

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 No.: 9,326,548

Issue Date: May 3, 2016

Title: Electronic Cigarette

Inter Partes Review No.: To Be Assigned

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 9,326,548 PURSUANT TO
35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42**

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TABLE OF AUTHORITIES

CASES

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OTHER AUTHORITIES

Manual of Patent Examining Procedure § 2143	27, 28, 29
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REGULATIONS

37 C.F.R. § 42	1, 2, 8, 9, 15
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EXHIBITS LIST

Exhibit No.	Description
Exhibit 1001:	U.S. Pat. No. 9,326,548 to Lik Hon
Exhibit 1002:	Chinese Pat. No. 2719043Y to Lik Hon
Exhibit 1003:	Certified English translation of Chinese Pat. No. 2719043Y to Lik Hon
Exhibit 1004:	U.S. Pat. No. 2,057,353 to C. L. Whittemore, Jr
Exhibit 1005:	WO 2005/099494, which is the PCT application equivalent of Hon (CN 2719043Y) (“Hon ’494”)
Exhibit 1006:	Certified English translation of WO 2005/099494 pursuant to 37 C.F.R. 42.63(b)
Exhibit 1007:	Application Data Sheet and Specification of U.S. Pat. Appl. No. 14/244,376 Filed April 3, 2014
Exhibit 1008:	Non-Final Office Action of September 4, 2014 in 14/244,376
Exhibit 1009:	Compilation of prosecution papers filed in 14/244,376
Exhibit 1010:	Non-Final Office Action of August 20, 2015 in 14/244,376
Exhibit 1011:	Amendment of November 20, 2015 in 14/244,376
Exhibit 1012:	Notice of Allowance of March 15, 2016 in 14/244,376
Exhibit 1013:	Board’s Decision Denying Institution in IPR2015-00859
Exhibit 1014:	Board's Order Dismissing Petition IPR2015-01587
Exhibit 1015:	Declaration of Dr. Robert Sturges
Exhibit 1016:	Rohsenow, “Heat, Mass, And Momentum Transfer”
Exhibit 1017:	Merriam-Webster Definition of “Set”
Exhibit 1018:	U.S. Pat. No. 6,155,268 to Takeuchi
Exhibit 1019:	U.S. Pat. No. 4,947,874 to Brooks et al.
Exhibit 1020:	U.S. Pat. No. 4,629,665 to Matsuo
Exhibit 1021:	U.S. Pat. No. 5,894,841 to Voges
Exhibit 1022:	U.S. Pat. Pub. No. 2005/0016550 to Katase

Exhibit 1023:	U.S. Pat. No. 5,703,633 to Gehrler et al.
Exhibit 1024:	IPR2014-01300, Paper No. 8

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 1-14 of U.S. Pat. No. 9,326,548 to Lik Hon, titled “Electronic Cigarette” (“‘548 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 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 1-14 of the ‘548 patent are unpatentable under 35 U.S.C. § 103 based upon the combination of Chinese Pat. No. 2719043Y to Lik Hon (“Hon ‘043,” Ex. 1002) and U.S. Pat. No. 2,057,353 (“Whittemore,” Ex. 1004) in further view of U.S. Pat. No. 5,894,841 (“Voges,” Ex. 1021) and/or U.S. Patent No. 5,703,633 (“Gehrer,” Ex. 1023). As explained herein, the claimed invention is simply the predictable use of prior art elements according to their established functions.¹

¹ On July 2, 2016, the Petitioner filed a petition for *inter partes* review based upon the combination of Hon ‘043 and Whittemore challenging claims 2-3 of U.S.

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

A. 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, 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. Related Matters

Petitioner is not aware of any reexamination certificates or pending prosecution concerning the ‘548 patent. Petitioner is a defendant in the following

Patent No. 8,365,742, which issued from the same application family as the ‘548 patent. *See* IPR2016-01268.

