

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

R.J. REYNOLDS VAPOR COMPANY,

Petitioner

v.

FONTEM HOLDINGS 1 B.V.,

Patent Owner

U.S. Patent 8,490,628

Issue Date: July 23, 2013

Title: Electronic Atomization Cigarette

Inter Partes Review No. IPR2016-01527

**PETITION FOR INTER PARTES REVIEW OF
U.S. PATENT NO. 8,490,628 PURSUANT TO
35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42**

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REGULATIONS

37 C.F.R. § 42	1, 2, 6, 11
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LIST OF EXHIBITS

Exhibit No.	Exhibit
1001	U.S. Patent No. 8,490,628 (“the ‘628 patent”)
1002	The ‘628 Patent File History
1003	US Pat. No. 6,155,268 (“Takeuchi”)
1004	US Pat. No. 2,057,353 (“Whittemore”)
1005	U.S. Pat. No. 5,894,841 (“Voges”)
1006	U.S. Pat. No. 5,703,633 (“Gehrer”)
1007	“Thermal Ink-Jet Print Cartridge Designers Guide” (2nd Edition Hewlett Packard)
1008	IPR2014-01300 Paper 8: Decision for <i>Inter Partes</i> Review Institution
1009	IPR2014-01300 Paper 2: <i>Inter Partes</i> Review Petition
1010	Expert Declaration of Robert Sturges, Ph.D. (“Sturges Decl.”)
1011	U.S. Patent No. 5,743,251 (“Howell”)
1012	U.S. Patent No. 1,514,682 (“Wilson”)
1013	U.S. Patent No. 4,947,874 (“Brooks”)
1014	U.S. Patent No. 5,745,985 (“Ghosh”)
1015	U.S. Patent No. 4,676,237 (“Wood”)
1016	U.S. Patent No. 4,945,448 (“Bremenour”)
1017	U.S. Patent No. 6,322,269 (“Kaufman”)
1018	U.S. Patent No. 6,722,763 (“Hsu”)
1019	U.S. Patent No. 5,646,666 (“Cowger”)
1020	U.S. Patent No. 7,284,424 (“Kanke”)
1021	U.S. Patent No. 5,224,265 (“Dux”)
1022	U.S. Patent No. 6,620,659 (“Emmma”)

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42, R.J. Reynolds Vapor Company (“Reynolds” or “Petitioner”) respectfully requests Inter Partes Review (“IPR”) of claims 1, 2, 5 and 8 of U.S. Patent No. 8,490,628 to Hon, titled “Electronic Atomization Cigarette” (“the ‘628 Patent,” Ex. 1001), which is currently assigned to Fontem Holdings 1 B.V. (“Fontem” or “Patent Owner”). The Petitioner authorizes the Patent and Trademark Office to charge Deposit Account No. 23-1925 for the fees set forth in 37 C.F.R. § 42.15(a) for this Petition for IPR, and further authorizes payment of any additional fees to be charged to this Deposit Account.

This Petition demonstrates a reasonable likelihood that claims 1, 2, 5 and 8 of the ‘628 patent are unpatentable. Claims 1, 2, and 8 are generally directed to an electronic cigarette comprising an “atomizer assembly” including “a porous body projecting into a liquid supply” and a “heating wire” having an “central axis oriented substantially perpendicular to the longitudinal axis of the housing.” Claim 5, which depends from claim 1, additionally recites that the liquid supply comprises “fiber material.” However, as explained herein, claims 1, 2, 5, and 8 are invalid as obvious under § 103, because they merely comprise the simple substitution and/or combination of known elements to yield predictable results.

II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Notice of Real Party-in-Interest

For purposes of 35 U.S.C. § 312(a)(2) and 37 C.F.R. § 42.8(b)(1) only, Petitioner, R.J. Reynolds Vapor Company (“Petitioner”) identifies the real-parties-in-interest as R.J. Reynolds Vapor Company, RAI Strategic Holdings, Inc., RAI Innovations Company (the direct parent company of R.J. Reynolds Vapor Company and RAI Strategic Holdings, Inc.), R. J. Reynolds Tobacco Company, and RAI Services Company. Each of the foregoing entities is a direct or indirect wholly owned subsidiary of Reynolds American Inc. Although Petitioner does not believe that Reynolds American Inc. is a real party-in-interest (*see* Patent Trial Practice Guide 77 Fed. Reg., Vol. 77, No. 157 (2012) at 48759-60), Reynolds American Inc. and each of its other wholly owned subsidiaries (direct and indirect) nevertheless agree to be bound by any final written decision in these proceedings to the same extent as a real party-in-interest. *See* 35 U.S.C. § 315(e).

B. Notice of Related Matters

1. Related Litigations

Petitioner is a defendant in the following litigation involving the ‘628 patent: *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 2:16-cv-02286 (C.D. Cal., filed April 4, 2016). Fontem has alleged that Reynolds infringes claims 1, 2, 5, and 8 of the ‘628 patent, the four claims for which Reynolds seeks *inter*

partes review. In addition to the foregoing, the Petitioner is aware of the following additional matters involving the ‘628 patent and other related matters listed in the tables below.

The Patent Owner has also asserted the ‘628 patent in the following pending district court proceedings in which Reynolds was not and is not a party:

Case Name	Case Number	District	Filed
Fontem Ventures BV et al v. Nu Mark LLC	2-16-cv-02291	CACD	April 4, 2016

The Patent Owner has also asserted the ‘628 patent in the following district court proceedings in which Reynolds was not and is not a party:

Case Name	Case Number	District	Filed
Fontem Ventures BV et al v. NJOY, Inc.	2-14-cv-01645	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. LOEC, Inc. et al	2-14-cv-01648	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. CB Distributors, Inc. et al	2-14-cv-01649	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. Vapor Corp.	2-14-cv-01650	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. FIN Branding Group, LLC et al	2-14-cv-01651	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. Ballantyne Brands, LLC	2-14-cv-01652	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. Spark Industries, LLC	2-14-cv-01653	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. Logic Technology Development LLC	2-14-cv-01654	CACD	Mar. 5, 2014
Fontem Ventures BV et al v. VMR	2-14-cv-01655	CACD	Mar. 5, 2014

Case Name	Case Number	District	Filed
Products, LLC			

2. Related Proceedings Before the Board

The ‘628 patent was (or is) also the subject of the following petitions for IPR:

Case Name	Case Number	Filed
Petition for Inter Partes Review by NJOY, Inc.	IPR2014-01300	Aug.15, 2014
Petition for Inter Partes Review by NU MARK LLC (pending)	IPR2016-01283	June 28, 2016
Petition for Inter Partes Review by NU MARK LLC (pending)	IPR2016-01285	June 28, 2016

Regarding *NJOY, Inc. v. Fontem Holdings 1 B.V.*, IPR2014-01300 (PTAB, filed August 15, 2014), the Board granted review of claims 1-5 and 7-8 of the ‘628 patent based upon obviousness over Voges (Ex. 1006) in view of Gehrer (Ex. 1007). *See* Exs. 1008; 1009. However, the review was dismissed before the Board issued a final written decision in view of the parties’ apparent settlement. The combination of Voges and Gehrer is relied upon in Ground 2 of this Petition. This Petition also relies upon Ground 1, which is based upon the combination of Takeuchi in view of Whittemore and Gehrer. Grounds 1 and 2 are not redundant, as explained below.

3. Pending Patent Applications

The '628 Patent claims priority, through a series of priority claims (continuation of U.S. Pat. Appl. No. 12/944,123 (U.S. Pat. No. 8,393,331), U.S. Pat. Appl. No. 10/587,707 (U.S. Pat. No. 7,832,410), International PCT Appl. No. PCT/CN05/00337), and to foreign patent application CN 20040031182.0. Two patents purportedly claim the direct benefit of the '628 Patent filing date, U.S. Patent Nos. 8,893,726 and 9,326,549. Additionally, three pending patent applications also claim the benefit of the '628 Patent filing date, U.S. Patent Appl. Nos. 14/525,066; 14/719,923; and 15/167,825.

C. Lead and Back-Up Counsel

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D. Service Information

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III. GROUNDS FOR STANDING

As required by 37 C.F.R. § 42.104(a), Petitioner certifies that the ‘628 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR on the grounds identified herein.

IV. IDENTIFICATION OF CHALLENGE AND STATEMENT OF THE PRECISE RELIEF REQUESTED

Petitioner requests *inter partes* review and cancellation of claims 1, 2, 5, and 8 of the ‘628 patent based upon 35 U.S.C. § 103 as set forth herein. The ‘628 patent is to be reviewed under pre-AIA § 103. Petitioner’s detailed statement of the reasons for relief requested is set forth below in the section titled “Statement of Reasons for the Relief Requested.” In accordance with 37 C.F.R. § 42.6(c), copies of the exhibits are filed herewith. In addition, this Petition is accompanied by the declaration of Dr. Robert Sturges. Ex. 1010.

Claims 1, 2, 5, and 8 are unpatentable based upon the following grounds:

Ground 1: Claims 1, 2, 5, and 8 are unpatentable under 35 U.S.C. § 103 as obvious based upon Takeuchi (Ex. 1003) in combination with Whittemore (Ex. 1004) and Gehrler (Ex. 1006).

Ground 2: Claims 1, 2, 5, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over Voges (Ex. 1005) in combination with Gehrler (Ex. 1006).

Each reference is prior art:

Exhibit No.	Description	Publication Date	Prior Art Under 35 USC §
1003	U.S. Pat. No. 6,155,268 ("Takeuchi")	Dec. 5, 2000	102(b)
1004	U.S. Pat. No. 2,057,353 ("Whittemore")	Oct. 13, 1936	102(b)
1005	U.S. Pat. No. 5,894,841 ("Voges")	Apr. 20, 1999	102(b)
1006	U.S. Pat. No. 5,703,633 ("Gehrler")	Dec. 30, 1997	102(b)

Statement of no redundancy: Grounds 1 and 2 are not redundant. Ground 1 relies upon Takeuchi as the lead reference, which discloses all of the claimed features with the arguable exception of the "heating wire" of claims 1 and 8 and the "fiber material" in the liquid supply of dependent claim 5. Whittemore teaches the claimed heating wire and Gehrler teaches the claimed fiber material in the liquid supply. Ground 2 relies on Voges as the lead reference which discloses all of the claimed features with the exception of the atomizer's porous body projecting into

the liquid supply, as recited in claims 1 and 8, and the “fiber material” in the liquid supply of dependent claim 5. Gehrer teaches each of the elements missing from Voges.

V. THRESHOLD REQUIREMENT FOR *INTER PARTES* REVIEW

This petition meets the threshold requirements for *inter partes* review because it establishes “a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

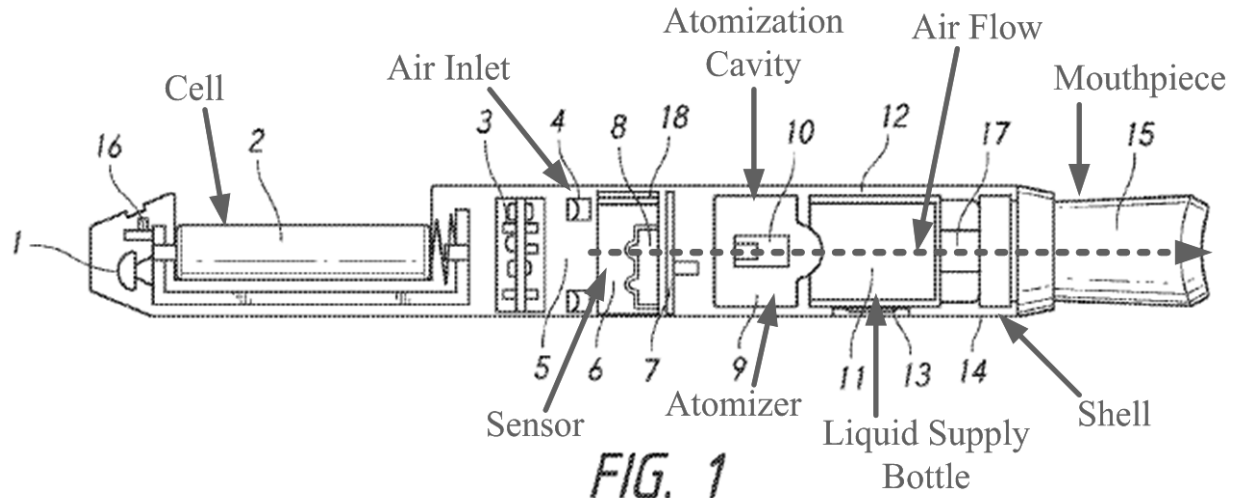
35 U.S.C. § 314(a). As explained below, there is a reasonable likelihood that Petitioner will prevail with respect to at least one of the challenged claims.

VI. STATEMENT OF REASONS FOR THE RELIEF REQUESTED

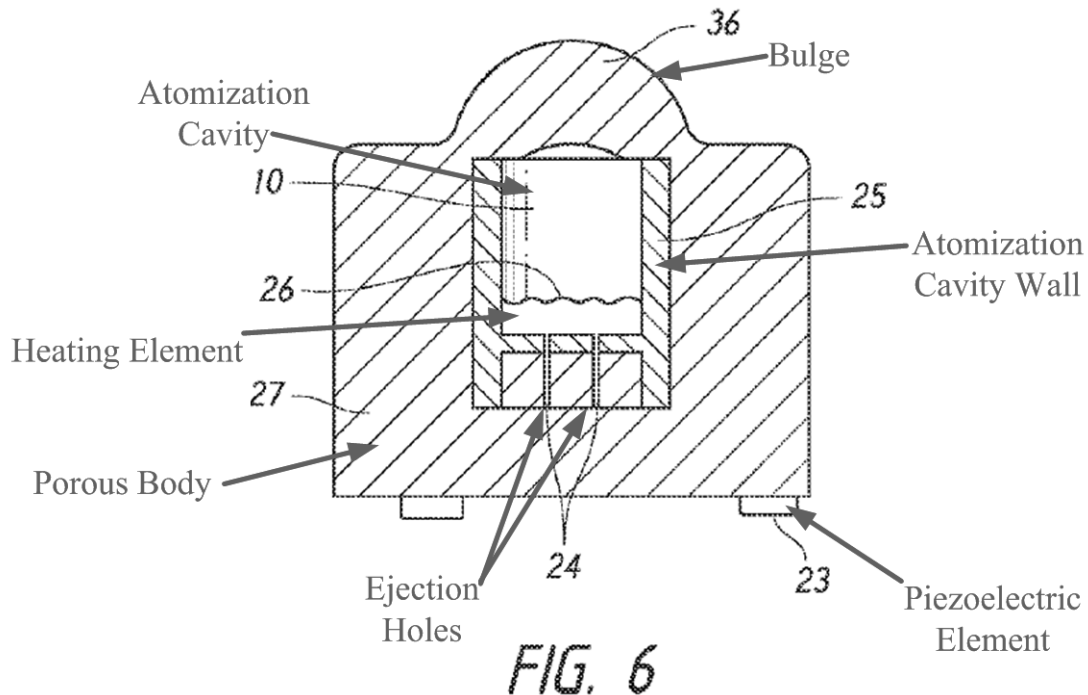
A. Background of the ‘628 Patent

1. Overview of the ‘628 Patent

The ‘628 patent describes the invention with reference to the annotated version of Figure 1 shown below. Ex. 1001, Fig. 1. “A LED 1, a cell 2, an electronic circuit board 3, a normal pressure cavity 5, a sensor 6, a vapor-liquid separator 7, an atomizer 9, a liquid-supplying bottle 11 and a mouthpiece 15 are sequentially provided within the shell 14.” *Id.* at 2:32-35. “An air inlet 4 is provided on the external wall of the shell 14.” *Id.* at 2:31-32. Airflow passes from the air inlet 4 to an outlet in the mouthpiece 15.



With reference to the annotated figure below, the atomizer 9 includes a porous body having bulge 36 that projects into the liquid supply and a heating wire with a central axis oriented substantially perpendicular to the longitudinal axis of the cigarette housing. *See* Claims 1 and 8. Liquid spent as a result of atomization is replenished from the liquid supplying bottle by “capillary infiltration” through bulge 36 of the porous body. *Id.* at 3:60-63.



2. Prosecution History of the '628 Patent

The '628 patent issued from U.S. Serial No. 13/560,789 filed on July 27, 2012, and claims priority to a Chinese application (CN 2004 0031182) filed on April 14, 2004. Ex. 1002 at pp. 179-216. In a Notice of Allowance (dated May 10, 2013) the Examiner stated that “[t]he closest prior art or [sic, of] record, specifically the Brooks et al reference (US. Pat. No. 4,947,875), teaches an electronic cigarette comprising a housing having a longitudinal axis, an inlet and an outlet; an airflow channel in the housing connecting the inlet to the outlet; and a liquid supply in the housing; however, said reference neither teaches nor reasonably suggests an atomizer assembly in the housing including a *porous body projecting into the liquid supply* and a *heating wire in the atomizer having a*

central axis oriented substantially perpendicular to the longitudinal axis of the housing.” Id. at pp. 28-40 (emphasis added).

As discussed herein, the prior art combinations relied upon in this Petition provide the teachings purportedly missing from Brooks.

B. Person Having Ordinary Skill in the Art (“PHOSITA”)

A PHOSITA for the ‘628 patent would have had at least the equivalent of a Bachelor’s degree in electrical engineering, mechanical engineering, or biomedical engineering or related fields, along with at least 5 years of experience designing electromechanical devices, including those involving circuits, fluid mechanics and heat transfer. Ex. 1010 at ¶ 23.

C. Claim Construction

Pursuant to 37 C.F.R. § 42.100(b), a claim in an unexpired patent is given its broadest reasonable construction in light of the specification in which it appears. *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278-79 (Fed. Cir. 2015), *aff’d* *Cuozzo Speed Techs. v. Lee*, 579 U. S. ____ (2016). With respect to the ‘628 patent, the Board previously construed the following limitations in IPR2014-1300 as set forth below. Ex. 1008 (IPR2014-01300, Paper 8) at pp. 8-10. The Petitioner applies these constructions for purposes of this Petition.

“electronic cigarette”: “a device for generating liquid droplets for inhalation by a user, where the device functions as a substitute for smoking, e.g., by providing nicotine without tar.” *Id.* at 8.

“longitudinal axis”: “the axis along the length, i.e., the longest dimension, of an object.” *Id.* at 8-9.

“atomizer”: “a part of the electronic cigarette that includes components that participate in facilitating atomization, but not components included in other recited parts of the electronic cigarette, such as the liquid supply.” *Id.* at 9.

