

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. IPR2017-01118

**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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37 C.F.R. § 42	1, 2, 8, 13
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OTHER AUTHORITIES

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LIST OF EXHIBITS

Exhibit No.	Exhibit
1001	U.S. Pat. No. 8,490,628 (“the ‘628 patent”)
1002	Expert Declaration of Robert Sturges, Ph.D. (“Sturges Decl.”)
1003	U.S. Pat. No. 6,155,268 (“Takeuchi”)
1004	U.S. Pat. No. 2,057,353 (“Whittemore”)
1005	The ‘628 Patent File History
1006	IPR2016-01527 Paper 10: Decision for <i>Inter Partes</i> Review Institution
1007	IPR2016-01283 Paper 12: Decision for <i>Inter Partes</i> Review Institution
1008	IPR2016-01285 Paper 10: Decision for <i>Inter Partes</i> Review Institution
1009	IPR2014-01300 Paper 8: Decision for <i>Inter Partes</i> Review Institution
1010	U.S. Pat. No. 5,743,251 (“Howell”)
1011	U.S. Pat. No. 1,514,682 (“Wilson”)
1012	U.S. Pat. No. 7,284,424 (“Kanke”)
1013	U.S. Pat. No. 4,947,874 (“Brooks”)
1014	U.S. Pat. No. 5,745,985 (“Ghosh”)
1015	U.S. Pat. No. 4,208,005 (“Nate”)
1016	U.S. Pat. No. 4,945,448 (“Bremenour”)
1017	U.S. Pat. No. 5,144,962 (“Counts”)
1018	Mark’s Standard Handbook for Mechanical Engineers, Eugene A. Avallone et al., published 1978, page 15-6.
1019	Excerpts from James W. Dally, <i>Packaging of Electronic Systems: A Mechanical Engineering Approach</i> (1990) (“Dally”)
1020	U.S. Pat. No. 6,598,607 (“Adiga”)
1021	U.S. Pat. No. 4,793,365 (“Sensabaugh”)
1022	U.S. Pat. No. 5,203,355 (“Clearman”)

1023	U.S. Pat. No. 2,472,282 ("Burchett")
1024	U.S. Pat. No. 2,032,695 ("Gimera")
1025	<i>Wire</i> , <u>Merriam-Webster's Collegiate Dictionary</u> (10 th ed. 2002)
1026	Declaration of James Donnelly

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42, R.J. Reynolds Vapor Company (“Petitioner”) respectfully requests *Inter Partes* Review (“IPR”) of claims 1, 2, 3, 5, 7 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. (“Patent Owner”). 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 IPR Petition, and authorizes payment of any additional fees to be charged to this Deposit Account.

This Petition demonstrates a reasonable likelihood that claims 1-3, 5, 7 and 8 of the ‘628 patent are unpatentable. The claims generally are directed to an electronic cigarette comprising an “atomizer assembly” including “a porous body projecting into a liquid supply” and a “heating wire” having a “central axis oriented substantially perpendicular to the longitudinal axis of the housing.” As explained herein, claims 1-3, 5, 7 and 8 are invalid as anticipated under § 102 based on Takeuchi or obvious under § 103 based on Takeuchi in view of Whittemore, because they merely comprise the simple substitution and/or combination of known elements to yield predictable results.

Specifically, Takeuchi discloses a flavor- generating device that uses tobacco liquid. Takeuchi discloses two alternative housing configurations (Figs. 1

and 8) and nine different capillary tube and heating element configurations that can be used with the two housing embodiments. Importantly, the Figure 8 housing embodiment discloses a liquid supply and atomizer in the upper housing portion, a wire-like rod heater in a capillary tube as shown in Fig. 4, and fiber in the capillary tube as shown in Figs. 14 and 15. Thus, Takeuchi fully discloses each and every limitation of claims 1-3, 5, 7 and 8 of the '628 patent. Additionally, to the extent Patent Owner argues that the rod-like heater located inside Takeuchi's capillary tube is not a wire, it would have been a simple matter for a PHOSITA to use the wire wrapped around a wick disclosed in Whittemore as a substitute heating element in Takeuchi.

Accordingly, Petitioner respectfully requests that this petition be granted.

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, identifies the real parties-in-interest as R.J. Reynolds Vapor Company, R.J. Reynolds Tobacco Company, and RAI Services Company. R.J. Reynolds Vapor Company further discloses that it is a wholly owned, indirect 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 its 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:

Case Name	Filed
<i>Fontem Ventures BV et al v. R.J. Reynolds Vapor Company</i> , 1:16-cv-01255 (M.D.N.C.) (filed as 2:16-cv-2286 (C.D. Cal.))	April 4, 2016
<i>Fontem Ventures BV et al v. R.J. Reynolds Vapor Company</i> , 1:16-cv-01257 (M.D.N.C.) (filed as 2:16-cv-03049 (C.D. Cal.), consolidated with lead case 1:16-cv-01255 (M.D.N.C.)) (U.S. Patent No. 9,326,549)	May 3, 2016

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

Case Name	Case Number	District	Filed
<i>Ruyan Investment Holdings Limited v. Smoking Everywhere, Inc. et al.</i>	2:11-cv-00367	C.D. Cal.	Jan. 12, 2011
<i>Ruyan Investment Holdings Limited v. Vapor Corp. et al.</i>	2:11-cv-06268	C.D. Cal.	Jul. 29, 2011
<i>Fontem Ventures BV et al. v. NJOY, Inc.</i>	2:14-cv-01645	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. LOEC, Inc. et al.</i>	2:14-cv-01648	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. CB Distributors, Inc. et al.</i>	2:14-cv-01649	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. Vapor</i>	2:14-cv-01650	C.D. Cal.	Mar. 5, 2014

Case Name	Case Number	District	Filed
<i>Corp.</i>			
<i>Fontem Ventures BV et al. v. FIN Branding Group, LLC et al.</i>	2:14-cv-01651	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. Ballantyne Brands, LLC</i>	2:14-cv-01652	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. Spark Industries, LLC</i>	2:14-cv-01653	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. Logic Technology Development LLC</i>	2:14-cv-01654	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. VMR Products, LLC</i>	2:14-cv-01655	C.D. Cal.	Mar. 5, 2014
<i>Fontem Ventures BV et al. v. NJOY, Inc. et al.</i>	2:14-cv-08144	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. LOEC, Inc. et al.</i>	2:14-cv-08149	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. CB Distributors, Inc. et al.</i>	2:14-cv-08154	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. Vapor Corp. et al.</i>	2:14-cv-08155	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. FIN Branding Group, LLC et al.</i>	2:14-cv-08156	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. Ballantyne Brands, LLC et al.</i>	2:14-cv-08157	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. Spark Industries, LLC et al.</i>	2:14-cv-08158	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. Logic Technology Development LLC et al.</i>	2:14-cv-08160	C.D. Cal.	Oct. 21, 2014
<i>Fontem Ventures BV et al. v. Nu Mark LLC</i>	1:16-cv-01261	M.D.N.C. (2-16-cv-02291 (C.D. Cal.))	April 4, 2016
<i>Fontem Ventures BV et al. v. Nu</i>	1:16-cv-01259	M.D.N.C.	Jun. 22, 2016

Case Name	Case Number	District	Filed
<i>Mark LLC</i>		(2:16-cv-04537 (C.D. Cal.), consolidated with lead case 1:16-cv-01261)	

2. Related Proceedings Before the Board

The '628 patent was (or is) also the subject of, or related to, the following petitions for IPR:

Case Name	Case Number	Filed
<i>NJOY, Inc. v. Fontem Holdings I B.V.</i> (U.S. Patent No. 8,393,331)	IPR2014-01289	Aug. 14, 2014
<i>NJOY, Inc. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,490,628)	IPR2014-01300	Aug. 15, 2014
<i>NJOY, Inc. et al v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,893,726)	IPR2015-01302	May 29, 2015
<i>NU MARK LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,893,726)	IPR2016-01288	Jun. 28, 2016
<i>NU MARK LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,490,628) (denied)	IPR2016-01283	Jun. 28, 2016
<i>NU MARK LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,490,628) (denied)	IPR2016-01285	Jun. 28, 2016
<i>NU MARK LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,893,726)	IPR2016-01297	Jun. 28, 2016
<i>NU MARK LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,393,331)	IPR2016-01299	Jun. 28, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,893,726) (denied)	IPR2016-01270	Jun. 28, 2016

Case Name	Case Number	Filed
<i>NU MARK LLC v. Fontem Holdings 1 B.V.</i> (U.S. Pat. No. 8,393,331)	IPR2016-01438	Jul. 14, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings 1 B.V.</i> (U.S. Pat. No. 8,490,628) (denied)	IPR2016-01527	Aug. 3, 2016
<i>NU MARK LLC v. Fontem Holdings 1 B.V.</i> (U.S. Pat. No. 9,326,549)	IPR2016-01664	Aug. 22, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings 1 B.V.</i> (U.S. Pat. No. 9,326,549) (denied)	IPR2016-01859	Sep. 23, 2016

3. Pending Patent Applications

The '628 Patent claims priority, through a series of priority claims, to U.S. Pat. Appl. No. 12/944,123 (issued as U.S. Pat. No. 8,393,331), U.S. Pat. Appl. No. 10/587,707 (issued as U.S. Pat. No. 7,832,410, Ex. 1004), International PCT Appl. No. PCT/CN05/00337 (published as WO 2005/099494), and to foreign patent application CN 20040031182.0. Ex. 1001 at 1:6-14. 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, the following pending patent applications also claim the benefit of the '628 Patent filing date:

Serial No.	Filed
U.S. Patent Application No. 14/525,066, which claim the benefit of the '628 patent filing date	October 27, 2014
U.S. Patent Application No. 14/719,923, which claims the benefit of the '628 patent filing date (Abandoned)	May 22, 2015
U.S. Patent Application No. 15/167,825, which claims the benefit of the '628 patent filing date	May 27, 2016

C. Lead and Back-Up Counsel

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D. Service Information

Please address all correspondence to the lead and backup counsel at the contact information above. Petitioner also consents to service by email at rgabric@brinksgilson.com, rmallin@brinksgilson.com and stimmerman@brinksgilson.com.

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 1-3, 5, 7 and 8 of the '628 patent based upon 35 U.S.C. § 102 and/or § 103 as set forth herein. The '628 patent is to be reviewed under pre-AIA §§ 102 and 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. 1002.

Claims 1-3, 5, 7 and 8 are unpatentable based upon the following grounds:

Ground 1: Claims 1-3, 5, 7 and 8 are unpatentable under 35 U.S.C. § 102 as anticipated by Takeuchi (Ex. 1003).

Ground 2: Claims 1-3, 5, 7 and 8 are unpatentable under 35 U.S.C. § 103 as obvious over Takeuchi (Ex. 1003) in combination with Whittemore (Ex. 1004).

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)

Statement of no redundancy: Grounds 1 and 2 are not redundant.

Ground 1 relies upon Takeuchi as an anticipating only reference, because it discloses all the claim limitations. Ground 2 relies on Takeuchi as the lead reference, but considers a combination of Takeuchi with Whittemore for the “heating wire” of claims 1, 7 and 8. Grounds 1 and 2 are not redundant of previous IPRs (Exs. 1006, 1007, 1008, 1009) based on Takeuchi because they were not based on the housing embodiment shown in Figure 8 of Takeuchi, which has not previously been considered or presented to the PTAB either in an IPR petition or during prosecution.

V. THRESHOLD REQUIREMENT FOR *INTER PARTES* REVIEW

This petition meets the threshold requirements under 35 U.S.C. § 314(a) because it establishes “a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” As explained below, there is a reasonable likelihood that Petitioner will prevail with respect to at least one challenged claim.

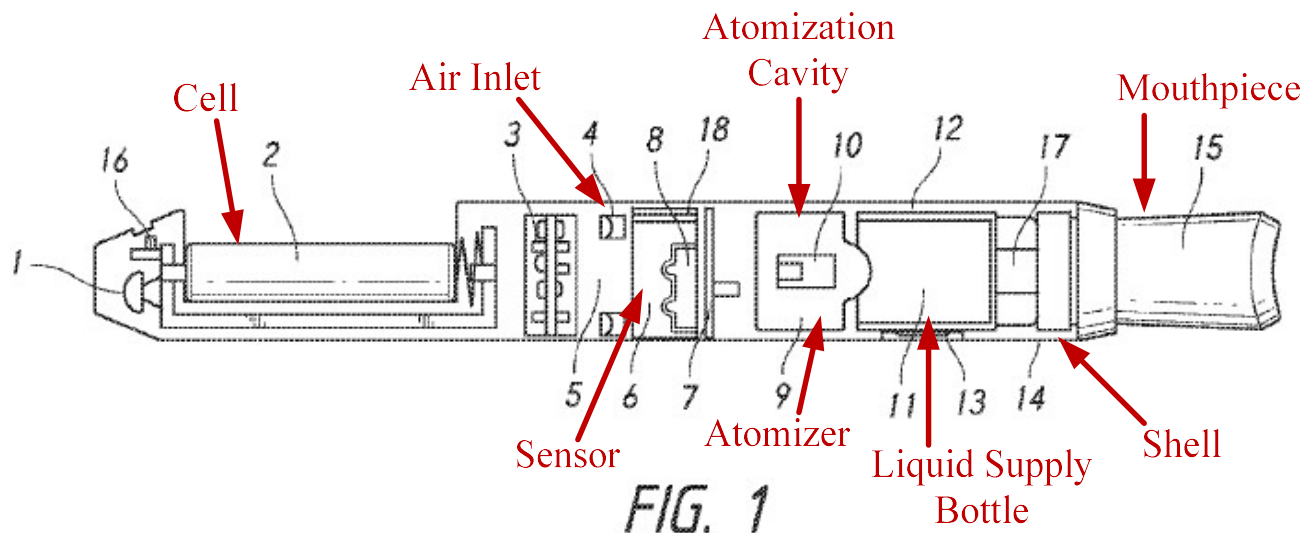
VI. STATEMENT OF REASONS FOR THE RELIEF REQUESTED

A. Background of the ‘628 Patent

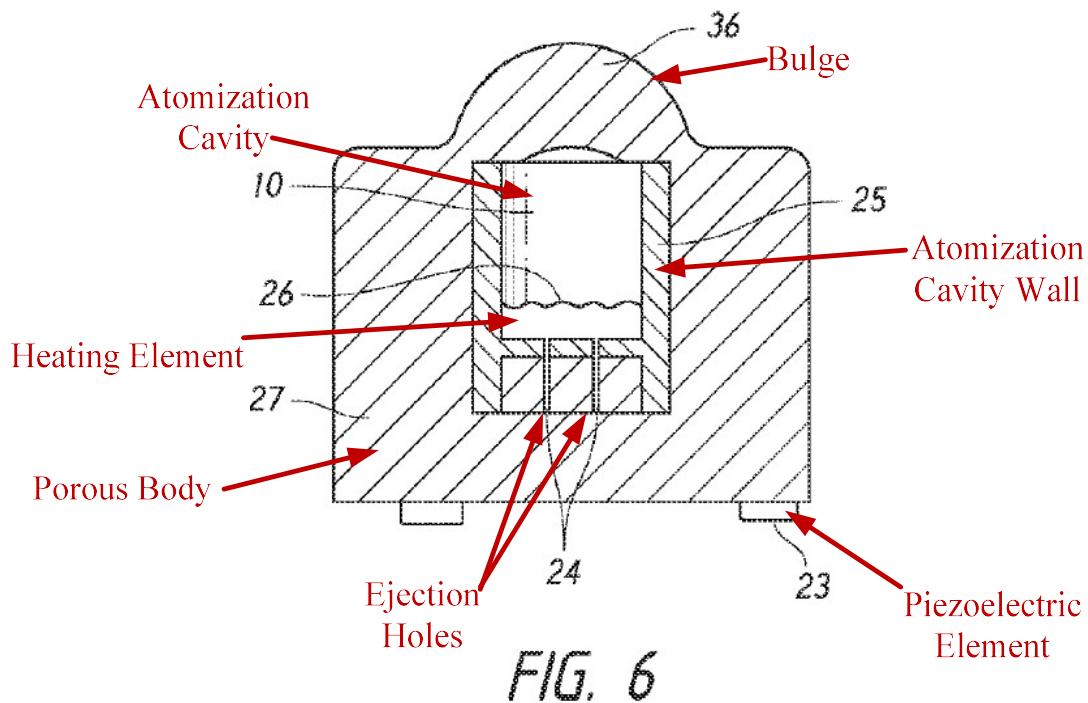
1. Overview of the ‘628 Patent

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, via the air passage 18, atomizer 9, aerosol passage 12, and gas vent 17. *Id.* at 3:13-15.



