The manually controlled valve 24 is positionable so that either the pressure provided by the compressor 22 is present in the line 26 or the line 26 is vented to atmosphere as indicated by the

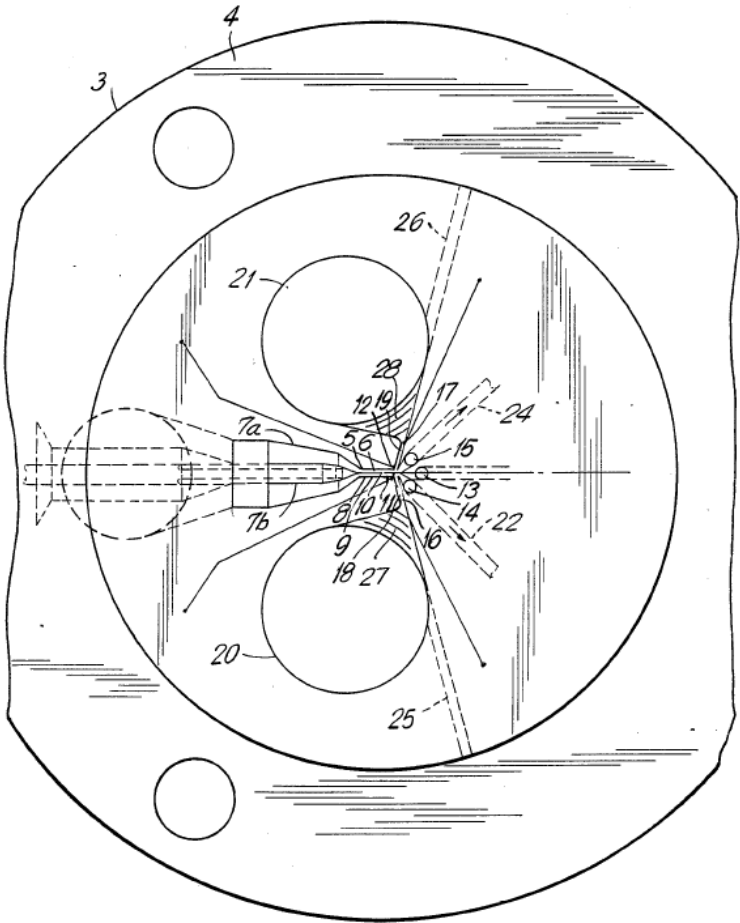
Asserted Claim Element	Exemplary Prior Art Disclosures
	vent passage 28. The gauge G measures the pressure in the line 26 when the air compressor 22 is connected thereto through the valve 24.” Brown, at 4:62-5:8. “In this condition of the valve, the capillary passage CP3 through the membrane 35 will pass the air under the pressure P2 substantially as is shown, it being appreciated that the porous membrane 35 is made of Teflon which is non-wettable by the principal fluid water.” Brown, at 5:65-6:2; <i>see also</i> Fig. 1 below. FIG. 1  “In addition to the above, the system includes the filters 326, 327 and 328 to aid in the cell selection and manipulation processes. The filter 326 may comprise individual "islands" spaced apart about 30 microns, for initial cell selection. Thus, as that area of the system surrounding the filter 326 is being viewed through a microscope with cells in media passing the filter 326 from

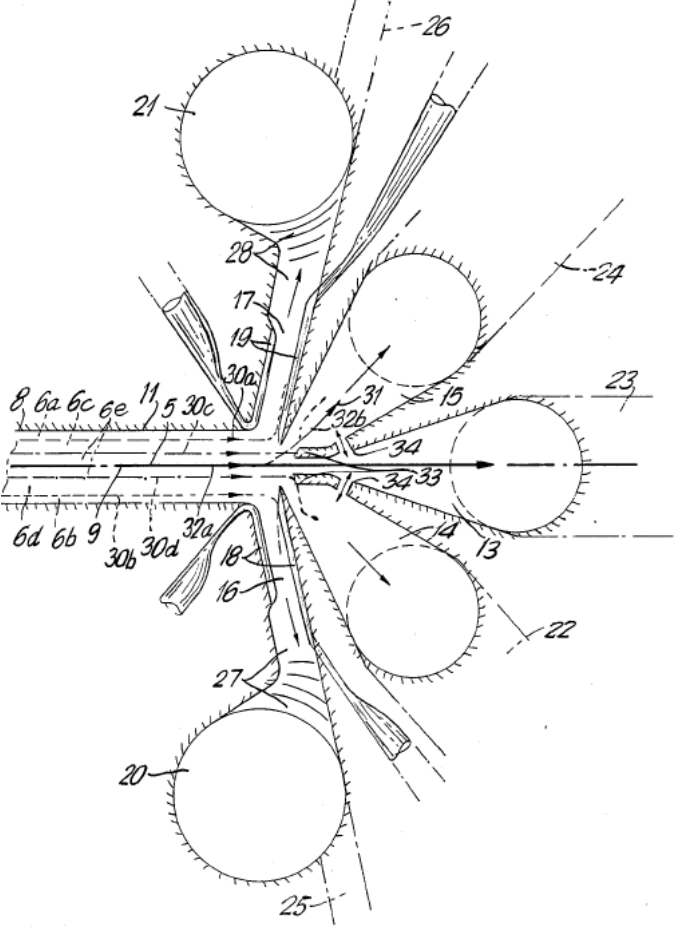
Asserted Claim Element	Exemplary Prior Art Disclosures
	region 321 toward region 322, a cell may be tentatively selected by opening the valve 314 to allow such cell and media to flow therethrough and into the cell select region 329. Now the smaller bracketed area may be viewed under increased magnification. The islands of the filters 327 and 328 are spaced apart about 5 microns so that a cell cannot pass therethrough. If the cell is not desired for further study, it may be rejected by opening the valves 311 and 312 and operating one of the pumps 301-333 and flushing it to waste. If the cell is not desired for further study, it may be rejected by opening the valves 311 and 312 and operating one of the pumps 301-333 and flushing it to waste. If the cell is desired for further manipulation, the valves 310 and 311 are opened and one of the pumps 301-313 operated to flush it toward the region 324 whereas the pump 300 ultimately flushes it into the region 324. The reason for the plurality of pumps shown is that once a cell has been selected, a selection of one or more reagents or media to be contacted with it may be desired. Thus, the several pumps should individually be connected to these several supplies rather than to the simplified single supply region 325 as shown.” Brown, at 12:34-60; <i>see also</i> Fig. 18 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 The diagram illustrates a microfluidic system with the following components and flow paths: Media and Reagent Supply (325): The central source of fluids. Pumps (FIG. 13): 1 ul Pump (300): Connected to the supply via line 301, leading to valve 309. 0.01 ul Pump (301): Connected via line 302, leading to valve 315. 0.01 ul Pump (302): Connected via line 303, leading to valve 317. Valves (309, 310, 311, 312, 313, 314, 315, 316, 317, 327, 328, 329): Represented by circles with an 'X' inside, controlling fluid flow between different channels. Cell Selection (328): A central region where cells are selected, indicated by small squares. Output Paths: 324: Selected cells and metered media to a receiving vessel. 323: Cells and media to waste. 322: Return cells and media to a culture vessel. 321: Cells and media from a culture vessel. Dimensions: A scale bar indicates 100 μm. Other Labels: 320, 326, and 321 are also present near the bottom of the system. FIG. 18 Zöld “According to the invention, if the fluids flow through the system under the influence of a

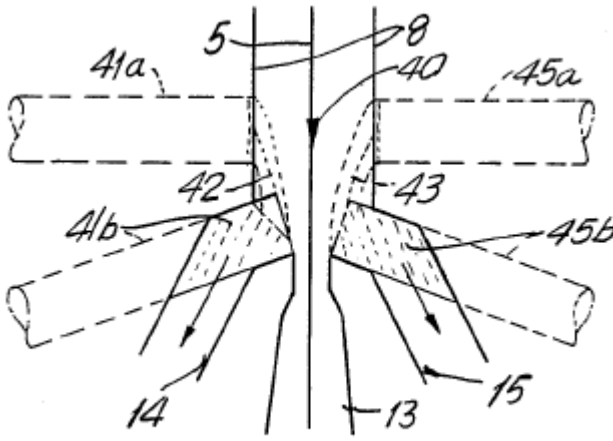
Asserted Claim Element	Exemplary Prior Art Disclosures
	vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an

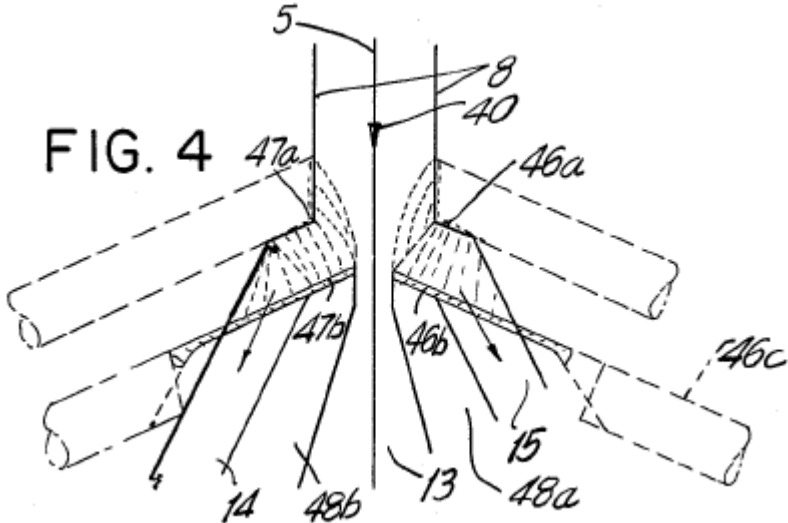
Asserted Claim Element	Exemplary Prior Art Disclosures
	extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary (3) and an inner boundary (4). Inside, there are two large circular regions (21 and 20) and a central area with various components labeled with numbers: 28, 12, 19, 17, 24, 26, 25, 27, 18, 9, 10, 11, 13, 14, 15, 16, 22, 5, 6, 7a, 7b, 8, 18, 27. Dashed lines indicate various paths or boundaries within the device.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

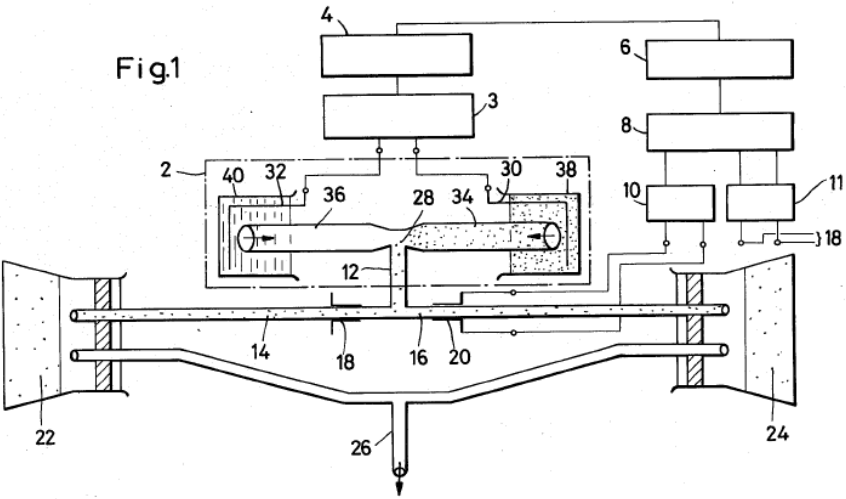
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

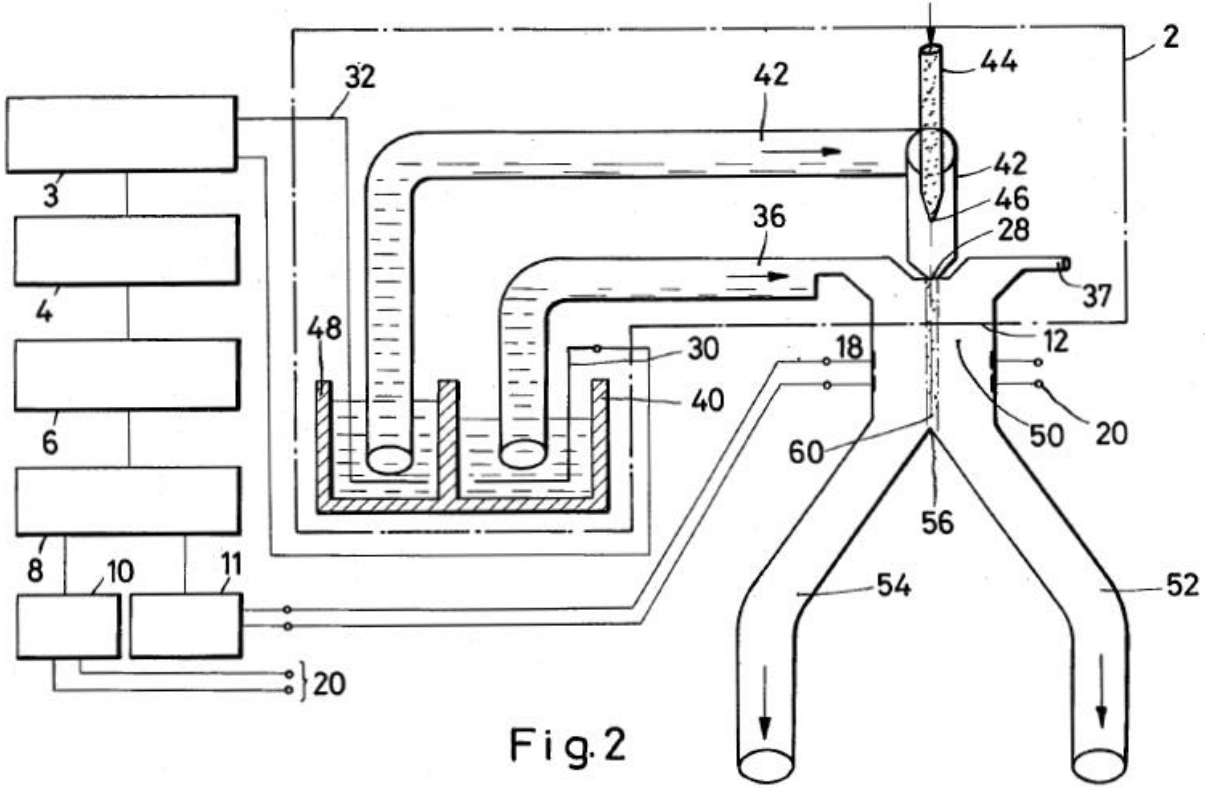
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are

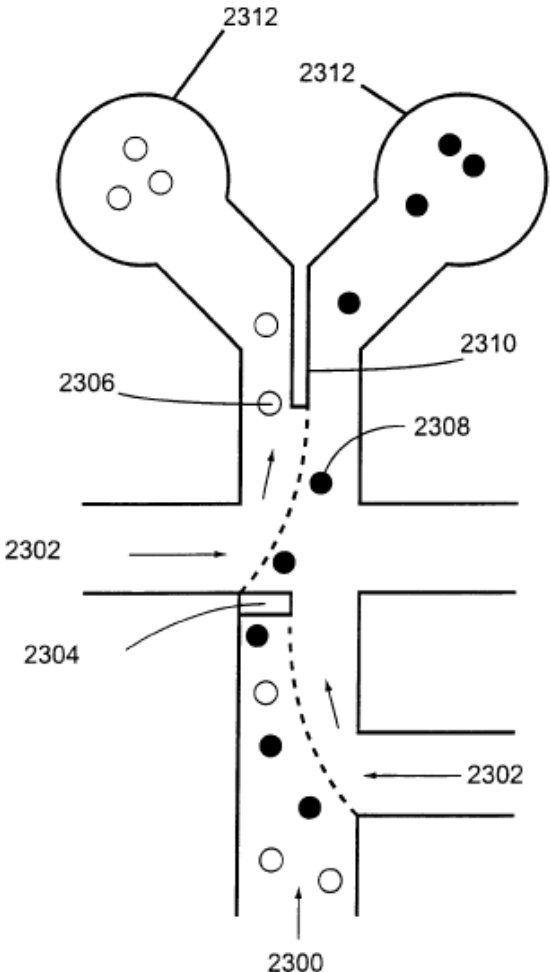
Asserted Claim Element	Exemplary Prior Art Disclosures
	equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11.

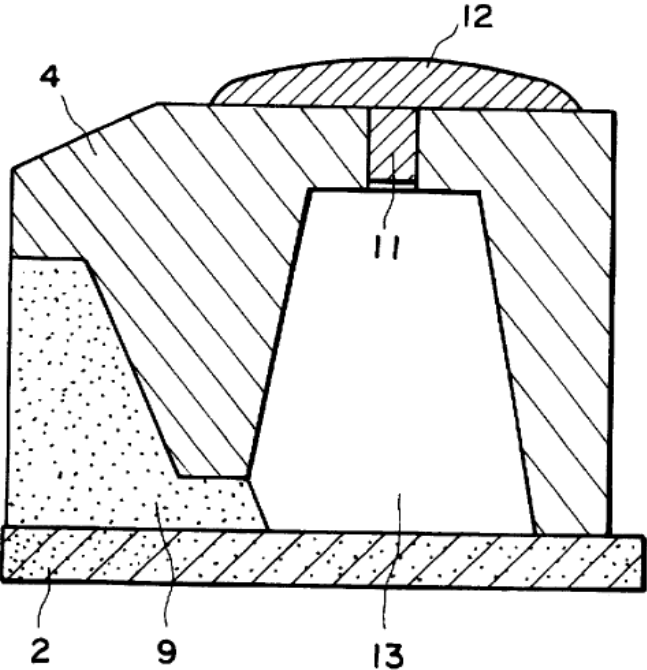
Asserted Claim Element	Exemplary Prior Art Disclosures
	“FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below. 

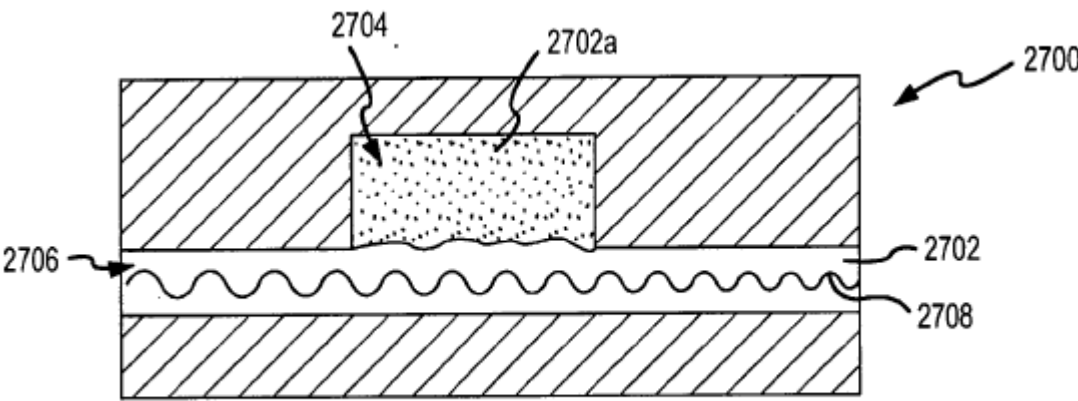
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2
(iii) dampening or absorbing the pressure pulse using a first reservoir in fluid communication with the microfluidic flow channel,	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada “Furthermore, the computer also typically includes an instruction set for flowing fluids from the third and the sixth microchannels into the first microchannel. Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:16-23. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

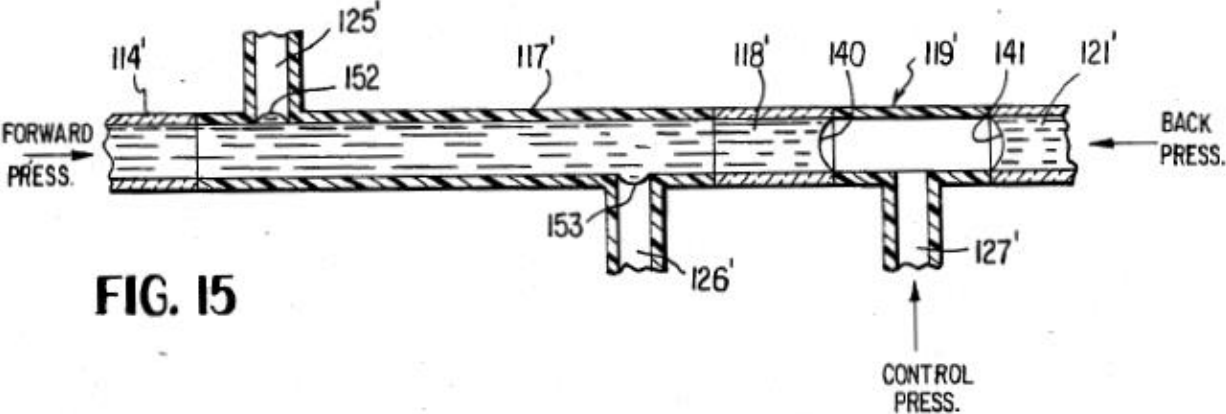
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one

Asserted Claim Element	Exemplary Prior Art Disclosures
	or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Otsuka “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57. “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 Chou “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “In addition, microfluidic devices of the present invention may comprise a damper which

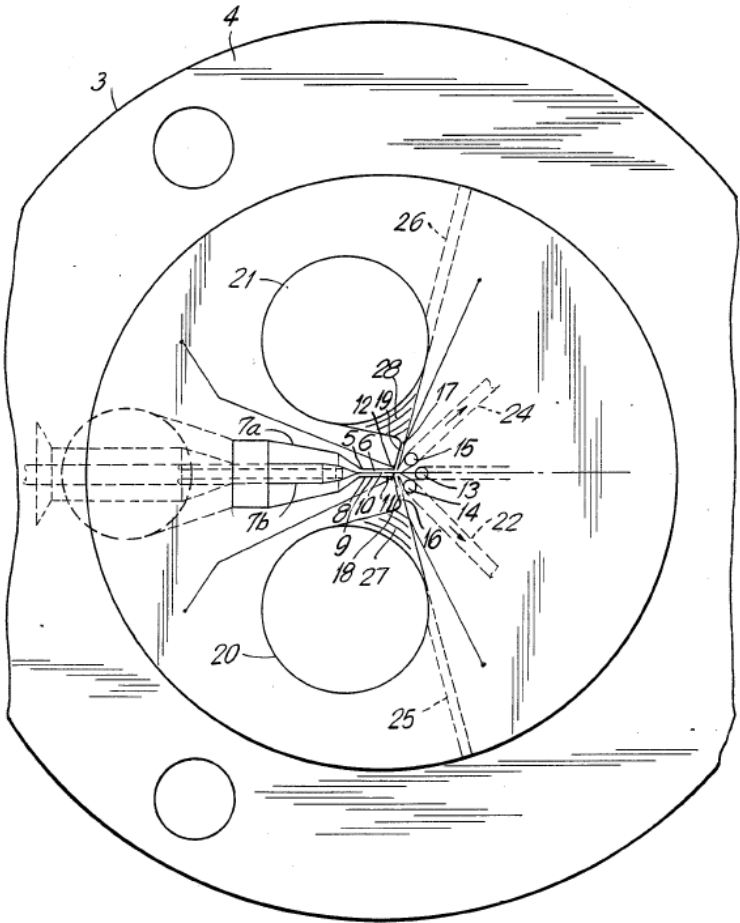
Asserted Claim Element	Exemplary Prior Art Disclosures
	reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “Figure 27 shows a cross-sectional view of yet another embodiment of a damper structure in accordance with the present invention, wherein damper structure 2700 comprises portion 2702a of flow channel 2702 having a larger cross-section, an upper region of portion 2702 being filled with air or some other type of fluid 2704. As material 2706 flowing through channel 2702 experiences pressure oscillations 2708 and eventually encounters damper 2700, energy is expended as material 2706 pushes against fluid 2704. This expenditure of energy serves to reduce the amplitude of energy of oscillation of material in the flow channel.” Chou, at 41:5-12; <i>see also</i> Fig. 27 below.  FIG.27

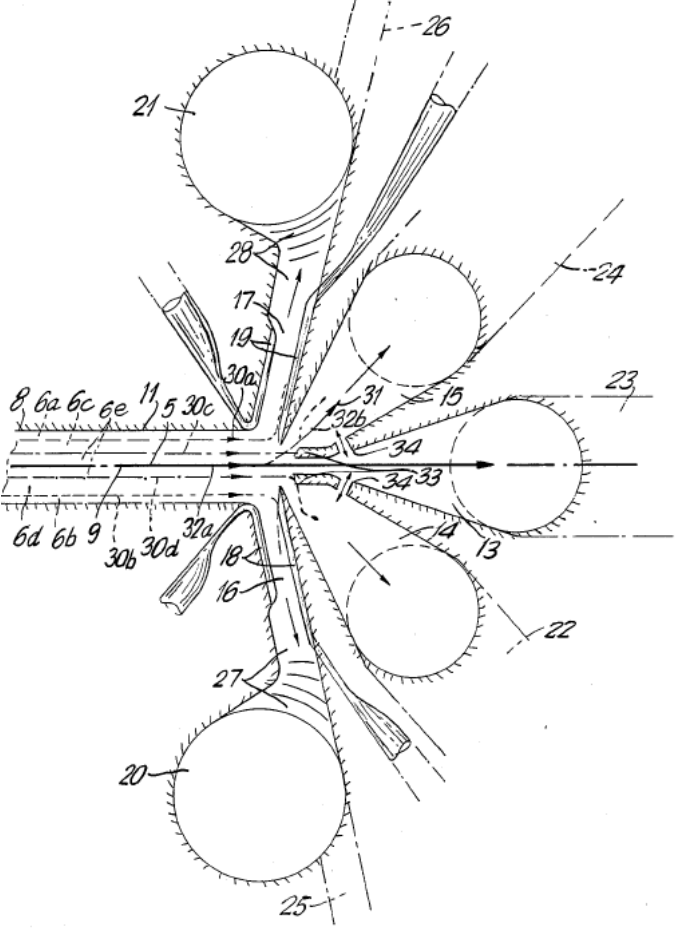
Asserted Claim Element	Exemplary Prior Art Disclosures
	Brown “In order to pump out the volumetric chamber 117, exogenous control fluid pressure is introduced as is indicated in FIG. 14 through the capillary passage 125 while the control valve 119 is opened by venting its capillary passage 127 as indicated. Both of these capillaries 125 and 127 are connected with suitable sources of control fluid having pressure control means associated therewith. It will be noted that in this embodiment, the capillary 126 is always vented to permit proper operation during filling so that it, in effect, is a passive element whose presence is nevertheless essential. The control fluid introduced at 125 forms a stabilized interface 128 at the downstream end of the necked down portion 115 and thereby prevents backflow of the control fluid therebeyond, i.e., a valving action is effected. The interface 130 is already present at the mouth of the capillary 126 where it joins the pump chamber so that as the principal fluid is being expelled from the pump chamber by the travelling interface 129, the only flow path for the principal fluid is through the necked down portion 118.” Brown, at 10:44-64; <i>see also</i> Fig. 14 below. “FIG. 15 shows the volumetric chamber 117’ after complete filling thereof under capillary

Asserted Claim Element	Exemplary Prior Art Disclosures
	action, the control fluid being vented both at 125' and 126' at this time so that no exogenous control fluid pressure is functional to prevent this capillary action." Brown, at 11:14-18; <i>see also</i> Fig. 15 below.  FIG. 15 Zöld “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the

Asserted Claim Element	Exemplary Prior Art Disclosures
	particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the

Asserted Claim Element	Exemplary Prior Art Disclosures
	middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary labeled 3. Inside, there are two large circular regions labeled 21 and 20. A central assembly includes a component labeled 7a, which is connected to a series of lines and components labeled 12, 19, 5, 17, 24, 15, 13, 14, 22, 16, 18, 27, 9, 8, 10, 11, 6, and 25. A dashed line labeled 26 is also shown. The entire device is surrounded by a region labeled 4.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

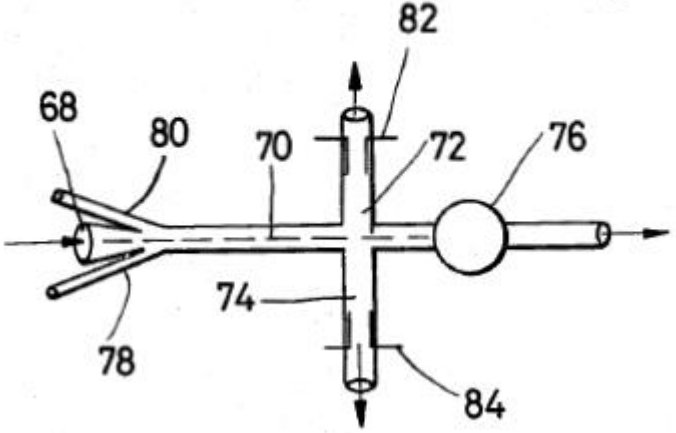
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite

Asserted Claim Element	Exemplary Prior Art Disclosures
	side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

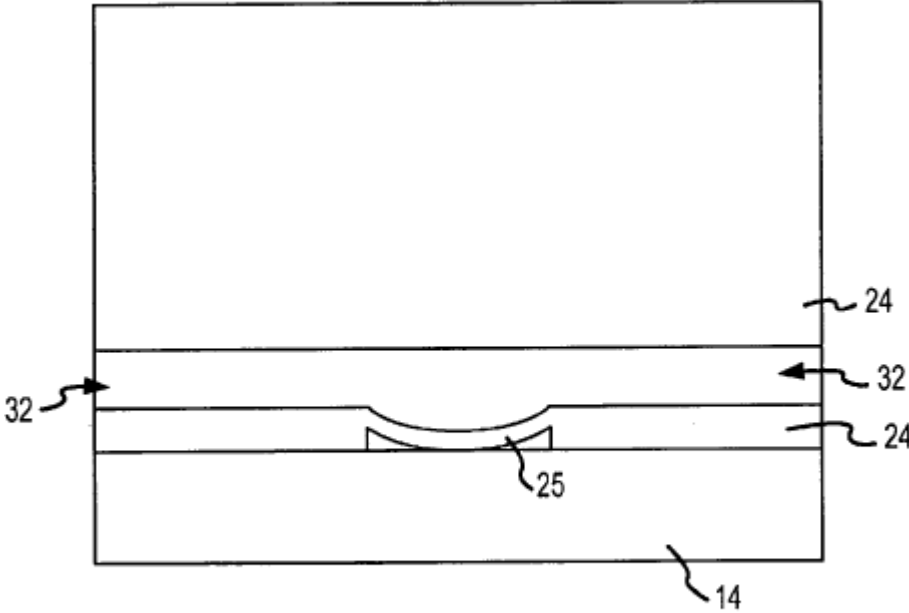
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig1

Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7  The diagram illustrates a fluidic system with a central horizontal main channel 70. On the left, a particle 68 is shown entering the channel. Two side channels, 72 (top) and 74 (bottom), branch off from the main channel. A detector 76 is located downstream of the side channels. Other components labeled include 80 (a nozzle or inlet on the left), 78 (a small opening or sensor near the nozzle), 82 (a vertical tube or channel above the main channel), and 84 (a vertical tube or channel below the main channel). Arrows indicate the flow direction from left to right.
(iv) wherein the pressure pulse is used to sort one or more particles suspended within the sample.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

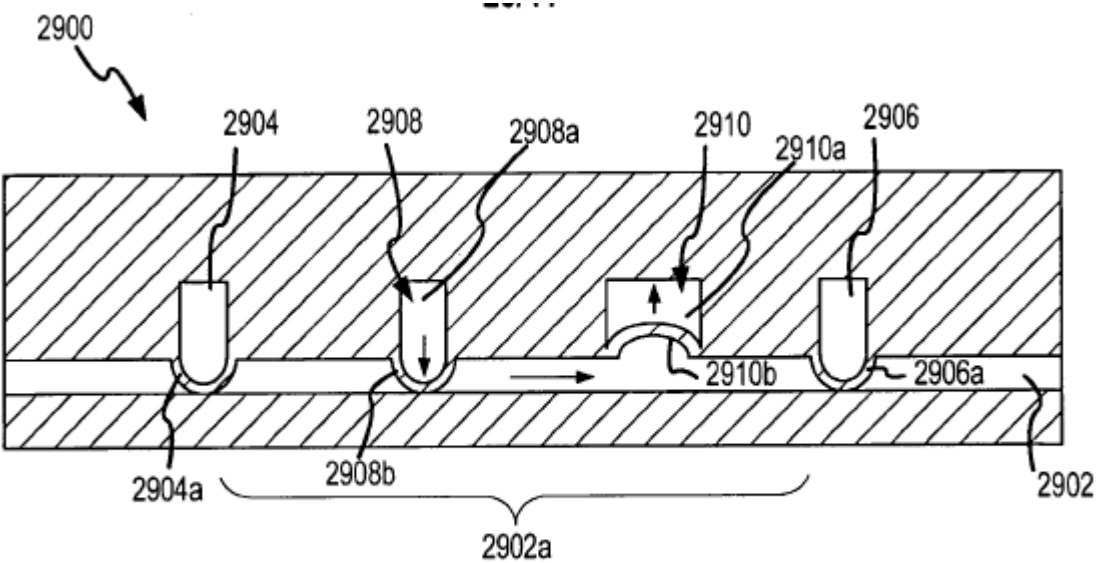
Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

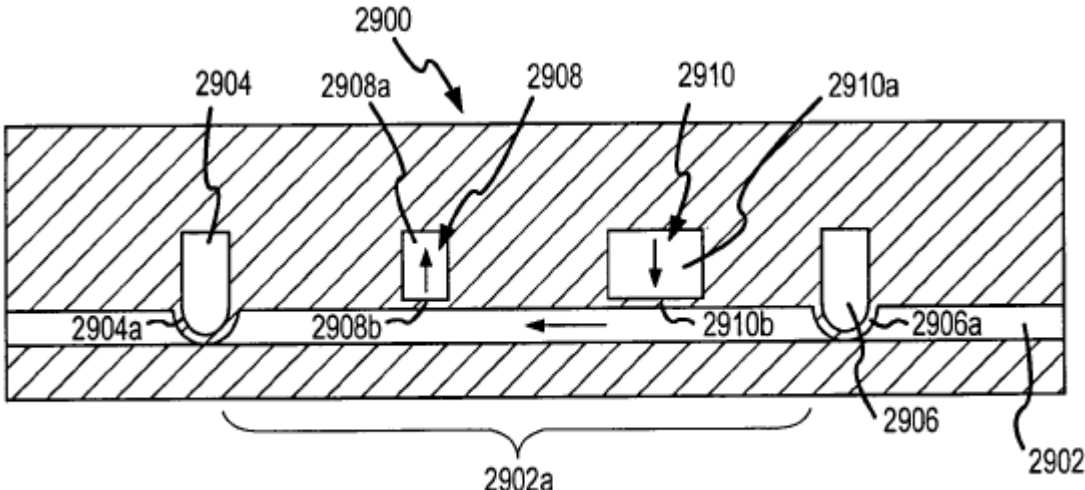
Asserted Claim Element	Exemplary Prior Art Disclosures
	The diagram illustrates a microfluidic device. At the top, there are two circular input chambers, each labeled 2312. These chambers are connected to a central vertical channel. On the left side of this central channel, there is a component labeled 2306. On the right side, there is a component labeled 2310. A dashed line runs vertically through the center of the channel, representing a flow path or interface. Along this path, there are several small circles, some solid black and some hollow white. A component labeled 2308 is located on the right side of the central channel. Below the central channel, there is a horizontal channel labeled 2302, which has arrows indicating flow direction. A component labeled 2304 is located on the left side of this horizontal channel. The entire device is bounded by a vertical channel labeled 2300 at the bottom, with arrows indicating flow direction. Chou “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device

Asserted Claim Element	Exemplary Prior Art Disclosures
	employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

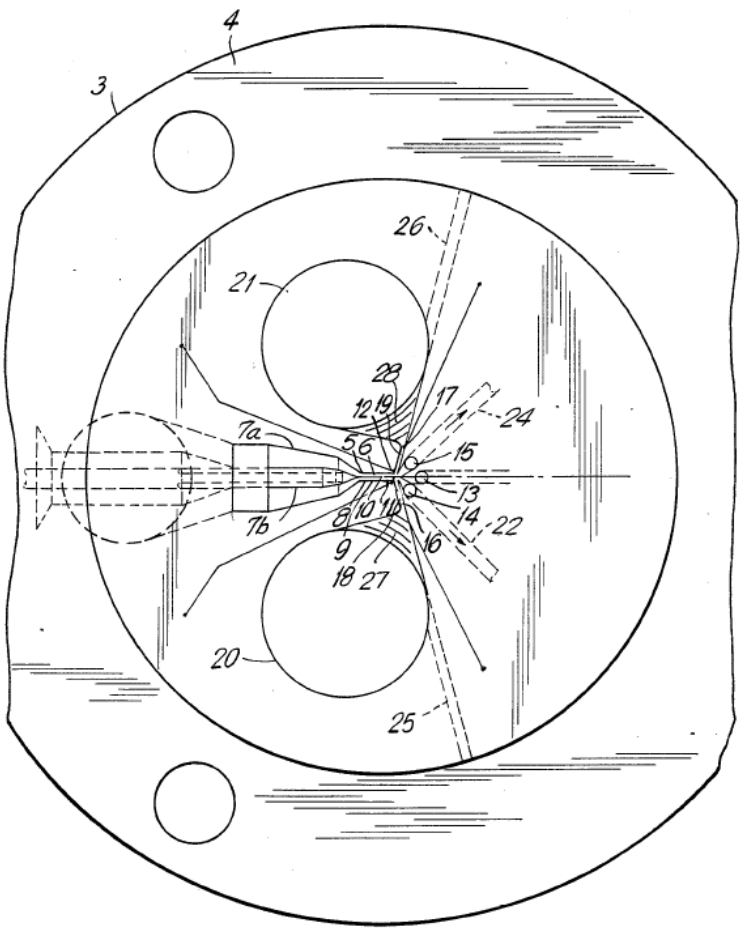
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either

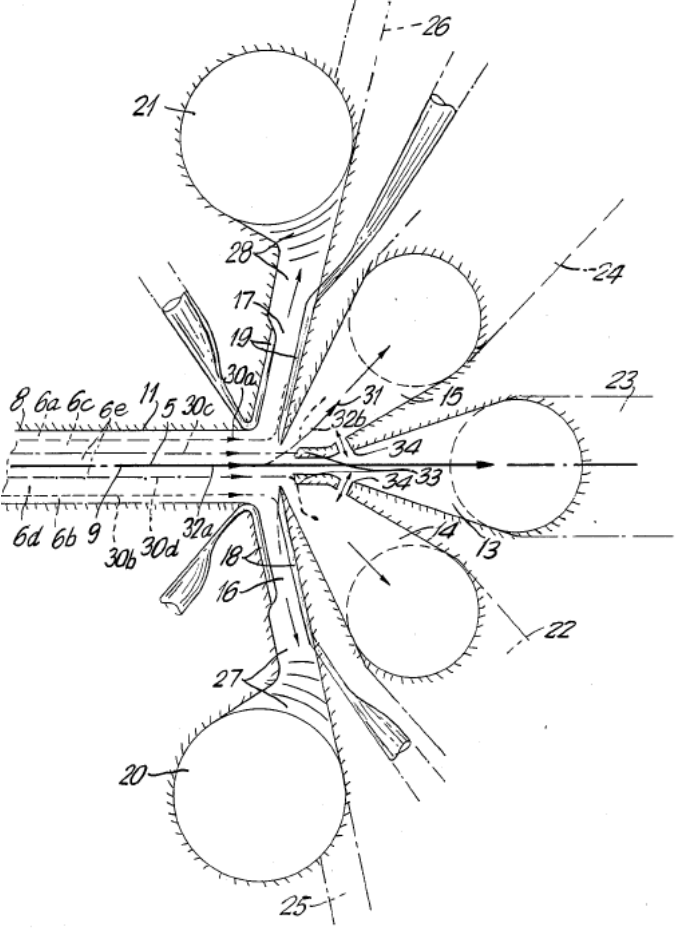
Asserted Claim Element	Exemplary Prior Art Disclosures
	or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is

Asserted Claim Element	Exemplary Prior Art Disclosures
	first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. Zöld “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte,

Asserted Claim Element	Exemplary Prior Art Disclosures
	flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of

Asserted Claim Element	Exemplary Prior Art Disclosures
	the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.  FIG. 1

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

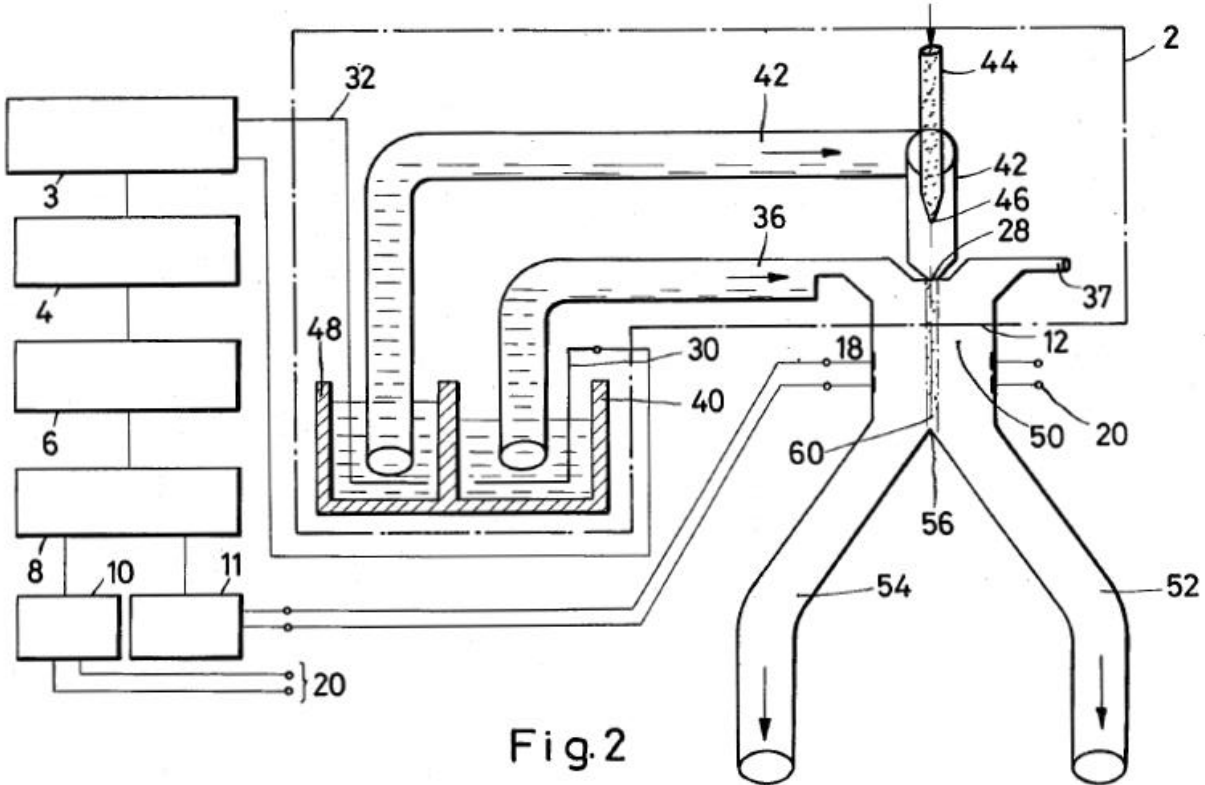
Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30.

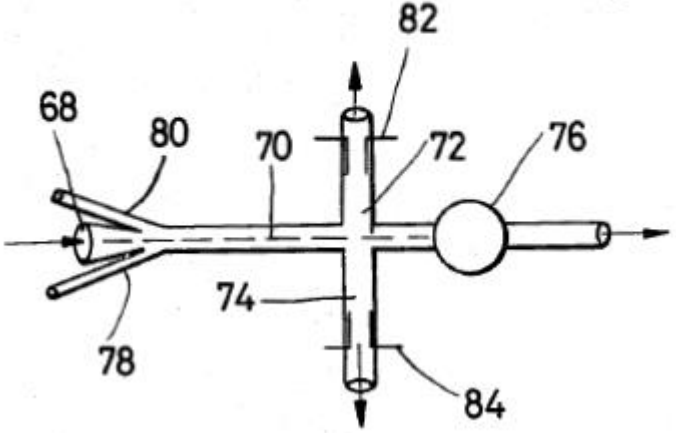
Asserted Claim Element	Exemplary Prior Art Disclosures
	Zöld 662 “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this

Asserted Claim Element	Exemplary Prior Art Disclosures
	manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle

Asserted Claim Element	Exemplary Prior Art Disclosures
	groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below. Fig1

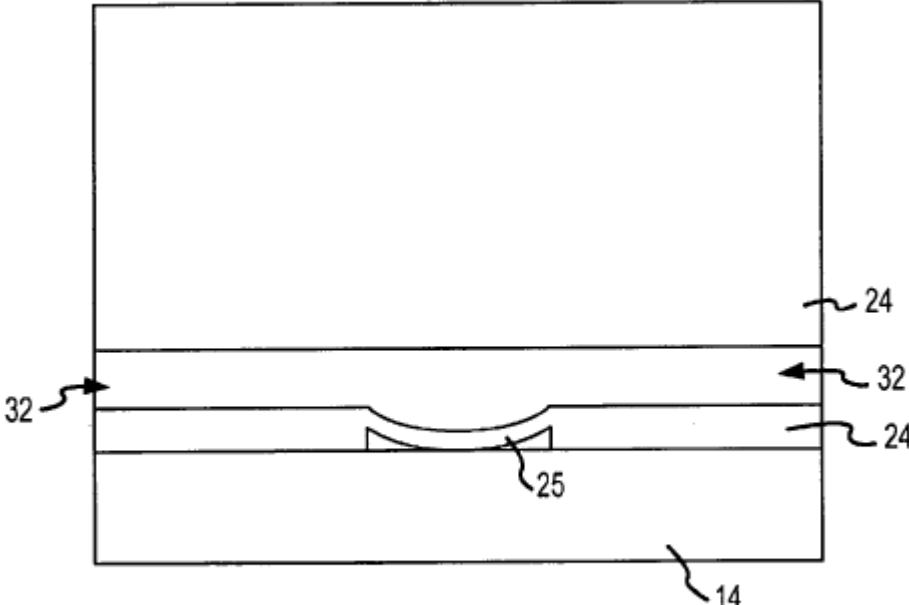
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2 “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively. The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such

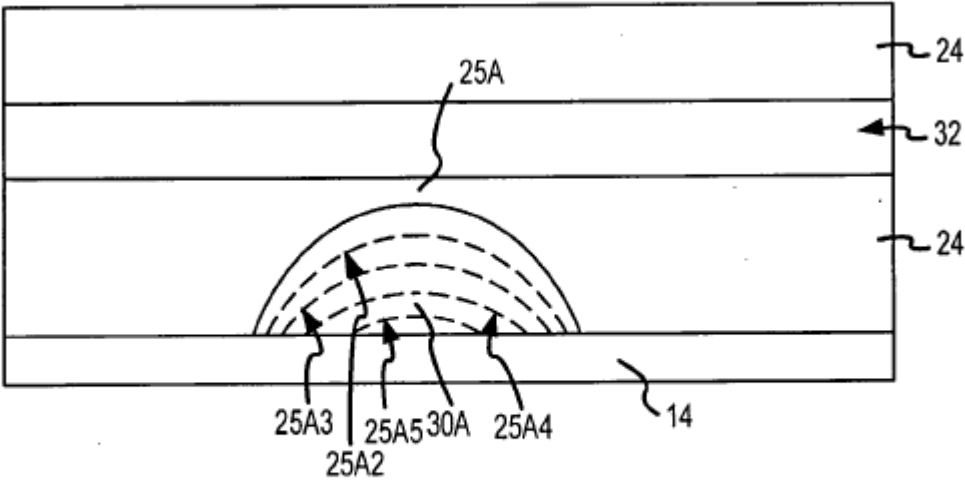
Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7  The diagram illustrates a fluidic system. A horizontal main channel 70 is shown. On the left, a particle 68 is entering the channel. Two side channels, 72 (top) and 74 (bottom), branch off from the main channel. A detector 76 is located downstream of the side channels. Other components labeled include 80 (a constriction or valve in the main channel), 78 (a side channel inlet), 82 (a vertical tube or probe), and 84 (a vertical tube or probe). Arrows indicate the direction of flow.
[2] The method of claim 1, wherein the pressure pulse is used to selectively control or otherwise affect the flow of the sample through the flow channel.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada The Wada disclosures in each limitation of claim 1 are incorporated by reference. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	The diagram illustrates a microfluidic system. At the top, two circular chambers (2312) are shown, each containing a set of particles (2306 on the left, 2310 on the right). These chambers are connected by a narrow channel (2308). Below this channel is a mixing region (2302) where the particles from both chambers meet. A dashed line indicates the path of the particles as they mix. Below the mixing region is a larger chamber (2304) which contains a mixture of particles (2300). Arrows indicate the flow of particles from the top chambers into the mixing region and then into the bottom chamber. Chou The Chou disclosures in each limitation of claim 1 are incorporated by reference.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

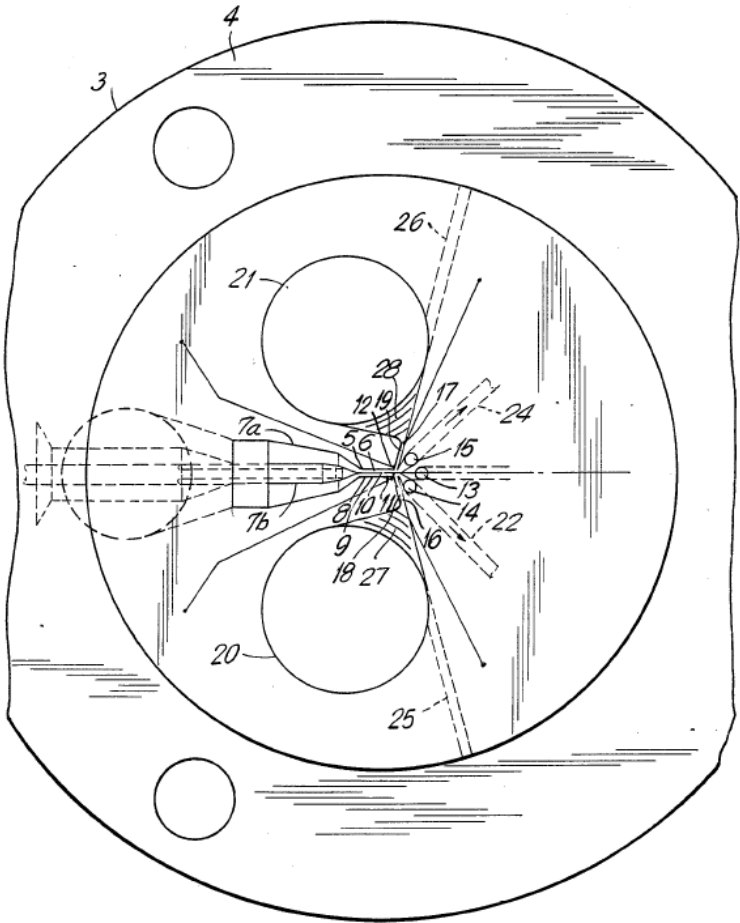
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 7H “In the alternate preferred embodiment of Fig. 11, flow channel 30a has a curved upper wall 25A. When flow channel 32 is pressurized, membrane portion 25 will move downwardly to the successive positions shown by dotted lines 25A2, 25A3, 25A4 and 25A5, with edge portions of the membrane moving first into the flow channel, followed by top membrane portions. An advantage of having such a curved upper surface at membrane 25A is that a more complete seal will be provided when flow channel 32 is pressurized. Specifically, the upper wall of the flow channel 30 will provide a continuous contacting edge against planar substrate 14, thereby avoiding the "island" of contact seen between wall 25 and the bottom of flow channel 30 in Fig. 10. Another advantage of having a curved upper flow channel surface at membrane 25A is that the membrane can more readily conform to the shape and volume of the flow channel in

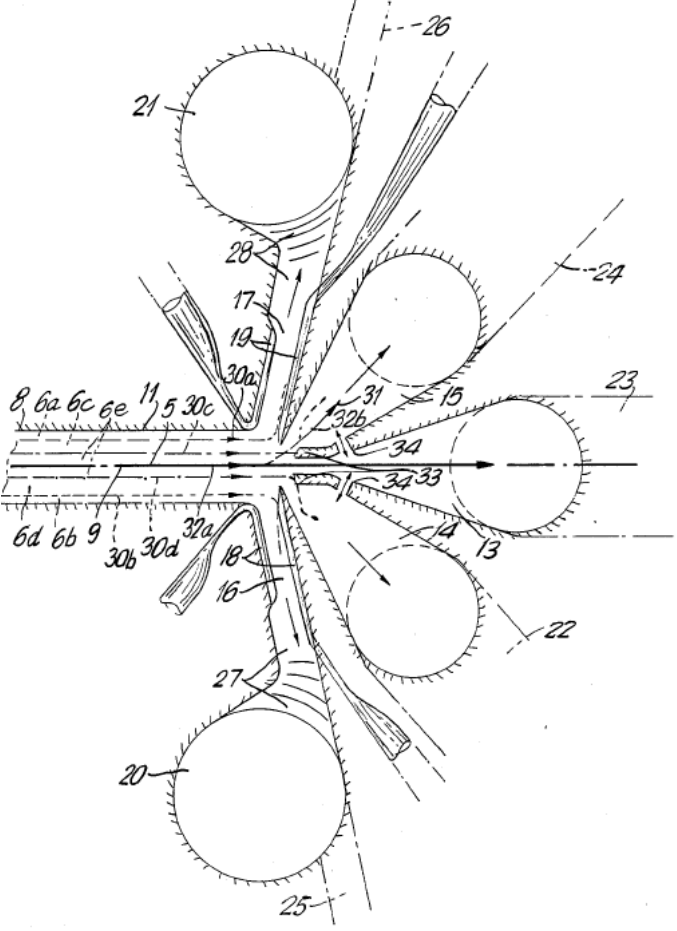
Asserted Claim Element	Exemplary Prior Art Disclosures
	response to actuation. Specifically, where a rectangular flow channel is employed, the entire perimeter (2x flow channel height, plus the flow channel width) must be forced into the flow channel. However where an arched flow channel is used, a smaller perimeter of material (only the semi-circular arched portion) must be forced into the channel. In this manner, the membrane requires less change in perimeter for actuation and is therefore more responsive to an applied actuation force to block the flow channel.” Chou, at 24:17-34; <i>see also</i> Fig. 11 below.  FIG.11 “In addition to pressure based actuation systems described above, optional electrostatic and magnetic actuation systems are also contemplated, as follows. Electrostatic actuation can be accomplished by forming oppositely charged electrodes (which will tend to attract one another when a voltage differential is applied to them) directly into the monolithic elastomeric structure. For example, referring to Fig. 7B, an optional first electrode 70 (shown in phantom) can be positioned on (or in) membrane 25 and an optional second electrode 72 (also shown in phantom)

Asserted Claim Element	Exemplary Prior Art Disclosures
	can be positioned on (or in) planar substrate 14. When electrodes 70 and 72 are charged with opposite polarities, an attractive force between the two electrodes will cause membrane 25 to deflect downwardly, thereby closing the "valve" (i.e.: closing flow channel 30). For the membrane electrode to be sufficiently conductive to support electrostatic actuation, but not so mechanically stiff so as to impede the valve's motion, a sufficiently flexible electrode must be provided in or over membrane 25. Such an electrode may be provided by a thin metallization layer, doping the polymer with conductive material, or making the surface layer out of a conductive material. In an exemplary aspect, the electrode present at the deflecting membrane can be provided by a thin metallization layer which can be provided, for example, by sputtering a thin layer of metal such as 20 nm of gold." Chou, at 26:9-26. "Referring first to Figs. 12A and 12B, a schematic of flow channels 30 and 32 is shown. Flow channel 30 preferably has a fluid (or gas) flow F passing therethrough. Flow channel 32, (which crosses over flow channel 30, as was already explained herein), is pressurized such that membrane 25 separating the flow channels may be depressed into the path of flow channel 30, shutting off the passage of flow F therethrough, as has been explained." Chou, at 28:18-23. "Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc." Chou, at 28:27-33. "As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 30.” Chou, at 31:13-20. “Many types of active structures may be present in the nonelastomer substrate. Active structures that could be present in an underlying hard substrate include, but are not limited to . . . actuators (including electrostatic, magnetic, electromagnetic, bimetallic, piezoelectric, shape-memory-alloy based, and others).” Chou, at 36:22-31. Zöld The Zöld disclosures in each limitation of claim 1 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this

Asserted Claim Element	Exemplary Prior Art Disclosures
	electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary (3) and an inner boundary (4). Inside, there are two large circular regions (21 and 20) and a central area with various components labeled with numbers: 28, 12, 19, 17, 24, 15, 13, 14, 22, 16, 18, 27, 25, 26, 7a, 7b, 8, 10, 11, 5, 6, 9. Dashed lines indicate internal structures and connections.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

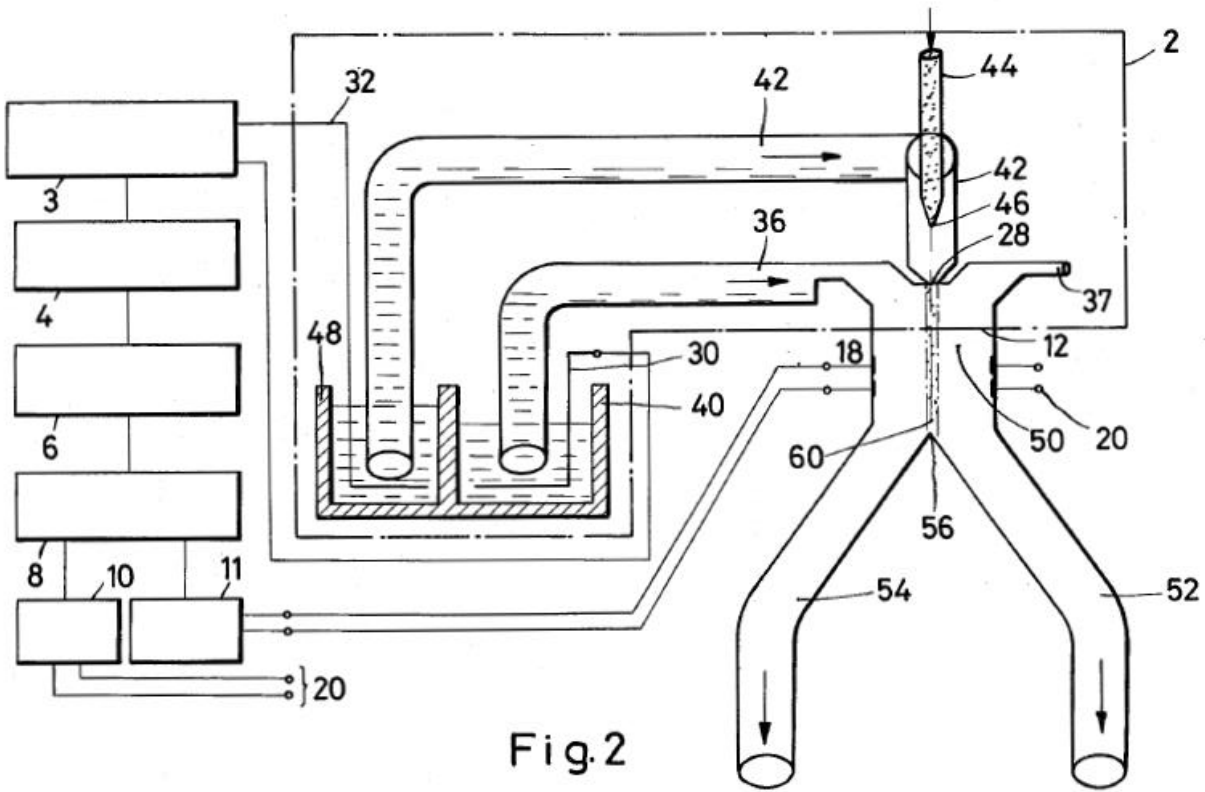
Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30.

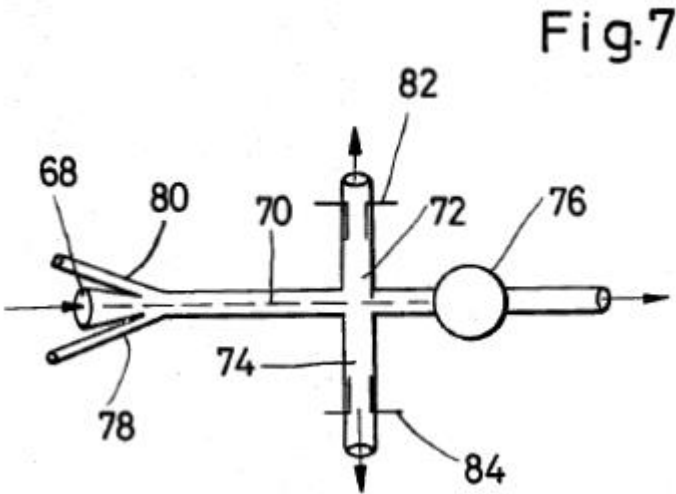
Asserted Claim Element	Exemplary Prior Art Disclosures
	Zöld 662 The Zöld 662 disclosures in each limitation of claim 1 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the

Asserted Claim Element	Exemplary Prior Art Disclosures
	right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the

Asserted Claim Element	Exemplary Prior Art Disclosures
	side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture." Zöld 662, at 4:55-5:10. "In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance." Zöld 662, at 5:54-6:11. "FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; see also Figs. 1 and 2 below. Fig.1

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig.2 “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively.

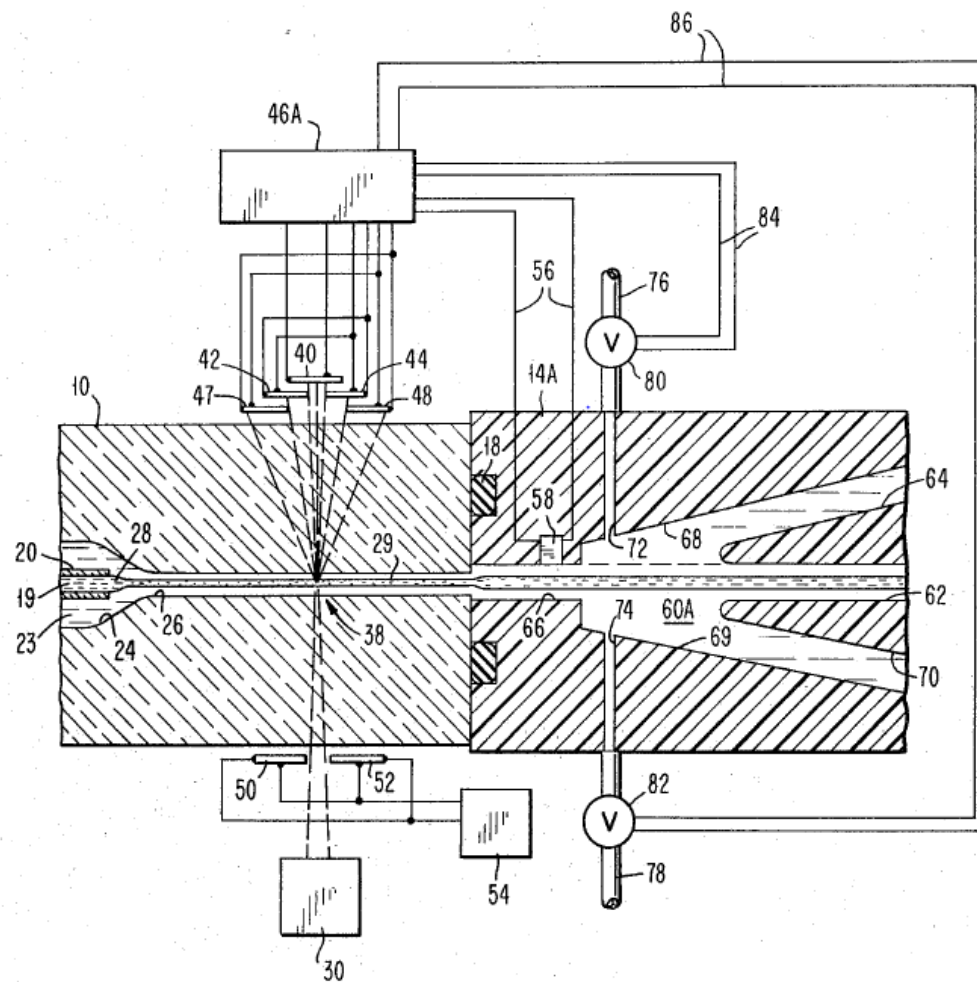
Asserted Claim Element	Exemplary Prior Art Disclosures
	The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below.  Fig.7
[3] The method of claim 1, wherein the first reservoir includes a gas pocket, wherein compression of the gas facilitates the dampening or absorbing of the pressure pulse.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Friedman The Friedman disclosures in each limitation of claim 1 are incorporated by reference. “For instance, in FIG. 2, three outlet ports are provided from the switching chamber and it will be understood that photoelectric sort detectors, such as elements 69 and 83, may be employed for each of those three outlet ports. FIG. 2 illustrates an alternative embodiment of the invention in which the switching chamber 60 is modified as shown at 60A, in a modified fluidic amplifier housing 14A, to provide an additional outlet port 70 and added control ports 72 and 74. A control fluid under pressure may be supplied to the switching chamber 60A through the control ports 72 and 74 through the respective supply lines 76 and 78 under the control of electromagnetically operated valves 80 and 82.” Friedman, at 8:53-67; <i>see also</i> Fig. 2 below.