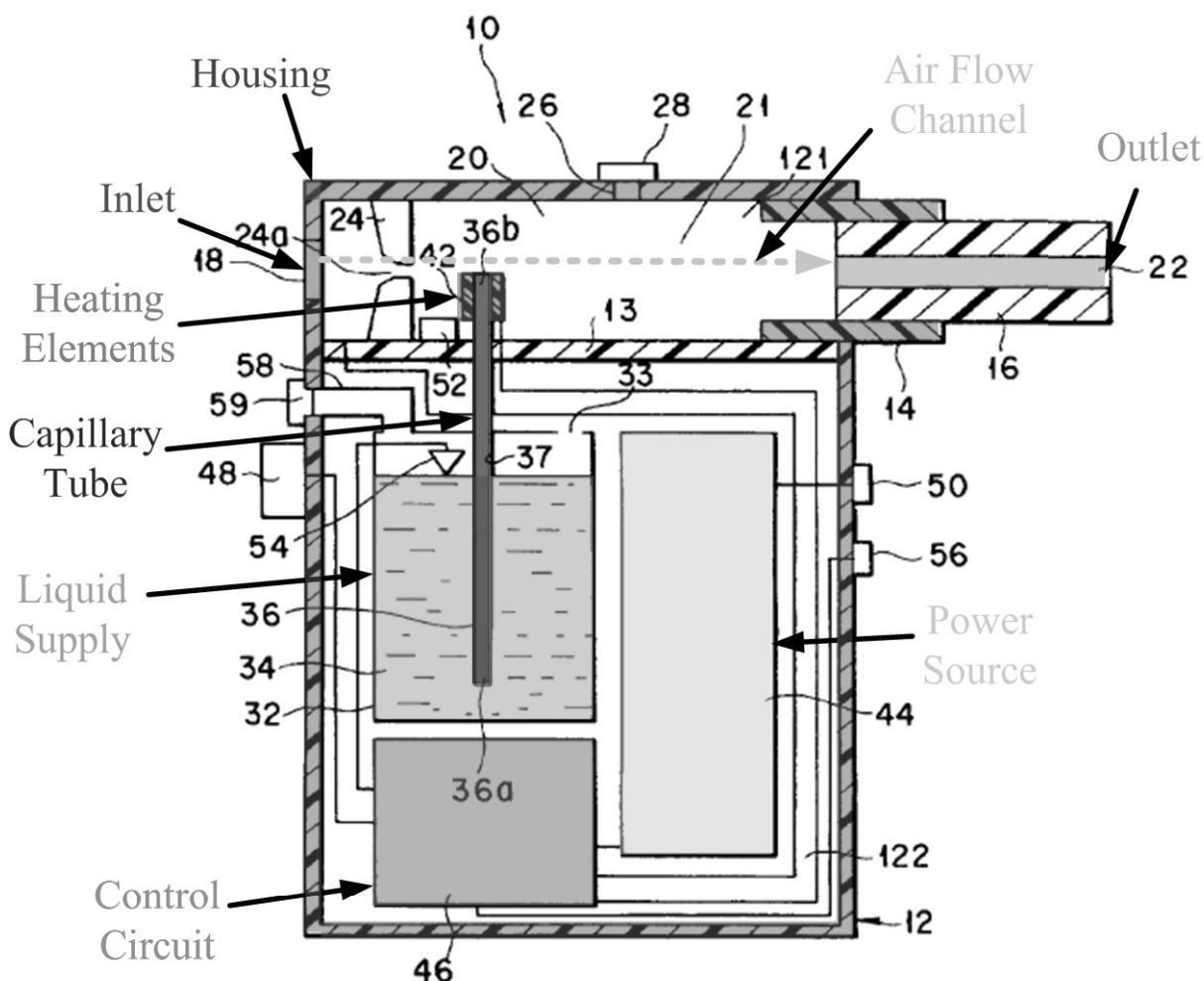
“projecting into” and “extending into”: “having at least a portion that protrudes into.” *Id.* at 9-10.

“liquid supply”: “a part of the recited electronic cigarette that includes one or more components that supply liquid to the atomizer.” *Id.* at 10.

D. Description of the Prior Art

1. Takeuchi (Ex. 1003)

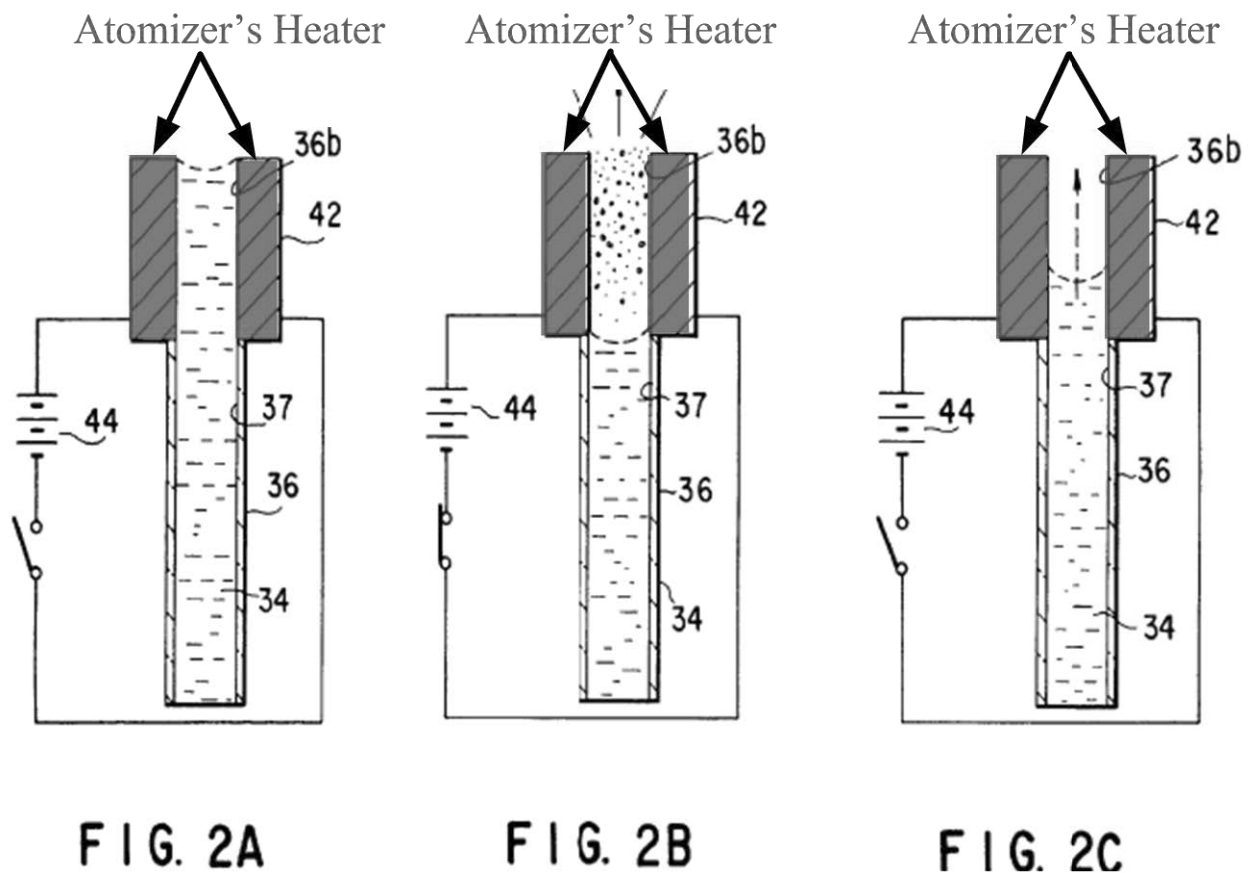
Like the ‘628 patent, Takeuchi describes a flavor generating device for enjoying simulated smoking without combustion. Ex. 1003 at 1:4-8. Takeuchi’s electronic cigarette is illustrated in annotated Figure 1.



Takeuchi has a housing 12 and an atomizer comprising heater 42 and capillary tube 36 that projects into liquid supply 34. The liquid supply may include, for example, tobacco components such as tobacco extracts and tobacco smoke condensate when the Takeuchi device is used as a simulated smoking article. *Id.* at 5:39-46. Liquid is transported by capillary force from the liquid supply 34 through the capillary tube 36 to the heater 42 where the liquid is then heated and gasified. *Id.* at 2:13-16; 6:4-12; 7:57-8:4.

The user inhales at mouthpiece 16 causing air to flow thorough an air passage extending from inlet 18 to outlet (i.e., “inhalation port”) 22. *Id.* at 7:48-8:15. The liquid vaporized at heater 42 is supplied into gas passageway 20 and carried by the air flow through the upper chamber of the housing to the outlet 22 at mouthpiece 16. *Id.* at 2:4-13; 4:50-52; 5:28-30; 5:47-52; 6:4-7.

With respect to the embodiment illustrated in Figure 1 above, Takeuchi illustrates in Figures 2A-2C further details about the structure of the atomizer and the process by which liquid is atomized by heater 42 at the atomizer’s outlet portion.



As noted above, the heater 42 is located above and in contact with the capillary tube 36. When the heater 42 is turned on the liquid flavor source within the outlet 36b is vaporized (Figure 2b) and replacement liquid flavor is supplied from the liquid supply by capillary force through the capillary tube 36. *Id.* at 7:57-8:4.

As illustrated in Figs. 14 and 15 below, Takeuchi also discloses that the capillary tube may include a porous material, (*i.e.*, intercommunicating pore structure 302) for transporting the liquid from the liquid source to the atomizer's outlet portion. The enclosure 301 may be a tube or two plates arranged spaced apart from each other wherein both sides are sealed. *Id.* at 10:50-63. Also, the intercommunicating pore structure may protrude from the enclosure 301. *Id.* The intercommunicating pore structure may include open-cell foamed structure, and bundled fibers, "but should not be limited thereto." *Id.* at 3:35-50.

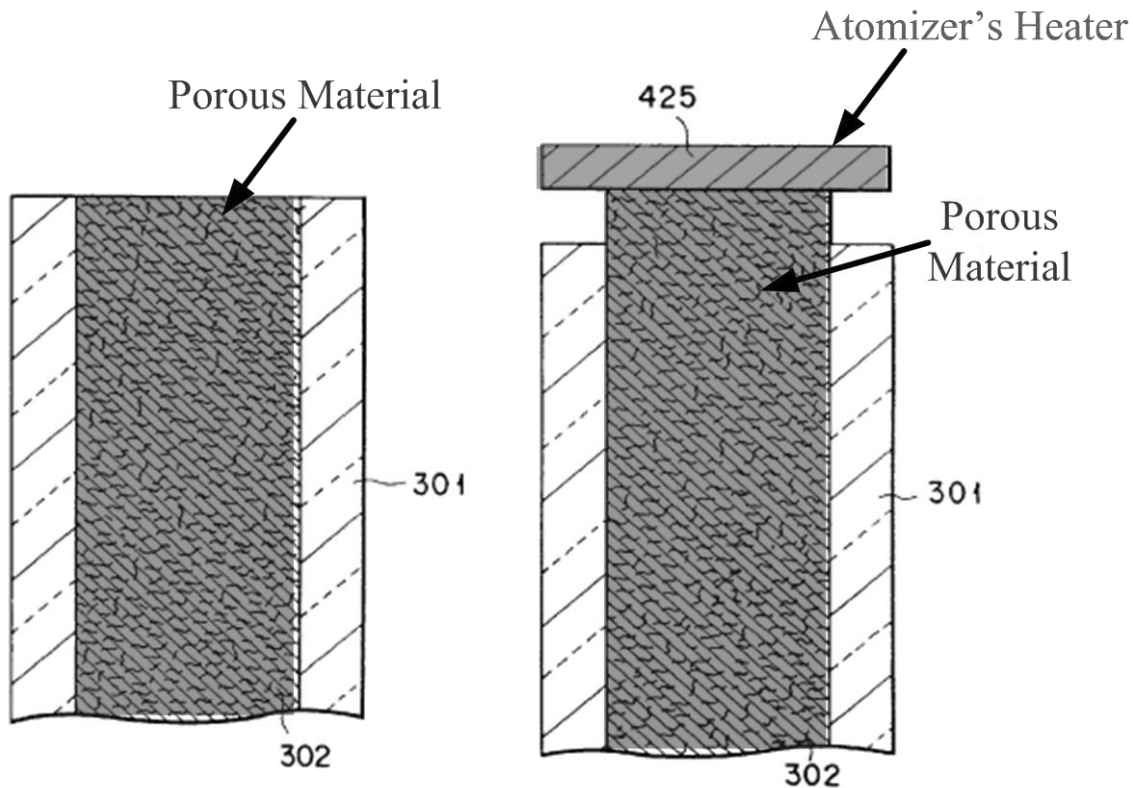


FIG. 14

FIG. 15

As illustrated, for example by Figures 1 and 15, respectively, Takeuchi also discloses that the heater may be oriented either generally perpendicular or parallel to airflow through the upper chamber 121.

Takeuchi also discloses additional alternative embodiments of the heater/intercommunicating pore structure, including locating the intercommunicating pore structure between spaced apart plate heaters 421 and 422 (or 423 and 424) that are either connected to or embedded within spaced apart plates 361 and 362. *Id.* at 10:58-60, 9:35-50, and 10:22-27; *see also* Ex. 1010 at ¶¶ 34-38.

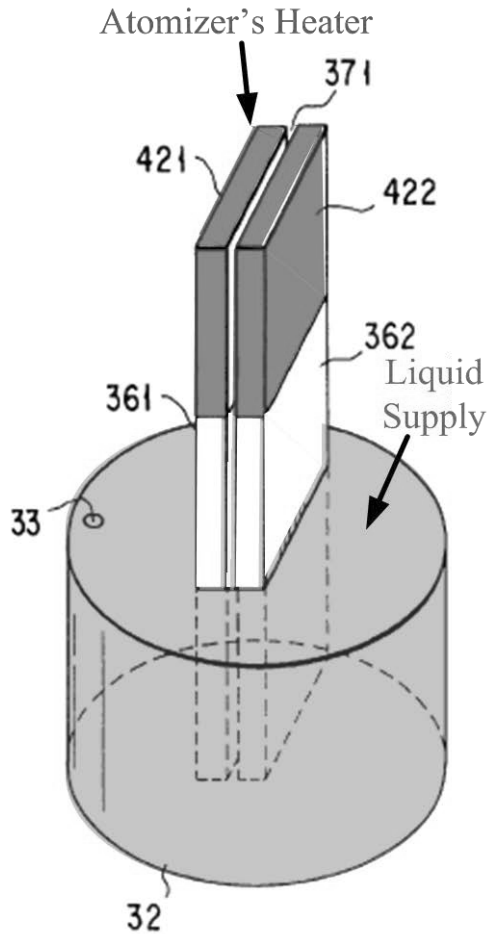


FIG. 10

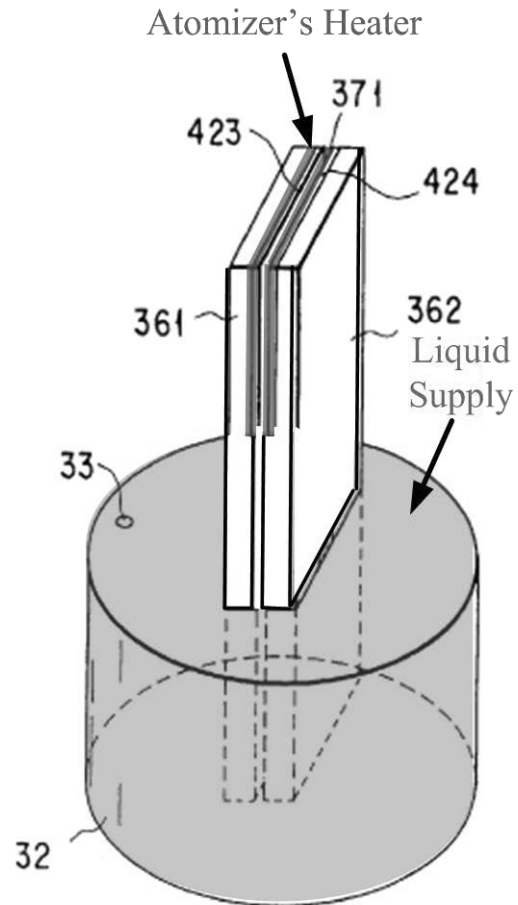
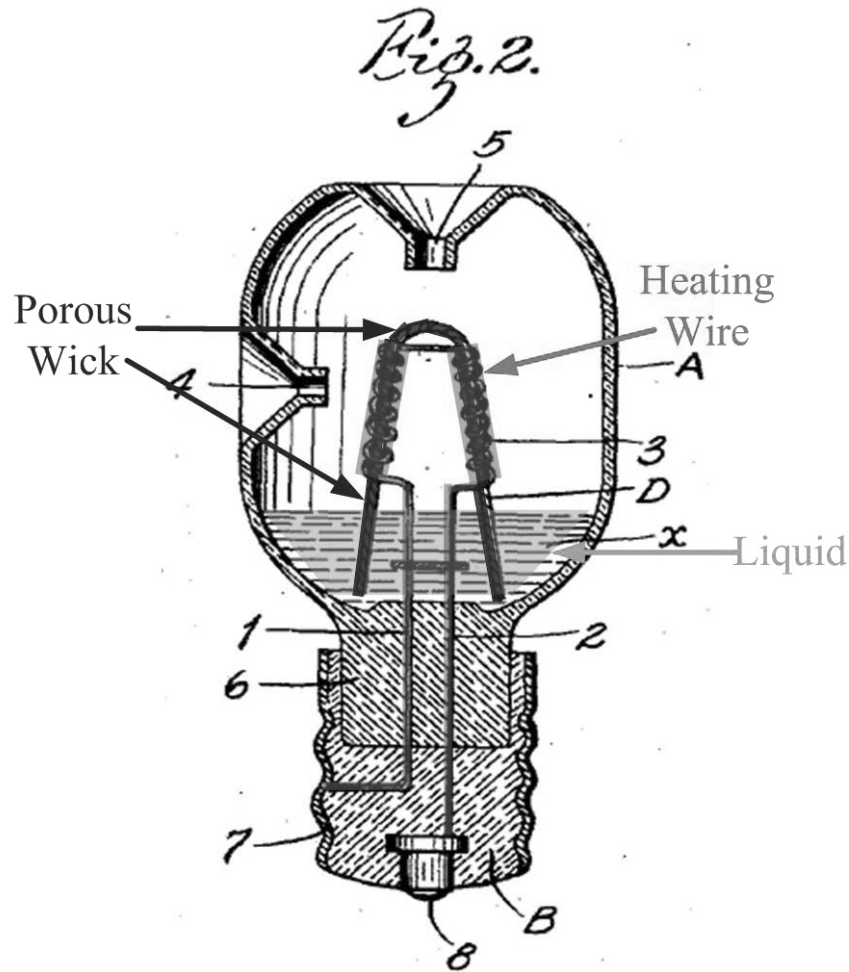


FIG. 11

2. Whittemore (Ex. 1004)

Whittemore describes a vaporizing unit for vaporizing liquid medicaments.

An embodiment of the vaporizing unit is shown in annotated Figure 2 below.



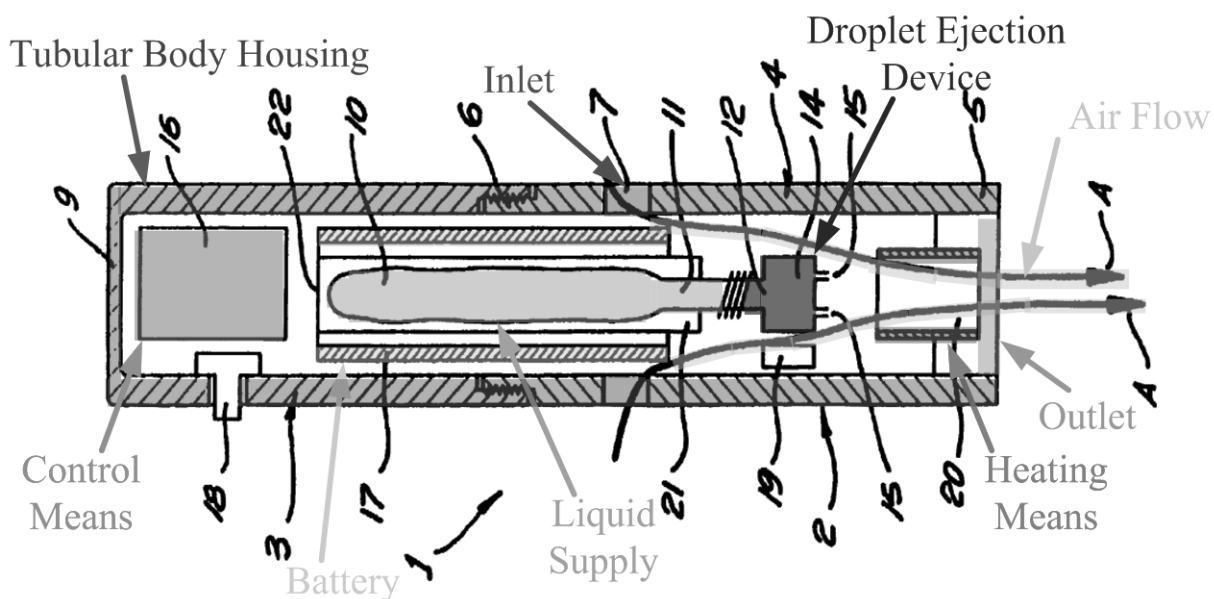
The vaporizing unit includes an atomizer comprising a coiled heating wire 3 wrapped around porous wick D. The wick extends into a supply of liquid medicament and transports the liquid medicament to the heating wire via capillary force where the liquid is then vaporized. The vaporizing unit also includes a vapor outlet 5. *Id.* at 1:54-2:8, claim 9. *See also* Ex. 1010 at ¶¶ 39-41.

3. Voges (Ex. 1005)

Like the '628 patent, Voges discloses a hand held "dispenser (cigarette substitute)" particularly suitable to self-administer physiologically active

substances, “primarily with reference to nicotine delivery,” by inhalation. Ex.

1005 at 2:31-34 and 3:7-15. Voges’ electronic cigarette is illustrated in annotated (and rotated) Figures 1 and 2 below.