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. 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. 1005 at 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 (Ex. 1013, 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 28-40.

As discussed herein, the prior art relied upon in this Petition provides 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. 1002 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).

“longitudinal axis”: This term was previously interpreted as “the axis along the length, i.e., the longest dimension, of an object.” Ex. 1006 at 8-9. Petitioner adopts that interpretation for purposes of this IPR.

“atomizer assembly” and “atomizer”: Petitioner submits that the terms “atomizer assembly” and “atomizer” mean “a part of the electronic cigarette that

includes components that facilitate and participate in atomization.” This interpretation is supported by the plain and ordinary meaning of the claim language and the specification. In particular, the claim language lists the items that make up the “atomizer assembly” and “atomizer” including a porous body that projects into the liquid supply and a heating wire. Ex. 1001 at 5:1-6. The specification identifies the heating wire 26 as being located inside the atomization cavity wall 25 which in turn is surrounded by the porous body 27. *Id.* at 2:47-50, 61-62, Fig. 6. The purpose of the porous body is simply to move the liquid from the liquid supplying bottle 11 to the wire so it can be vaporized. Ex. 1002, ¶30; Ex. 1001 at 3:45-63.

This term was previously construed 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.*” Ex. 1009 at 9 (emphasis added). However, there is no intrinsic support for the negative limitation language in this prior construction: “but not components included in other recited parts of the electronic cigarette, such as the liquid supply.” *See e.g., Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1322-23 (Fed. Cir. 2003) (concluding that absent “any express disclaimer or independent lexicography in the written description,” there is no basis in the patent specification for adding a negative limitation). Indeed, there is nothing in the specification that

describes this negative limitation or otherwise precludes any part of the “liquid supply” or any other structure from being part of the atomizer. *See e.g., Powell v. Home Depot U.S.A., Inc.*, 663 F.3d 1221, 1331-32 (Fed. Cir. 2011) (concluding that the same structure in the accused product can satisfy two distinct claim terms when the specification does not suggest that the claim terms require separate structures); and Ex. 1002 at ¶30. Thus, under the broadest reasonable interpretation, the appropriate construction for “atomizer” is “a part of the electronic cigarette that includes components that facilitate and participate in atomization.”

“projecting into” and “extending into”: This term was previously interpreted as “having at least a portion that protrudes into.” Ex. 1009 at 9-10. Petitioner adopts that interpretation for purposes of this IPR.

“liquid supply”: This term was previously interpreted as meaning “the liquid itself.” Ex. 1007 at 5-10. Petitioner adopts that interpretation for purposes of this IPR.

“heating wire”: “a thread or rod that can generate heat.”

The dictionary defines wire as “metal in the form of a usually very flexible thread or slender rod [and] a thread or rod of such material.” *Wire*, Merriam-Webster Dictionary (10th ed. 2002), Ex. 1025. The ’628 specification only uses “wire” twice: “A heating element 26, which can be made of platinum *wire*, nickel

chromium alloy or iron chromium aluminum alloy *wire* with rare earth element, is provided within the cavity, and can also be made into a sheet form with conductive ceramics or PTC ceramics.” Ex. 1001 at 2:47-52 (emphasis added). Any wire with an electrical resistance can generate heat. Ex. 1002 at ¶¶34, 60. The ’628 specification describes wire as platinum, nickel chromium alloy, or iron chromium aluminum alloy, so a construction of a thread or rod that can generate heat is consistent with the ’628 specification. Ex. 1001 at 2:47-52; Ex. 1002 at ¶¶34, 60-61.

“substantially perpendicular”/ “generally perpendicular”: “not completely perpendicular.”

The terms “substantially perpendicular” and “generally perpendicular” are not used or described in the ’628 Patent specification. In fact, the words “perpendicular,” “substantially,” and “generally” are not used anywhere in the specification. A PHOSITA would understand that while those terms do not provide any clear guidance as to what is and is not substantially or generally perpendicular, they do provide flexibility that the heating wire is not completely perpendicular to the longitudinal axis, and the angle between the longitudinal axis and the heating wire is not crucial. Ex. 1002 at ¶35. In view of the absence of any guidance as to what the terms mean, a PHOSITA would understand them to mean “not completely perpendicular.” Ex. 1002 at ¶¶35, 62-63.

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 8:49-9:34.

Takeuchi illustrates two embodiments of electronic cigarette housings in Figure 1 and Figure 8, respectively. Annotated Figure 8 is shown below:

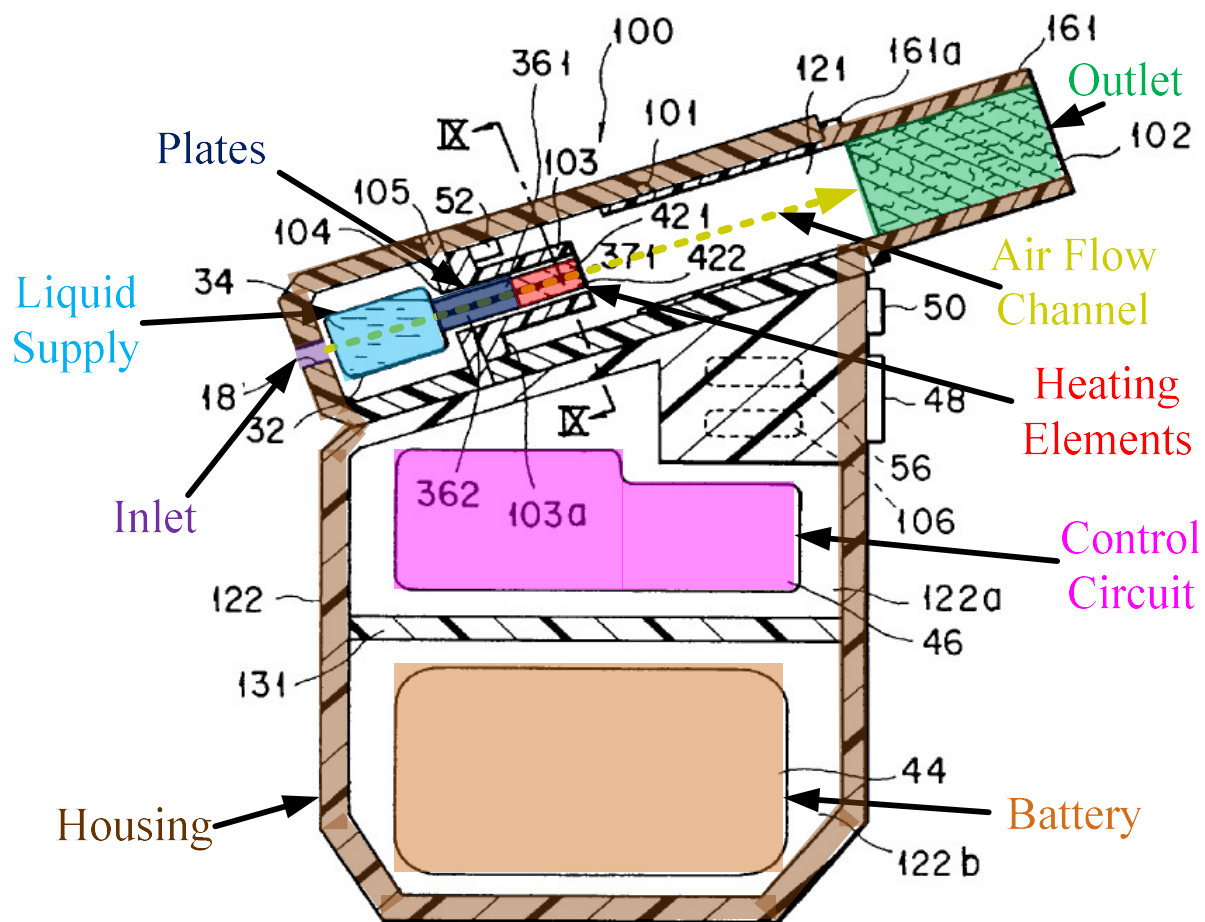
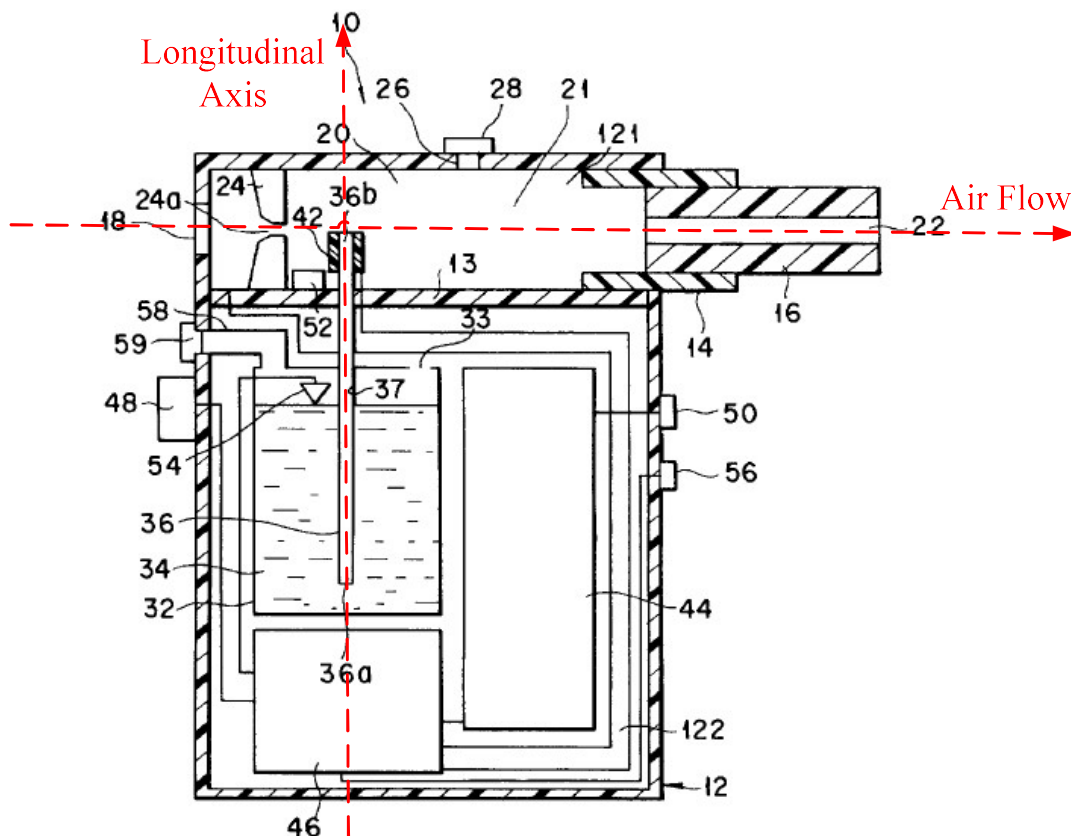


FIG. 8

In that embodiment, Takeuchi has a housing 121, 122 and an atomizer comprising heater 421, 422 and liquid passageway 371 (formed by plates 361, 362)

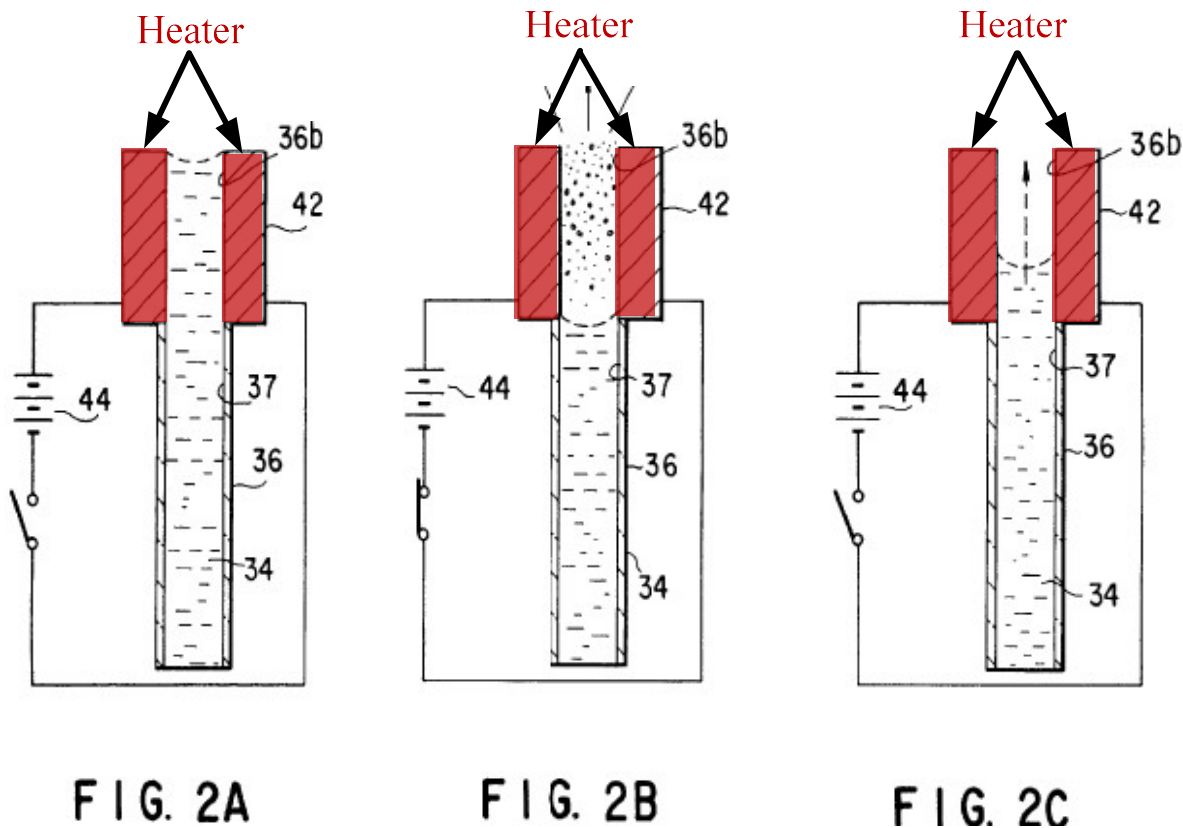
that projects into liquid flavor source 34 that is contained in the liquid container 32. *Id.* at 8:49-9:50. The liquid flavor source may include, for example, tobacco components such as tobacco extracts and tobacco smoke condensate when the Takeuchi device is used as a simulated smoking article. *Id.* at 5:40-46. Liquid moves by capillary force from the liquid supply 34 through the capillary tube 371 to the heaters 421, 422 where the liquid is then heated and gasified. *Id.* at 5:23-5:44; 2:8-16; 6:4-12; 7:57-8:4. The heater 421, 422 can be energized in response to the user's inhaling action that is detected by sensor 52. *Id.* at 6:55-62, 7:48-56.