Asserted Claim Element

Exemplary Prior Art Disclosures

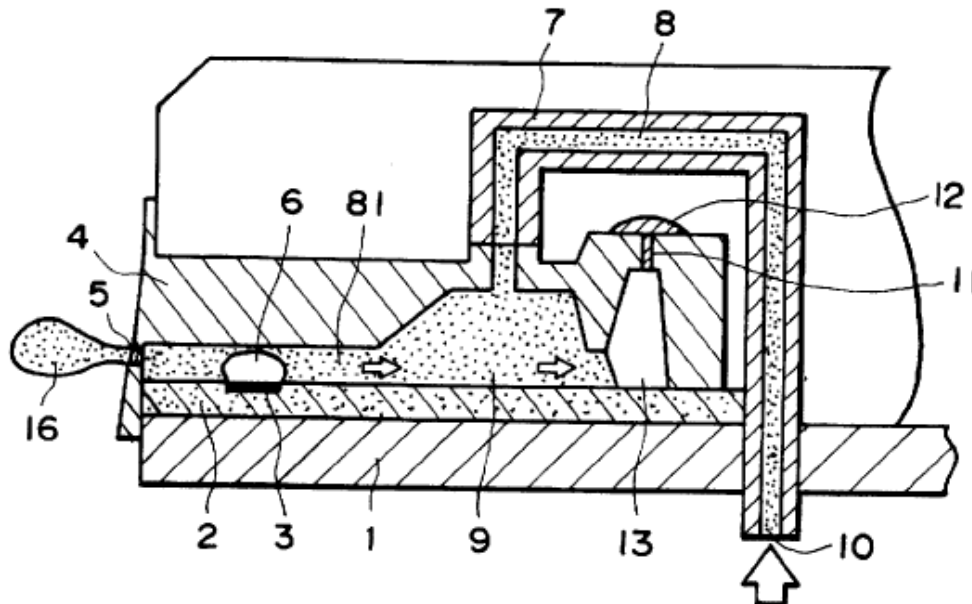
FIG. 2



Asserted Claim Element	Exemplary Prior Art Disclosures
	“As illustrated in the drawing, the opposite walls 68 and 69 of the switching chamber 60A are essentially equidistant from the nozzle formed by the inlet 66. Accordingly, they are equally capable of displaying the wall attachment effect in the presence of turbulence in the liquid stream, as previously described above. Thus, just as the wall attachment effect to wall 68 directs the liquid stream to outlet port 64, the wall attachment effect at wall 69 leads the fluid stream to the outlet port 70. Once established at one wall, the wall attachment effect will be maintained and will hold the stream to one of these two walls, and thus direct the stream to one of these two outlet ports, as long as turbulence continues. In order to determine which direction the stream will take, a signal must be supplied from one of the control ports 72 or 74. If the signal takes the form of a supply of control fluid under pressure, it has the effect of shifting the stream away from the wall adjacent to the control port and over to the opposite wall. Thus, if control fluid is supplied to the switching chamber 68 through the control port 74, the supply of fluid destroys the low pressure bubble at the wall 69, causing the stream to shift to the opposite wall 68. A similar, but opposite effect is available if a vacuum is applied at the control port 74. This reduces the pressure at the wall 69, tending to increase the wall attachment at the wall 69 and to switch the device so that the liquid stream is pulled away from the wall 68 and to the wall 69 and to the port 70. The embodiment of FIG. 2 is capable of several different alternative modes of operation. For instance, if the switching chamber 60A is fabricated in an asymmetrical form such that the wall 68 is substantially closer to the nozzle formed by the inlet 66 than the wall 69, then without any control signals at the control ports 72 and 74, the switching action will be identical to that described above for the embodiment of FIG. 1. Thus, if a signal is supplied to the transducer 58, the resulting turbulence will cause the stream to attach to the wall 68 and to be directed to port 64. In the absence of a signal at transducer 58, the laminar flow will continue, and the stream will be directed through the outlet port 62.” Friedman, at 9:3-45. “The switching fluid used at the ports 72 and 74 should be compatible with the liquid in the main stream, but it need not be identical to that liquid. Thus, where the liquid in the main stream is water, the switching fluid may be water, or air, or some other compatible fluid.” Friedman, at 10:45-50. “As illustrated in the simplified schematic diagram of FIG. 3, additional fluidic amplifier switches may be employed downstream from the fluidic amplifier switch of the system of FIG. 1, or in that of FIG. 2. This provides the possibility of still further sorting and segregation of particles on a single pass through the apparatus. The downstream fluidic amplifiers may also be connected to receive control signals from circuits 46. FIG. 3, at the left side, illustrates in simplified schematic form an

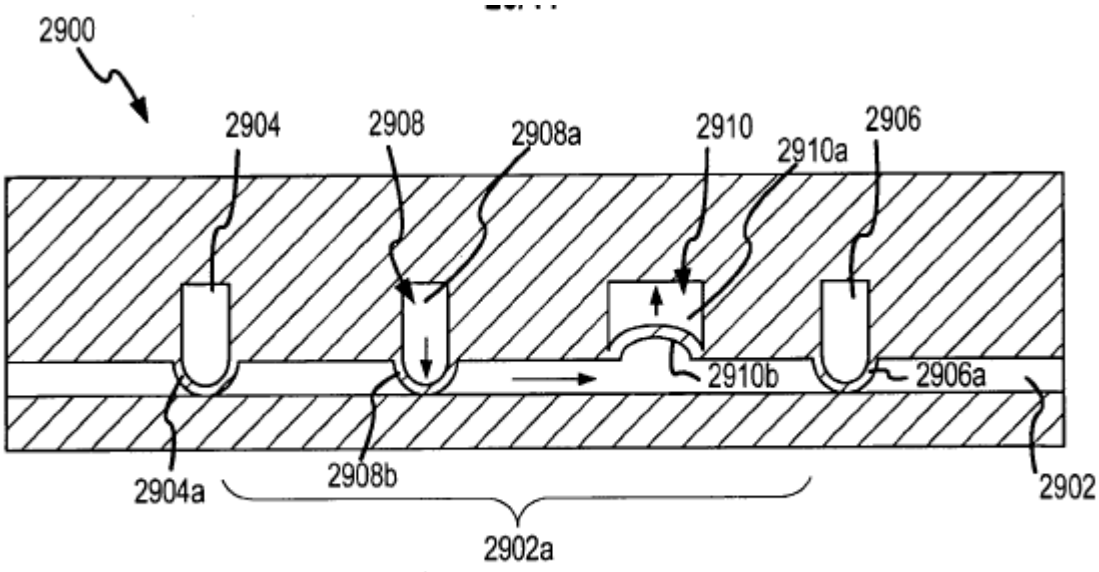
Asserted Claim Element	Exemplary Prior Art Disclosures
	apparatus corresponding to the apparatus of FIG. 2, with corresponding parts correspondingly numbered. The main stream outlet port 62 is connected to a second fluidic amplifier switch housing 114 which may correspond exactly in structure and operation with the fluidic switch contained within the housing 14 and described above in connection with FIG. 1. The fluidic switch 114 responds to a signal from circuits 46 on a connection indicated at 146 through a delay circuit 149 and a gate circuit 151 to control a signal from an oscillator 153 to a transducer within the switch housing 114. By this means, particles which were not sorted and segregated in the first fluidic amplifier within housing 14, and diverted to the outlet port 64, continue on through the port connection 62, through the switch 114, and may be sorted and segregated according to a second particle characteristic into an outlet port 164. If the particles are not so segregated, they continue on in the main stream outlet port 162 from the housing 114. Thus, FIG. 3 illustrates the principle that a plurality of fluidic amplifier switches may be controlled to accomplish several sorting operations based on signals obtained from a single optical chamber 10.” Friedman, at 11:33-65; <i>see also</i> Fig. 3 below. FIG. 3 Otsuka

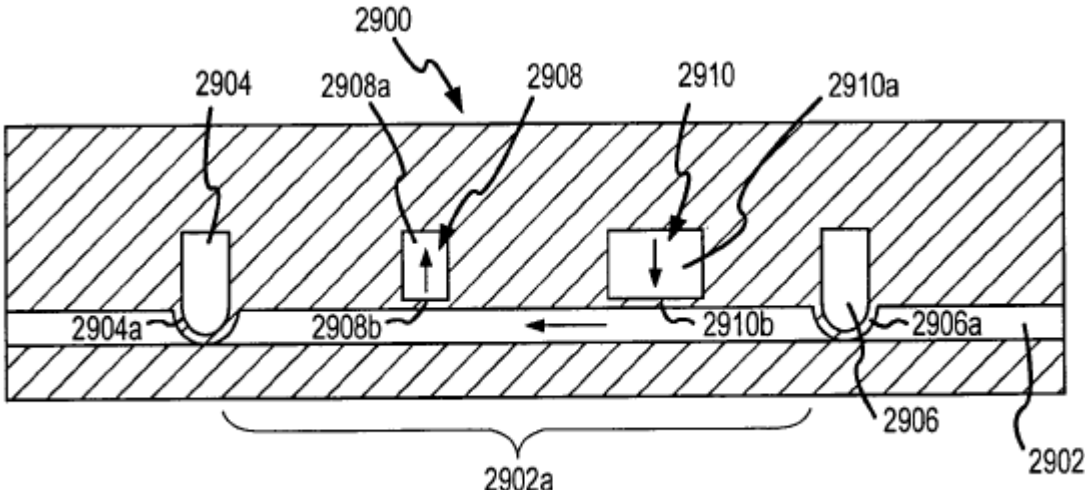
Asserted Claim Element	Exemplary Prior Art Disclosures
	The Otsuka disclosures in each limitation of claim 1 are incorporated by reference. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	A cross-sectional diagram of a microfluidic device. The device consists of a base layer (2) with a channel (9) and a central structure (11) with a top cap (12). A side wall (4) is also shown. FIG. 2 Chou The Chou disclosures in each limitation of claim 1 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b

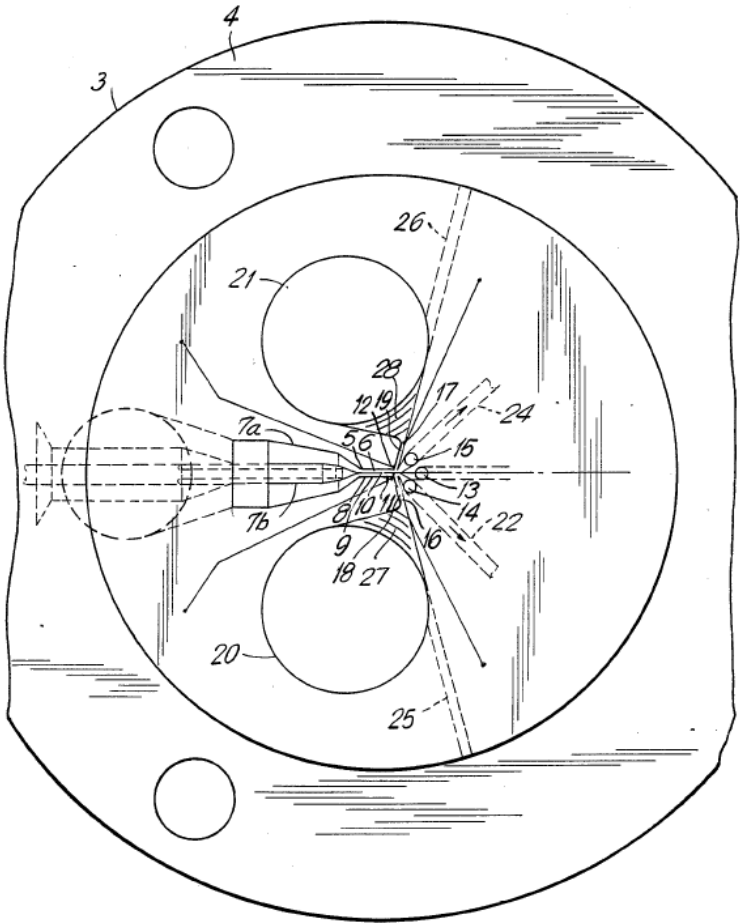
Asserted Claim Element	Exemplary Prior Art Disclosures
	relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

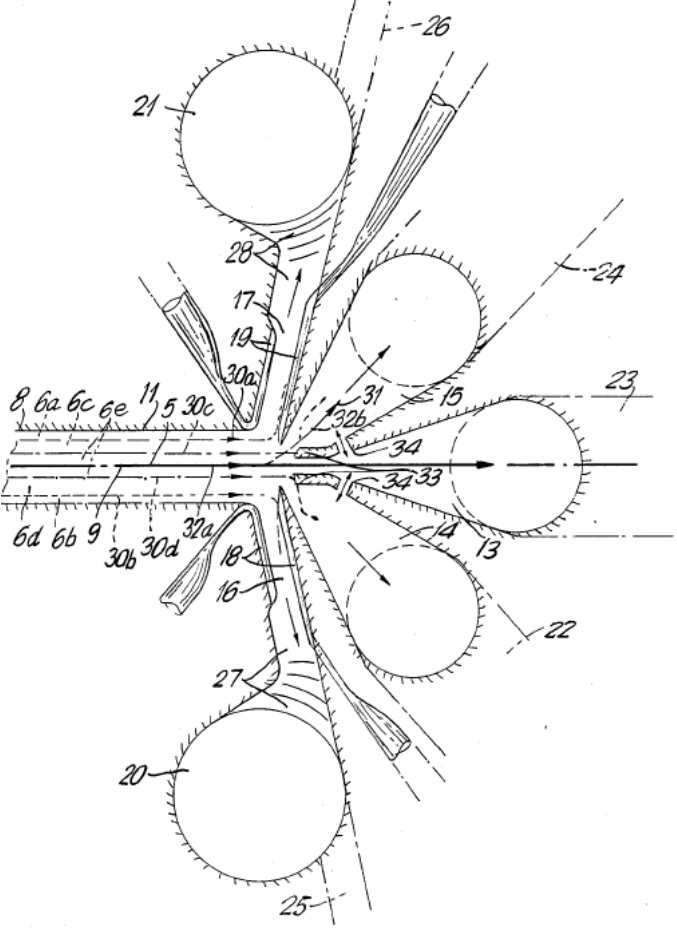
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B
[4] The method of claim 1, wherein the first reservoir includes a resilient wall for facilitating dampening or absorbing of the pressure pulse.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada The Wada disclosures in each limitation of claim 1 are incorporated by reference. “In preferred aspects, the bottom portion of the device comprises a solid substrate that is substantially planar in structure, and which has at least one substantially flat upper surface. A variety of substrate materials may be employed as the bottom portion. Typically, because the devices are microfabricated, substrate materials will be selected based upon their compatibility with known microfabrication techniques, e.g., photolithography, wet chemical etching, laser

Asserted Claim Element	Exemplary Prior Art Disclosures
	ablation, air abrasion techniques, injection molding, embossing, and other techniques. The substrate materials are also generally selected for their compatibility with the full range of conditions to which the microfluidic devices are typically exposed, including extremes of pH, temperature, salt concentration, and application of electric fields. Accordingly, in some preferred aspects, the substrate material optionally includes materials normally associated with the semiconductor industry in which such microfabrication techniques are regularly employed, including, e.g., silica based substrates, such as glass, quartz, silicon or polysilicon, as well as other substrate materials, such as gallium arsenide and the like.” Wada, at 38:18-31. “In additional preferred aspects, the substrate materials will comprise polymeric materials, e.g., plastics, such as polymethylmethacrylate (PM-MA), polycarbonate, polytetrafluoroethylene (TEFLON™), polyvinylchloride (PVC), polydimethylsiloxane (PDMS), polysulfone, polystyrene, polymethylpentene, polypropylene, polyethylene, polyvinylidene fluoride, ABS (acrylonitrile-butadiene-styrene copolymer), and the like.” Wada, at 39:3-8. Chou The Chou disclosures in each limitation of claim 1 are incorporated by reference. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane,

Asserted Claim Element	Exemplary Prior Art Disclosures
	preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “The damper is separated from the fluid flow channel by a thin membrane. Preferably this thin membrane has sufficient elasticity to deflect "upward" when a fluid having a peak of sinusoidal wave-like passes underneath. In this manner, some of the fluid oscillation energy is absorbed by the damper, thereby reducing the height (i.e., peak) of fluid oscillation. Typically, the thickness of the membrane between the damper and the fluid flow channel depends on a variety of factors including the depth and width of the flow channel, the amount of fluid oscillation produced by the pump and the elasticity (i.e., the material) of the membrane. One of ordinary skill in the art can readily determine the proper membrane thickness to achieve a desired attenuation of fluid oscillation depending on a desired application and materials used.” Chou, at 40:10-19. Zöld The Zöld disclosures in each limitation of claim 1 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a

Asserted Claim Element	Exemplary Prior Art Disclosures
	value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary 3. Inside, there are two large circular regions, 21 (top) and 20 (bottom). A central assembly includes a horizontal component 7a and 7b, and a vertical component 5. Various other parts are labeled with numbers: 4, 12, 19, 17, 24, 15, 13, 14, 22, 16, 18, 27, 25, 26, and 28. Dashed lines indicate internal structures and connections.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

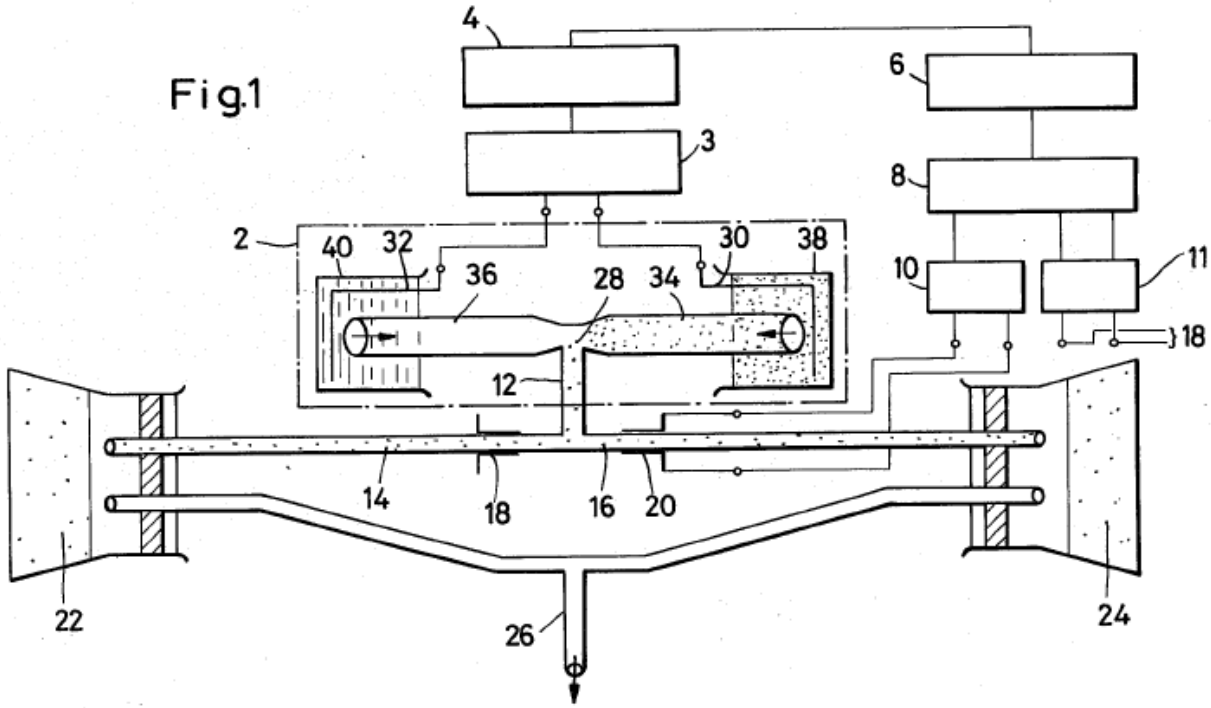
Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

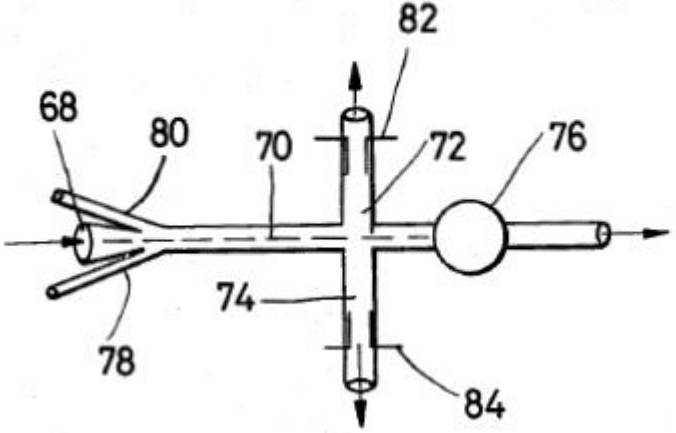
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld disclosures in each limitation of claim 1 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of

Asserted Claim Element	Exemplary Prior Art Disclosures
	more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly

Asserted Claim Element	Exemplary Prior Art Disclosures
	before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by

Asserted Claim Element	Exemplary Prior Art Disclosures
	letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

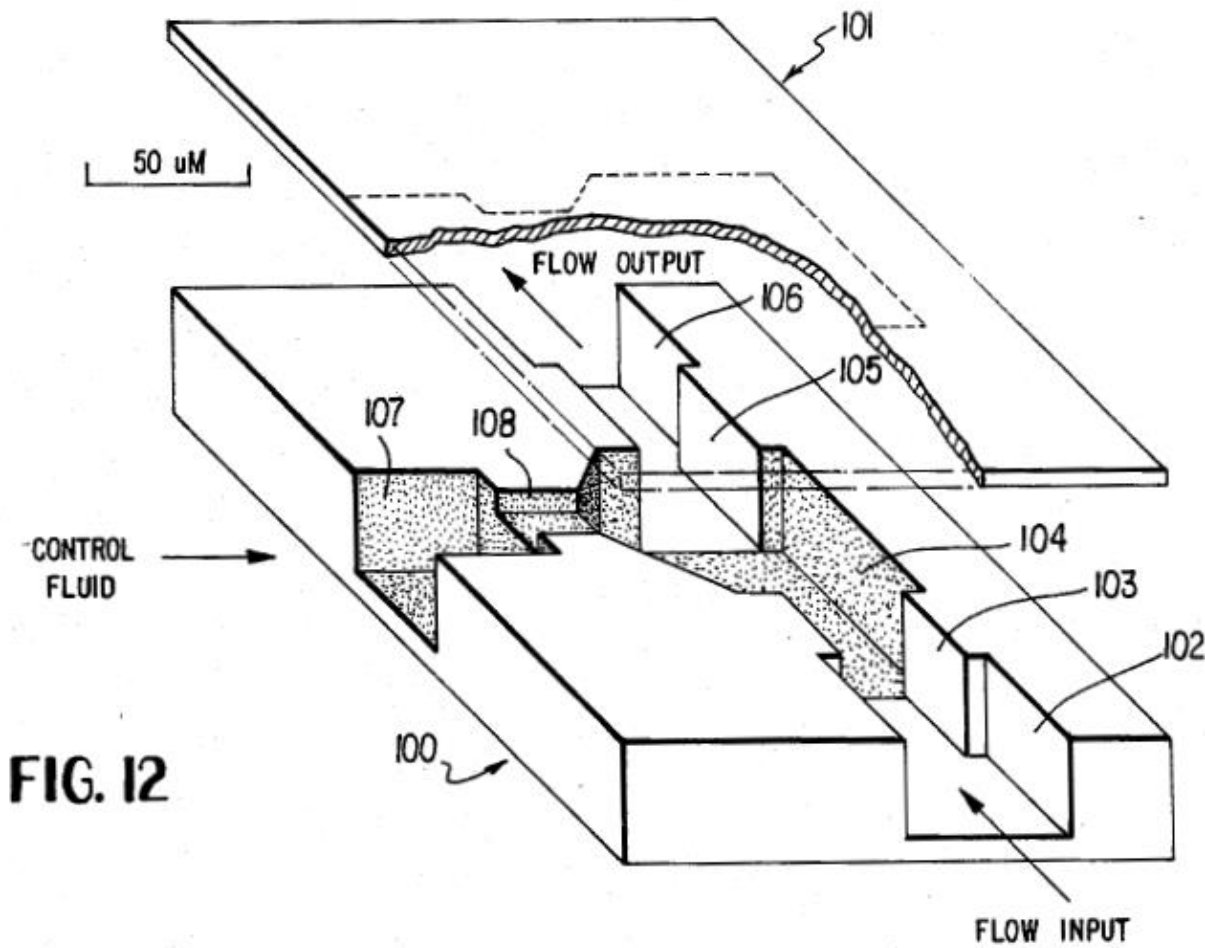
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig1  The diagram, labeled Fig 1, illustrates a complex system. At the top center is a rectangular block (2) containing two sub-components, 12 and 16. To the left of block 2 is a vertical assembly with components 40, 32, and 36. To the right is another vertical assembly with components 30, 34, and 38. Above block 2 are blocks 4 and 3, and to the right are blocks 6, 8, 10, and 11. Below block 2 is a horizontal structure with components 14, 18, 16, and 20. At the bottom are components 22, 24, and 26. The entire system is interconnected by a network of lines representing connections or conduits.

Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7  35 U.S.C. § 112 The Patent Act requires that “[t]he specification shall contain a written description of the invention.” 35 U.S.C. § 112, ¶ 1; <i>see also Ariad Pharm., Inc. v. Eli Lilly and Co.</i>, 598 F.3d 1336, 1344-45 (Fed. Cir. 2010) (en banc). “[T]he test for sufficiency [of a written description] is whether the disclosure of the application relied upon reasonably conveys to those skilled in the

Asserted Claim Element	Exemplary Prior Art Disclosures
	art that the inventor had possession of the claimed subject matter as of the filing date. . . . [P]ossession as shown in the disclosure is a more complete formulation.” <i>Ariad Pharm.</i>, 598 F.3d at 1351 (internal citations omitted). “To fulfill the written description requirement, a patent specification must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that ‘the inventor invented the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood v. Am. Airlines, Inc.</i>, 107 F.3d 1565, 1572, and <i>In re Gosteli</i>, 872 F.2d 1008, 1012 (Fed. Cir. 1989)). “Thus, an applicant complies with the written description requirement ‘by describing the invention, with all its claimed limitations, not that which makes it obvious,’ and by using ‘such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood</i>, 107 F.3d at 1572); <i>see also In re Curtis</i>, 354 F.3d 1347, 1355 (Fed. Cir. 2004) (affirming a finding of invalidity for lack of written description by BPAI where “unpredictability in performance of certain species or subcombinations other than those specifically enumerated [in the disclosure]” was present (internal quotations omitted)). “Compliance with the written description requirement is essentially a fact-based inquiry that will ‘necessarily vary depending on the nature of the invention claimed.’” <i>Enzo Biochem</i>, 323 F.3d at 963, 63 USPQ2d at 1613. Satisfying the written description requirement is a question of fact that must be decided on a case-by-case basis. <i>Vas-Cath, Inc. v. Mahurkar</i>, 935 F.2d at 1563, 19 USPQ2d at 1116 (Fed. Cir. 1991). Moreover, “[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.” 35 U.S.C. § 112 (emphasis added). “To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without ‘undue experimentation’.” <i>Genentech, Inc. v. Novo Nordisk A/S</i>, 108 F.3d 1361, 1365, (Fed. Cir. 1997) (quoting <i>In re Wright</i>, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). During prosecution of the ’797 patent, to overcome a rejection by the examiner over Friedman, Plaintiff argued that “Friedman fails to disclose, teach or suggest a first reservoir which includes ‘resilient properties for dampening or absorbing a pressure pulse,’ as recited in the claim

Asserted Claim Element	Exemplary Prior Art Disclosures
	(Applicants note that the requirement that the first reservoir include resilient properties is a structural requirement which must be substantively addressed by the Examiner). Indeed, control ports 72 and 74 and associated fluid pathways in Friedman are not disclosed as having resilient properties.” ’797 patent file history, Response to non-final Office Action filed February 24, 2014, at 8. However, no degree of dampening is indicated in the claim. Any polymer structure would naturally dampen pressure to some degree, for example high stiffness materials such as glass or metals would dampen to a lesser degree as to more flexible polymer structures. The term “resilient” is only used in the ’797 patent specification in the context of a bubble valve with a resilient wall or a compressible gas. See ’797 patent at 12:18-22; 12:28-32. Thus, claim 4 is invalid for failure to provide adequate written description to enable a person of ordinary skill in the art to make and use a device having a first reservoir with “a resilient wall for facilitating dampening or absorbing the pressure pulse” without undue experimentation.
[5] A microfluidic device adapted to facilitate analysis or processing of a sample, the microfluidic device comprising:	To the extent the preamble of the independent claims are found to be limiting, the following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Brown Brown discloses a microfluidic device as shown in Figs. 1 and 2 below.

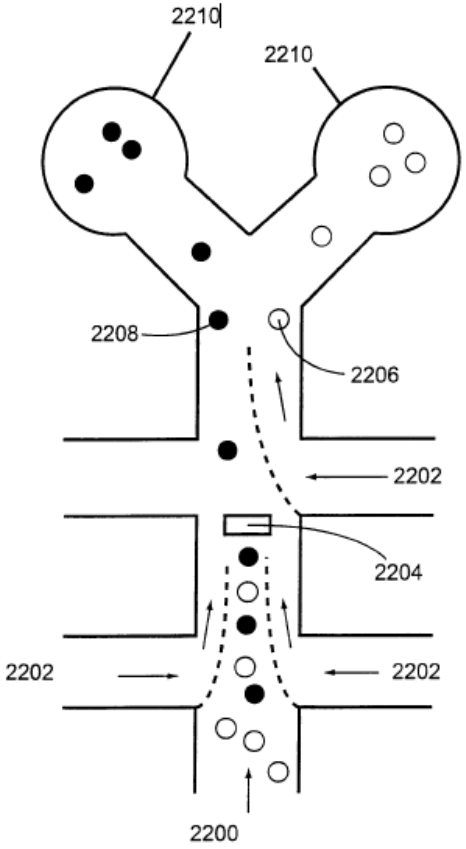
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 1 The diagram illustrates a fluid system. A pump (12) is connected to a water reservoir (18) through a line (16). The pump's output (14) feeds into a rectangular unit (10) labeled 'SEE FIG. 2'. A line (20) exits the top of this unit. A second line (26) connects the bottom of unit 10 to a valve (24). The valve (24) features a vent (28) and is linked to an air compressor (22). A gauge (G) is positioned on the line connecting the valve to the air compressor. A double-headed arrow indicates a bidirectional flow path between the top of unit 10 and the valve assembly.

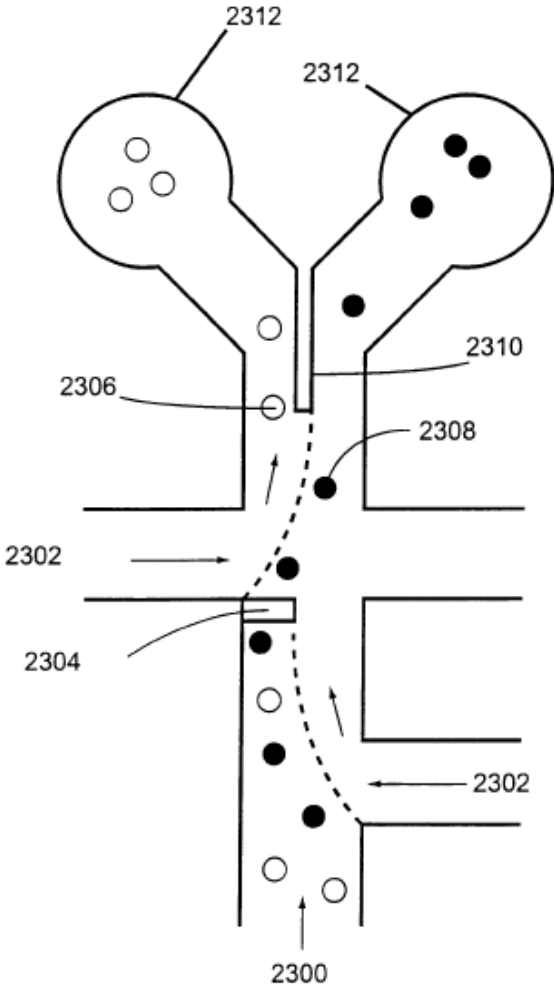
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 12 Chou “An embodiment of a microfluidic device in accordance with the present invention comprises pumps, valves, and fluid oscillation dampers.” Chou, at 2:23-24.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel.” Chou, at 3:1-4. Wada “The present invention relates to methods of focusing particles in microchannels, e.g., to improve assay throughput, to sort particles, to count particles, or the like.” Wada, at 3:13-15. “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity. Prior to performing the flowing step, the particles are optionally sampled with at least one capillary element, e.g., by dipping the capillary element into a well containing, the particles on a microwell plate and drawing the particles into, e.g., reservoirs, microchannels, or other chambers of the device. The particles (e.g., a cell, a set of cells, a microbead, a set of microbeads, a functionalized microbead, a set of functionalized microbeads, a molecule, a set of molecules, etc.) are optionally focused horizontally and/or vertically in the first microchannel to provide substantially uniform flow velocity to the particles in the first microchannel. Particles are optionally focused using one or more fluid direction components (e.g., a fluid pressure force modulator, an electrokinetic force modulator, a capillary force modulator, a fluid wicking element, or the like). Additional options include sorting, detecting or otherwise manipulating the focused particles.” Wada, at 3:22-4:5. Zöld “The subject invention pertains to the dispensing of fluids gases or aerosols in accordance with a preselected program, or the sorting or individual particles, such as cells, of a suspension in accordance with some of their individual physio-chemical properties, such as particle size, DNA and/or protein-content of a cell. Such a method and apparatus, therefore, is useful in cytology, for

Asserted Claim Element	Exemplary Prior Art Disclosures
	cell sorting and analysis, i.e., for example, in cancer research or for the dispensing of any fluids and/or gases.” Zöld, at 1:15-24. Zöld 662 “This invention is concerned with a method and device for the control of motion and especially for the sorting of particles of an electrolytic suspension, where the input flow path can be split up into several output channels leading to respective receptacles. This invention furthermore, is concerned with a sorting device in which by the production of gas particles or cells can be sorted out in accordance with their physical and/or chemical properties such as, particle (cell) size, DNA and/or content.” Zöld 662, at 1:5-14. Marcus “The present invention relates to a fluidic sorting device for the separation of two or more different materials or particles which are suspended in a fluid. The materials or particles to be separated may differ based on shape, texture, color, or any other visually distinctive characteristics. The particles may additionally differ in their visual reaction to an externally applied force, for example an electrostatic or magnetic field. The sorting device of the present invention comprises a fluidic logic element and a machine vision apparatus.” Marcus, at 1:12-22. Friedman “In carrying out the invention there is provided apparatus for sorting small particles such as biological cells while the particles are suspended in a liquid comprising a housing defining a detection chamber, means for moving the particle suspending liquid through said housing in a stream to convey the particles through the stream. A detection means is associated with said detection chamber for detecting differences in particle characteristics and operable to provide electrical signals which vary in accordance with said differences in particle characteristics. A digital fluidic amplifier is provided having an inlet connected to the outlet of said chamber to

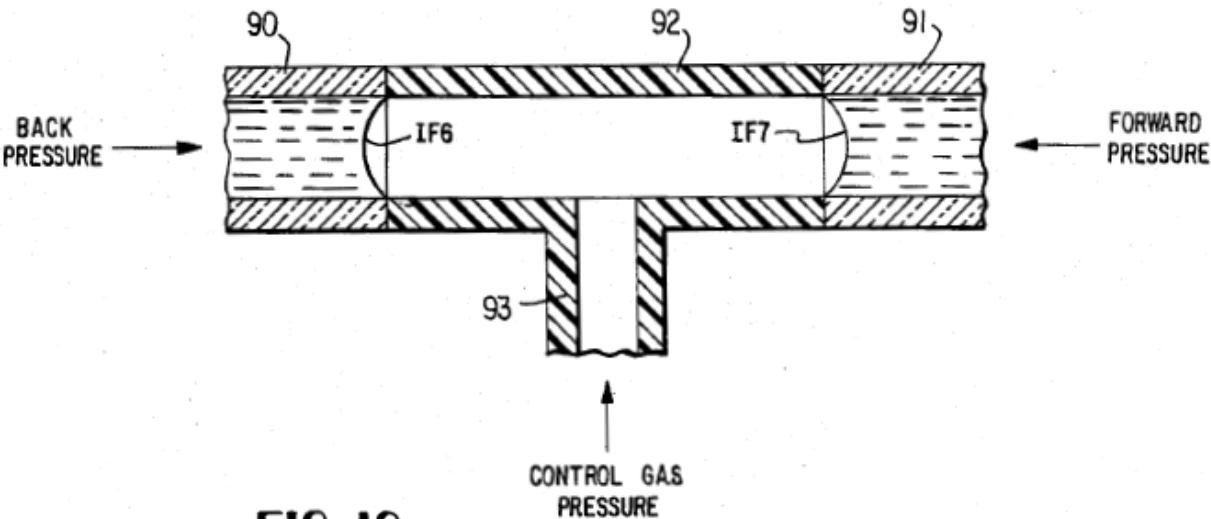
Asserted Claim Element	Exemplary Prior Art Disclosures
	receive the particle stream, said fluidic amplifier having a switching chamber communicating with said inlet and at least two different outlet ports communicating with said switching chamber, with an electrical transducer coupled to receive electrical signals from said detection means and operable to provide control signals to said fluidic amplifier. Said fluidic amplifier is operable in response to said control signals to switch the liquid particle carrying stream entering the inlet thereof from a first outlet port to a second selected outlet port in response to a predetermined particle characteristic control signal from said transducer.” Friedman, at 1:61-2:16.
(i) a microfluidic flow channel formed in a substrate, the flow channel having a width and a length that exceeds the width; and	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In exemplary embodiments, fluid passes through a channel of a desired cross-section (e.g., diameter) to enhance thermal transfer of energy from the current to the fluid. The channels are optionally formed on almost any type of substrate material such as, amorphous materials (e.g., glass, plastic, silicon), composites, multi-layered materials, combinations thereof, or the like.” Wada, at 21:1-5; <i>see also</i> Figs. 22-24 below.

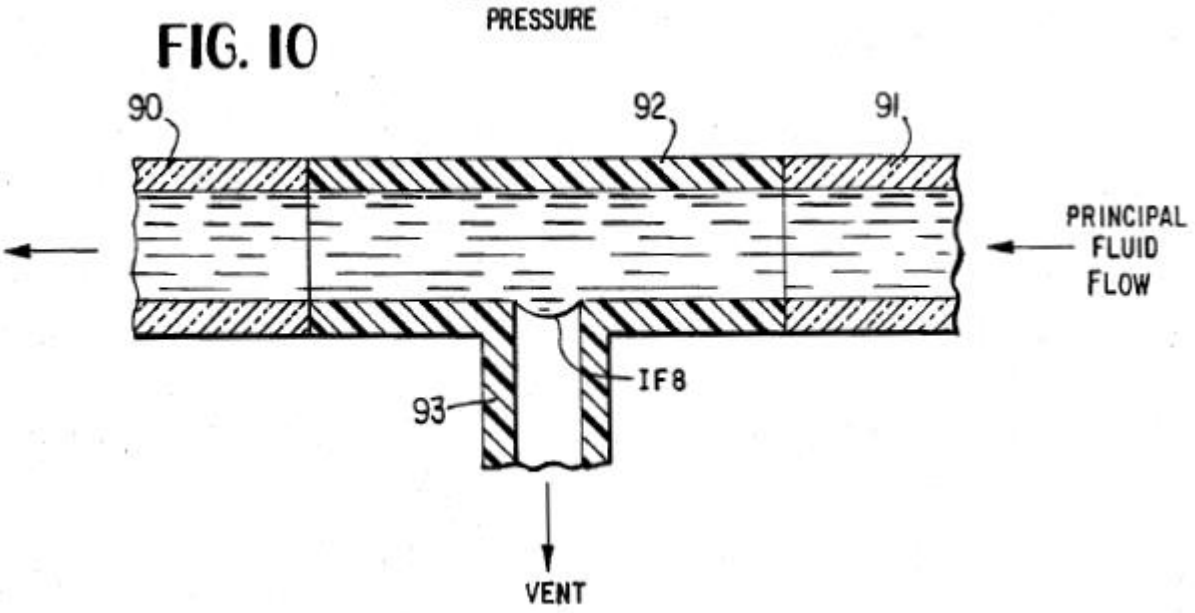
Asserted Claim Element	Exemplary Prior Art Disclosures
	 The diagram illustrates a microfluidic device with a central vertical channel. At the top, two circular reservoirs (2210) are connected to the channel. The left reservoir contains three black dots, and the right contains three white circles. A dashed line (2206) represents a mixing interface or boundary. Below this, a central channel (2200) is flanked by side chambers (2202). A small rectangular component (2204) is positioned in the central channel. Arrows indicate the flow of material from the reservoirs into the central channel and then downwards. Labels 2208 and 221d point to specific features near the top of the central channel. Fig. 22

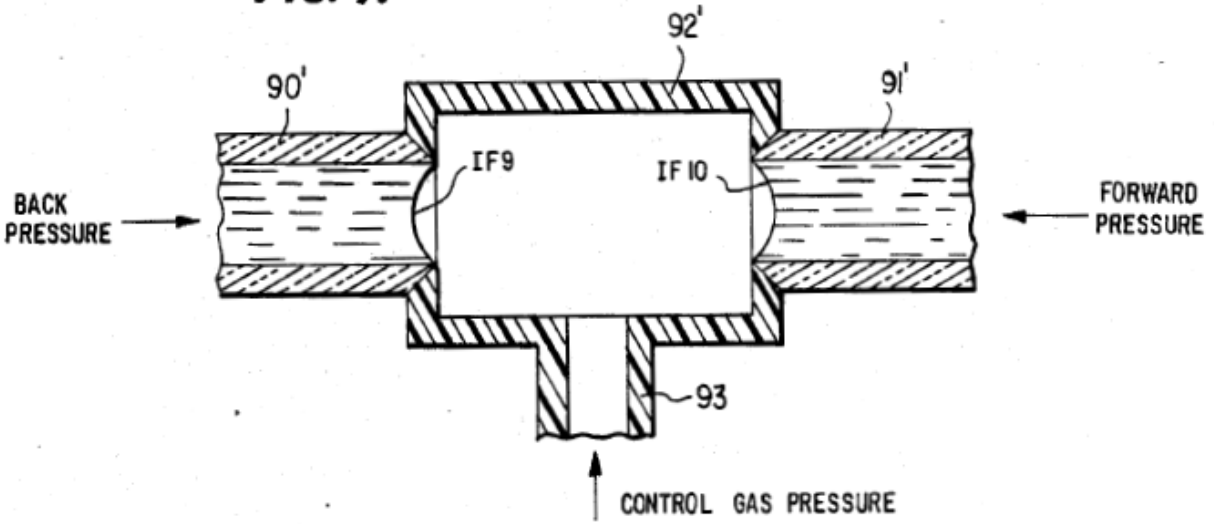
Asserted Claim Element	Exemplary Prior Art Disclosures
	 The diagram illustrates a microfluidic device (2300) with a central vertical channel. At the top, two side chambers (2312) are connected to the main channel. The left chamber contains three white circles, while the right chamber contains three black circles. The central channel is divided into sections by horizontal walls. A dashed line indicates a flow path or interface. Various components are labeled: 2302 points to horizontal walls on both sides; 2304 points to a small rectangular feature on the left wall; 2306 points to a white circle in the left section; 2308 points to a black circle in the right section; and 2310 points to a black circle in the right section. Arrows indicate the direction of flow, with some pointing upwards and others downwards. The bottom of the device is labeled 2300.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input

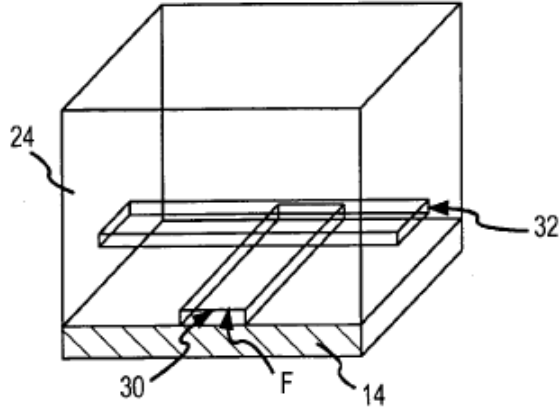
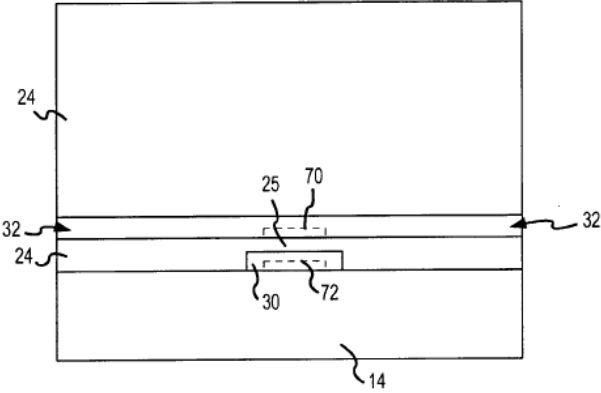
Asserted Claim Element	Exemplary Prior Art Disclosures
	flow port 2 through which a suspension containing particulate matter is forced.” Marcus, at 3:28-33; <i>see also</i> Fig. 1 below. FIG. 1 Brown Brown shows a microfluidic device comprising a microchannel (label 90 in Figs. 9-11) having an interior bounded by a sidewall (label 90). <i>See</i> Brown, Figs. 9-11 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 9  The diagram shows a cross-section of a device with a central horizontal tube. The left end of the tube is labeled 90 and contains a fluid chamber IF6. The right end is labeled 91 and contains a fluid chamber IF7. The central part of the tube is labeled 92. Below the central part, there is a vertical inlet labeled 93. Arrows indicate 'BACK PRESSURE' entering from the left, 'FORWARD PRESSURE' entering from the right, and 'CONTROL GAS PRESSURE' entering from the bottom into the vertical inlet 93.

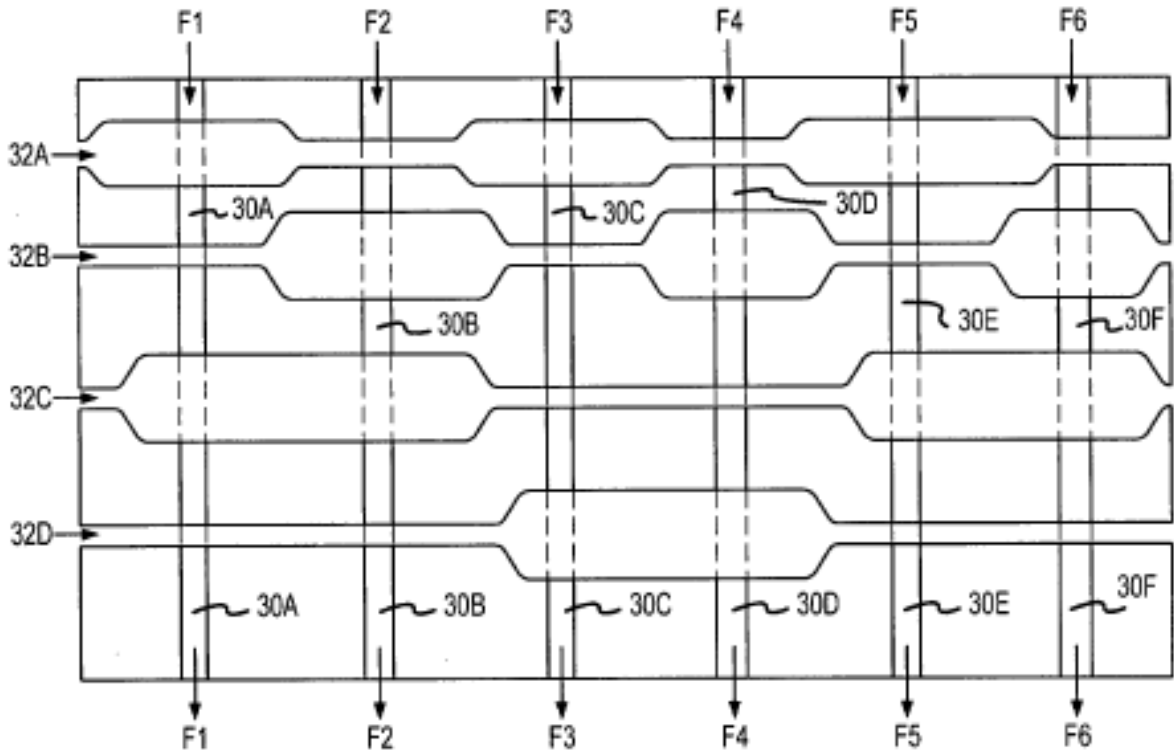
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 10  The diagram shows a cross-section of a device. A horizontal channel (92) is formed between a top wall (90) and a bottom wall (91). The channel contains fluid, indicated by horizontal lines. Arrows on either side of the channel point towards the left, labeled 'PRINCIPAL FLUID FLOW'. Above the channel, the word 'PRESSURE' is written. Below the channel, a vertical vent (93) is shown, leading to a larger vent (VENT). A label 'IF8' is positioned near the vent. The walls are shown with hatching to indicate they are solid.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 11  “In a particular embodiment of the invention, a device relates to capillary flow control and in particular to controlling such flow with respect to extremely small volumes of a principal fluid. By extremely small volumes of principal fluid, as used herein, is meant volumes which may be as small as in the order of one picoliter.” Brown, at 3:45-50. “FIGS. 9 and 10 show a control valve construction which is functionally equivalent to those shown in FIGS. 1-6, although, the principal fluid flow rate in this case is extremely small because all of the passages illustrated in FIGS. 9 and 10 are of capillary size.” Brown, at 8:33-37. Friedman “Referring more particularly to FIG. 1, there is shown an optical chamber formed by a glass tube member 10 which is clamped by means not shown to a digital fluidic switch chamber housing

Asserted Claim Element	Exemplary Prior Art Disclosures
	member 14, the two members being sealed together by a liquid-tight annular seal 18. The liquid 19 containing the particles to be observed enters the apparatus through a tube 20 centrally disposed within the funnel-shaped entrance portion 24 of the cylindrical central bore 26 of the member 10. Another liquid 23 also enters the mouth 24 of the central bore 26 and forms a sheath of liquid for the liquid 19 containing the particles.” Friedman, at 2:30-41; <i>see also</i> Fig. 1 below. FIG. 1 Chou “An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel. An embodiment of a microfluidic sorting device comprises

Asserted Claim Element	Exemplary Prior Art Disclosures
	a first flow channel formed in a first layer of elastomer material, a first end of the first flow channel in fluid communication with a collection pool and a second end of the first flow channel in fluid communication with a waste pool.” Chou, at 3:1-8; <i>see also</i> Figs. 7A and 7B below.   FIG. 7A FIG. 7B “As will be explained, the preferred method of Figs. 1 to 7B involves using pre-cured elastomer layers which are assembled and bonded. In an alternative method, each layer of elastomer may be cured "in place". In the following description "channel" refers to a recess in the elastomeric structure which can contain a flow of fluid or gas.” Chou, at 8:18-21. “As can be seen in Fig. 7A and 7B, flow channels 30 and 32 are preferably disposed at an angle to one another with a small membrane 25 of substrate 24 separating the top of flow channel 30 from the bottom of flow channel 32.” Chou, at 9:20-22. “Figs. 7B and 7H together show the closing of a first flow channel by pressurizing a second flow channel, with Fig. 7B (a front sectional view cutting through flow channel 32 in corresponding Fig. 7A), showing an open first flow channel 30; with Fig. 7H showing first flow channel 30 closed by pressurization of the second flow channel 32. Referring to Fig. 7B, first flow channel

Asserted Claim Element	Exemplary Prior Art Disclosures
	30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position)." Chou, at 19:1-16; <i>see also</i> Fig. 16 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 16 Zöld “These partial streams are delimited by the two physically real sides of the transporting channel, which is the combination of the connecting channel 8 and of the delay channel 11, and partly by the virtual planes, imagined to be laid on the stream lines from 30a to 30d and are directed

Asserted Claim Element	Exemplary Prior Art Disclosures
	perpendicularly to the bottom of the transporting channel, i.e., to the sheet of the paper of FIG. 2. The extreme side streams 6a and 6b flow into the left and right only control channels 17 and 16, respectively. The amount of the electrolyte, that flows in these two streams, has to be as large as possible because through these two streams is achieved the generation of the already described asymmetry of the flow in the channel branching volume 12, shown in FIG. 1, and hence, the deflection of the center stream 5, and that of the particles too, into one of the only-dispenser channels 14 or 15. The middle side streams 6c and 6d, delimited by the vertical planes laid on the stream lines 30a and 30c, and 30b and 30d, respectively, flow into the side exit only-dispenser channels 15 and 14, flowing at first against the slightly pointed ends of the separating wall pair 33 and being deflected thereby into these channels.” Zöld, at 18:4-26. “It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels.” Zöld, at 23:66-24:7. Zöld 662 “The operation of the known method and device is as follows: In a flow chamber with a capillary exit of very small diameter a very thin (cca. 25 micron diameter) stream of the suspension is produced.” Zöld 662, at 1:24-28. “Therefore, it is one object of the invention to provide a method and a device for controlling the flow of an electrolyte in closed channels of capillary size in order to make possible the sorting of at least one but rather two kinds of particles (cells) from a mixture . . . this problem is solved in such a manner that the electrolyte flowing in a channel can be split into at least two side channels and that the thin suspension stream can be deflected completely into at least one of the side channels from the entrance channel or middle channel by producing a sudden and short electrolysis gas impulse in that side channel lying opposite to the side channel in which the

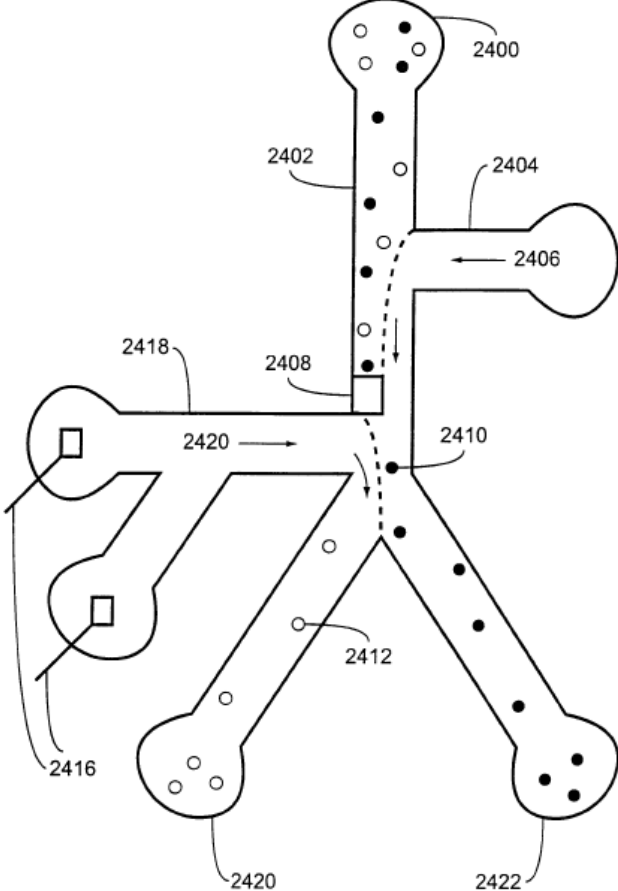
Asserted Claim Element	Exemplary Prior Art Disclosures
	suspension stream is to be deflected. This method of sorting is based on the direct changing of the electrolyte flow path while the suspended particles are deflected only indirectly by this change of the electrolyte flow.” Zöld 662, at 1:57-2:8. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into

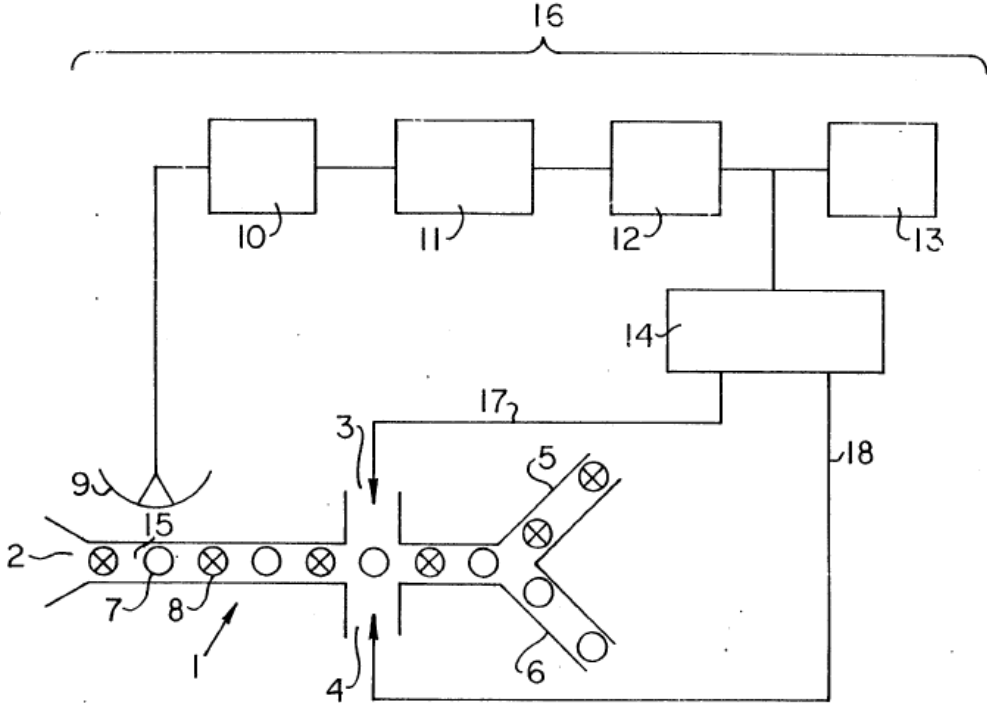
Asserted Claim Element	Exemplary Prior Art Disclosures
	another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1, that the suspension flowing from container 38 through the entrance channel 34 and the orifice 28 continues to flow in the relatively narrow capillary exit channel 12 after mixing with pure electrolyte from container 40 and another entrance channel 36, thus making possible the lining-up of the particles for further analysis or sorting.” Zöld 662, at 7:2-8. “The operation of the T-sorter is as follows: Under the suction effect of the pump (not shown) connected to the tube 26 suspension and pure electrolyte flow from containers 38 and 40 through the entrance channels 34 and 36, respectively, towards the orifice 28 into the exit channel 12 and then through the side channels 14 and 16 into the containers 22 and 24, respectively.” Zöld 662, at 7:33-39.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In this version, as can be seen in FIG. 2, the suspension is injected into the counter through a very thin capillary tube 44 which ends in a nozzle 46 and is located substantially coaxially inside the entrance channel 42; the pure electrolyte flowing in the entrance channel 42 focuses the suspension into a very thin stream at the upstream side of the orifice 28 concentrically with the orifice from where the suspension further flows into the exit channel or middle channel 50 of the sorter device. Adjacent the orifice 28 pure electrolyte enters laminarly at both sides of the suspension stream 60 through the side entrance channels 36 and 37 to keep the suspension stream 60 at the center of the middle channel 50 and to direct the suspension and thus, the particles, right against the tip 56 of the branching of the middle channel 50 into the two side channels 52 and 54. The pairs 18 and 20 of control electrodes are provided at a small distance before the branching of the middle channel 50 on the inner side walls of the middle channel. Alternatively, the pairs of control electrodes can also be provided in the side channels 52 and 54 in the manner shown in FIG. 1. The deflection of the suspension stream 60 into one side channel, say into channel 52, is achieved by producing a sufficiently large amount of gas by the control electrodes 18; the control electrodes 20 would, clearly, produce the deflection of the suspension stream into the side channel 54. It is an advantage of this embodiment that the deflection of the very thin suspension stream 60 is simpler and faster than in the T-sorter and as a result faster operation can be achieved with the Y-sorter than with the T-sorter.” Zöld 662, at 8:14-46. “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively. The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels

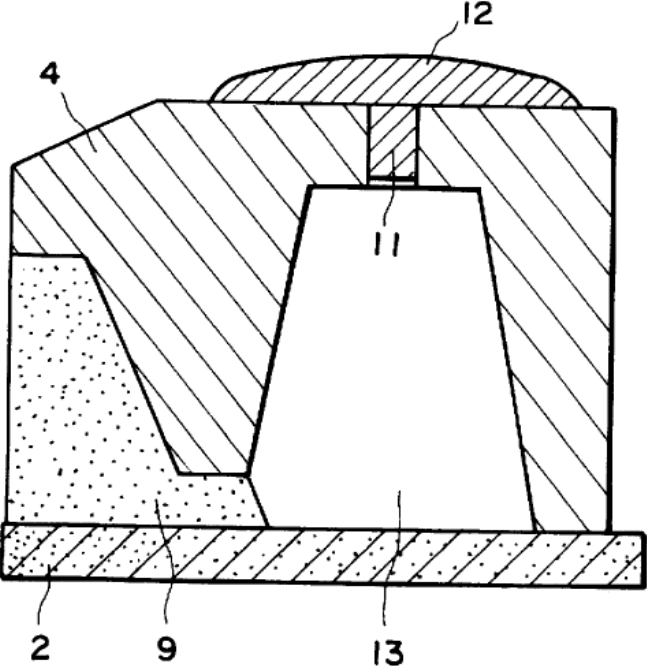
Asserted Claim Element	Exemplary Prior Art Disclosures
(ii) a first reservoir in fluid communication with the flow channel adapted for dampening or absorbing a pressure pulse propagated across the width of the flow channel,	should be zero when a particle passes these channels.” Zöld 662, at 9:1-22. The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting

Asserted Claim Element	Exemplary Prior Art Disclosures
	microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control port A and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at 3:49-62.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 Otsuka “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for