litigation involving the ‘548 patent: *Fontem Ventures B.V. et al v. R.J. Reynolds Vapor Company*, No. 2:16-cv-03049 (C.D. Cal., filed May 3, 2016). Fontem has alleged that Reynolds infringes claims 1-14 of the ‘548 patent, as well as certain claims of U.S. Patent No. 9,326,549. The above-referenced action is one of three related patent infringement actions filed by the Patent Owner against the Petitioner. In the related action, *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 2:16-cv-02286 (C.D. Cal., filed April 4, 2016), the Patent Owner has asserted U.S. Patent Nos. 8,365,742; 8,490,628; 8,893,726; and 8,899,239. In addition to the petitions for IPR noted below with respect to the ‘742 patent, the Petitioner has also recently filed petitions for IPR against the ‘628 patent (2016IPR-01527), the ‘726 patent (2016IPR-01270), and the ‘239 patent (2016IPR-01272). In the other related action, *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 2:16-cv-04534 (C.D. Cal., filed June 22, 2016), the Patent Owner has asserted U.S. Patent No. 9,370,205.²

In addition to the foregoing, the Petitioner is aware of the following additional matters involving or related to the ‘548 patent.

Pending Litigations and IPRs

² The court in the three related actions recently ordered transfer of the cases to the United States District Court for The Middle District of North Carolina.

Case Name	Filed
<i>Fontem Ventures BV v. Nu Mark LLC</i> , 2-16-cv-04537 (CACD)	June 22, 2016
<i>Fontem Ventures B.V. and Fontem Holdings 1 B.V. v. Nu Mark LLC</i> , 2-16-cv-02291 (C.D. Cal.)	April 4, 2016
Petition for <i>Inter Partes</i> Review by R.J. Reynolds Vapor Company, IPR No.: To Be Assigned (challenging claims 1-14 of the ‘548 patent)	Filed concurrently with this petition
Petition for <i>Inter Partes</i> Review by Nu Mark LLC, IPR2016-01641 (challenging claims 1-14 of the ‘548 patent)	August 18, 2016
Petition for <i>Inter Partes</i> Review by Nu Mark LLC, IPR2016-01642 (US9,370,205)	August 18, 2016
Petition for <i>Inter Partes</i> Review by R.J. Reynolds Vapor Company, IPR2016-01268 (US8,365,742)	July 2, 2016
Petition for <i>Inter Partes</i> Review by R.J. Reynolds Vapor Company, IPR2016-01532 (US8,365,742)	August 5, 2016
Petition for <i>Inter Partes</i> Review by Nu Mark LLC, IPR2016-01303 (US8,365,742)	June 28, 2016
<i>Nu Mark LLC v. Fontem Holdings 1 B.V.</i> , IPR2016-01307 (US8,375,957)	June 28, 2016
<i>Nu Mark LLC v. Fontem Holdings 1 B.V.</i> , IPR2016-01309 (US8,863,752)	June 28, 2016

Pending Patent Applications

Serial No.	Filed
U.S. Patent Application No. 13/740,011, which claims priority to the ‘742 patent	January 11, 2013
U.S. Patent Application No. 15/167,659, which claims priority to the ‘742 patent	May 27, 2016
U.S. Patent Application No. 15/167,690, which claims priority to the ‘742 patent	May 27, 2016
U.S. Patent Application No. 15/158,421, which claims priority to the same foreign application as does the ‘742 patent	May 18, 2016
U.S. Patent Re-Examination No. 95/002,235, which claims priority to the ‘742 patent	September 13, 2012

Terminated Litigations and IPRs

Case Name	Filed
<i>Fontem Ventures BV et al v. NJOY, Inc.</i> , No. 2:14-cv-01645 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. LOEC, Inc. et al</i> , No. 2:14-cv-01648 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. CB Distributors, Inc. et al</i> , No. 2:14-cv-01649 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. Vapor Corp.</i> , No. 2:14-cv-01650 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. FIN Branding Group, LLC et al</i> , No. 2:14-cv-01651 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. Ballantyne Brands, LLC</i> , No. 2:14-cv-01652 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. Spark Industries, LLC</i> , No. 2:14-cv-01653 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. Logic Technology Development LLC</i> , No. 2:14-cv-01654 (C.D. Cal.)	March 5, 2014
<i>Fontem Ventures BV et al v. VMR Products, LLC</i> , No. 2:14-cv-01655 (C.D. Cal.)	March 5, 2014
<i>Ruyan Investment (Holdings) Limited v. Sottera, Inc.</i> , 2:12-CV-5454 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. LOEC, Inc.</i> , 2:12-CV-5455 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. CB Distributors, Inc. et al</i> , 2:12-CV-5456 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. The Safe Cig LLC</i> , 2:12-CV-5462 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. Vapor Corp.</i> , 2:12-CV-5466 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. Finiti Branding Group LLC</i> , 2:12-CV-5468 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. Barjan LLC et al</i> , 2:12-CV-5470 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. Spark Industries LLC</i> , 2:12-CV-5472 (C.D. Cal.)	June 22, 2012