The user inhales at mouthpiece 161 causing air to flow thorough an air passage extending from inlet 18 to outlet (i.e., filter 102 through which the air flows out of the mouthpiece 161). *Id.* at 9:8-22; 7:48-8:15. The liquid vaporized at heater 421, 422 is supplied into the upper chamber 121 and carried by the air flow through the housing to the outlet 102 at mouthpiece 161. *Id.* at 9:8-10:21; 2:4-13; 4:50-52; 5:28-30; 5:47-52; 6:4-7. The air flow path is substantially perpendicular to the longitudinal access of the device 100, where the longitudinal axis is the vertical direction. *See e.g.*, Ex. 1006, at 8-10 (stating that the longitudinal axis of Fig. 1 (shown below) is in the vertical direction, which is perpendicular to the air flow).



Takeuchi illustrates numerous heating element configurations that can be used interchangeably in the flavor-generating device. *See* Ex. 1002 at ¶¶40, 57; Ex. 1003, Figs. 2A-C, 3-7, 9-11, 14-15, Col. 8:16-48, 9:35-44, 10:22-27, 10:50-67. All configurations utilize capillary action to move the fluid to the heating element. *Id.* at ¶42. The capillary action is obtained using either a capillary tube, a gap or space between at least two spaced-apart plates, or an intercommunicating pore structure (i.e., porous body) filled in an enclosure that extend into the liquid container. Ex. 1003 at 3:35-42, 11:32-40, 12:27-32, Figs. 1, 10, 11; Ex. 1002, ¶42. For example, Figures 2A-2C (shown below) of Takeuchi disclose use of a heater that sits on top of capillary tube 36 and illustrates further details about the structure

of the atomizer and the process by which liquid is atomized by heaters 421, 422 (labeled as 42 in Figs. 2A-2C) at the atomizer's outlet portion.



Figures 3-7 show other possible heater combinations, including wrapping the heating element around a capillary tube, inserting the heating element inside the capillary tube, and the use of multiple heating elements and capillary devices. For example, Takeuchi illustrates that the heater(s) may be rod-like as shown in Figures 4 and 6. *Id.* at 8:22-24 and 8:33-36.

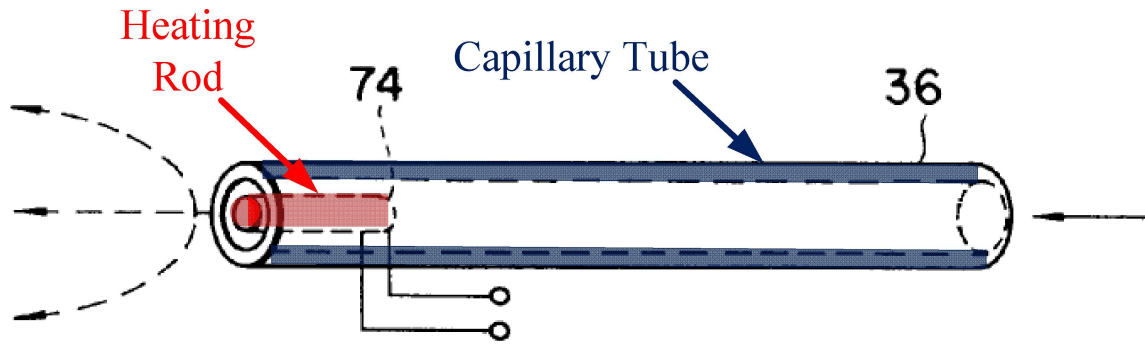


FIG. 4

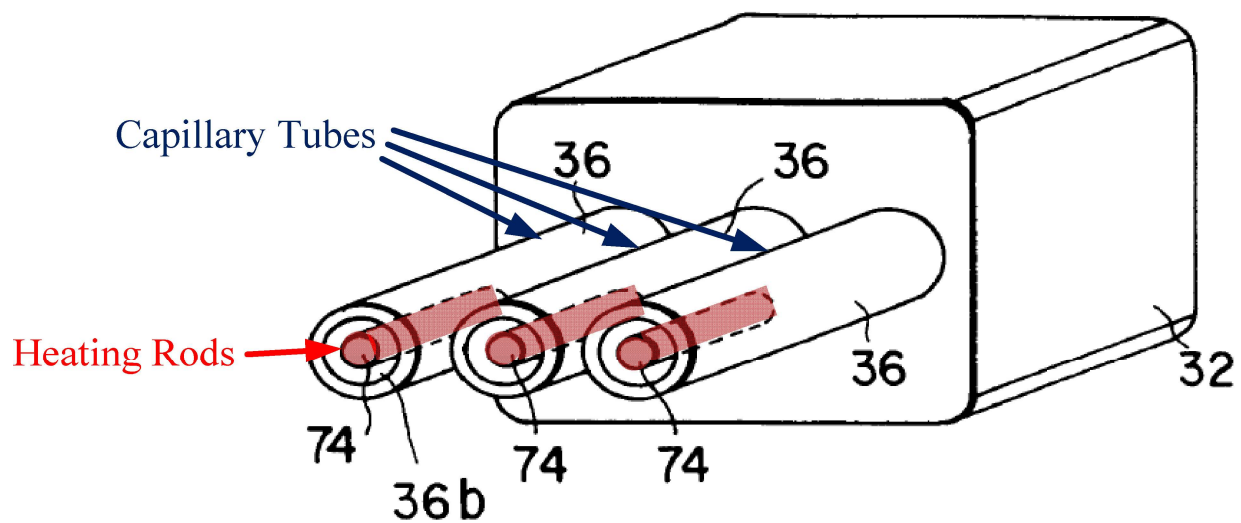


FIG. 6

Figures 10 illustrates yet another heater embodiment where the liquid passageway (371) itself extends into the liquid container and thus provides the capillary action to move the fluid from the liquid container to the heater. Ex. 1003 at 9:35-44. Figure 11 is similar but only a portion of the plates that provide the capillary action make up the heating elements. *Id.* at 10:22-27. Figures 10-11

illustrate a passageway 371 (formed by the plates 361, 362) projecting or extending into the liquid supply.

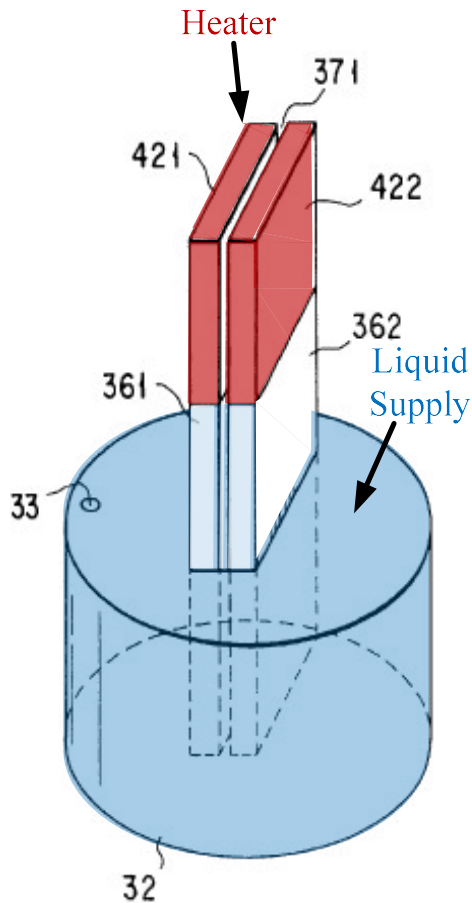


FIG. 10

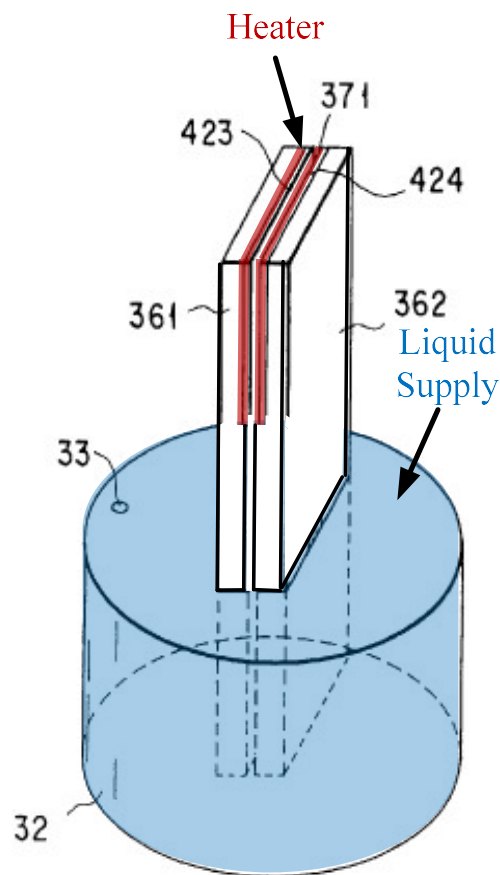
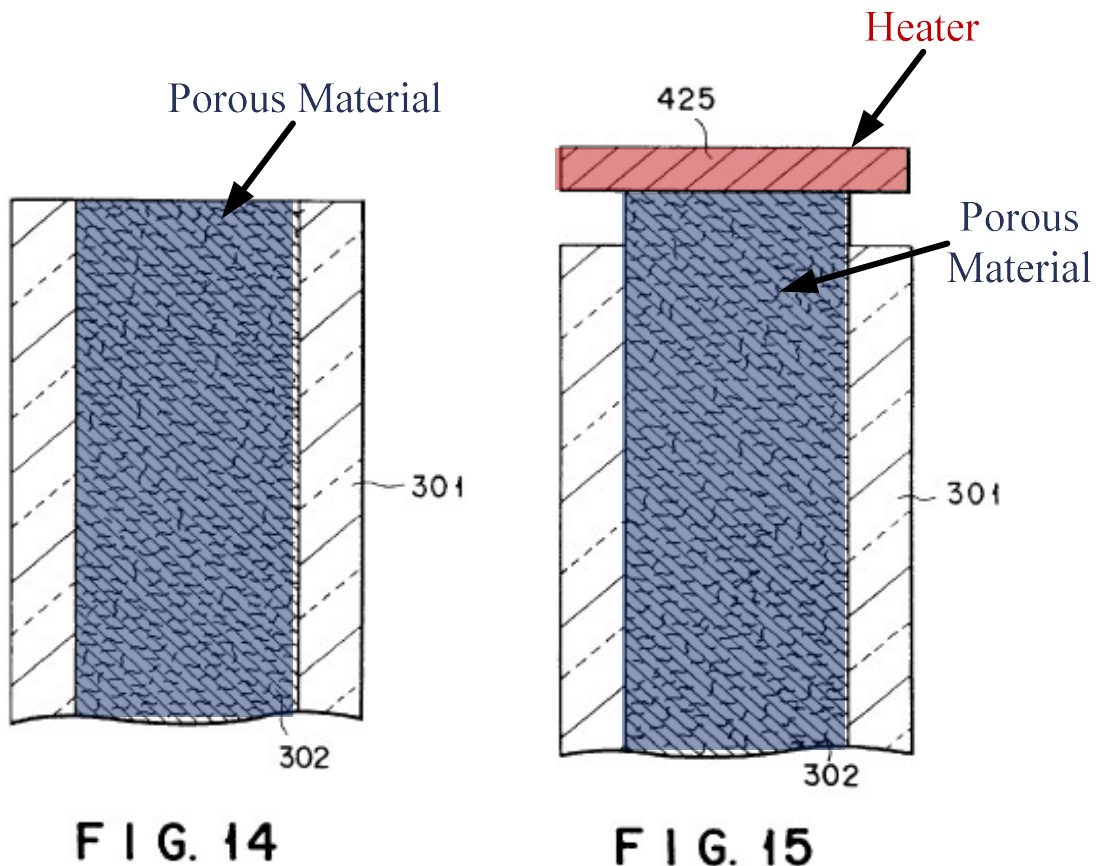


FIG. 11

As illustrated in Figs. 14 and 15 (shown below), Takeuchi also discloses that the capillary tube or liquid passageway 371 may include a porous material, (*i.e.*, intercommunicating pore structure 302) for transporting the liquid supply 34 from the liquid container 32 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 (stating that "...enclosure 301 may be provided by a tube,

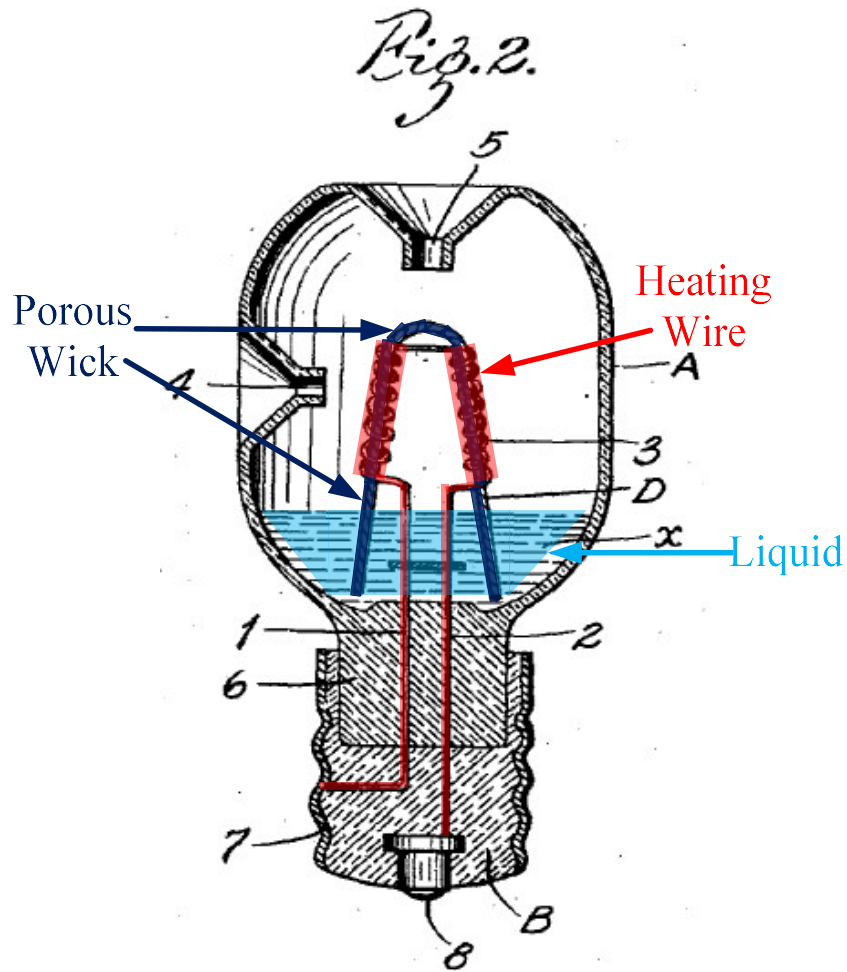
or two plates arranged spaced apart from each other...”). Also, the intercommunicating pore structure may protrude from the enclosure 301. *Id.* The intercommunicating pore structure may include open-cell foamed structure, and bundled fibers, “but should not be limited thereto.” *Id.* at 3:35-50.