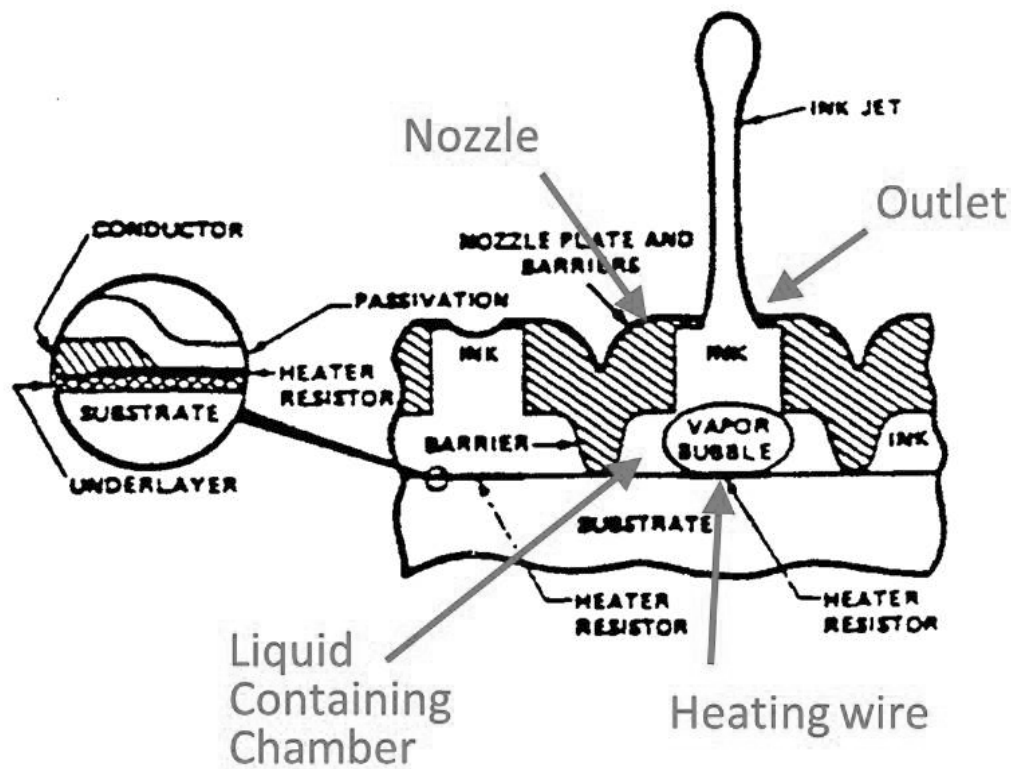


Voges’s electronic cigarette has a liquid nicotine supply 10 and an atomizer comprising droplet ejection device 14, which can be of the type used in bubble jet printing. *Id.* at 5:58-64. When the user inhales, air is drawn in from inlets 7 through the device towards mouthpiece 5, and the pressure sensor 19 (detecting the change in pressure) issues an actuation signal that causes the droplet ejection device 14 to expel through orifices 15 droplets of nicotine solution which are entrained in the airflow towards mouthpiece 5. *Id.* at 6:8-22.

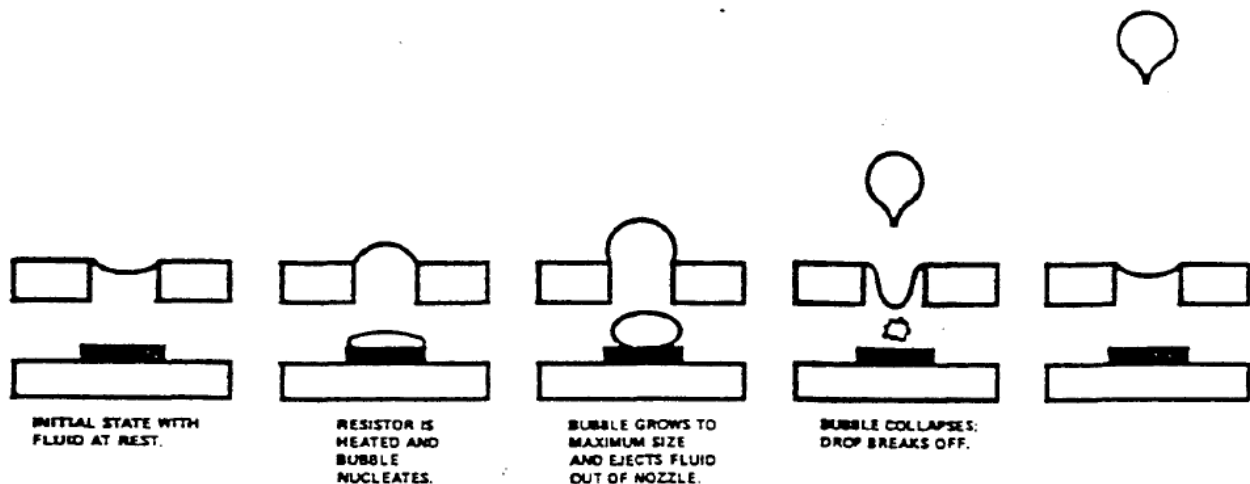
Explicitly referring to the ink jet printing art, Voges states that the droplet ejection device 14, preferably includes a thermal “bubble jet” device of the kind used in ink jet printing, and expressly incorporates by reference “Thermal Ink-Jet

Print Cartridges Designer Guide (2nd Edition Hewlett Packard)” *Id.* at 3:62-4:5.

Ex. 1007 (“Ink Jet Guide”). The bubble jet device disclosed in the Ink Jet Guide is illustrated in the annotated Figure 2 from the guide.

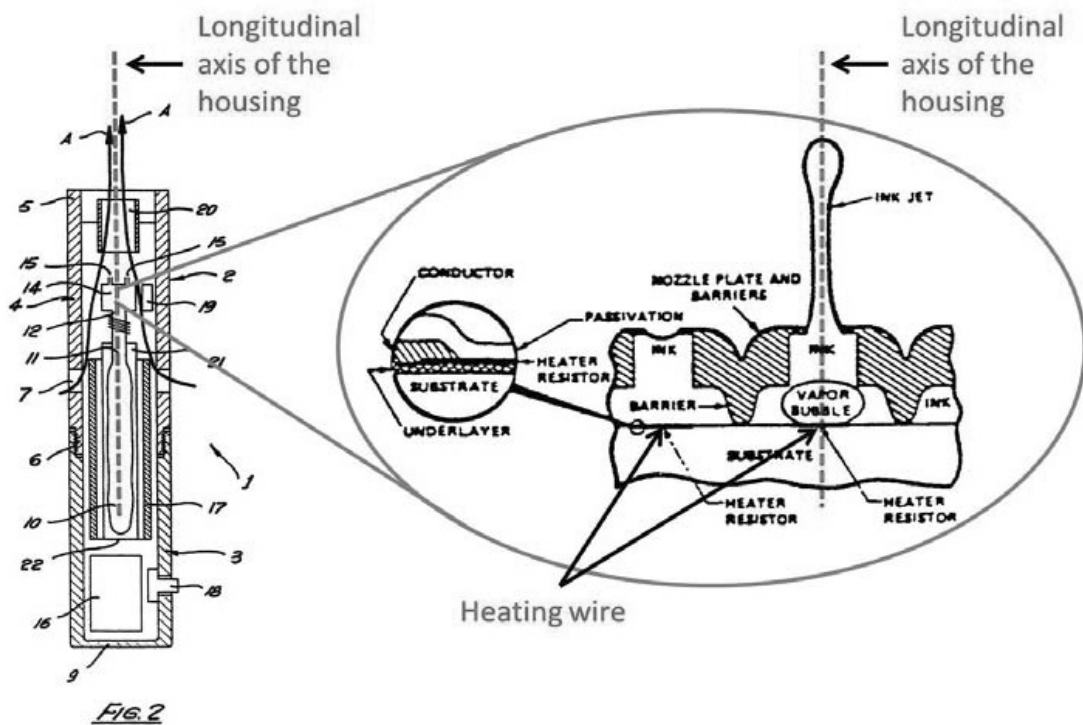


As explained by Voges, the atomizer (*i.e.*, DED 14) includes a liquid containing chamber and an array of nozzles. The atomizer also includes thin film resistors (*i.e.*, heating wire) located behind each nozzle. Ex. 1005 at 4:4-12. Each nozzle supplies a droplet of liquid from the chamber when the heating wire is energized by an electrical pulse. Additional details of the drop ejection sequence are illustrated in Figure 3 of the Ink Jet Guide below.



Thus, when the heating wire is heated, the liquid in contact with the heating wire is vaporized within a few milliseconds forming a bubble. As the bubble grows, it causes a droplet of liquid to be ejected through the nozzle. *Id.* at 4:13-17. The ejected volume of liquid lost from the chamber is then automatically replaced by drawing it from the liquid supply 10 via capillary action or other means. *Id.* at 4:17-20.

The above-described preferred atomizer of Voges, further illustrating the drop ejection device, relative to the other components of the e-cigarette is illustrated below.



As illustrated above, the atomizer, which includes at least drop ejection device 14, ejects nicotine droplets towards the mouthpiece 5, parallel to the longitudinal axis of the housing. The heating wire is arranged perpendicular to the longitudinal axis of the housing. *See also* Ex. 1010 at ¶¶ 42-46.

4. Gehrler (Ex. 1006)

Gehrler disclose a liquid container for ink jet printers. As shown in annotated Figure 3 below, Gehrler's container includes a liquid supply (*i.e.*, ink reservoir 8) comprising fiber material. Gehrler includes a capillary body 18 connected to a porous wick 37, and a porous coupling member 20A at the liquid withdrawal port connected to a porous wick 38. Ink is fed from the capillary coupling member 20A to an ink consuming device such as an ink jet print head, a

FIG. 3

23

Fontem Ex. 2028
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functions to ensure proper pressure equalization (through vent 25) within the liquid supply container while also preventing leakage (through vent 25). *Id.* at 2:33-36, 8:55-58. The wick 38 draws liquid (*i.e.*, ink) from the liquid supply 8 to the coupling member 20A. *Id.* at 8:17-26, and 8:58-62. *See also* Ex. 1010 at ¶¶ 47-50.

E. GROUND 1: CLAIMS 1, 2, 5, AND 8 OF THE ‘628 PATENT ARE UNPATENTABLE AS OBVIOUS OVER TAKEUCHI IN VIEW OF WHITTEMORE AND GEHRER

As explained below, claims 1, 2, 5, and 8 of the ‘628 patent are unpatentable as obvious under 35 U.S.C. § 103 over Takeuchi in view of Whittemore and Gehrler. Takeuchi discloses all of the features of claims 1, 2, 3, and 8 except arguably a heating “wire” (claims 1 and 8) and a liquid supply comprising fiber material (claim 5).¹ However, the missing teachings are provided by Whittemore and Gehrler, respectively. Whittemore discloses a vaporization device having heating wire and Gehrler discloses a liquid supply comprising fiber

¹ With respect to the claimed heating “wire,” Takeuchi discloses certain embodiments that comprise “rod-like heaters,” which arguably meet the “wire” limitation, especially under the applicable BRI standard. Ex. 1003 at 8:22-23 and Fig. 4. Nevertheless, the current Petition relies upon the teachings of Whittemore for the claimed heating “wire.”

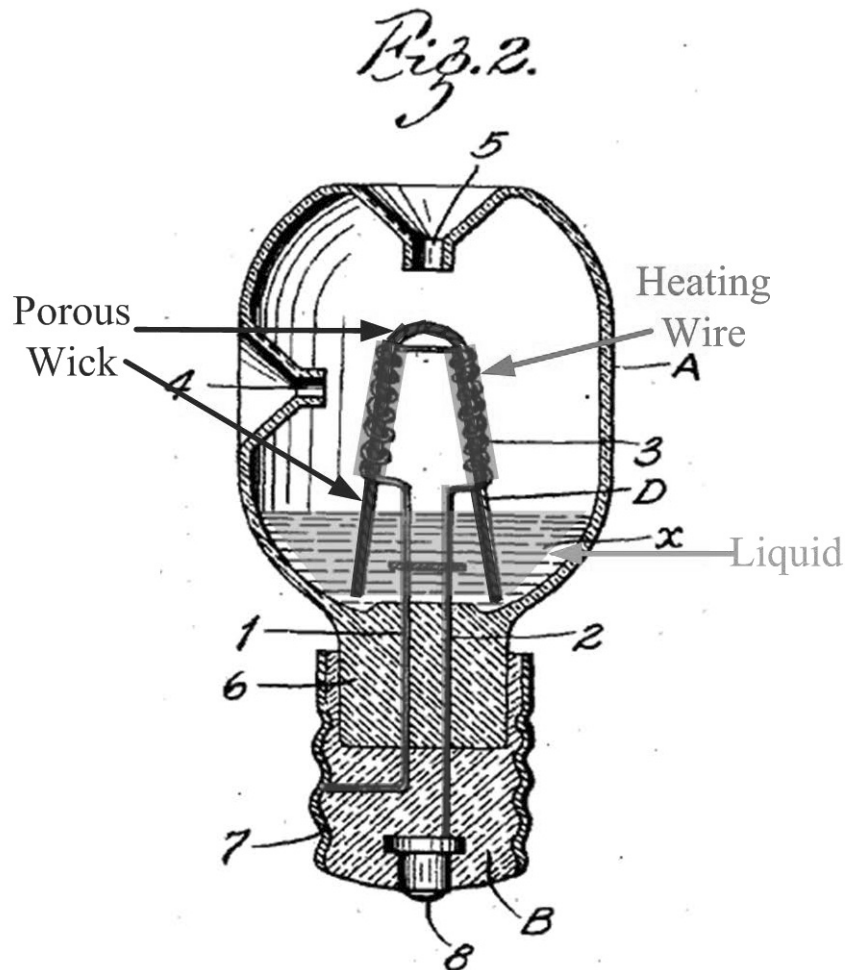
material. Substituting Whittemore's heating wire for Takeuchi's heaters is nothing more than the simple substitution of one known element for another to obtain predictable results. Similarly, adding fiber as taught by Gehrler to Takeuchi's liquid supply in order to maintain pressure equilibrium and prevent leakage is nothing more than the combination of known elements to achieve predictable results.

1. It Would Have Been Obvious To Combine Takeuchi With Whittemore and Gehrler

It would have been obvious to the PHOSITA to combine Takeuchi with Whittemore. Ex. 1010 at ¶¶ 52-55. Takeuchi and Whittemore, for example, are both directed to devices for vaporizing liquids, both use an atomizer having a porous body projecting into a liquid supply for transporting liquid from the liquid supply to the atomizer's heating element, and both heat the liquid transported by the porous body. Ex. 1003 at 2:1-16, 3:32-35, 3:47-50, and 10:50-63; Ex. 1004 at 1:49-2:25. The only difference is that Takeuchi discloses plate-like heaters, rod-like heaters, and ring-shaped heaters while Whittemore discloses a heating wire. However, it would have been a matter of routine design choice to substitute Whittemore's heating wire for the heaters disclosed in Takeuchi.

For example, in certain embodiments of Takeuchi the heaters are in direct contact with the porous body (intercommunicating pore material 302) and function to vaporize liquid in the porous body. *See* Ex. 1003, 10:50-67; 3:35-50; Figs. 1,

2A-2C, Figs. 10-11, and 15. Similarly, Whittemore's heating wire is in direct contact with the porous body and functions to vaporize liquid in the porous body.



Because Takeuchi's heaters and Whittemore's heating wire were known for vaporizing liquid in a porous body, substituting Whittemore's heating wire for the heaters of Takeuchi is the simple substitution of one known element (a heating wire) for another (Takeuchi's heaters) to yield predictable results, namely, the vaporization of a liquid carried by a porous body. Ex. 1010 at ¶ 53. Indeed, Takeuchi's disclosure, which teaches variety of different heater configurations,

conveys to the PHOSITA that the selection of heater configuration is merely a matter of design choice. Ex. 1003 at 8:19-29, Figures 1-7, 10-11, and 15. Thus, it would have been obvious to wrap heating wire, as taught by Whittemore, around the porous fiber material 302 of Takeuchi.

Although no further motivation is required for demonstrating obviousness, *i.e.*, a showing that the proposed combination is merely the substitution of one known element for another to achieve predictable results being sufficient, the PHOSITA nonetheless would have understood that Whittemore's heating wire achieves good heat transfer. For example, Howell expressly discloses a vaporizer that has a heating element using close, tight wire coils to ensure good heat transfer. Ex. 1011 at 11:20-22. Indeed, coils have been a known shape for heating elements in vaporizing devices for nearly a hundred years, as revealed by the disclosure of Wilson. *See e.g.*, Ex. 1012 at 1:99-103, 2:14-20, 2:75-85. In short, there simply is nothing patentable about substituting a heating wire for the heating elements disclosed in Takeuchi. Moreover, heating wire permits more precise control of the amount and location of the porous body to be heated. As the PHOSITA would have recognized, strips of heating wire could be located on the porous body surfaces to be heated. Thus, for example, with reference to Figure 15 of Takeuchi, strips of heating wire would be substituted for plate 425 and located on the top surface, side exposed surface, and/or at other locations on the surface of porous

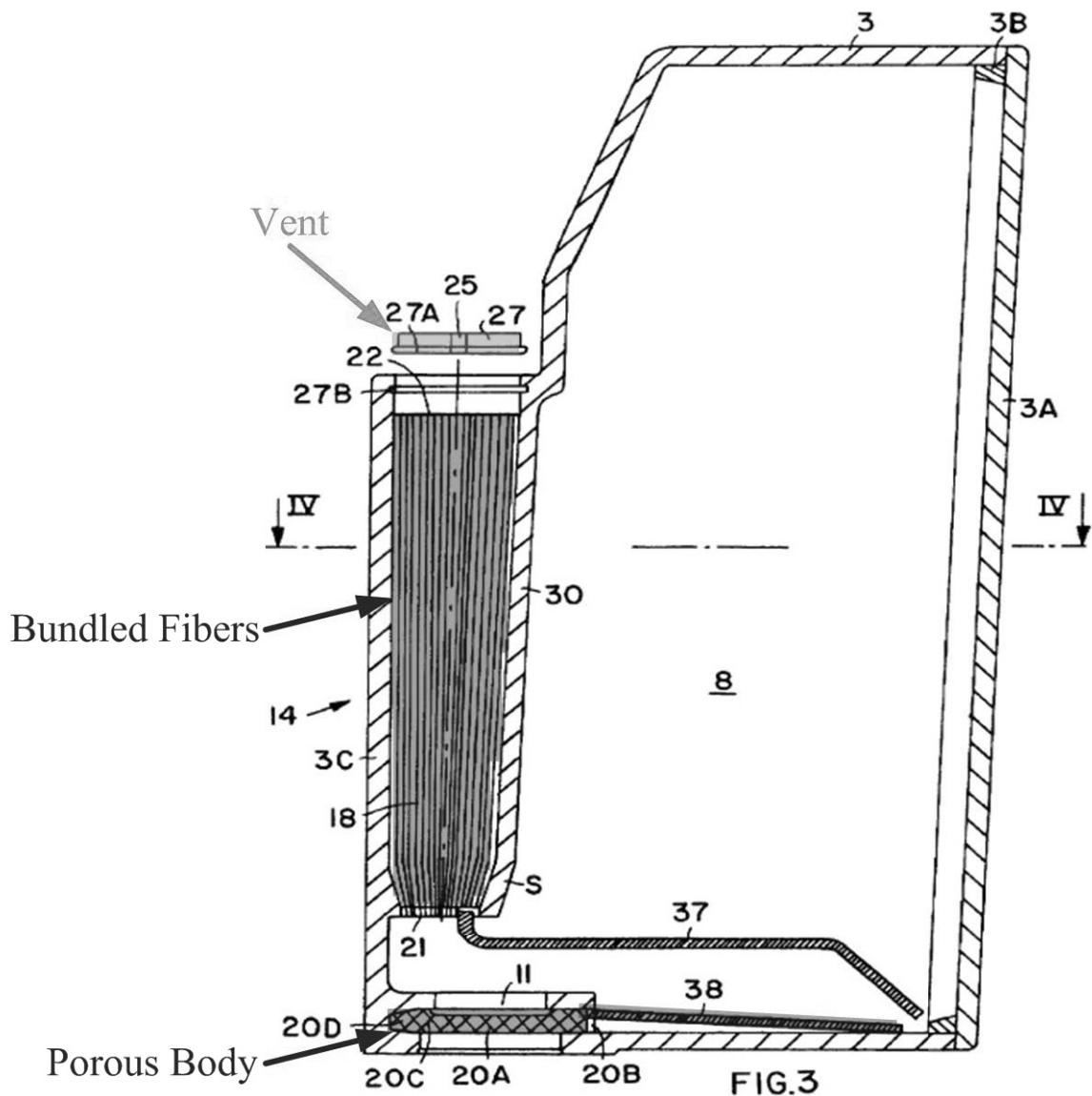
material 302. Alternatively, or in addition to the foregoing, heating wire could be coiled around the porous material 302. *See* Ex. 1003 at Fig. 15; Ex. 1010 at ¶ 55.