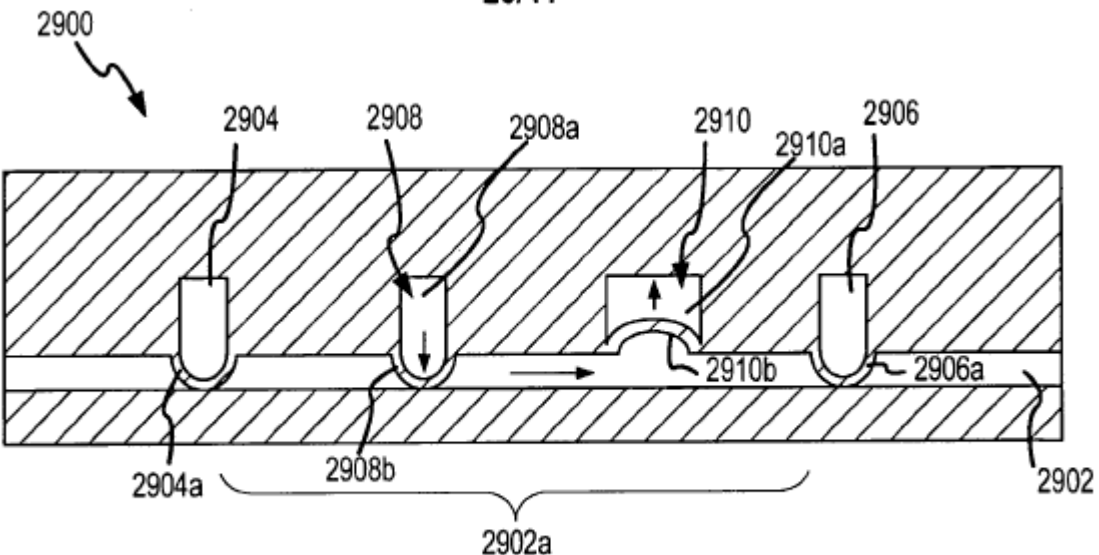
Asserted Claim Element	Exemplary Prior Art Disclosures
	attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below. FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid

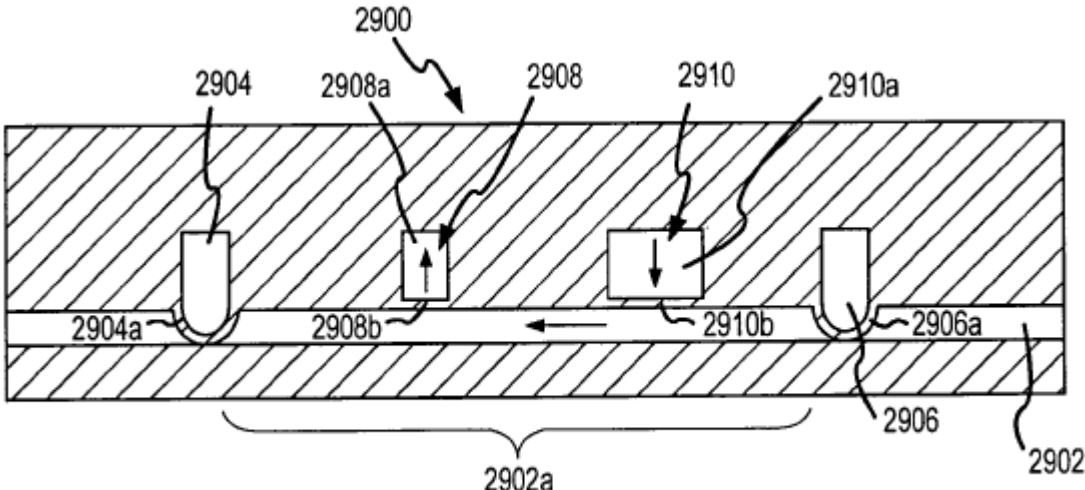
Asserted Claim Element	Exemplary Prior Art Disclosures
	chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.  FIG. 2 Brown “In order to pump out the volumetric chamber 117, exogenous control fluid pressure is introduced as is indicated in FIG. 14 through the capillary passage 125 while the control valve 119 is opened by venting its capillary passage 127 as indicated. Both of these capillaries 125 and 127 are connected with suitable sources of control fluid having pressure control means

Asserted Claim Element	Exemplary Prior Art Disclosures
	associated therewith. It will be noted that in this embodiment, the capillary 126 is always vented to permit proper operation during filling so that it, in effect, is a passive element whose presence is nevertheless essential. The control fluid introduced at 125 forms a stabilized interface 128 at the downstream end of the necked down portion 115 and thereby prevents backflow of the control fluid therebeyond, i.e., a valving action is effected. The interface 130 is already present at the mouth of the capillary 126 where it joins the pump chamber so that as the principal fluid is being expelled from the pump chamber by the travelling interface 129, the only flow path for the principal fluid is through the necked down portion 118.” Brown, at 10:44-64; <i>see also</i> Fig. 14 below. FIG. 14 Chou “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure

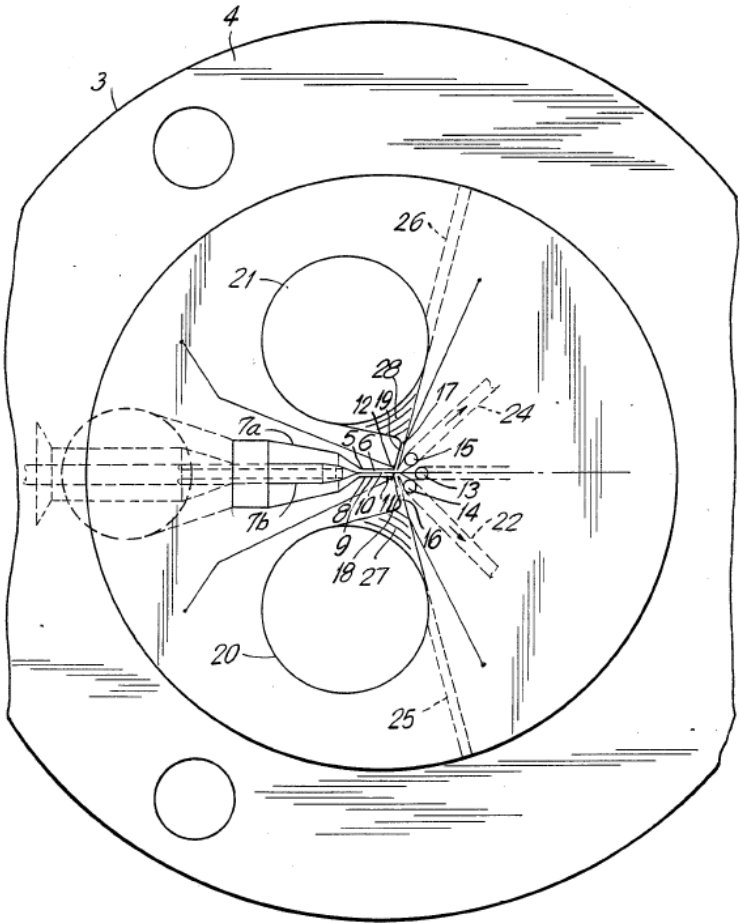
Asserted Claim Element	Exemplary Prior Art Disclosures
	may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Figure 27 shows a cross-sectional view of yet another embodiment of a damper structure in accordance with the present invention, wherein damper structure 2700 comprises portion 2702a

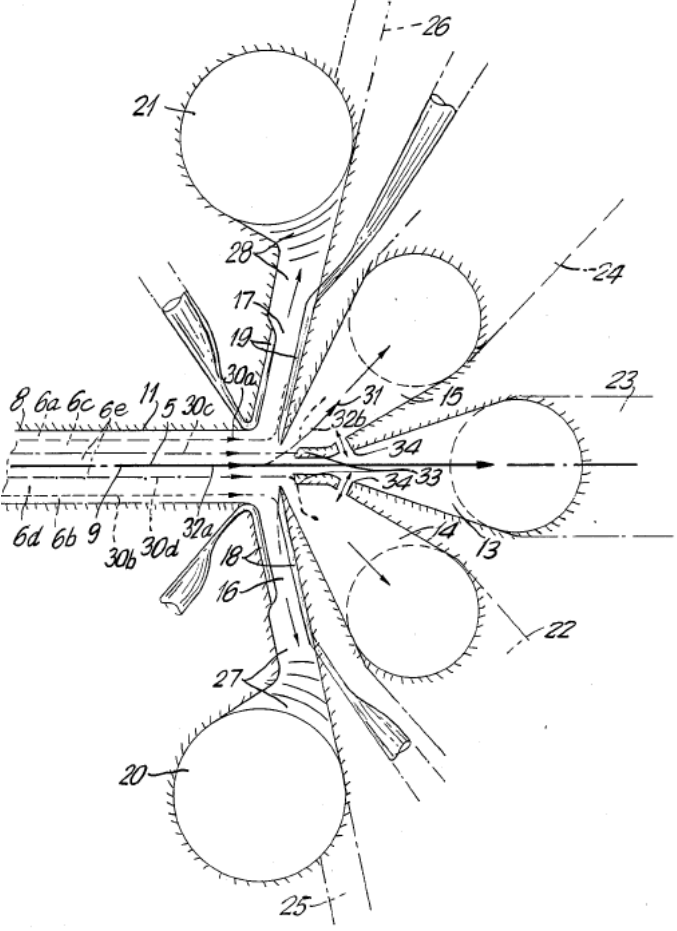
Asserted Claim Element	Exemplary Prior Art Disclosures
	of flow channel 2702 having a larger cross-section, an upper region of portion 2702 being filled with air or some other type of fluid 2704. As material 2706 flowing through channel 2702 experiences pressure oscillations 2708 and eventually encounters damper 2700, energy is expended as material 2706 pushes against fluid 2704. This expenditure of energy serves to reduce the amplitude of energy of oscillation of material in the flow channel.” Chou, at 41:5-12; <i>see also</i> Fig. 27 below. FIG.27 “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactivated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure

Asserted Claim Element	Exemplary Prior Art Disclosures
	experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29B Zöld “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible

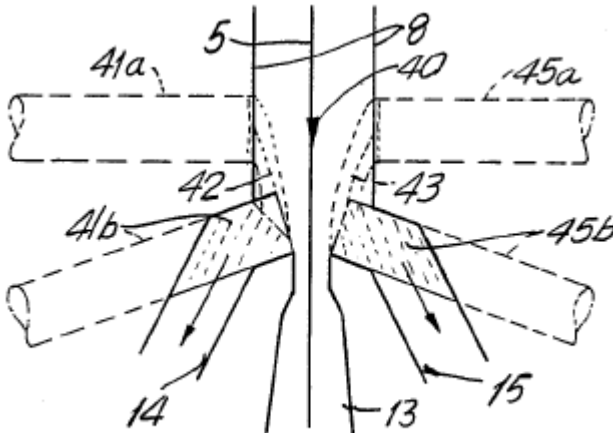
Asserted Claim Element	Exemplary Prior Art Disclosures
	since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

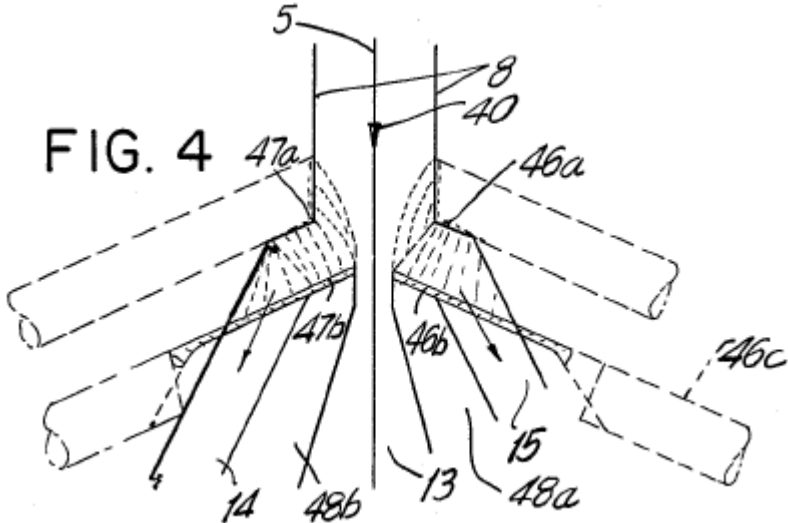
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

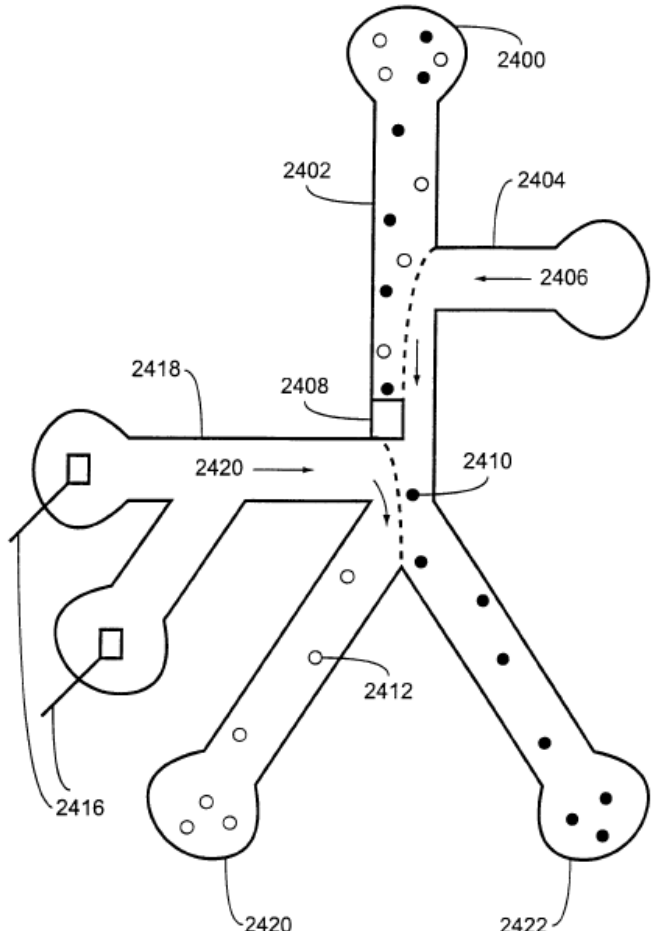
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

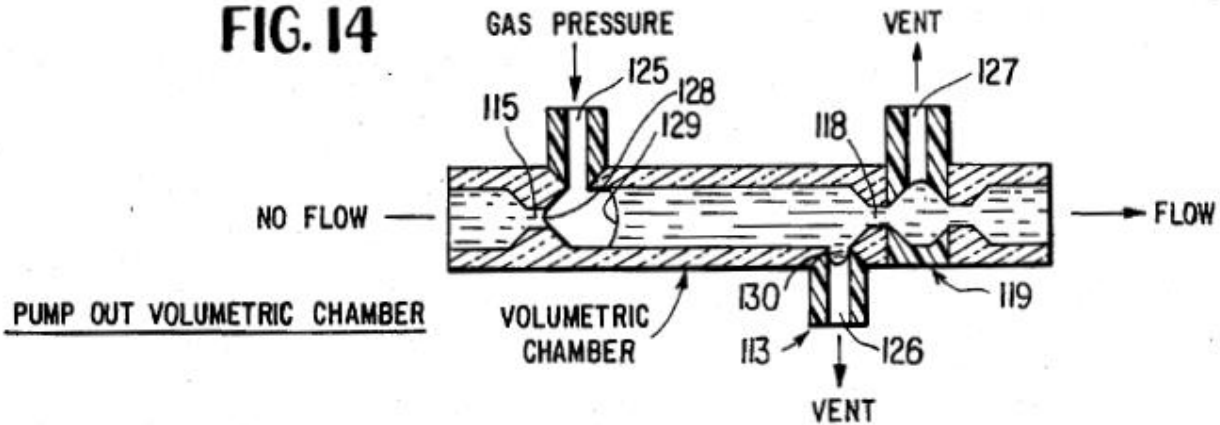
Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

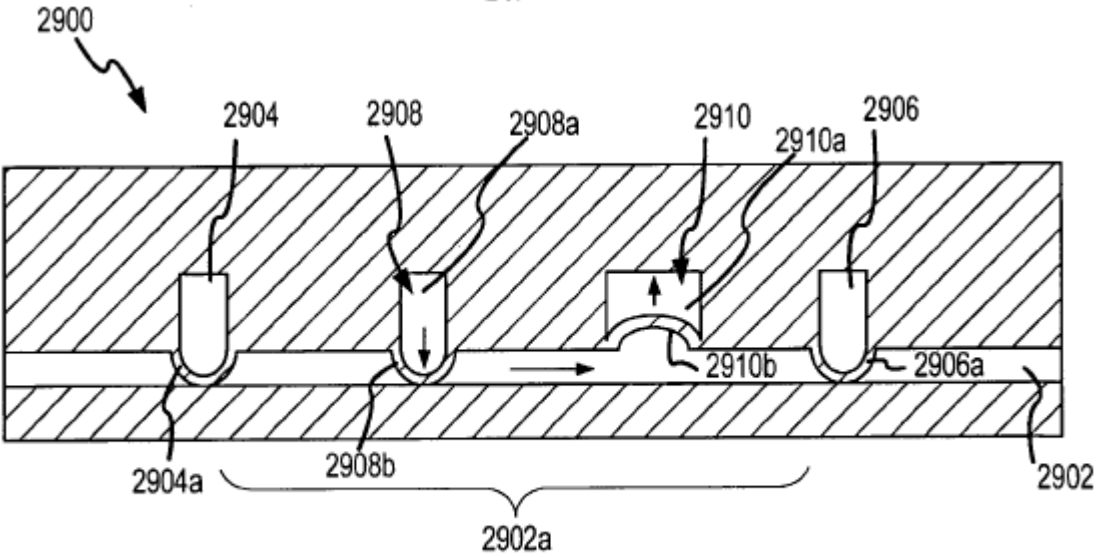
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30.
(iii) wherein the first reservoir is otherwise sealed from an exterior environment.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23

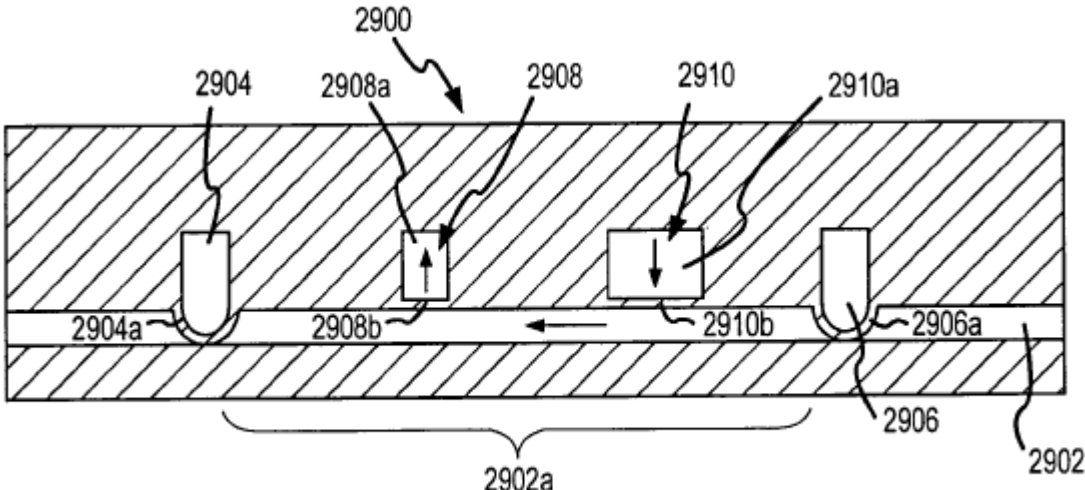
Asserted Claim Element	Exemplary Prior Art Disclosures
	(discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below. 

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Brown “In order to pump out the volumetric chamber 117, exogenous control fluid pressure is introduced as is indicated in FIG. 14 through the capillary passage 125 while the control valve 119 is opened by venting its capillary passage 127 as indicated. Both of these capillaries 125 and 127 are connected with suitable sources of control fluid having pressure control means associated therewith. It will be noted that in this embodiment, the capillary 126 is always vented to permit proper operation during filling so that it, in effect, is a passive element whose presence is nevertheless essential. The control fluid introduced at 125 forms a stabilized interface 128 at the downstream end of the necked down portion 115 and thereby prevents backflow of the control fluid therebeyond, i.e., a valving action is effected. The interface 130 is already present at the mouth of the capillary 126 where it joins the pump chamber so that as the principal fluid is being expelled from the pump chamber by the travelling interface 129, the only flow path for the principal fluid is through the necked down portion 118.” Brown, at 10:44-64; <i>see also</i> Fig. 14 below.

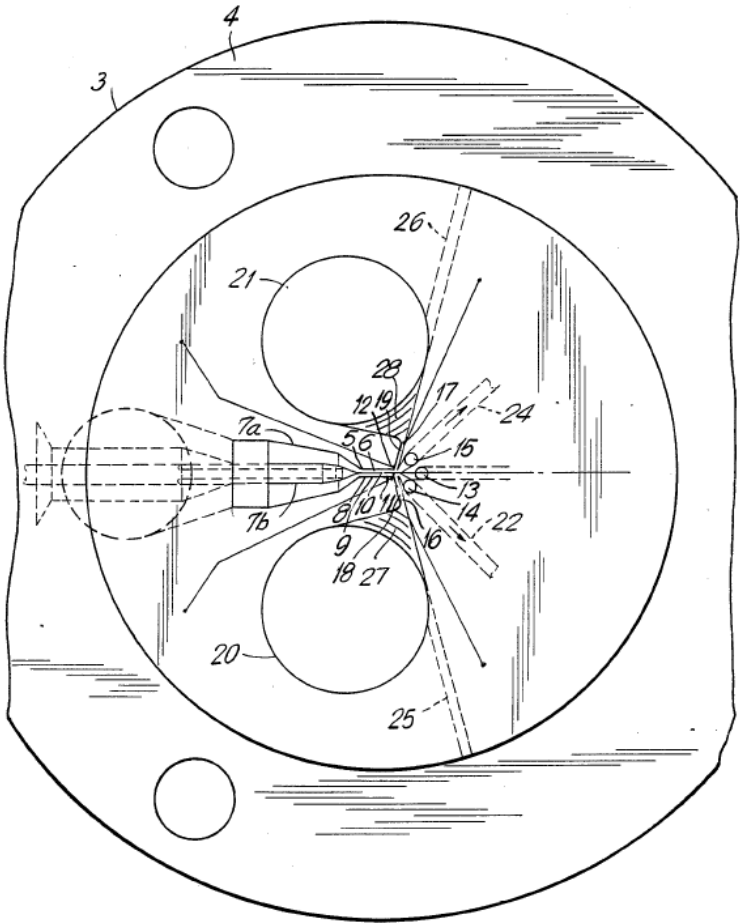
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 14  Chou “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times,

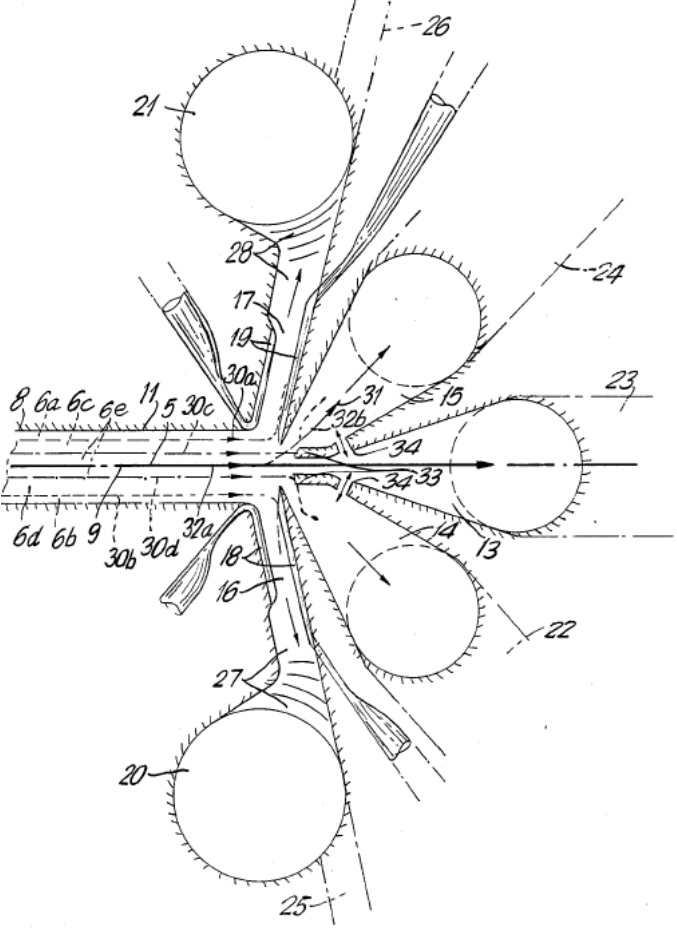
Asserted Claim Element	Exemplary Prior Art Disclosures
	preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29B Zöld “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible

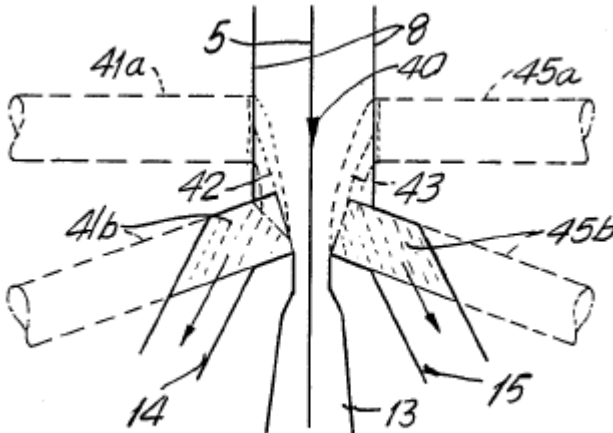
Asserted Claim Element	Exemplary Prior Art Disclosures
	since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

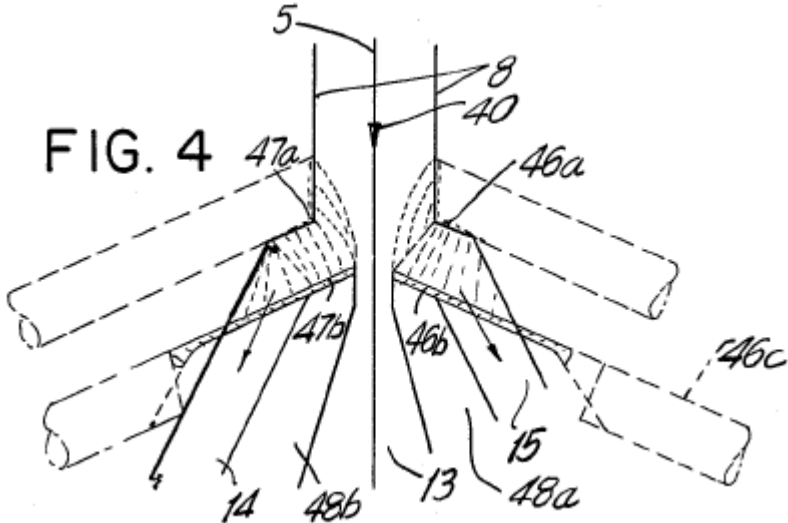
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

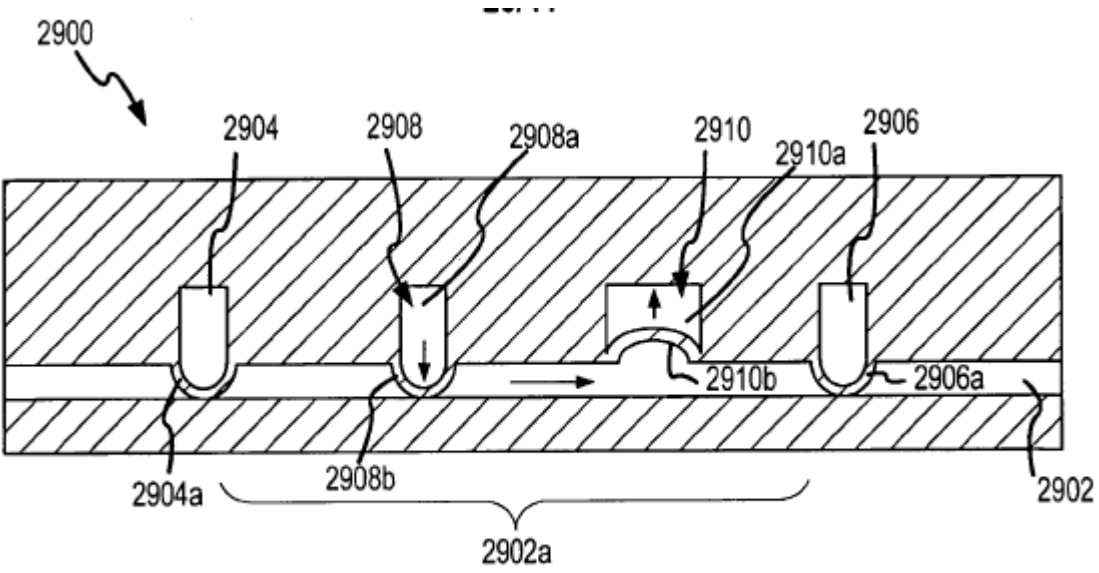
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

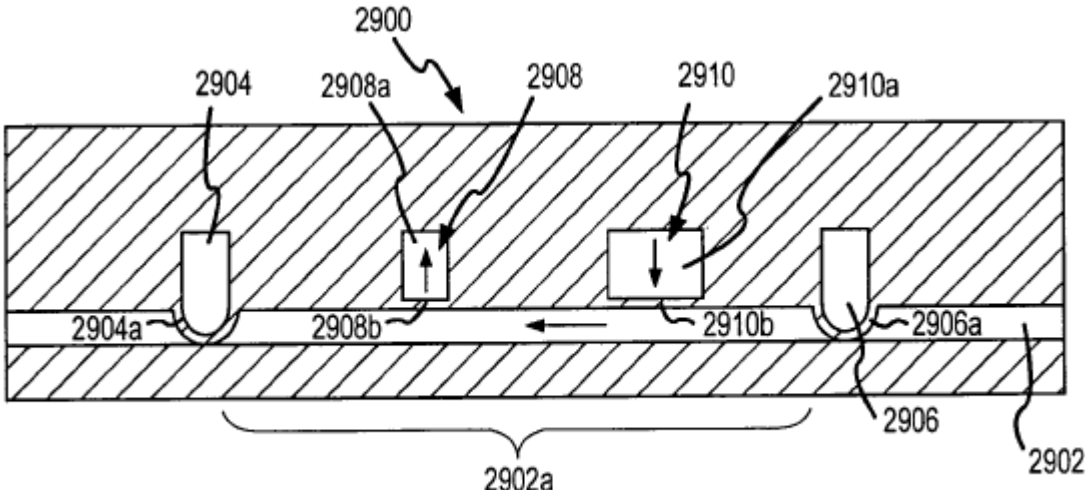
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30.
[6] The device of claim 5, wherein the first reservoir includes resilient properties which enable the dampening or absorbing the pressure.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada The Wada disclosures in each limitation of claim 5 are incorporated by reference.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In preferred aspects, the bottom portion of the device comprises a solid substrate that is substantially planar in structure, and which has at least one substantially flat upper surface. A variety of substrate materials may be employed as the bottom portion. Typically, because the devices are microfabricated, substrate materials will be selected based upon their compatibility with known microfabrication techniques, e.g., photolithography, wet chemical etching, laser ablation, air abrasion techniques, injection molding, embossing, and other techniques. The substrate materials are also generally selected for their compatibility with the full range of conditions to which the microfluidic devices are typically exposed, including extremes of pH, temperature, salt concentration, and application of electric fields. Accordingly, in some preferred aspects, the substrate material optionally includes materials normally associated with the semiconductor industry in which such microfabrication techniques are regularly employed, including, e.g., silica based substrates, such as glass, quartz, silicon or polysilicon, as well as other substrate materials, such as gallium arsenide and the like.” Wada, at 38:18-31. “In additional preferred aspects, the substrate materials will comprise polymeric materials, e.g., plastics, such as polymethylmethacrylate (PM-MA), polycarbonate, polytetrafluoroethylene (TEFLON™), polyvinylchloride (PVC), polydimethylsiloxane (PDMS), polysulfone, polystyrene, polymethylpentene, polypropylene, polyethylene, polyvinylidene fluoride, ABS (acrylonitrile-butadiene-styrene copolymer), and the like.” Wada, at 39:3-8. Otsuka The Otsuka disclosures in each limitation of claim 5 are incorporated by reference. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41.

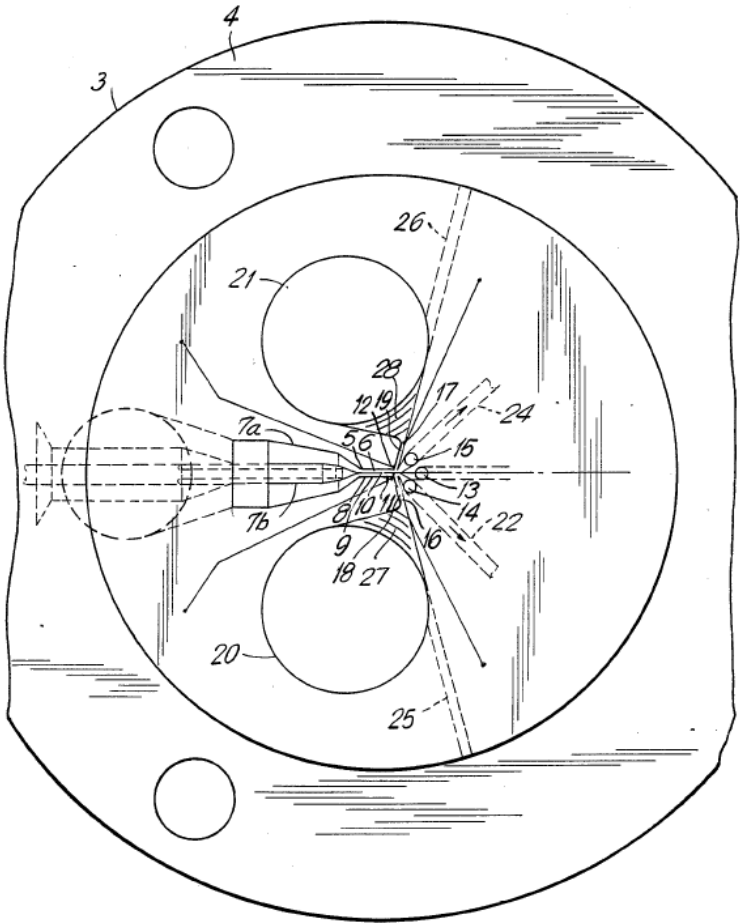
Asserted Claim Element	Exemplary Prior Art Disclosures
	“[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57. “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38. Chou The Chou disclosures in each limitation of claim 5 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within

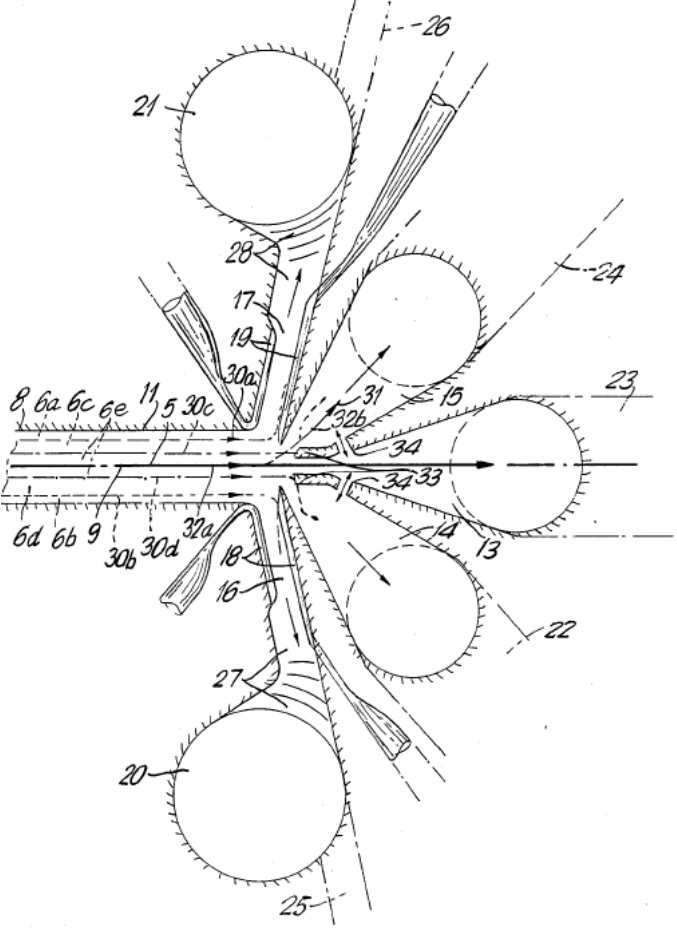
Asserted Claim Element	Exemplary Prior Art Disclosures
	the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “The damper is separated from the fluid flow channel by a thin membrane. Preferably this thin membrane has sufficient elasticity to deflect "upward" when a fluid having a peak of sinusoidal wave-like passes underneath. In this manner, some of the fluid oscillation energy is absorbed by the damper, thereby reducing the height (i.e., peak) of fluid oscillation. Typically, the thickness of the membrane between the damper and the fluid flow channel depends on a variety of factors including the depth and width of the flow channel, the amount of fluid oscillation produced by the pump and the elasticity (i.e., the material) of the membrane. One of ordinary skill in the art can readily determine the proper membrane thickness to achieve a desired attenuation of fluid oscillation depending on a desired application and materials used.” Chou, at 40:10-19. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to

Asserted Claim Element	Exemplary Prior Art Disclosures
	permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactivated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29B Zöld The Zöld disclosures in each limitation of claim 5 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas

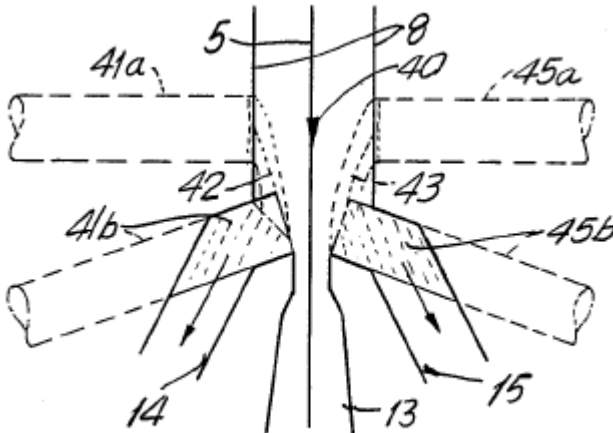
Asserted Claim Element	Exemplary Prior Art Disclosures
	bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

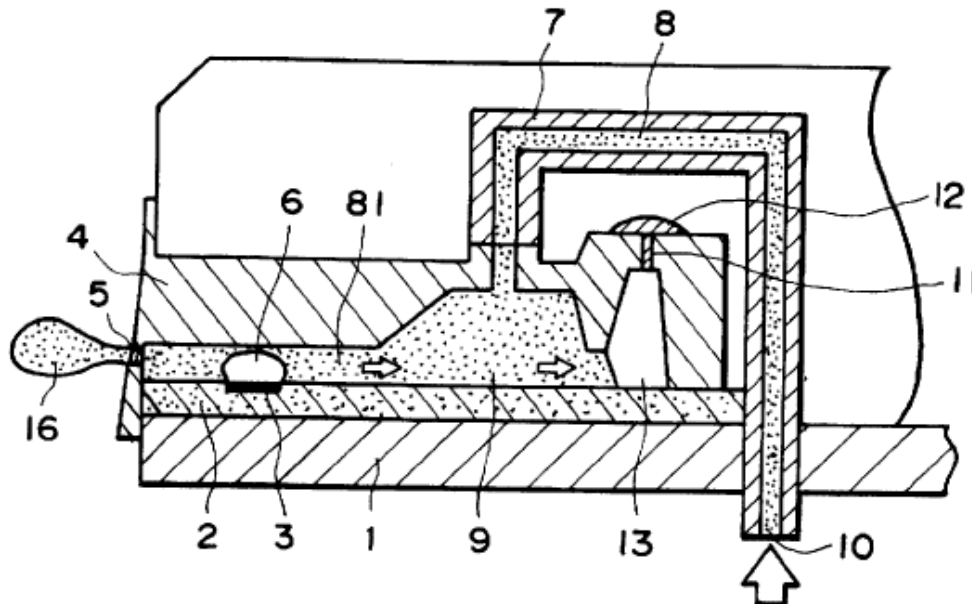
Asserted Claim Element	Exemplary Prior Art Disclosures
	can clearly conclude that ‘the inventor invented the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood v. Am. Airlines, Inc.</i>, 107 F.3d 1565, 1572, and <i>In re Gosteli</i>, 872 F.2d 1008, 1012 (Fed. Cir. 1989)). “Thus, an applicant complies with the written description requirement ‘by describing the invention, with all its claimed limitations, not that which makes it obvious,’ and by using ‘such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood</i>, 107 F.3d at 1572); <i>see also In re Curtis</i>, 354 F.3d 1347, 1355 (Fed. Cir. 2004) (affirming a finding of invalidity for lack of written description by BPAI where “unpredictability in performance of certain species or subcombinations other than those specifically enumerated [in the disclosure]” was present (internal quotations omitted)). “Compliance with the written description requirement is essentially a fact-based inquiry that will ‘necessarily vary depending on the nature of the invention claimed.’” <i>Enzo Biochem</i>, 323 F.3d at 963, 63 USPQ2d at 1613. Satisfying the written description requirement is a question of fact that must be decided on a case-by-case basis. <i>Vas-Cath, Inc. v. Mahurkar</i>, 935 F.2d at 1563, 19 USPQ2d at 1116 (Fed. Cir. 1991). Moreover, “[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.” 35 U.S.C. § 112 (emphasis added). “To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without ‘undue experimentation’.” <i>Genentech, Inc. v. Novo Nordisk A/S</i>, 108 F.3d 1361, 1365, (Fed. Cir. 1997) (quoting <i>In re Wright</i>, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). During prosecution of the ’797 patent, to overcome a rejection by the examiner over Friedman, Plaintiff argued that “Friedman fails to disclose, teach or suggest a first reservoir which includes ‘resilient properties for dampening or absorbing a pressure pulse,’ as recited in the claim (Applicants note that the requirement that the first reservoir include resilient properties is a structural requirement which must be substantively addressed by the Examiner). Indeed, control ports 72 and 74 and associated fluid pathways in Friedman are not disclosed as having resilient properties.” ’797 patent file history, Response to non-final Office Action filed February

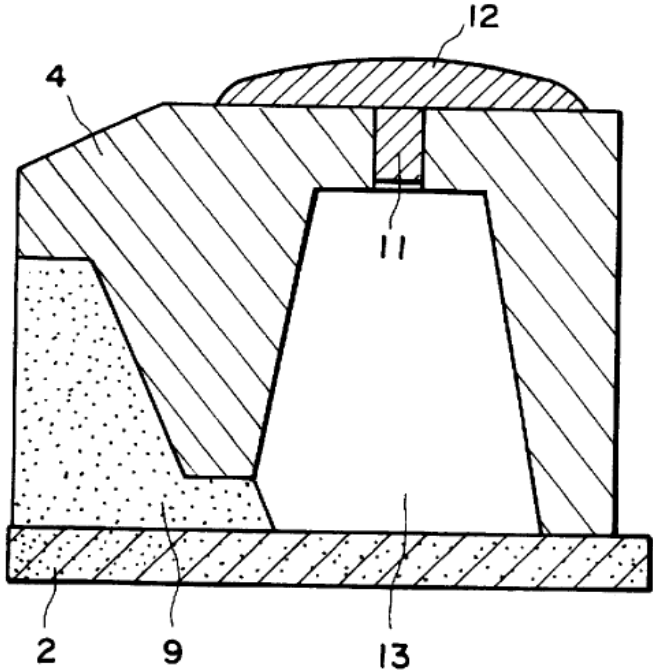
Asserted Claim Element	Exemplary Prior Art Disclosures
	24, 2014, at 8. However, no degree of dampening is indicated in the claim. Any polymer structure would naturally dampen pressure to some degree, for example high stiffness materials such as glass or metals would dampen to a lesser degree as to more flexible polymer structures. The term “resilient” is only used in the ’797 patent specification in the context of a bubble valve with a resilient wall or a compressible gas. See ’797 patent at 12:18-22; 12:28-32. Thus, claim 6 is invalid for failure to provide adequate written description to enable a person of ordinary skill in the art to make and use a device having a first reservoir including “resilient properties” without undue experimentation.
[7] The device of claim 6, wherein the resilient properties of the first reservoir include a gas pocket, wherein compression of the gas facilitates the dampening or absorbing of the pressure pulse.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Friedman The Friedman disclosures in each limitation of claim 6 are incorporated by reference. “For instance, in FIG. 2, three outlet ports are provided from the switching chamber and it will be understood that photoelectric sort detectors, such as elements 69 and 83, may be employed for each of those three outlet ports. FIG. 2 illustrates an alternative embodiment of the invention in which the switching chamber 60 is modified as shown at 60A, in a modified fluidic amplifier housing 14A, to provide an additional outlet port 70 and added control ports 72 and 74. A control fluid under pressure may be supplied to the switching chamber 60A through the control ports 72 and 74 through the respective supply lines 76 and 78 under the control of electromagnetically operated valves 80 and 82.” Friedman, at 8:53-67; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“As illustrated in the drawing, the opposite walls 68 and 69 of the switching chamber 60A are essentially equidistant from the nozzle formed by the inlet 66. Accordingly, they are equally capable of displaying the wall attachment effect in the presence of turbulence in the liquid stream, as previously described above. Thus, just as the wall attachment effect to wall 68 directs the liquid stream to outlet port 64, the wall attachment effect at wall 69 leads the fluid stream to the outlet port 70. Once established at one wall, the wall attachment effect will be maintained and will hold the stream to one of these two walls, and thus direct the stream to one of these two outlet ports, as long as turbulence continues. In order to determine which direction the stream will take, a signal must be supplied from one of the control ports 72 or 74. If the signal takes the form of a supply of control fluid under pressure, it has the effect of shifting the stream away from the wall adjacent to the control port and over to the opposite wall. Thus, if control fluid is supplied to the switching chamber 68 through the control port 74, the supply of fluid destroys the low pressure bubble at the wall 69, causing the stream to shift to the opposite wall 68. A similar, but opposite effect is available if a vacuum is applied at the control port 74. This reduces the pressure at the wall 69, tending to increase the wall attachment at the wall 69 and to switch the device so that the liquid stream is pulled away from the wall 68 and to the wall 69 and to the port 70. The embodiment of FIG. 2 is capable of several different alternative modes of operation. For instance, if the switching chamber 60A is fabricated in an asymmetrical form such that the wall 68 is substantially closer to the nozzle formed by the inlet 66 than the wall 69, then without any control signals at the control ports 72 and 74, the switching action will be identical to that described above for the embodiment of FIG. 1. Thus, if a signal is supplied to the transducer 58, the resulting turbulence will cause the stream to attach to the wall 68 and to be directed to port 64. In the absence of a signal at transducer 58, the laminar flow will continue, and the stream will be directed through the outlet port 62.” Friedman, at 9:3-45. “The switching fluid used at the ports 72 and 74 should be compatible with the liquid in the main stream, but it need not be identical to that liquid. Thus, where the liquid in the main stream is water, the switching fluid may be water, or air, or some other compatible fluid.” Friedman, at 10:45-50. “As illustrated in the simplified schematic diagram of FIG. 3, additional fluidic amplifier switches may be employed downstream from the fluidic amplifier switch of the system of FIG. 1, or in that of FIG. 2. This provides the possibility of still further sorting and segregation of particles on a single pass through the apparatus. The downstream fluidic amplifiers may also be connected to receive control signals from circuits 46. FIG. 3, at the left side, illustrates in simplified schematic form an

Asserted Claim Element	Exemplary Prior Art Disclosures
	apparatus corresponding to the apparatus of FIG. 2, with corresponding parts correspondingly numbered. The main stream outlet port 62 is connected to a second fluidic amplifier switch housing 114 which may correspond exactly in structure and operation with the fluidic switch contained within the housing 14 and described above in connection with FIG. 1. The fluidic switch 114 responds to a signal from circuits 46 on a connection indicated at 146 through a delay circuit 149 and a gate circuit 151 to control a signal from an oscillator 153 to a transducer within the switch housing 114. By this means, particles which were not sorted and segregated in the first fluidic amplifier within housing 14, and diverted to the outlet port 64, continue on through the port connection 62, through the switch 114, and may be sorted and segregated according to a second particle characteristic into an outlet port 164. If the particles are not so segregated, they continue on in the main stream outlet port 162 from the housing 114. Thus, FIG. 3 illustrates the principle that a plurality of fluidic amplifier switches may be controlled to accomplish several sorting operations based on signals obtained from a single optical chamber 10.” Friedman, at 11:33-65; <i>see also</i> Fig. 3 below. FIG. 3 Otsuka

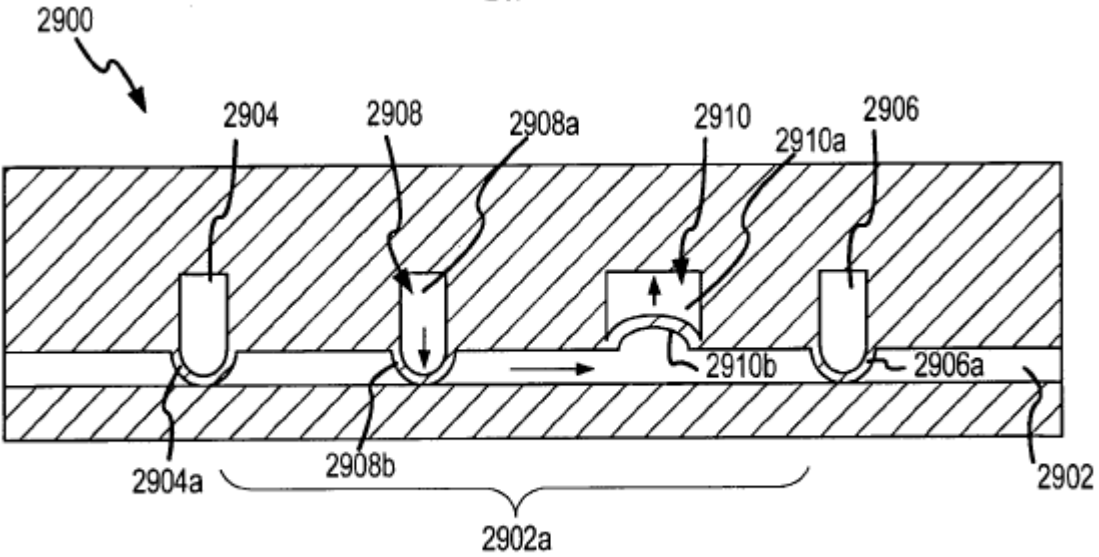
Asserted Claim Element	Exemplary Prior Art Disclosures
	The Otsuka disclosures in each limitation of claim 6 are incorporated by reference. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below.

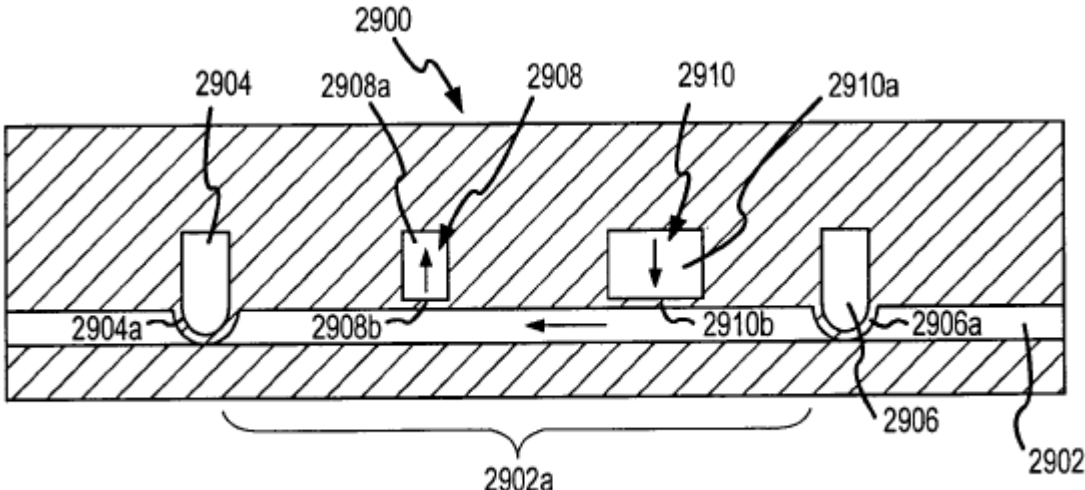
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 Chou The Chou disclosures in each limitation of claim 6 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are

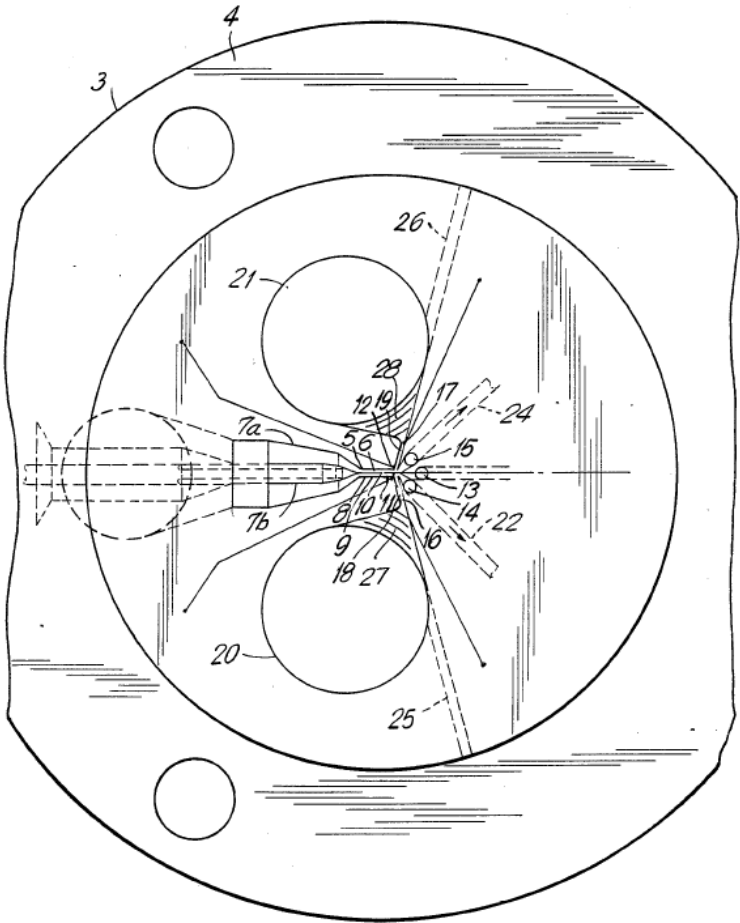
Asserted Claim Element	Exemplary Prior Art Disclosures
	actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “The damper is separated from the fluid flow channel by a thin membrane. Preferably this thin

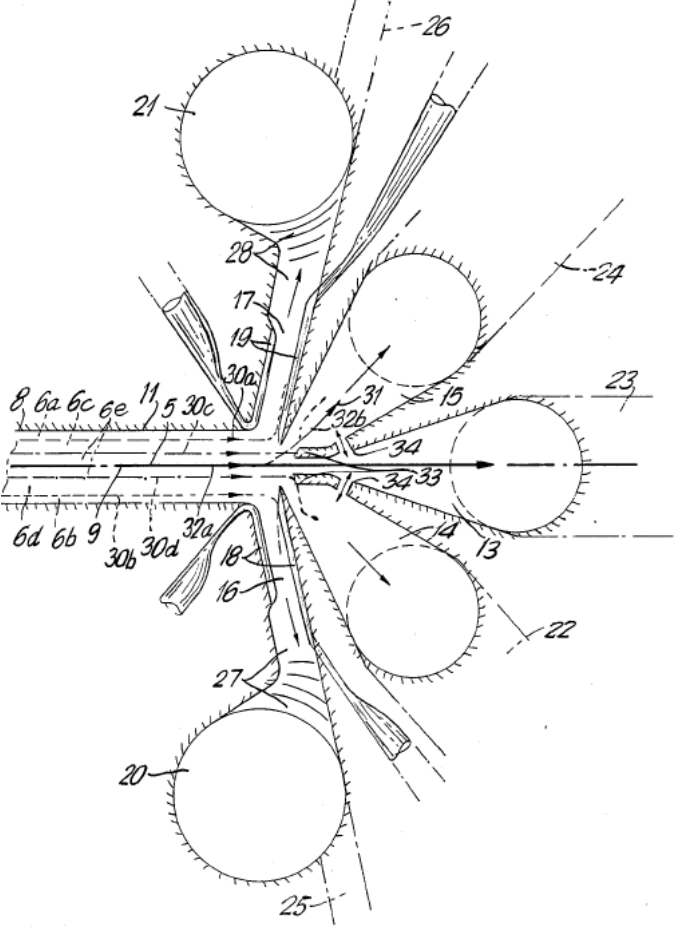
Asserted Claim Element	Exemplary Prior Art Disclosures
	membrane has sufficient elasticity to deflect "upward" when a fluid having a peak of sinusoidal wave-like passes underneath. In this manner, some of the fluid oscillation energy is absorbed by the damper, thereby reducing the height (i.e., peak) of fluid oscillation. Typically, the thickness of the membrane between the damper and the fluid flow channel depends on a variety of factors including the depth and width of the flow channel, the amount of fluid oscillation produced by the pump and the elasticity (i.e., the material) of the membrane. One of ordinary skill in the art can readily determine the proper membrane thickness to achieve a desired attenuation of fluid oscillation depending on a desired application and materials used.” Chou, at 40:10-19. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29B Zöld The Zöld disclosures in each limitation of claim 6 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas

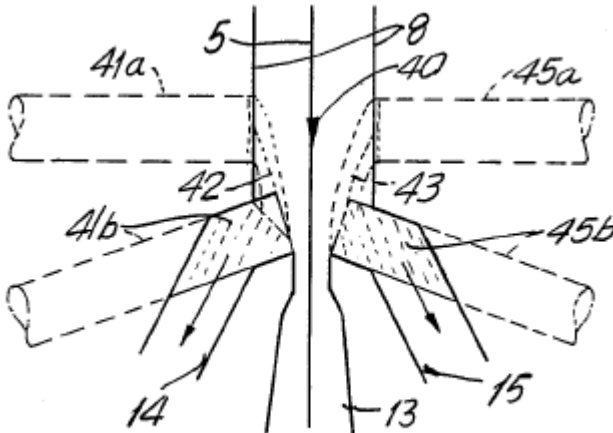
Asserted Claim Element	Exemplary Prior Art Disclosures
	bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

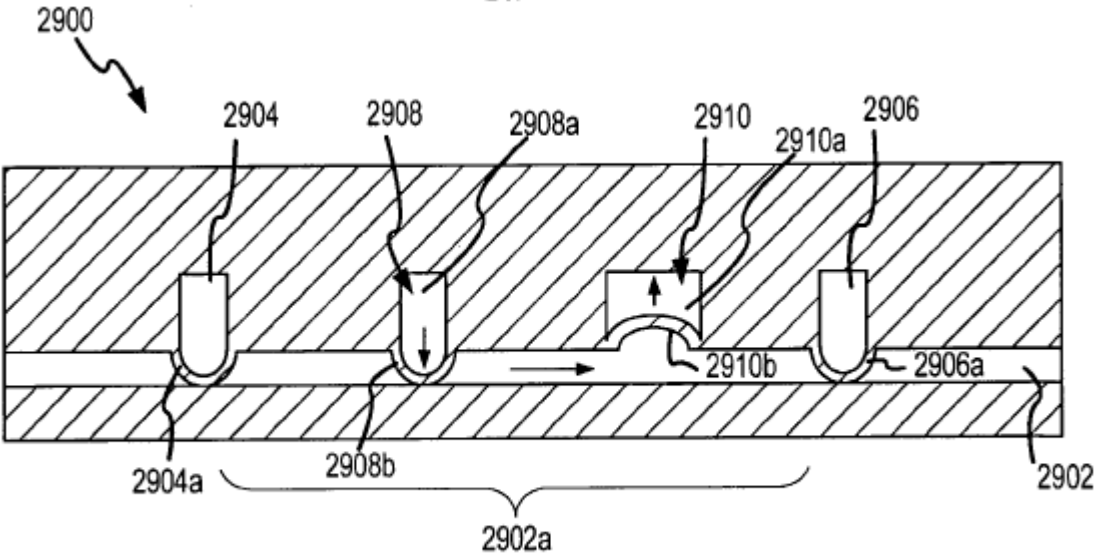
Asserted Claim Element	Exemplary Prior Art Disclosures
[8] The device of claim 7, further comprising a fluid filled region interfacing with the flow channel and the gas pocket.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Chou The Chou disclosures in each limitation of claim 7 are incorporated by reference.

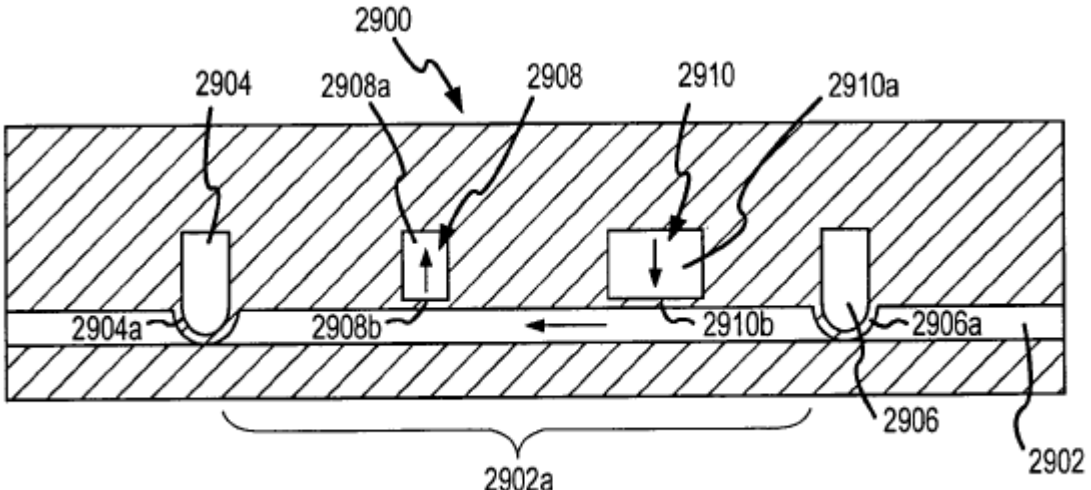
Asserted Claim Element	Exemplary Prior Art Disclosures
	“A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

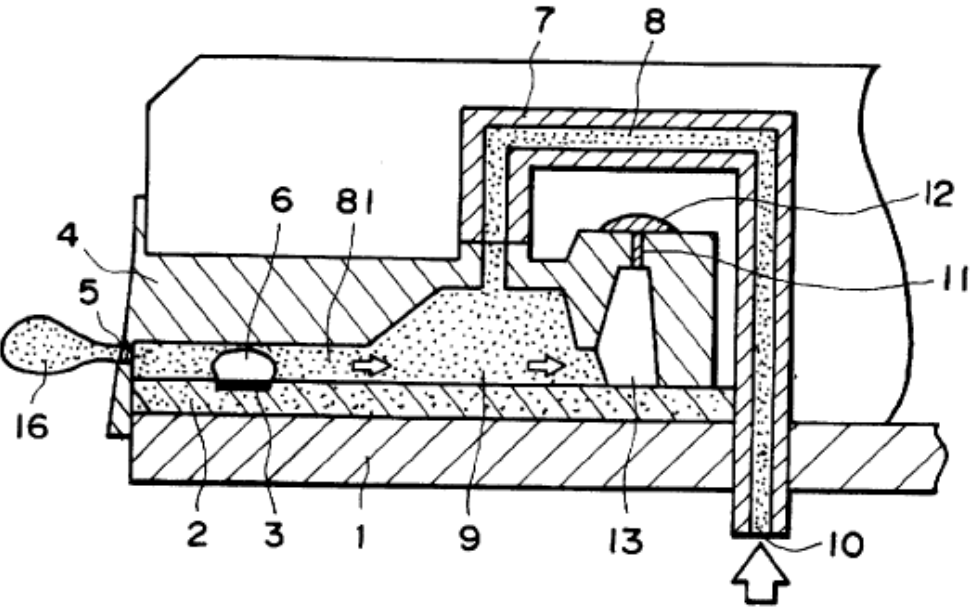
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the

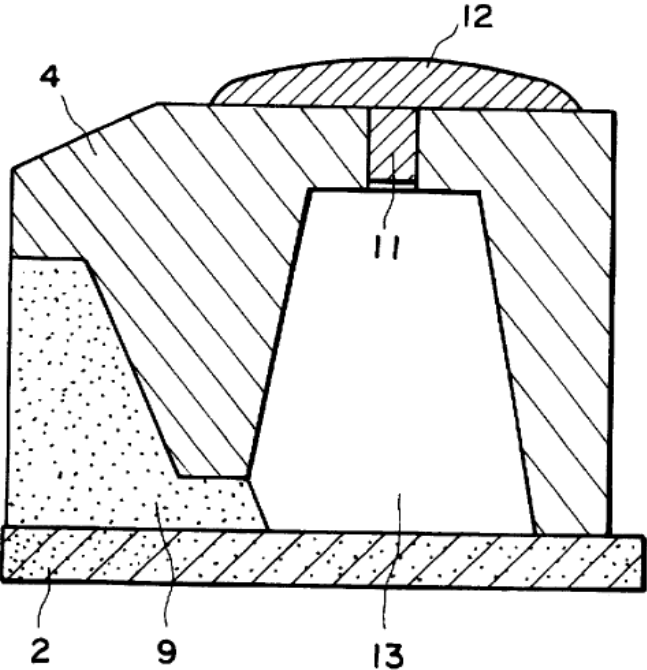
Asserted Claim Element	Exemplary Prior Art Disclosures
	integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “The damper is separated from the fluid flow channel by a thin membrane. Preferably this thin membrane has sufficient elasticity to deflect "upward" when a fluid having a peak of sinusoidal wave-like passes underneath. In this manner, some of the fluid oscillation energy is absorbed by the damper, thereby reducing the height (i.e., peak) of fluid oscillation. Typically, the thickness

Asserted Claim Element	Exemplary Prior Art Disclosures
	of the membrane between the damper and the fluid flow channel depends on a variety of factors including the depth and width of the flow channel, the amount of fluid oscillation produced by the pump and the elasticity (i.e., the material) of the membrane. One of ordinary skill in the art can readily determine the proper membrane thickness to achieve a desired attenuation of fluid oscillation depending on a desired application and materials used.” Chou, at 40:10-19. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.