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. Ex. 1004 at 1:18-2:8, claim 9. *See also* Ex. 1002 at ¶¶ 43-45.

E. GROUND 1: CLAIMS 1-3, 5, 7, AND 8 OF THE ‘628 PATENT ARE UNPATENTABLE AS ANTICIPATED BY TAKEUCHI

As explained below, claims 1-3, 5, 7, and 8 of the ‘628 patent are anticipated under 35 U.S.C. § 102 by Takeuchi.

1. Claims 1, 7 and 8

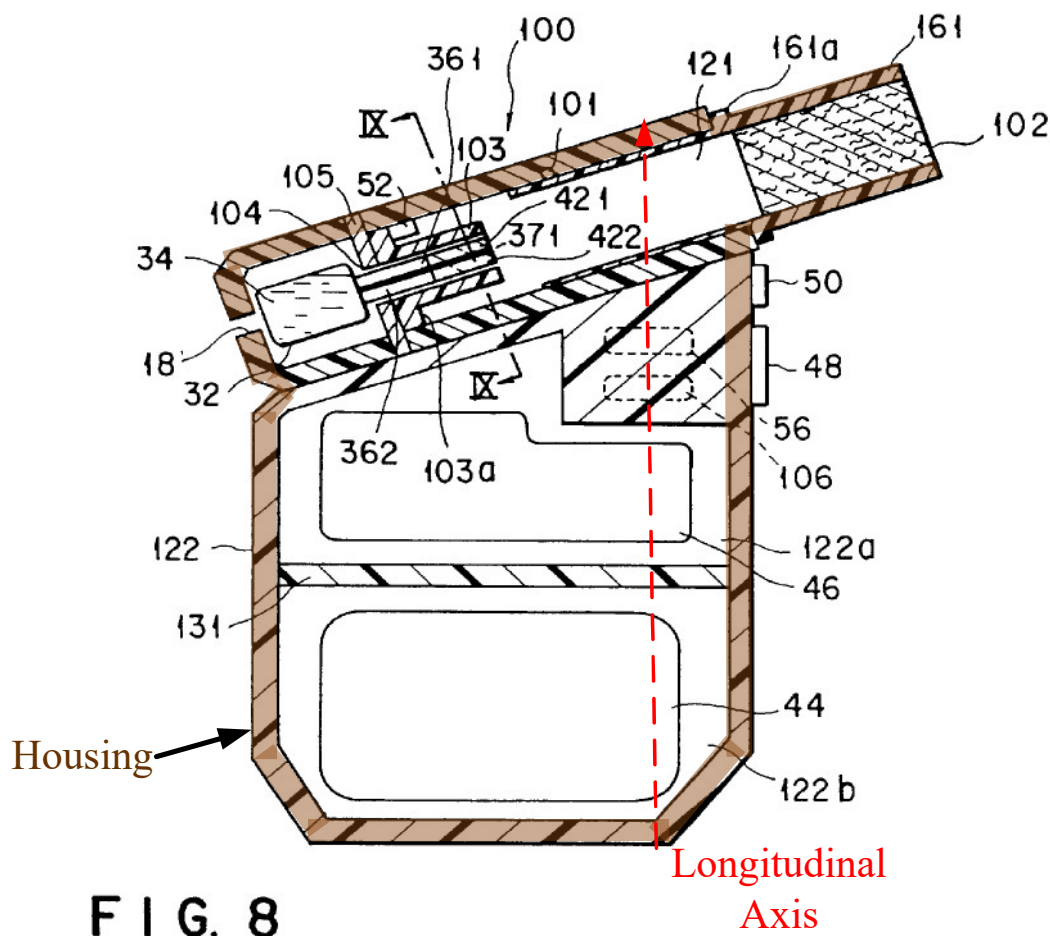
a. “An electronic cigarette comprising”

The preambles of claims 1, 7 and 8 each recite “[a]n electronic cigarette, comprising.” To the extent that the preamble is considered a claim limitation, Takeuchi discloses an electronic cigarette.

Claims 1.P, 7.P and 8.P	
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>

b. “a housing having a longitudinal axis”

Claim 1 recites a housing having a longitudinal axis. Figure 8 in Takeuchi illustrates the device 100 includes an upper chamber 121 and a lower chamber 122 with a housing around the device. 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.” Ex. 1009 at 8-9. The longitudinal axis in Fig. 8 is the vertical axis shown below which is the longest dimension of the housing. Ex. 1002 at ¶47.



Claim 1.1

a housing having a longitudinal axis,

Ex. 1003 at Figure 8:

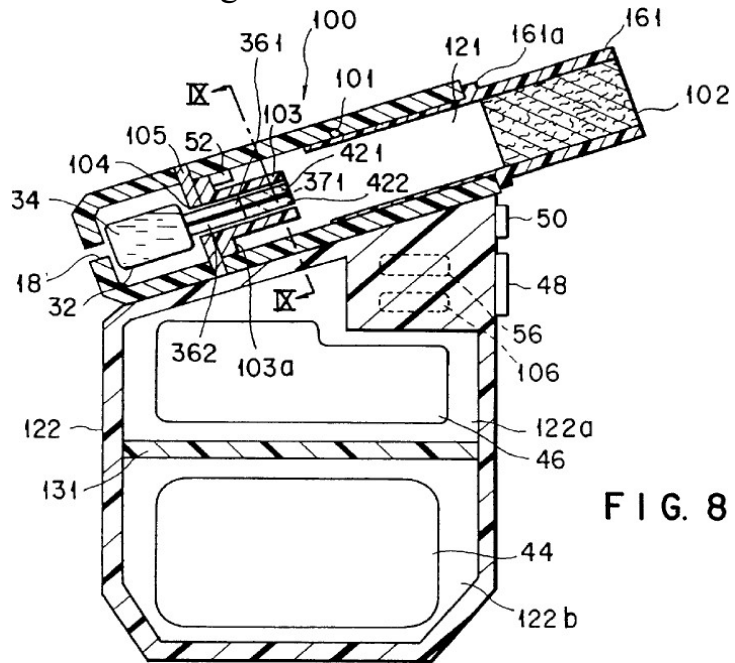


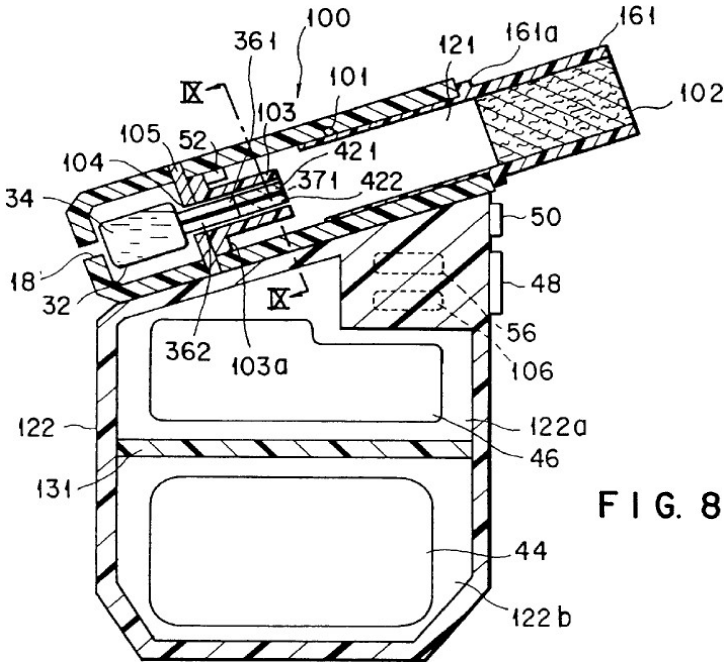
FIG. 8

“The upper chamber 121, which has a hollow cylindrical shape closed at one end (lower end), is provided on the lower chamber 121 along the inclined upper wall of the lower chamber 122. Thus, the upper chamber 121 is correspondingly inclined as a whole. The lower chamber 122 is partitioned by a partition wall 131 into an upper sub-chamber 122a, which houses the control circuit 46, and a lower sub-chamber 122b, which houses the electric power source 14.” *Id.* at 8:63-9:7.

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

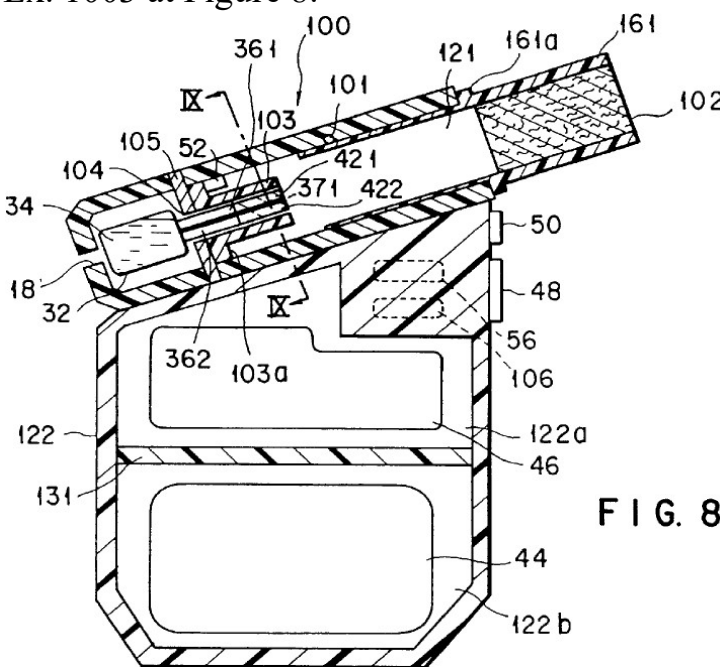
Claim 1 recites “an inlet and an outlet” and claims 7 and 8 recite “a housing having an inlet and an outlet. Takeuchi discloses an inlet (Air Intake Port 18) and

an outlet (Filter 102 at Mouthpiece 161) within a housing (Upper Chamber 121) as shown in the claim chart below. Ex. 1002 at ¶49.

Claims 1.2, 7.1, and 8.1	
<p><u>Claim 1:</u> an inlet and an outlet;</p> <p><u>Claims 7 and 8:</u> a housing having an inlet and an outlet;</p>	<p>Ex. 1003 at Figure 8:</p>  <p style="text-align: right;">FIG. 8</p> <p>“The air intake port 18 like one shown in FIG. 1 is provided at the closed end (lower end) of the upper chamber 121. A mouthpiece 161 may be detachably inserted directly, i.e., without through a holder, into the open end portion (upper end portion) of the upper chamber 121.</p> <p>...</p> <p>Further, a filter 102 may be inserted into the mouthpiece 161 over the region from the position corresponding to the protrusion 161a to the proximal end of the mouthpiece 161, i.e. inhalation portion of the mouthpiece 161, as shown in FIG. 8.” <i>Id.</i> at 9:8-22.</p>

d. “a liquid supply in the housing”

Claims 1 and 7 recite a liquid supply in the housing. The Board previously construed “liquid supply” to mean “the liquid itself.” Ex. 1007 at 5-10. Takeuchi discloses a liquid supply (Liquid Flavor Source 34 in the Liquid Container 32) in the housing (Upper Chamber 121) as shown in the claim chart below. Ex. 1002 at ¶50.

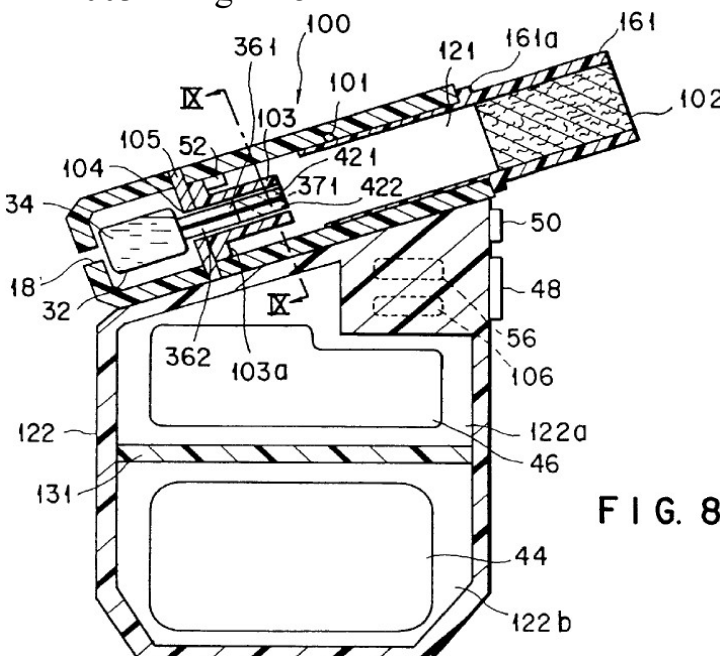
Claims 1.3 and 7.2	
<p><u>Claim 1 and Claim 7:</u> a liquid supply in the housing;</p>	<p>Ex. 1003 at Figure 8:</p>  <p>FIG. 8</p> <p>“[A] small exchangeable liquid container 32 containing the liquid flavor source and having an opening (not shown) like the opening 33 in FIG. 1 is arranged in the upper chamber 121 so as not to clog the air intake port 18. A liquid passageway 371 for the liquid flavor source is provided in fluid communication with the liquid flavor source 34 in the container 32.” <i>Id.</i> at 9:23-29.</p>

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 illustrated in the claim chart below, Takeuchi discloses a liquid flavor source 34, a battery 44 and an electronic circuit board 46. Ex. 1002 at ¶¶51-52. Takeuchi discloses an electronic circuit board (Control Circuit 46) electrically connected to a battery. Takeuchi’s electronic circuit also includes signal processing and control. Ex. 1003 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.”). The PHOSITA would have understood from the disclosure of Takeuchi that control circuit 46 necessarily, and inherently, includes an electronic circuit board. Ex. 1002 at ¶ 52; see also Ex. 1014 (method of attaching a microchip to a circuit board); Ex.1015 (method for mounting parts on circuit boards); Ex. 1016, Bremenour (a patent directed to a memory cartridge for a circuit board); and Ex. 1019 at 3-5, 129-134 (method of packaging electronic systems using circuit boards).