Similarly, it would have been obvious to the PHOSITA to combine Takeuchi with Gehrler. Ex. 1010 at ¶¶ 56-62. Takeuchi and Gehrler, for example, both include liquid storage bodies for storing liquid that is then transported by a porous body via capillary action to another element for atomization (*e.g.*, atomizers in, respectively, an electronic cigarette and ink jet printer head). Takeuchi stores liquid 34 in a container 32 that is subsequently transported to another location via capillary action through capillary tube 37, which may contain porous material 302. Gehrler stores liquid (*i.e.*, ink) in a reservoir 8 that is subsequently transported via capillary action through porous body wick 38 and connector 20A. *See e.g.*, Ex. 1003 at 2:1-16, 3:32-35, 3:47-50, and 10:50-63; Ex. 1006, Abstract.

Moreover, both Takeuchi and Gehrler address the problems of pressure equalization and leakage with respect to their liquid storage containers. Takeuchi locates a small opening or vent 33 to maintain the pressure inside liquid container 32 at an atmospheric pressure notwithstanding the reduction in liquid volume inside the container as the liquid is depleted from use. Ex. 1003 at 5:58-62. To address the potential for leakage at opening 33, Takeuchi locates the opening 33 in an area least likely to leak liquid (*i.e.*, liquid flavor source 34) even when the device is turned upside down. *Id.* at 5:63-6:2. However, a PHOSITA would have

recognized that the leak problem, although mitigated, would not be completely solved, because liquid could still leak even through a small opening. Thus, the PHOSITA would have sought to further eliminate the potential for leakage while still permitting pressure equalization. The PHOSITA would have turned to the solution disclosed by Gehrler. Ex. 1010 at ¶ 60.

Like Takeuchi, Gehrler also addresses the problems of pressure equalization and leakage. Although Gehrler, like Takeuchi, uses a vent (*i.e.*, an opening) to maintain pressure equilibrium inside the liquid container, unlike Takeuchi, Gehrler also includes fiber material (*i.e.*, fibrous capillary body 18) to assist in both maintaining pressure equilibrium inside the liquid chamber while more effectively preventing leakage than Takeuchi. More specifically, Gehrler discloses using an air-permeable fiber material to permit pressure equalization within the liquid chamber while also preventing liquid leakage. Ex. 1006 at 8:10-12 (“the rear end of capillary body 18 is vented through a vent 25), and 8:55-60, and 2:33-26 (““The chamber holding the capillary body that functions as a pressure equalization member vessel and additionally makes sure that ink cannot leak out through the vent.”).



Thus, because Takeuchi's opening, although allowing for pressure equalization, would still pose a threat for leakage, the PHOSITA would have turned to the solution disclosed in Gehrer. The PHOSITA would have been motivated to include fiber material as taught by Gehrer to prevent leakage thorough Takeuchi's opening 33. As taught by Gehrer, fiber material in combination with Takeuchi's opening 33 would provide for maintaining pressure

equalization and better leak protection. Thus, including fiber material in the liquid supply of Takeuchi is merely the combination of known elements to achieve predictable results, namely, pressure equalization while preventing leakage. Ex. 1010 at ¶ 62.

Improving Takeuchi's liquid supply by including fiber material as taught by Gehrler would not have adversely affected the underlying operation of Takeuchi. Fluid will still be delivered to the atomizer, vaporized, and provided to the user. *Id.* at 34-38. Moreover, as noted by Takeuchi, as liquid is removed from the container, the pressure inside the liquid storage container can become unbalanced unless a means for pressure equalization is provided. Gehrler's fiber material, in combination with opening 33, assists in maintaining pressure in Takeuchi's liquid storage while simultaneously providing better leak prevention. For the foregoing reasons, it would have been obvious to the PHOSITA to include fiber in Takeuchi's liquid supply as taught by Gehrler.

Finally, that the PHOSITA would have consulted the ink jet printing art for suggestions on how to improve electronic cigarettes is further confirmed by Voges. Voges discloses an electronic cigarette that includes a droplet ejection device of the type used in "bubble jet" ink printers. Ex. 1005 at 3:62-4:5; *see also* Ex. 1010 at ¶ 59 (both Takeuchi and Gherer address the problems of preventing leakage while maintaining pressure equilibrium in a liquid supply).

As shown below, the combination of Takeuchi with Whittemore and Gehrer teaches each of the limitations of claims 1, 2, 5, and 8. *See* Ex. 1010 at ¶¶ 63-83.

2. Claims 1 and 8

Because claims 1 and 8 are similar, they are addressed together.

a. “An electronic cigarette comprising”

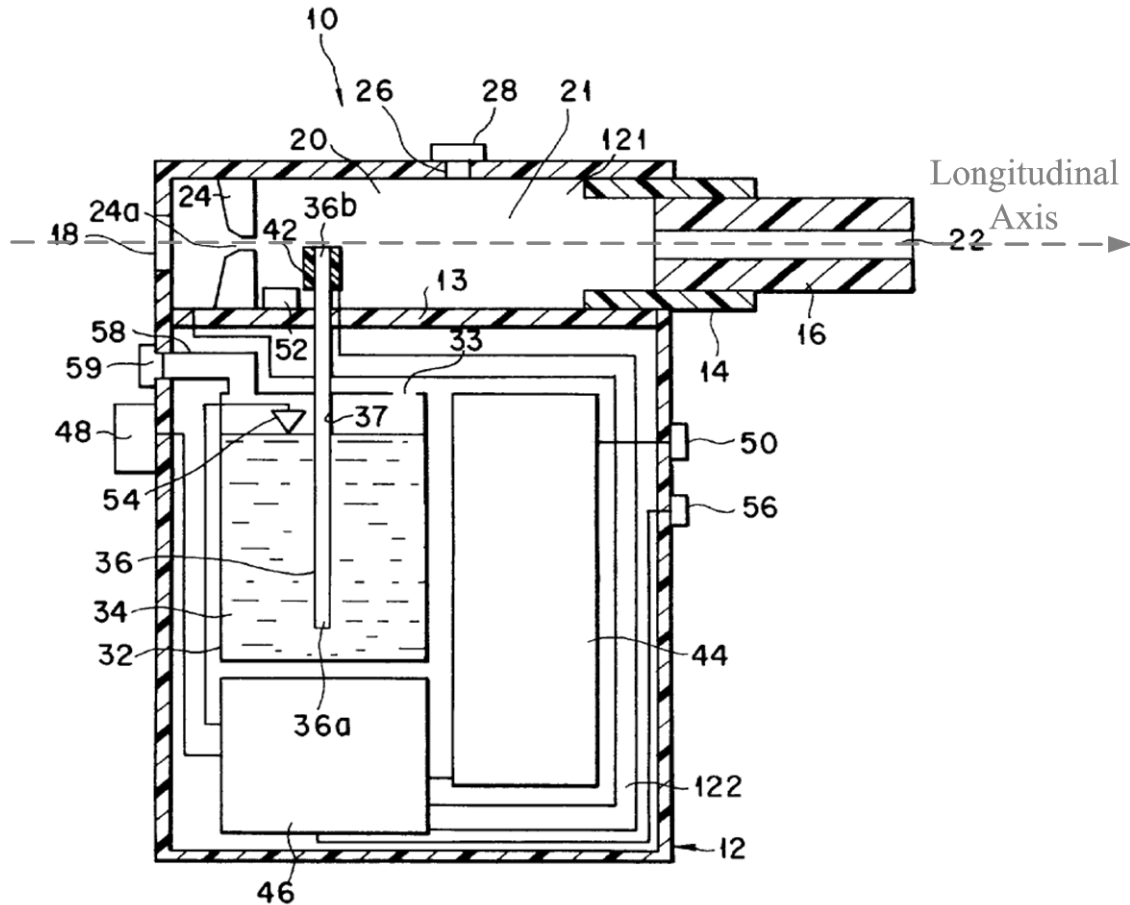
The preambles of claims 1 and 8 both recite “[a]n electronic cigarette, comprising.” To the extent that the preamble is considered a claim limitation, Takeuchi discloses an electronic cigarette.

Claims 1 and Claim 8	
An electronic cigarette, comprising:	<p>“The present invention relates to a flavor-generating device for enjoying inhalation of flavor or for enjoying simulated smoking, and more particularly, to a flavor-generating device for generating flavor which is to be inhaled by a user by heating a liquid flavor source without relying on combustion.” Ex. 1003 at 1:3-8.</p> <p>“[W]here the device is used as a simulated smoking article, it is possible for the liquid flavor source 34 to contain tobacco components such as tobacco extracts and a tobacco smoke condensate.” <i>Id.</i> at 5:40-46.</p> <p>“[T]he lower chamber 122 is used as a housing for housing a liquid container 32, a power source 44 and a control circuit.” <i>Id.</i> at 4:36-38.</p>

b. “a housing having a longitudinal axis”

Claim 1 recites a housing having a longitudinal axis. The Board previously construed “longitudinal axis” under the applicable BRI standard to mean “the axis along the length, *i.e.*, the longest dimension, of an object.”

Takeuchi discloses a housing having an upper chamber 121 and a lower chamber 122. The upper chamber 121 has a longitudinal axis along its longest functional length, extending from the inlet 18 along passageway 20 to the outlet 22. The housing also has a vertical height that extends from the base of the lower chamber 122 to the top of upper chamber 121. The PHOSITA would have understood that the longitudinal axis of Takeuchi’s housing is from the inlet 18 to the outlet 22, which is the path of airflow through the upper chamber 121 of Takeuchi’s device. Ex. 1010 at ¶¶ 64-67.



Takeuchi discloses that the heater may be oriented either generally perpendicular or generally parallel to the “longitudinal axis” of the housing (*see, e.g., Ex. 1003 at Figs. 1 (heater 42) and 15 (plate 425)*). Thus, as confirmed by Takeuchi, the orientation of the heater relative to the longitudinal axis is simply a matter of design choice.

Moreover, the dimensional aspect of the “longitudinal axis” limitation, *i.e.,* that a particular axis of the device be the longest, cannot as a matter of law patentably distinguish the challenged claims over the proposed combination of Takeuchi with Whittemore and Gehrler. As the Federal Circuit has noted,

dimensional limitations that do not affect the device's operation should not preclude a finding of obviousness. *See Gardner v. TEC Sys., Inc.*, 725 F.2d 1338, 1349 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 105 S.Ct. 116 (1984) (affirming obviousness determination because “the dimensional limitation did not specify a device which performed and operated any differently from the prior art”). That is precisely the case here. The PHOSITA would have appreciated that reasonable variations in the relative dimensions of the upper and lower chambers of Takeuchi's housing would not affect the device's operation, and thus the upper chamber's horizontal axis could be lengthened to exceed the length of the vertical height of the housing. Moreover, as the Board has previously noted, limitations that are effectively ornamental should not be given patentable weight. *See* IPR2014-00424 – Paper 8 at p. 8 (citing *In re Seid*, 161 F.2d 229, 231 (CCPA 1947)).

Thus, it would have been obvious to modify the relative height and width of Takeuchi's device such that the horizontal axis of the housing's upper chamber is the longest dimension. Takeuchi discloses an exemplary housing, and places no restrictions on the horizontal length of the upper chamber 121 relative to the vertical height of the device. Moreover, the PHOSITA would have understood that the vertical height of Takeuchi's lower chamber could be shortened without sacrificing functionality, the chamber needing only to be sufficiently sized to hold

the liquid storage, battery, and other components, which could be rearranged if needed. Similarly, the PHOSITA would have readily understood that the horizontal length of the upper chamber could be lengthened, either for functional or aesthetic reasons, without sacrificing performance. For example, the PHOSITA interested in providing better access to the mouthpiece while the device is gripped at the lower chamber would be motivated to provide a greater horizontal distance between the mouthpiece and the lower chamber. Alternatively, the PHOSITA interested in replicating the look and feel of Brooks' electronic cigarette (Ex. 1013; Fig. 1 illustrated below), would have modified Takeuchi's device by lengthening the horizontal axis of Takeuchi's upper chamber (or shortening the vertical height of the housing) so that the longest length of the housing was along the upper chamber 121 similar to the configuration of Brooks.

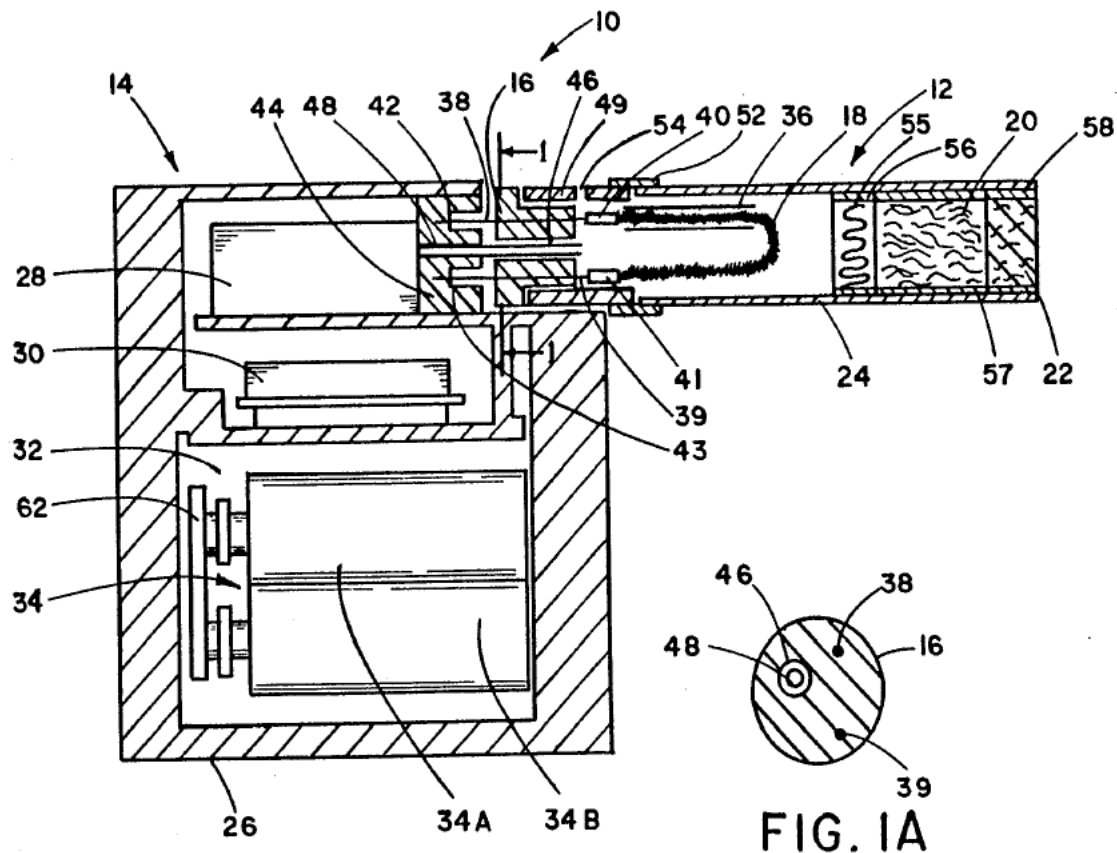
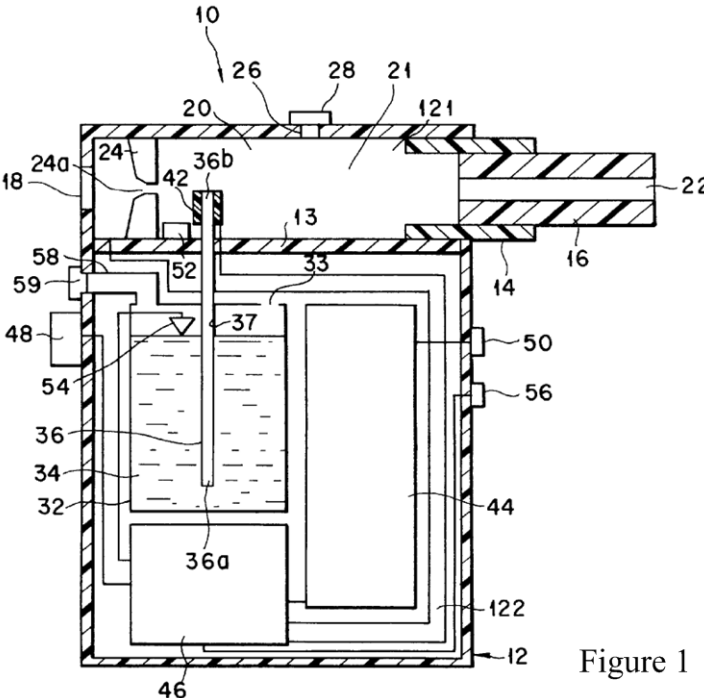


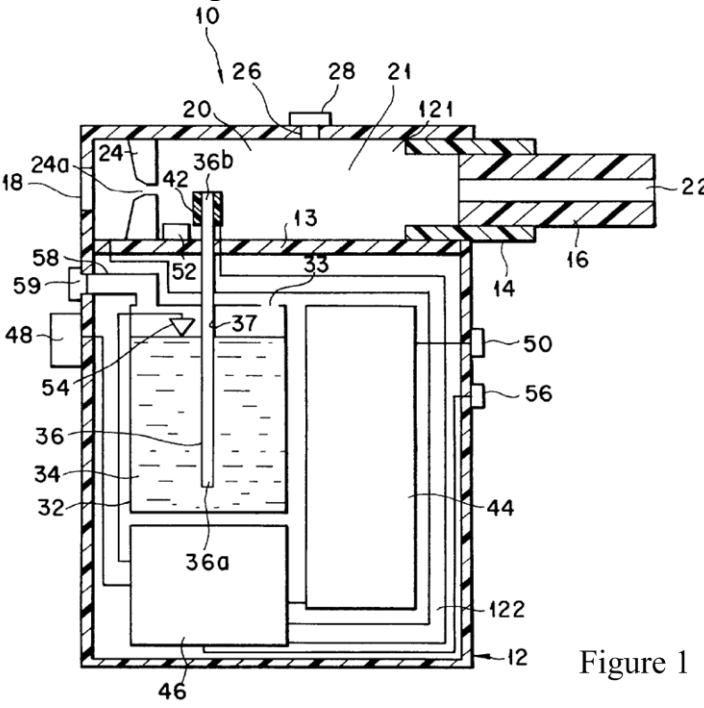
FIG. 1

In short, the PHOSITA would have readily appreciated that reasonable variations in the relative dimensions of the upper and lower chambers of Takeuchi's housing were a matter of routine design choice that could be implemented without detracting from the performance of the device, and that such reasonable variations would include an upper chamber having a horizontal length (*i.e.*, axis) that is the longest dimension of the device. Ex. 1010 at ¶¶ 68-70.

Claim 1	
a housing having a longitudinal axis,	<p>Ex. 1003 at Figure 1:</p>  <p>Figure 1</p> <p>“The inner space of the casing 12 is partitioned into an upper chamber 121 and a lower chamber 122 by a partition wall 13. As will be described herein later, the upper chamber 121 is used as a gas passageway 20 for forming a gaseous stream of a flavor which is to be inhaled by a user.” Ex. 1003 at 4:31-38.</p>

c. “an inlet and an outlet” and “a housing having an inlet and an outlet”

Claim 1 recites “an inlet and an outlet” and claim 8 recites “a housing having an inlet and an outlet. Takeuchi discloses an inlet (Air Intake Port 18) and an outlet (Inhalation Port 22) as shown in the claim chart below.