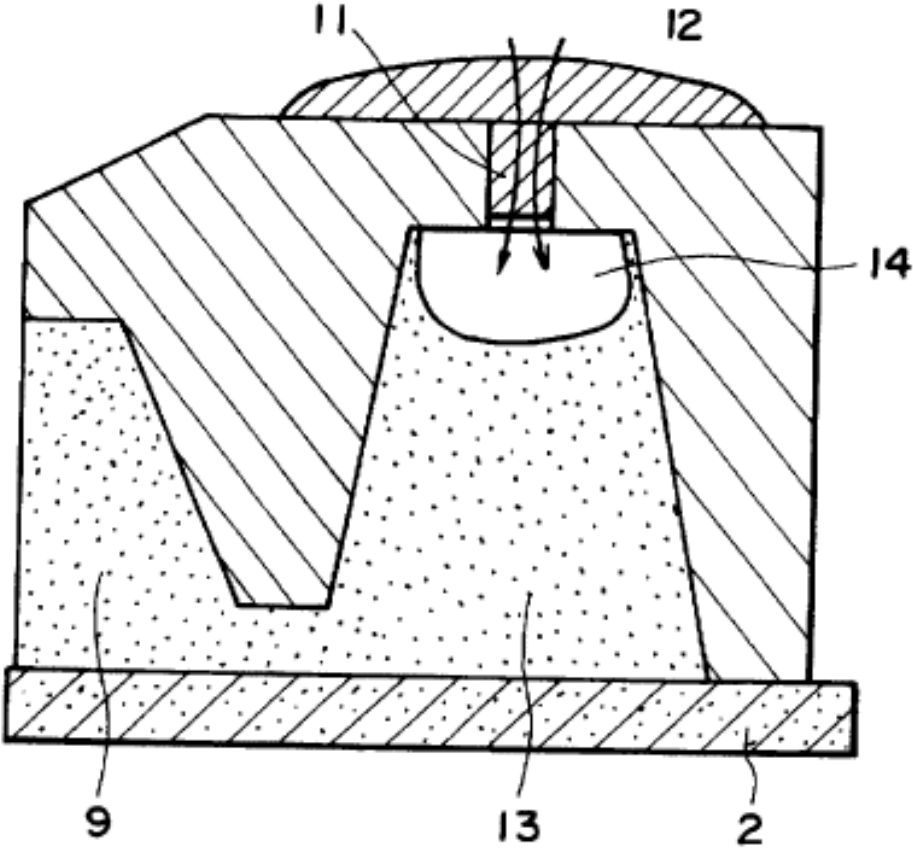
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B Otsuka The Otsuka disclosures in each limitation of claim 7 are incorporated by reference. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for

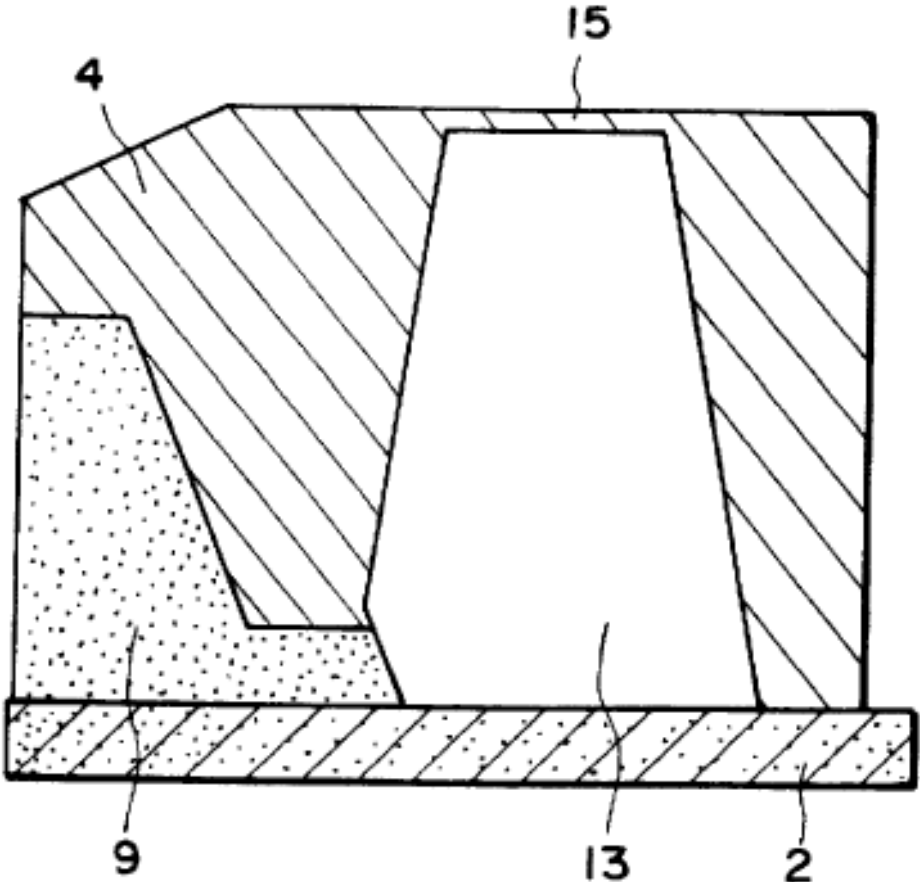
Asserted Claim Element	Exemplary Prior Art Disclosures
	attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below.  FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “In order to efficiently absorb the pressure wave, it is desirable that, as shown in FIG. 1, an opening to the common liquid chamber is provided in the buffering chamber 13 at a position faced to each nozzle (passage).” Otsuka, at 6:39-42. “However, in this invention, the buffering chamber is provided with a portion (gas transmitting portion) which relatively easily permits the gases to enter the buffering chamber. Therefore, the gases (air) is external of the print head are supplied into the buffering chamber, as shown in FIG. 4. For this reason, even if the gases in the buffering chamber are reduced, the gases are refilled.

Asserted Claim Element	Exemplary Prior Art Disclosures
	In this-manner, the ink vibration can be suppressed for a long period of time, thus stabilizing the printing operation. In the structure in which an opening 11 is formed in a part of a wall constituting a buffering chamber, and it is sealed by a gas transmitting scaling material, it is desirable that the practical properly is provided by controlling the gas transmitting speed of the sealing member.” Otsuka, at 6:55-7:2.

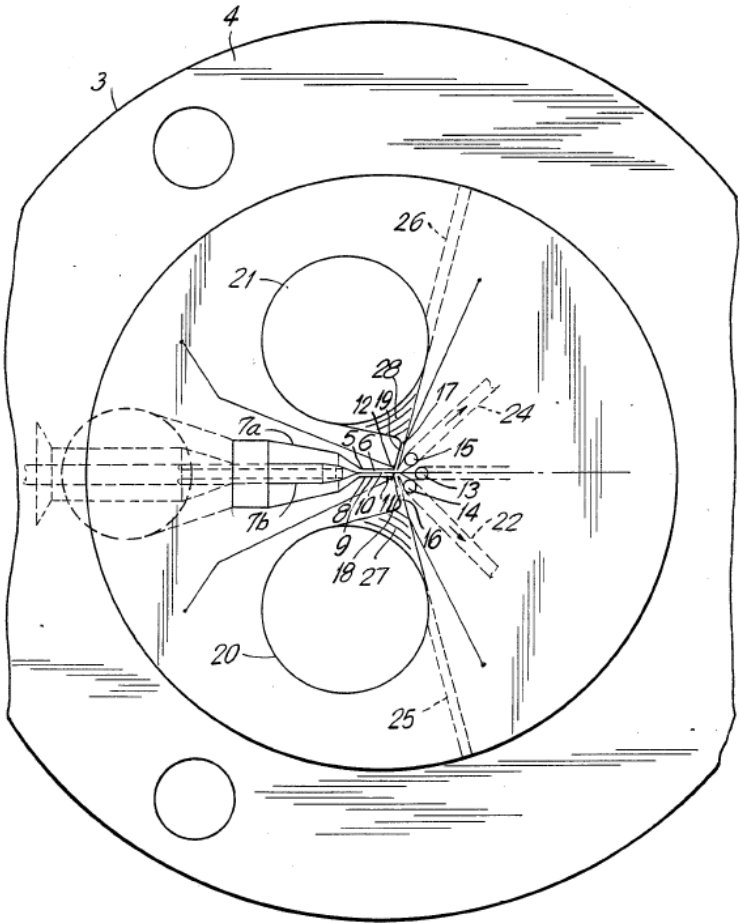
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “FIG. 11 shows another embodiment. The buffering chamber 13 of this embodiment is similar to that of the foregoing embodiment. However, it is different structurally therefrom in that there is no separate member for the gas transmission. In the structure of this embodiment, the thickness

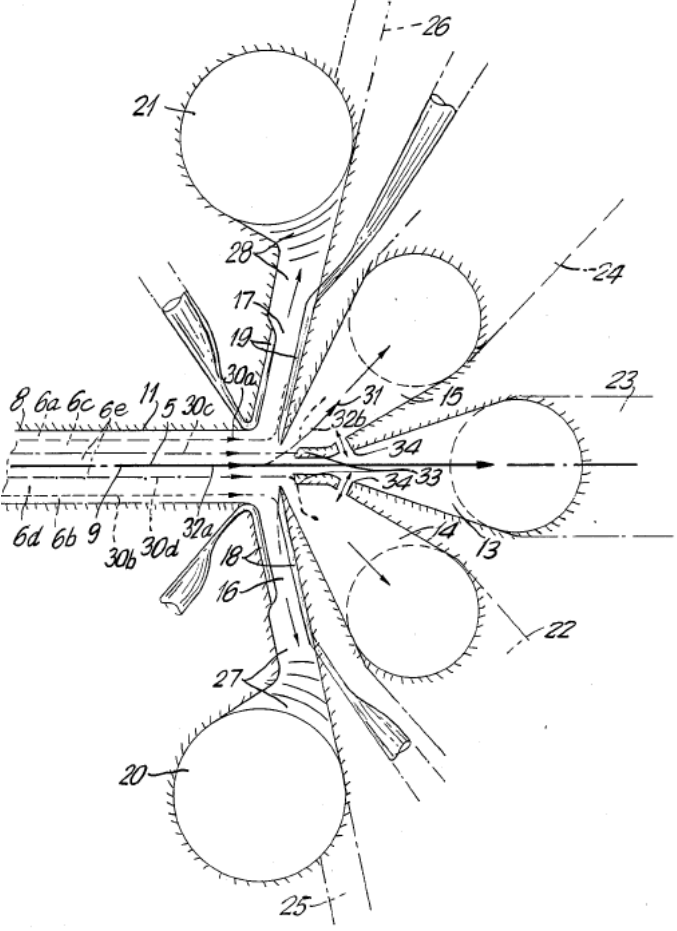
Asserted Claim Element	Exemplary Prior Art Disclosures
	of the wall at the rearmost position of the pressure buffering chamber 13 is made very thin, as compared with the other portion of the wall, so that the intended advantage of the present invention is provided. This embodiment uses the property that the amount of the gas transmission increases with decrease of the thickness of the member. By reducing the thickness to the significant extent, the rearmost position of the pressure buffering chamber 14 permits the gas transmission selectively at the position. Thus, the ink entered into the pressure buffering chamber 13 can be pushed out.” Otsuka, at 8:23-38.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 11 Zöld

Asserted Claim Element	Exemplary Prior Art Disclosures
	The Zöld disclosures in each limitation of claim 7 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control

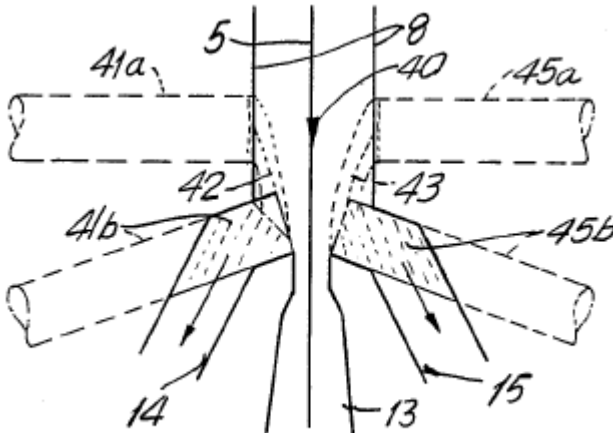
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

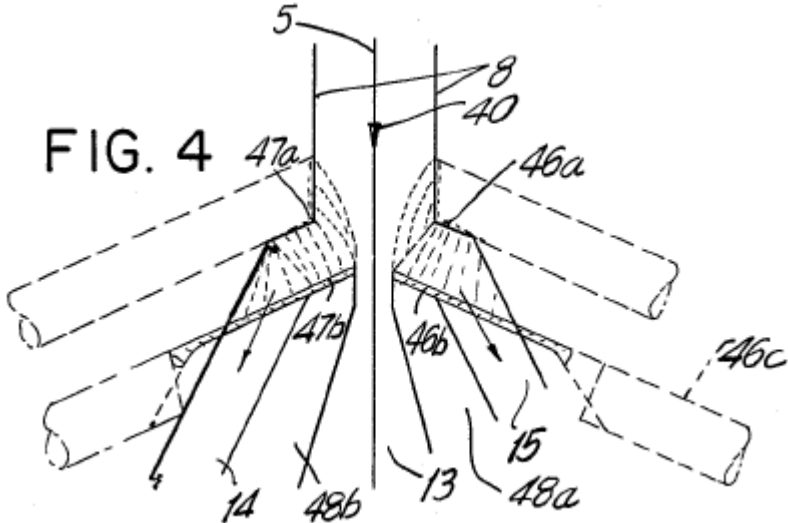
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

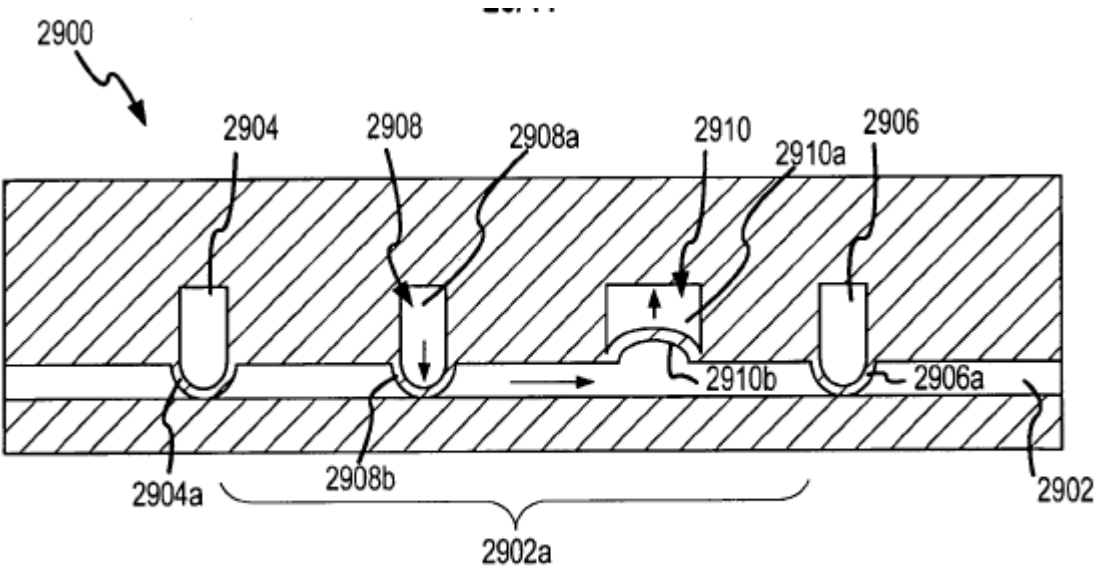
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

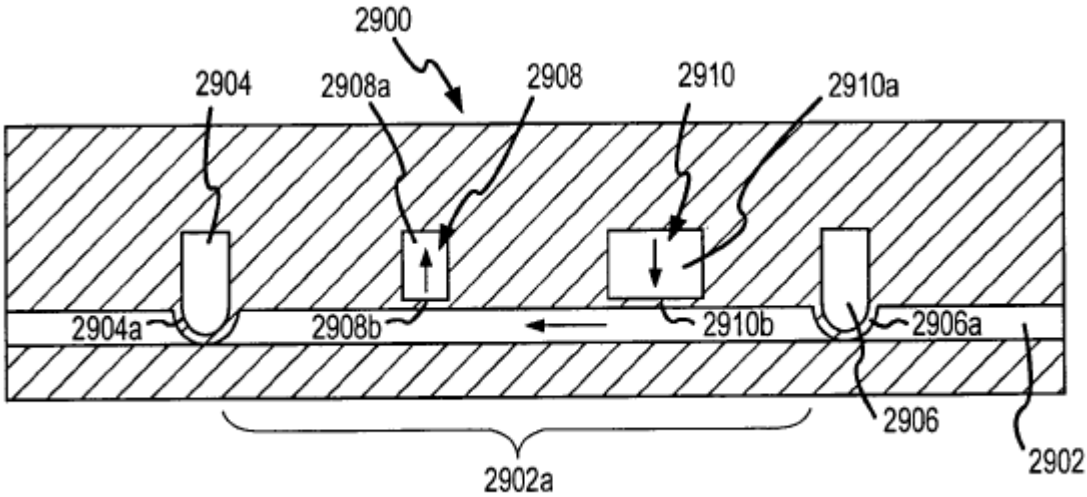
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30.
[9] The device of claim 8, wherein the fluid filled region includes a portion of the first reservoir.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Chou The Chou disclosures in each limitation of claim 8 are incorporated by reference.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 IL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

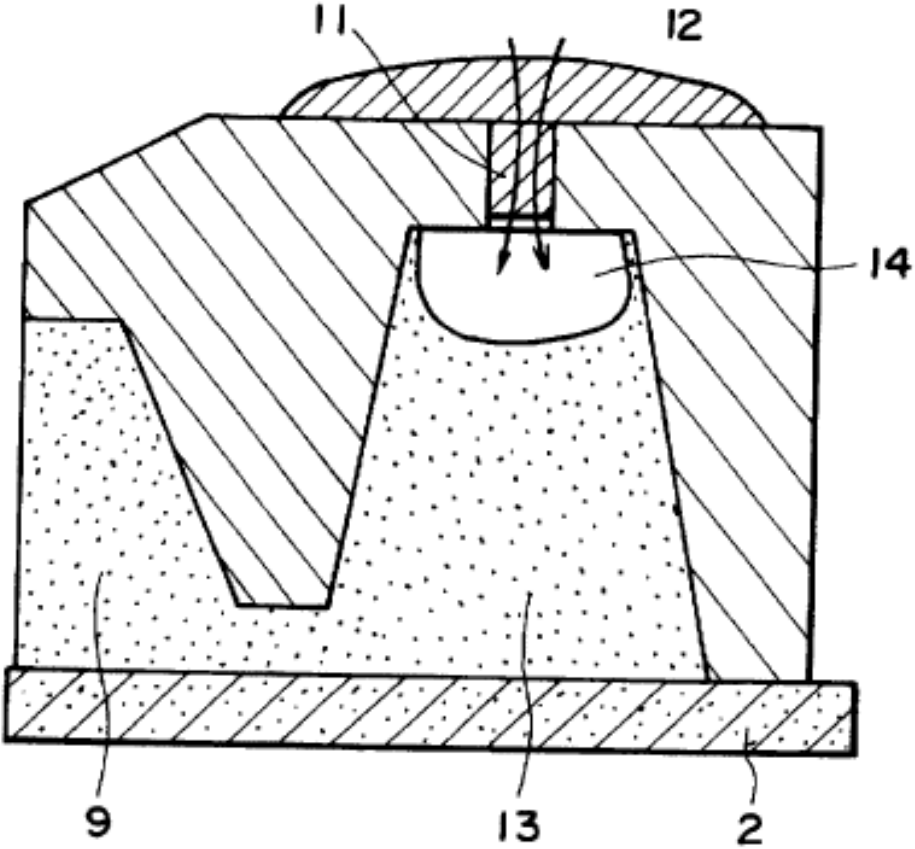
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the

Asserted Claim Element	Exemplary Prior Art Disclosures
	integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to

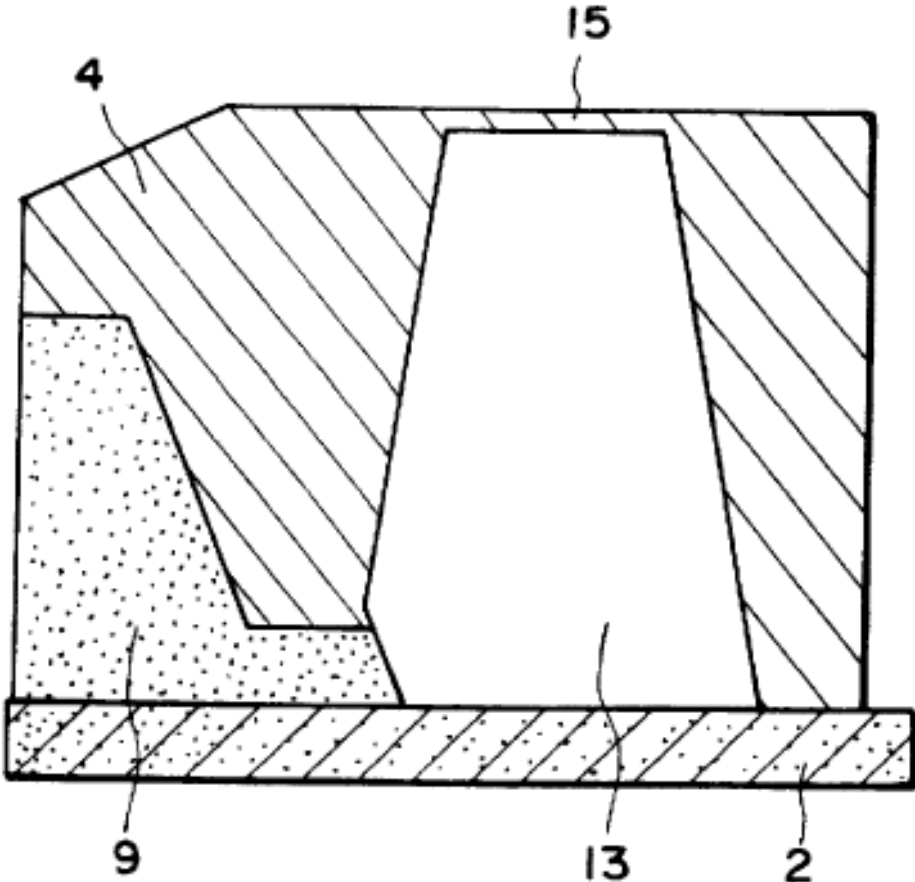
Asserted Claim Element	Exemplary Prior Art Disclosures
	permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactivated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. Otsuka The Otsuka disclosures in each limitation of claim 8 are incorporated by reference. “In order to efficiently absorb the pressure wave, it is desirable that, as shown in FIG. 1, an opening to the common liquid chamber is provided in the buffering chamber 13 at a position faced to each nozzle (passage).” Otsuka, at 6:39-42.

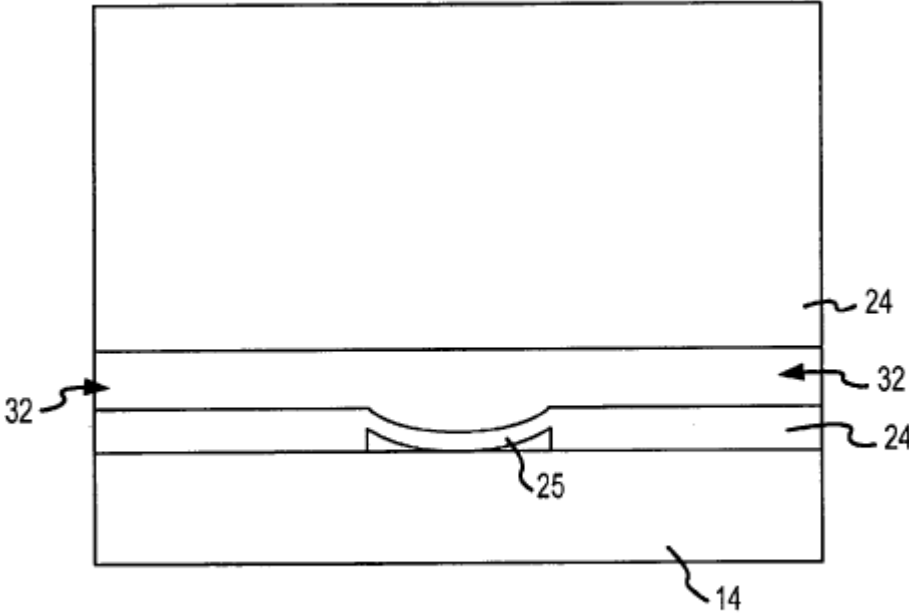
Asserted Claim Element	Exemplary Prior Art Disclosures
	“However, in this invention, the buffering chamber is provided with a portion (gas transmitting portion) which relatively easily permits the gases to enter the buffering chamber. Therefore, the gases (air) is external of the print head are supplied into the buffering chamber, as shown in FIG. 4. For this reason, even if the gases in the buffering chamber are reduced, the gases are refilled. In this-manner, the ink vibration can be suppressed for a long period of time, thus stabilizing the printing operation. In the structure in which an opening 11 is formed in a part of a wall constituting a buffering chamber, and it is sealed by a gas transmitting sealing material, it is desirable that the practical properly is provided by controlling the gas transmitting speed of the sealing member.” Otsuka, at 6:55-7:2.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “FIG. 11 shows another embodiment. The buffering chamber 13 of this embodiment is similar to that of the foregoing embodiment. However, it is different structurally therefrom in that there is no separate member for the gas transmission. In the structure of this embodiment, the thickness

Asserted Claim Element	Exemplary Prior Art Disclosures
	of the wall at the rearmost position of the pressure buffering chamber 13 is made very thin, as compared with the other portion of the wall, so that the intended advantage of the present invention is provided. This embodiment uses the property that the amount of the gas transmission increases with decrease of the thickness of the member. By reducing the thickness to the significant extent, the rearmost position of the pressure buffering chamber 14 permits the gas transmission selectively at the position. Thus, the ink entered into the pressure buffering chamber 13 can be pushed out.” Otsuka, at 8:23-38.

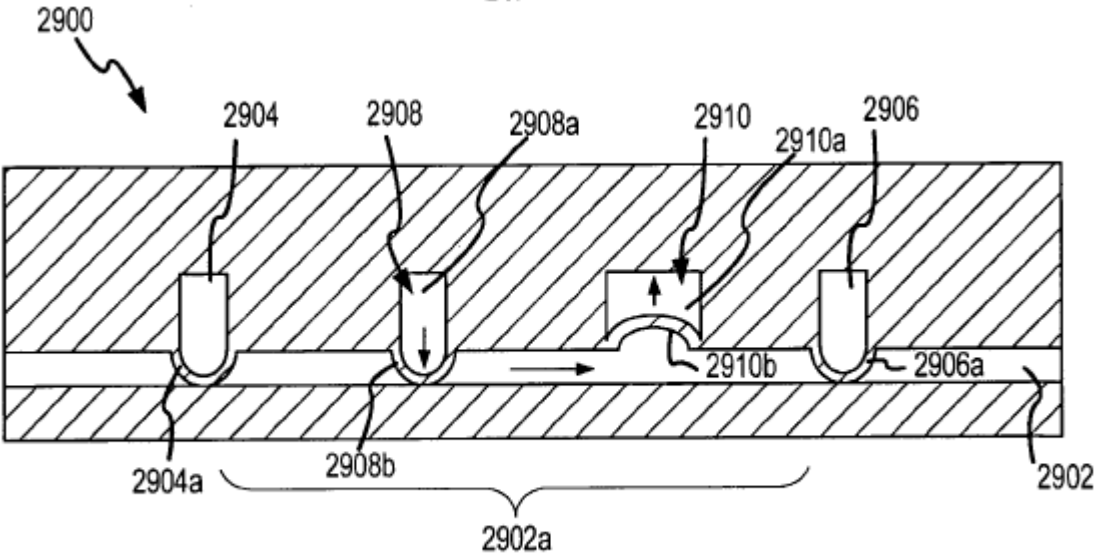
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 11
[10] The device of claim 8, wherein the fluid filled region	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been

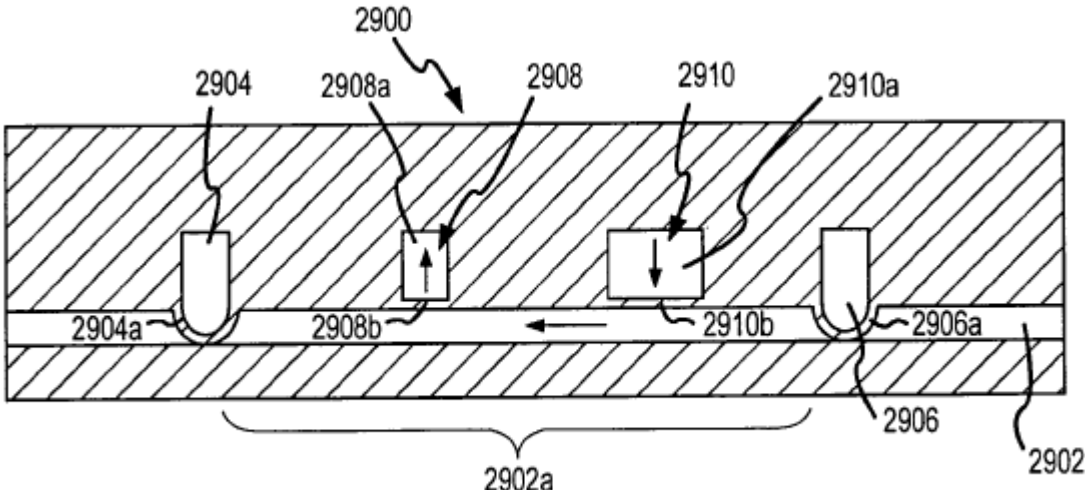
Asserted Claim Element	Exemplary Prior Art Disclosures
includes a side channel connecting the first reservoir to the flow channel.	obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Chou The Chou disclosures in each limitation of claim 8 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position,

Asserted Claim Element	Exemplary Prior Art Disclosures
	rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL." Chou, at 19:7-25; <i>see also</i> Fig. 7H below.  FIG.7H

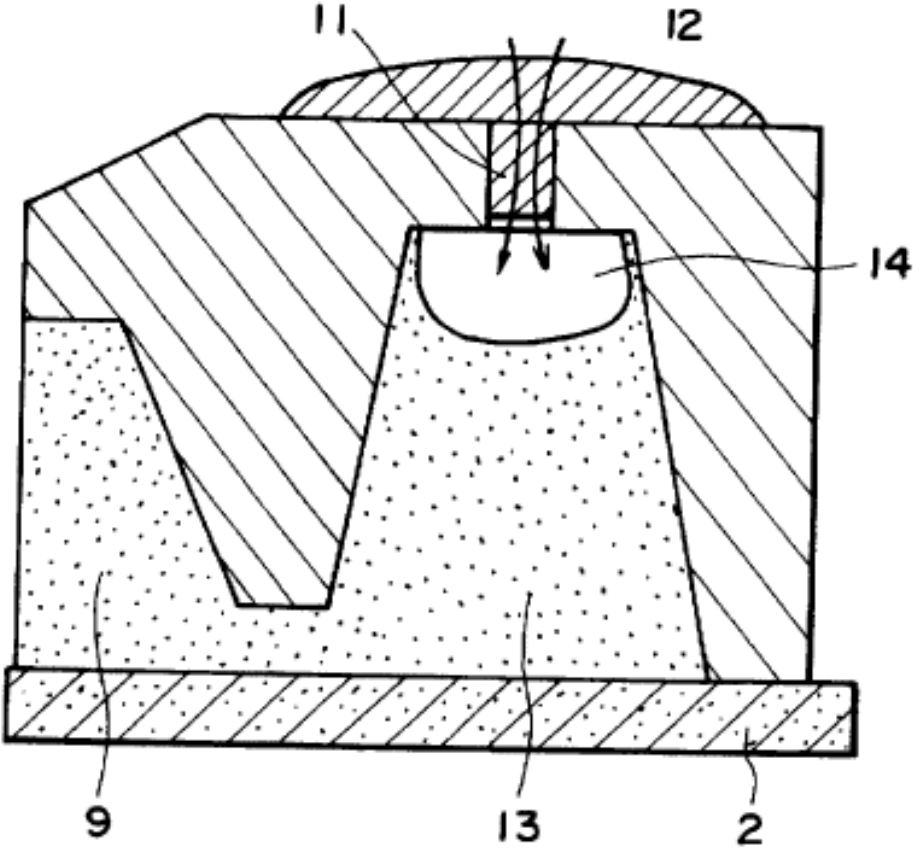
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between

Asserted Claim Element	Exemplary Prior Art Disclosures
	the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.

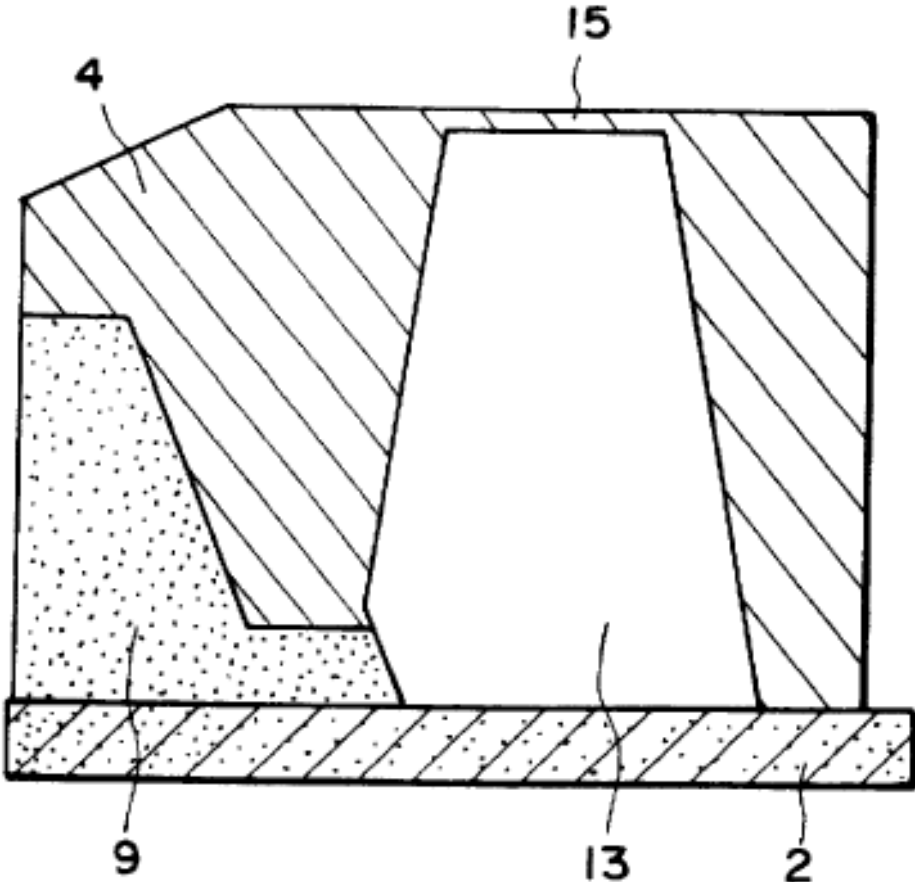
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. Otsuka The Otsuka disclosures in each limitation of claim 8 are incorporated by reference. “In order to efficiently absorb the pressure wave, it is desirable that, as shown in FIG. 1, an opening to the common liquid chamber is provided in the buffering chamber 13 at a position faced to each nozzle (passage).” Otsuka, at 6:39-42.

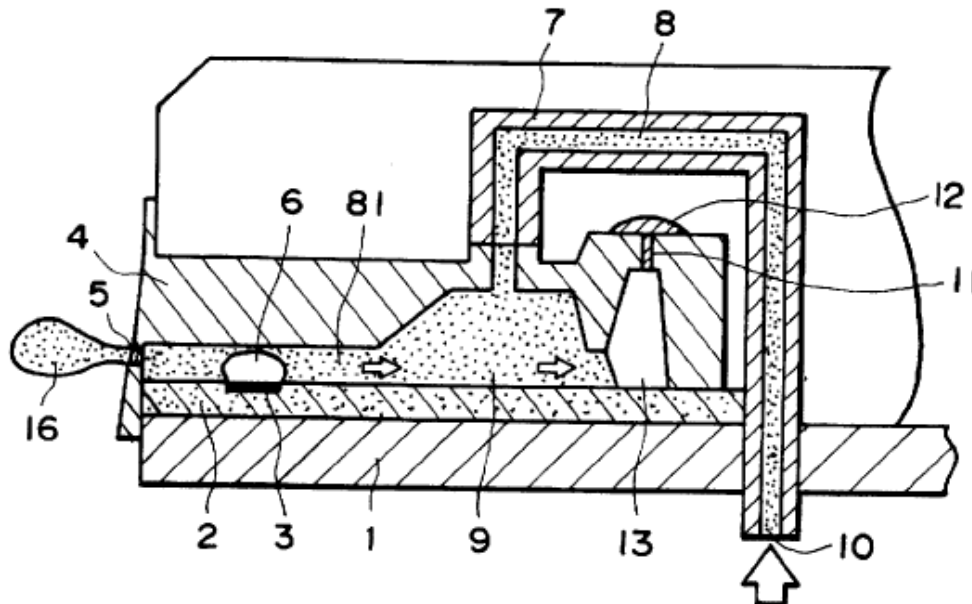
Asserted Claim Element	Exemplary Prior Art Disclosures
	“However, in this invention, the buffering chamber is provided with a portion (gas transmitting portion) which relatively easily permits the gases to enter the buffering chamber. Therefore, the gases (air) is external of the print head are supplied into the buffering chamber, as shown in FIG. 4. For this reason, even if the gases in the buffering chamber are reduced, the gases are refilled. In this-manner, the ink vibration can be suppressed for a long period of time, thus stabilizing the printing operation. In the structure in which an opening 11 is formed in a part of a wall constituting a buffering chamber, and it is sealed by a gas transmitting sealing material, it is desirable that the practical properly is provided by controlling the gas transmitting speed of the sealing member.” Otsuka, at 6:55-7:2.

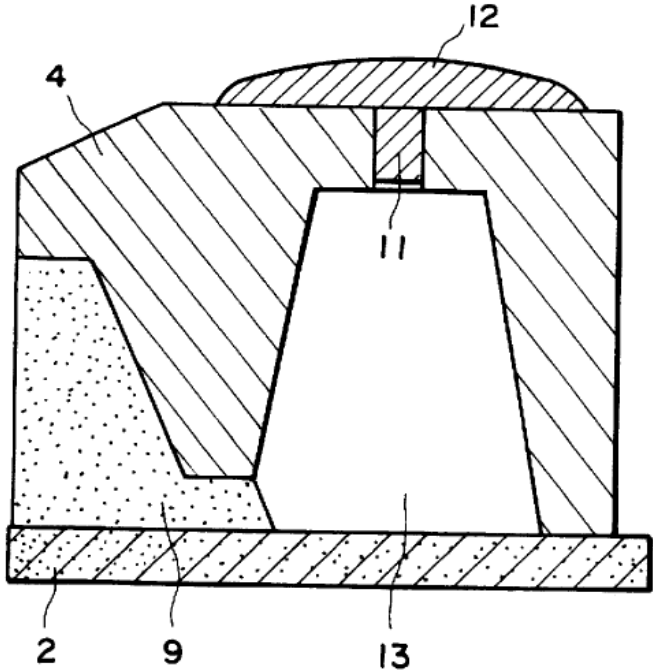
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “FIG. 11 shows another embodiment. The buffering chamber 13 of this embodiment is similar to that of the foregoing embodiment. However, it is different structurally therefrom in that there is no separate member for the gas transmission. In the structure of this embodiment, the thickness

Asserted Claim Element	Exemplary Prior Art Disclosures
	of the wall at the rearmost position of the pressure buffering chamber 13 is made very thin, as compared with the other portion of the wall, so that the intended advantage of the present invention is provided. This embodiment uses the property that the amount of the gas transmission increases with decrease of the thickness of the member. By reducing the thickness to the significant extent, the rearmost position of the pressure buffering chamber 14 permits the gas transmission selectively at the position. Thus, the ink entered into the pressure buffering chamber 13 can be pushed out.” Otsuka, at 8:23-38.

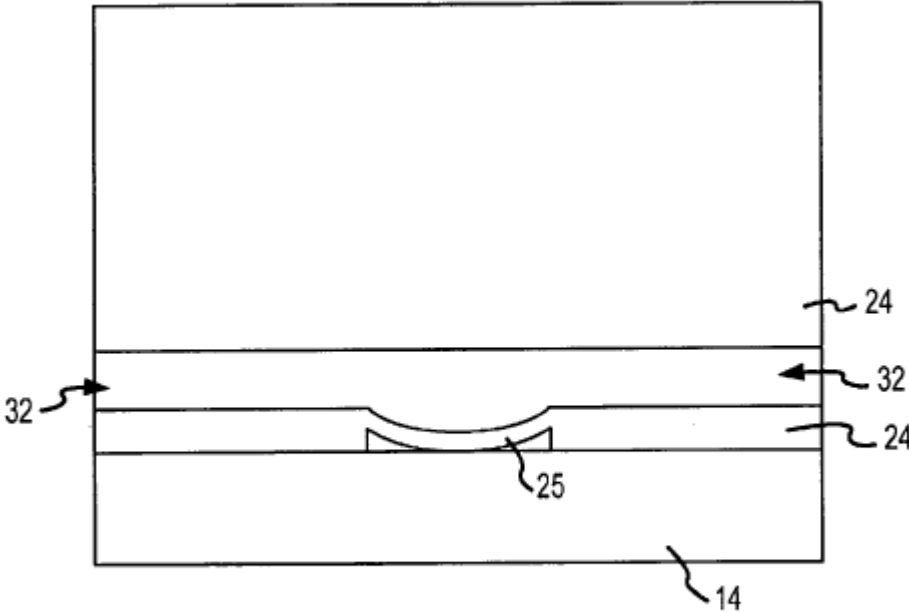
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 11
[11] The device of claim 8,	The following exemplary citations to prior art references establish that this claim limitation is

Asserted Claim Element	Exemplary Prior Art Disclosures
wherein the fluid filled region prevents the gas from the gas pocket from leaking into the flow channel.	taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Otsuka The Otsuka disclosures in each limitation of claim 8 are incorporated by reference. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below.

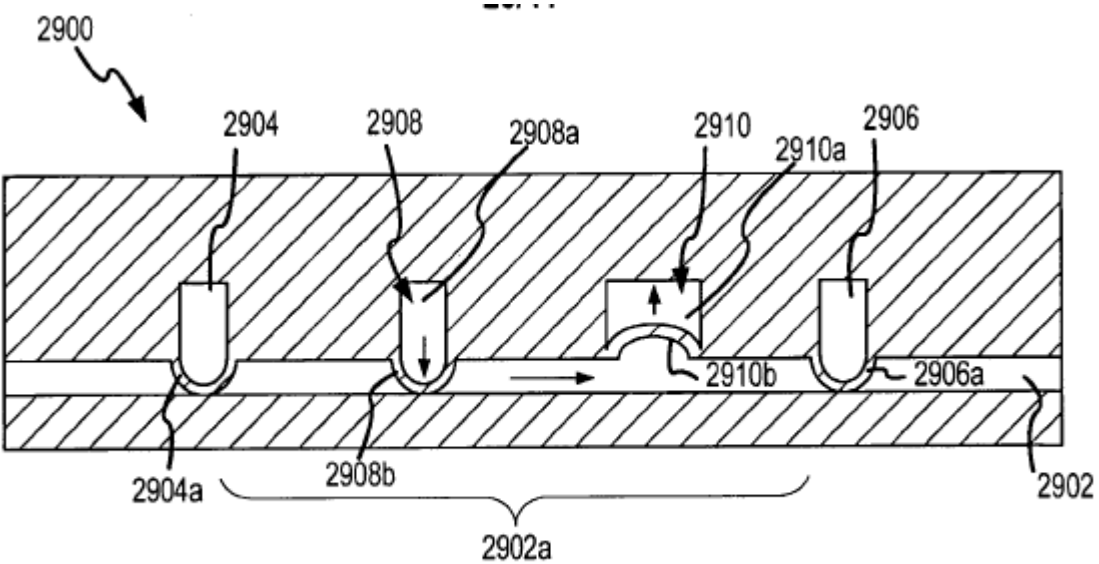
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

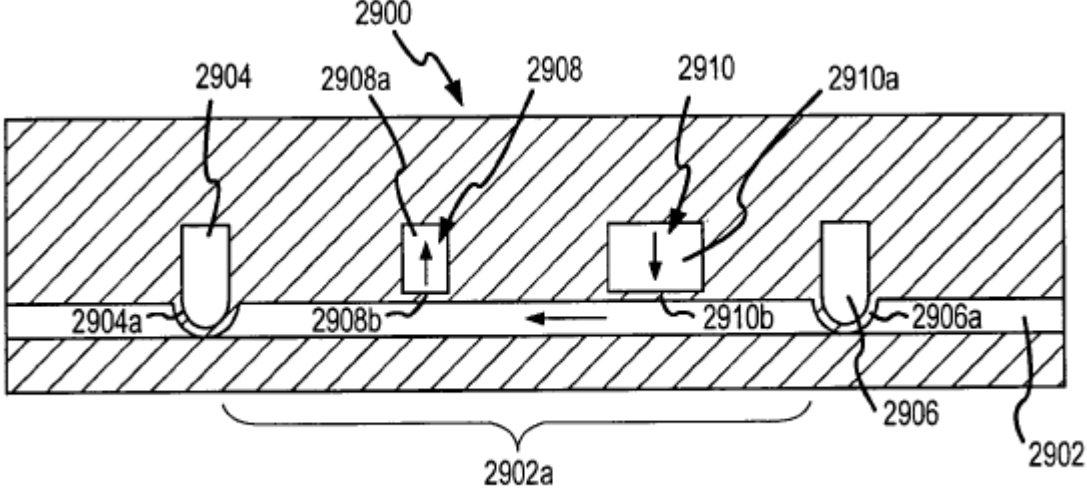
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “In each of the foregoing embodiments, the position of the bubbles is used to assure the permanent existing of the bubbles adjacent the common liquid chamber, so that the vibration of the ink in the liquid chamber is suppressed . . . By doing so, the pressure weight going to return to the upstream due to the vibration is blocked.” Otsuka, at 9:19-26. Chou The Chou disclosures in each limitation of claim 8 are incorporated by reference.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 IL to 1 nL,

Asserted Claim Element	Exemplary Prior Art Disclosures
	and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.  FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer

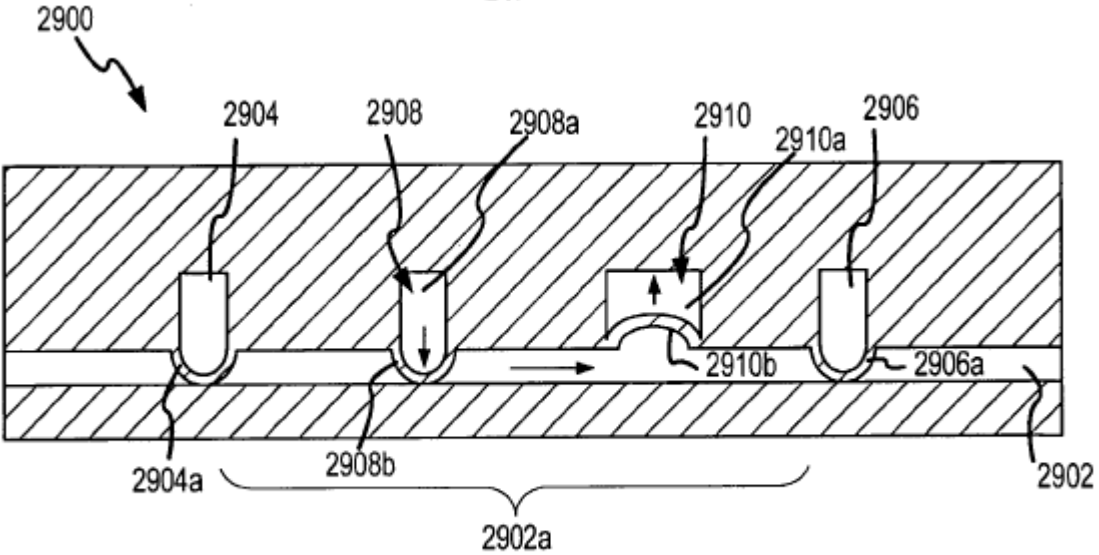
Asserted Claim Element	Exemplary Prior Art Disclosures
	110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by

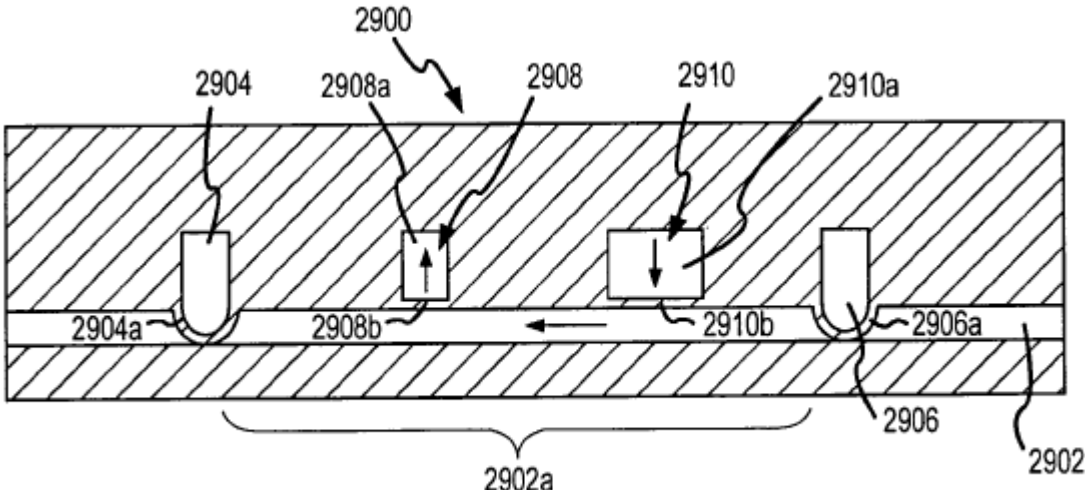
Asserted Claim Element	Exemplary Prior Art Disclosures
	damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactivated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25.
[12] The device of claim 6, wherein the resilient properties of the first reservoir include a resilient wall for facilitating dampening or absorbing of the pressure pulse.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada

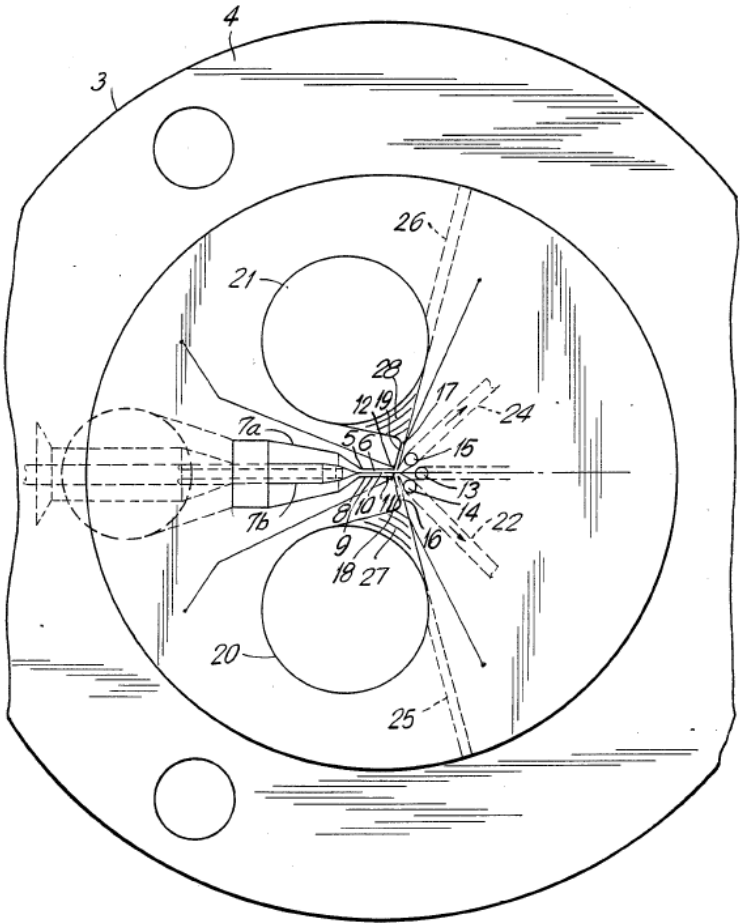
Asserted Claim Element	Exemplary Prior Art Disclosures
	The Wada disclosures in each limitation of claim 6 are incorporated by reference. “In preferred aspects, the bottom portion of the device comprises a solid substrate that is substantially planar in structure, and which has at least one substantially flat upper surface. A variety of substrate materials may be employed as the bottom portion. Typically, because the devices are microfabricated, substrate materials will be selected based upon their compatibility with known microfabrication techniques, e.g., photolithography, wet chemical etching, laser ablation, air abrasion techniques, injection molding, embossing, and other techniques. The substrate materials are also generally selected for their compatibility with the full range of conditions to which the microfluidic devices are typically exposed, including extremes of pH, temperature, salt concentration, and application of electric fields. Accordingly, in some preferred aspects, the substrate material optionally includes materials normally associated with the semiconductor industry in which such microfabrication techniques are regularly employed, including, e.g., silica based substrates, such as glass, quartz, silicon or polysilicon, as well as other substrate materials, such as gallium arsenide and the like.” Wada, at 38:18-31. “In additional preferred aspects, the substrate materials will comprise polymeric materials, e.g., plastics, such as polymethylmethacrylate (PM-MA), polycarbonate, polytetrafluoroethylene (TEFLON™), polyvinylchloride (PVC), polydimethylsiloxane (PDMS), polysulfone, polystyrene, polymethylpentene, polypropylene, polyethylene, polyvinylidene fluoride, ABS (acrylonitrile-butadiene-styrene copolymer), and the like.” Wada, at 39:3-8. Chou The Chou disclosures in each limitation of claim 6 are incorporated by reference. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29.