Even if the Board were to determine that there is a question about whether control circuit 46 is an “electronic circuit board,” it would have nonetheless been obvious to place control circuit 46 on a circuit board. As explained above, Takeuchi discloses a control circuit 46 that includes signal processing and control.

Circuit boards for implementing various electronic circuits including those that perform signal processing and control were known for decades prior to 2004, and a PHOSITA would have known to place the control circuit 46 on a circuit board to achieve the predictable result of supporting and electrically connecting components of the control circuit 46 to provide signal processing and control. Ex. 1002 at ¶ 52.

Claim 8.2	
<p>a liquid supply, a battery, and an electronic circuit board in the housing;</p>	<p>Ex. 1003 at Figure 8:</p>  <p>FIG. 8</p> <p>“[A] small exchangeable liquid container 32 containing the liquid flavor source and having an opening (not shown) like the opening 33 in FIG. 1 is arranged in the upper chamber 121 so as not to clog the air intake port 18. A liquid passageway 371 for the liquid flavor source is provided in fluid communication with the liquid flavor source 34 in the container 32.” <i>Id.</i> at 9:23-29.</p> <p>“It is desirable to use as the power source 44 a DC power source available on the market such</p>

	<p>as a primary battery (dry battery), or a secondary battery (rechargeable battery).” <i>Id.</i> at 6:15-17.</p> <p>“...a display mechanism 106 for indicating the remaining amount of the power source 44 connected to the control circuit may be provided as shown in FIG. 8.” <i>Id.</i> at 10:19-21.</p> <p>“The lower chamber 122 is partitioned by a partition wall 131 into an upper sub-chamber 122a, which houses the control circuit 46, and a lower sub-chamber 122b, which houses the electric power source 14 (sic).” <i>Id.</i> at 9:1-5.</p>
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- 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, with part of the air flow channel extending alongside of the liquid supply”**

Claims 1, 7, and 8 recite an air flow channel in the housing connecting/between the inlet to/and the outlet. Claim 7 also requires that part of the airflow channel extend alongside the liquid supply. Takeuchi includes an airflow channel in the housing that extends from the air intake port 18 to the mouthpiece 161 and includes air guiding path 104 that extends alongside the liquid container 32 and the capillary plates 361, 361 both of which contain the liquid flavor source 34. Ex. 1003 at 9:8-12, 9:57-10:13; Ex. 1002 at ¶¶ 53-54.

Claims 1.4, 7.3, and 8.3	
<u>Claim 1:</u> an air flow channel in the	Ex. 1003 at Figure 8:

housing connecting the inlet to the outlet;

Claim 7:

an air flow channel through the housing connecting the inlet to the outlet, with part of the air flow channel extending alongside of the liquid supply;

Claim 8:

an air flow channel in the housing between the inlet and the outlet

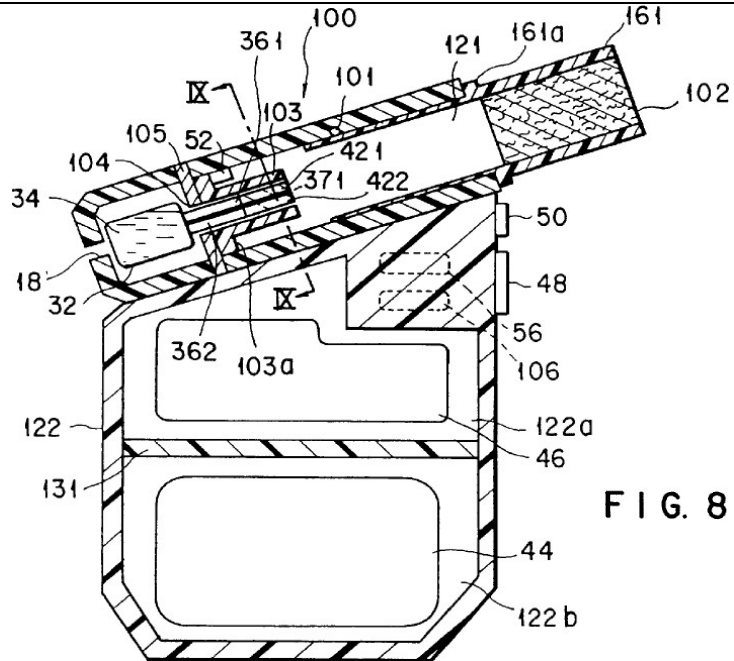


FIG. 8

“The air intake port 18 like one shown in FIG. 1 is provided at the closed end (lower end) of the upper chamber 121. A mouthpiece 161 may be detachably inserted directly, i.e., without through a holder, into the open end portion (upper end portion) of the upper chamber 121.” *Id.* at 9:8-12.

“...the cylindrical body may have a rectangular cross section, and defines an air passageway 104 between it and the plates. The air passageway (air guiding path) 104 guides, along it, the air introduced by the inhalation action of the user from the air intake port 18 provided at the closed end edge of the upper chamber 121. The introduced air embraces or surrounds the gasified liquid flavor source at the outlet portion of the liquid passageway 371, and is directed toward the inhalation port by the air passageway 104.” *Id.* at 9:57-66.

- g. “and an atomizer assembly in the housing between the inlet and the outlet,” “and an atomizer 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, Claim 7 recites an atomizer in the housing between the inlet and the outlet, and Claim 8 recites an atomizer in the housing. Takeuchi discloses an “atomizer assembly” that includes at least a heater and a liquid passageway. Ex. 1003 at 6:4-8; 7:48-8:4; 8:19-48; 9:35-50, 10:22-27; and 10:50-63. The heater turns the liquid into aerosol and the liquid passageway moves the liquid to the heater so that it can be atomized. *Id.* at 6:4-8; 7:48-8:4; 8:19-48; 9:35-50, 10:22-27; 10:50-63; Ex. 1002 at ¶¶ 55-57. As Dr. Sturges explains, these structures perform the same roles as the heating wire and porous body disclosed in the specification and recited in the claims below. Ex. 1002 at ¶57.

Specifically, Takeuchi discloses several heaters (42, 74, 421, 422, 423, 424, or 425) that atomize the liquid flavor. Ex. 1003 at 6:4-8; 7:48-8:4; 8:19-48; 9:35-50, 10:22-27; and 10:50-63. In Figure 8, the liquid flavor 34 is atomized by plates 361, 362. However, the other heaters that can be used include the rod-like heater shown in Figs. 4 and 6, the tubular body heater shown in Fig. 2, the ring-shaped heater in Fig. 3, the plate-like heater in Fig. 5, or the heater frame shown in Fig. 7. Ex. 1002 at ¶57. In all cases, the heater is between the air inlet and the outlet.

The liquid passageway 371 moves the liquid 34 from the liquid container 32 to the heater by capillary action. *Id.* at ¶¶56-57. The liquid passageway tube may

include a capillary tube, a gap between at least two plates or an “intercommunicating void or pore structure filled in an enclosure,” such as open-cell foam structure or bundled fibers, “which is in fluid communication with the liquid flavor source contained in the liquid container.” Ex. 1003 at 3:36-50; 10:50-65, Figs. 8, 14, and 15. Further, as shown in Figs. 14-15, the intercommunicating pore structure may be contained in the enclosure tube 301 or protrude from it. *Id.* at 10:59-63, Figs. 14-15.

Finally, Takeuchi discloses that the heater and liquid passageway to the heater (e.g., the heater 421/422, plates 361/362 forming the liquid passageway with outlet portion 371) reside in the housing between the inlet and the outlet. Ex. 1003 at 9:8-22, 9:57-66, Fig. 8 (annotated) below. Ex. 1002 at ¶55.

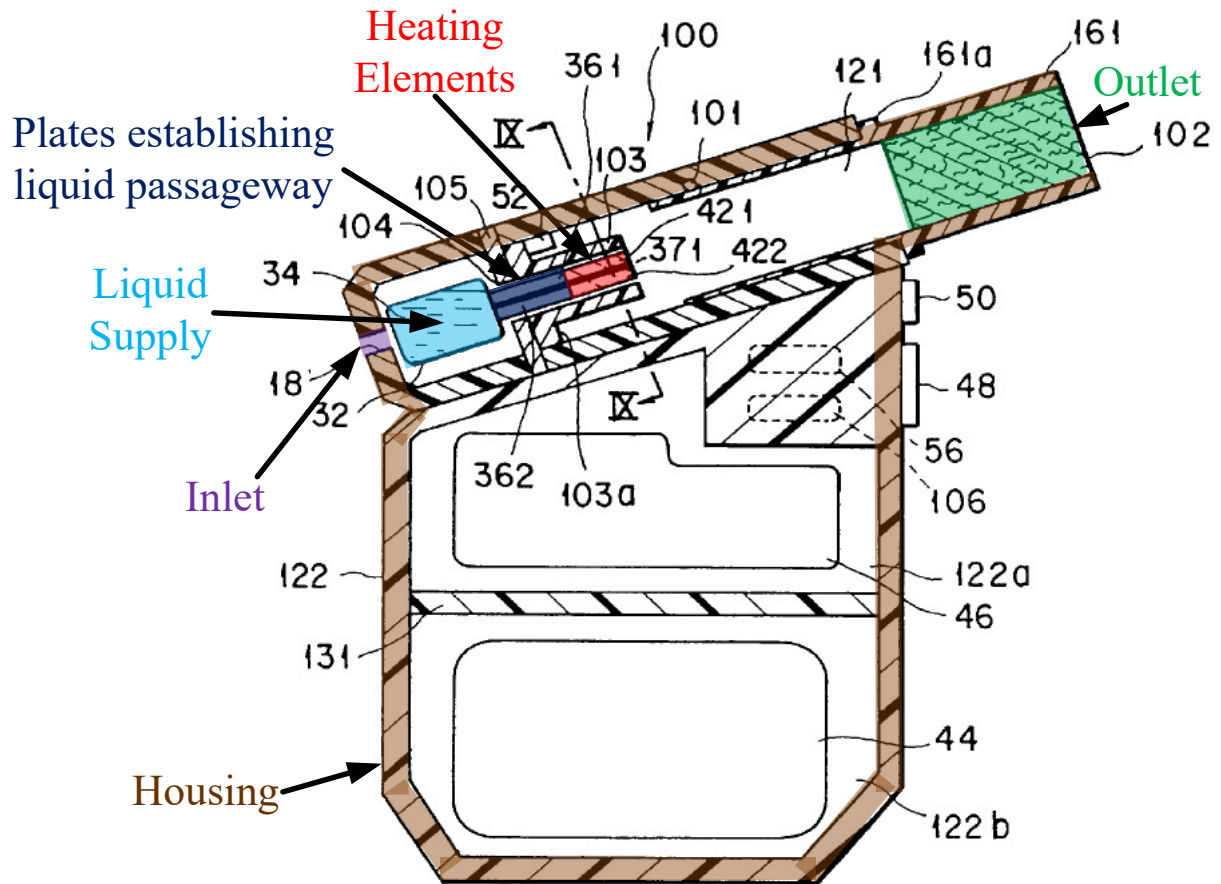


FIG. 8

Claims 1.5, 7.4, and 8.4	
<p><u>Claim 1:</u> and an atomizer assembly in the housing between the inlet and the outlet,</p> <p><u>Claim 7:</u> and an atomizer in the housing between the inlet and the outlet,</p> <p><u>Claim 8:</u> an atomizer in the housing including:</p>	<p>Ex. 1003 at Figure 8:</p>

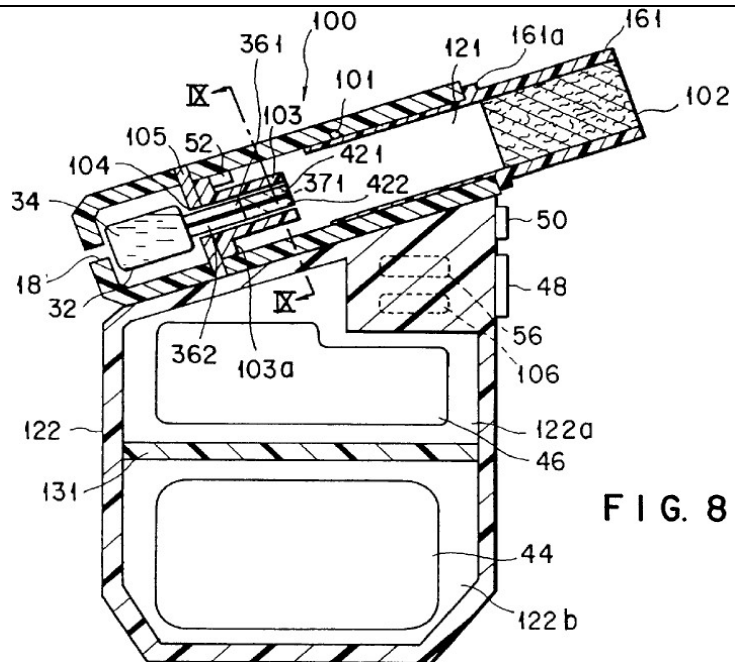


FIG. 8

“[B]y providing the air guiding path 104 which can direct the air locally or selectively to the gasified flavor source at the outlet portion of the liquid passageway, an aerosol formation efficiency can be more enhanced when the liquid flavor source contains the aerosol generation material, since the mixing of the gasified flavor source with the air and the cooling of the gasified flavor source thereby can be simultaneously effected efficiently by means of the air stream passing through the air guiding path 104.” *Id.* at 10:5-12.

“In the device shown in FIG. 8, the liquid passageway 371 is defined between two substantially parallel plates spaced apart from each other. The distal end portion (the outlet portion of the liquid flavor source) of the liquid passageway 371 is heated by plate-like heaters 421 and 422 mounted to the plate 361 and 362, respectively.” *Id.* at 9:28-34.