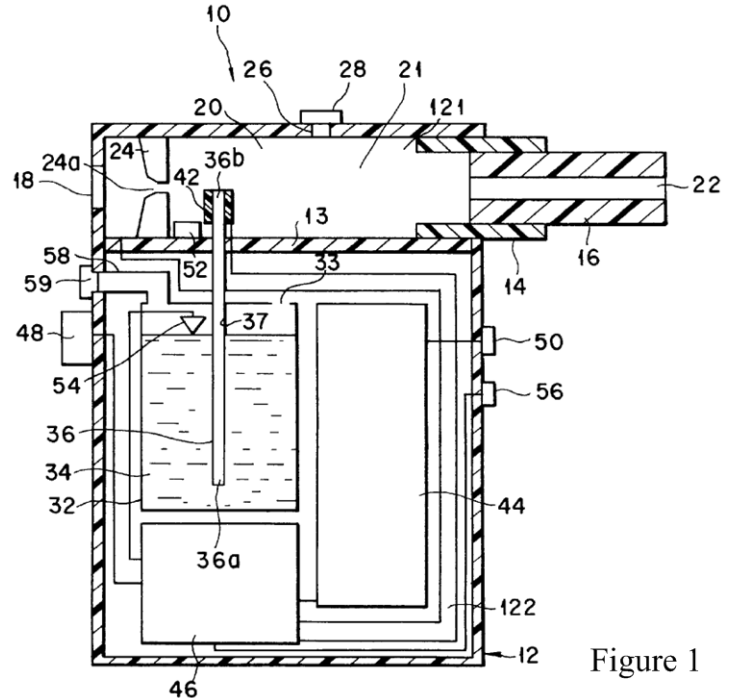
Claim 1 and Claim 8	
<p><u>Claim 1:</u> an inlet and an outlet;</p> <p><u>Claim 8:</u> a housing having an inlet and an outlet;</p>	<p>Ex. 1003 at Figure 1:</p>  <p>Figure 1</p> <p>“The gas passageway 20 is defined within the upper chamber 121 of the casing 12, between the air intake port 18 and the inhalation port 22.” Ex. 1003 at 4:50-52.</p>

d. “a liquid supply in the housing”

Claim 1 recites a liquid supply in the housing. The Board previously construed “liquid supply” under the applicable BRI standard to mean “a part of the recited electronic cigarette that includes one or more components that supply liquid to the atomizer.”

Takeuchi discloses a liquid supply in the housing as shown in the claim chart below.

electronic circuit board in the housing;



“[L]iquid container 32 housing a liquid flavor source 34 is fixed within the lower chamber 122 of the casing 12.” Ex. 1003 at 5:28-30.

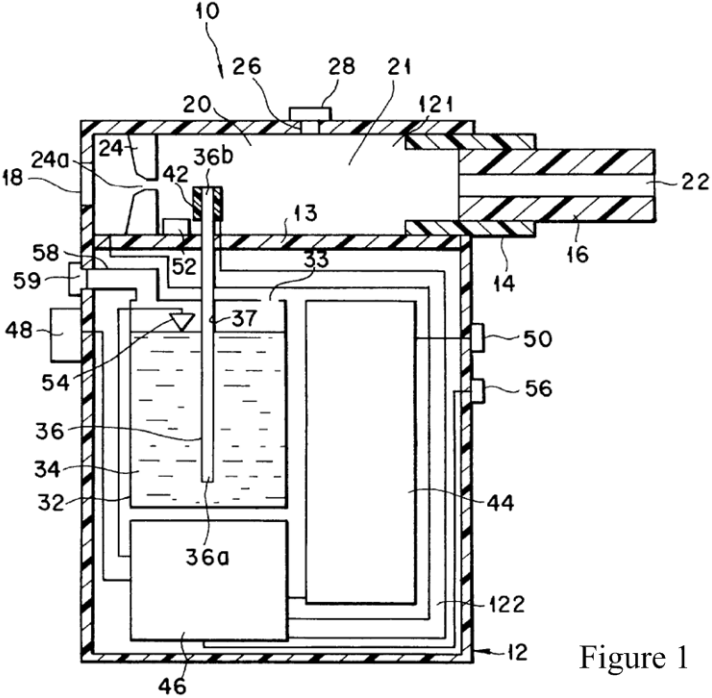
“The liquid flavor source 34 is housed in the container 32 in an amount conforming with a plurality of puffs of a user.” *Id.* at 5:30-32.

“It is desirable to use as the power source 44 a DC power source available on the market such as a primary battery (dry battery), or a secondary battery (rechargeable battery).” *Id.* at 6:15-17.

“The heater 42 and the power source 44 are driven under the control of the control circuit 46 fixed within the lower chamber 122. To the control circuit 46, a switch 48 for the heater 42 which can independently turn the heater on, and a sensor 52 for detecting the inhalation action of a use are connected.” *Id.* at 6:23-28.

- f. “an air flow channel in the housing connecting the inlet to the outlet” and “an air flow channel in the housing between the inlet and the outlet”

Claims 1 and 8 recite an air flow channel in the housing connecting/between the inlet to/and the outlet. The features are also disclosed by Takeuchi as shown below.

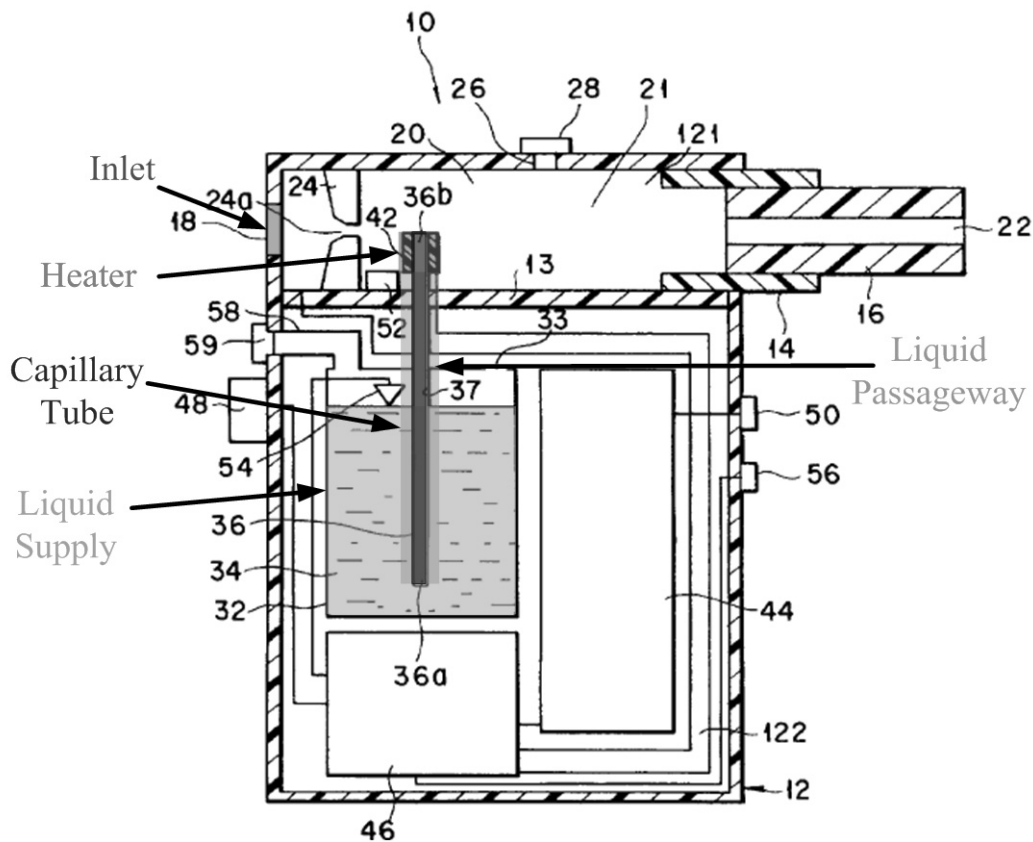
Claims 1 and Claim 8	
<p><u>Claim 1:</u> an air flow channel in the housing connecting the inlet to the outlet;</p> <p><u>Claim 8:</u> an air flow channel in the housing between the inlet and the outlet</p>	<p>Ex. 1003 at Figure 1:</p>  <p>Figure 1</p> <p>“The gas passageway 20 is defined within the upper chamber 121 of the casing 12, between the air intake port 18 and the inhalation port 22.” Ex. 1003 at 4:50-52.</p> <p>“The free space between the outlet portion 36b of the capillary tube 36 and the inhalation port 22 can act as a cooling chamber 21 which constitutes a part of the gas passageway.” <i>Id.</i> at 5:1-4.</p>

g. “and an atomizer assembly in the housing between the inlet and the outlet” and “an atomizer in the housing”

Claim 1 recites an atomizer assembly in the housing between the inlet and the outlet and Claim 8 recites an atomizer in the housing. The Board previously construed “atomizer” under the applicable BRI standard to mean “a part of the electronic cigarette that includes components that participate in facilitating atomization, but not components included in other recited parts of the electronic cigarette, such as the liquid supply.”

Takeuchi discloses an atomizer (or atomizer assembly) in the housing between the inlet and outlet which comprises heater 42, capillary tube 36, and intercommunicating pore material 302. Ex. 1010, ¶ 67. Takeuchi discloses a heater 42 for atomizing liquid. Ex. 1003 at 6:4-8. Liquid from the liquid supply is transported to the heating element by capillary tube 36, which creates a liquid passageway 37 that may include an “inter-communicating void or pore structure filled in an enclosure,” such as open-cell foam structure or bundled fibers. *Id.* at 3:36-50; 10:50-65, Figs. 1, 14, and 15. Further, when an intercommunicating pore structure is used in the tube 36, the pore structure protrudes from the tube allowing for direct contact between the heater and the porous material 302. *Id.* at 6:4-7, 10:59-63, Fig. 1, Fig. 15. The capillary tube 36/porous material 302 are part of the atomizer because, as taught by Takeuchi, they function to deliver liquid to the

heater where vaporization of the liquid takes place at the outlet port 36b of the capillary tube, where the heater 42 is located. *Id.* at 7:48-8:4. Takeuchi also discloses that the capillary tube 36/porous material 302 are “inserted within the liquid container,” *id.* at 5.47-49, and, therefore, the capillary tube 36/porous material 302 are not a part of the liquid container but rather project into it.²



² Figures 1, 2A, 2B, 2C, 6, and 7 show element 36b as the outlet port of the capillary tube 36, yet Takeuchi’s specification occasionally describes 36a as the outlet port. The PHOSITA would have recognized this as a recurring typographical error. Ex 1010 at ¶ 76, footnote 2.

In addition, with respect to the intercommunicating pore structure 302, Takeuchi discloses that this porous material may be used enclosed in a tube or between spaced apart plates, and that the heater may be arranged as in the embodiments illustrated in FIG. 1, 10, or 11. *Id.* at 10:53-63. Thus, Takeuchi expressly teaches that the intercommunicating pore structure can be included in the capillary tube 36 as illustrated in Figure 1, as well as in other embodiments of Takeuchi's electronic cigarette.

Finally, the atomizer assembly, i.e., the heater 42, capillary tube 36/porous material 302, which is where liquid vaporization occurs, resides in the housing between the inlet and the outlet. Ex. 1003 at 4:33-35, 4:50-52, 4:61-67, Fig. 1 (annotated) below. Ex. 1010 at ¶ 76.

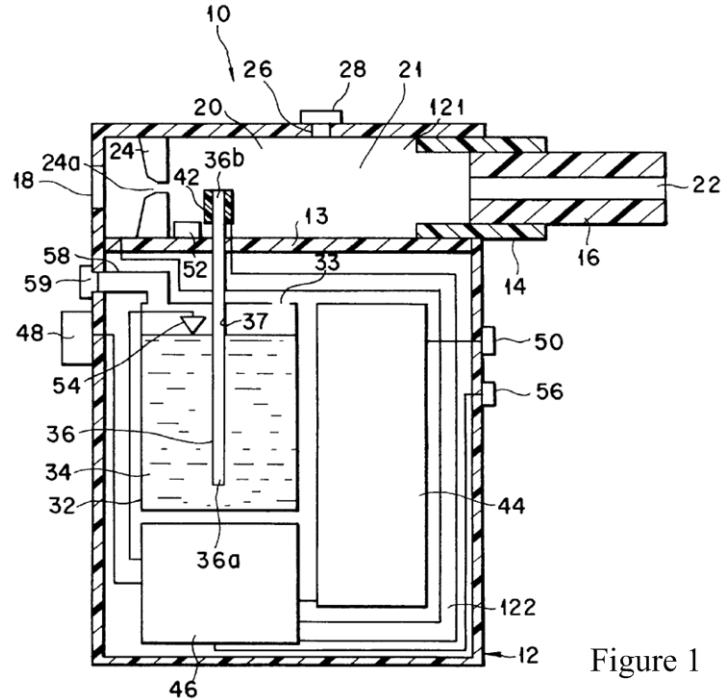


Figure 1

“The upper end portion of the capillary tube 36 protrudes into the upper chamber 121 of the casing 12 somewhat downstream of the squeeze plate 24 and is equipped with the heater 42 serving to gasify the liquid flavor source 34.” Ex. 1003 at 6:4-8.

“A gas containing a flavor, which is formed by the heating of the liquid flavor source with a heater 42, is mixed with the outer air within the cooling chamber 21 so as to be cooled and, then, flows to reach the inhalation port 22.” *Id.* at 5:7-11.

“The squeeze hole 24a of the squeeze plate 24 act to regulate or direct the air introduced from the intake port 18 selectively toward a [sic] outlet portion 36b of a capillary tube 36...” *Id.* at 4:63-67.

“The free space between the outlet portion 36b of the capillary tube 36 and the inhalation port 22 can act as a cooling chamber 21 which

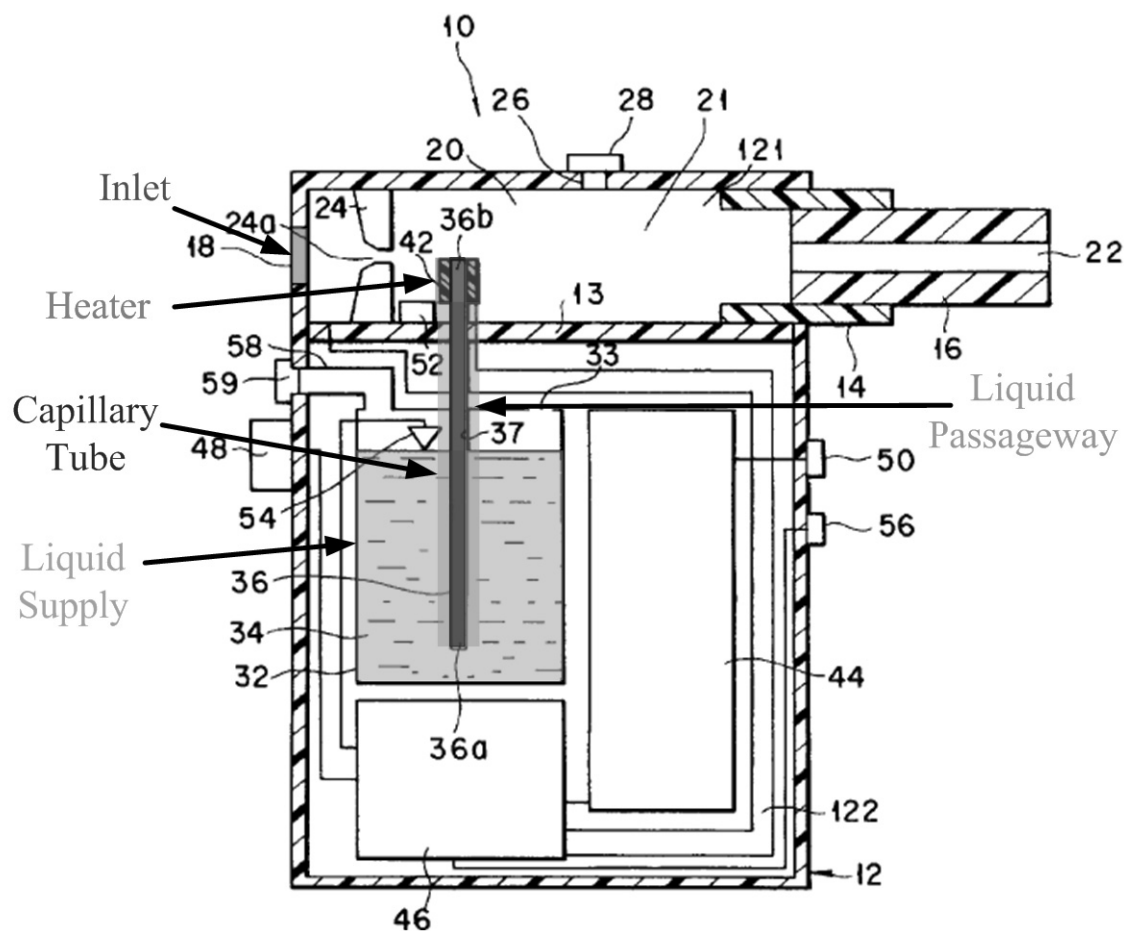
	<p>constitutes a part of the gas passageway.” <i>Id.</i> at 5:1-4.</p> <p>“...the heater 42 consists of a tubular body mounted to the capillary tube 36 and having an inner diameter equal to that of the capillary tube 36. In other words, the outlet port 36a [sic, 36b] of the liquid passageway 36 is formed by the heater 42 itself.” <i>Id.</i> at 6:8-12.</p> <p>“In this step, the liquid flavor source 34 is already transported to the outlet port 36a [sic, 36b] of the capillary tube 36 by the capillary force of the capillary tube 36 in FIG. 2A. If the heater 42 is turned on under this condition, the liquid flavor source 34 within the outlet port 36a is instantly gasified by the heat generated from heater 42 as shown in FIG. 2B so as to be supplied into the gas passageway 20. Upon gasification of the liquid flavor source 34 within the outlet port 36a [sic, 36b] by the heating with the heater 42, the liquid flavor source 34 is newly supplied from the liquid container 32 into outlet port 36a [sic, 36b] of the capillary tube 36 by the capillary force of the capillary tube 36, as shown in FIG. 2C. In this fashion, supply and gasification of the liquid flavor source 34 are repeated within the outlet port 36a [sic, 36b] of the capillary tube 36.” <i>Id.</i> at 7:57-8:5.</p>
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**h. “a porous body projecting into the liquid supply” and
“a porous body extending into the liquid supply”**

Claims 1 and 8 recite that the atomizer includes a porous body projecting into/extending into the liquid supply. The Board previously construed “projecting

into” and “extending into” under the applicable BRI standard to mean “having at least a portion that protrudes into.”

As previously discussed, Takeuchi discloses tube 36/ intercommunicating pore structure 302 (*i.e.*, porous body) projecting into the liquid supply. Ex. 1003 at 10:50-60, 3:36-50, 7:48-8:4, Fig. 14, Fig. 1 (annotated) below. *See also* Ex. 1010 at ¶¶ 76-77.



The capillary tube 36, which may include a porous body (“intercommunicating pore structure” 302), has at least a portion that protrudes into the liquid supply.

Claim 1 and Claim 8

Claim 1:

[the atomizer including:] a porous body projecting into the liquid supply;

Claim 8:

[the atomizer including] a porous body extending into the liquid supply;

Ex. 1003 at Figure 1:

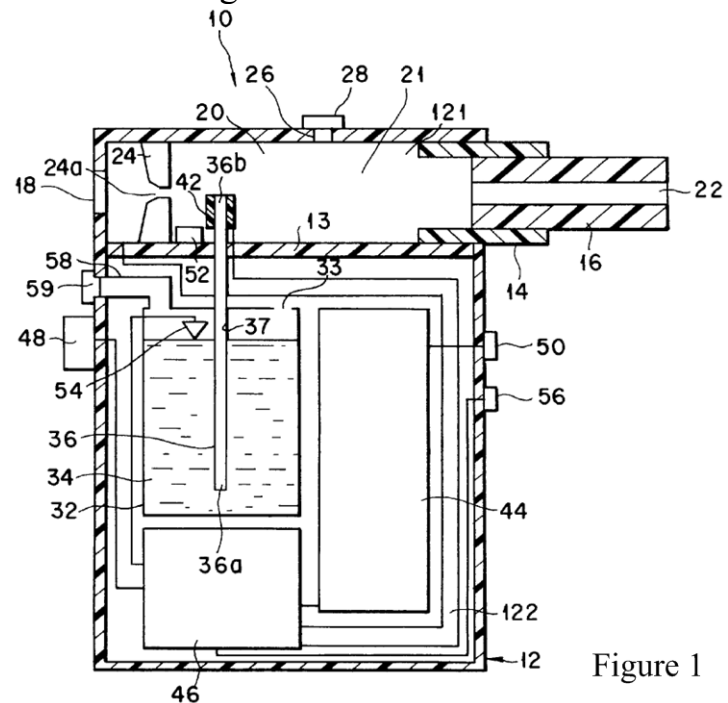


Figure 1

“The capillary tube 36 for transporting the liquid flavor source by the capillary force is inserted within the liquid container. The capillary tube 36 defines a liquid passageway 37 for the liquid flavor source, and its lower end 36a is positioned in the vicinity of the bottom of the liquid container 32.” Ex. 1003 at 5:47-52.