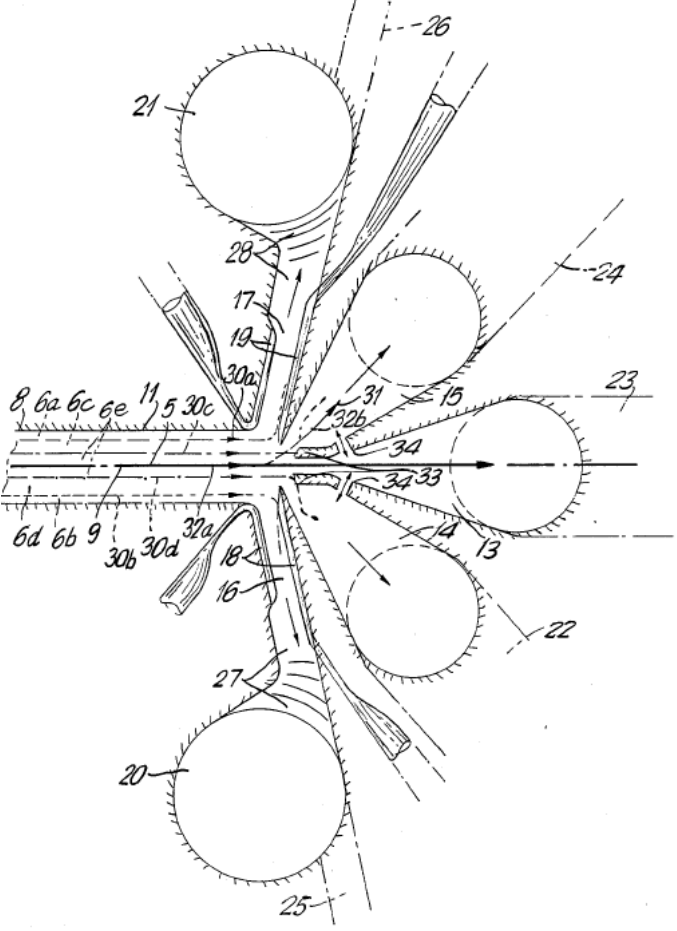
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “The damper is separated from the fluid flow channel by a thin membrane. Preferably this thin membrane has sufficient elasticity to deflect "upward" when a fluid having a peak of sinusoidal wave-like passes underneath. In this manner, some of the fluid oscillation energy is absorbed by the damper, thereby reducing the height (i.e., peak) of fluid oscillation. Typically, the thickness of the membrane between the damper and the fluid flow channel depends on a variety of factors including the depth and width of the flow channel, the amount of fluid oscillation produced by the pump and the elasticity (i.e., the material) of the membrane. One of ordinary skill in the art can readily determine the proper membrane thickness to achieve a desired attenuation of fluid oscillation depending on a desired application and materials used.” Chou, at 40:10-19. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane

Asserted Claim Element	Exemplary Prior Art Disclosures
	2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B Zöld The Zöld disclosures in each limitation of claim 6 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas

Asserted Claim Element	Exemplary Prior Art Disclosures
	bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary 3 and an inner boundary 4. Inside, there are two large circular regions 21 and 20. A central assembly includes components labeled 28, 12, 19, 17, 24, 15, 13, 14, 22, 16, 18, 27, 9, 8, 10, 11, 5, 6, 7a, and 7b. Dashed lines 26 and 25 indicate specific paths or boundaries within the device.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

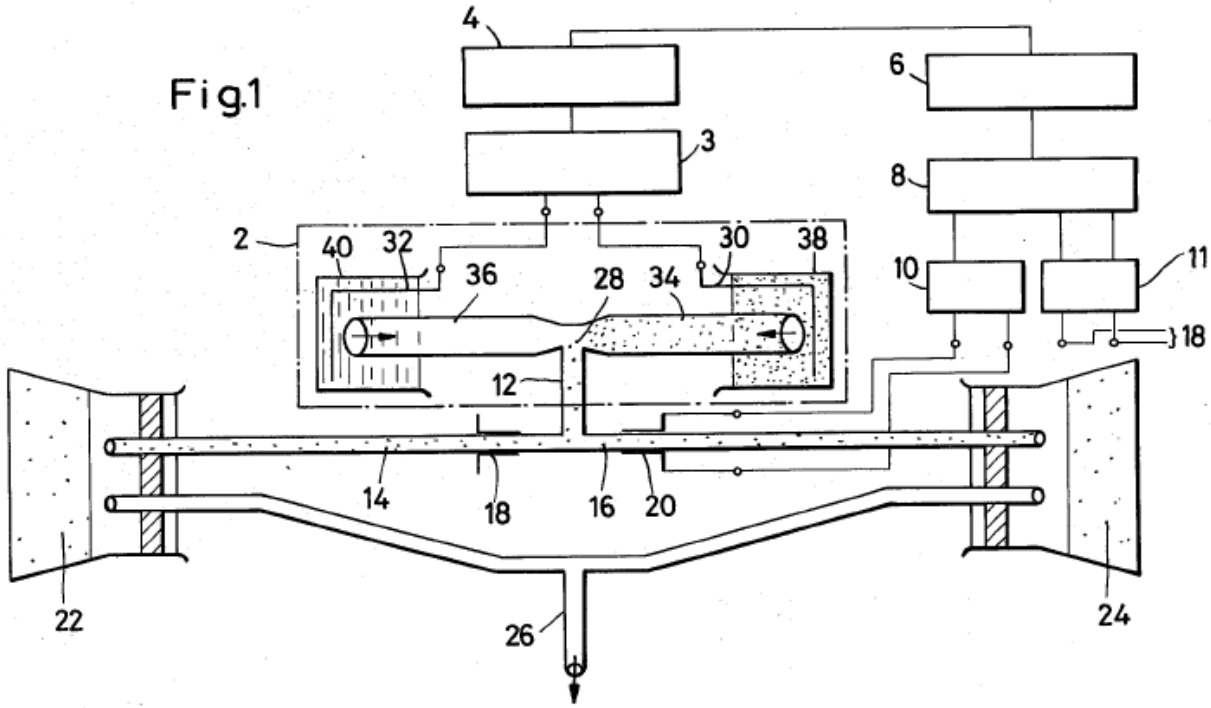
Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

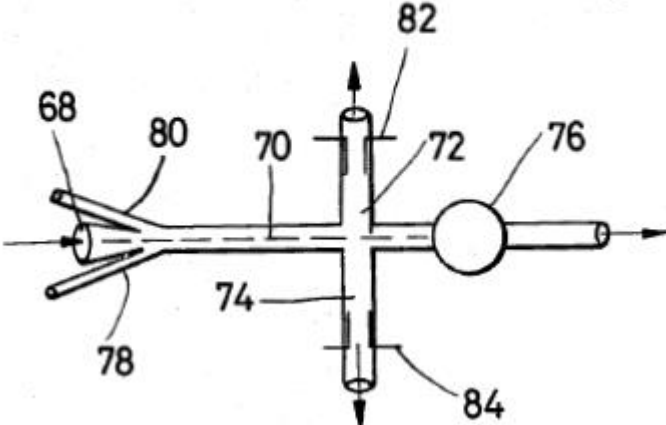
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 6 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of

Asserted Claim Element	Exemplary Prior Art Disclosures
	more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly

Asserted Claim Element	Exemplary Prior Art Disclosures
	before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by

Asserted Claim Element	Exemplary Prior Art Disclosures
	letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

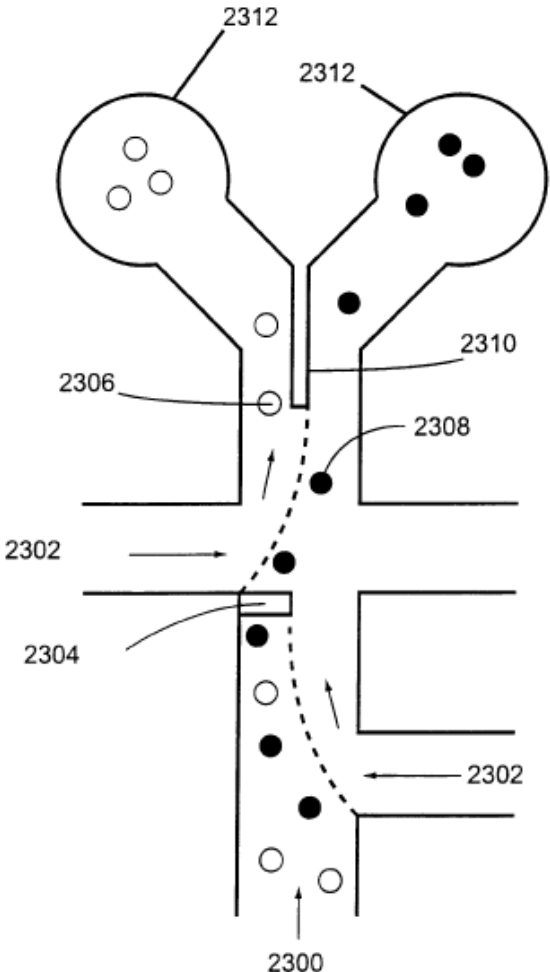
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig1 

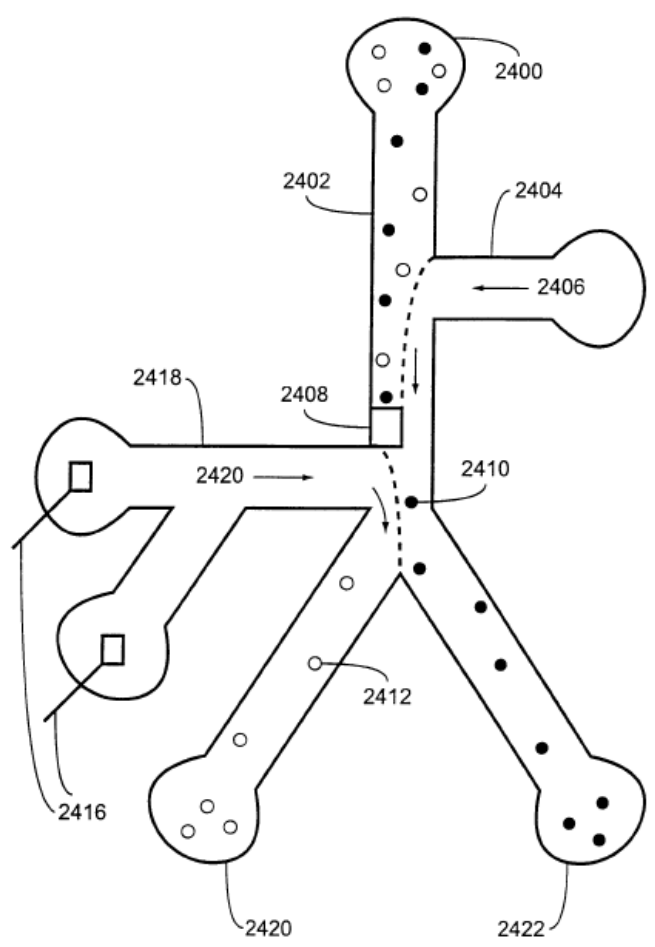
Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7  35 U.S.C. § 112 The Patent Act requires that “[t]he specification shall contain a written description of the invention.” 35 U.S.C. § 112, ¶ 1; <i>see also Ariad Pharm., Inc. v. Eli Lilly and Co.</i>, 598 F.3d 1336, 1344-45 (Fed. Cir. 2010) (en banc). “[T]he test for sufficiency [of a written description] is whether the disclosure of the application relied upon reasonably conveys to those skilled in the

Asserted Claim Element	Exemplary Prior Art Disclosures
	art that the inventor had possession of the claimed subject matter as of the filing date. . . . [P]ossession as shown in the disclosure is a more complete formulation.” <i>Ariad Pharm.</i>, 598 F.3d at 1351 (internal citations omitted). “To fulfill the written description requirement, a patent specification must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that ‘the inventor invented the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood v. Am. Airlines, Inc.</i>, 107 F.3d 1565, 1572, and <i>In re Gosteli</i>, 872 F.2d 1008, 1012 (Fed. Cir. 1989)). “Thus, an applicant complies with the written description requirement ‘by describing the invention, with all its claimed limitations, not that which makes it obvious,’ and by using ‘such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention.’” <i>Id.</i> at 1566 (quoting <i>Lockwood</i>, 107 F.3d at 1572); <i>see also In re Curtis</i>, 354 F.3d 1347, 1355 (Fed. Cir. 2004) (affirming a finding of invalidity for lack of written description by BPAI where “unpredictability in performance of certain species or subcombinations other than those specifically enumerated [in the disclosure]” was present (internal quotations omitted)). “Compliance with the written description requirement is essentially a fact-based inquiry that will ‘necessarily vary depending on the nature of the invention claimed.’” <i>Enzo Biochem</i>, 323 F.3d at 963, 63 USPQ2d at 1613. Satisfying the written description requirement is a question of fact that must be decided on a case-by-case basis. <i>Vas-Cath, Inc. v. Mahurkar</i>, 935 F.2d at 1563, 19 USPQ2d at 1116 (Fed. Cir. 1991). Moreover, “[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.” 35 U.S.C. § 112 (emphasis added). “To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without ‘undue experimentation’.” <i>Genentech, Inc. v. Novo Nordisk A/S</i>, 108 F.3d 1361, 1365, (Fed. Cir. 1997) (quoting <i>In re Wright</i>, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). During prosecution of the ’797 patent, to overcome a rejection by the examiner over Friedman, Plaintiff argued that “Friedman fails to disclose, teach or suggest a first reservoir which includes ‘resilient properties for dampening or absorbing a pressure pulse,’ as recited in the claim

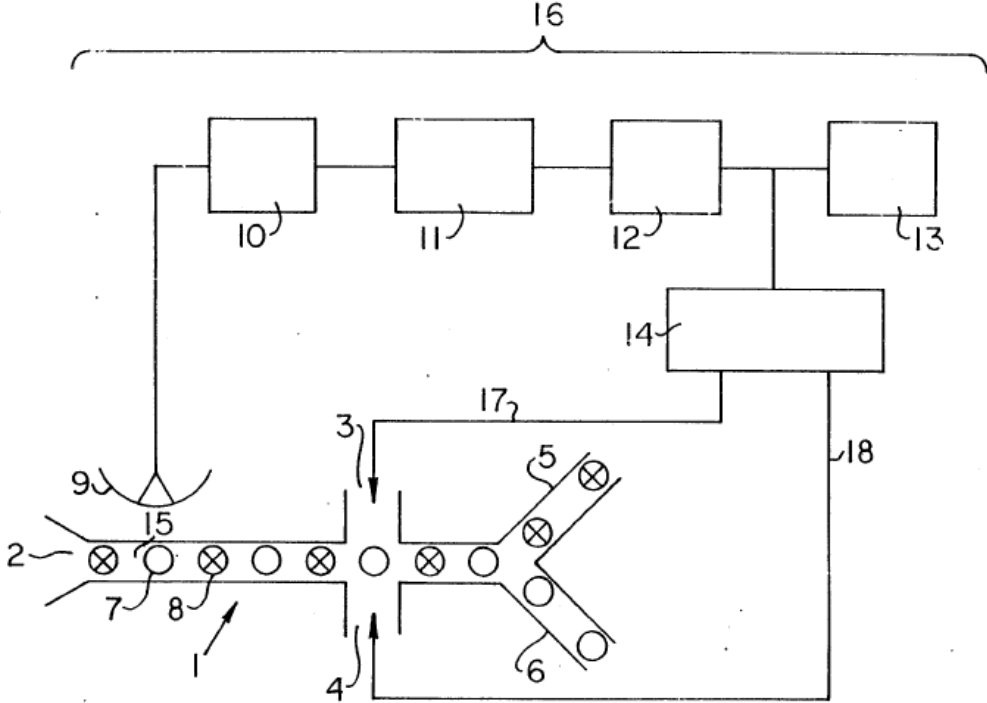
Asserted Claim Element	Exemplary Prior Art Disclosures
	(Applicants note that the requirement that the first reservoir include resilient properties is a structural requirement which must be substantively addressed by the Examiner). Indeed, control ports 72 and 74 and associated fluid pathways in Friedman are not disclosed as having resilient properties.” ’797 patent file history, Response to non-final Office Action filed February 24, 2014, at 8. However, no degree of dampening is indicated in the claim. Any polymer structure would naturally dampen pressure to some degree, for example high stiffness materials such as glass or metals would dampen to a lesser degree as to more flexible polymer structures. The term “resilient” is only used in the ’797 patent specification in the context of a bubble valve with a resilient wall or a compressible gas. See ’797 patent at 12:18-22; 12:28-32. Thus, claim 12 is invalid for failure to provide adequate written description to enable a person of ordinary skill in the art to make and use a device having a first reservoir “wherein the resilient properties of the first reservoir include a resilient wall for facilitating dampening or absorbing of the pressure pulse” without undue experimentation.
[13] The device of claim 5, further comprising an actuator or pressurizer operatively associated with flow channel and adapted for generating the pressure pulse across the width of the flow channel.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada The Wada disclosures in each limitation of claim 5 are incorporated by reference. “Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:18-23. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of

Asserted Claim Element	Exemplary Prior Art Disclosures
	separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

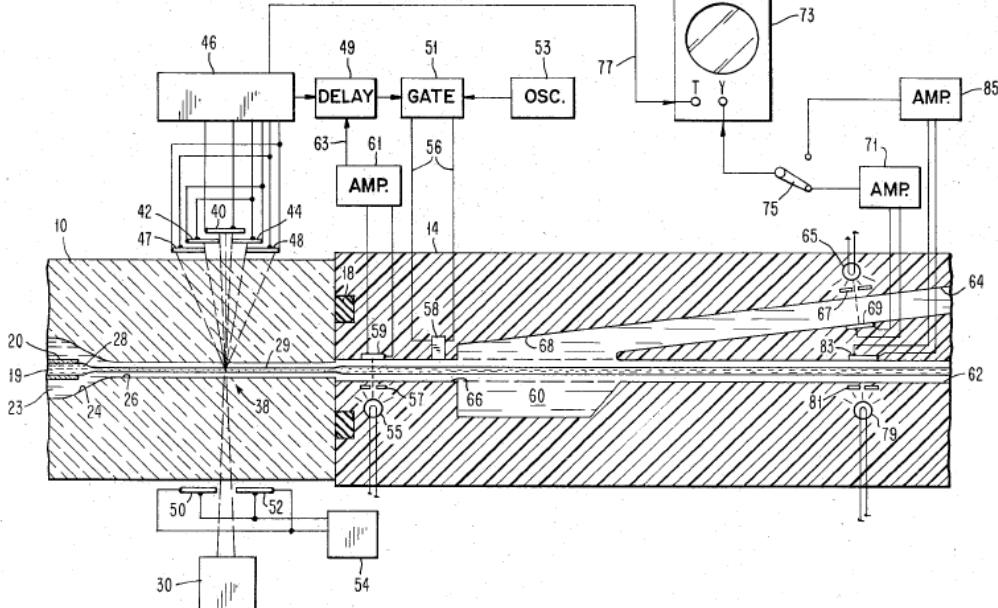
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles

Asserted Claim Element	Exemplary Prior Art Disclosures
	against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.  The diagram illustrates a microfluidic device with a central vertical microchannel 2402. At the top, a reservoir 2400 feeds into the channel. A horizontal microchannel 2404 branches off to the right, leading to a reservoir 2406. A horizontal microchannel 2418 branches off to the left, leading to a reservoir 2416. A horizontal microchannel 2420 branches off to the left, leading to a reservoir 2420. A horizontal microchannel 2412 branches off to the right, leading to a reservoir 2422. A detector 2408 is located on the main channel 2402, opposite the T-junction. A selected particle 2410 is shown being detected by the detector. Arrows indicate the flow direction: from the top reservoir 2400 down the main channel 2402, and from the side channels 2404, 2418, 2420, and 2412 into their respective reservoirs.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Otsuka The Otsuka disclosures in each limitation of claim 5 are incorporated by reference. “The consideration will be made as to the case in which all of the ejection nozzles are continuously actuated by the ejection heater 3 being actuated.” Otsuka, at 2:28-30. Marcus The Marcus disclosures in each limitation of claim 5 are incorporated by reference. “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control port A and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then

Asserted Claim Element	Exemplary Prior Art Disclosures
	transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at 3:49-62.  FIG. 1 Friedman The Friedman disclosures in each limitation of claim 5 are incorporated by reference.

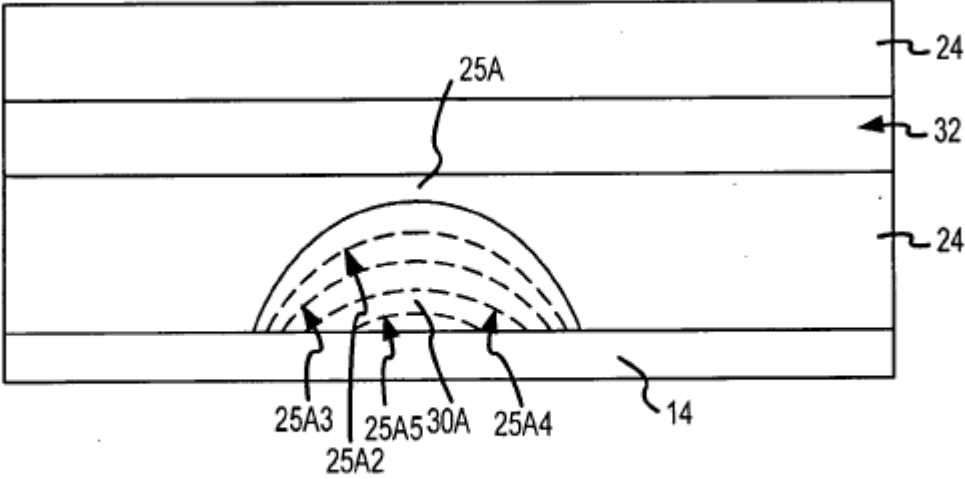
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Another object of the invention is to provide an improved particle sorter incorporating at least one digital fluidic amplifier, or digital switch, as a basic element.” Friedman, at 1:54-56. “A digital fluidic amplifier is provided having an inlet connected to the outlet of said chamber to receive the particle stream, said fluidic amplifier having a switching chamber communicating with said inlet and at least two different outlet ports communicating with said switching chamber, with an electrical transducer coupled to receive electrical signals from said detection means and operable to provide control signals to said fluidic amplifier. Said fluidic amplifier is operable in response to said control signals to switch the liquid particle carrying stream entering the inlet thereof from a first outlet port to a second selected outlet port in response to a predetermined particle characteristic control signal from said transducer.” Friedman, at 2:3-16. “When a unique particle characteristic is detected which signifies the presence of a unique particle which is to be segregated from the other particles, the detection circuits 46 send out an electrical signal through a delay circuit 49, a gate circuit 51, and connections 56 to an electrical transducer 58 which is mounted within the fluidic switch housing 14. This causes a switching of the particle-carrying stream from one outlet port to another. The fluidic amplifier housing 14 defines a switching chamber 60 having a first outlet port 62, and a second outlet port 64. The flow of liquid through the optical chamber 10 is in a laminar (non-turbulent) mode. In the absence of a signal at the transducer 58, the stream of fluid emanating from the bore 26 of the chamber 10 continues to flow in a laminar mode into the inlet 66 of the fluidic amplifier housing 14, and continues in the laminar mode through the switching chamber 60, and out through the first outlet port 62, which is in direct axial alignment with the inlet 66. However, when the transducer 58 is energized, it induces turbulence into the liquid stream. In the presence of turbulence, the stream tends to attach itself to the nearest side wall 68. This "wall attachment" effect causes the stream to follow the side wall 68 to the second outlet port 64.” Friedman, at 3:24-28; <i>see also</i> Fig. 1 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 1  “The switching chamber 60, and the ports 62, 64, and 66 may preferably be formed by providing the chamber housing 14 in two parts, one part containing cavities to provide the chamber and ports, and the other part constituting a cover which is attached over the other part to enclose the cavities. Thus, the part of the housing 14 containing the cavities may contain the pick-up elements 59, 69, and 83 in the back walls thereof, and the light sources 55, 65, and 79, together with their associated optical masks, may be attached to, or be a part of, the cover member. These positions may, of course, be reversed.” Friedman, at 8:21-33. “For instance, in FIG. 2, three outlet ports are provided from the switching chamber and it will be understood that photoelectric sort detectors, such as elements 69 and 83, may be employed for each of those three outlet ports. FIG. 2 illustrates an alternative embodiment of the invention in which the switching chamber 60 is modified as shown at 60A, in a modified fluidic amplifier housing 14A, to provide an additional outlet port 70 and added control ports 72 and 74. A control fluid under pressure

Asserted Claim Element	Exemplary Prior Art Disclosures
	may be supplied to the switching chamber 60A through the control ports 72 and 74 through the respective supply lines 76 and 78 under the control of electromagnetically operated valves 80 and 82.” Friedman, at 8:53-67; <i>see also</i> Fig. 2 below. FIG. 2

Asserted Claim Element	Exemplary Prior Art Disclosures
	“The embodiment of FIG. 2 is capable of several different alternative modes of operation. For instance, if the switching chamber 60A is fabricated in an asymmetrical form such that the wall 68 is substantially closer to the nozzle formed by the inlet 66 than the wall 69, then without any control signals at the control ports 72 and 74, the switching action will be identical to that described above for the embodiment of FIG. 1. Thus, if a signal is supplied to the transducer 58, the resulting turbulence will cause the stream to attach to the wall 68 and to be directed to port 64. In the absence of a signal at transducer 58, the laminar flow will continue, and the stream will be directed through the outlet port 62.” Friedman, at 9:32-45. Chou The Chou disclosures in each limitation of claim 5 are incorporated by reference. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

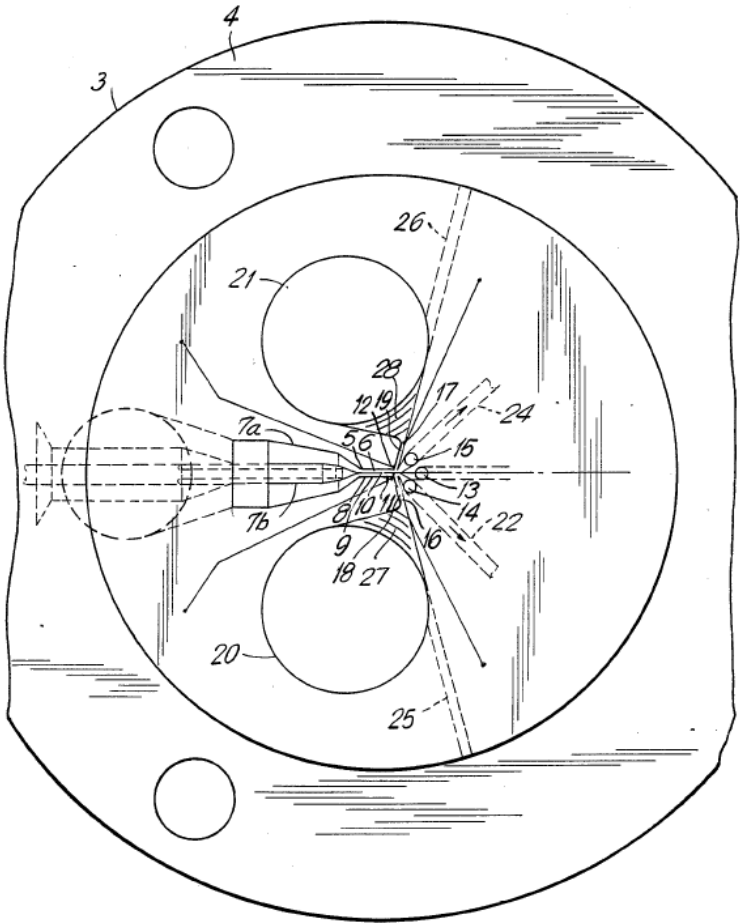
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 7H “In the alternate preferred embodiment of Fig. 11, flow channel 30a has a curved upper wall 25A. When flow channel 32 is pressurized, membrane portion 25 will move downwardly to the successive positions shown by dotted lines 25A2, 25A3, 25A4 and 25A5, with edge portions of the membrane moving first into the flow channel, followed by top membrane portions. An advantage of having such a curved upper surface at membrane 25A is that a more complete seal will be provided when flow channel 32 is pressurized. Specifically, the upper wall of the flow channel 30 will provide a continuous contacting edge against planar substrate 14, thereby avoiding the "island" of contact seen between wall 25 and the bottom of flow channel 30 in Fig. 10. Another advantage of having a curved upper flow channel surface at membrane 25A is that the membrane can more readily conform to the shape and volume of the flow channel in

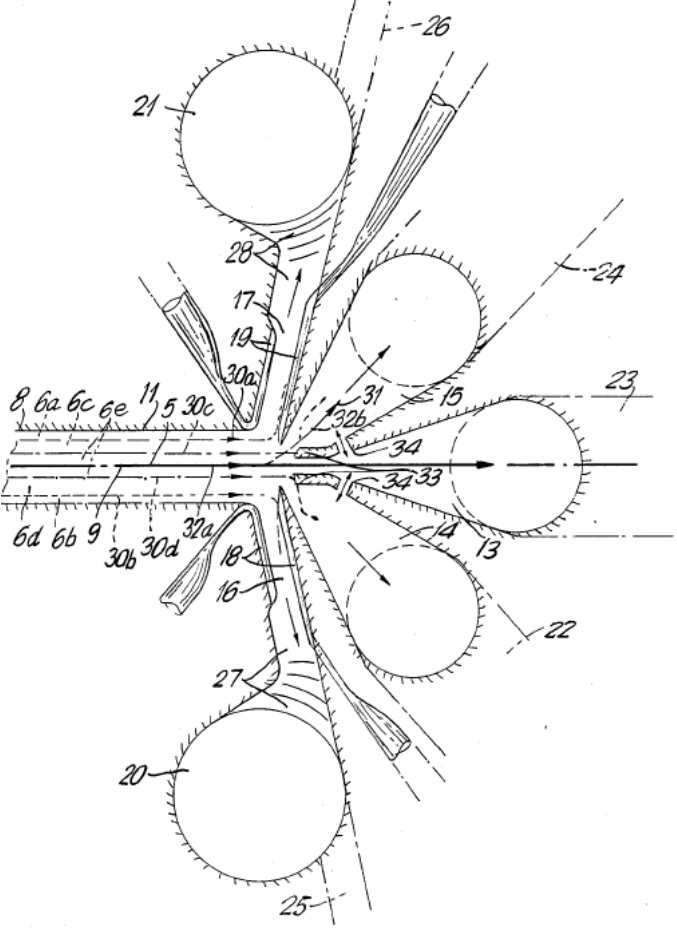
Asserted Claim Element	Exemplary Prior Art Disclosures
	response to actuation. Specifically, where a rectangular flow channel is employed, the entire perimeter (2x flow channel height, plus the flow channel width) must be forced into the flow channel. However where an arched flow channel is used, a smaller perimeter of material (only the semi-circular arched portion) must be forced into the channel. In this manner, the membrane requires less change in perimeter for actuation and is therefore more responsive to an applied actuation force to block the flow channel.” Chou, at 24:17-34; <i>see also</i> Fig. 11 below.  FIG.11 “In addition to pressure based actuation systems described above, optional electrostatic and magnetic actuation systems are also contemplated, as follows. Electrostatic actuation can be accomplished by forming oppositely charged electrodes (which will tend to attract one another when a voltage differential is applied to them) directly into the monolithic elastomeric structure. For example, referring to Fig. 7B, an optional first electrode 70 (shown in phantom) can be positioned on (or in) membrane 25 and an optional second electrode 72 (also shown in phantom)

Asserted Claim Element	Exemplary Prior Art Disclosures
	can be positioned on (or in) planar substrate 14. When electrodes 70 and 72 are charged with opposite polarities, an attractive force between the two electrodes will cause membrane 25 to deflect downwardly, thereby closing the "valve" (i.e.: closing flow channel 30). For the membrane electrode to be sufficiently conductive to support electrostatic actuation, but not so mechanically stiff so as to impede the valve's motion, a sufficiently flexible electrode must be provided in or over membrane 25. Such an electrode may be provided by a thin metallization layer, doping the polymer with conductive material, or making the surface layer out of a conductive material. In an exemplary aspect, the electrode present at the deflecting membrane can be provided by a thin metallization layer which can be provided, for example, by sputtering a thin layer of metal such as 20 nm of gold." Chou, at 26:9-26. "Referring first to Figs. 12A and 12B, a schematic of flow channels 30 and 32 is shown. Flow channel 30 preferably has a fluid (or gas) flow F passing therethrough. Flow channel 32, (which crosses over flow channel 30, as was already explained herein), is pressurized such that membrane 25 separating the flow channels may be depressed into the path of flow channel 30, shutting off the passage of flow F therethrough, as has been explained." Chou, at 28:18-23. "Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc." Chou, at 28:27-33. "As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow

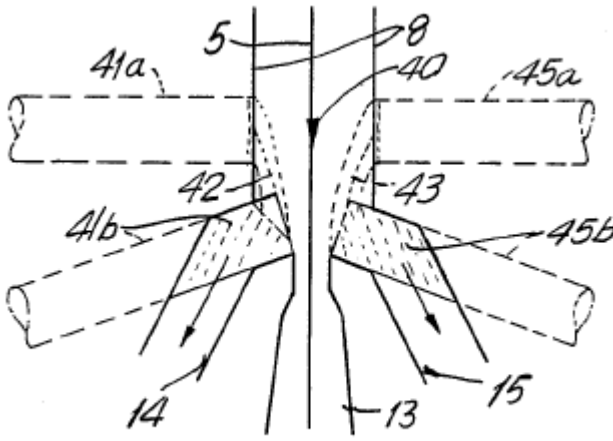
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 30.” Chou, at 31:13-20. Zöld The Zöld disclosures in each limitation of claim 5 are incorporated by reference. “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a

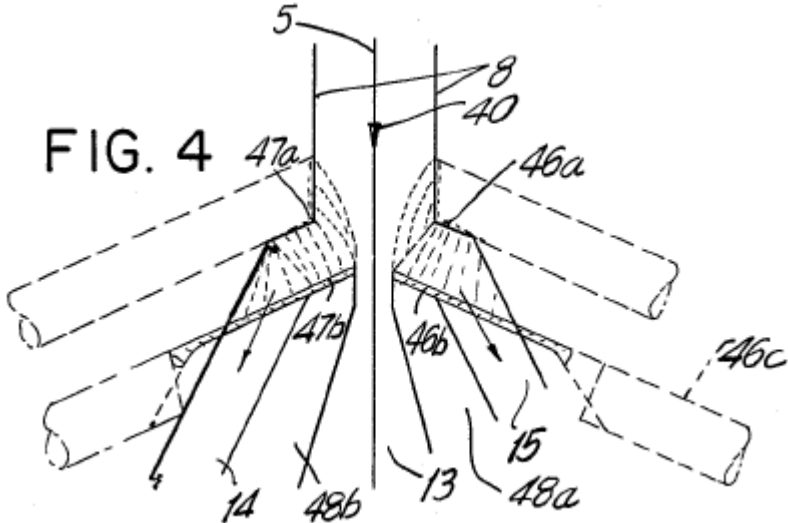
Asserted Claim Element	Exemplary Prior Art Disclosures
	value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary 3 and an inner boundary 4. Inside, there are two large circular regions 21 and 20. A central assembly includes components labeled 28, 12, 19, 17, 24, 15, 13, 14, 22, 16, 18, 27, 9, 8, 10, 11, 5, 6, 7a, and 7b. Dashed lines 26 and 25 indicate specific paths or boundaries within the device.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

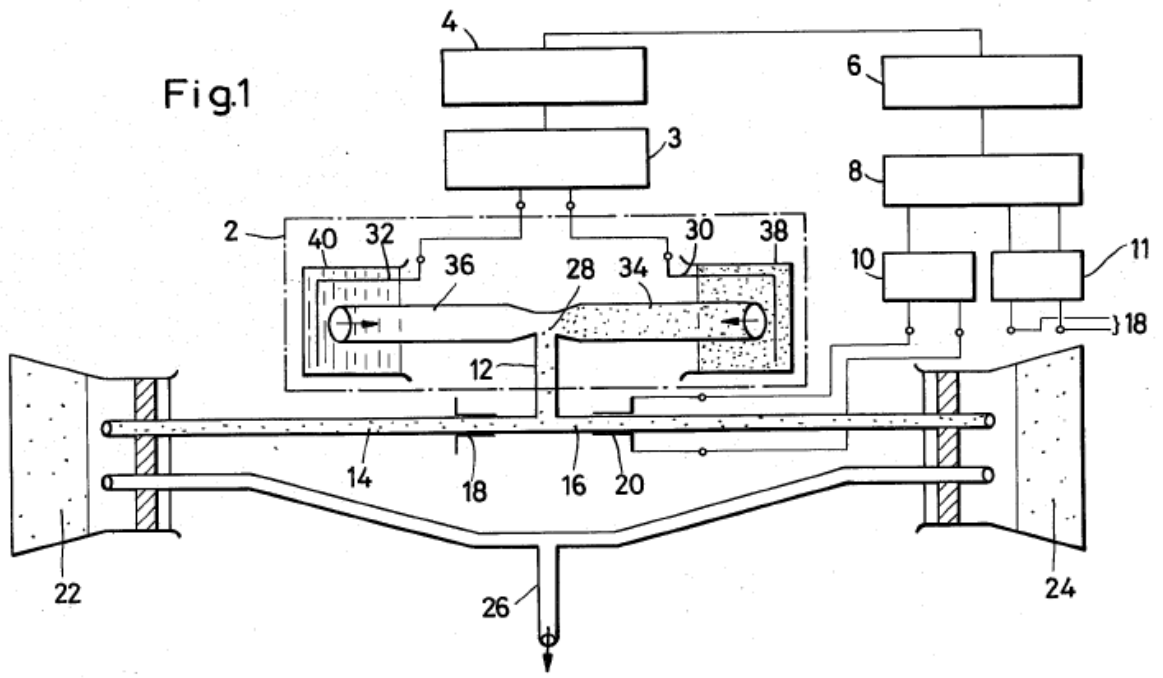
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 5 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser

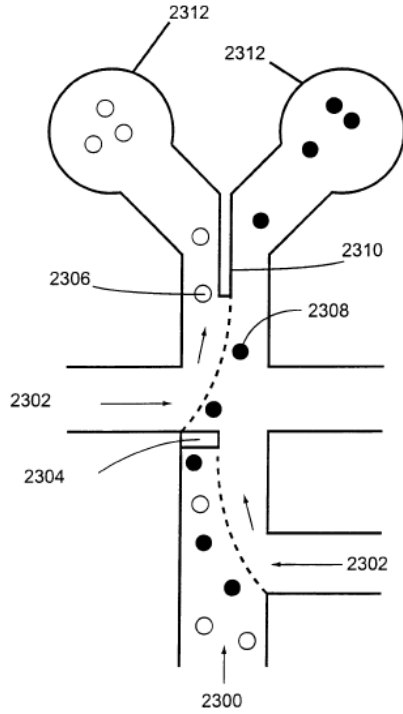
Asserted Claim Element	Exemplary Prior Art Disclosures
	portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of

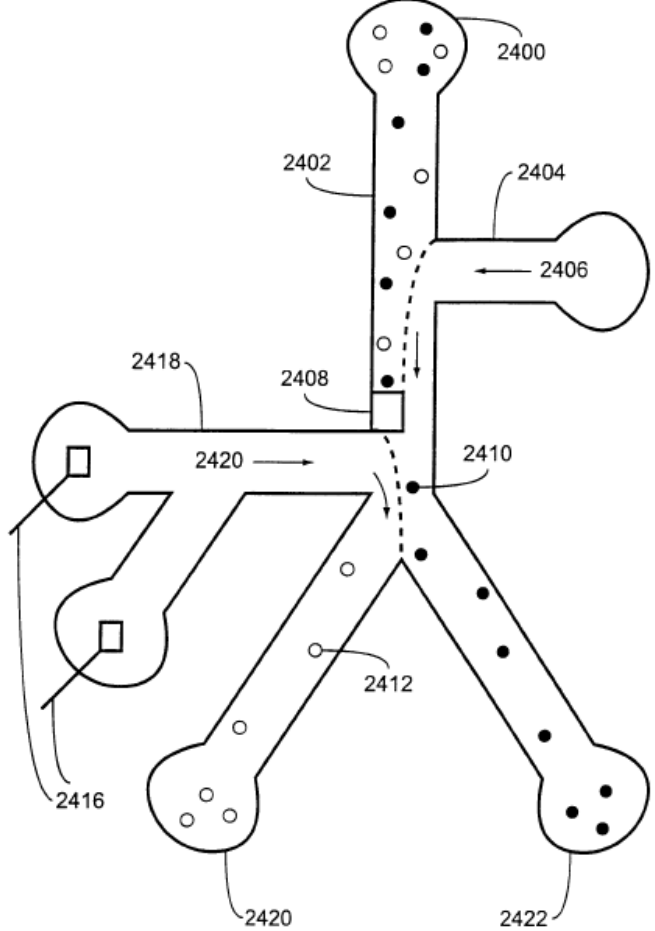
Asserted Claim Element	Exemplary Prior Art Disclosures
	the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

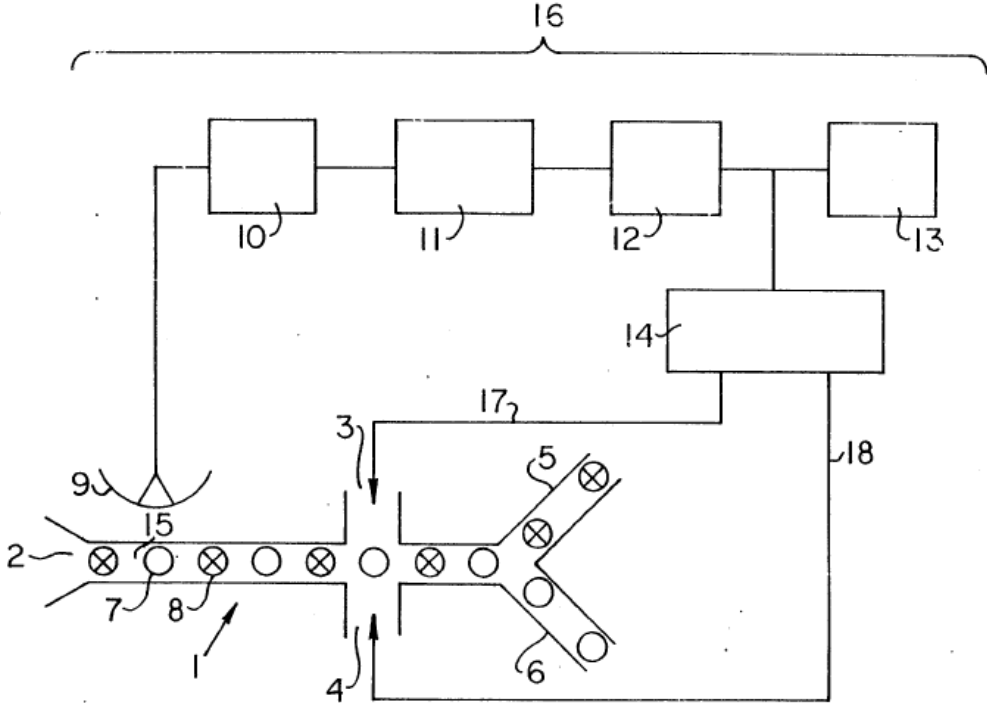
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig.1  The diagram illustrates a medical device, likely a dialyzer or a similar fluid-handling apparatus. It features a central chamber (2) with internal components including a pump or motor (12) and a filter or membrane (14). The chamber is connected to various external components via tubes and electrical lines. Key components labeled include: 4 (top left block), 3 (top center block), 6 (top right block), 8 (middle right block), 10 (bottom right block), 11 (bottom right block), 18 (bottom right block), 22 (left side plate), 24 (right side plate), 26 (bottom outlet), 28 (internal component), 30 (internal component), 32 (internal component), 34 (internal component), 36 (internal component), 38 (internal component), 40 (internal component), 16 (bottom center tube), 20 (bottom center tube), and 18 (bottom center tube). The device is shown in a cross-sectional view, revealing its internal structure and the flow paths for fluid or gas.

Asserted Claim Element	Exemplary Prior Art Disclosures
the second reservoir.	Wada The Wada disclosures in each limitation of claim 5 are incorporated by reference. “Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:18-23. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

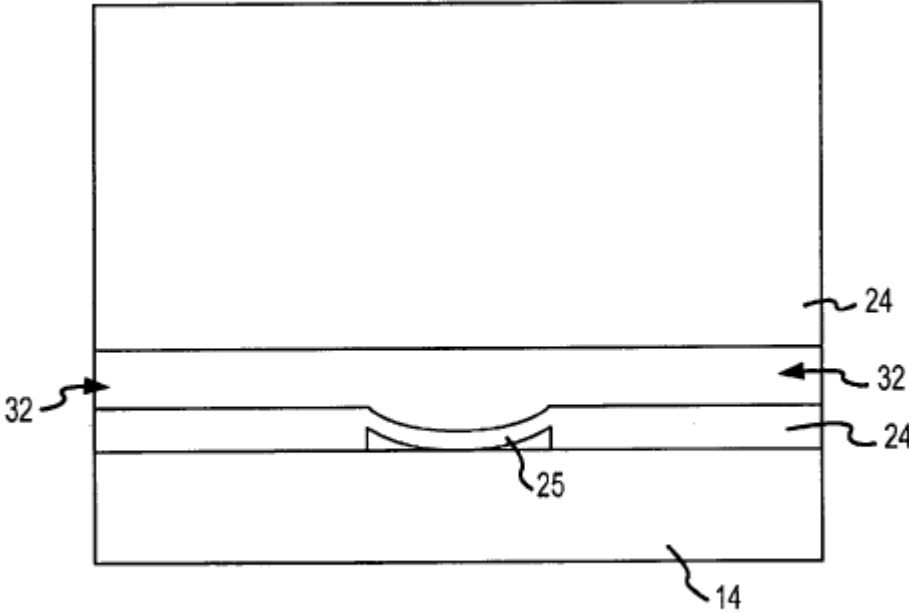
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

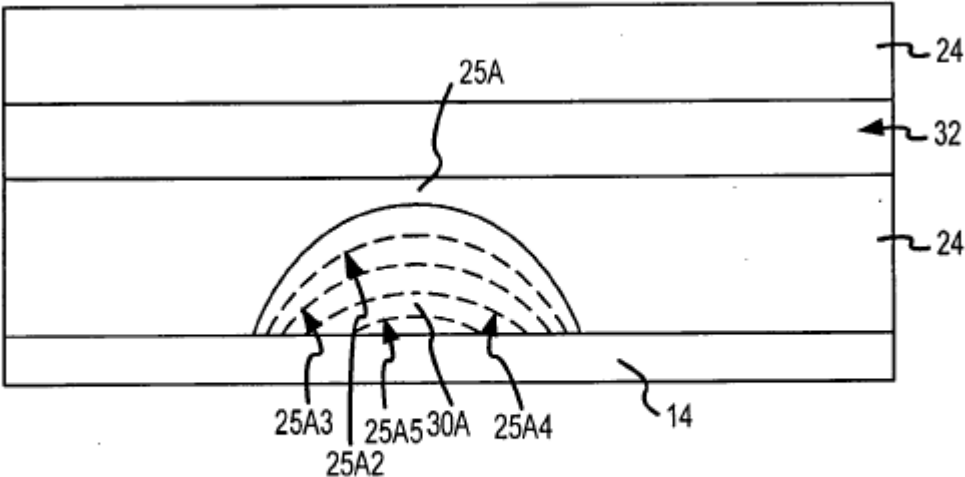
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting

Asserted Claim Element	Exemplary Prior Art Disclosures
	microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Marcus The Marcus disclosures in each limitation of claim 5 are incorporated by reference. “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control port A and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at 3:49-62.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 Otsuka The Otsuka disclosures in each limitation of claim 5 are incorporated by reference. “The consideration will be made as to the case in which all of the ejection nozzles are continuously actuated by the ejection heater 3 being actuated.” Otsuka, at 2:28-30. Chou

Asserted Claim Element	Exemplary Prior Art Disclosures
	The Chou disclosures in each limitation of claim 5 are incorporated by reference. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

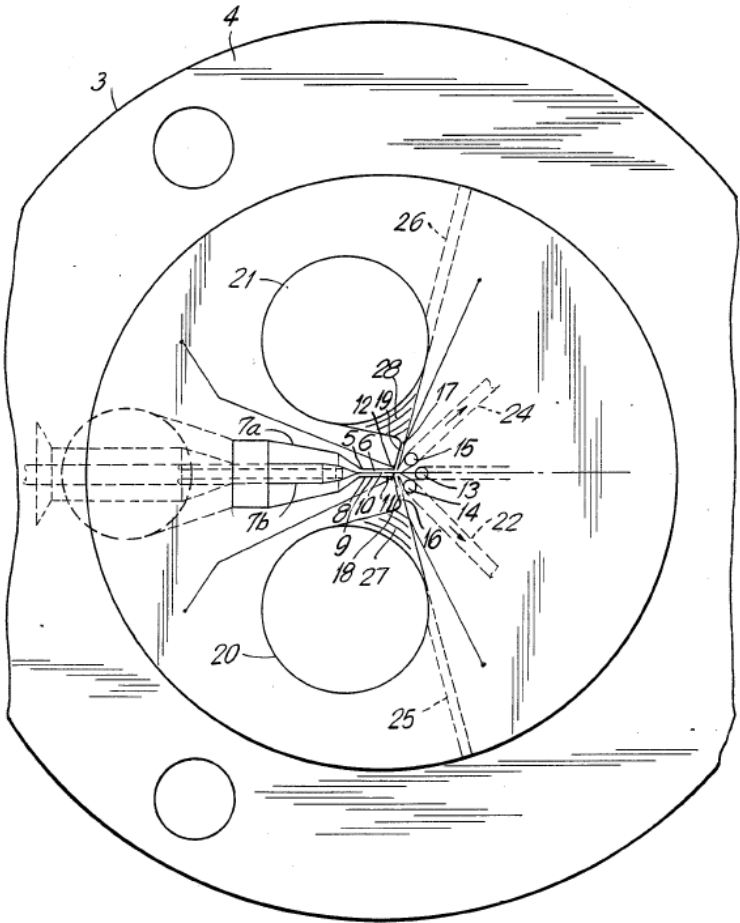
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 7H “In the alternate preferred embodiment of Fig. 11, flow channel 30a has a curved upper wall 25A. When flow channel 32 is pressurized, membrane portion 25 will move downwardly to the successive positions shown by dotted lines 25A2, 25A3, 25A4 and 25A5, with edge portions of the membrane moving first into the flow channel, followed by top membrane portions. An advantage of having such a curved upper surface at membrane 25A is that a more complete seal will be provided when flow channel 32 is pressurized. Specifically, the upper wall of the flow channel 30 will provide a continuous contacting edge against planar substrate 14, thereby avoiding the "island" of contact seen between wall 25 and the bottom of flow channel 30 in Fig. 10. Another advantage of having a curved upper flow channel surface at membrane 25A is that the membrane can more readily conform to the shape and volume of the flow channel in

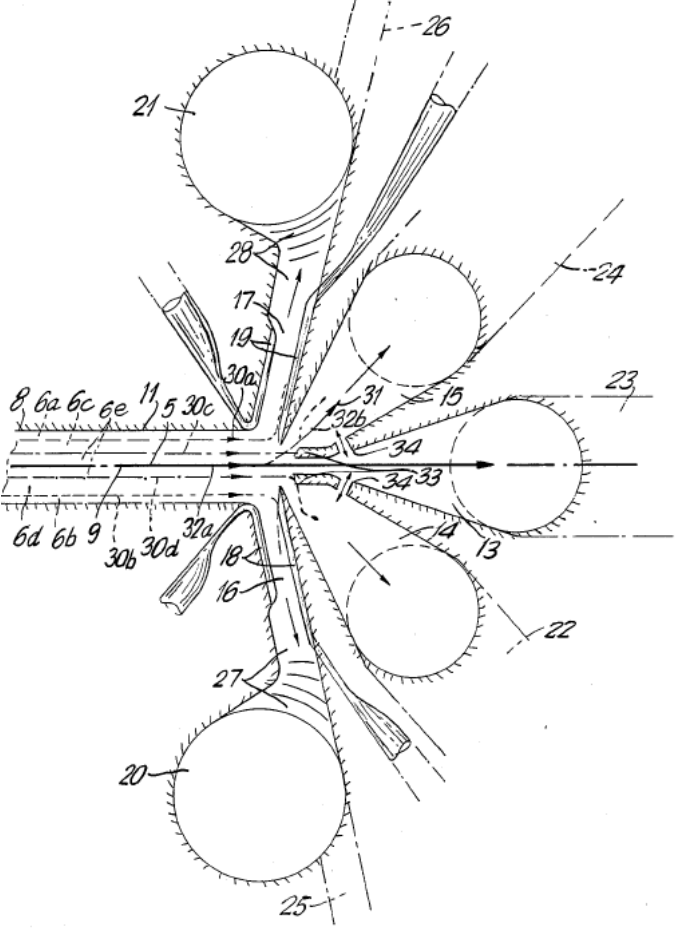
Asserted Claim Element	Exemplary Prior Art Disclosures
	response to actuation. Specifically, where a rectangular flow channel is employed, the entire perimeter (2x flow channel height, plus the flow channel width) must be forced into the flow channel. However where an arched flow channel is used, a smaller perimeter of material (only the semi-circular arched portion) must be forced into the channel. In this manner, the membrane requires less change in perimeter for actuation and is therefore more responsive to an applied actuation force to block the flow channel.” Chou, at 24:17-34; <i>see also</i> Fig. 11 below.  FIG.11 “In addition to pressure based actuation systems described above, optional electrostatic and magnetic actuation systems are also contemplated, as follows. Electrostatic actuation can be accomplished by forming oppositely charged electrodes (which will tend to attract one another when a voltage differential is applied to them) directly into the monolithic elastomeric structure. For example, referring to Fig. 7B, an optional first electrode 70 (shown in phantom) can be positioned on (or in) membrane 25 and an optional second electrode 72 (also shown in phantom)

Asserted Claim Element	Exemplary Prior Art Disclosures
	can be positioned on (or in) planar substrate 14. When electrodes 70 and 72 are charged with opposite polarities, an attractive force between the two electrodes will cause membrane 25 to deflect downwardly, thereby closing the "valve" (i.e.: closing flow channel 30). For the membrane electrode to be sufficiently conductive to support electrostatic actuation, but not so mechanically stiff so as to impede the valve's motion, a sufficiently flexible electrode must be provided in or over membrane 25. Such an electrode may be provided by a thin metallization layer, doping the polymer with conductive material, or making the surface layer out of a conductive material. In an exemplary aspect, the electrode present at the deflecting membrane can be provided by a thin metallization layer which can be provided, for example, by sputtering a thin layer of metal such as 20 nm of gold." Chou, at 26:9-26. "Referring first to Figs. 12A and 12B, a schematic of flow channels 30 and 32 is shown. Flow channel 30 preferably has a fluid (or gas) flow F passing therethrough. Flow channel 32, (which crosses over flow channel 30, as was already explained herein), is pressurized such that membrane 25 separating the flow channels may be depressed into the path of flow channel 30, shutting off the passage of flow F therethrough, as has been explained." Chou, at 28:18-23. "Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc." Chou, at 28:27-33. "As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow

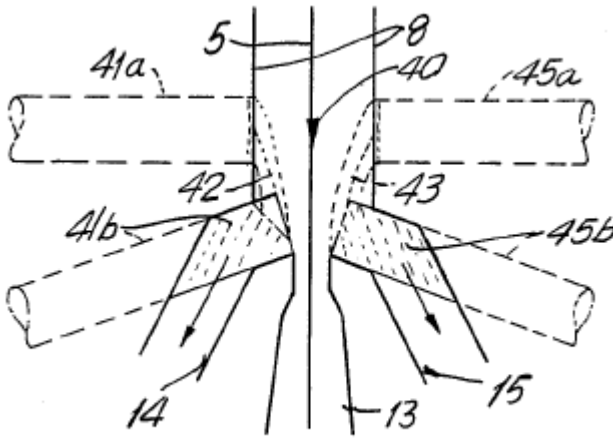
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 30.” Chou, at 31:13-20. Zöld The Zöld disclosures in each limitation of claim 5 are incorporated by reference. “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a

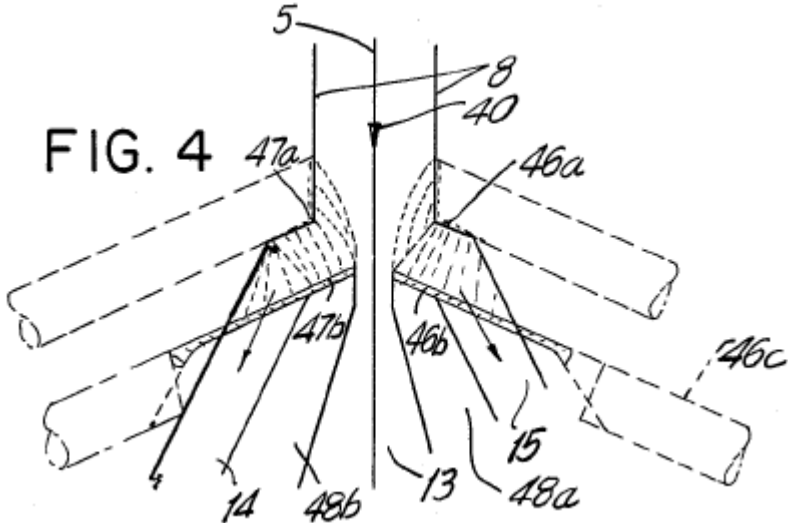
Asserted Claim Element	Exemplary Prior Art Disclosures
	value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

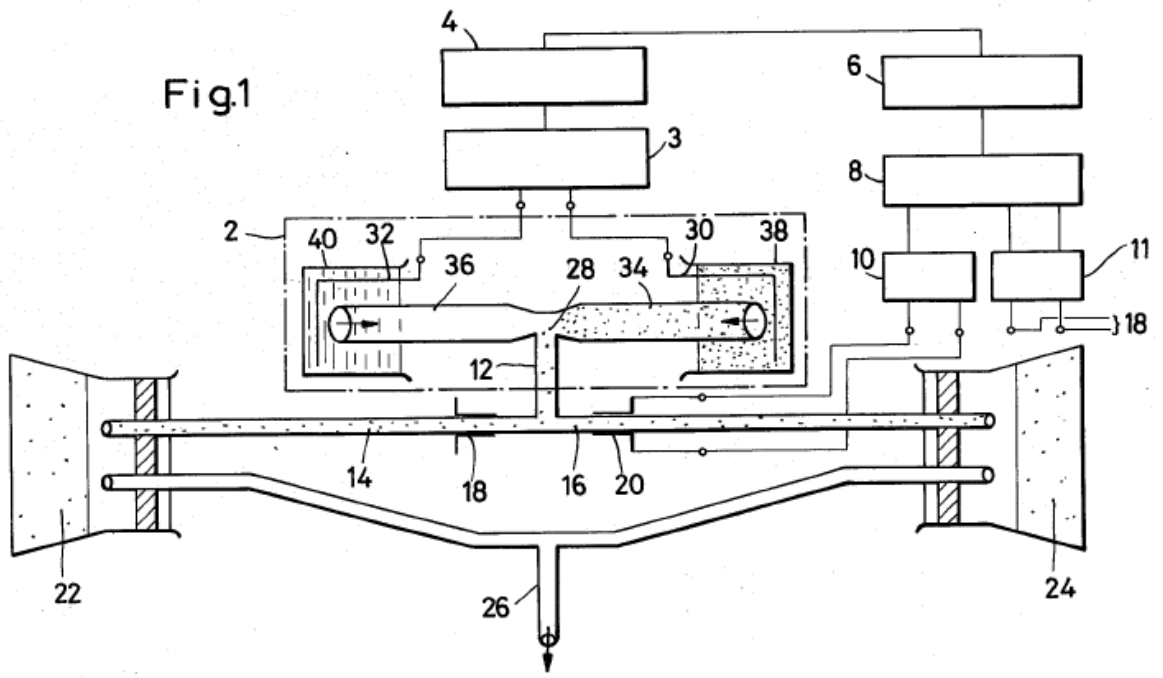
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

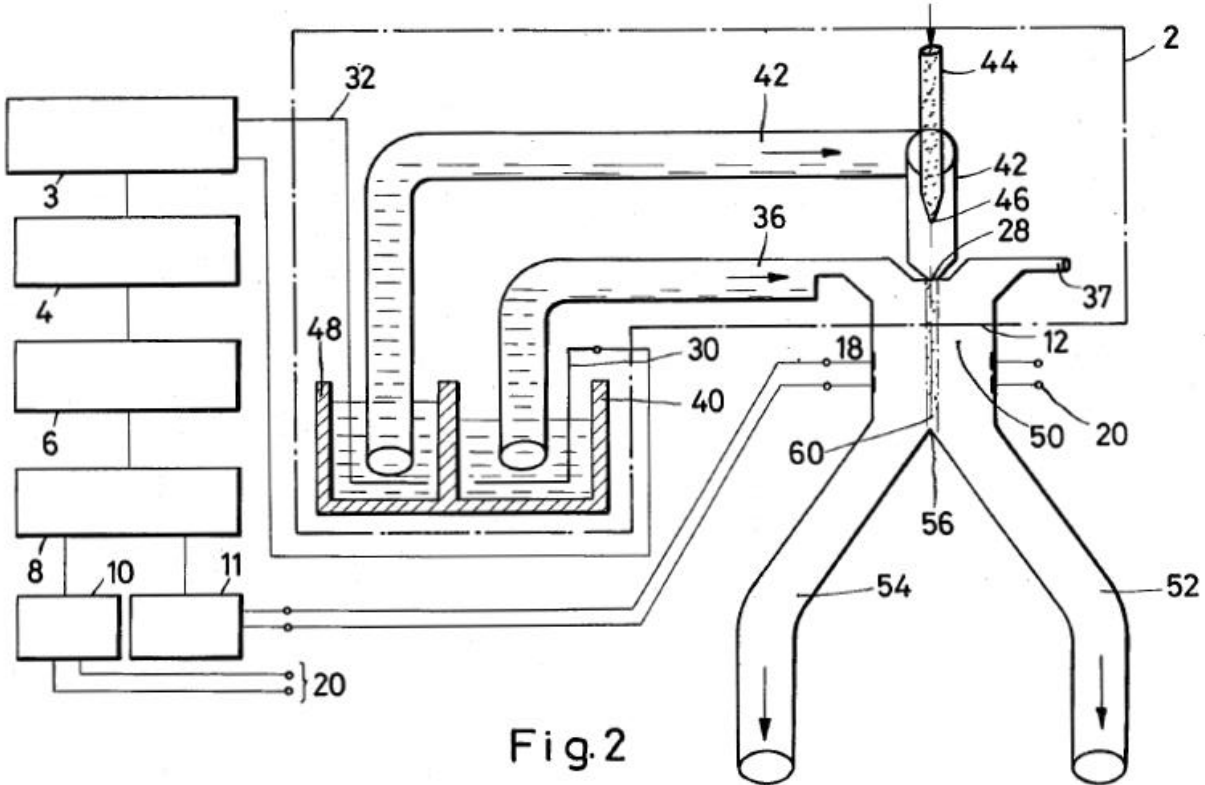
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 5 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser

Asserted Claim Element	Exemplary Prior Art Disclosures
	portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of

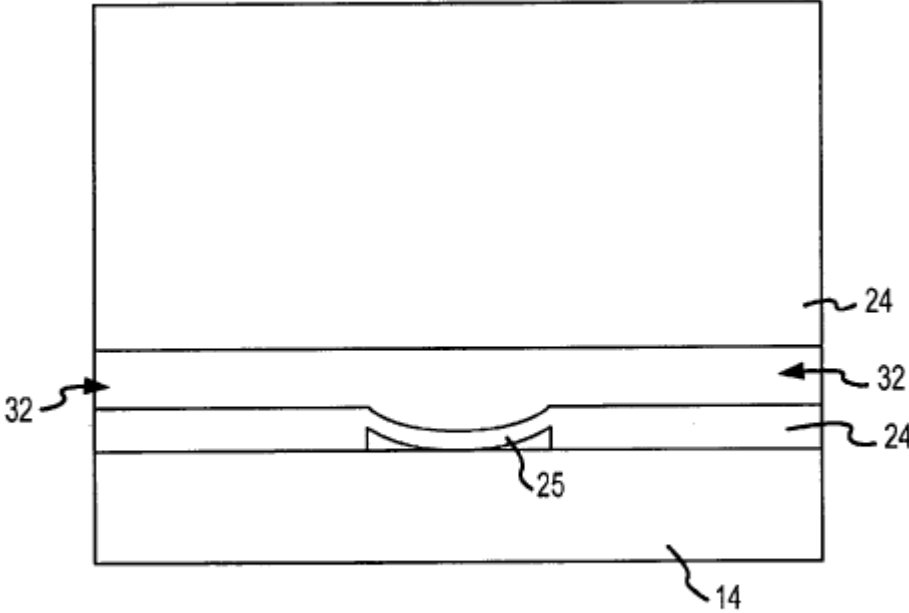
Asserted Claim Element	Exemplary Prior Art Disclosures
	the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side

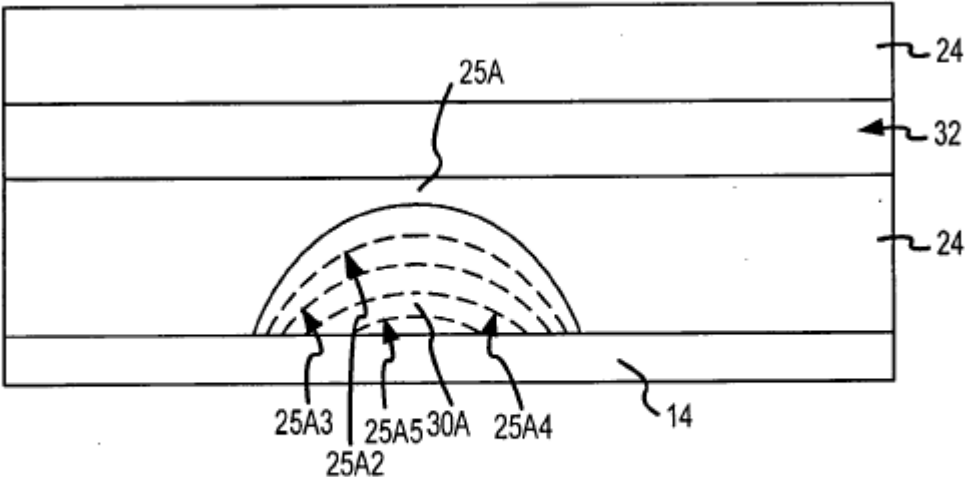
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig.1  The diagram illustrates a medical device, likely a dialyzer or a similar fluid-handling apparatus. It features a central chamber (2) with internal components including a pump or motor (12) and a filter or membrane (14). The chamber is connected to various external components and conduits. On the left, a wall (22) is shown with a conduit (14) entering the chamber. On the right, a wall (24) is shown with a conduit (20) exiting the chamber. A central conduit (16) leads from the chamber to a lower outlet (26). Above the chamber, there are two main control or monitoring units (4 and 6) connected to the internal components. Unit 4 is connected to a sensor or probe (3) which is positioned near the chamber. Unit 6 is connected to a sensor or probe (8) which is positioned near the chamber. Both units 4 and 6 are connected to a common bus or control line (18). The diagram also shows various other components and connections, including a pump or motor (10), a sensor or probe (11), and a control line (18) connecting the two main units.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2
[15] The device of claim 14, wherein the second reservoir includes a gas pocket, wherein compression of the gas facilitates the generating of the pressure pulse.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Chou The Chou disclosures in each limitation of claim 14 are incorporated by reference. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 IL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

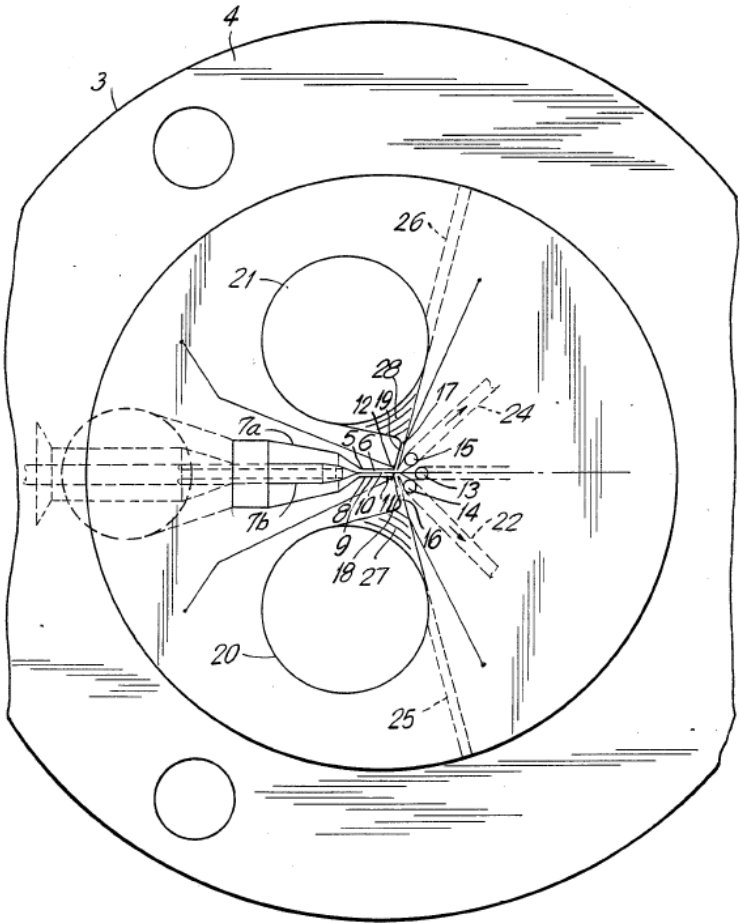
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 7H “In the alternate preferred embodiment of Fig. 11, flow channel 30a has a curved upper wall 25A. When flow channel 32 is pressurized, membrane portion 25 will move downwardly to the successive positions shown by dotted lines 25A2, 25A3, 25A4 and 25A5, with edge portions of the membrane moving first into the flow channel, followed by top membrane portions. An advantage of having such a curved upper surface at membrane 25A is that a more complete seal will be provided when flow channel 32 is pressurized. Specifically, the upper wall of the flow channel 30 will provide a continuous contacting edge against planar substrate 14, thereby avoiding the "island" of contact seen between wall 25 and the bottom of flow channel 30 in Fig. 10. Another advantage of having a curved upper flow channel surface at membrane 25A is that the membrane can more readily conform to the shape and volume of the flow channel in