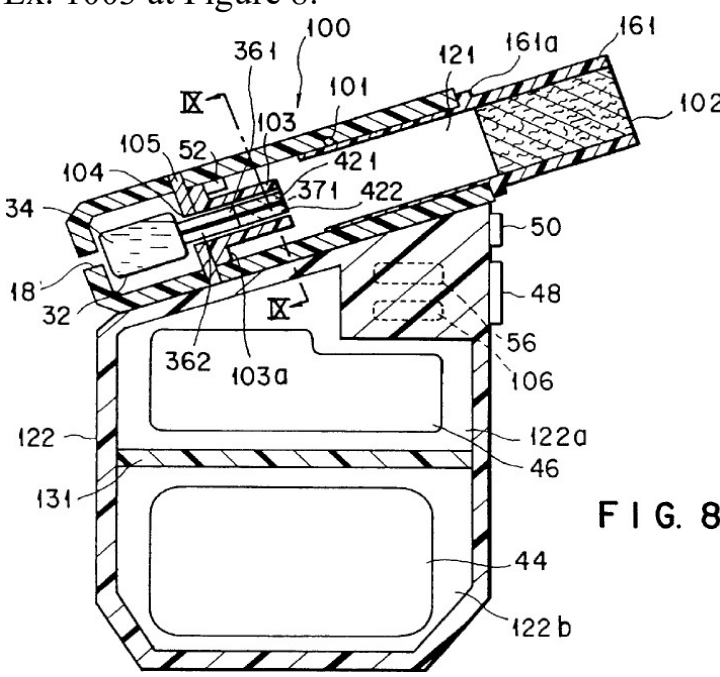
“The enclosure 301 may be provided by a tube,

	<p>or two plates arranged spaced apart from each other wherein the 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 302.” <i>Id.</i> at 10:55-63.</p> <p>“The outlet portion of the liquid passageway 371 is constituted by the heaters 421 and 422.” <i>Id.</i> at 9:43-44.</p> <p>“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.” <i>Id.</i> at 5:7-11.</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, 7, 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.” Ex. 1009 at 9-10. As previously discussed, Takeuchi discloses a variety of heater and liquid passageways. One liquid passageway is the tube or plates with an “inter-communicating void or pore structure filled in an enclosure,” such as open-cell foam structure or bundled fibers,

“which is in fluid communication with the liquid flavor source contained in the liquid container.” Ex. 1003 at 3:36-50; 10:50-65, Figs. 8, 14, and 15; Ex. 1002 at ¶56. The tube containing the porous structure must project into the liquid container otherwise there would not be any capillary action. Indeed, this is described and shown for all embodiments. Ex. 1003 at 5:47-52; 9:23-44; 11:32-40, 12:27-32; Figs. 1, 8, 10-11 (showing plates extending into the liquid container 32); Ex. 1002 at ¶¶39, 55-58. Thus, Takeuchi discloses a porous body projecting into the liquid supply.

Claims 1.6, 7.5, and 8.5	
<p><u>Claim 1:</u> [the atomizer including:] a porous body projecting into the liquid supply;</p> <p><u>Claim 7:</u> the atomizer including: a porous body extending into the liquid supply;</p> <p><u>Claim 8:</u> [the atomizer including] a porous body extending into the liquid supply;</p>	<p>Ex. 1003 at Figure 8:</p>  <p>“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</p>

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.

“The outlet portion of the liquid passageway 371 is constituted by the heaters 421 and 422.” *Id.* at 9:43-44.

Id. at Figure 14:

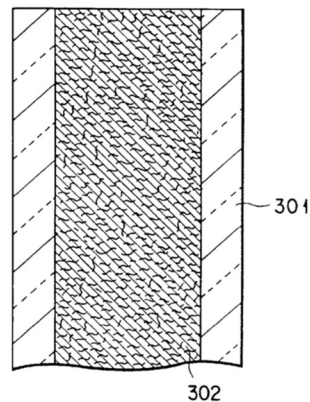


FIG. 14

“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.

Id. at Fig. 15:

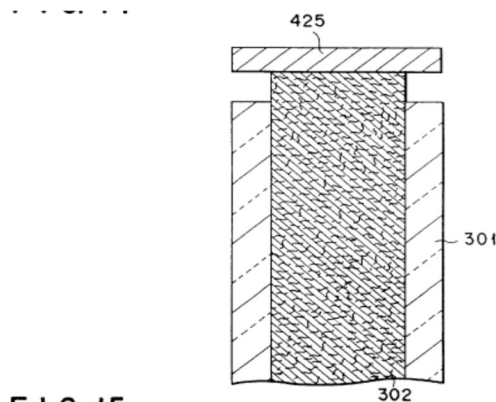


FIG. 15

- 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, 7, 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. A heating wire is “a thread or rod that generates heat.” One of the available heaters disclosed in

Takeuchi is a rod-like heater 74 as shown in Figs. 4 and 6. This heater can be used with either of the housing configurations. Ex. 1002 at ¶¶57, 59; Ex. 1003 at 2:59-61, 65-67; 11:1-9; 12:36-37. As Dr. Sturges explains, the rod-like heater is a heater wire. Ex. 1002 at ¶¶59-61. A PHOSITA would have understood that a wire is a flexible thread or slender rod and a heating wire is a thread or rod that generates heat. *Id.* at ¶61. That is exactly what is disclosed in Takeuchi – a rod-like heater. Additionally, a PHOSITA would have understood that the rod-like heater in Takeuchi is very thin. *Id.* Indeed, Takeuchi discloses that the capillary tube varies in diameter from 0.01mm to 3mm in diameter. Ex. 1003 at 5:53-57. This diameter would be filled by wire as small as 40 gauge (0.01 mm tube) and as large as 9 gauge (3 mm tube). *Id.* Even assuming the tube using the rod-like heaters is a little bigger or smaller, the rod-like heater would still be comparable to the diameter of well-known wire. *Id.* In fact, the device itself limits the size of the rod-like heater to a small gauge given its use as a small hand-held device. Ex. 1003 at 1:65-67; Ex. 1002 at ¶61.

Figures 4 and 6 (shown below) illustrate the rod-like heater rod(s) 74 within an enclosure, such as a capillary tube 36.

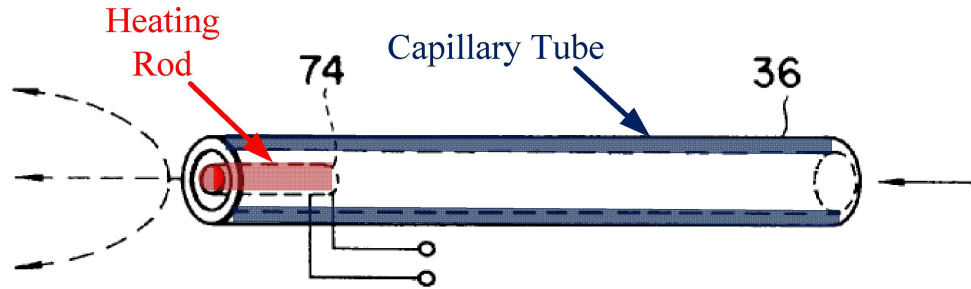


FIG. 4

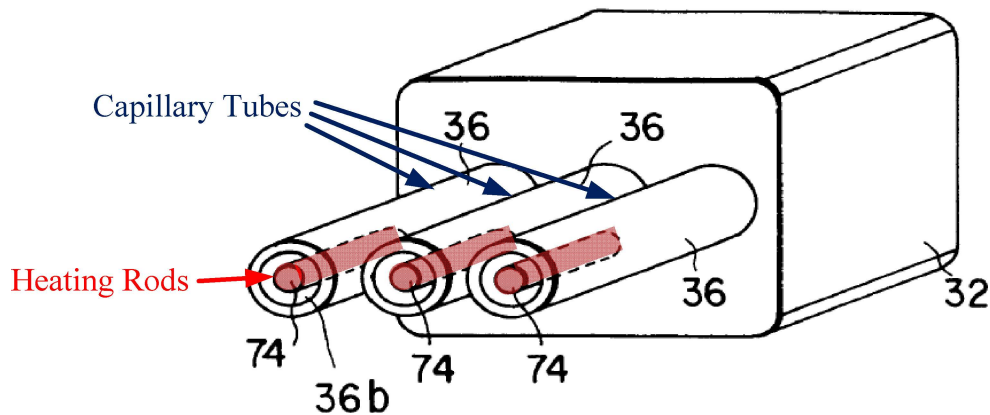
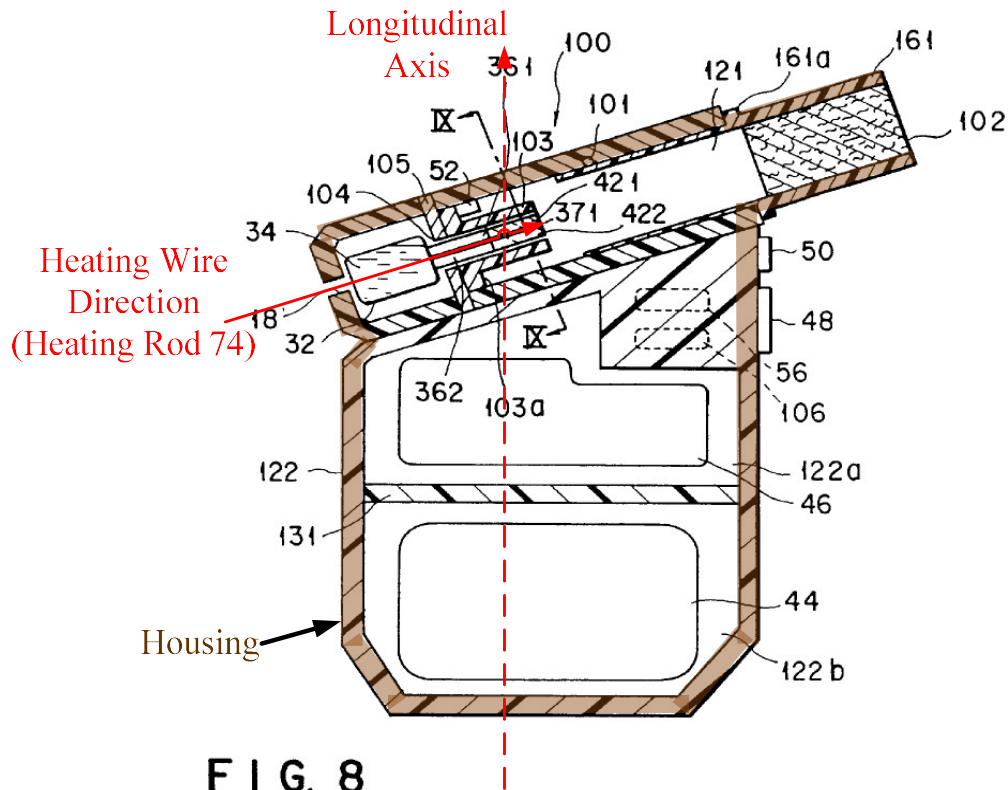


FIG. 6

As shown in the annotated version of the Figure 8 below, the heating wire (e.g. rod-like heater 74) has a central axis along the liquid passageway 371 or air flow path. This central axis of the heating wire crosses the longitudinal axis at an angle that is close to 90°, but not completely perpendicular. Ex. 1002 at ¶62.



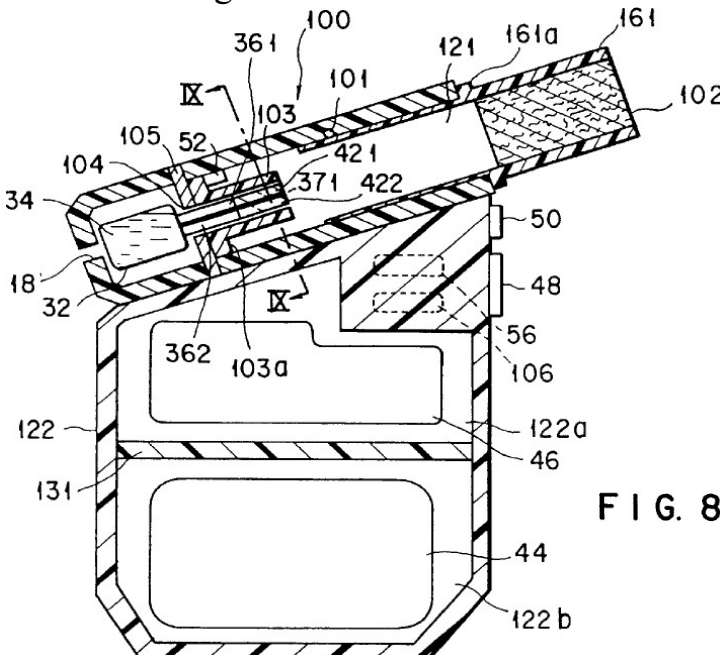
As Dr. Sturges explains, this angle meets the limitation for “substantially perpendicular” and “generally perpendicular” because while those terms do not provide any clear meaning as to what does and does not fall within the scope of these limitations, they do provide flexibility that the heating wire is not completely perpendicular to the longitudinal axis. *Id.* at ¶¶62-63. Dr. Sturges further explains that this limitation does not have any criticality or importance as compared to the prior art or other orientations. *Id.* at ¶63. Importantly, these terms are not described or explained in the patent specification. In fact, the words “substantially,” “generally” and “perpendicular” are not used in the specification, and instead appear only in the claims. Nor is there any explanation as to why this

claim term is meaningful or operates differently from the prior art. Ex. 1002 at ¶¶ 35, 62.

The Federal Circuit has found 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. As Dr. Sturges also explains, a PHOSITA would have appreciated that reasonable variations in the relative angle of the heating wire would not affect the device's operation, and thus the upper chamber's angle relative to the longitudinal axis can be adjusted. Ex. 1002 at ¶63.

Further, Takeuchi discloses that the heater may be oriented either generally perpendicular or generally parallel to the vertical longitudinal axis of the housing (see, e.g., Ex. 1003 at Fig. 8 (heaters 421, 422) and Fig. 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 amount of incline of the upper housing in the Fig. 8 embodiment is not critical and can be increased (further from perpendicular) or decreased (closer to perpendicular) as a mere design choice.

Ex. 1002 at ¶63. Indeed, Takeuchi makes clear that the embodiments can be modified. Ex. 1003 at 11:1-9.

Claims 1.7, 7.6, and 8.6	
<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 7:</u> [the atomizer including:] a heating wire in the atomizer having a central axis oriented substantially perpendicular to a 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 8:</p>  <p style="text-align: right;">FIG. 8</p> <p>“In the device shown in FIG. 8, the liquid passageway 371 is defined between two substantially parallel plates spaced apart from each other. The distal end portion (the outlet portion of the liquid flavor source) of the liquid passageway 371 is heated by plate-like heaters 421 and 422 mounted to the plate 361 and 362, respectively.” <i>Id.</i> at 9:28-34.</p> <p>“The enclosure 301 may be provided by a tube, or two plates arranged spaced apart from each other wherein the 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</p>

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 302.” *Id.* at 10:55-63.