“In the present invention, the liquid passageway through which the liquid flavor source is transported by the capillary force can be constituted by the inner region of at least one capillary tube, a gap or space between at least two plates spaced apart from each other in substantially parallel, or an intercommunicating void or pore structure filled in an enclosure. The intercommunicating pore structure refers to a structure having intercommunicating voids or pores through which the liquid may be elevated from the inlet

of the passageway which is in fluid communication with the liquid flavor source contained in the liquid container to the outlet of the passageway by the capillary force. Representative examples of the structure include open-cell foamed structure, and bundled fibers, but should not be limited thereto.” *Id.* at 3:36-50.

Ex. 1003 at Figure 14:

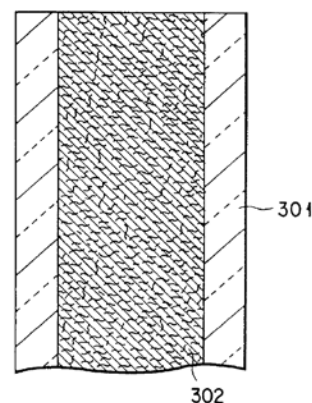
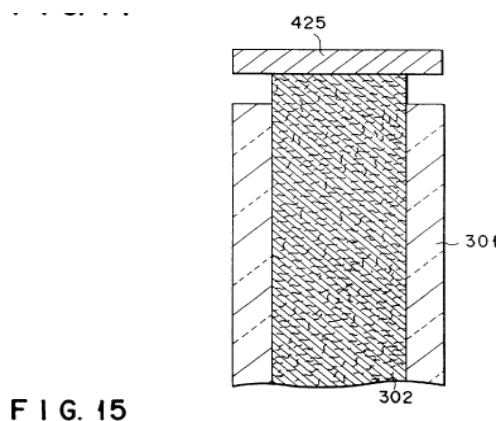


FIG. 14

“Fig. 14 is a cross-sectional view showing another embodiment of the liquid passageway for a liquid flavor source used in a flavor-generating device according to the invention. In this case, a liquid passageway 372 is constituted by the intercommunicating pore structure 302 filled in an enclosure 301, as mentioned earlier. The enclosure 301 may be provided by a tube, or two plates arranged spaced apart from each other wherein both sides are sealed. In this embodiment, a heater or heaters (not shown) may be arranged as in Fig. 1, 10 or 11. Further, as shown in FIG. 15, the intercommunicating pore structure 302 may protrude from the enclosure 301. In such a case, a heater 425 can be provided on the protruded end of the intercommunicating pore

structure.” *Id.* at 10:50-63.

Ex. 1003 at Fig. 15:



- i. **a heating wire in the atomizer having a central axis oriented substantially perpendicular to the longitudinal axis of the housing” and “a heating wire having a central axis generally perpendicular to a longitudinal axis of the housing”**

Claims 1 and 8 recite that the atomizer includes a heating wire in the atomizer having a central axis “oriented substantially perpendicular”/”generally perpendicular” to “the”/“a” longitudinal axis of the housing.

Takeuchi in combination with Whittemore discloses an atomizer including a heating wire having a central axis orientated substantially perpendicular to the longitudinal axis of the housing. As discussed in Section VI.E.2.b *supra*, Takeuchi discloses that the heating elements may be oriented either parallel or horizontal to the longitudinal axis of the housing. *See* Ex. 1003 at Figs 1 and 15. As explained in Section VI.E.1 *supra*, it would have been obvious to substitute Whittemore’s

heating wire for Takeuchi's heaters. Similar to the configuration disclosed in Takeuchi, and consistent with the teachings of Whittemore, it would have been a matter of routine design choice to arrange heating wire in intimate contact with the intercommunicating pore structure 302. Moreover, as taught by Takeuchi, the heating wire could be oriented generally parallel (Ex. 1003 at Fig. 1) or generally perpendicular (Ex. 1003 at Fig. 15) to the longitudinal axis of the claimed housing. The PHOSTA would have readily appreciated that heating wire could either be wrapped around the porous material 302. Alternatively, one or more strips of heating wire (the strips mimicking Whittemore's coiled structure) could be located across the top and/or exposed sides of the porous material 302 protruding from the tube 36. Ex. 1010 at ¶¶ 53-55.

Claim 1 and Claim 8	
<p><u>Claim 1:</u> [the atomizer including:] a heating wire in the atomizer having a central axis oriented substantially perpendicular to the longitudinal axis of the housing.</p> <p><u>Claim 8:</u> [the atomizer including] a heating wire having a central axis generally perpendicular to a longitudinal axis of the housing; and</p>	<p>Ex. 1003 at Figure 1:</p>

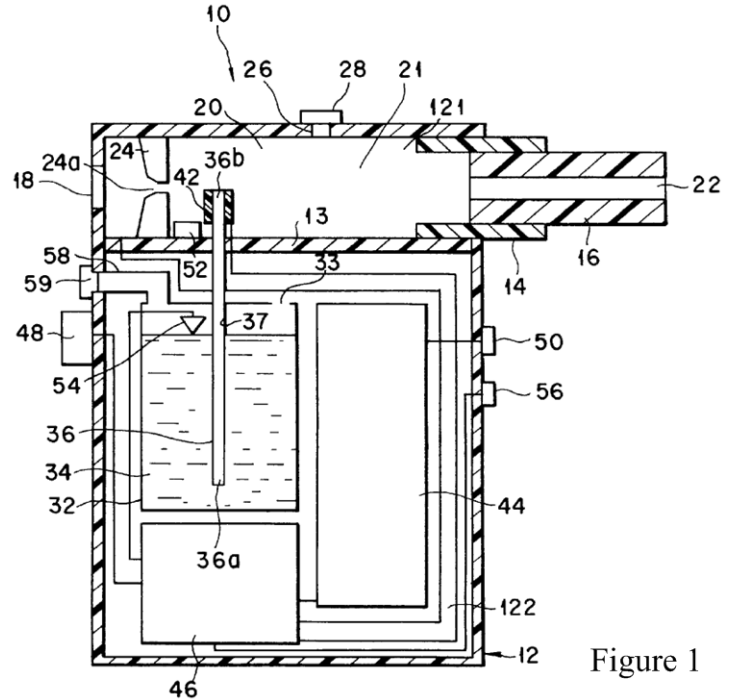


Figure 1

“[T]he heater 42 consists of a tubular body mounted to the capillary tube 36 and having an inner diameter equal to that of the capillary tube 36. In other words, the outlet port 36a [sic] of the liquid passageway 36 is formed by the heater 42 itself.” Ex. 1003 at 6:8-12.

Ex. 1003 at Fig. 15:

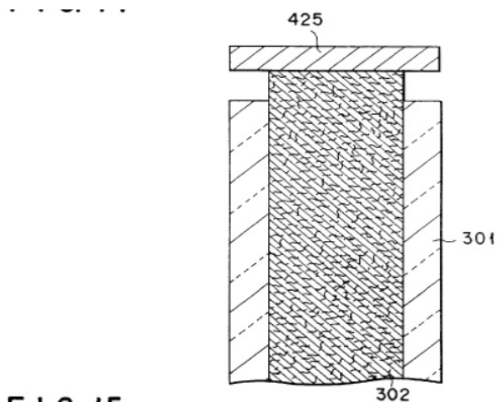
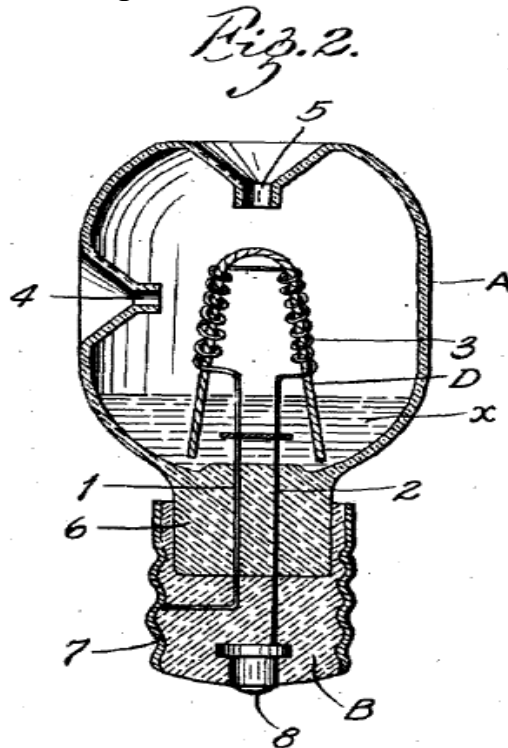


FIG. 15

“Further, as shown in FIG. 15, the intercommunicating pore structure 302 may protrude from the enclosure 301. In such a

case, a heater 425 can be provided on the protruded end of the intercommunicating pore structure.” Ex. 1003 at 10:50-63.

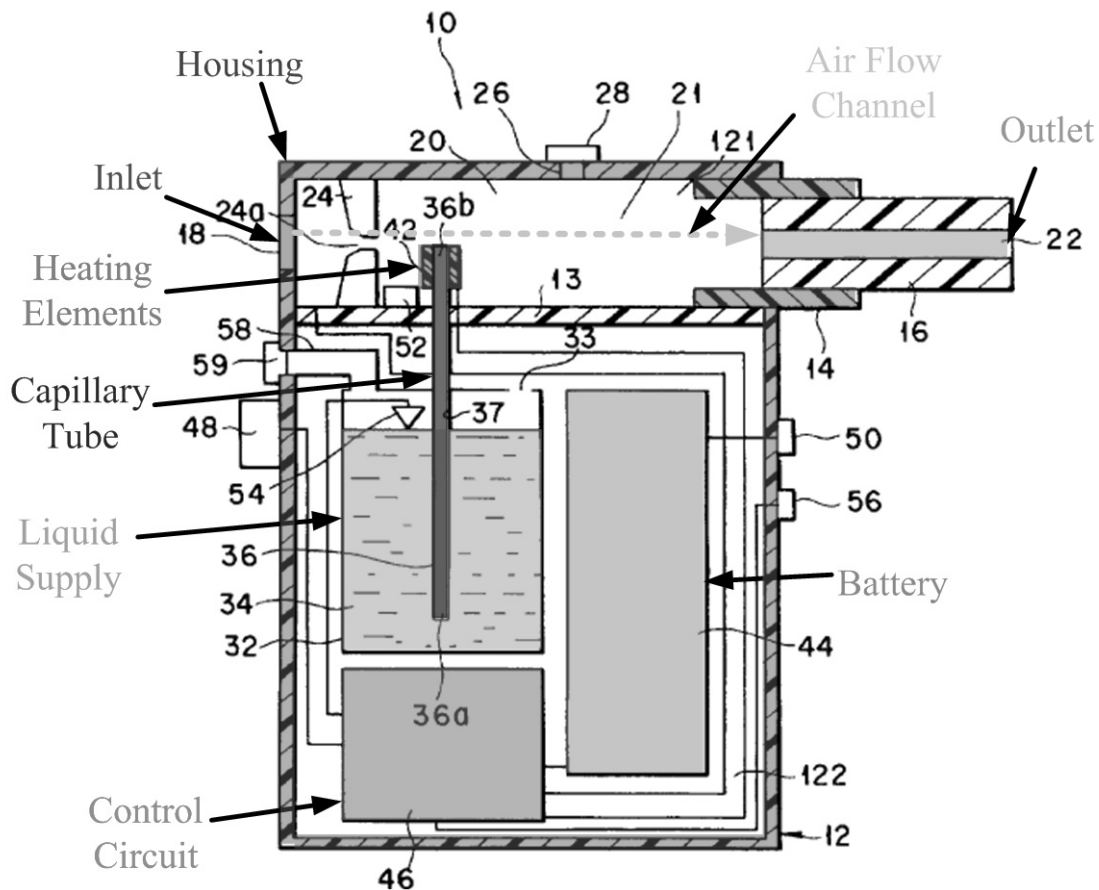
Ex. 1004 at Figure 2:



“[A] wick D made of any suitable material and combined with the heating element or filament 3 in such a way that a portion of said wick is always in contact or approximate contact with the heating element or filament 3, and a portion of said wick is always in contact with the medicament in the vaporizing vessel, whereby said medicament will be carried by capillary action to a point where it will be vaporized by the heat from the filament 3.” Ex. 1004 at 1:54-2:8.

j. “with the circuit board electrically connected to the battery and the heating wire”

Claim 8 recites the circuit board electrically connected to the battery, the sensor and the heating wire. Takeuchi discloses an electronic circuit board (control circuit 46) electrically connected to a battery (power source 44), sensor (sensor 52), and heater 42. Ex. 1003 at 7:51-56 (“As a result, an inhaling action signal is transferred from the sensor 52 to the control circuit 46. Then, under the control of the control circuit 46, an electric power is supplied from the power source 44 to the heater 42 so as to turn the heater 42 on.”), *see also id.* at 6:12-17, 6:23-25, 6:46-49, 9:1-5, Figure 1 (annotated) below.



Takeuchi’s electronic circuit also includes signal processing and control. *Id.* at 6:59-62 (“The signal processing and control are performed within the control circuit 46 in accordance with, for example, a known analog control, a two position control or a combination thereof.”). To the extent that Takeuchi discloses a control circuit but allegedly not a “circuit board,” the limitation is nonetheless obvious, because circuit boards were conventional, well-known components of small electronics devices long before the priority date of the ‘628 patent. Ex. 1010 at ¶ 74.

As noted in in Section VI.E.1 *supra*, Takeuchi in combination with Whittemore discloses that the heating element can be in the form of a heating wire. Takeuchi’s heating element is electrically connected to the power supply within the housing. Ex. 1003 at 7:53-56. Accordingly, Takeuchi in view of Whittemore discloses a wire shaped heating element that is electrically connected to the battery.

Claims 1 and 8	
with the circuit board electrically connected to the battery and the heating wire.	Ex. 1003 at Figure 1:

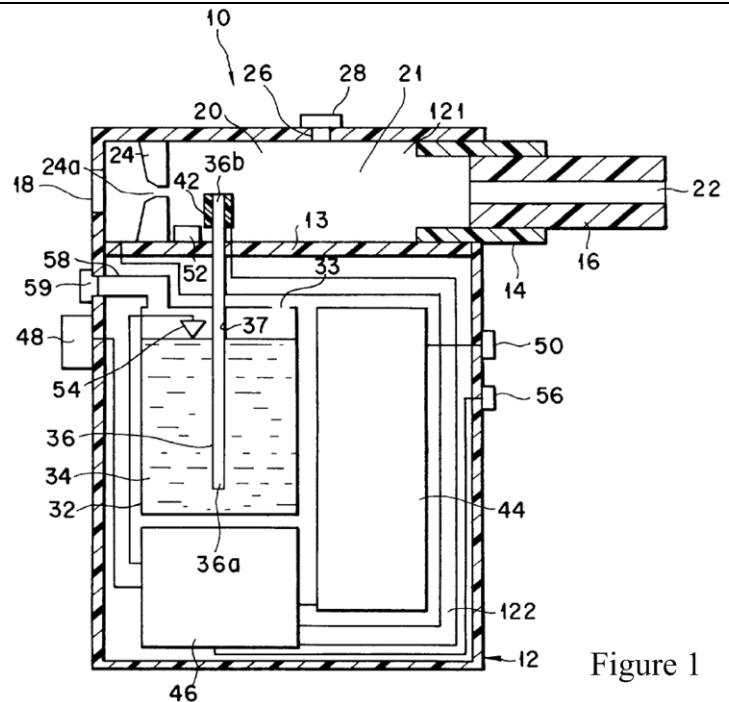


Figure 1

“The heater 42 and the power source 44 are driven under the control of the control circuit 46 fixed within the lower chamber 122. To the control circuit 46, a switch 48 for the heater 42 which can independently turn the heater on, and a sensor 52 for detecting the inhalation action of a use are connected.” Ex. 1003 at 6:23-28; *see also* 7:51-56, 6:12-17, 6:46-49, 6:59-62, 9:1-5.

3. Dependent Claim 2

a. “a battery, a sensor and an electronic circuit board within the housing”

Claim 2 recites the electronic cigarette of claim 1 further including a battery, a sensor and an electronic circuit board within the housing. As discussed above with respect to claim 8, Takeuchi discloses a battery, sensor and an electronic circuit board within the housing. Ex. 1003 at FIG. 1; Ex. 1010 at ¶ 81.

b. “with the circuit board electrically connected to the battery, the sensor and the heating wire”

Claim 2 further recites the circuit board electrically connected to the battery, the sensor and the heating wire. As discussed above with respect to claims 2 and 8, Takeuchi discloses the circuit board electrically connected to the battery, the sensor and the heating wire. Ex. 1010 at ¶ 81.

4. Dependent Claim 5

a. “the liquid supply comprising a fiber material”

Claim 5 recites the electronic cigarette of claim 1 with the liquid supply comprising a fiber material. Takeuchi in combination with Gehrer disclose an electronic cigarette with the liquid supply comprising a fiber material. As discussed above, Takeuchi discloses a liquid supply. Ex. 1003 at 5:28-33, Fig. 1. Moreover, as noted above, the PHOSITA would have been motivated to combine Gehrer’s fiber teachings with Takeuchi. Ex. 1010 at ¶¶ 56-62.

Claim 5	
The electronic cigarette of claim 1 with the liquid supply comprising a fiber material.	Ex. 1003 at Figure 1:

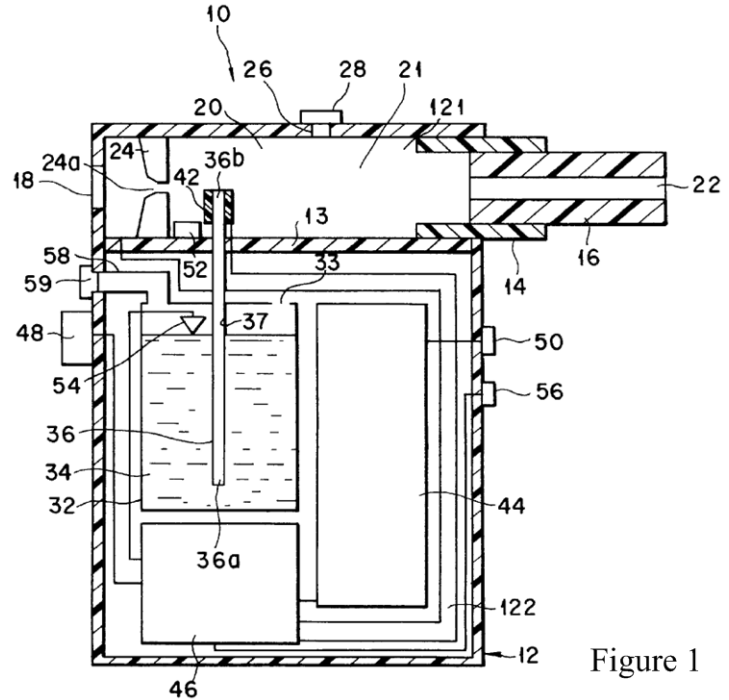


Figure 1

“In order to ensure the transfer of the liquid flavor source 34 by capillary force, the liquid container 32 is provided with an opening 33 communicating with the outer atmosphere so as to maintain the inner pressure of the liquid container 32 at an atmospheric pressure. It is desirable for the opening 33 to be formed at the highest position of the container 32 during the ordinary operation of the flavor-generating device and to have a sufficiently small diameter so that liquid flavor source 34 may not lead to the outside therethrough even if the device is inadvertently turned upside down. For example, a pin hole extending through the wall of the container 32 satisfies the particular requirements of the opening 33. Ex. 1003 at 5:57-6:3.

Ex. 1006 at Figure 3:

	<p>that has a sealing rim fitting into a groove 27B of the chamber 14.” <i>Id.</i> at 8:10-12.</p> <p>“The capillary body may be advantageously made of any suitable wicking material such as foam materials, felts, or fibrous materials, especially linear or elongated fiber material to form a storage for ink.” <i>Id.</i> at 3:7-11.</p>
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F. GROUND 2: CLAIMS 1, 2, 5, AND 8 OF THE ‘628 PATENT ARE UNPATENTABLE AS OBVIOUS OVER VOGES IN VIEW OF GEHRER

Claims 1, 2, 5, and 8 of the ‘628 patent are unpatentable under 35 U.S.C. § 103 as obvious over Voges in combination with Gehrer. Voges discloses all the features of claims 1, 2, 5, and 8 except for a porous body extending into the liquid supply and a liquid supply comprising fiber material. Gehrer discloses the features missing from Voges.