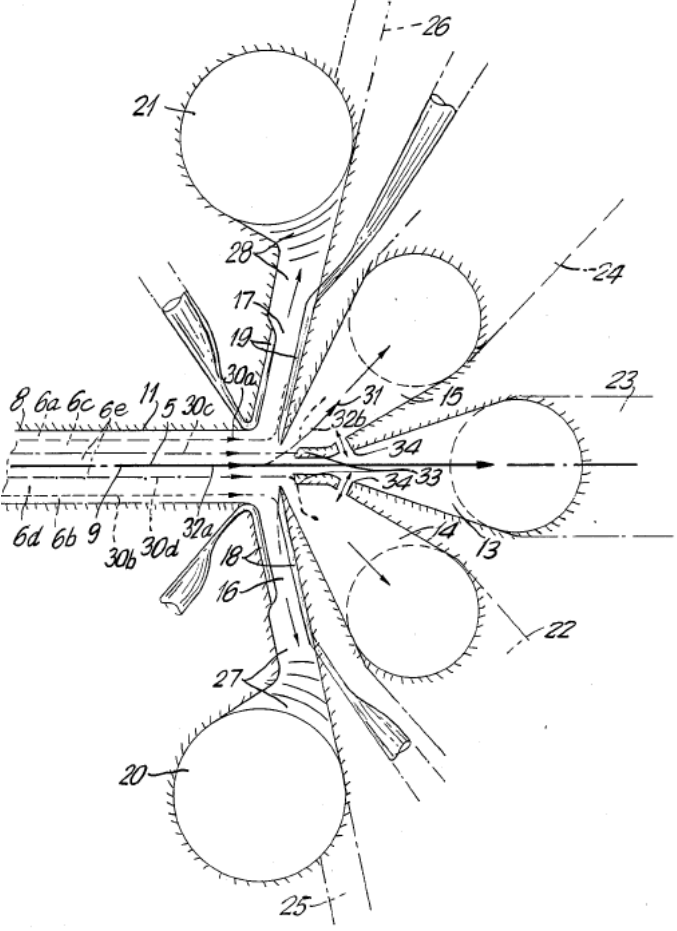
Asserted Claim Element	Exemplary Prior Art Disclosures
	response to actuation. Specifically, where a rectangular flow channel is employed, the entire perimeter (2x flow channel height, plus the flow channel width) must be forced into the flow channel. However where an arched flow channel is used, a smaller perimeter of material (only the semi-circular arched portion) must be forced into the channel. In this manner, the membrane requires less change in perimeter for actuation and is therefore more responsive to an applied actuation force to block the flow channel.” Chou, at 24:17-34; <i>see also</i> Fig. 11 below.  FIG.11 “In addition to pressure based actuation systems described above, optional electrostatic and magnetic actuation systems are also contemplated, as follows. Electrostatic actuation can be accomplished by forming oppositely charged electrodes (which will tend to attract one another when a voltage differential is applied to them) directly into the monolithic elastomeric structure. For example, referring to Fig. 7B, an optional first electrode 70 (shown in phantom) can be positioned on (or in) membrane 25 and an optional second electrode 72 (also shown in phantom)

Asserted Claim Element	Exemplary Prior Art Disclosures
	can be positioned on (or in) planar substrate 14. When electrodes 70 and 72 are charged with opposite polarities, an attractive force between the two electrodes will cause membrane 25 to deflect downwardly, thereby closing the "valve" (i.e.: closing flow channel 30). For the membrane electrode to be sufficiently conductive to support electrostatic actuation, but not so mechanically stiff so as to impede the valve's motion, a sufficiently flexible electrode must be provided in or over membrane 25. Such an electrode may be provided by a thin metallization layer, doping the polymer with conductive material, or making the surface layer out of a conductive material. In an exemplary aspect, the electrode present at the deflecting membrane can be provided by a thin metallization layer which can be provided, for example, by sputtering a thin layer of metal such as 20 nm of gold." Chou, at 26:9-26. "Referring first to Figs. 12A and 12B, a schematic of flow channels 30 and 32 is shown. Flow channel 30 preferably has a fluid (or gas) flow F passing therethrough. Flow channel 32, (which crosses over flow channel 30, as was already explained herein), is pressurized such that membrane 25 separating the flow channels may be depressed into the path of flow channel 30, shutting off the passage of flow F therethrough, as has been explained." Chou, at 28:18-23. "Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc." Chou, at 28:27-33. "As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow

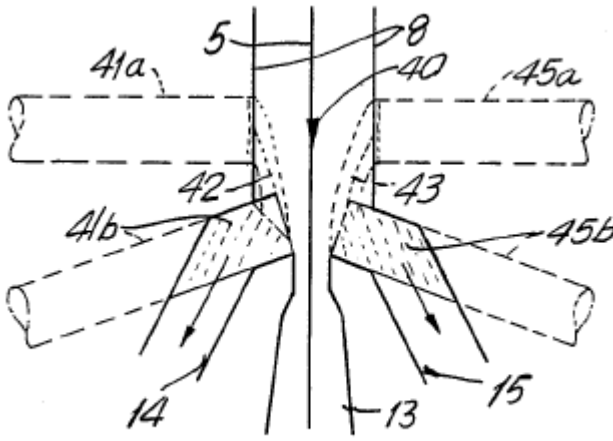
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 30.” Chou, at 31:13-20. Zöld The Zöld disclosures in each limitation of claim 14 are incorporated by reference. “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a

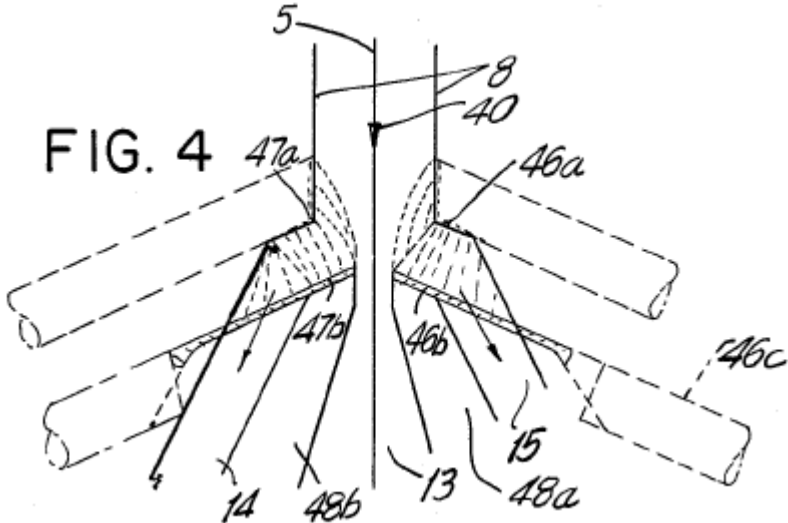
Asserted Claim Element	Exemplary Prior Art Disclosures
	value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

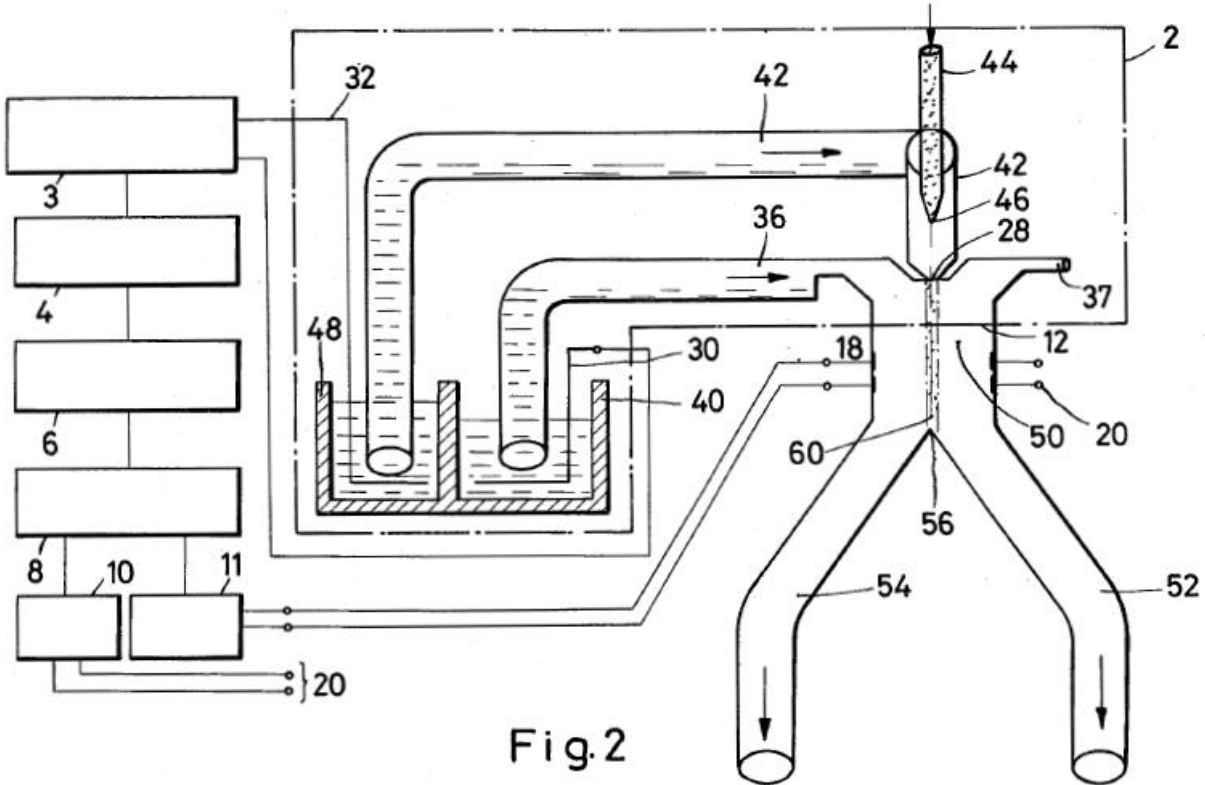
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 14 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser

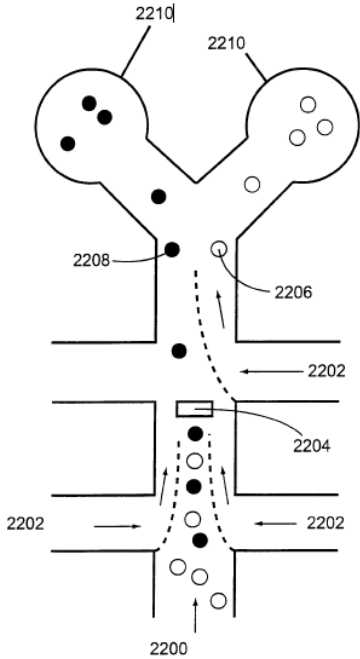
Asserted Claim Element	Exemplary Prior Art Disclosures
	portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of

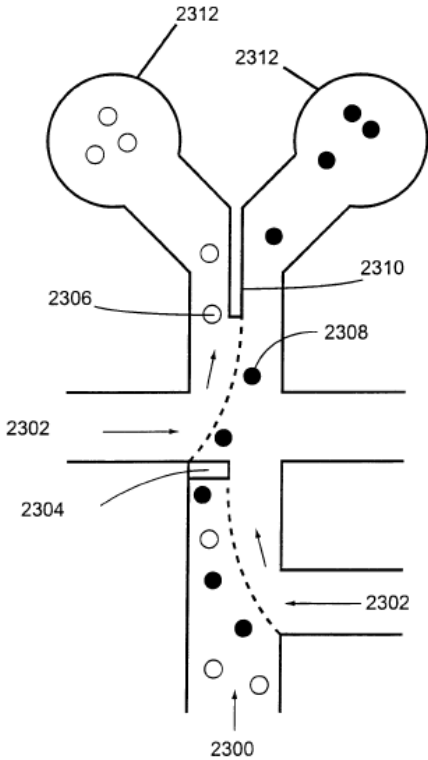
Asserted Claim Element	Exemplary Prior Art Disclosures
	the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2
[16] The device of claim 5, wherein the flow channel includes a branched portion, wherein the pressure pulse is used to sort one or more particles suspended within the sample into a selected branch of	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
the branched portion.	Wada The Wada disclosures in each limitation of claim 5 are incorporated by reference. “Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:18-23. “Figure 22 schematically illustrates one particle sorting configuration utilizing these methods. As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above. A second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one hydrodynamic flow 2202 so as to direct selected cells (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210.” Wada, at 19:23-20:2; <i>see also</i> Fig. 22 below.

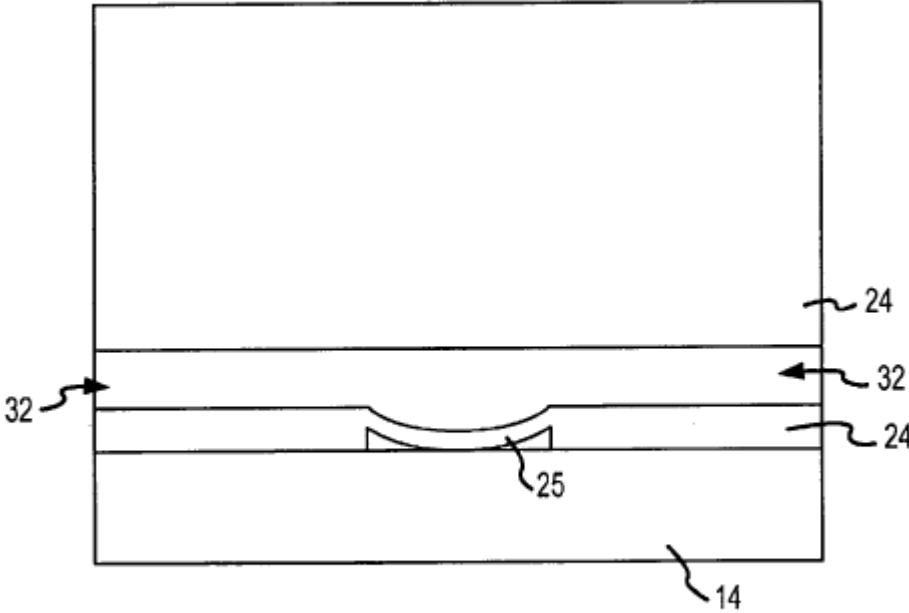
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 22 “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is

Asserted Claim Element	Exemplary Prior Art Disclosures
	optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.  “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes

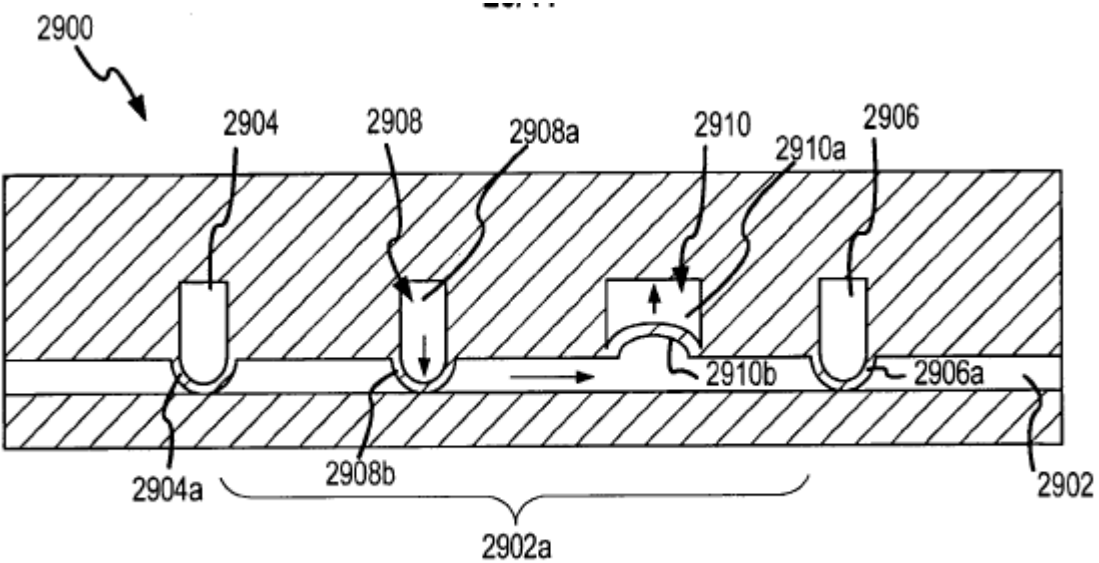
Asserted Claim Element	Exemplary Prior Art Disclosures
	2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below. “The heat produced by current flowing from Joule heating electrodes 2416 raises the temperature of, e.g., a buffer or gel disposed within branched particle sorting microchannel 2418, thus reducing hydrodynamic resistance in the buffer or gel. The reduced viscosity, in conjunction with vacuum source(s) that are typically operably connected to the device at non-selected particle collection well 2420 and/or selected particle collection well 2422, induce or increase flow of the buffer or gel from branched particle sorting microchannel 2418, which intersects main microchannel 2402 downstream from detector 2408. The induced flow of buffer or gel into main microchannel 2402 thus deflects or redirects the flow of selected particle 2410 into selected particle collection well 2422. In this embodiment, non-selected particle 2412 does not trigger Joule heating/redirecting flow and as such, flows unimpeded into non-selected particle collection well 2420. Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example,

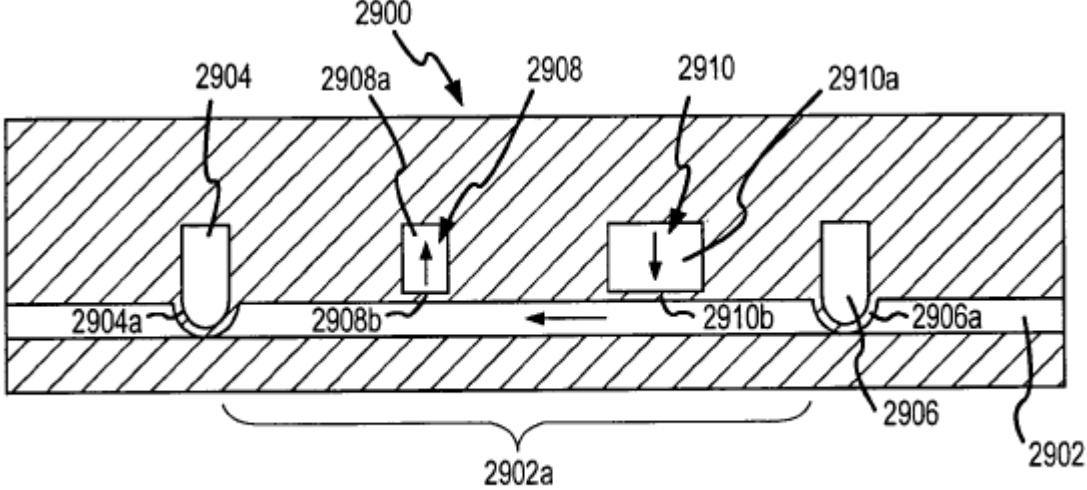
Asserted Claim Element	Exemplary Prior Art Disclosures
	although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:7-29. Chou The Chou disclosures in each limitation of claim 5 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either

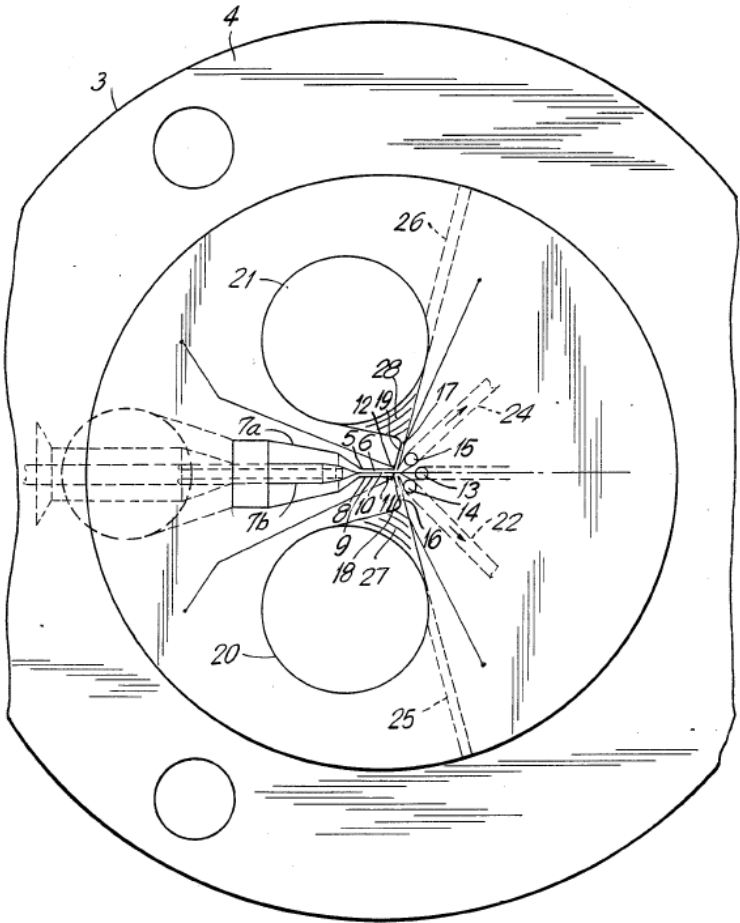
Asserted Claim Element	Exemplary Prior Art Disclosures
	or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2. “Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is

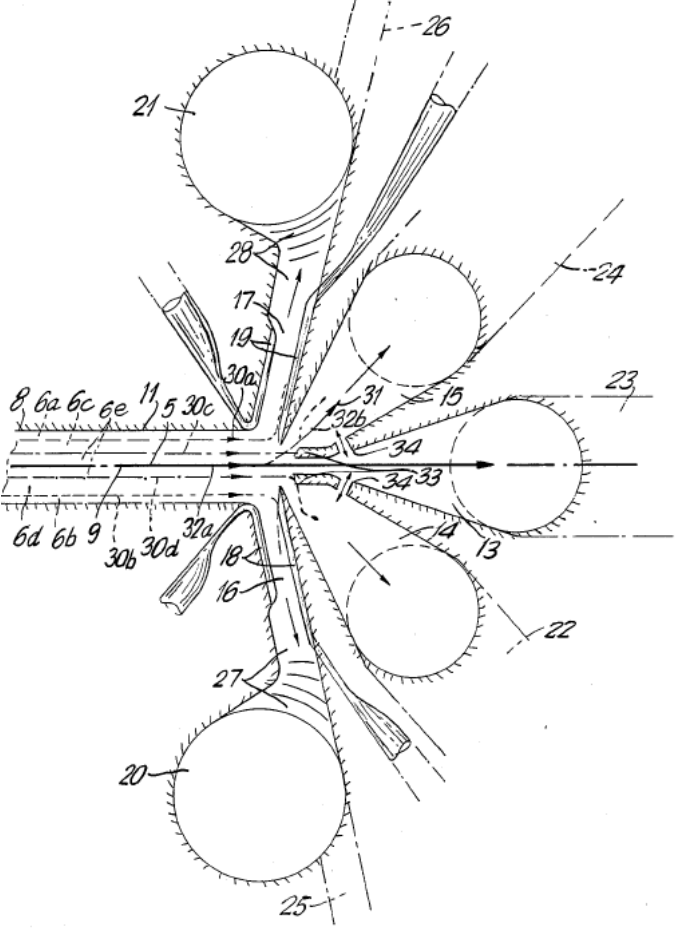
Asserted Claim Element	Exemplary Prior Art Disclosures
	first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.  FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. Zöld The Zöld disclosures in each limitation of claim 5 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis,

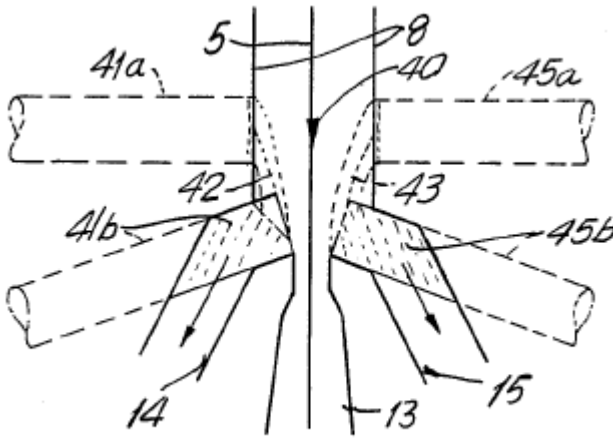
Asserted Claim Element	Exemplary Prior Art Disclosures
	or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-

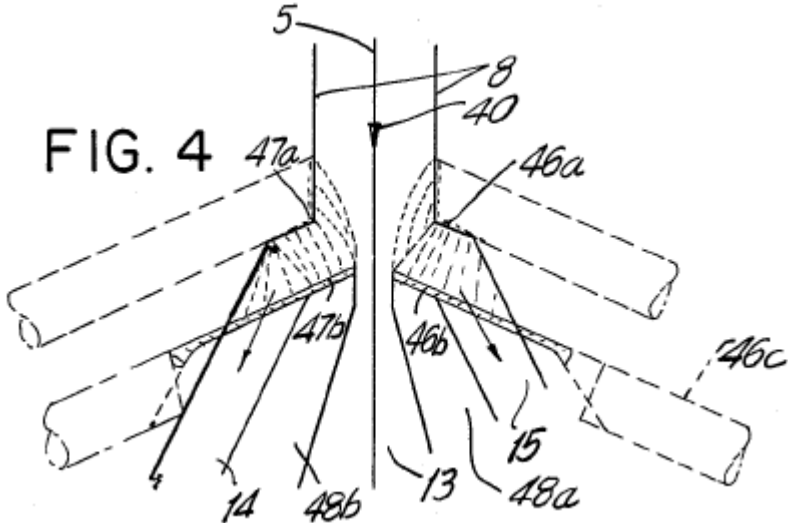
Asserted Claim Element	Exemplary Prior Art Disclosures
	dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

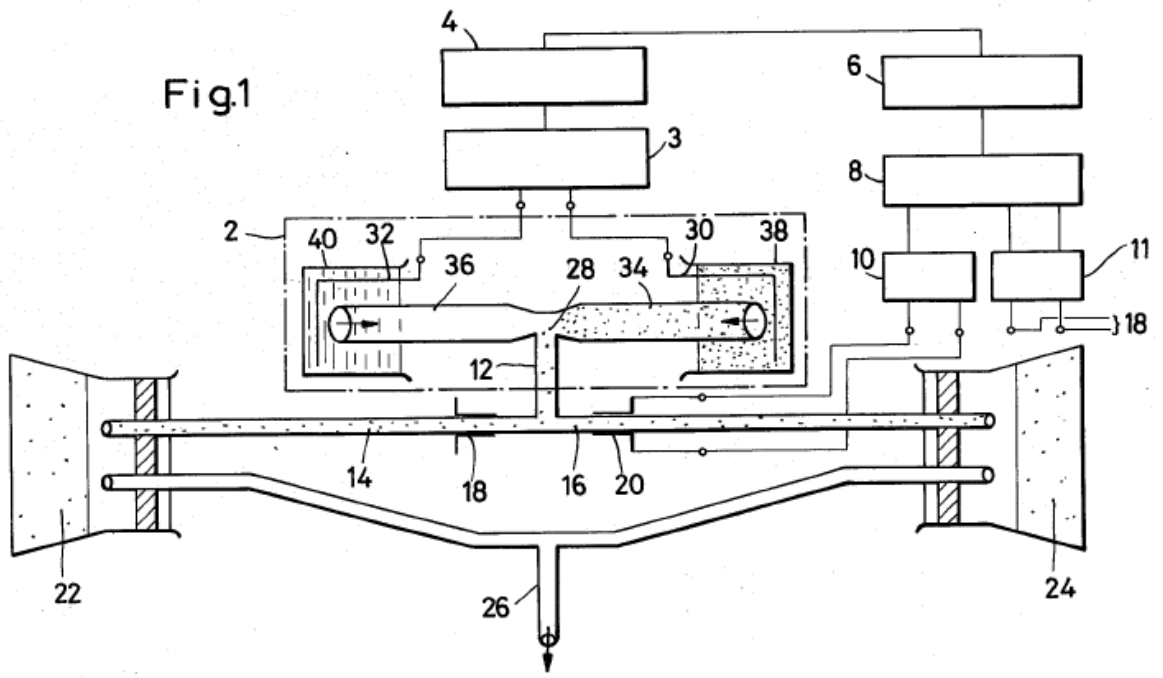
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

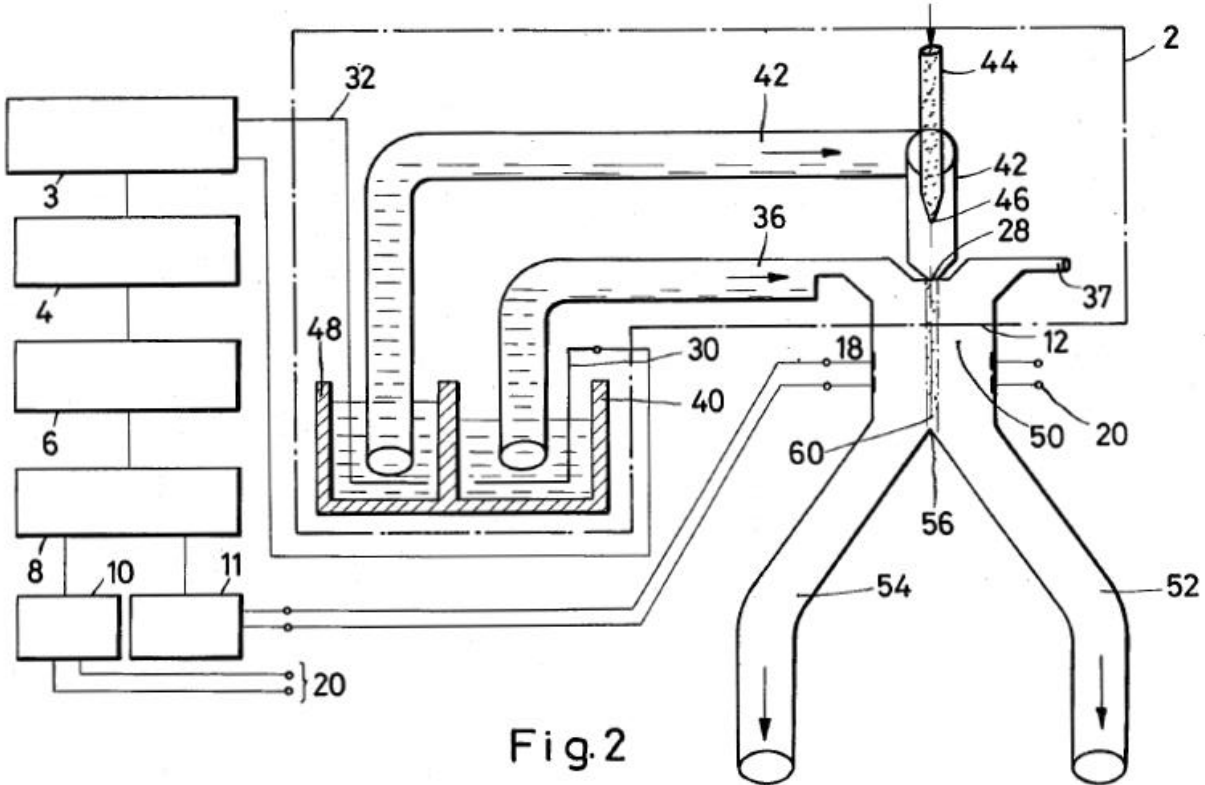
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 5 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser

Asserted Claim Element	Exemplary Prior Art Disclosures
	portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of

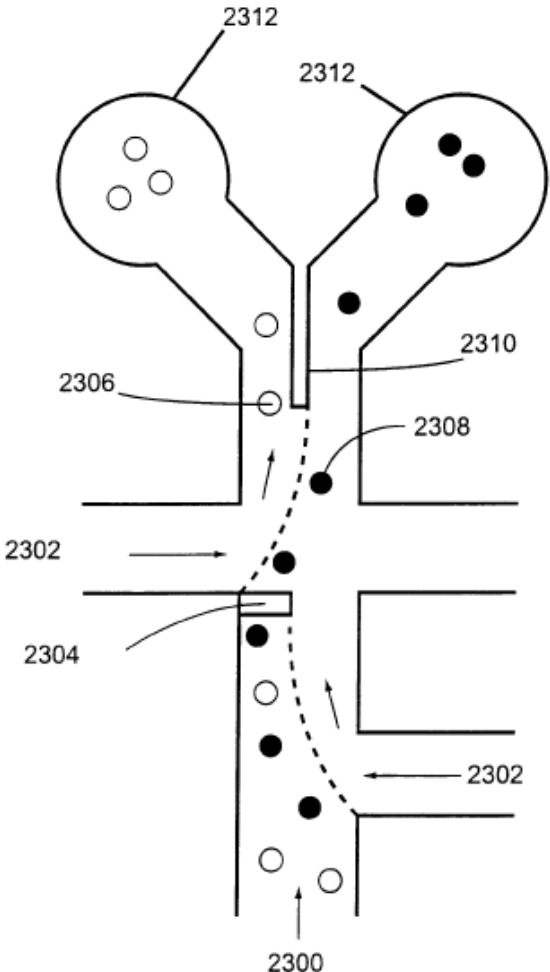
Asserted Claim Element	Exemplary Prior Art Disclosures
	the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

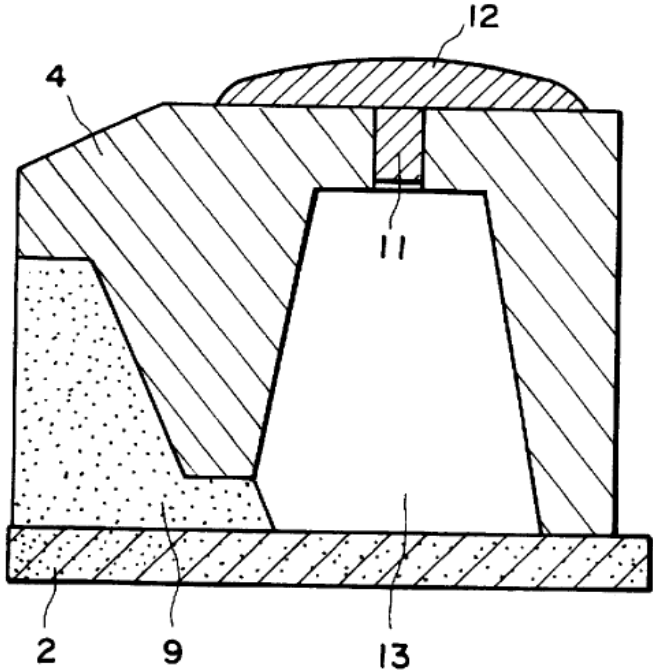
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig.1  The diagram illustrates a medical device, likely a dialyzer or a similar fluid-handling apparatus. It features a central body with two main chambers, 28 and 34, separated by a partition 12. Chamber 28 contains a filter or membrane 36, and chamber 34 contains a filter or membrane 38. The device has multiple ports for fluid entry and exit: port 2 on the left, port 4 at the top, port 6 on the right, port 8 on the right, port 10 on the right, port 11 on the right, port 12 on the right, port 14 on the left, port 16 on the right, port 18 on the right, port 20 on the right, port 22 on the left, port 24 on the right, and a central outlet port 26. The device is connected to external components via lines, including a line 3 connecting to port 4, a line 6 connecting to port 6, a line 8 connecting to port 8, a line 10 connecting to port 10, a line 11 connecting to port 11, a line 12 connecting to port 12, a line 14 connecting to port 14, a line 16 connecting to port 16, a line 18 connecting to port 18, a line 20 connecting to port 20, a line 30 connecting to port 30, a line 32 connecting to port 32, a line 36 connecting to port 36, and a line 38 connecting to port 38. The device is shown in a cross-sectional view, with the central body 2 and the outlet port 26 clearly visible.

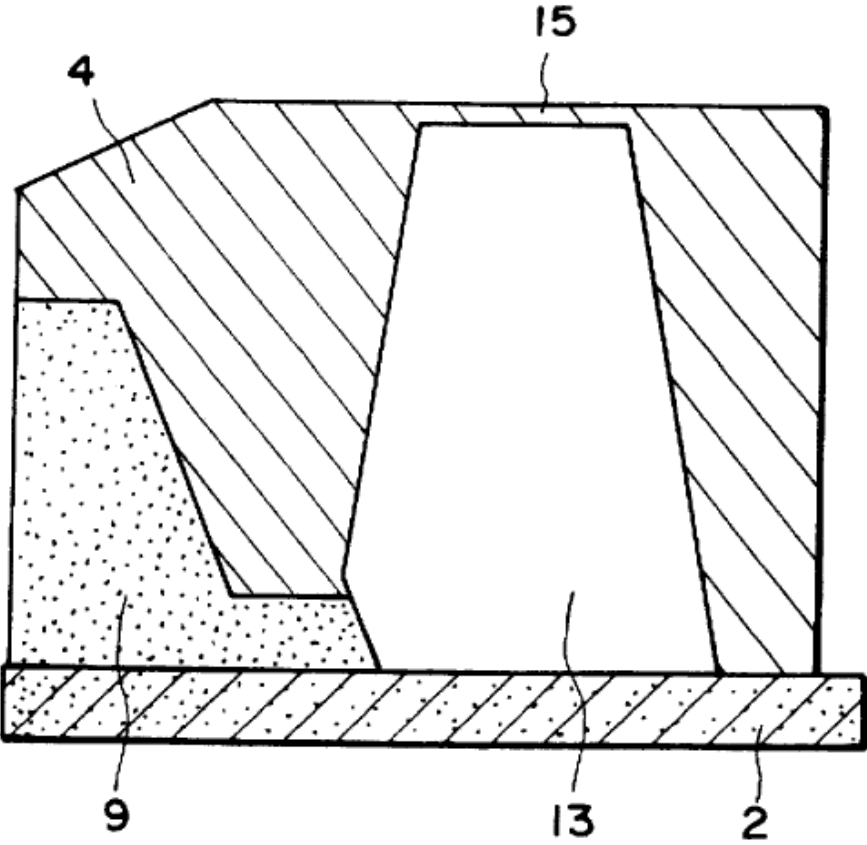
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2
[17] The device of claim 5, wherein the first reservoir is adjacent to an aperture in a sidewall of the flow channel.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada The Wada disclosures in each limitation of claim 5 are incorporated by reference. “Furthermore, the computer also typically includes an instruction set for flowing fluids from the third and the sixth microchannels into the first microchannel. Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:16-23. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

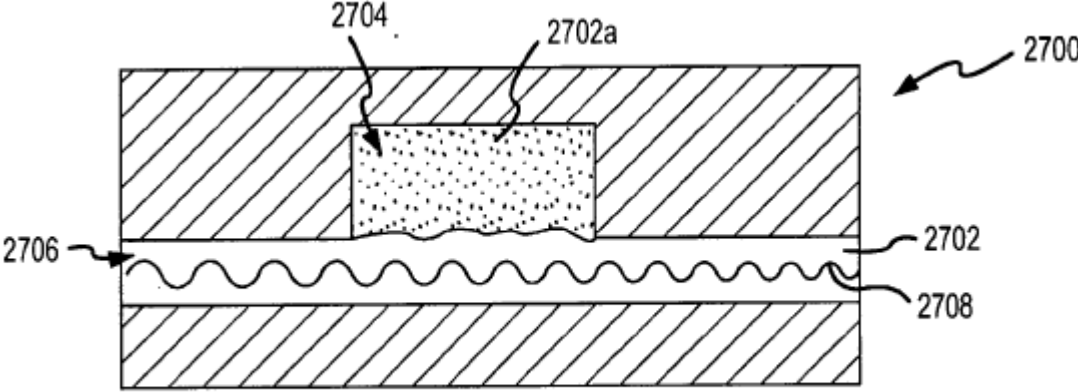
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one

Asserted Claim Element	Exemplary Prior Art Disclosures
	or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Otsuka The Otsuka disclosures in each limitation of claim 5 are incorporated by reference. “Also designated by a reference numeral 13 is a buffering chamber for retaining air to absorb vibration of the ink The structure thereof is such that an opening is formed between the top plate 4 adjacent the heater board 2, and communicates with the ink in the common liquid chamber 9. Reference numeral 11 designates a hole constituting the gas transmitting portion, formed at a rearmost wall of the buffering chamber 13. The hole 11 is sealed by a gas transmitting sealing member 12 for transmitting gases to a satisfactory extent. FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:24-38; <i>see also</i> Figs. 1, 2, and 11 below.

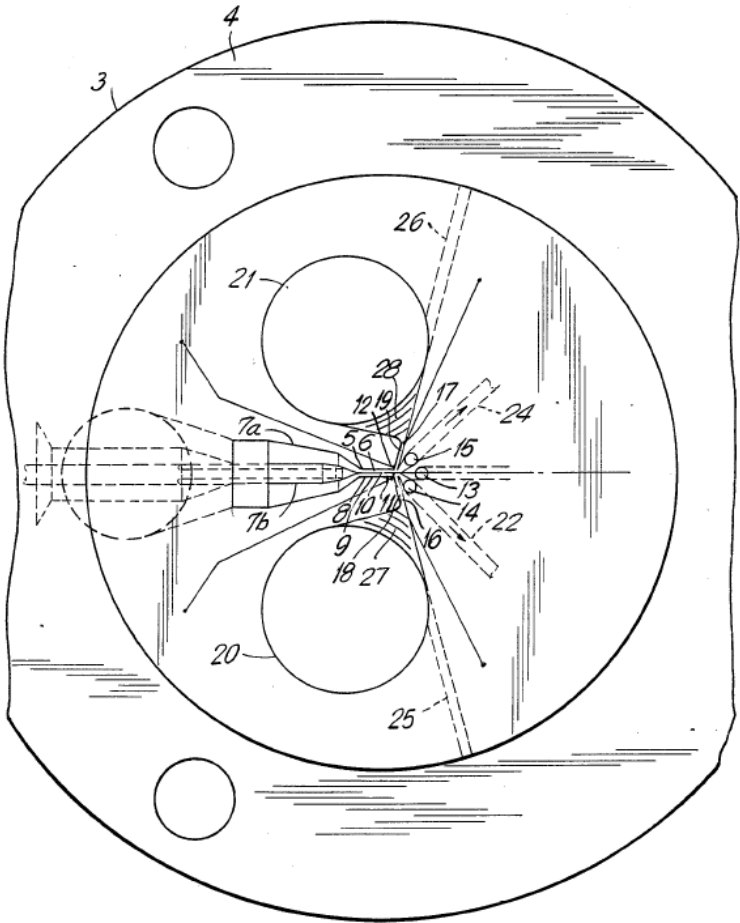
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2

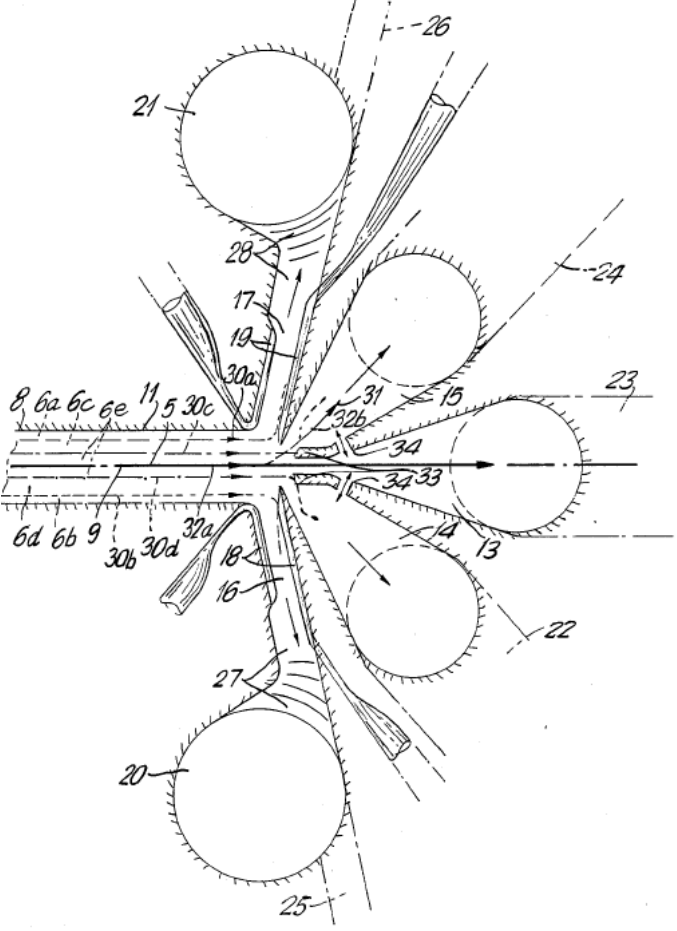
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 11 Chou

Asserted Claim Element	Exemplary Prior Art Disclosures
	The Chou disclosures in each limitation of claim 5 are incorporated by reference. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “Figure 27 shows a cross-sectional view of yet another embodiment of a damper structure in accordance with the present invention, wherein damper structure 2700 comprises portion 2702a of flow channel 2702 having a larger cross-section, an upper region of portion 2702 being filled with air or some other type of fluid 2704. As material 2706 flowing through channel 2702 experiences pressure oscillations 2708 and eventually encounters damper 2700, energy is expended as material 2706 pushes against fluid 2704. This expenditure of energy serves to reduce the amplitude of energy of oscillation of material in the flow channel.” Chou, at 41:5-12; <i>see also</i> Fig. 27 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG.27 Zöld The Zöld disclosures in each limitation of claim 5 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible

Asserted Claim Element	Exemplary Prior Art Disclosures
	since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

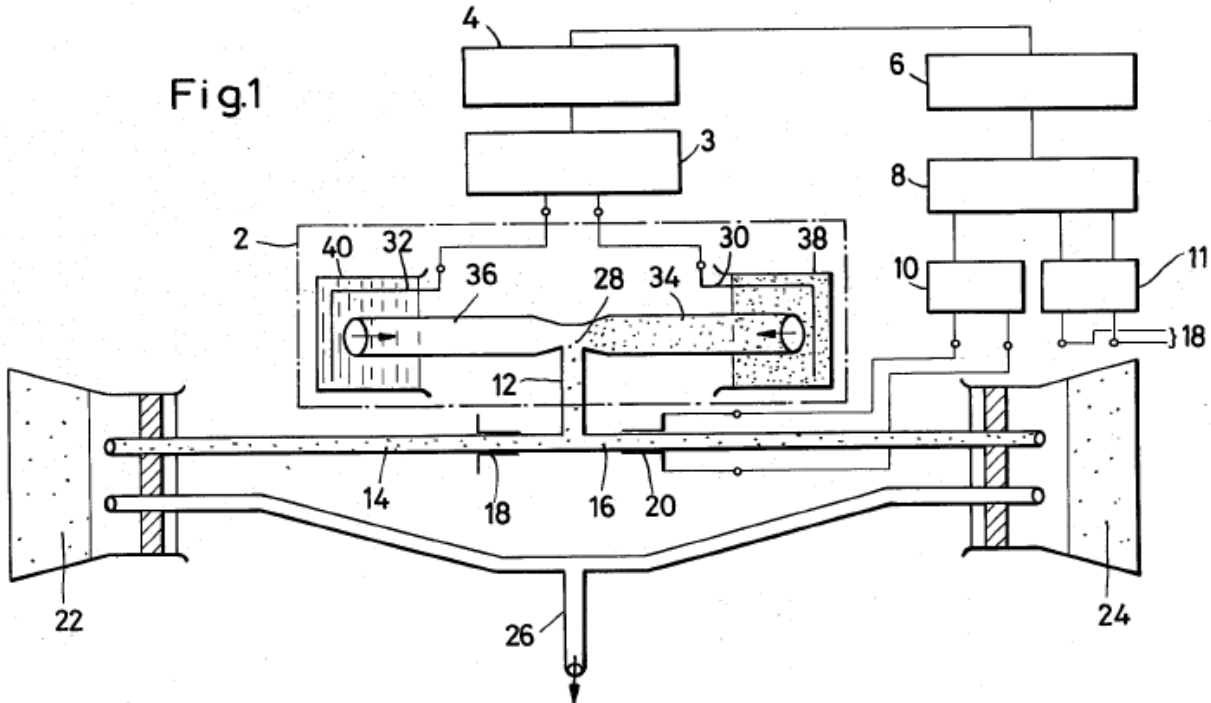
Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

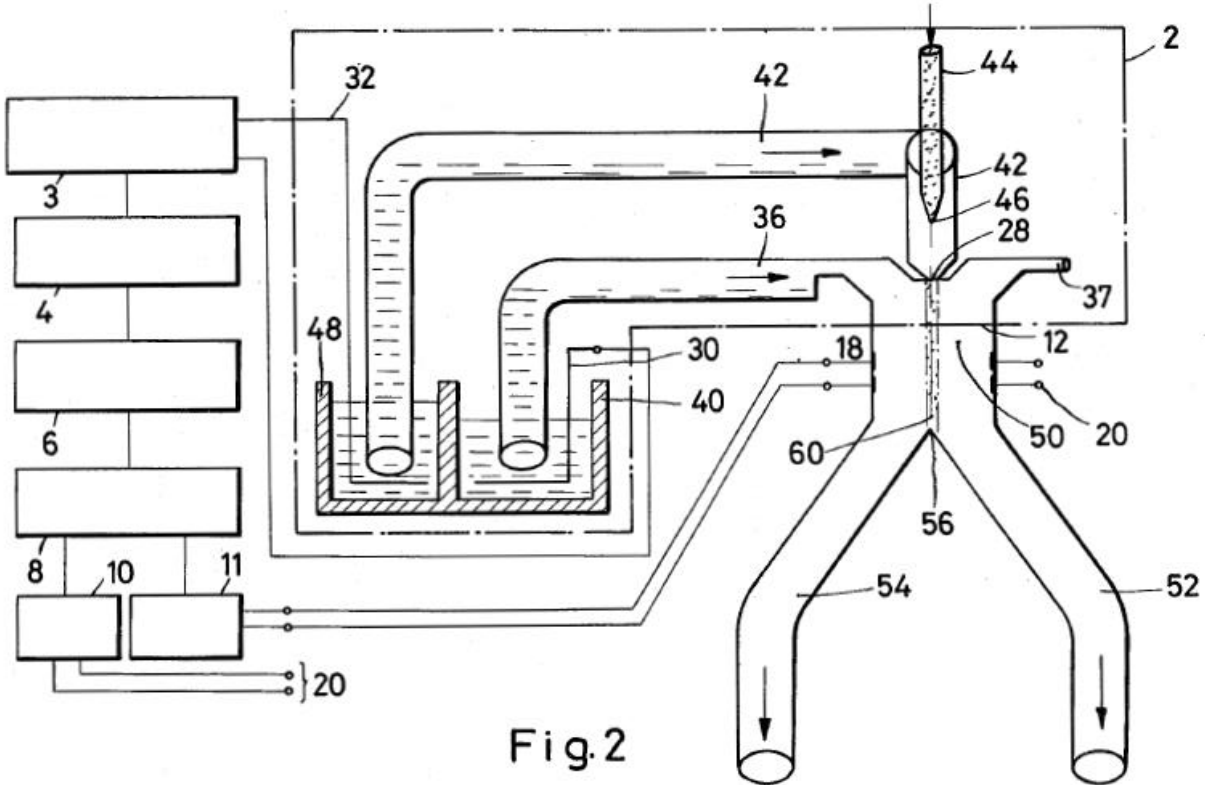
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 5 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of

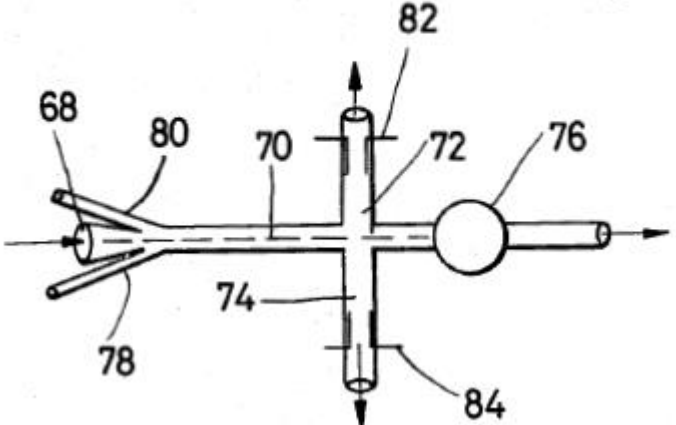
Asserted Claim Element	Exemplary Prior Art Disclosures
	more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly

Asserted Claim Element	Exemplary Prior Art Disclosures
	before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by

Asserted Claim Element	Exemplary Prior Art Disclosures
	letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

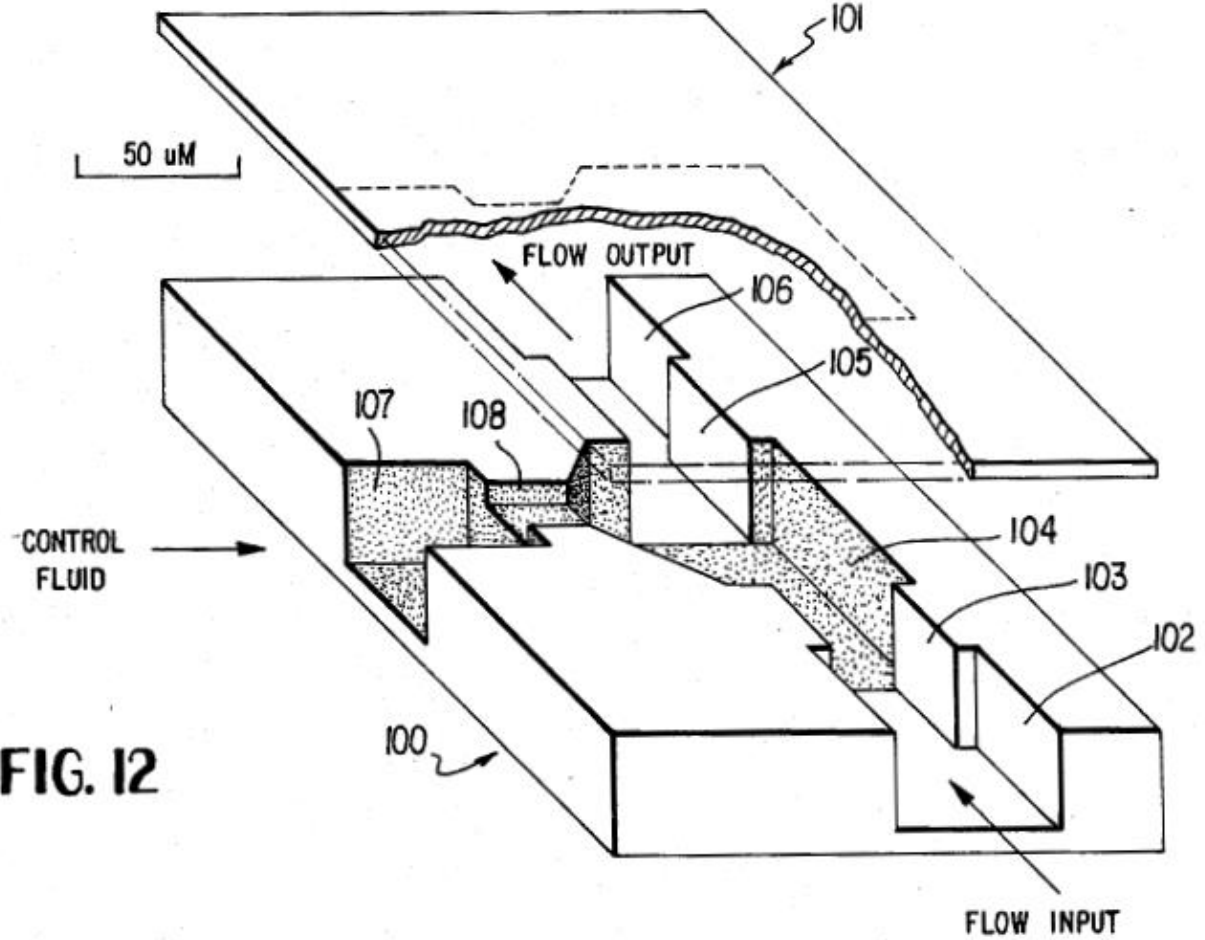
Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig1 

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2 “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively. The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such

Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7  The diagram illustrates a fluidic system with a central horizontal main channel 70. On the left, a particle 68 is shown entering the channel. Two side channels, 72 (top) and 74 (bottom), branch off from the main channel. A photometer 76 is connected to the main channel via a tube. Arrows indicate flow directions: 80 points right into the main channel, 82 points up into side channel 72, 84 points down into side channel 74, and 86 points right out of the main channel.
[18] A method comprising:	To the extent the preamble of the independent claims are found to be limiting, the following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Brown Brown discloses a microfluidic device as shown in Figs. 1 and 2 below. FIG. 1 The diagram shows a microfluidic device. On the left, a circular pump (12) is connected to a rectangular water reservoir (18) by a vertical tube (16). A horizontal tube (14) leads from the pump to a rectangular microfluidic chip (10). The chip has an outlet (20) at the top. A double-headed arrow is shown between the chip and a valve (24). The valve is connected to an air compressor (22) below it and a gauge (G) to its right. A vent (28) is also connected to the valve. A tube (26) leads from the chip to the valve. The entire system is labeled FIG. 1.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 2 “A practical version of a micro flow control valve according to the present invention is illustrated in FIG. 12. In this Figure, the capillary passages involved are formed by suitable etching or other processes in a glass 2 substrate 100 which is provided with the glass cover plate 101. The substrate 100 with its cover plate 101 may form a microscope slide on which an entire controlled flow system for manipulating cells may be formed, as hereinafter more particularly described.” Brown, at 9:22-30; <i>see also</i> Fig. 12 below.

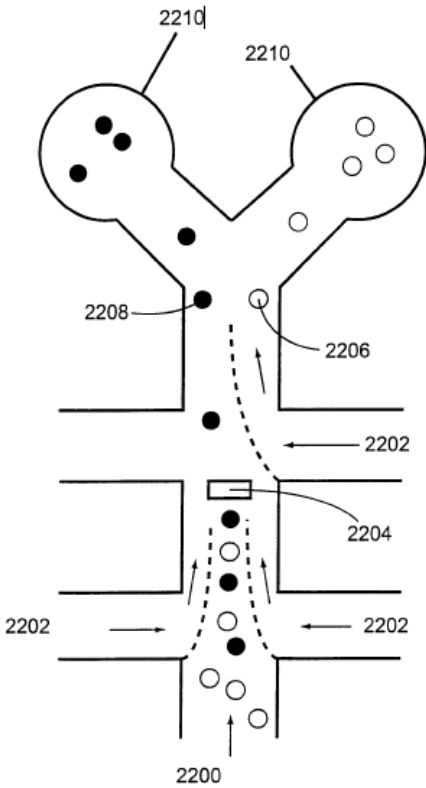
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 12 Chou “An embodiment of a microfluidic device in accordance with the present invention comprises pumps, valves, and fluid oscillation dampers.” Chou, at 2:23-24.

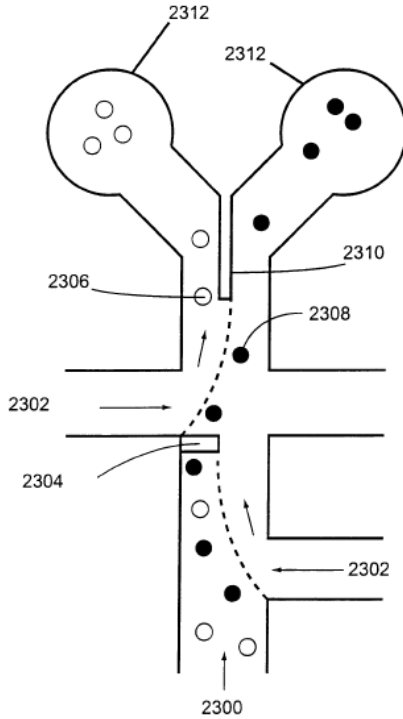
Asserted Claim Element	Exemplary Prior Art Disclosures
	“An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel.” Chou, at 3:1-4. Wada “The present invention relates to methods of focusing particles in microchannels, e.g., to improve assay throughput, to sort particles, to count particles, or the like.” Wada, at 3:13-15. “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity. Prior to performing the flowing step, the particles are optionally sampled with at least one capillary element, e.g., by dipping the capillary element into a well containing, the particles on a microwell plate and drawing the particles into, e.g., reservoirs, microchannels, or other chambers of the device. The particles (e.g., a cell, a set of cells, a microbead, a set of microbeads, a functionalized microbead, a set of functionalized microbeads, a molecule, a set of molecules, etc.) are optionally focused horizontally and/or vertically in the first microchannel to provide substantially uniform flow velocity to the particles in the first microchannel. Particles are optionally focused using one or more fluid direction components (e.g., a fluid pressure force modulator, an electrokinetic force modulator, a capillary force modulator, a fluid wicking element, or the like). Additional options include sorting, detecting or otherwise manipulating the focused particles.” Wada, at 3:22-4:5. Zöld “The subject invention pertains to the dispensing of fluids gases or aerosols in accordance with a preselected program, or the sorting or individual particles, such as cells, of a suspension in accordance with some of their individual physio-chemical properties, such as particle size, DNA and/or protein-content of a cell. Such a method and apparatus, therefore, is useful in cytology, for

Asserted Claim Element	Exemplary Prior Art Disclosures
	cell sorting and analysis, i.e., for example, in cancer research or for the dispensing of any fluids and/or gases.” Zöld, at 1:15-24. Zöld 662 “This invention is concerned with a method and device for the control of motion and especially for the sorting of particles of an electrolytic suspension, where the input flow path can be split up into several output channels leading to respective receptacles. This invention furthermore, is concerned with a sorting device in which by the production of gas particles or cells can be sorted out in accordance with their physical and/or chemical properties such as, particle (cell) size, DNA and/or content.” Zöld 662, at 1:5-14. Marcus “The present invention relates to a fluidic sorting device for the separation of two or more different materials or particles which are suspended in a fluid. The materials or particles to be separated may differ based on shape, texture, color, or any other visually distinctive characteristics. The particles may additionally differ in their visual reaction to an externally applied force, for example an electrostatic or magnetic field. The sorting device of the present invention comprises a fluidic logic element and a machine vision apparatus.” Marcus, at 1:12-22. Friedman “In carrying out the invention there is provided apparatus for sorting small particles such as biological cells while the particles are suspended in a liquid comprising a housing defining a detection chamber, means for moving the particle suspending liquid through said housing in a stream to convey the particles through the stream. A detection means is associated with said detection chamber for detecting differences in particle characteristics and operable to provide electrical signals which vary in accordance with said differences in particle characteristics. A digital fluidic amplifier is provided having an inlet connected to the outlet of said chamber to

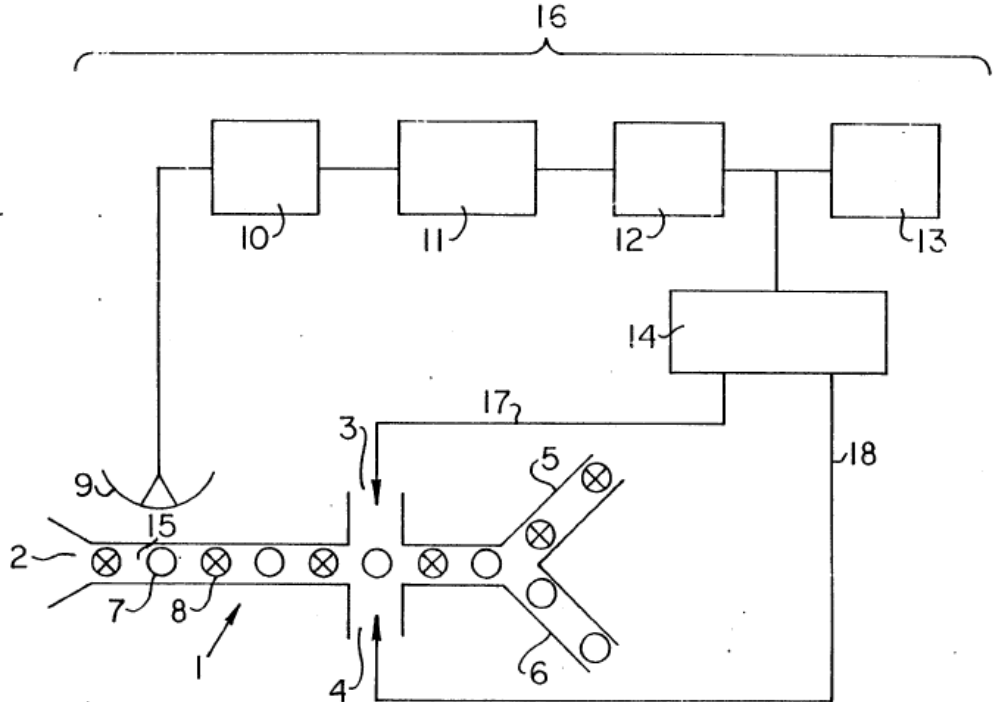
Asserted Claim Element	Exemplary Prior Art Disclosures
	receive the particle stream, said fluidic amplifier having a switching chamber communicating with said inlet and at least two different outlet ports communicating with said switching chamber, with an electrical transducer coupled to receive electrical signals from said detection means and operable to provide control signals to said fluidic amplifier. Said fluidic amplifier is operable in response to said control signals to switch the liquid particle carrying stream entering the inlet thereof from a first outlet port to a second selected outlet port in response to a predetermined particle characteristic control signal from said transducer.” Friedman, at 1:61-2:16.
(i) providing the microfluidic device of claim 5;	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: <i>See</i> prior art references disclosed for claim 5, above.
(ii) flowing a sample through the microfluidic flow channel;	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity.” Wada, at 3:22-26. “Fluid flow streams are optionally "pinched" or "focused" into a narrow region

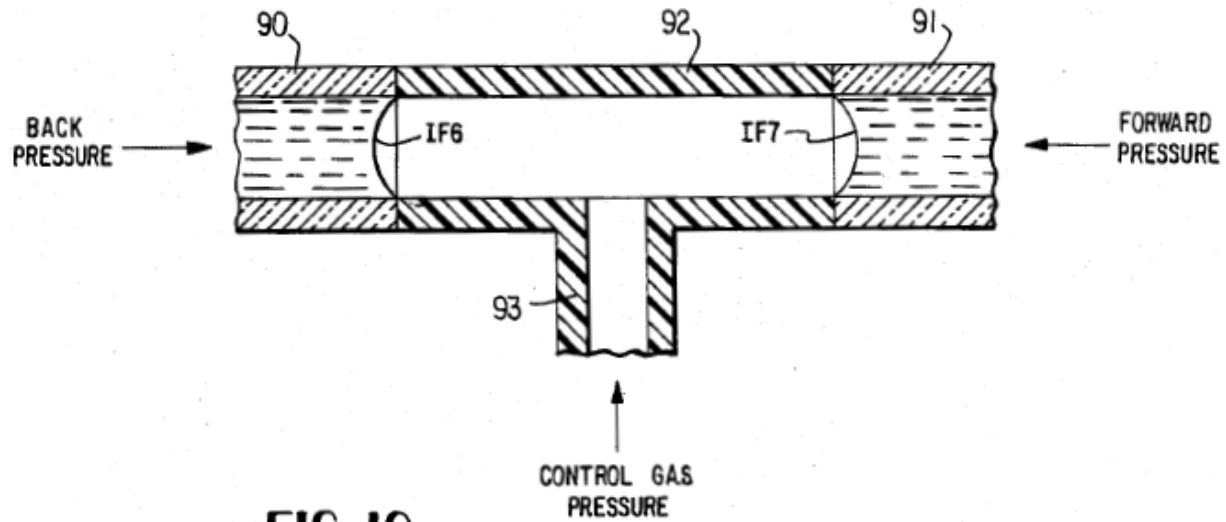
Asserted Claim Element	Exemplary Prior Art Disclosures
	of a microchannel to facilitate single particle or narrow streamline detection using a variety of optical detection schemes (discussed further, below). In one embodiment, particle focusing is achieved electrostatically (see also, Ramsey et al., "Apparatus and Method for Performing Electrodynamic Focusing on a Microchip." U.S. Pat. No. 5,858,187, issued January 12, 1999). In other preferred embodiments, pressure, Joule heating, and/or other fluid movement methods are used to focus cells or other particles." Wada, at 12:7-14. "As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above . . . [a] second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one hydrodynamic flow 2202 so as to direct selected cells 2208 (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210." Wada, at 19:24-20:2; <i>see also</i> Fig. 22 below.