“The outlet portion of the liquid passageway 371 is constituted by the heaters 421 and 422.” *Id.* at 9:43-44.

“It should be noted in the present invention that the liquid passageway defined by the substantially parallel plates is fluid-tightly sealed at its sides by a sealing material (not shown) such as a plastic film or a metal foil so as to prevent the leakage or the evaporation of the liquid flavor source from the sides of the plates.” *Id.* at 9:45-50.

“In the modification shown in FIG. 4, a rod-like heater 74 is inserted into the outlet port 36a of the capillary tube 36.” *Id.* at 8:22-23.

Id. at Fig. 4:

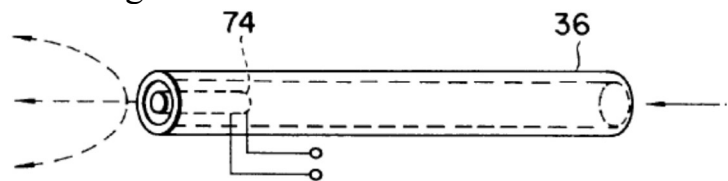


FIG. 4

The device according to claim 2 wherein said heater is a cylindrical element. *Id.* at 12:36-37.

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

Claim 7 recites a battery, a sensor and an electronic circuit board within the housing. As illustrated in the claim chart below, Takeuchi discloses a battery 44, a sensor 52 and an electronic circuit board 46 located within the device upper and lower chambers 121, 122. Ex. 1002 at ¶64; *see also* Section VI.E.1.e, *supra*.

<p>Claim 7.7</p>	<p>and a battery, a sensor and an electronic circuit board within the housing,</p>
	<p>Ex. 1003 at Figure 8:</p>
	<p>FIG. 8</p>
	<p>“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).” <i>Id.</i> at 6:15-17</p> <p>“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</p>

	<p>which can independently turn the heater on, and a sensor 52 for detecting the inhalation action of a use are connected.” <i>Id.</i> at 6:23-29.</p> <p>“...a display mechanism 106 for indicating the remaining amount of the power source 44 connected to the control circuit may be provided as shown in FIG. 8.” <i>Id.</i> at 10:19-21.</p> <p>“The lower chamber 122 is partitioned by a partition wall 131 into an upper sub-chamber 122a, which houses the control circuit 46, and a lower sub-chamber 122b, which houses the electric power source 14 [sic].” <i>Id.</i> at 9:1-5.</p>
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k. “with the circuit board electrically connected to the battery, the sensor and the heating wire” and “with the circuit board electrically connected to the battery and the heating wire”

Claim 7 recites that the circuit board is electrically connected to the battery, the sensor and the heating wire. Claim 8 recites that the circuit board is electrically connected to the battery 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 heaters (421, 422). Ex. 1002 at ¶¶ 52, 64; 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. 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.”).

Claims 7.8 and 8.7

Claim 7:
with the circuit board electrically connected to the battery, the sensor and the heating wire.

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

Ex. 1003 at Figure 8:

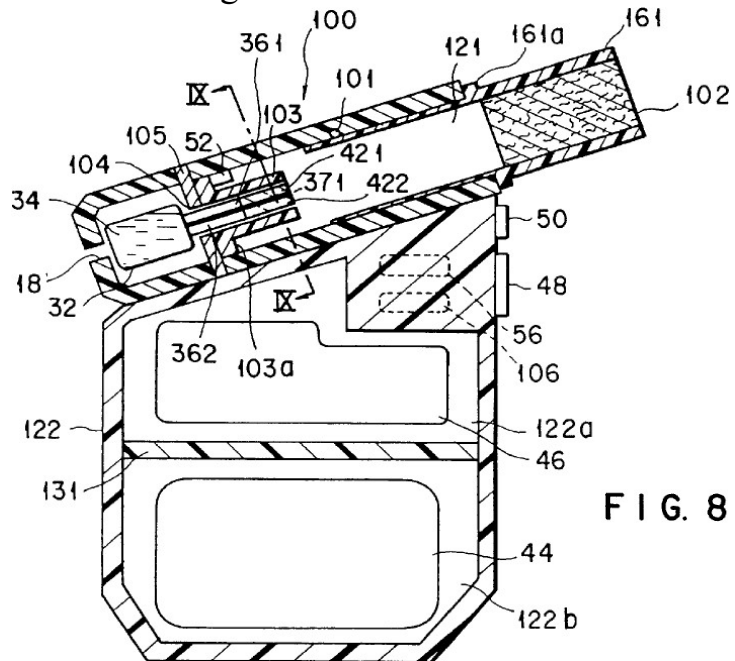


FIG. 8

“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. Further, a switch 50 for the on/off operation of the power source 44 is connected to the power source 44.” *Id.* at 6:23-29.

“The control circuit 46 serves to start up the heater 42 based on the signal from the heater switch 48 or in accordance with the inhaling action of the user based on the signal from the sensor 52 so as to gasify the liquid flavor

	<p>source 34 at the outlet portion 36b of the capillary tube 36.” <i>Id.</i> at 6:55-59.</p> <p>“...a display mechanism 106 for indicating the remaining amount of the power source 44 connected to the control circuit may be provided as shown in FIG. 8.” <i>Id.</i> at 10:19-21.</p> <p>“The lower chamber 122 is partitioned by a partition wall 131 into an upper sub-chamber 122a, which houses the control circuit 46, and a lower sub-chamber 122b, which houses the electric power source 14 [sic].” <i>Id.</i> at 9:1-5.</p>
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2. 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. 8; Ex. 1002 at ¶¶ 64-65.

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 7 and 8, Takeuchi discloses the circuit board electrically connected to the battery, the sensor and the heating wire. Ex. 1002 at ¶65.

3. Dependent Claim 3

a. “an atomization cavity within the atomizer”

Claim 3 recites the electronic cigarette of claim 1 further including an atomization cavity within the atomizer. As discussed above with respect to claims 1, 7 and 8, Takeuchi discloses an atomizer with rod-like heaters 74 in the upper chamber 121. Ex. 1003 at FIGS. 4 and 8; Ex. 1002 at ¶66. Annotated Figure 8 illustrates a cylindrical body 103 that forms an atomization cavity at the liquid passageway 371. Ex. 1002 at ¶66.

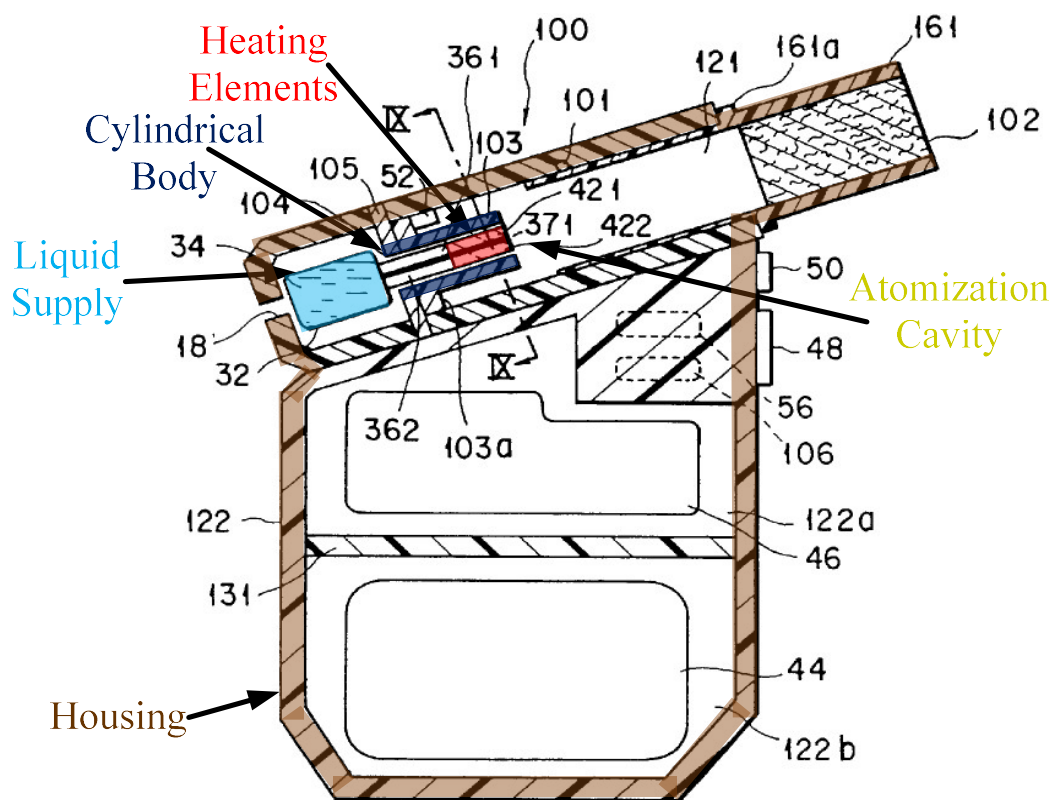


FIG. 8

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. The liquid supply is the liquid itself (liquid 34) in the liquid container 32 and as shown in at least Figs. 10-11, the liquid passageway is at least partially within the liquid. Ex. 1003 at 5:47-52, 9:23-34. “FIG. 10 is a perspective view showing the liquid passageway and the heater together with the liquid container used in the device of FIG. 8.” *Id.* at 8:52-55. Takeuchi discloses that the liquid passageway 371 with porous material 302 “is in fluid communication with the liquid flavor source in the container 32.” *Id.* at 9:26-29, 10:32-37, 11:32-35, and 12:33-35. Because the liquid passageway 371 may include an “inter-communicating void or pore structure filled in an enclosure,” such as open-cell foam structure or bundled fibers, the liquid supply (Liquid 32) comprises a fiber material (Pore Structure 302). *Id.* at 3:36-50; 10:50-63, Figs. 8, 14, and 15. Indeed, to the extent that the “fiber” limitation is met by the solution storage porous body being fiber, then the fiber limitation is met by the bundled fibers in Takeuchi that are in the liquid and hold the liquid. Ex. 1002 at ¶ 39; *see* Ex. 1007 at 10. (“Consistent with that further limitation, we determine that the “liquid supply” is not limited to the liquid itself, and may include other things in the liquid, such as the fiber material recited in claim 5.”).

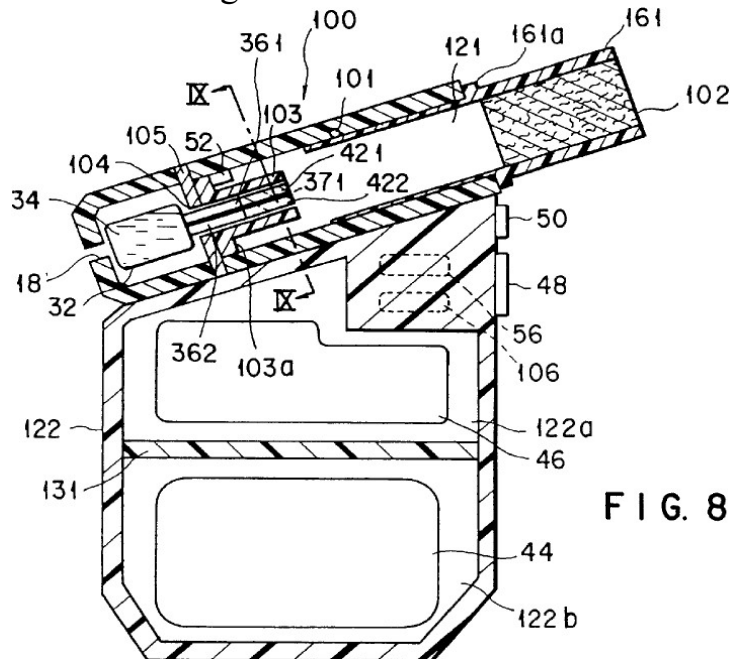
To the extent that the pore structure 302 somehow is not considered fiber that is part of the liquid supply, then it would have been obvious to include fiber in the liquid supply as using a fiber as a container to retain a liquid in electronic cigarettes and other related applications was well-known to a PHOSITA. *Id.* at ¶ 68. For example, U.S. Patent No. 6,598,607 (“Adiga”) discloses a non-combustible cigarette including a porous cartridge for storing a liquid. Ex. 1020 at 2:44-47. Adiga discloses a porous cartridge made of porous media, such as carbon filter, cotton, or other fabric materials. *Id.* at 3:1-3. Similarly, U.S. Patent No. 4,793,365 (“Sensabaugh”) states that it is well known to use thermally stable substrate materials as carriers for aerosol forming stances and that they release vapor upon heating. Ex. 1021 at 10:51-66. Sensabaugh includes a list of nearly 20 exemplary porous materials, including carbon felts, fibers, and mats. *Id.* U.S. Patent No. 5,203,355 (“Clearman”) discloses cigarettes including a “cellulosic material” for containing a liquid and releasing the liquid during smoking. Ex. 1022 at 9:36-52. Clearman includes a list of suitable materials, including fibrous materials such as cotton, rayon, and paper. *Id.* U.S. Patent No. 2,472,282 (“Burchett”) discloses a cigarette lighter with a “fuel chamber [that] may be filled with cotton or other absorbent material, as indicated at 44, in order to retain fuel which may be inserted into the chamber.” Ex. 1023 at 3:29-32. U.S. Patent No. 2,032,695 (“Gimera”) discloses a cigarette lighter with a reservoir for fuel “which

is carried by stuffing of saturated cotton waste.” Ex. 1024 at 1:46-48; Ex. 1002 at ¶ 68. Simply adding fiber to the liquid supply is the mere application of a known technique (incorporating fiber into liquid storage bodies) to a known device (an electronic cigarette) ready for improvement to yield the predictable result of providing a means to transport liquid from the liquid supply to the atomizer, with the additional benefits of reducing the possibility of leakage and improving the feel of the device by reducing sloshing. Ex. 1002 at ¶ 68.

Claim 5

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

Ex. 1003 at Figure 8:



“In the present invention, the liquid passageway through which the liquid flavor source is transported by the capillary force can be . . . an inter-communicating 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.

Id. at Figure 14:

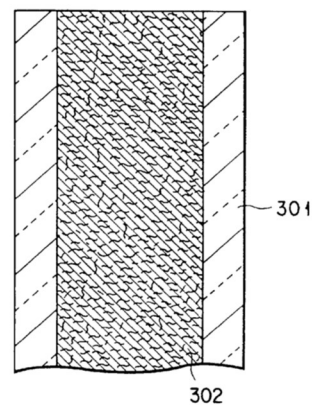


FIG. 14

“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. . . . *Id.* at 10:50-63.