As noted above, the Board previously instituted a trial with respect to claims 1, 2, 5, 8 (as well as other claims of the ‘628 patent) based upon the combination of Voges and Gehrer. Ex. 1008 at p. 2. The case was dismissed at the parties’ request in view of an apparent settlement.

1. It Would Have Been Obvious To Combine Voges With Gehrer

It would have been obvious to the PHOSITA to combine Voges with Gehrer. Ex. 1010 at ¶¶ 85-90. Voges and Gehrer both address the same technical problem,

the transport of liquid from a liquid supply for use (*i.e.*, atomization) at another location within the device. Voges discloses a liquid container 10. Liquid nicotine is transported from the container 10 to the droplet ejection device 14 through inlet port 12. The liquid is consumed, *i.e.*, vaporized, by the droplet ejection device 14. In the illustrated embodiments, the liquid container 10 is a collapsible bladder, which is disposable or replaceable, and is in fluid communication with the inlet port 12 by means of a threaded bayonet or other suitable sealing connection. Ex. 1005 at 6:31-40. However, Voges contemplates other means for delivering liquid to the droplet ejection device, including by “capillary action.” *Id.* at 4:17-20. Gehrler discloses an alternative liquid delivery system that relies upon capillary action for transporting liquid (*i.e.*, ink) from a liquid supply for use (*e.g.*, atomization) by an ink consuming element such as an ink jet print head. Gehrler’s system includes an ink withdrawal port comprising a porous coupling member 20A and porous wick 38 extending into the liquid supply. Liquid is transported via capillary action by the wick 38 through coupling member 20A. Ex. 1006 at Abstract, 2:4-7, 6:19-20, 8:17-26. The coupling member 20A feeds the ink from the liquid supply to a printing head, a writing tip, or other ink consuming element. *Id.* at 8:53-67.

Gehrler discloses additional benefits of the liquid delivery system disclosed therein. The wick 38 prevents the coupling member 20A from drying out. *Id.* at

2:17-21; 5:14-30; 8:17-34. Moreover Gehrer's liquid supply also includes a capillary body 18 (*i.e.*, fiber material) for maintaining pressure equilibrium inside the liquid storage while also preventing leakage through vent 25. *Id.* at Abstract, 2:33-47 ("The chamber holding the capillary body that functions as a pressure equalization member vessel and additionally makes sure that ink cannot leak out through the vent"); 3:3-5 ("The present structure inherently prevents spilling"), 8:55-58 ("The capillary body [18] makes sure that the required pressure equalization inside the reservoir is provided in response to pressure and/or temperature variations during operation"). The capillary body 18 also includes a wick to ensure that the ink facing surface of the capillary body does not dry out. *Id.* at 2:17-21, 5:14-29.

For several reasons, the PHOSITA would have been motivated to either substitute Gehrer's liquid supply for the liquid supply of Voges, or, in the alternative, modify the liquid supply of Voges to have the features taught by Gehrer. First, Gehrer discloses a "simple and cost efficient" (*id.* at 3:6-7) system for transporting liquid via "capillary action," a mechanism of fluid transport expressly contemplated by Voges. Thus, the PHOSITA would have been motivated to simply substitute Gehrer's liquid supply for the liquid container 10 of Voges. The proposed substitution is nothing more than the substitution of one known element (*i.e.*, Gehrer's liquid storage container) for another (*i.e.*, Voges'

liquid storage container) to obtain predictable results, namely, transport of liquid via capillary action from the liquid supply to the droplet ejection device 14 of Voges. Although nothing more is required to demonstrate the motivation for the proposed combination, Gehrer's teachings nevertheless provide further motivation for the proposed combination. Gehrer's liquid supply system includes features that improve upon the liquid container 10 of Voges. Gehrer's system includes a capillary body 18 (and associated vent) for maintaining pressure equilibrium within the liquid supply while also preventing leakage, regardless of the orientation of the device. Voges does not even address these issues, much less offer solutions. Thus, the PHOSITA would have been further motivated to modify Voges to include the features of Gehrer's liquid supply to achieve the additional – and predicted – benefits of maintaining pressure equilibrium within the liquid supply while also preventing leakage. Modifying Voges as taught by Gehrer is merely the combination of known elements to achieve predictable results.

The Board previously instituted trial on claims 1, 2, 5, and 8 based upon the combination of Voges and Gehrer. As noted below, the proposed combination discloses all of the elements of claims 1, 2, 5, and 8. *See* Ex. 1010 at ¶¶ 91-104.

2. Claims 1 and 8

Because claims 1 and 8 are similar, they are addressed together.

a. “an electronic cigarette”

The preambles of claims 1 and 8 both recite “[a]n electronic cigarette, comprising.” To the extent the preamble is a limitation, Voges discloses an electronic cigarette. Voges “cigarette substitute,” or electronic cigarette, includes components that use electricity. Ex. 1005 at 5:66-6:2 (“Device 14 and control means 16 as well as other electrically-powered parts are energized by means of hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user.”).

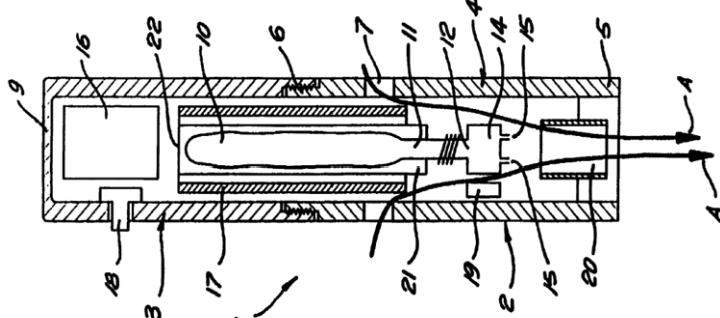
Claims 1 and Claim 8	
An electronic cigarette, comprising:	<p>“It is an object of other preferred embodiments of the invention to provide a cigarette substitute.” Ex. 1005 at 3:29-30.</p> <p>“With reference to FIGs. 1 and 2 there is shown a first embodiment of the invention consisting of a nicotine dispenser comprising a cigarette-shaped hollow tubular body 1” <i>Id.</i> at 5:48-51.</p> <p>“Device 14 and control means 16 as well as other electrically-powered parts are energized by means of a hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user. <i>Id.</i> at 5:66-6:2.</p> <p>“This not only produces a sensation on inhalation similar to that obtained by smoking a combustible cigarette” <i>Id.</i> at 6:27-28.</p> <p>“By selectively programming of the controller the smoking instrument can be adjusted to simulate ‘light’ or ‘ultralight’ cigarette nicotine levels” <i>Id.</i> at 8:57-60.</p> <p>“The invention is of particular application for</p>

	assisting those wishing to withdraw from cigarette smoking being programmable to progressively reduce the dose of nicotine obtainable.” <i>Id.</i> at 8:63-66.
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b. “a housing having a longitudinal axis”

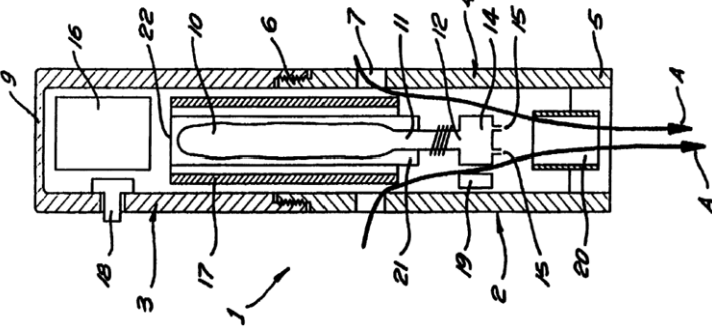
Claim 1 recites “a housing having a longitudinal axis.” The Board previously construed “longitudinal axis” under the applicable BRI standard to mean “the axis along the length, *i.e.*, the longest dimension, of an object.”

The axis along the longest dimension of Voges is along the tubular body 1 from end 9 to mouthpiece 5. Ex. 1005, FIG. 2 and 5:48-51.

Claim 1	
a housing having a longitudinal axis,	<p>Ex. 1005 at Figure 2:</p>  <p>“[A] first embodiment of the invention consisting of a nicotine dispenser comprising a cigarette-shaped hollow tubular body 1 comprising connected body parts 2, 3.” Ex. 1005 at 5:48-51.</p>

c. “an inlet and an outlet” and “a housing having an inlet and an outlet”

Claim 1 recites “an inlet and an outlet,” and claim 8 recites “a housing having an inlet and an outlet. Voges discloses an inlet (slots 7) and an outlet (mouthpiece 5) in the housing. Ex. 1005, FIG. 2 and 6:2-5.

Claim 1 and Claim 8	
<p><u>Claim 1:</u> an inlet and an outlet;</p> <p><u>Claim 8:</u> a housing having an inlet and an outlet;</p>	<p>Ex. 1005 at Figure 2:</p>  <p>“[A] first embodiment of the invention consisting of a nicotine dispenser comprising a cigarette-shaped hollow tubular body 1 comprising connected body parts 2, 3. Body part 2 has a sidewall 4, a mouthpiece 5 at or adjacent one end and a threaded other end 6. A plurality of axially extending slots 7 penetrate side wall 4.” Ex. 1005 at 5:48-54.</p> <p>“When a user inhales at mouthpiece 5, a stream of air ‘A’ is drawn into body 1 via slots 7, through body part 2, and mouthpiece 5 into the user's lungs.” Ex. 1005 at 6:2-5.</p> <p>“With reference to FIG. 5 there is shown a dispenser comprising a pen shaped hollow tubular body 1 assembled from hollow body parts.” Ex. 1005 at 10:43-45.</p> <p>“Tubular body 1 may be made of any suitable material e.g. plastics, ceramics, precious metals</p>

	or the like. Mouthpiece 5 may be integral or may be soft-tip, for example of rubber or plastics cardboard, or paper and may be independently disposable.” Ex. 1005 at 8:28-32.
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d. “a liquid supply in the housing”

Claim 1 recites a liquid supply in the housing. The Board previously construed “liquid supply” under the applicable BRI standard to mean “a part of the recited electronic cigarette that includes one or more components that supply liquid to the atomizer.”

Voges discloses a liquid supply (container 10) in the housing. Ex. 1005, FIG. 2.

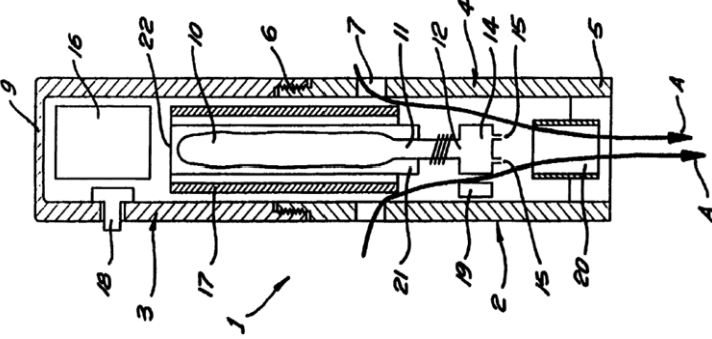
Claim 1	
a liquid supply in the housing;	<p>Ex. 1005 at Figure 2:</p> <p>“Nicotine in a suitable solvent (for example water) is provided in container 10 which is adapted by means of a spigot shaped outlet and coupling 11, for fluid connection in an inlet port 12 of a droplet ejection device 14. In the</p>

	<p>present example, device 14 is of the kind used in a bubble jet printer and is provided with one or more droplet ejection orifices.” <i>Id.</i> at 5:58-64.</p> <p>“[T]he active substance container 10 is a collapsible bladder which is housed within a protective hollow cylindrical cartridge 21 having an air vent 22.” Ex. 1005 at 6:31-34.</p> <p>“However other forms of container (for example a cylinder fitted with a piston) could be used. Cartridge 21 is optional and serves to shield bladder 10. Container 10 is disposable or replaceable and may be adapted for fluid communication with inlet 12 of device 14 by means of a threaded, bayonet, or other suitably sealing connection.” <i>Id.</i> 6:37-40.</p> <p>“Cartridge 10 is in fluid communication with one or more droplet ejector devices 14 via one or more conduits 11.” <i>Id.</i> at 10:50-53.</p>
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e. “a liquid supply, a battery, and an electronic circuit board in the housing”

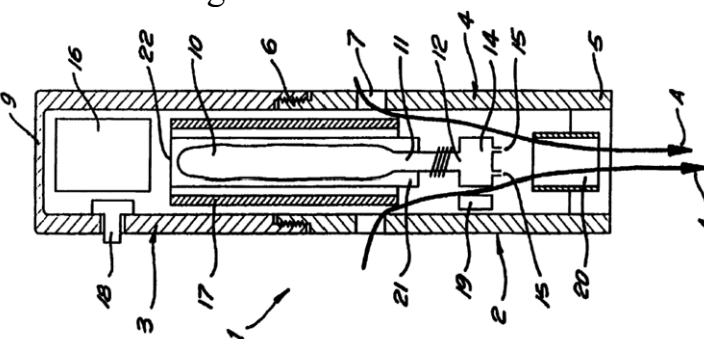
Claim 8 recites a liquid supply, a battery and an electronic circuit board in the housing. As noted with respect to claim 1, Voges discloses a liquid supply. Voges also discloses a battery 17, and an electronic circuit board (control means 16) within the housing. Voges’s control means 16 would have been understood by the PHOSITA to be an electronic circuit board electrically connected to a sensor (pressure sensor 19) within the housing. To the extent that Voges is deemed to disclose a circuit but not a “circuit board,” it would render this limitation obvious,

as circuit boards were conventional components of small electronic devices before the priority date of the '628 patent. Ex. 1005, FIG. 2; Ex. 1010 at ¶¶ 74, 101.

Claim 8	
<p>a liquid supply, a battery, and an electronic circuit board in the housing;</p>	<p>See claim 1 for “liquid supply”</p> <p>Ex. 1005 at Figure 2:</p>  <p>“Optionally, battery 17 may be of annular form and adapted to sleeve cartridge 21 to save space.” <i>Id.</i> at 6:41-42.</p> <p>“The battery may be replaceable or rechargeable.” <i>Id.</i> at 8:32.</p> <p>“Device 14 is controlled by control means 16, for example a microelectronic circuit or microprocessor means. Device 14 and control means 16 as well as other electrically-powered parts are energised by means of a hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user.” <i>Id.</i> at 5:66-6:2.</p>

- f. “an air flow channel in the housing connecting the inlet to the outlet” and “an air flow channel in the housing between the inlet and the outlet”

Claims 1 and 8 recite an air flow channel in the housing connecting/between the inlet to the outlet. Voges airflow (airstream A) from inlet slots 7 to outlet (mouthpiece 5). Ex. 1005, FIG. 2.

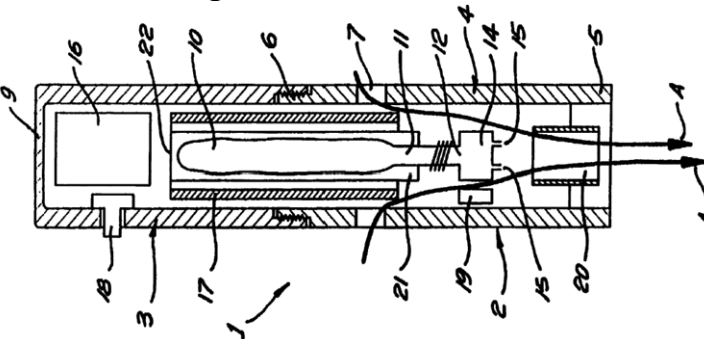
Claims 1 and Claim 8	
<p><u>Claim 1:</u> an air flow channel in the housing connecting the inlet to the outlet;</p> <p><u>Claim 8:</u> an air flow channel in the housing between the inlet and the outlet</p>	<p>Ex. 1005 at Figure 2:</p>  <p>“When a user inhales at mouthpiece 5, a stream of air ‘A’ is drawn into body 1 via slots 7, through body part 2, and mouthpiece 5 into the user's lungs.” Ex. 1005 at 6:2-5.</p> <p>“The liquid containing nicotine issues from device 14 as a fine spray of droplets which are entrained in the inhalation airflow from slots 7 to-wards mouthpiece 5.” <i>Id.</i> at 6:19-21.</p>

- g. “and an atomizer assembly in the housing between the inlet and the outlet” and “an atomizer in the housing”

Claim 1 recites and an atomizer assembly in the housing between the inlet and the outlet, and Claim 8 recites an atomizer in the housing. The Board

construed “atomizer” under the BRI standard applicable here to mean “a part of the electronic cigarette that includes components that participate in facilitating atomization, but not components included in other recited parts of the electronic cigarette, such as the liquid supply.”

Voges discloses an atomizer assembly comprising droplet ejection device 14 and droplet ejection orifices 15 located between the inlet and outlet of the housing. Ex. 1005, FIG. 2.

Claim 1 and Claim 8	
<p><u>Claim 1:</u> and an atomizer assembly in the housing between the inlet and the outlet,</p> <p><u>Claim 8:</u> an atomizer in the housing including:</p>	<p>Ex. 1005 at Figure 2:</p>  <p>“Device 14 responds to the output signal or signals by issuing a plurality of droplets of nicotine solution from orifices 15 of device 14. The liquid containing nicotine issues from device 14 as a fine spray of droplets which are entrained in the inhalation airflow from slots 7 towards mouthpiece 5. The spray typically comprises fine droplets which tend to vaporise in the airflow.” Ex. 1005 at 6:17-23.</p> <p>“The ejected volume of liquid is automatically replaced in the chamber from a reservoir by capillary action or by atmospheric pressure acting on collapsible reservoir bladder, a piston or the like.” <i>Id.</i> at 4:17-20.</p>

**h. “a porous body projecting into the liquid supply” and
“a porous body extending into the liquid supply”**

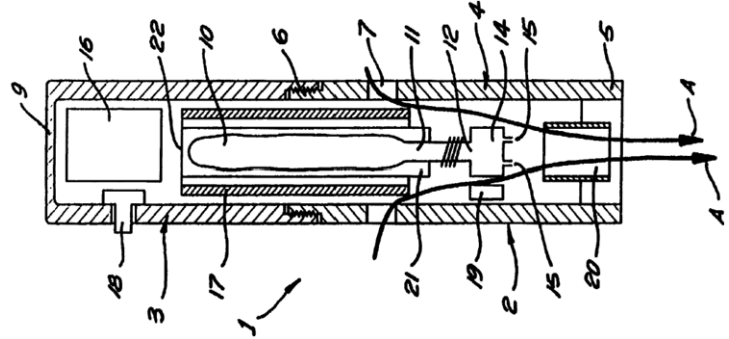
Claims 1 and 8 recite that the atomizer includes a porous body projecting/extending into the liquid supply. The Board previously construed “projecting into” and “extending into,” under the BRI standard applicable here to mean “having at least a portion that protrudes into.”

Voges in combination with Gehrer discloses an atomizer assembly having a porous body projecting into the liquid supply. First, Voges includes a liquid supply, namely, container 10 that contains liquid nicotine. *See* Sections VI.F.2.d *supra*. As discussed above in Section VI.F.1, it would have been obvious to substitute Gehrer’s liquid supply for Voges’ liquid container 10, or, in the alternative, to modify Voges’ liquid container to include the features of Gehrer’s liquid supply. The PHOSITA would have connected Gehrer’s coupling member 20A with the inlet port 12 of the atomizer assembly in Voges. The ink conducting element (wick 38) would be part of the atomizer assembly, because it delivers liquid for atomization and thus facilitates atomization. Ex. 1010 at ¶¶ 88, 98.