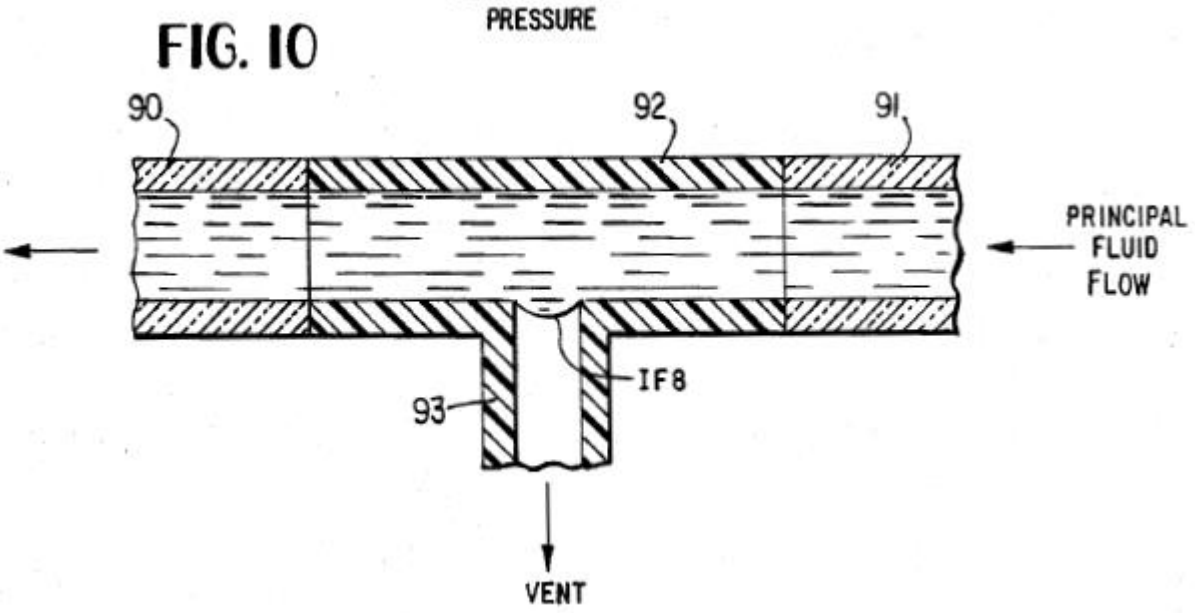
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 22 “In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304.” Wada, at 20:4-6; <i>see also</i> Fig. 23 below.

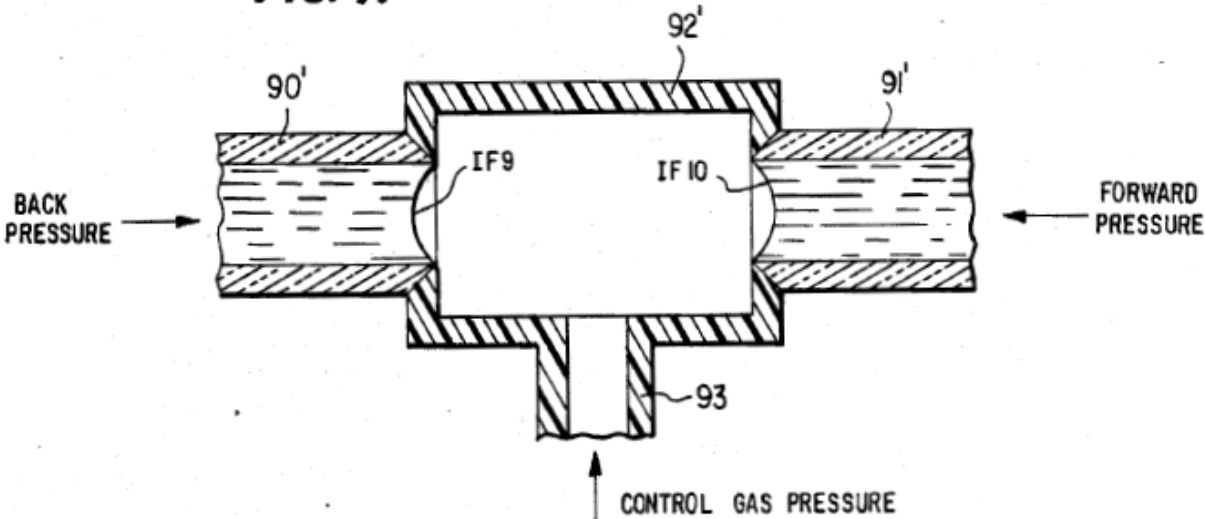
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control Port and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36; <i>see also</i> Fig. 1 below.

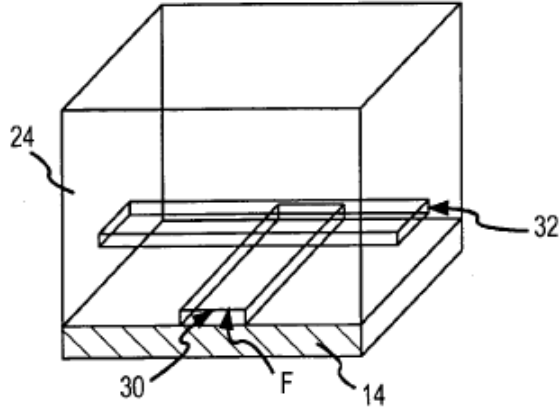
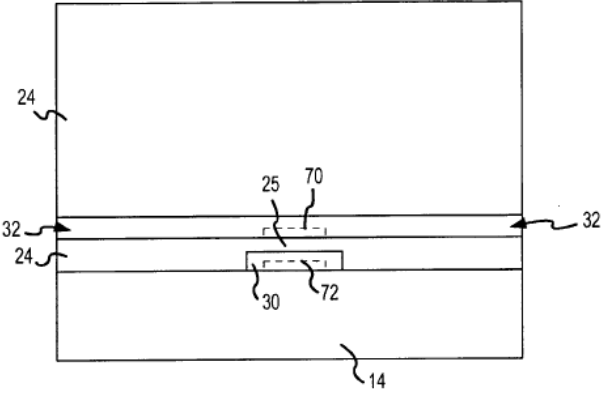
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15.” Marcus, 3:49-51. Brown Brown shows a microfluidic device comprising a microchannel (label 90 in Figs. 9-11) having an interior bounded by a sidewall (label 90). See Brown, Figs. 9-11 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 9  The diagram, labeled FIG. 9, shows a cross-section of a device. It features a central horizontal channel with a hatched outer wall. Inside this channel, there are two curved, shaded regions labeled IF6 and IF7. To the left of IF6, an arrow labeled 'BACK PRESSURE' points into the channel. To the right of IF7, an arrow labeled 'FORWARD PRESSURE' points into the channel. Below the main channel, there is a vertical side port labeled 93. An arrow labeled 'CONTROL GAS PRESSURE' points upwards into this side port. The top of the device is labeled with reference numerals 90, 92, and 91 from left to right.

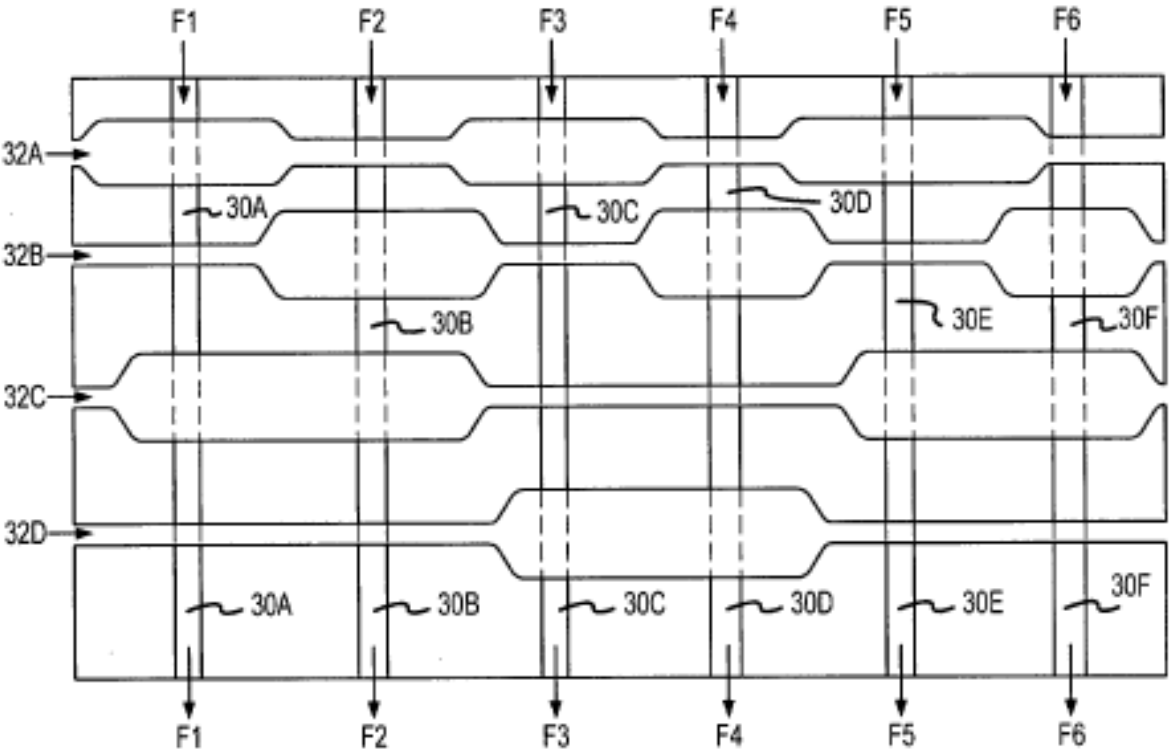
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 10  The diagram shows a cross-section of a device with a central horizontal channel. The channel is bounded by upper and lower walls, labeled 90 and 91 respectively. A central portion of the channel is labeled 92. A side vent, labeled 93, is located below the channel. The vent is connected to the channel via a vertical passage labeled IF8. An arrow labeled VENT points downwards from the bottom of the vent. Two arrows labeled PRINCIPAL FLUID FLOW point horizontally away from the channel, one to the left and one to the right. The word PRESSURE is written above the channel.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 11  “In a particular embodiment of the invention, a device relates to capillary flow control and in particular to controlling such flow with respect to extremely small volumes of a principal fluid. By extremely small volumes of principal fluid, as used herein, is meant volumes which may be as small as in the order of one picoliter.” Brown, at 3:45-50. “FIGS. 9 and 10 show a control valve construction which is functionally equivalent to those shown in FIGS. 1-6, although, the principal fluid flow rate in this case is extremely small because all of the passages illustrated in FIGS. 9 and 10 are of capillary size.” Brown, at 8:33-37. Friedman “Referring more particularly to FIG. 1, there is shown an optical chamber formed by a glass tube member 10 which is clamped by means not shown to a digital fluidic switch chamber housing

Asserted Claim Element	Exemplary Prior Art Disclosures
	member 14, the two members being sealed together by a liquid-tight annular seal 18. The liquid 19 containing the particles to be observed enters the apparatus through a tube 20 centrally disposed within the funnel-shaped entrance portion 24 of the cylindrical central bore 26 of the member 10. Another liquid 23 also enters the mouth 24 of the central bore 26 and forms a sheath of liquid for the liquid 19 containing the particles.” Friedman, at 2:30-41; <i>see also</i> Fig. 1 below. FIG. 1 Chou “An embodiment of a microfluidic device in accordance with the present invention comprises a flow channel, a pump operatively interconnected to said flow channel for moving a fluid in said flow channel, and a damper operatively interconnected to said flow channel for reducing the fluid oscillation in said flow channel. An embodiment of a microfluidic sorting device comprises

Asserted Claim Element	Exemplary Prior Art Disclosures
	a first flow channel formed in a first layer of elastomer material, a first end of the first flow channel in fluid communication with a collection pool and a second end of the first flow channel in fluid communication with a waste pool.” Chou, at 3:1-8; <i>see also</i> Figs. 7A and 7B below.   FIG. 7A FIG. 7B “As will be explained, the preferred method of Figs. 1 to 7B involves using pre-cured elastomer layers which are assembled and bonded. In an alternative method, each layer of elastomer may be cured "in place". In the following description "channel" refers to a recess in the elastomeric structure which can contain a flow of fluid or gas.” Chou, at 8:18-21. “As can be seen in Fig. 7A and 7B, flow channels 30 and 32 are preferably disposed at an angle to one another with a small membrane 25 of substrate 24 separating the top of flow channel 30 from the bottom of flow channel 32.” Chou, at 9:20-22. “Figs. 7B and 7H together show the closing of a first flow channel by pressurizing a second flow channel, with Fig. 7B (a front sectional view cutting through flow channel 32 in corresponding Fig. 7A), showing an open first flow channel 30; with Fig. 7H showing first flow channel 30 closed by pressurization of the second flow channel 32. Referring to Fig. 7B, first flow channel

Asserted Claim Element	Exemplary Prior Art Disclosures
	30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position)." Chou, at 19:1-16; <i>see also</i> Fig. 16 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 16 Zöld “In particular, the object of this invention is to provide a method for the fast and reliable sorting of individual particles in suspension in accordance with one or more of their physio-chemical

Asserted Claim Element	Exemplary Prior Art Disclosures
	properties, or for the fast and reliable dispensing of any kind of fluid, gas, or aerosol in accordance with a preselected program, wherein the substance flows through a closed or hole-like flow system, regardless of whether or not the same rate of the fluid or suspension exists in all of the outlets of the system.” Zöld, at 5:34-43. “Accordingly, a method is described for the control of the flow of fluid substances, such as fluids, gases, aerosols and individual particles (cells) of a suspension, either in accordance with a preselected dispensing program, in one mode of operation, or in accordance with one or more individual physio-chemical properties of these particles, in another mode of operation, where the substance flows through a closed, or hole-like, and environmentally friendly, duct system under the effect of a pressure difference, created between the inlets and the outlets of the system, and where a combined compensating process assures fast and reliable achievement of each preselected flow configuration, defined by the distribution of the flow of the substance to be dispensed and the flow of the injected control substance, a fluid or gas, in the outlet ducts, and the return of the flow to its steady state flow configuration after each dispensing flow configuration during the whole operation of the system. The method includes transporting said fluid substance in one or more streams in at least one transporting duct towards a duct branching volume; analyzing the individual particles in said transporting duct in accordance with one or more of their physio-chemical properties in the sorting mode of the operation;” Zöld, at 5:53-6:8. “The combination of the center stream 5, called earlier as the very thin stream, enveloped by the sheath stream 6, is generated in the nozzle chamber 7a where the fluid of the center stream 5, and hence the particles to be processed, flow into the nozzle chamber 7a through the nozzle 7b where the sheath stream 6 fluid envelopes it under the suction effect of a vacuum (system) pump, attached to the outlets of the flow system.” Zöld, at 15:30-37. “After leaving the orifice 9, the particles pass through the delay channel 11, being still inside of the center stream 5, where the former extends from the orifice 9 to the entrance of the channel branching volume 12, where the latter is defined as the volume delimited by the cross-sections of the six channels which either end or begin there, by the bottom part of the channel system, and

Asserted Claim Element	Exemplary Prior Art Disclosures
	by the lower side of the cover glass. After this traversal, and depending on the sorting conditions, the particles either continue their linear flow into the middle dispenser channel 13, where this flow configuration defines also the steady flow state of the suspension and that of the particles too, or they are deflected into one of the side dispensing channels 14 or 15 through the deflecting process, described below. Subsequently, the suspension is filtered either by the inside located filtering/collector cavity (not shown) or by the outside filter/collector bottle of FIG. 5.” Zöld, at 16:3-21. “These partial streams are delimited by the two physically real sides of the transporting channel, which is the combination of the connecting channel 8 and of the delay channel 11, and partly by the virtual planes, imagined to be laid on the stream lines from 30a to 30d and are directed perpendicularly to the bottom of the transporting channel, i.e., to the sheet of the paper of FIG. 2. The extreme side streams 6a and 6b flow into the left and right only control channels 17 and 16, respectively. The amount of the electrolyte, that flows in these two streams, has to be as large as possible because through these two streams is achieved the generation of the already described asymmetry of the flow in the channel branching volume 12, shown in FIG. 1, and hence, the deflection of the center stream 5, and that of the particles too, into one of the only-dispenser channels 14 or 15. The middle side streams 6c and 6d, delimited by the vertical planes laid on the stream lines 30a and 30c, and 30b and 30d, respectively, flow into the side exit only-dispenser channels 15 and 14, flowing at first against the slightly pointed ends of the separating wall pair 33 and being deflected thereby into these channels.” Zöld, at 18:4-26. “It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels.” Zöld, at 23:66-24:7. Zöld 662

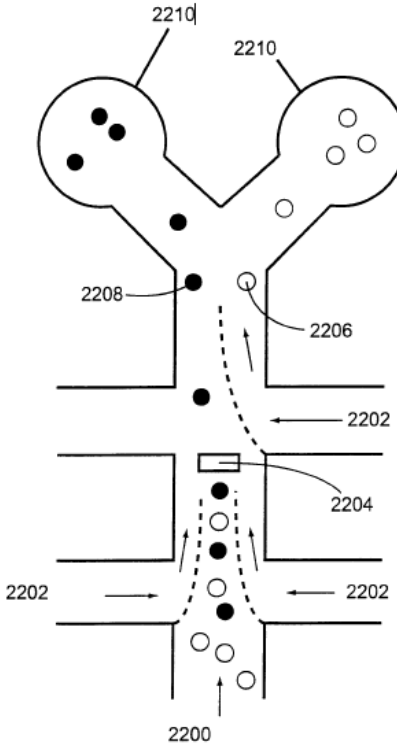
Asserted Claim Element	Exemplary Prior Art Disclosures
	“The operation of the known method and device is as follows: In a flow chamber with a capillary exit of very small diameter a very thin (cca. 25 micron diameter) stream of the suspension is produced.” Zöld 662, at 1:24-28. “Therefore, it is one object of the invention to provide a method and a device for controlling the flow of an electrolyte in closed channels of capillary size in order to make possible the sorting of at least one but rather two kinds of particles (cells) from a mixture . . . this problem is solved in such a manner that the electrolyte flowing in a channel can be split into at least two side channels and that the thin suspension stream can be deflected completely into at least one of the side channels from the entrance channel or middle channel by producing a sudden and short electrolysis gas impulse in that side channel lying opposite to the side channel in which the suspension stream is to be deflected. This method of sorting is based on the direct changing of the electrolyte flow path while the suspended particles are deflected only indirectly by this change of the electrolyte flow.” Zöld 662, at 1:57-2:8. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are

Asserted Claim Element	Exemplary Prior Art Disclosures
	equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54.

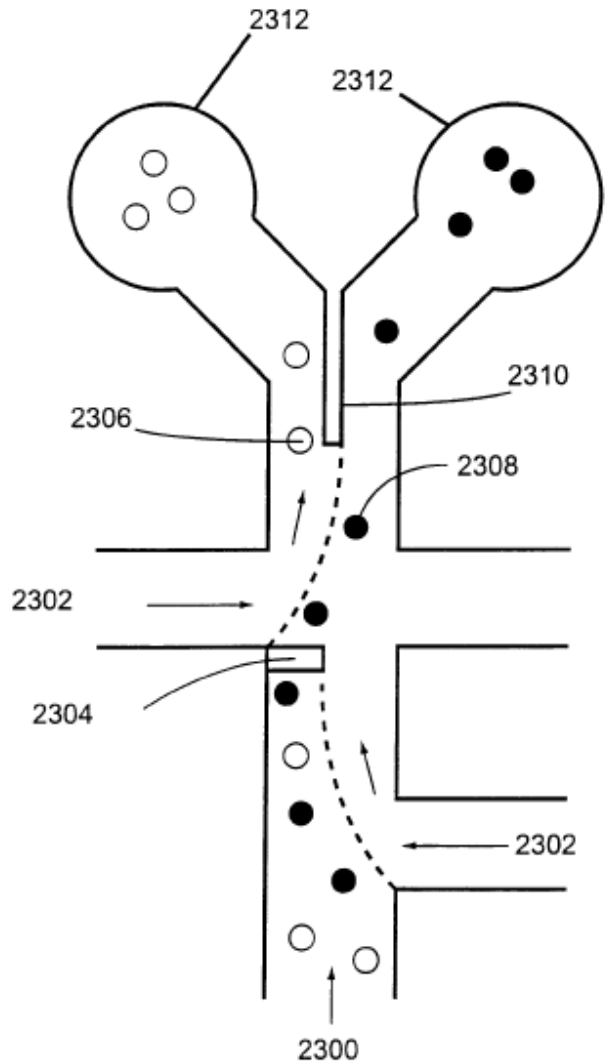
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“FIG. 1, that the suspension flowing from container 38 through the entrance channel 34 and the orifice 28 continues to flow in the relatively narrow capillary exit channel 12 after mixing with pure electrolyte from container 40 and another entrance channel 36, thus making possible the lining-up of the particles for further analysis or sorting.” Zöld 662, at 7:2-8. “The operation of the T-sorter is as follows: Under the suction effect of the pump (not shown) connected to the tube 26 suspension and pure electrolyte flow from containers 38 and 40 through the entrance channels 34 and 36, respectively, towards the orifice 28 into the exit channel 12 and then through the side channels 14 and 16 into the containers 22 and 24, respectively.” Zöld 662, at 7:33-39. “In this version, as can be seen in FIG. 2, the suspension is injected into the counter through a very thin capillary tube 44 which ends in a nozzle 46 and is located substantially coaxially inside the entrance channel 42; the pure electrolyte flowing in the entrance channel 42 focuses the suspension into a very thin stream at the upstream side of the orifice 28 concentrically with the orifice from where the suspension further flows into the exit channel or middle channel 50 of the sorter device. Adjacent the orifice 28 pure electrolyte enters laminaarly at both sides of the suspension stream 60 through the side entrance channels 36 and 37 to keep the suspension stream 60 at the center of the middle channel 50 and to direct the suspension and thus, the particles, right against the tip 56 of the branching of the middle channel 50 into the two side channels 52 and 54. The pairs 18 and 20 of control electrodes are provided at a small distance before the branching of the middle channel 50 on the inner side walls of the middle channel. Alternatively, the pairs of control electrodes can also be provided in the side channels 52 and 54 in the manner shown in FIG. 1. The deflection of the suspension stream 60 into one side channel, say into channel 52, is achieved by producing a sufficiently large amount of gas by the control electrodes 18; the control electrodes 20 would, clearly, produce the deflection of the suspension stream into the side channel 54. It is an advantage of this embodiment that the deflection of the very thin suspension stream 60 is simpler and faster than in the T-sorter and as a result faster operation can be achieved with the Y-sorter than with the T-sorter.” Zöld 662, at 8:14-46. “FIG. 7 shows the channel arrangement of a device which in accordance with the invention is capable to reduce the interparticle spacing of particles suspended in a suspension stream in a

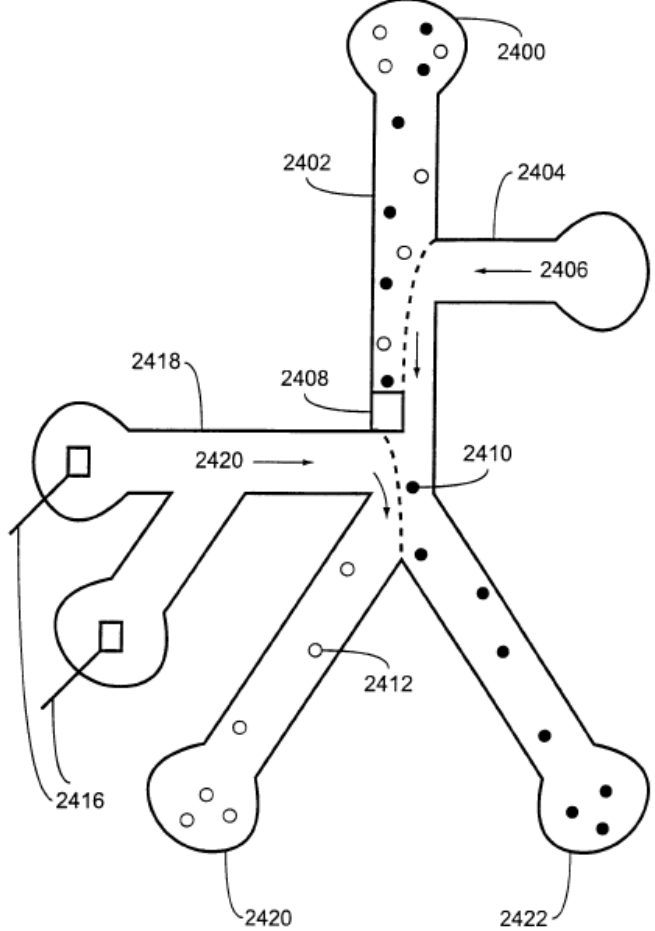
Asserted Claim Element	Exemplary Prior Art Disclosures
	capillary channel. The particles flow through a channel counter 68, 78 and 80 into a main channel 70 of capillary cross-section from which two side channels 72 and 74 branch out symmetrically each of which being provided with a valve-electrode pair 82 and 84, respectively. The valve-electrode pairs 82 and 84 are programmed by an electronic system (not shown) such that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22.
(iii) propagating the pressure pulse across the width of the flow channel; and	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example: Wada “Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:18-23. “As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above . . . [a] second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one

Asserted Claim Element	Exemplary Prior Art Disclosures
	hydrodynamic flow 2202 so as to direct selected cells 2208 (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210.” Wada, at 19:24-20:2; <i>see also</i> Fig. 22 below.  Fig. 22 “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that

Asserted Claim Element	Exemplary Prior Art Disclosures
	intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 The diagram illustrates a microfluidic device 2300. A central vertical channel contains a mixture of white and black particles. A dashed line indicates a separation interface. At the top, the channel splits into two outlets, 2312. The left outlet contains only white particles, while the right outlet contains only black particles. Labels include: 2312 for the outlets; 2306 for a white particle in the left outlet; 2310 for a black particle in the right outlet; 2308 for a black particle in the main channel; 2302 for horizontal inlet/outlet ports with arrows indicating flow; 2304 for a small rectangular component on the left wall; and 2300 for the entire device.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 “Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting

Asserted Claim Element	Exemplary Prior Art Disclosures
	microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control port A and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “A suspension containing at least two visually different particulate matter is forced through input flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at 3:49-62.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 1 Friedman “For instance, in FIG. 2, three outlet ports are provided from the switching chamber and it will be understood that photoelectric sort detectors, such as elements 69 and 83, may be employed for each of those three outlet ports. FIG. 2 illustrates an alternative embodiment of the invention in which the switching chamber 60 is modified as shown at 60A, in a modified fluidic amplifier housing 14A, to provide an additional outlet port 70 and added control ports 72 and 74. A control fluid under pressure may be supplied to the switching chamber 60A through the control ports 72 and 74 through the

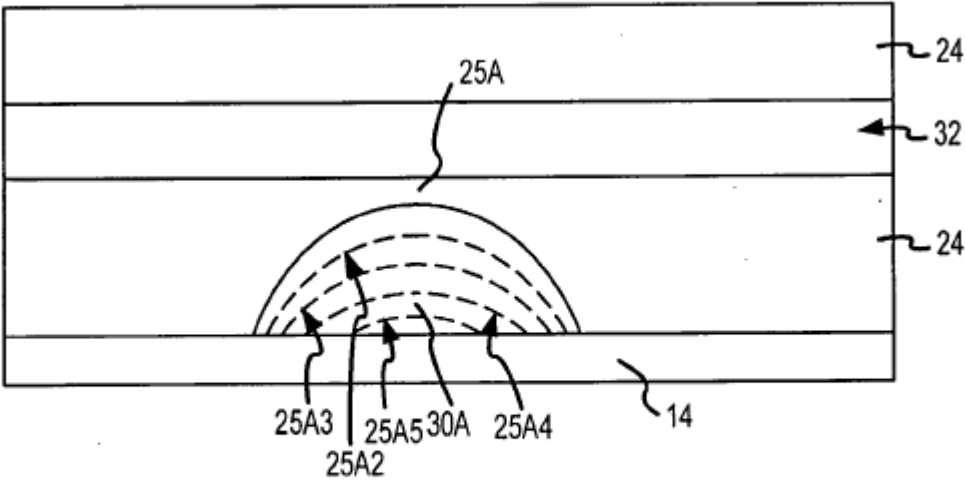
Asserted Claim Element	Exemplary Prior Art Disclosures
	respective supply lines 76 and 78 under the control of electromagnetically operated valves 80 and 82.” Friedman, at 8:53-67; <i>see also</i> Fig. 2 below. FIG. 2

Asserted Claim Element	Exemplary Prior Art Disclosures
	“As illustrated in the drawing, the opposite walls 68 and 69 of the switching chamber 60A are essentially equidistant from the nozzle formed by the inlet 66. Accordingly, they are equally capable of displaying the wall attachment effect in the presence of turbulence in the liquid stream, as previously described above. Thus, just as the wall attachment effect to wall 68 directs the liquid stream to outlet port 64, the wall attachment effect at wall 69 leads the fluid stream to the outlet port 70. Once established at one wall, the wall attachment effect will be maintained and will hold the stream to one of these two walls, and thus direct the stream to one of these two outlet ports, as long as turbulence continues. In order to determine which direction the stream will take, a signal must be supplied from one of the control ports 72 or 74. If the signal takes the form of a supply of control fluid under pressure, it has the effect of shifting the stream away from the wall adjacent to the control port and over to the opposite wall. Thus, if control fluid is supplied to the switching chamber 68 through the control port 74, the supply of fluid destroys the low pressure bubble at the wall 69, causing the stream to shift to the opposite wall 68. A similar, but opposite effect is available if a vacuum is applied at the control port 74. This reduces the pressure at the wall 69, tending to increase the wall attachment at the wall 69 and to switch the device so that the liquid stream is pulled away from the wall 68 and to the wall 69 and to the port 70. The embodiment of FIG. 2 is capable of several different alternative modes of operation. For instance, if the switching chamber 60A is fabricated in an asymmetrical form such that the wall 68 is substantially closer to the nozzle formed by the inlet 66 than the wall 69, then without any control signals at the control ports 72 and 74, the switching action will be identical to that described above for the embodiment of FIG. 1. Thus, if a signal is supplied to the transducer 58, the resulting turbulence will cause the stream to attach to the wall 68 and to be directed to port 64. In the absence of a signal at transducer 58, the laminar flow will continue, and the stream will be directed through the outlet port 62.” Friedman, at 9:3-45. “The switching fluid used at the ports 72 and 74 should be compatible with the liquid in the main stream, but it need not be identical to that liquid. Thus, where the liquid in the main stream is water, the switching fluid may be water, or air, or some other compatible fluid.” Friedman, at 10:45-50. “As illustrated in the simplified schematic diagram of FIG. 3, additional fluidic amplifier switches may be employed downstream from the fluidic amplifier switch of the system of FIG. 1, or in that of FIG. 2. This provides the possibility of still further sorting and segregation of particles on a single pass through the apparatus. The downstream fluidic amplifiers may also be connected to receive control signals from circuits 46. FIG. 3, at the left side, illustrates in simplified schematic form an

Asserted Claim Element	Exemplary Prior Art Disclosures
	apparatus corresponding to the apparatus of FIG. 2, with corresponding parts correspondingly numbered. The main stream outlet port 62 is connected to a second fluidic amplifier switch housing 114 which may correspond exactly in structure and operation with the fluidic switch contained within the housing 14 and described above in connection with FIG. 1. The fluidic switch 114 responds to a signal from circuits 46 on a connection indicated at 146 through a delay circuit 149 and a gate circuit 151 to control a signal from an oscillator 153 to a transducer within the switch housing 114. By this means, particles which were not sorted and segregated in the first fluidic amplifier within housing 14, and diverted to the outlet port 64, continue on through the port connection 62, through the switch 114, and may be sorted and segregated according to a second particle characteristic into an outlet port 164. If the particles are not so segregated, they continue on in the main stream outlet port 162 from the housing 114. Thus, FIG. 3 illustrates the principle that a plurality of fluidic amplifier switches may be controlled to accomplish several sorting operations based on signals obtained from a single optical chamber 10.” Friedman, at 11:33-65; <i>see also</i> Fig. 3 below. FIG. 3 Otsuka

Asserted Claim Element	Exemplary Prior Art Disclosures
	“The consideration will be made as to the case in which all of the ejection nozzles are continuously actuated by the ejection heater 3 being actuated.” Otsuka, at 2:28-30. Chou “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.

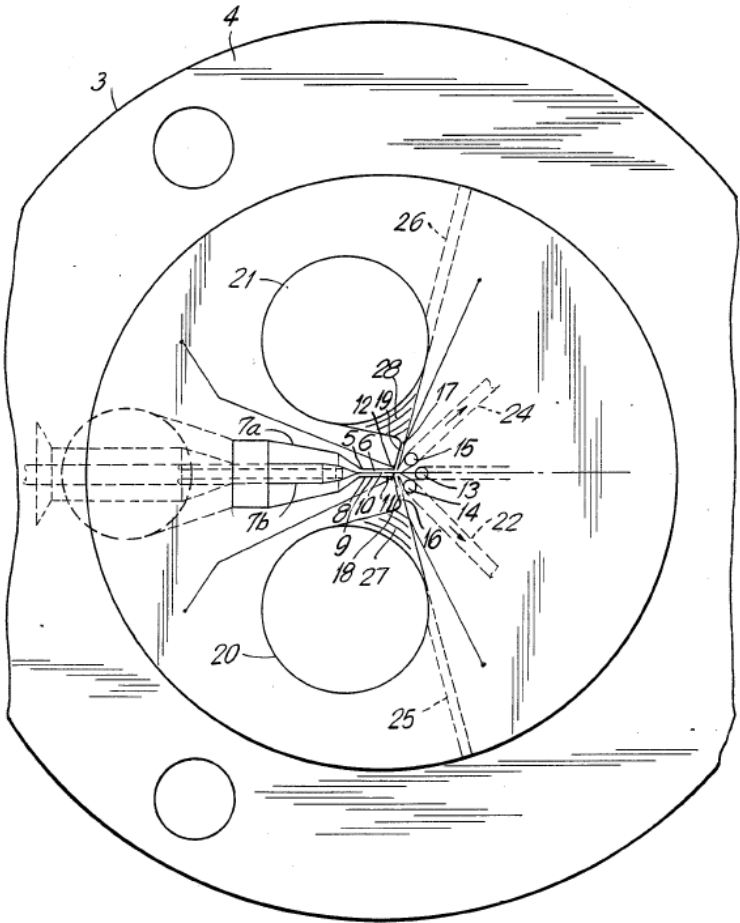
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 7H “In the alternate preferred embodiment of Fig. 11, flow channel 30a has a curved upper wall 25A. When flow channel 32 is pressurized, membrane portion 25 will move downwardly to the successive positions shown by dotted lines 25A2, 25A3, 25A4 and 25A5, with edge portions of the membrane moving first into the flow channel, followed by top membrane portions. An advantage of having such a curved upper surface at membrane 25A is that a more complete seal will be provided when flow channel 32 is pressurized. Specifically, the upper wall of the flow channel 30 will provide a continuous contacting edge against planar substrate 14, thereby avoiding the "island" of contact seen between wall 25 and the bottom of flow channel 30 in Fig. 10. Another advantage of having a curved upper flow channel surface at membrane 25A is that the membrane can more readily conform to the shape and volume of the flow channel in

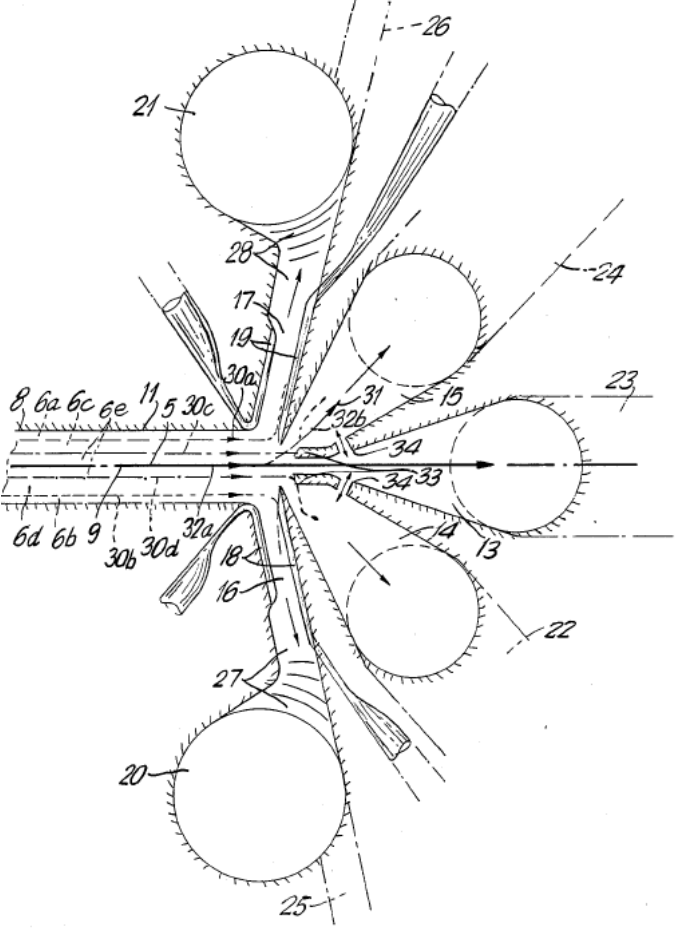
Asserted Claim Element	Exemplary Prior Art Disclosures
	response to actuation. Specifically, where a rectangular flow channel is employed, the entire perimeter (2x flow channel height, plus the flow channel width) must be forced into the flow channel. However where an arched flow channel is used, a smaller perimeter of material (only the semi-circular arched portion) must be forced into the channel. In this manner, the membrane requires less change in perimeter for actuation and is therefore more responsive to an applied actuation force to block the flow channel.” Chou, at 24:17-34; <i>see also</i> Fig. 11 below.  FIG.11 “In addition to pressure based actuation systems described above, optional electrostatic and magnetic actuation systems are also contemplated, as follows. Electrostatic actuation can be accomplished by forming oppositely charged electrodes (which will tend to attract one another when a voltage differential is applied to them) directly into the monolithic elastomeric structure. For example, referring to Fig. 7B, an optional first electrode 70 (shown in phantom) can be positioned on (or in) membrane 25 and an optional second electrode 72 (also shown in phantom)

Asserted Claim Element	Exemplary Prior Art Disclosures
	can be positioned on (or in) planar substrate 14. When electrodes 70 and 72 are charged with opposite polarities, an attractive force between the two electrodes will cause membrane 25 to deflect downwardly, thereby closing the "valve" (i.e.: closing flow channel 30). For the membrane electrode to be sufficiently conductive to support electrostatic actuation, but not so mechanically stiff so as to impede the valve's motion, a sufficiently flexible electrode must be provided in or over membrane 25. Such an electrode may be provided by a thin metallization layer, doping the polymer with conductive material, or making the surface layer out of a conductive material. In an exemplary aspect, the electrode present at the deflecting membrane can be provided by a thin metallization layer which can be provided, for example, by sputtering a thin layer of metal such as 20 nm of gold." Chou, at 26:9-26. "Referring first to Figs. 12A and 12B, a schematic of flow channels 30 and 32 is shown. Flow channel 30 preferably has a fluid (or gas) flow F passing therethrough. Flow channel 32, (which crosses over flow channel 30, as was already explained herein), is pressurized such that membrane 25 separating the flow channels may be depressed into the path of flow channel 30, shutting off the passage of flow F therethrough, as has been explained." Chou, at 28:18-23. "Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under membrane 25B at the intersection of control line 32B and flow channel 30, etc." Chou, at 28:27-33. "As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow

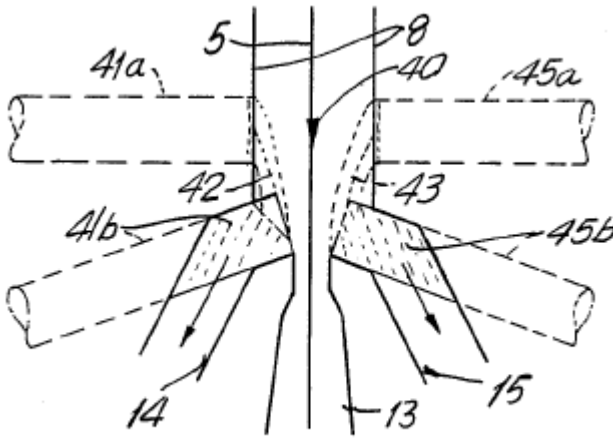
Asserted Claim Element	Exemplary Prior Art Disclosures
	channel 30.” Chou, at 31:13-20. Zöld “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas

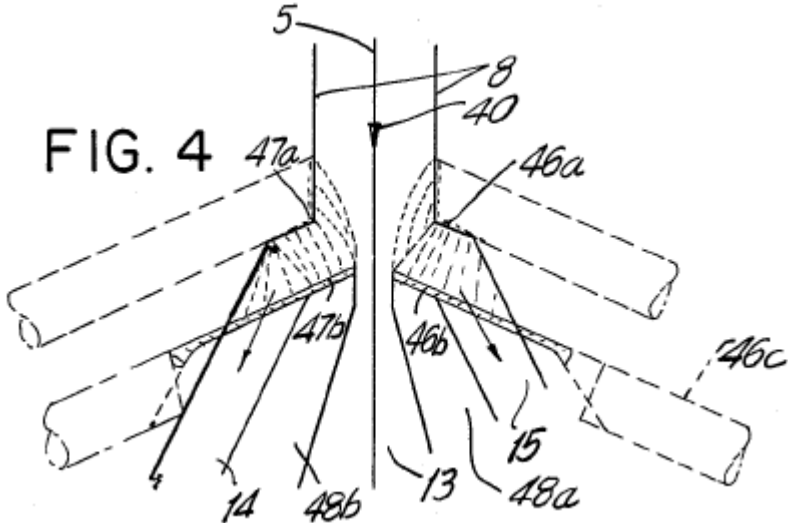
Asserted Claim Element	Exemplary Prior Art Disclosures
	production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary (3) and an inner boundary (4). Inside, there are two large circular regions (21 and 20) and a central area with various components labeled with numbers: 28, 12, 19, 17, 24, 15, 13, 14, 22, 16, 18, 27, 9, 8, 10, 11, 5, 6, 7a, 7b, 25, and 26. Dashed lines indicate internal structures and connections.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

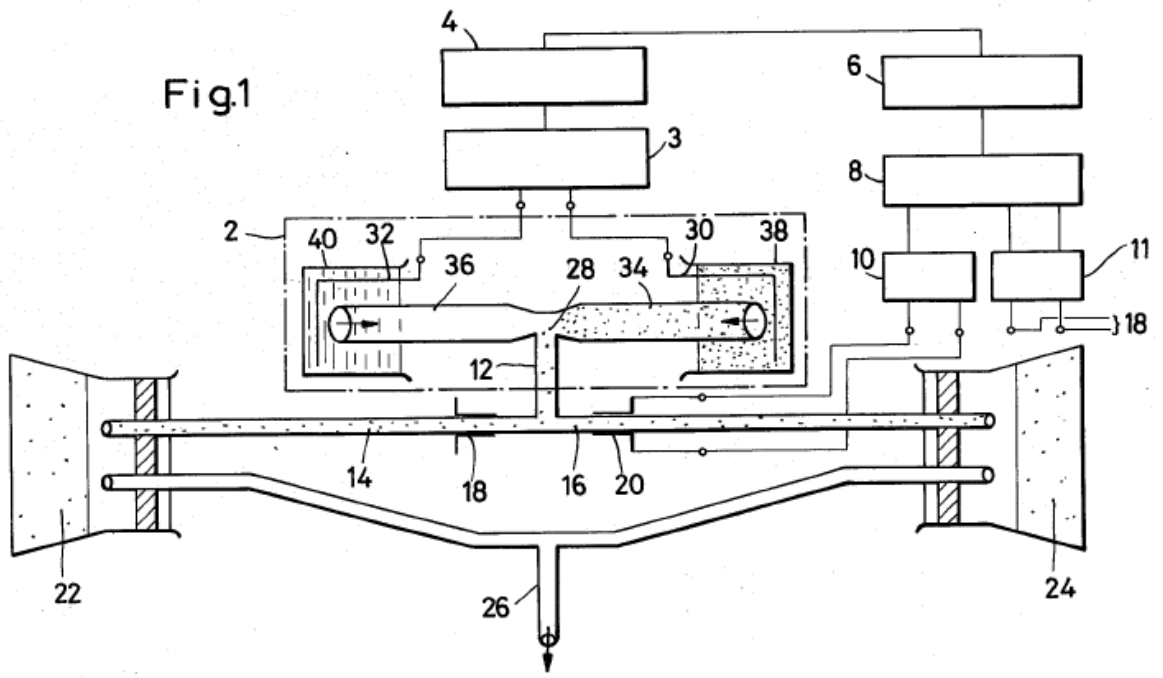
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

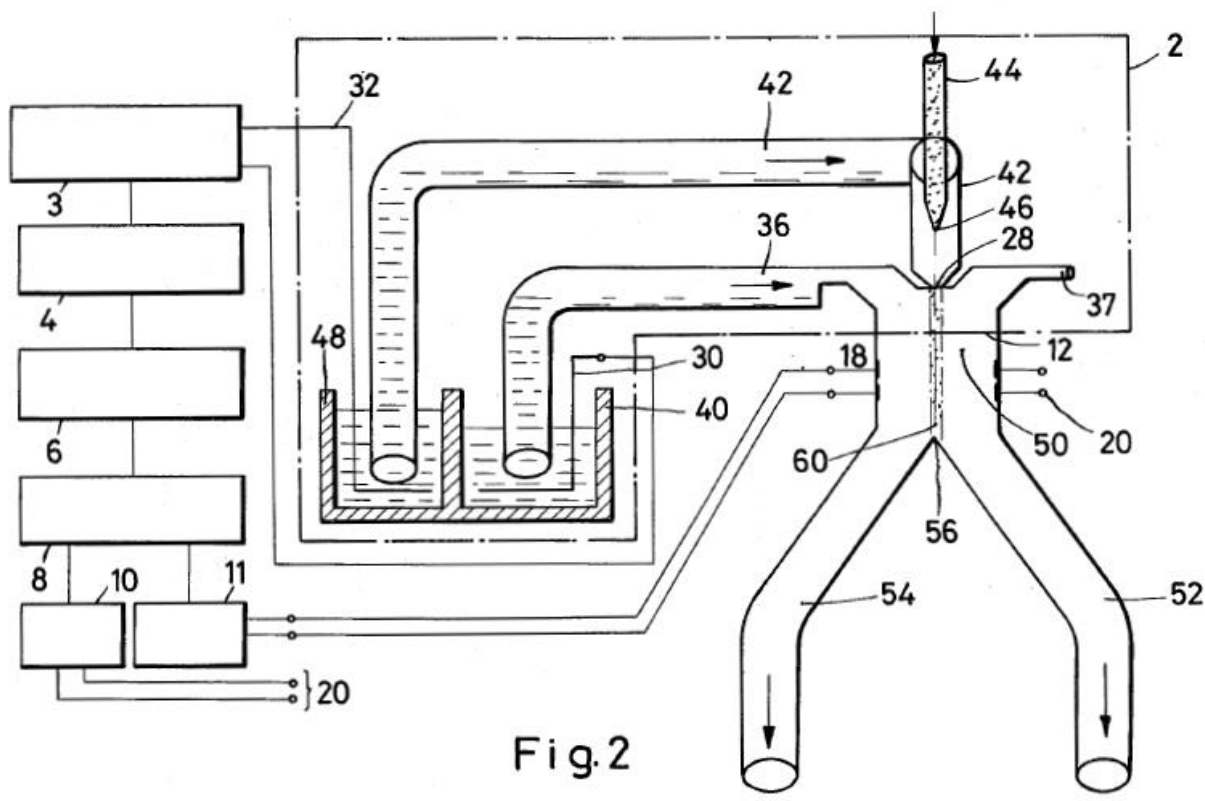
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are

Asserted Claim Element	Exemplary Prior Art Disclosures
	equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54.

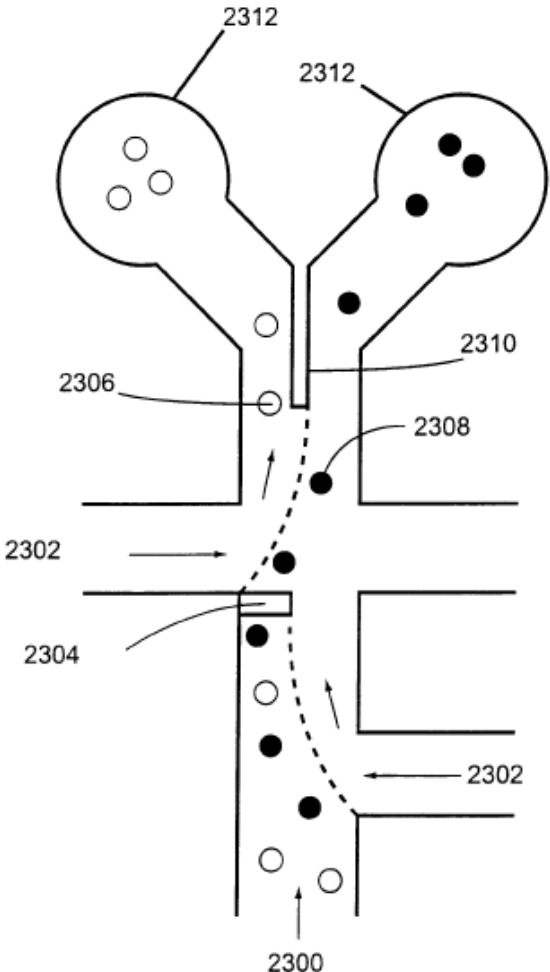
Asserted Claim Element	Exemplary Prior Art Disclosures
	“In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11.

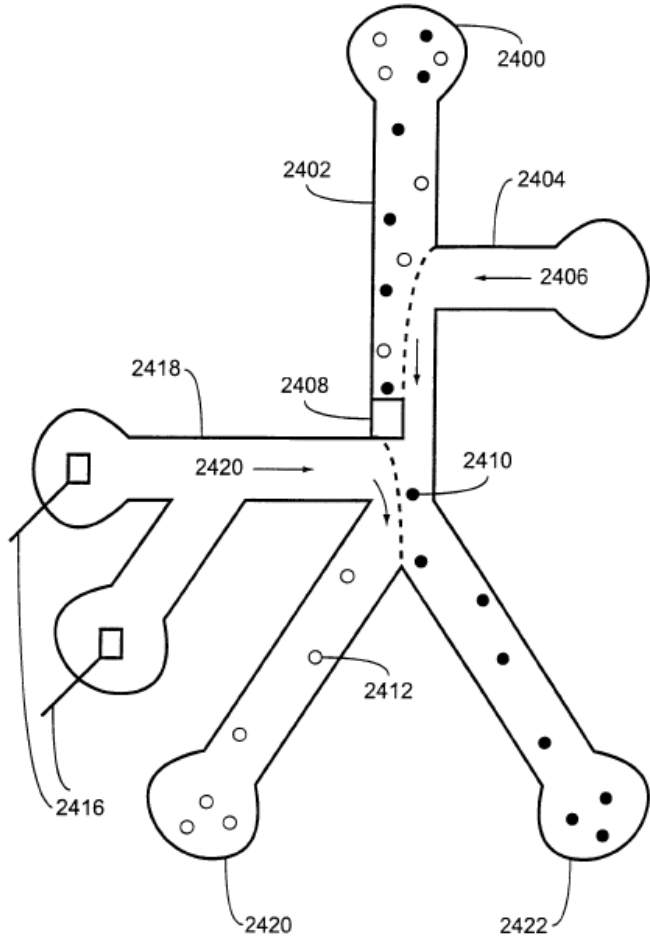
Asserted Claim Element	Exemplary Prior Art Disclosures
	“FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig.1  The diagram illustrates a medical device, likely a dialyzer or a similar fluid-handling apparatus. It features a central chamber (2) with internal components including a pump or motor (4), a control unit (3), and various fluid ports and channels (6, 8, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40). The device is shown in a cross-sectional view, revealing its internal structure and the flow paths for fluid. The central chamber (2) is connected to a main body (14) which has a central outlet (26) and side ports (12, 16, 20). The device is mounted on a base (22) and a top cover (24). The internal components are connected to external systems (4, 6, 8, 10, 11, 18, 28, 30, 32, 34, 36, 38, 40) via various ports and channels.