F. GROUND 2: CLAIMS 1, 2, 3, 5, 7, AND 8 OF THE ‘628 PATENT ARE UNPATENTABLE AS OBVIOUS OVER TAKEUCHI IN VIEW OF WHITTEMORE

Claims 1-3, 5, 7 and 8 of the ‘628 patent are unpatentable under 35 U.S.C.

§ 103 as obvious over Takeuchi in combination with Whittemore. Takeuchi

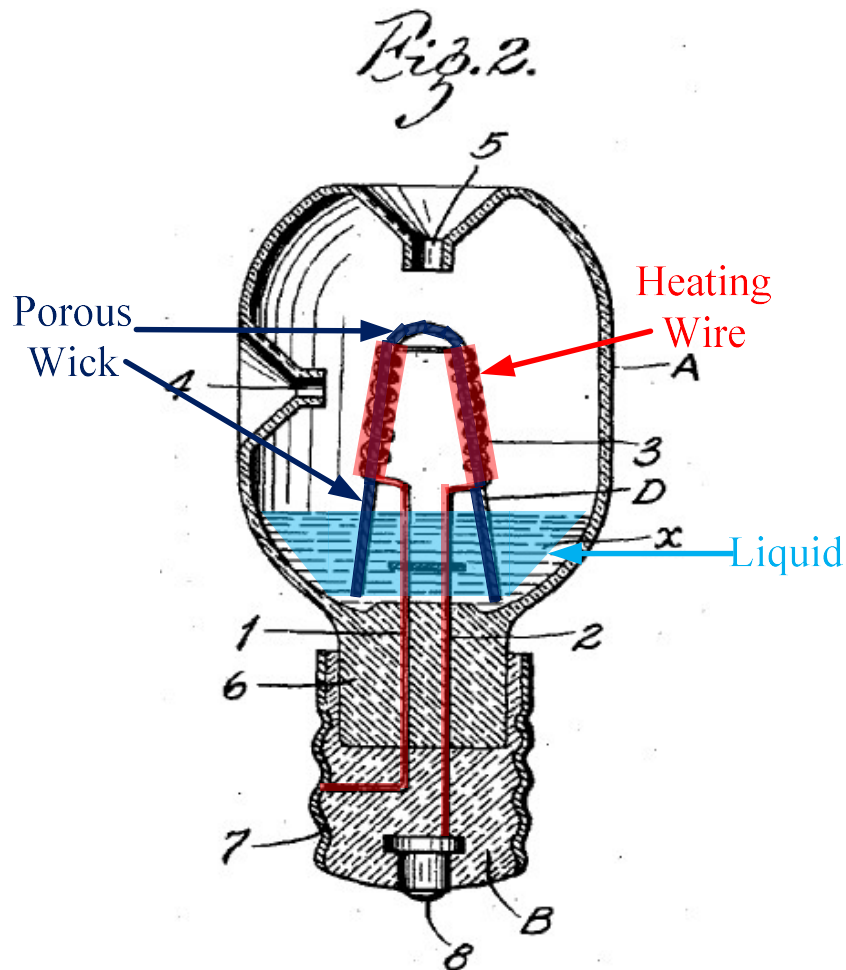
discloses all of the features of claims 1-3, 5, 7 and 8. To the extent the rod-like heaters are not considered to be a heating “wire” (claims 1, 7 and 8), Whittemore discloses a vaporization device having heating wire. Substituting Whittemore’s heating wire for Takeuchi’s heaters is nothing more than the simple substitution of one known element for another to obtain predictable results.

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

It would have been obvious to the PHOSITA to combine Takeuchi with Whittemore. Ex. 1002 at ¶¶ 70-79. 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 1:19-2:25. Takeuchi makes use of a variety of heaters including plate-like heaters, rod-like heaters, and ring-shaped heaters while Whittemore uses a heating wire wrapped around a wick. 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, Takeuchi discloses that the heater may be 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. 1002 at ¶ 72. 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; Ex. 1002 at ¶¶71-73. Thus, it would have been obvious to wrap heating wire, as taught by Whittemore, around the porous fiber material 302 of Figs. 14 and 15 in Takeuchi.

A PHOSITA also 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. 1010 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. 1011 at 1:99-103, 2:14-20, 2:75-85. Coiling a wire around a porous body as in Whittemore will achieve more efficient heating than merely placing a heater plate on top of the porous body shown in Fig. 15 of Takeuchi. Ex. 1002 at ¶ 74. Similarly, using a wire coiled around the porous structure would be more efficient than using the heater 42 that sets on top of the tube or the ring shaped heater that is mounted on the outside of the tube. *Id.* Such a replacement would result in the improvement of the Takeuchi device by applying a known technique for efficient heating (wire coil in Whittemore) to a known device in Takeuchi that is ready for improvement. *Id.* Indeed, this simple substitution would meet Takeuchi's objective for low energy use. Ex. 1003 at 1:59-64; Ex. 1002 at ¶ 74. 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 that the heating wire could be located on the porous body surfaces to be heated. Ex. 1002 at ¶ 71. Thus, for example, with reference to Figure 15 of Takeuchi, heating wire could be coiled around the porous material 302. *See* Ex. 1003 at Fig. 15; Ex. 1002 at ¶ 74.

2. Claims 1, 7 and 8

a. “an electronic cigarette”

The analysis is identical to that set forth in section VI.E.1.a.

b. “a housing having a longitudinal axis”

The analysis is identical to that set forth in section VI.E.1.b.

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

The analysis is identical to that set forth in section VI.E.1.c.

d. “a liquid supply in the housing”

The analysis is identical to that set forth in section VI.E.1.d.

e. “a liquid supply, a battery, and an electronic circuit board in the housing”

The analysis is identical to that set forth in section VI.E.1.e.

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, with part of

the air flow channel extending alongside of the liquid supply”

The analysis is identical to that set forth in section VI.E.1.f.

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

The analysis is identical to that set forth in section VI.E.1.g.

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

The analysis is identical to that set forth in section VI.E.1.h.

- 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”**

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.1.i, *supra*, Takeuchi discloses multiple heater embodiments with different orientations. *See* Ex. 1003 at Figs 8 and 15. As explained in Section VI.F.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 use the heating wire with the intercommunicating pore structure 302. The PHOSITA

would have readily appreciated that heating wire could either be wrapped around the porous material 302 in Figs. 14-15. Ex. 1002 at ¶¶ 72-74.

Annotated Figures 14 and 15 of Takeuchi (shown below) illustrate one way that the heating coil of Whittemore could be used with the porous material in Takeuchi. *Id.* As noted by Dr. Sturges, improved heating results in a quicker response time when a user puffs the flavor generating device, which is one of the objectives of Takeuchi. *Id.* at ¶ 72. The use of a heating wire would improve response time for generating the flavor. *Id.* Substituting the heating coils for the heating plates 421, 422 of Figure 8 would have been a matter of routine design choice that uses one known technique to achieve the result of improved heating, and would result in the central axis through the heating coil is substantially perpendicular to the vertical longitudinal axis of Figure 8. *Id.* at ¶¶ 72-74. This central axis of the heating wire crosses the longitudinal axis at an angle that is close to 90°, but not completely perpendicular.

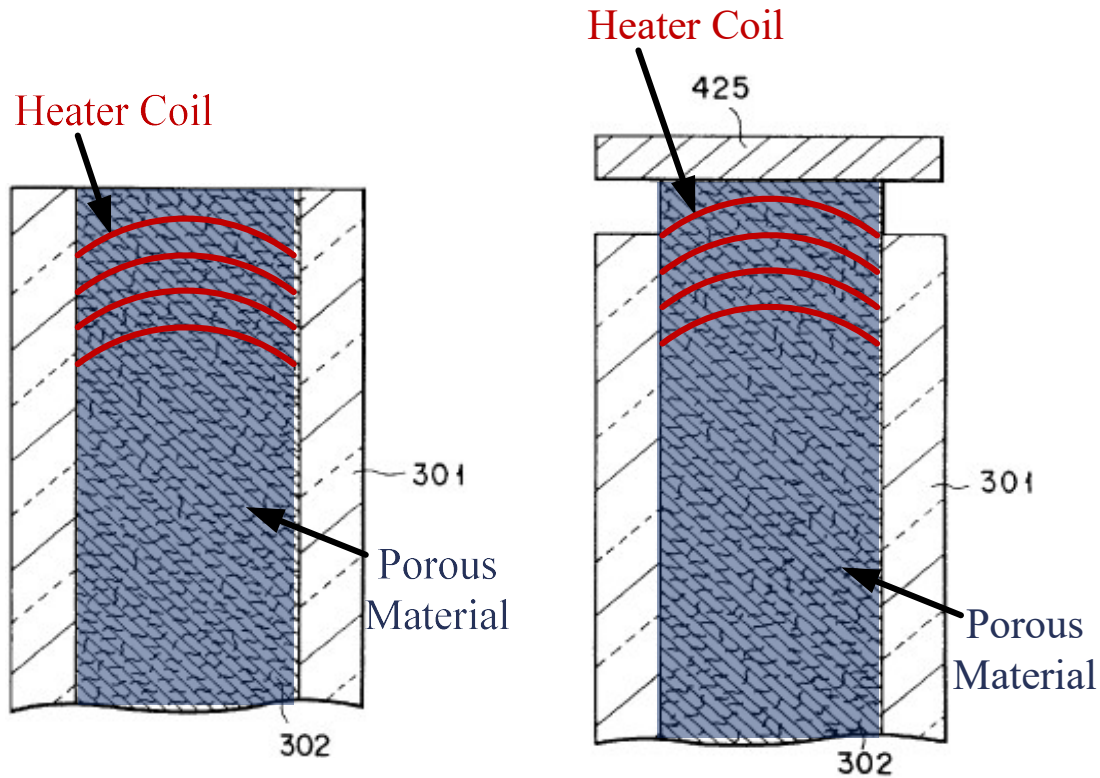
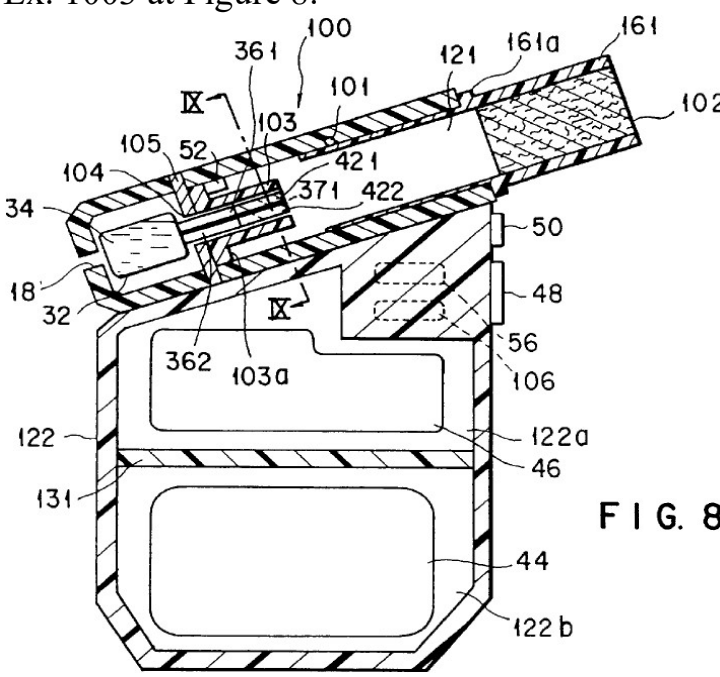


FIG. 14

FIG. 15

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 of the upper chamber inclination relative to the vertical longitudinal axis of Takeuchi's housing would not affect the device's operation. Ex. 1002 at ¶ 63.

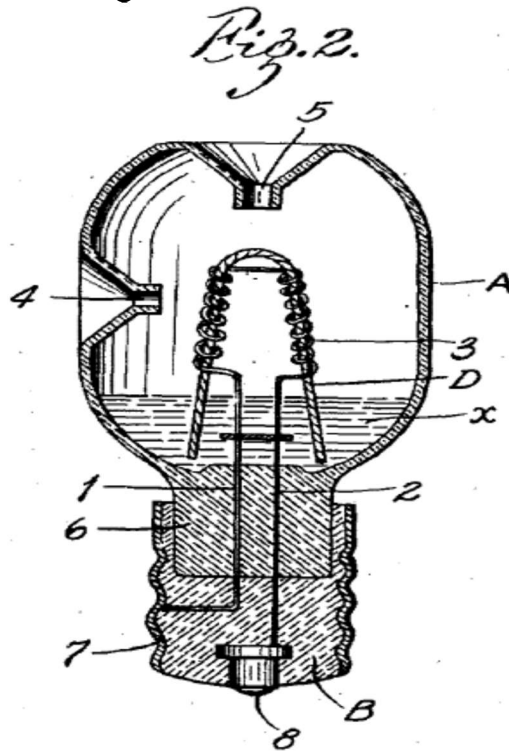
Also, it was well known that a heating resistor may include a wire. *See* Ex. 1012 at 1:23-26 (disclosing that a heating resistor includes a wire: “[I]ts heating resistor is constructed by winding a platinum wire around a bobbin and then coating the wire with glass, or by forming a thin film resistor 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. 1009 at 18-19 (“[A]n ordinary artisan would have understood that thin film resistors included heating wires, such as platinum wire.”).

Claim 1, 7, and 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 7:</u> [the atomizer including:] a heating wire in the atomizer having a central axis oriented substantially perpendicular to a 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 8:</p>  <p>FIG. 8</p> <p>“In the device shown in FIG. 8, the liquid passageway 371 is defined between two substantially parallel plates spaced apart from each other. The distal end portion (the outlet portion of the liquid flavor source) of the liquid</p>

passageway 371 is heated by plate-like heaters 421 and 422 mounted to the plate 361 and 362, respectively.” *Id.* at 9:28-34.

“The enclosure 301 may be provided by a tube, or two plates arranged spaced apart from each other wherein the 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 302.” *Id.* at 10:55-63.

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.” <i>Id.</i> at 1:54-2:8.
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j. “a battery, a sensor and an electronic circuit board within the housing”

The analysis is identical to that set forth in section VI.E.1.j.

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

The analysis is similar to that set forth in section VI.E.1.k. However, as noted in in Section VI.F.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.

3. Dependent Claim 2

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

The analysis is identical to that set forth in section VI.E.2.a.

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

The analysis is identical to that set forth in section VI.E.2.b.

4. Dependent Claim 3

- a. “an atomization cavity within the atomizer”**

The analysis is identical to that set forth in section VI.E.3.a.

5. Dependent Claim 5

- a. “the liquid supply comprising a fiber material”**

The analysis is identical to that set forth in section VI.E.4.a.

VII. 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 1-3, 5, 7, and 8 of the '628 patent. Petitioner request institution of an *inter partes* review to cancel the challenged claims.

Dated: April 3, 2017

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 10,701 words as calculated by the “Word Count” feature of Microsoft Word 2016, 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: April 3, 2017

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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 April 3, 2017, 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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