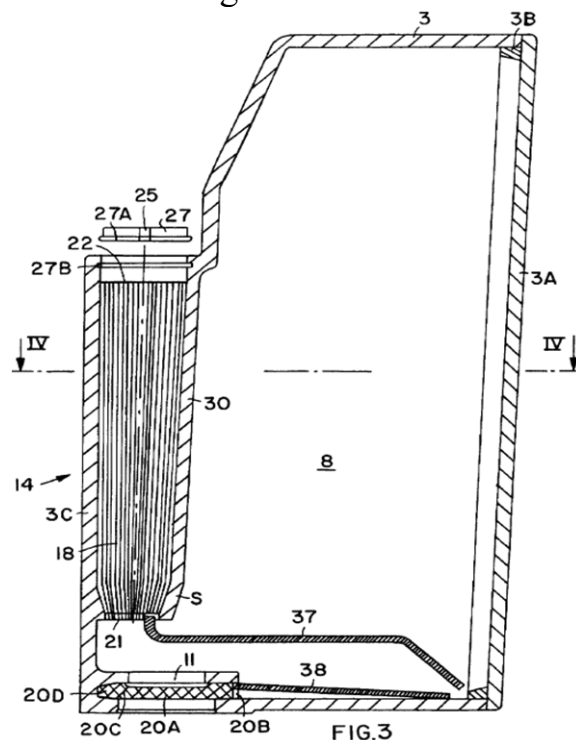
Claim 1 and Claim 8	
<u>Claim 1:</u> [the atomizer including:] a porous body projecting into the liquid supply;	Ex. 1005 at Figure 2:

Claim 8:

[the atomizer including] a porous body extending into the liquid supply;



Ex. 1006 at Figure 3:



“All eight figures illustrate the basic construction of the present ink pot or ink container. In all embodiments the ink container 1 or 2 or 3 or 4 or 5 encloses an ink reservoir 6 or 7 or 8 or 9 or 10. Each container comprises an ink withdrawal opening or port 11 which is closed by a capillary coupling member 20, 20A, 20E. These coupling members may have different configurations and they may be made of different wicking materials. In all instances the function is the same, namely to supply ink

	<p>out of the reservoir into a printing head not shown but connected to socket” <i>Id.</i> at 6:11-24.</p> <p>“Further, in FIG. 3 each of the capillary components, namely the capillary coupling member 20A and the capillary body 18 are provided with their respective ink conducting elements 38 and 37 such as a wick connected at one end to the coupling 20A or to the body 18 while the other end reaches to the lowest point in the reservoir 8 to keep the coupling member 20A and the front end or facing end 21 wetted with ink.” <i>Id.</i> at 8:17-26.</p> <p>“In order to facilitate the function of the wicking elements 37 and 38 to keep the coupling member 20A and the forward or facing end 21 constantly wetted, it is preferred to end these wicking elements in a lowest spot that may be formed as a sink in the container.” <i>Id.</i> at 8:27-31.</p> <p>“. . . to make the capillary body and capillary coupling member of readily available inexpensive capillary wicking material such as open cell foam materials, felts, fibers, especially linear fiber materials.” <i>Id.</i> at 2:4-7.</p>
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- i. a heating wire in the atomizer having a central axis oriented substantially perpendicular to the longitudinal axis of the housing” and “a heating wire having a central axis generally perpendicular to a longitudinal axis of the housing”**

Claims 1 and 8 recite a heating wire in the atomizer/a heating wire having a central axis oriented substantially perpendicular/generally perpendicular to the/a longitudinal axis of the housing.

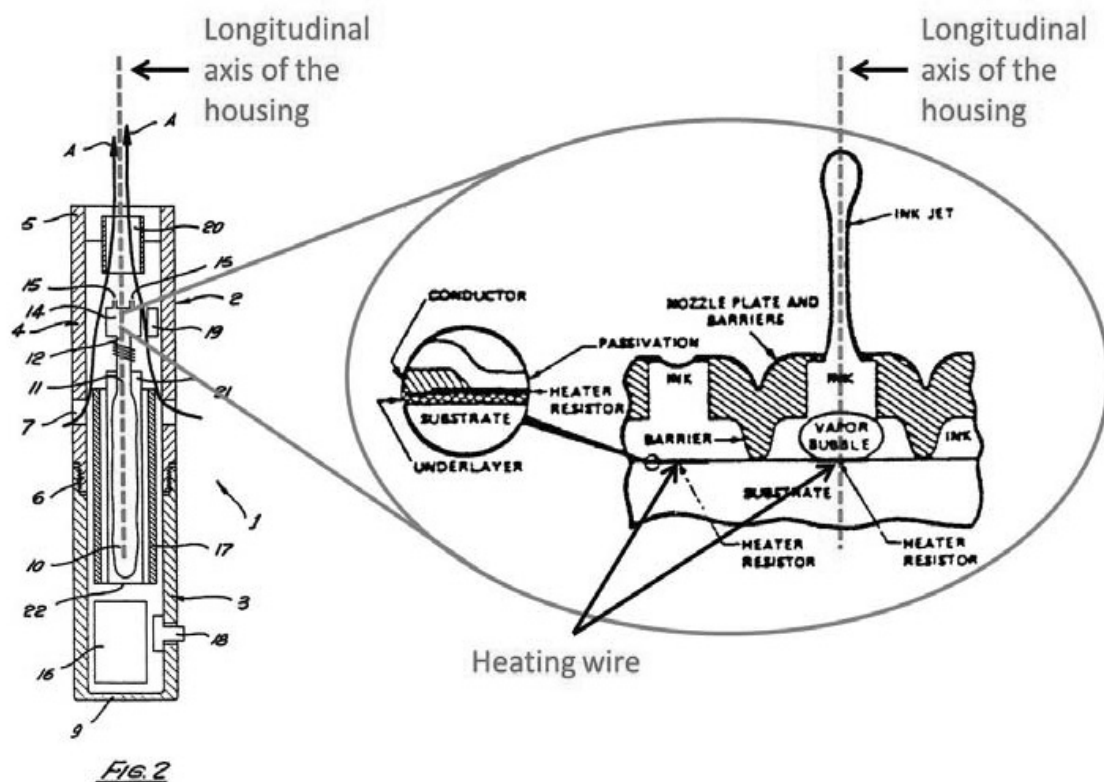
Voges discloses the claimed structure. Voges discloses an atomizer assembly comprising a droplet ejection device 14, and incorporates by reference, among other things, thermal devices as described in ‘Thermal Ink-Jet Print Cartridge Designers Guide’ (2nd Edition Hewlett Packard). Ex. 1005, 3:66-4:5; Ex. 1007. The Ink Jet Guide discloses a droplet ejection device with a heating wire (*i.e.*, thin film resistor) located behind a nozzle within the bubble jet device where it is energized resulting in vaporization of the liquid contacting the heating wire.

Also, it was well known that a heating resistor may include a wire. *See* Ex. 1020, U.S. Patent No. 7,284,424 (“Kanke”) at 1:23-26 (disclosing that a heating resistor includes a wire: “[I]ts heating resistor is constructed by winding a platinum wire around a bobbin and then coating the wire with glass, or by forming a thin film resistor on a ceramic substrate or a silicon substrate”). This is further confirmed by the Board’s prior decision that determined that a thin film resistor could include a heating wire. Ex. 1008 at pp. 18-19 (“[A]n ordinary artisan would

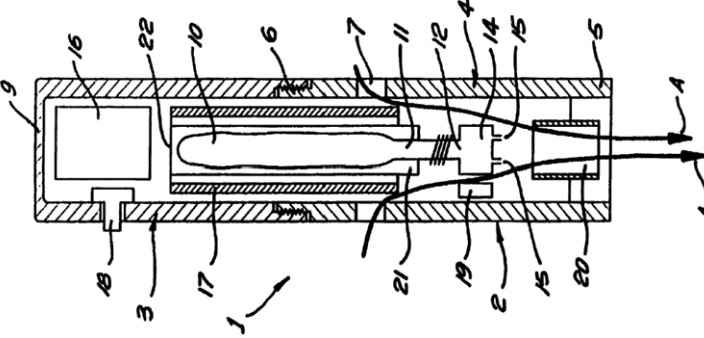
have understood that thin film resistors included heating wires, such as platinum wire.”).

Given the space limitations in the droplet ejection device 14, a heating wire, and more specifically, a thin film resistor, would have been well adapted for use in this application, as Voges teaches, because it would reduce the space requirements of the droplet ejection device 14.

The Ink Jet Guide further teaches that the heating wire’s (thin film resistor) central axis is oriented perpendicular to the direction in which the liquid is expelled, as illustrated in the figure below.

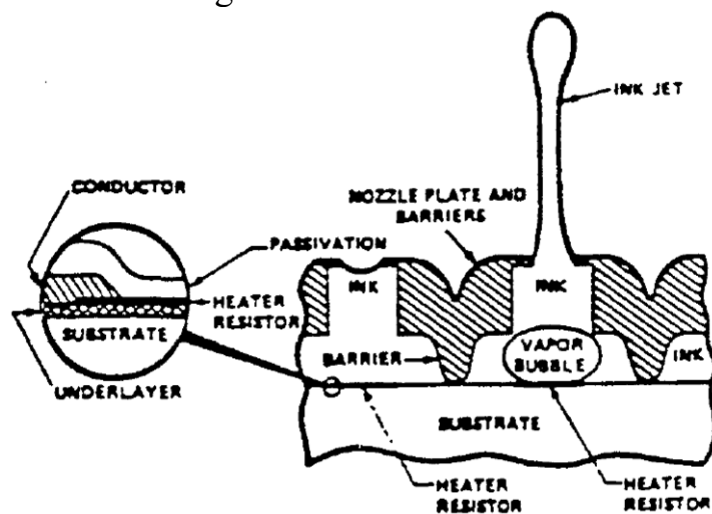


The heating wire vaporizes liquid, creating a vapor bubble that expels liquid through the nozzle along the longitudinal axis of the housing. The heating wire, on the other hand, is perpendicular to the longitudinal axis. Ex. 1010 at ¶¶ 99-100.

Claim 1 and Claim 8	
<p><u>Claim 1:</u> [the atomizer including:] a heating wire in the atomizer having a central axis oriented substantially perpendicular to the longitudinal axis of the housing.</p> <p><u>Claim 8:</u> [the atomizer including] a heating wire having a central axis generally perpendicular to a longitudinal axis of the housing; and</p>	<p>Ex. 1005 at Figure 2:</p>  <p>“In preferred embodiments of the invention, the droplet ejection device (“DED”) . . . is a thermal ‘bubble jet’ device of the kind used in ink jet printing. . . . By way of example . . . thermal devices are broadly described in “Thermal Ink-Jet Print Cartridge Designers Guide” (2nd Edition Hewlett Packard), both incorporated herein by reference.” Ex. 1005 at 3:62-4:5.</p> <p>“Briefly, a typical thermal device consists of a liquid-containing chamber provided with an array of twelve coaxially divided nozzles and has twelve thin film resistors, a resistor being located directly behind each nozzle. Each nozzle supplies a droplet of liquid from the chamber if and when the corresponding resistor is energized by a short electrical pulse. The resistors thus function as ejection means. . . . The ejected volume of liquid is automatically replaced in the chamber from a reservoir by</p>

capillary action or by atmospheric pressure acting on collapsible reservoir bladder, a piston or the like.” *Id.* at 4:6-20.

Ex. 1007 at Figure 2:

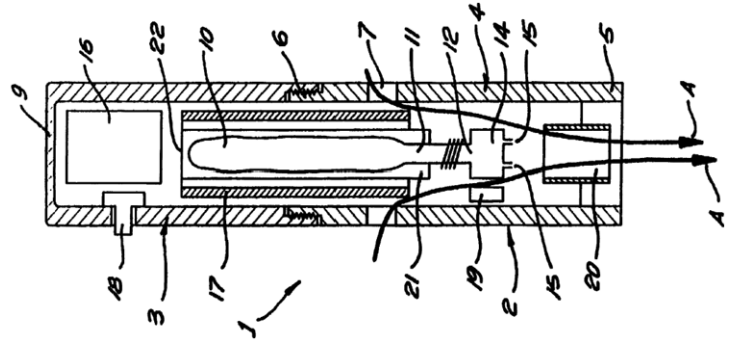


“The resistors are located directly behind each nozzle as shown in Figure 2. Each nozzle can supply a droplet of ink on demand by energizing the corresponding resistor... Within a few microseconds the ink above the resistor is vaporized. The vapor bubble grows rapidly and imparts momentum to the ink above the bubble.” Ex. 1007 at p. 2.

j. “with the circuit board electrically connected to the battery and the heating wire”

Claim 8 recites the circuit board electrically connected to the battery and the heating wire.

Claim 8	
with the circuit board electrically connected to the battery and the heating wire.	Ex. 1005 at Figure 2:



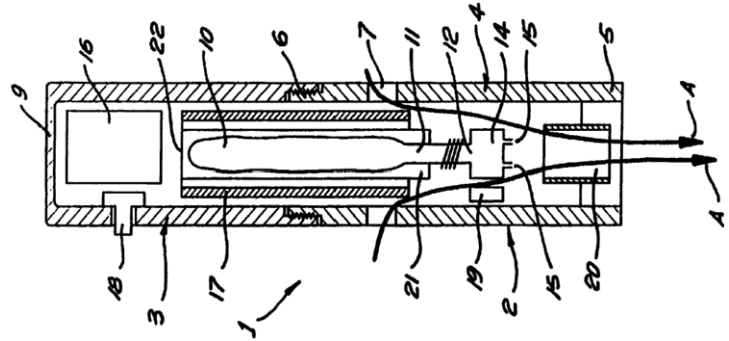
“Device 14 is controlled by control means 16, for example a microelectronic circuit or microprocessor means. Device 14 and control means 16 as well as other electrically-powered parts are energised by means of a hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user.” Ex. 1005 at 5:66-6:2.

3. Dependent Claim 2

a. “a battery, a sensor and an electronic circuit board within the housing”

Claim 2 recites the electronic cigarette of claim 1 further including a battery, a sensor and an electronic circuit board within the housing. Voges discloses these features.

Claim 2	
The electronic cigarette of claim 1 further including a battery, a sensor and an electronic circuit board within the housing,	Ex. 1005 at Figure 2:



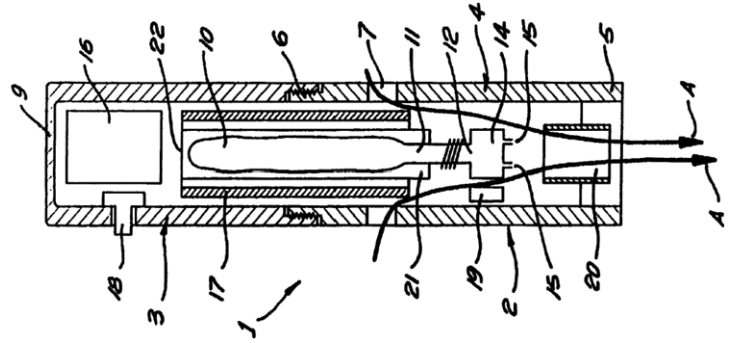
“Device 14 is controlled by control means 16, for example a microelectronic circuit or microprocessor means. Device 14 and control means 16 as well as other electrically-powered parts are energised [sic] by means of a hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user.” Ex. 1005 at 5:66-6:2.

“A pressure sensor 19 detects a change in pressure in the device due to inhalation or suction at mouthpiece 5 and issues an actuation signal via cables (not illustrated) to control means 16.” *Id.* at 6:8-11.

b. “with the circuit board electrically connected to the battery, the sensor and the heating wire”

Claim 2 further recites the circuit board electrically connected to the battery, the sensor and the heating wire. Voges discloses these features.

Claim 2	
with the circuit board electrically connected to the battery, the sensor and the heating wire.	Ex. 1005 at Figure 2:



“Device 14 is controlled by control means 16, for example a microelectronic circuit or microprocessor means. Device 14 and control means 16 as well as other electrically-powered parts are energised [sic] by means of a hollow cylindrical battery 17 via an on-off switch 18 extending through side wall 14 and operable by the user.” Ex. 1005 at 5:66-6:2.

“A pressure sensor 19 detects a change in pressure in the device due to inhalation or suction at mouthpiece 5 and issues an actuation signal via cables (not illustrated) to control means 16. Control means 16 responds to the actuation signal by issuing an output signal or signals via cables (not illustrated) to device 14 according to pre-programmed parameters or algorithms as hereinafter described.” *Id.* at 6:8-15.

4. Dependent Claim 5

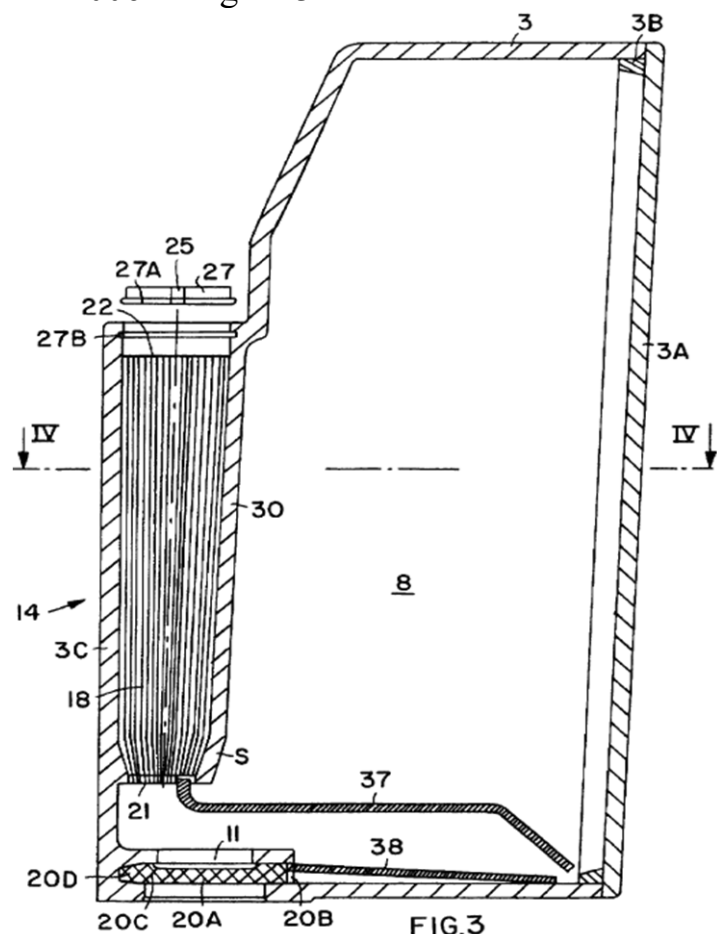
a. “the liquid supply comprising a fiber material”

Claim 5 recites the electronic cigarette of claim 1 with the liquid supply comprising a fiber material. Gehrer illustrates a liquid supply comprising a fiber material (capillary body 18). Ex. 1006 at FIG. 3 and 3:7-11.

Claim 5

The electronic cigarette of claim 1 with the liquid supply comprising a fiber material.

Ex. 1006 at Figure 3:



“The capillary body [18] may be advantageously made of any suitable wicking material such as foam materials, felts, or fibrous materials, especially linear or elongated fiber material to form a storage for ink. Such a capillary body can be simply cut from commercially available half finished materials as mentioned above. These materials are relatively inexpensive, yet their intended wicking function by capillary action is assured with certainty. ” Ex. 1006 at 3:7-15.

“FIGS. 3 and 4 illustrate the arrangement of the chamber 14 with its capillary body 18 so as to share an outside wall 3A of the ink container 3 which is closed by a cover 3A provided with a

	<p>seal rim 3B.” <i>Id.</i> at 7:62-65.</p> <p>“This equalization of the capillary flow areas is especially advantageous in connection with capillary bodies made of linear or elongated fibers.” <i>Id.</i> at 3:28-30.</p> <p>“The capillary bodies 16 or 17 in the chambers 12 or 13 are preferably made of fibrous materials forming a capillary storage for ink. The preferred fibers are linear or elongated fibers for this purpose.” <i>Id.</i> at 6:33-36.</p>
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VIII. CONCLUSION

For the foregoing reasons, there is a reasonable likelihood that Petitioner will prevail in its challenge of patentability for at least one of claims 1, 2, 5, and 8 of the '628 patent. Petitioner request institution of an *inter partes* review to cancel the challenged claims.

Dated: August 3, 2016

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

The undersigned certifies that this brief complies with the type-volume limitations of 37 CFR § 42.24(a)(1)(i). This brief contains 12,674 words as calculated by the “Word Count” feature of Microsoft Word 2010, the word processing program used to create it.

The undersigned further certifies that this brief complies with the typeface requirements of 37 CFR § 42.6(a)(2)(ii) and typestyle requirements of 37 CFR § 42.6(a)(2)(iii). This brief has been prepared in a proportionally spaced typeface using Microsoft Word 2010 in Times New Roman 14 point font.

DATED: August 3, 2016

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on August 3, 2016, a complete and entire copy of this Petition for *Inter Partes* Review, and all supporting exhibits, were served EXPRESS MAIL® to the Patent Owner by serving the correspondent of record, as indicated below:

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