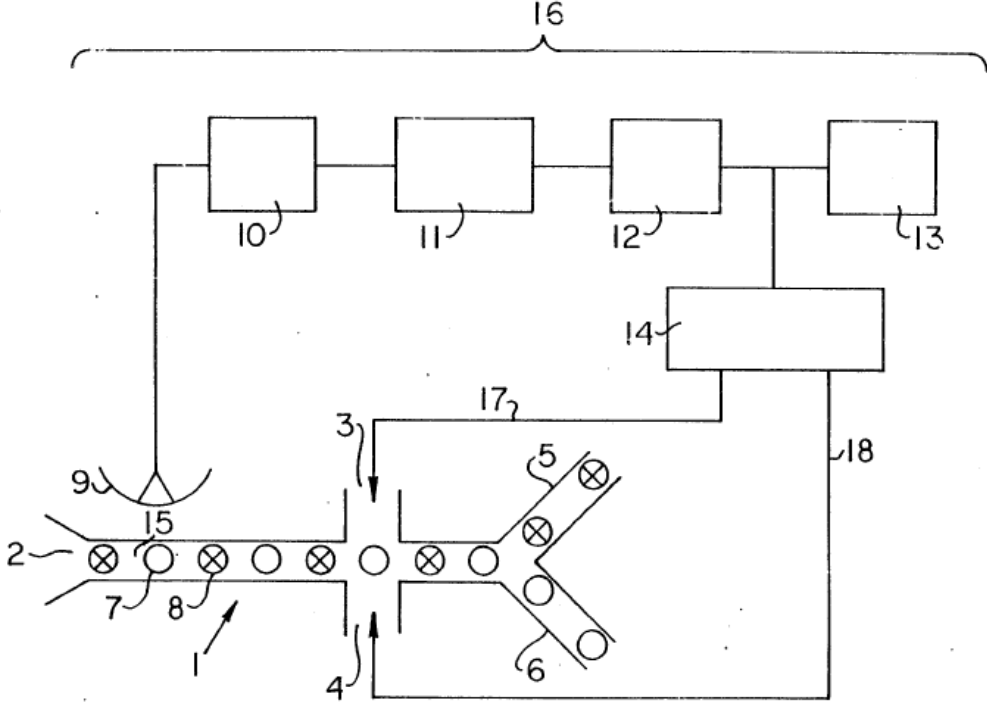
Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2
(iv) dampening or absorbing the pressure pulse using the first reservoir in fluid communication with the flow channel.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada “Furthermore, the computer also typically includes an instruction set for flowing fluids from the third and the sixth microchannels into the first microchannel. Optionally, the instruction set directs individual or simultaneous fluid flow from the third and sixth microchannels by individually or simultaneously activating at least one heating element (e.g., a Joule heating electrode, a conductively coated microchannel portion, or the like) disposed within each of the third and sixth microchannels or within at least one well that fluidly communicates with each of the third and sixth microchannels.” Wada, at 8:16-23. “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

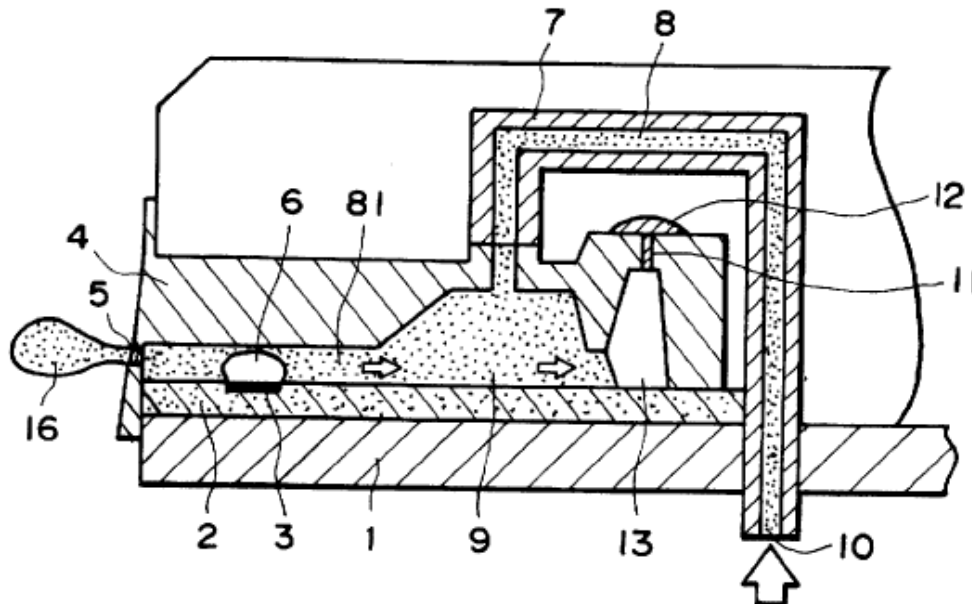
Asserted Claim Element	Exemplary Prior Art Disclosures
	 “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles

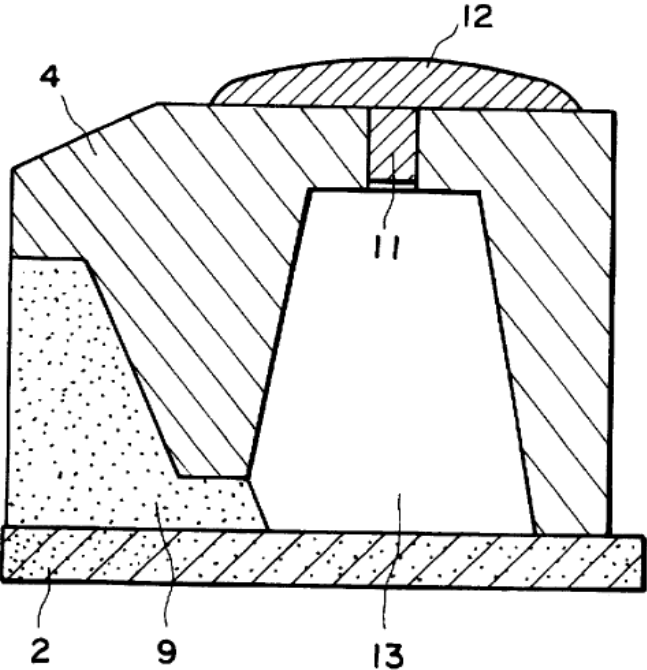
Asserted Claim Element	Exemplary Prior Art Disclosures
	against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.  The diagram illustrates a microfluidic device with a central vertical main microchannel 2402. At the top, a chamber 2400 contains several particles. A side channel 2404 branches off to the right, leading to a chamber 2406. A horizontal channel 2418 branches off to the left, leading to a chamber 2420. Below the main channel, two diagonal channels branch out, leading to chambers 2412 and 2422. A detector 2408 is positioned on the right wall of the main channel 2402, just above a T-junction. A selected particle 2410 is shown at this junction. A dashed line indicates the path of a particle from the top chamber 2400, through the main channel 2402, and towards the T-junction. Arrows indicate the flow direction: downwards in the main channel, rightwards in the side channel 2404, leftwards in the horizontal channel 2418, and outwards into the diagonal channels. Electrodes 2416 are shown at the ends of the horizontal channel 2418.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29. “In some instances, electrokinetic material transport systems are used to direct one or more of the flow of cell suspensions, the injection of test compounds, and other material movement parameters. In such cases, the overall system used in performing the assay will typically include an appropriate controller and interface for controlling such electrokinetic material transport. Typically, such transport systems include one or more electrical power supplies that are operably coupled to the termini of the channels in a microfluidic device, e.g., as described in greater detail below. The connection of the power supply(ies) with the channels is typically accomplished via electrodes placed into reservoirs at the termini of the channels, which electrodes are coupled to the power supply(ies). The power supply(ies) then deliver(s) appropriate voltage levels to the various electrodes to yield a desired flow pattern within the channels of the device, e.g., flowing the cell suspension and periodically injecting a test compound.” Wada, at 36:20-32. Marcus “FIG. 1 generally teaches the apparatus and concept of the present invention. In said figure, element 1 broadly depicts the fluidic logic element. Said fluidic logic element 1 comprises input flow port 2 through which a suspension containing particulate matter is forced. Fluidic logic element 1 further comprises control port A and control port B, 4 and 3, respectively; and output port A and output port B, 5 and 6, respectively.” Marcus, at 3:28-36. “A suspension containing at least two visually different particulate matter is forced through input

Asserted Claim Element	Exemplary Prior Art Disclosures
	flow port 2. The suspension contains particle type A, 8, particle type B, 7, and a fluid carrier 15. Machine vision camera lens 9 reads the appearance of said particles 7 and 8. It transmits what is read to an image capture device 10 which forwards what it sees to an image interpretation device 11 which is able to interpret and register a distinction between particles 7 and 8. This distinction is then transmitted to a control decision device 12 which signals a fluidic controller device 14 to instruct control ports A and B, 4 and 3 respectively; to separate out said particles 7 and 8. These particles 7 and 8 are then sorted through output port A and output port B, 5 and 6.” Marcus, at 3:49-62.  FIG. 1

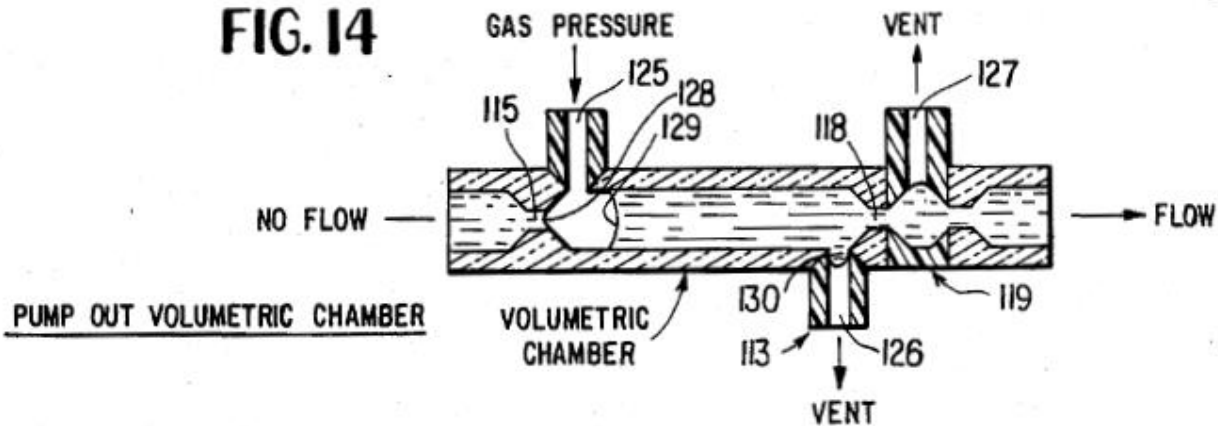
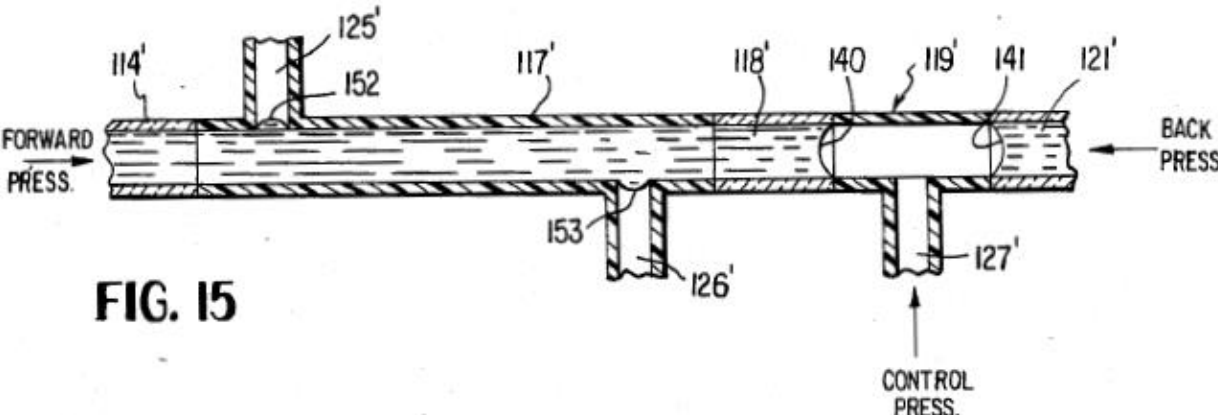
Asserted Claim Element	Exemplary Prior Art Disclosures
	Otsuka “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave.” Otsuka, at Abstract. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate, the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property.” Otsuka, at 4:34-41. “[A] buffering chamber disposed at a position through which a pressure wave resulting from driving of the ejection energy generating elements propagate. the buffering chamber containing a gas for attenuating the pressure wave, wherein a part of a wall constituting the buffering chamber has a gas transmitting property; and driving signal supply means for supplying a driving signal for ejecting the ejecting energy generating elements.” Otsuka, at 4:49-57; <i>see also</i> Fig. 1 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 1 “FIG. 2 shows an enlarged buffer chamber 13 according to an embodiment of this invention. As shown, the buffering chamber 13 filled with the gases partly communicates with the common liquid chamber 9. and the gases function to absorb the pressure wave.” Otsuka, at 6:34-38; <i>see also</i> Fig. 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 Chou “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of

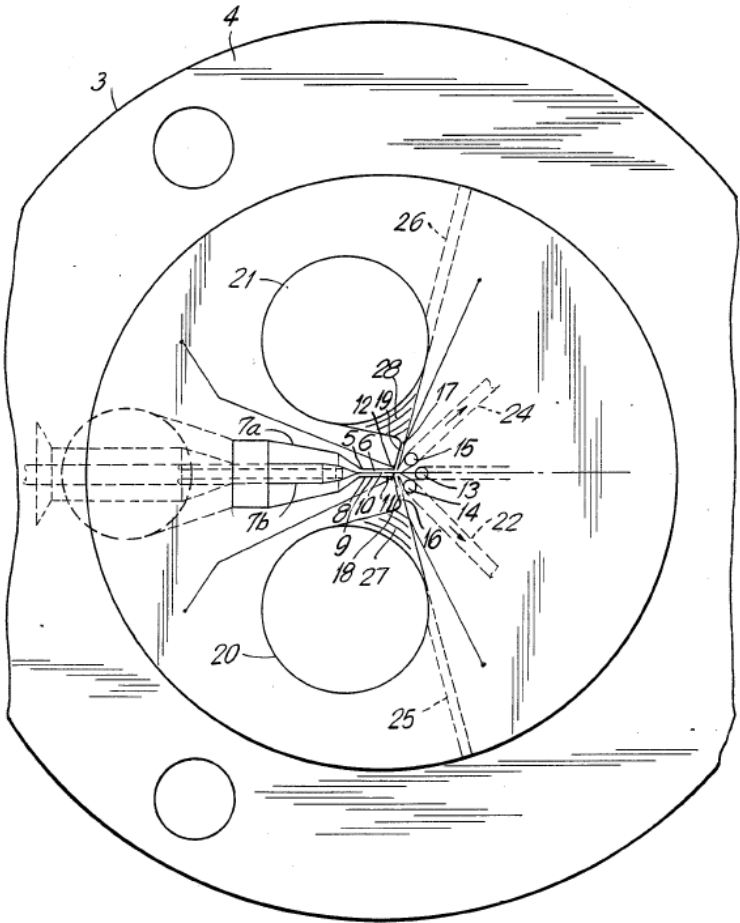
Asserted Claim Element	Exemplary Prior Art Disclosures
	oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper.” Chou, at 39:25-33. “Figure 27 shows a cross-sectional view of yet another embodiment of a damper structure in accordance with the present invention, wherein damper structure 2700 comprises portion 2702a of flow channel 2702 having a larger cross-section, an upper region of portion 2702 being filled with air or some other type of fluid 2704. As material 2706 flowing through channel 2702 experiences pressure oscillations 2708 and eventually encounters damper 2700, energy is expended as material 2706 pushes against fluid 2704. This expenditure of energy serves to reduce the amplitude of energy of oscillation of material in the flow channel.” Chou, at 41:5-12; <i>see also</i> Fig. 27 below.

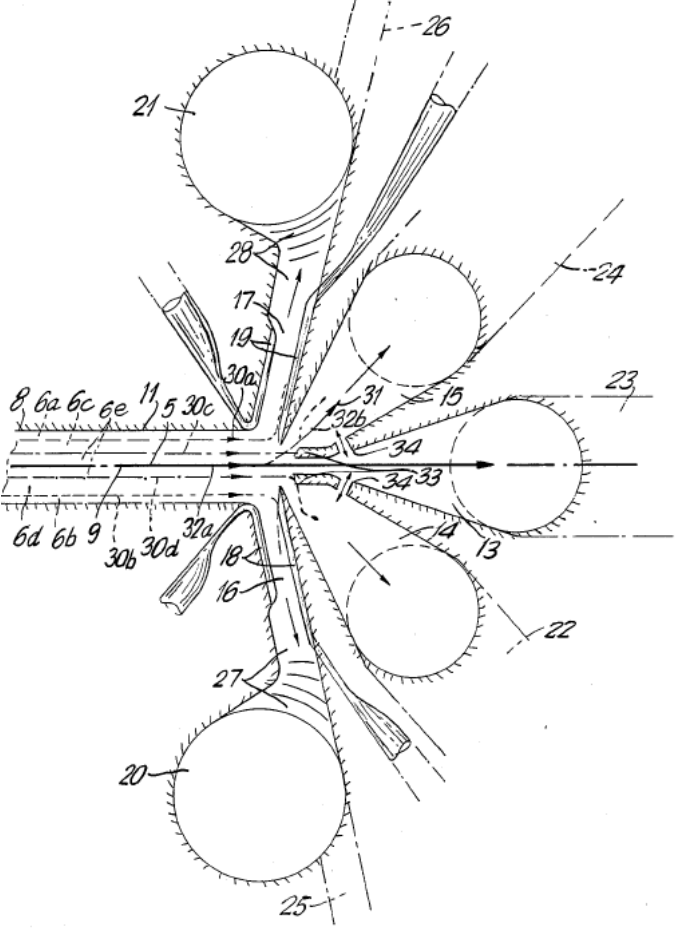
Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG.27 Brown “In order to pump out the volumetric chamber 117, exogenous control fluid pressure is introduced as is indicated in FIG. 14 through the capillary passage 125 while the control valve 119 is opened by venting its capillary passage 127 as indicated. Both of these capillaries 125 and 127 are connected with suitable sources of control fluid having pressure control means associated therewith. It will be noted that in this embodiment, the capillary 126 is always vented to permit proper operation during filling so that it, in effect, is a passive element whose presence is nevertheless essential. The control fluid introduced at 125 forms a stabilized interface 128 at the downstream end of the necked down portion 115 and thereby prevents backflow of the control fluid therebeyond, i.e., a valving action is effected. The interface 130 is already present at the mouth of the capillary 126 where it joins the pump chamber so that as the principal fluid is being expelled from the pump chamber by the travelling interface 129, the only flow path for the principal fluid is through the necked down portion 118.” Brown, at 10:44-64; <i>see also</i> Fig. 14 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	FIG. 14  “FIG. 15 shows the volumetric chamber 117' after complete filling thereof under capillary action, the control fluid being vented both at 125' and 126' at this time so that no exogenous control fluid pressure is functional to prevent this capillary action.” Brown, at 11:14-18; <i>see also</i> Fig. 15 below.  FIG. 15

Asserted Claim Element	Exemplary Prior Art Disclosures
	Zöld “According to the invention, if the fluids flow through the system under the influence of a vacuum created at the outlets of the whole flow system, then the use of a gas as a control medium, injected through the injection duct, is used as one possibility; in this case, an electromechanical or piezoelectrical valve controls the injection process. However, if the substance to be dispensed is of some kind of a liquid, then a gas or vapor, injected, or more properly created, through some electrical or electrochemical process, is especially advantageous here as a control medium because the gas or vapor can be generated, in many cases, right at the optimal place of its injection defined earlier, instead of being led to that place through an injection duct where the injection process is manipulated through bulky valves.” Zöld, at 8:22-36. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis, or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value

Asserted Claim Element	Exemplary Prior Art Disclosures
	that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary 3. Inside, there are two large circular regions, 21 (top) and 20 (bottom). A central horizontal axis features a component 7a on the left and 7b on the right. Various other components are labeled with numbers: 4, 12, 13, 14, 15, 16, 17, 18, 19, 22, 24, 25, 26, 27, 28, 5, 6, 8, 9, 10, 11. Dashed lines indicate internal structures and connections between these components.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “Furthermore, the suction stabilization is achieved through the use of the buffer cavities, which are large holes 20 and 21, drilled into the body 1 of the device quasi perpendicularly into its top surface 4, as shown in FIGS. 1 and 2, and most of their volume is free of an electrolyte, from where their stabilization characteristic follows. Their outlet holes are connected through flexible tubes (not shown) to a waste bottle of very large volume in such a manner that both the electrolyte and the generated gas can flow parallel to each other without blocking each other's flow into the bottle. On the other hand, the outlet holes of the only-dispenser channels 13, 14 and 15 are connected through flexible tubes to the filtering/collector bottles of very large volume where the already processed suspension is filtered, after flowing through the two-position multiple-tube valve, which, in this case, is a triple-tube valve.” Zöld, at 20:41-57. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels,

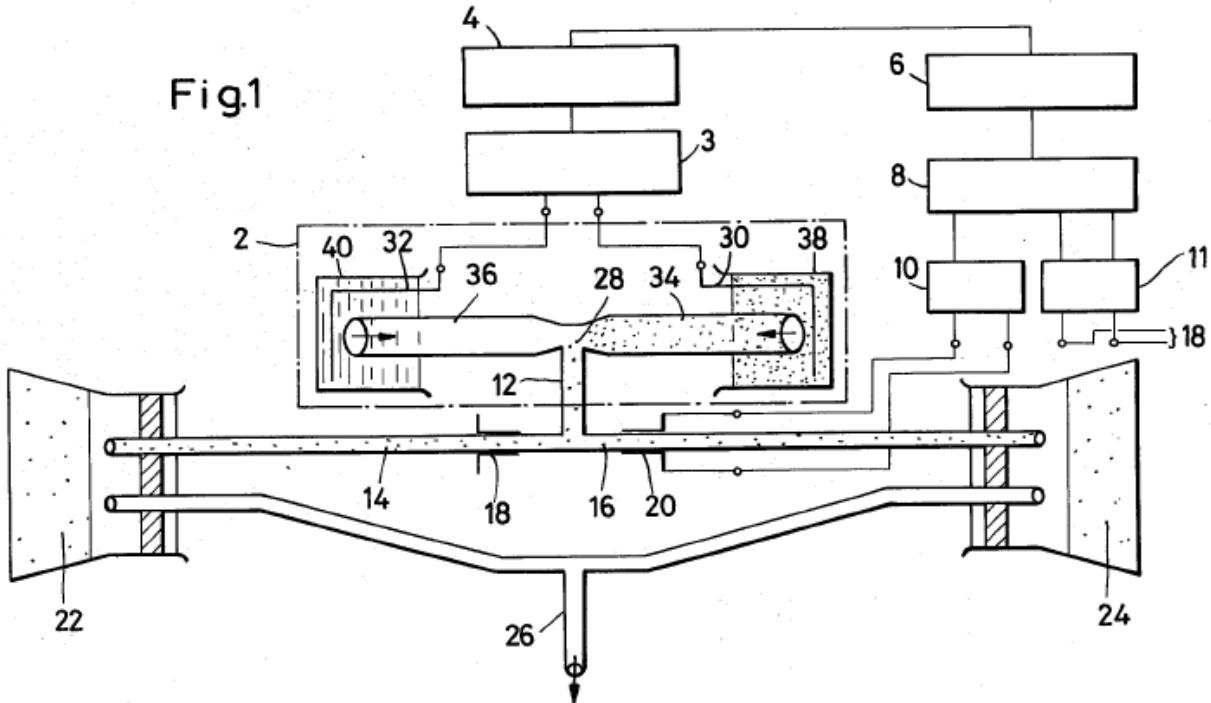
Asserted Claim Element	Exemplary Prior Art Disclosures
	using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44. “It is important to note that buffer devices are often applied at other branches of the modern techniques, too. For instance, the storage elements, at the interface between the central processing unit of a computer and the attached peripheral unit, such as a keyboard, are a build-screen, functions in the same manner by permitting fast operation of the extremely fast central processing unit in spite of the quoted slowly functioning peripheral units. From the above description, it is also clear that for fast and reliable sorting, as is defined above, the use of the buffer cavities are of paramount importance both for the stabilization of the vacuum and for the decoupling of the very fast fluctuating suspension to be dispensed in the dispenser channels from the very slowly flowing, and the large amount of the processed substance of the connecting tubes. The fact that in these cavities the gas is also separated from the suspension, as the result of the known buoyancy, provides yet a third use of these cavities; this third type of cavities are used, however, only in such devices where the control and dispensing process takes place in the same channel or duct.” Zöld, at 21:60-22:13. “Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic

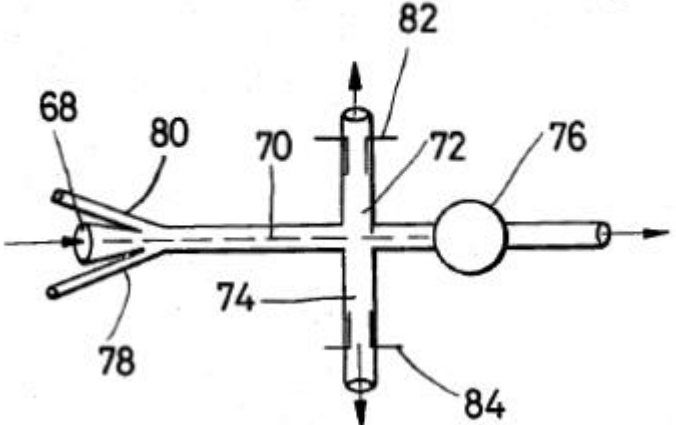
Asserted Claim Element	Exemplary Prior Art Disclosures
	characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“In accordance with one embodiment of the invention the particles flow from the analyser portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite

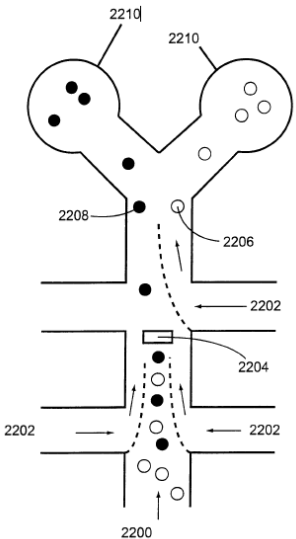
Asserted Claim Element	Exemplary Prior Art Disclosures
	side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side

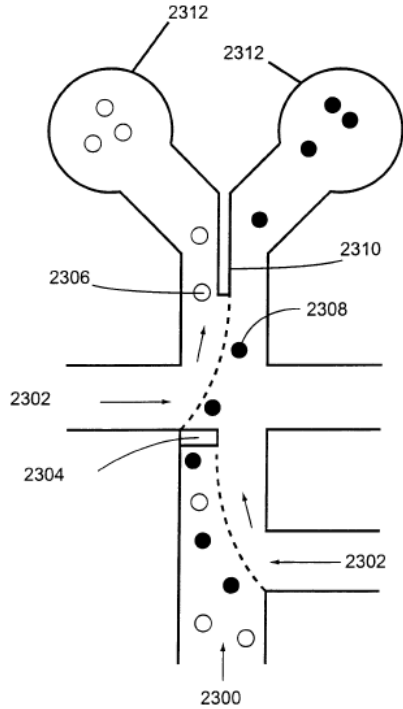
Asserted Claim Element	Exemplary Prior Art Disclosures
	channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig1 

Asserted Claim Element	Exemplary Prior Art Disclosures
	that the amount of the electrolyte and hence the spacing between two particles in the main channel is reduced to a desired value at those intervals during which no particle passes across the entrance of the side channels. With the reduction of the interparticle spacing the operation of another analyser such as an impulse cyto-photometer 76 can be improved since the through-put of the particles through the analyzer will be somewhat increased. It should be understood that the programming of the system should be such that the suction effect exerted from the side channels should be zero when a particle passes these channels.” Zöld 662, at 9:1-22; <i>see also</i> Fig. 7 below. Fig.7 
[19] The method of claim 18, wherein the pressure pulse is used to sort one or more particles suspended within the sample.	The following exemplary citations to prior art references establish that this claim limitation is taught by the prior art. Additionally, they show that this claim limitation would have been obvious in view of the prior art (including the following references alone and in combinations) and the knowledge of the person having ordinary skill in the art. For example:

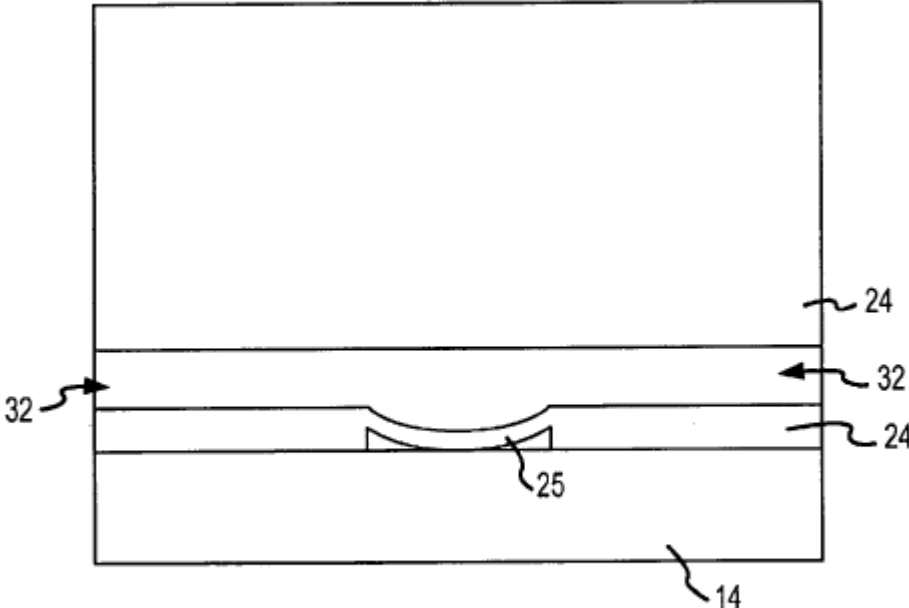
Asserted Claim Element	Exemplary Prior Art Disclosures
	Wada The Wada disclosures in each limitation of claim 18 are incorporated by reference. “In one aspect, the invention provides methods of providing substantially uniform flow velocity to particles flowing in a first microchannel. In the methods, the particles are optionally flowed in the microchannel, e.g., using pressure-based flow, in which the particles flow with a substantially non-uniform flow velocity.” Wada, at 3:22-26. “The system also optionally includes at least a second microchannel that intersects the first microchannel for introducing at least one fluid into the first microchannel to horizontally or vertically focus the members of the at least one particle population in the first microchannel.” Wada, at 5:22-25. “As shown, cells 2200 are generally flowed in a main microchannel that includes at least two sets of opposing microchannels for focusing and/or otherwise directing the flow of cells 2200 using hydrodynamic flow 2202 (e.g., cell buffer flow). One set of opposing microchannels is typically located, e.g., upstream from detector 2204 for simultaneously introducing hydrodynamic flow 2202 from both microchannels to focus cells 2200, as described above . . . [a] second set of opposing microchannels is typically located downstream from detector 2204 for introducing at least one hydrodynamic flow 2202 so as to direct selected cells 2208 (e.g., fluorescently-labeled cells) and non-selected cells 2206 into, in this case, one of two microchannels, each terminating in particular collection wells 2210.” Wada, at 19:24-20:2; <i>see also</i> Fig. 22 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 22 “Figure 23 schematically depicts a microchannel configuration that includes one embodiment of separation element 2310. In this example, cells 2300 are typically flowed in a microchannel that intersects with another microchannel located upstream from detector 2304. The upstream intersecting microchannel is optionally used to focus cells 2300 to one side of the microchannel as cells 2300 pass through detector 2304 using hydrodynamic flow 2302. This illustration also includes a set of opposing microchannels located downstream from the detector for introducing at least one hydrodynamic flow 2302 to direct selected cells 2308 (e.g., fluorescently-labeled cells) and non-selected cells 2306 to either side of separation element 2310 and into, in this case, one of two microchannels, each terminating in particular collection wells 2312. Separation element 2310 is optionally omitted, with cells 2300 or other particles being directed into destination regions as desired.” Wada, at 20:3-14; <i>see also</i> Fig. 23 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 “In the configuration depicted, focusing microchannel 2404 intersects with main microchannel 2402 in a ‘T- junction’ upstream from detector 2408. Similar to the device represented in Figure 23 (discussed above), focusing flow stream 2406 is optionally used to focus or pinch the particles against the wall of main microchannel 2402 opposing the ‘T-junction’ as the particles flow through detector 2408. When selected particle 2410 (e.g., a fluorescently-labeled particle) is detected, an electrical signal from detector 2408 typically triggers the flow of current to Joule heating electrodes 2416.” Wada, at 22:25-32; <i>see also</i> Fig 24 below.

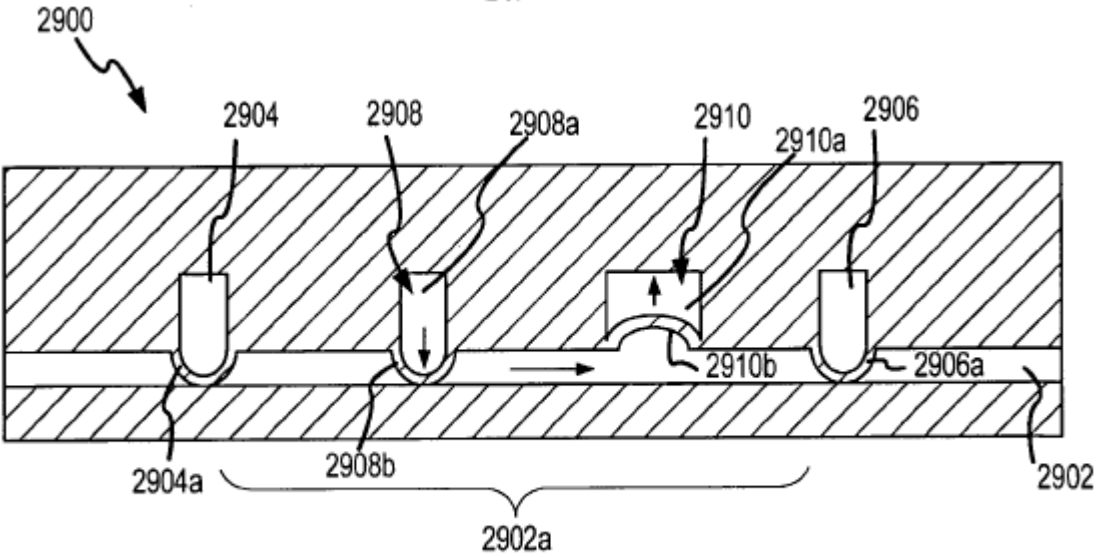
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Many alternative embodiments that incorporate Joule heating to control fluid viscosity and particle flow are possible. For example, although not shown in Figure 22, one or both microchannels of the second set of opposing microchannels located downstream from detector 2204 optionally include one or more Joule heating electrodes (e.g., 1, 2, 3, 4, 5, or more electrodes) and/or conductive coating portions. One or both of the opposing microchannels also optionally includes a branched channel structure similar to the branched structure depicted in Figure 24, above (i.e., branched particle sorting microchannel 2418). Optionally, one or both of the opposing microchannels includes greater than two branches, each branch of which optionally includes one or more Joule heating electrode(s). In other embodiments, separation elements, such as those discussed above are optionally included.” Wada, at 23:19-29.

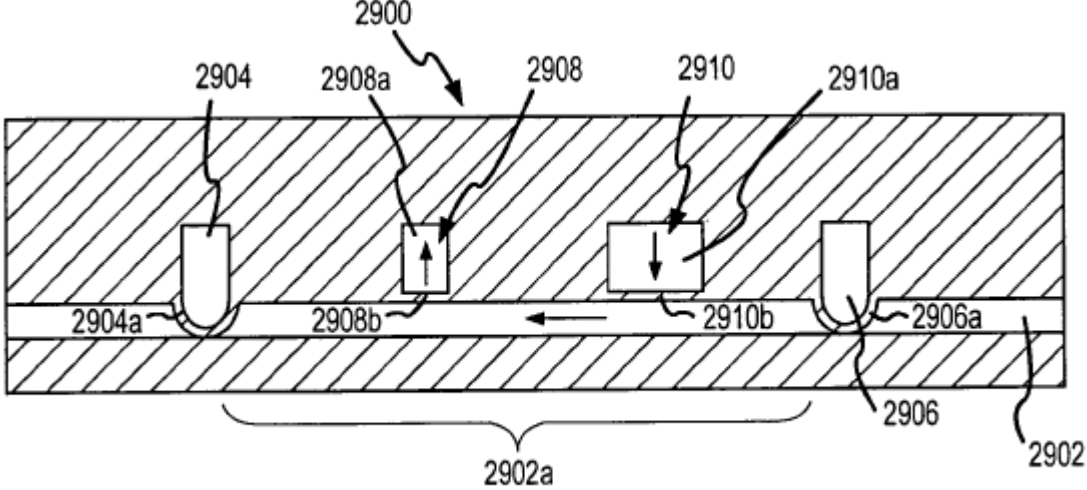
Asserted Claim Element	Exemplary Prior Art Disclosures
	Chou The Chou disclosures in each limitation of claim 18 are incorporated by reference. “A microfluidic device comprises pumps, valves, and fluid oscillation dampers. In a device employed for sorting, an entity is flowed by the pump along a flow channel through a detection region to a junction. Based upon an identity of the entity determined in the detection region, a waste or collection valve located on opposite branches of the flow channel at the junction are actuated, thereby routing the entity to either a waste pool or a collection pool. A damper structure may be located between the pump and the junction. The damper reduces the amplitude of oscillation pressure in the flow channel due to operation of the pump, thereby lessening oscillation in velocity of the entity during sorting process.” Chou, at Abstract. “An embodiment of a damper in accordance with the present invention for a microfluidic device comprises a flow channel formed in an elastomer material, and an energy absorber adjacent to the flow channel and configured to absorb an energy of oscillation of a fluid positioned within the flow channel.” Chou, at 3:26-29. “Referring to Fig. 7B, first flow channel 30 and second flow channel 32 are shown. Membrane 25 separates the flow channels, forming the top of first flow channel 30 and the bottom of second flow channel 32. As can be seen, flow channel 30 is "open". As can be seen in Fig. 7H, pressurization of flow channel 32 (either by gas or liquid introduced therein) causes membrane 25 to deflect downward, thereby pinching off flow F passing through flow channel 30. Accordingly, by varying the pressure in channel 32, a linearly actuatable valving system is provided such that flow channel 30 can be opened or closed by moving membrane 25 as desired. (For illustration purposes only, channel 30 in Fig. 7G is shown in a "mostly closed" position, rather than a "fully closed" position). Since such valves are actuated by moving the roof of the channels themselves (i.e.: moving membrane 25) valves and pumps produced by this technique have a truly zero dead volume, and switching valves made by this technique have a dead volume approximately equal to the active volume of the valve, for example about $100 \times 100 \times 10 \text{ } \mu\text{m} = 100\text{pL}$. Such dead volumes and areas consumed by the moving membrane are approximately two

Asserted Claim Element	Exemplary Prior Art Disclosures
	orders of magnitude smaller than known conventional microvalves. Smaller and larger valves and switching valves are contemplated in the present invention, and a non-exclusive list of ranges of dead volume includes 1 aL to 1 uL, 100 aL to 100 nL, 1 fL to 10 nL, 100 pL to 1 nL, and 1 pL to 100 pL.” Chou, at 19:7-25; <i>see also</i> Fig. 7H below.  FIG. 7H “Referring to Fig. 13A and 13B, a system for peristaltic pumping is provided, as follows. A flow channel 30 has a plurality of generally parallel flow channels (i.e.: control lines) 32A, 32B and 32C passing thereover. By pressurizing control line 32A, flow F through flow channel 30 is shut off under membrane 25A at the intersection of control line 32A and flow channel 30. Similarly, (but not shown), by pressurizing control line 32B, flow F through flow channel 30 is shut off under

Asserted Claim Element	Exemplary Prior Art Disclosures
	membrane 25B at the intersection of control line 32B and flow channel 30, etc.” Chou, at 28:27-33. “As seen in the exploded view of Fig. 17C, and assembled view of Fig. 17D, elastomeric layer 110 is placed over elastomeric layer 100. Layers 100 and 110 are then bonded together, and the integrated system operates to selectively direct fluid flow F (through flow channel 30) into either or both of reaction chambers 80A and 80B, as follows. Pressurization of control line 32A will cause the membrane 25 (i.e.: the thin portion of elastomer layer 100 located below extending portion 33A and over regions 82A of reaction chamber 80A) to become depressed, thereby shutting off fluid flow passage in regions 82A, effectively sealing reaction chamber 80 from flow channel 30.” Chou, at 31:13-20. “Microfluidic devices of the present invention comprise an integrated pump which can be electronic, magnetic, mechanical, or preferably pneumatic pumps. By using a pneumatic pump, microfluidic devices of the present invention allow more precise control of the fluid flow within the fluid channel. In addition, unlike electro-osmotic driven fluid flow, pneumatic pump allows the flow of fluids in both directions, thereby allowing reversible sorting of materials, as discussed in greater detail below. Furthermore, a pneumatic pump provides at least 10 times, preferably at least about 20 times, and more preferably at least about 30 times the fluid flow rate capacity compared to the capacity of electro-osmotic fluid flow. In addition, microfluidic devices of the present invention may comprise a damper which reduces or eliminates the fluid oscillation within the fluid channel. The damper can any device which attenuates the fluid oscillation. For example, the damper can simply be a channel which is open to the ambient atmosphere and has a thin elastic membrane between the channel and the fluid flow channel. Preferably, the damper is an encapsulated pocket of fluid medium with a thin elastic membrane above the fluid flow channel. The fluid medium can be a liquid or, preferably, a gas. The damper is generally located above the fluid flow channels with a thin membrane, preferably an elastic membrane, between the fluid flow channel and the damper. Typically, there is at least 1 damper posterior to the pump in the direction of the fluid flow. Preferably, there is at least 2 dampers, more preferably at least 3 dampers and most preferably at least about 5 dampers posterior to the pump.” Chou, at 39:16-40:2.

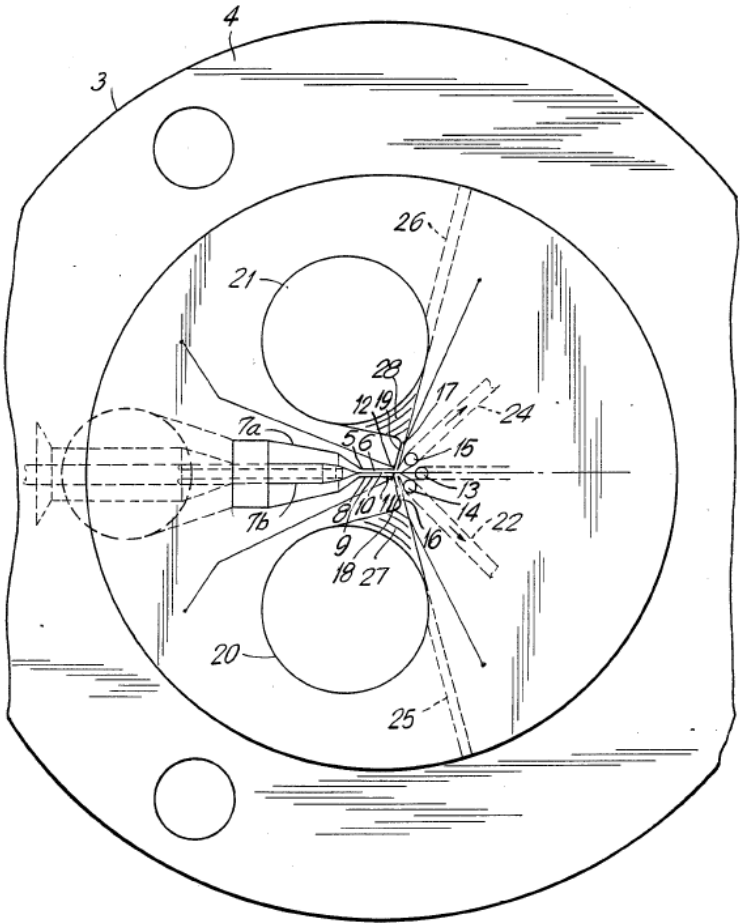
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Pump 2908 and damper 2910 are positioned adjacent to sealed flow segment 2902a. Pump 2908 comprises recess 2908a separated from underlying flow channel 2902 by pump membrane 2908b. Damper 2910 comprises cavity 2910a separated from underlying flow channel 2902 by damper membrane 2910b. As shown in Figs. 29A-B, pump 2908 and damper 2910 cooperate to permit a continuous circulation of fluid within sealed segment 2902a. Specifically, pump 2908 is first actuated such that pump membrane 2908b deflects into flow channel 2902, increasing the pressure within sealed segment 2902a. In response to this increased pressure, damper membrane 2910b is displaced into cavity 2910a and fluid within segment 2902a circulates to occupy the additional space. Subsequently, pump 2908 is deactuated such that pump membrane 2908b relaxes to its original position, out of flow channel 2902. Because of the reduced pressure experienced by segment 2902a as a result of the deactuation of pump 2908, damper membrane 2910b also relaxes back into its original position, displacing material back into flow channel 2902. As a result of this action, the material within sealed segment 2902a experiences a back flow, and circulation is accomplished.” Chou, at 42:16-31; <i>see also</i> Figs. 29A and 29B.

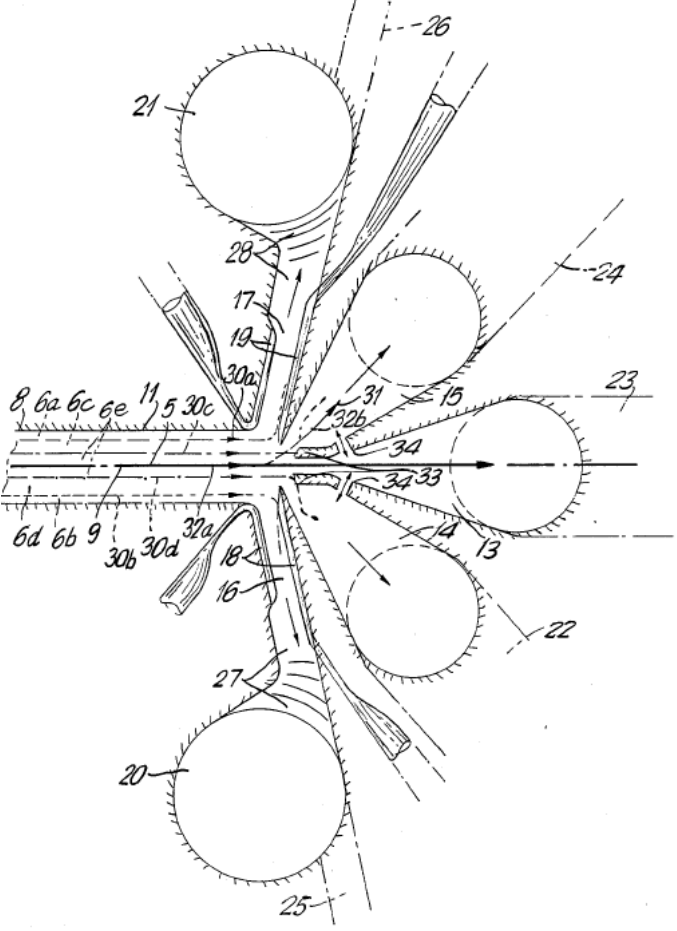
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29A

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 29B “In general, damper structures in accordance with embodiments of the present invention feature an energy absorber adjacent to the flow channel, the energy absorber configured to experience a physical change in response to an oscillation within the flow channel. As described below, the energy absorber can take several forms, including but not limited to a flexible membrane, a pocket filled with a compressible fluid, and/or flexible walls of the flow channel itself.” Chou, at 40:20-25. Zöld The Zöld disclosures in each limitation of claim 18 are incorporated by reference. “The deflection process, i.e., the deflection of the center stream 5 and, hence, that of the particles, into the left only-dispenser channel 15, which is being continued by the left outlet hole 24, in detail, is as follows. Since the device, shown in FIGS. 1 and 2, is of the suction type, therefore, the flow of the electrolyte is controlled by the generation of gas through electrolysis,

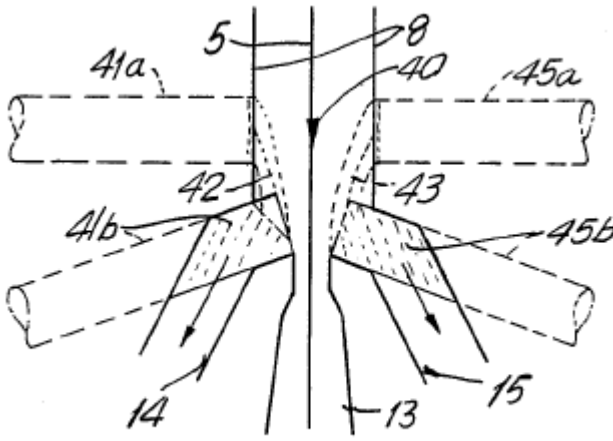
Asserted Claim Element	Exemplary Prior Art Disclosures
	or by another appropriate vapor producing process described earlier. As it is well known, such gas is generated by sending a well controlled electrical current impulse through the electrolyte, flowing between the electrode pair 18, itself being imbedded in the vertical walls of the right only control channel 16. It is easy to see, furthermore, that of the rate if the gas-volume production, which is not equal to the gas molecule production in males, between the electrode pair is not smaller than the rate of the flow of the electrolyte in the right only-control channel 16, or in its lower part 27, then the electrolyte flows undisturbed at the down stream end of the gas bubble towards the buffer cavity 20 since the generated gas fills up the volume being left empty by the electrolyte at the same rate the electrolyte flows out therefrom. This is naturally possible since during this process the pressure has been increased between the electrode pair to such a value and for such a long time that no further electrolyte flow into this only-control channel is possible during this time. This is in accordance the invention which says that during gas production, the pressure has to be increased, i.e., the vacuum has to be decreased, to such a value that no electrolyte is able to enter into this channel. From this flows, therefore, that during gas production no suction is exerted on the electrolyte at the up-stream end of the electrode pair 18, i.e., at the inlet of channel 16. In other words, at said rate of gas generation between this electrode pair, the right only-control channel 16 is overflowed by the gas or vapor, to such an extent that at the constant vacuum, exerted at the low-stream end of channel 16, i.e., in part 27 of this channel, only the generated gas bubble and the electrolyte at the low-stream end of the former is sucked towards the right buffer cavity 20 and, therefore, there is no more suction effect left to deflect the right extreme side stream 6b into the only-control channel 16. Consequently, the symmetrical flow, which exists in the transporting channel at the steady flow state, is thereby destroyed since the otherwise powerful right only-control channel 16 is now being paralyzed in the manner described above. The consequence of this paralysis is that the left only-control channel 17 and the left only-dispenser channel 15 suck in more electrolyte than they do at the steady flow state since their capability to deflect the various partial streams is now not compensated by the right only-control channel 16. The result of this is that the right extreme side stream 6b flows now partly into the right only-dispenser channel 14 and partly also into the middle only-dispenser channel 13. Additionally, the also deflected right middle side stream 6d flows into the middle only-dispenser channel 13, and further in the middle outlet hole 23, and the middle partial sheath stream 6e, together with the center stream 5 flow into the left only-

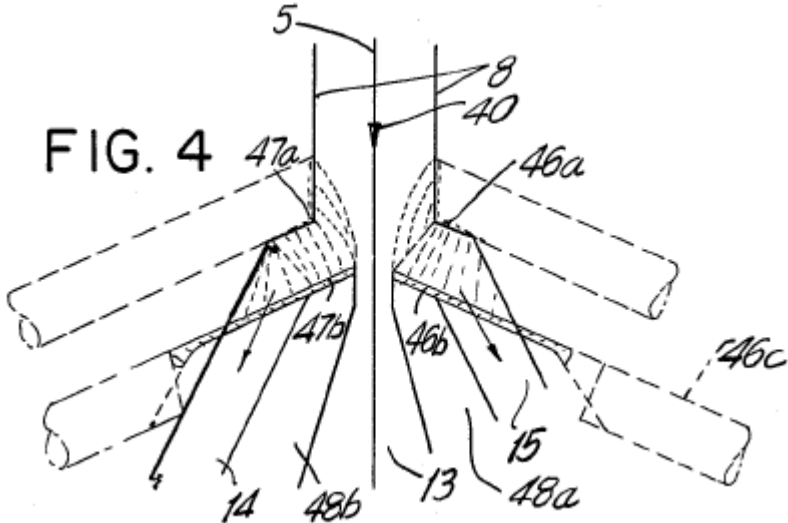
Asserted Claim Element	Exemplary Prior Art Disclosures
	dispenser channel 15, and into the corresponding outlet hole 24, if the deflected amount of the electrolyte of the right extreme side stream 6b is large enough. Consequently, an excess flow of the electrolyte takes place both in the middle side stream 6c and in the left extreme side stream 6a.” Zöld, at 18:47-19:44; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. I The diagram shows a circular device with an outer boundary 3. Inside, there are two large circular regions, 21 (top) and 20 (bottom). A central horizontal axis features a component 7a on the left and 7b on the right. Various other components are labeled with numbers: 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 24, 25, 26, 27, and 28. Dashed lines indicate internal structures and connections between these components.

Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 2 “At this phase of the deflection process, the center stream 5 takes its "to-the-left-deflected" form, as is indicated by curve 31, and if a particle is located slightly at the up-stream side of the only-control channels 16 and 17, i.e., at the position 32a, and if the center stream deflection time is

Asserted Claim Element	Exemplary Prior Art Disclosures
	long enough, then said particle or cell enters into the left only-dispenser channel 15, as is indicated by the point 32b. The return to the steady flow state phase starts at the ceasing of the gas generation in the only-control channel 16 between the right electrode pair 18, i.e. timewise speaking, at the end of the electrical impulse. Consequently, the generated gas bubble is sucked out of channel 16 into the right buffer cavity 20, and the force, exerted at the right extreme side stream 6b at the steady state, is acting on it again when this stream starts to flow into channel 16 again. After this process, all the streams return to their steady state flow since the symmetry of the pressure has been restored everywhere, whereby the sorting of the particle 32a into the left only-dispenser channel 15 has been completed; after this process, the particles leave the device through the left outlet hole 24. It is easy to see that the sorting of a particle into the right only-dispenser channel 14, follows in a similar manner if a gas bubble is generated in the left only-control channel 17 between the electrode pair 19. In this case, after being deflected into the right only-dispenser channel 14, the particles leave the device through the right outlet hole 22 and enter into the corresponding filtering/collector bottle (not shown).” Zöld, at 19:45-20:6. “The buffer cavities, therefore, are very important elements of the new device, and of the invention too, and their necessity was clearly seen after the analysis of the performance of the previous sorter devices, constructed in accordance with U.S. Pat. No. 4,175,662, which naturally does not describe such a cavity since it was not known at that time. In the previously conducted experiments, it was observed that by generating gas bubbles only in one of the side channels, using an impulse generator to provide the electrical current impulses for the gas generation, the center stream, made visible and therefore distinguishable from the sheath stream by using a thick suspension of dyed mouse tymus cells of about 5 microns diameter, have shown a steady deflection away from that side channel where the gas bubbles were generated. This observation shows clearly that without the vacuum compensating effect of the buffer cavities, the vacuum decreases for increasing gas bubble production in the control channels, i.e., in those channels where gas is produced, and this is one of the justifications for the use of these cavities described below. High quality sorting of cells was, however, possible in the older devices when the number of cells to be sorted was about the same in both populations. However, in the asymmetrical sortings, i.e., where the cell number was considerably different in the two cell populations, only the sorting of the larger cell (number) component was good enough.” Zöld, at 21:17-44.

Asserted Claim Element	Exemplary Prior Art Disclosures
	“Therefore, the electrode pairs of the only-control channels 16 and 17 have to begin as close to the entrance of these channels as possible, although care should be taken to avoid the spilling of the control gas into the channels which are located down-stream from the entrance of these only-control channels, because such an overspilling of the gas might cause some undesirable contamination of the originally clean electrolyte flowing in the delay channel, which is the basic characteristic of this type of sorter/dispenser device. As was defined earlier, the length of the only-dispenser channels has to be at least so long that the control medium, in this case a gas, can develop in it without flowing into the corresponding buffer cavity; otherwise its development and consequently, the deflection process could be disturbed.” Zöld, at 22:39-54. “FIGS. 3 and 4 show two other practical arrangements for the control electrodes, which are imbedded in 4 the device body in such a manner that the control gas is generated partly inside and partly at the very vicinity of the channel branching volume, defined here by the joining of the transport channel 8 and the three dispensing control channels 13, 14 and 15, which are called in this manner since they carry out both types of operation;” Zöld, at 23:44-52; <i>see also</i> Figs. 3 and 4 below.  FIG. 3

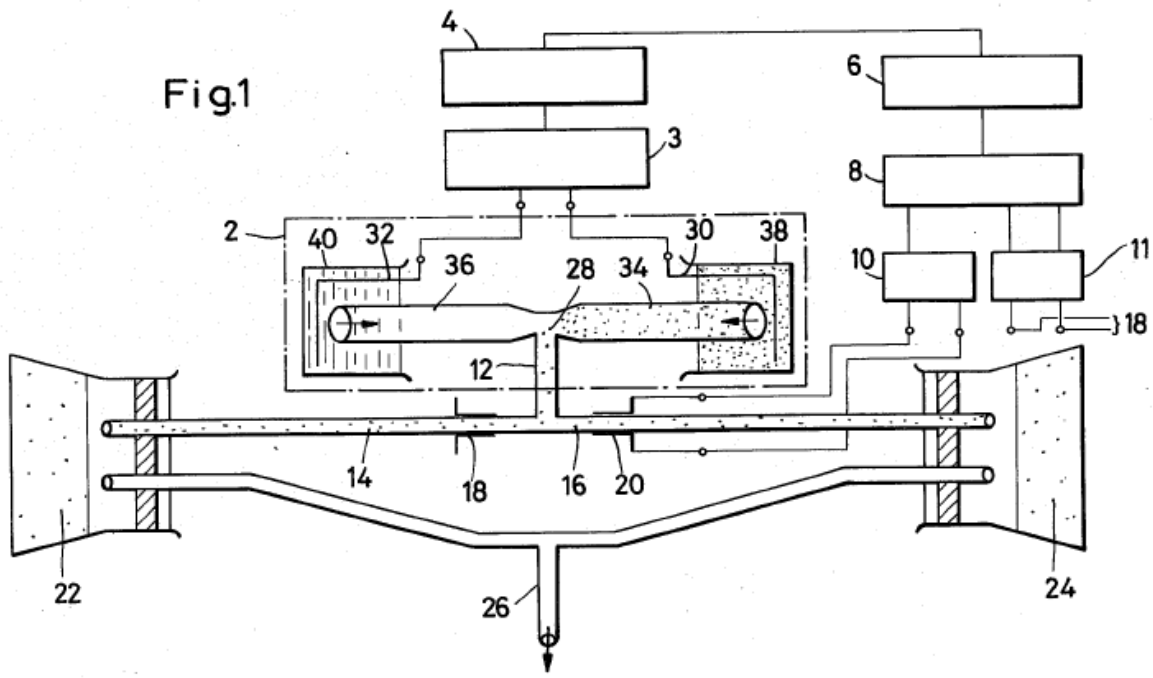
Asserted Claim Element	Exemplary Prior Art Disclosures
	 FIG. 4 “In accordance with the invention, these types of electrode arrangements are the optimal ones for the operation of such types of devices, i.e., where the same outlet channels carry out both the flow control and the dispensing operations. Accordingly, the deflection of the center stream 5 is caused to the left, relative to its steady flow state line 40, through the generation of gas between the electrode pair 41a and 41b when an electrical field 42, shown by discontinuous curves, and the concomitant electrical current, is created between the electrodes. In the same manner, deflection of the center stream is caused to its right, if the electric field 43 is generated between the electrode pairs 45a and 45b. It is clearly seen from FIG. 3 that the active surfaces of the electrodes 41a and 45a are mostly only their tips, with which they form a part of the walls of the transporting channel 8. On the other hand, the active surfaces of the electrodes 41b and 45b, i.e., the shaded areas, form a part of the bottom of the dispenser channels 14 and 15 at the channel branching volume. Consequently, the gas generation takes place, off-center, partly at the inside of the channel branching volume and partly in the channels. Since the electrode tips of 41a and 45a can be made of the pointed form, therefore, this electrode arrangement can also be used readily for the generation of well controlled electrical arcs, described earlier as other means for the generation of the control medium, i.e., of the control vapor.” Zöld, at 23:53-24:12.

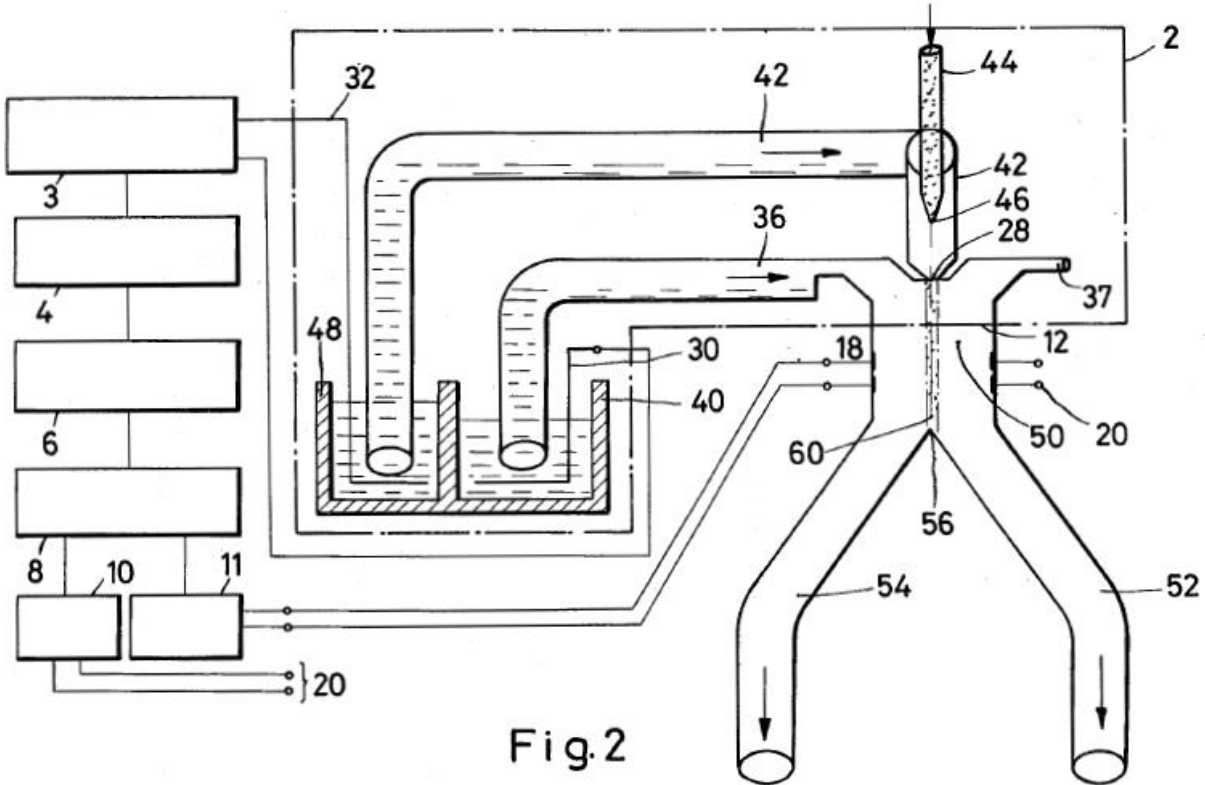
Asserted Claim Element	Exemplary Prior Art Disclosures
	“Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present description is for purposes of illustration only and not to be construed as a limitation of the subject invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.” Zöld, at 26:23-30. Zöld 662 The Zöld 662 disclosures in each limitation of claim 18 are incorporated by reference. “According to a preferred embodiment of the invention a middle channel is provided with relatively large cross-section, or more preferably, the channel should be rather wider than deep. In this middle channel there flows a rather thin suspension stream surrounded by a laminar stream of pure electrolyte. In the quiescent state the suspension stream flows right at the center of the middle channel. The middle channel at its downstream end splits up into at least two but rather three or more side channels symmetrically arranged with respect to the center of the middle channel, obtaining in this manner a system with two, three, or more side channels in which one, two, or more kinds of particles can be separated, respectively, in accordance with their properties, analysed in the analysing system located at the upstream end of the sorter and transformed into respective electrical impulses used to trigger the control electrode pairs at appropriate times, i.e. just before the particle corresponding to a certain trigger impulse reaches the selected pair of control electrodes.” Zöld 662, at 2:64-3:15. “In accordance with the invention a plurality of side channels can be provided at the end of the middle channel and by properly triggering the gas impulses the suspension stream can be deflected successively into any of these side channels, thus providing a means to sort particles of more than one or two kinds at one and the same flow-through of the particle mixture.” Zöld 662, at 3:39-45. “In accordance with one embodiment of the invention the particles flow from the analyser

Asserted Claim Element	Exemplary Prior Art Disclosures
	portion through the middle channel which ends in two side channels which are perpendicular to the middle channel. In the quiescent state the electrolyte and therefore also the particle are equally split between the two side channels. In each of the side channels a pair of control electrodes is located preferably at the inner side walls of the side channels in such a manner that the electrodes of each pair are aligned in parallel to each other. When a particle to be sorted out from the mixture is programmed to enter into the left side channel an appropriate amount of gas is produced by supplying the electrodes in the right side channel with a trigger impulse at the right time to block this side channel for the passing of the respective particle. By this blocking action only in the left side channel suction will be exercised on the electrolyte sucking in this manner the particle into the left channel. All the other particles which do not arrive at the same time as the electrodes in the right channel will enter into the right side channel due to the production of gas impulses in the left side channel. Due to its shape this embodiment is called T-sorter.” Zöld 662, at 3:66-4:20. “In an improved embodiment of the T-sorter the suspension enters into the middle channel in a very thin hydro-dynamically focused stream. In this case the velocity of all particles within the stream is about the same. Thus, the proper triggering of the gas production relative to arriving particles is facilitated as the flow velocity is strongly dependent on the position of the particle relative to the middle axis of the channel.” Zöld 662, at 4:21-28. “An embodiment similar to the T-sorter is the so-called Y-sorter which can, however, operate only in the hydro-dynamically focused form. In this device two side streams enter laminarly preferably on both sides of the suspension stream at the upstream end of the middle channel in parallel alignment to the very thin suspension stream. The two side channels in this version are provided with equal acute angles relative to the axis of the middle channel where the thin suspension stream flows. The gas producing electrode pairs can be located either in the side channels in the same manner as in the T-sorter or at the inner wall of the middle channel slightly before the branching into the side channels. In any case, the thin suspension stream can be deflected into either of the side channels by the production of gas impulses either in the opposite side channel or at the electrode pair located on the opposite side of the middle channel. It follows from its advantageous geometry that the sorting capability of the Y-sorter is higher than that of

Asserted Claim Element	Exemplary Prior Art Disclosures
	the T-sorter.” Zöld 662, at 4:34-54. “In another embodiment of the invention the middle channel is branched into three narrower channels, the middle exit channel and the two side channels, symmetrically arranged to the middle exit channel, such that the suspension stream in the quiescent state flows in the substantially straight middle exit channel. Either only the two side channels or the two side channels and the middle exit channel have a pair of gas producing electrodes. In the first case the side channels should be several times wider than the middle exit channel in order to achieve an appropriate deflection of the suspension stream. With this model two different kinds of particle groups can be sorted by the two deflection paths of the suspension stream. This device will be called "T-sorter". Clearly such a channel element or stage can be connected in series, in such a manner that the middle exit channel is provided at its downstream end with two additional laminar side streams forming in this manner another middle channel which can be branched into another triplet of channels as was the case in the first stage of the device. With such a multiple system a very large number of particle groups with different characteristics can be sorted out from the mixture by one and the same flow of the mixture.” Zöld 662, at 4:55-5:10. “In accordance with the principles of the invention there is an additional field of use for the controlling of the electrolyte flow by electrolytic gas production in order to reduce the large distance and irregular sequence of particles flowing in a channel or very small cross-section. Such a device consists of a main channel for the suspension from which at least one side channel branches out substantially perpendicular and provided with control electrodes. By the control of the electrolyte output through the side channels which reduces the electrolyte content of the suspension, the spacing between two particles can be controlled during the time in which any of the particles are remote from the side channel. An electronic circuit controls the gas production of the electrodes and receives the control impulses from a sensor, such as a channel counter, in such a manner that the spacing between two particles can be reduced to a desirable extent by letting out the appropriate amount of electrolyte through the side channels. In the programming of such a system or device care must be taken that neither of the particles can enter the side channels because such a particle would be lost. This is achieved by closing the side channels with the aid of the gas production at the control electrodes during the particles pass the side

Asserted Claim Element	Exemplary Prior Art Disclosures
	channel entrance.” Zöld 662, at 5:54-6:11. “FIG. 1 shows a first embodiment of the invention, the so-called T-sorter, and a channel counter as volume sensor as lines 21 and 22 have been rewritten as the above referred to co-pending application. A capillary exit channel 12 of the channel counter 2 which serves as a volume sensor for the particles suspended in an electrolyte, branches at its downstream end into two side channels 14 and 16 of the same cross-section and length transversely to the axis of the exit channel 12. By flexible tubes the side channels are connected to the containers 22 and 24, respectively, which are under low vacuum, to exercise a suction effect on the contents of the side channels via tube 26 which in turn is connected to a suction pump (not shown). Under the suction operation of the pump suspension electrolyte and pure electrolyte flow from containers 38 and 40, respectively, into the counter 2 where they mix and continue to flow through the exit channel 12 and equally divided through the side channels 14, 16 and finally into the containers 22 and 24, respectively. In each of the side channels 14 and 16 a pair of control electrodes 18, 20 is located preferably on the surface of the channel wall. The control electrodes 18, 20 produce controlling gas impulses at the proper time determined by the electronic circuit, which transmits a voltage impulse to the selected control electrode pair for each single control action.” Zöld 662, at 6:38-64; <i>see also</i> Figs. 1 and 2 below.

Asserted Claim Element	Exemplary Prior Art Disclosures
	Fig.1  The diagram illustrates a medical device system. A central unit (2) is shown with internal components including a pump or motor (12), a chamber (14), a filter (16), and a valve (18). The unit is connected to external components via various lines and ports. On the left, a port (22) is shown. On the right, a port (24) is shown. The system includes a control unit (4) and a power source (6). A flow path is indicated by arrows, showing fluid entering through a port (26) and exiting through a port (24). The system is connected to a network of lines (8, 10, 11, 18) and a control unit (4). The central unit (2) is connected to a control unit (4) and a power source (6). The system is connected to a network of lines (8, 10, 11, 18) and a control unit (4). The central unit (2) is connected to a control unit (4) and a power source (6). The system is connected to a network of lines (8, 10, 11, 18) and a control unit (4).

Asserted Claim Element	Exemplary Prior Art Disclosures
	 Fig. 2