Case Name	Filed
<i>Ruyan Investment (Holdings) Limited v. Nicotek LLC</i> , 2:12-CV-5477 (C.D. Cal.)	June 22, 2012
<i>Ruyan Investment (Holdings) Limited v. Logic Technology Development LLC</i> , 2:12-CV-5482 (C.D. Cal.)	June 22, 2012
<i>In re: Fontem Holdings I B.V.</i> , Appeal No. 15-1511 (Fed. Cir.)	April 1, 2015
<i>JT International S.A. v. Fontem Holdings I B.V.</i> , IPR2015-01587 (PTAB, filed) (US8,365,742)	July 14, 2015
<i>VMR Products, LLC v. Fontem Holdings I B.V.</i> , IPR2015-00859 (PTAB) (US8,365,742).	March 10, 2015
<i>CB Distributors, Inc. v. Fontem Holdings I B.V.</i> , IPR2013-00387 (US8,156,944)	June 27, 2013
<i>Logic Technology Development, LLC v. Fontem Holdings I B.V.</i> , IPR2015-00098 (US8,375,957)	October 21, 2014
<i>NJOY, Inc. v. Fontem Holdings I B.V.</i> , IPR2015-01301 (US8,863,752)	May 29, 2015
<i>JT International S.A. v. Fontem Holdings I B.V.</i> , IPR2015-01513 (US8,375,957)	June 26, 2015
<i>JT International S.A. v. Fontem Holdings I B.V.</i> , IPR2015-01604 (US8,863,752)	July 20, 2015

As noted above, the grandparent of the ‘548 patent, U.S. Patent No. 8,365,742 (the “‘742 patent”), has been challenged in several IPRs. In IPR2015-01587, the Board dismissed JT International’s petition for *inter partes* review of the ‘742 patent at the parties request in view of an apparent settlement. Ex.1014 at 2.

The VMR Petition

In IPR2015-00859, the Board denied institution of VMR’s petition for *inter partes* review of the ‘742 patent. Ex. 1013 at 2. VMR’s petition relied on the

combination of Hon ‘043 with Whittemore, which are also relied upon in the current Petition with respect to the ‘548 patent. According to the Board, VMR failed to articulate sufficient reasoning with rational underpinnings (as opposed to conclusory statements) as to why the person of ordinary skill in the art would have been motivated to combine Hon ‘043 with Whittemore. Specifically, the Board concluded that VMR’s contention that “more efficient, uniform heating” as the motivation for combining the references consisted of unsupported conclusory statements. *Id.* at 17-19, 21-25. As discussed herein, the proposed combination of Hon ‘043 and Whittemore in the current Petition does not suffer from any such defect. There are multiple rationales (in addition to, or in lieu of, the motivation for “more efficient, uniform heating”) why the person of ordinary skill in the art would have been motivated to combine Hon ‘043 and Whittemore to arrive at the claimed invention, any one of which standing alone is sufficient.

C. Lead and Back-Up Counsel

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D. Service Information

Service of any documents via hand delivery, express mail or regular mail may be made to the lead and backup counsel at the postal mailing address above. Petitioner also consents to service by email at the above-designated email addresses.

E. Proof of Service

Proof of service of this Petition on the Patent Owner at the correspondence address of record for the ‘548 Patent is attached.

III. GROUNDS FOR STANDING

As required by 37 C.F.R. § 42.104(a), Petitioner certifies that the ‘548 Patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review on the grounds identified herein.

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

Pursuant to 37 C.F.R. § 42.104(b), the precise relief requested is that the Patent Trial and Appeal Board review and find unpatentable claims 1-14 of the ‘548 Patent.

Petitioner requests *inter partes* review and cancellation of claims 1-14 of the ‘548 patent pursuant to 35 U.S.C. § 103 as set forth herein. The ‘548 patent is to be reviewed under pre-AIA § 103. Petitioner’s detailed statement of the reasons for the 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, the Petition is accompanied by the Declaration of Dr. Robert Sturges (“Sturges Decl.”) Ex. 1015.

Claims 1-14 of the ‘548 patent are unpatentable based upon the following ground:

Ground 1: Claims 1-14 are obvious over the combination of Chinese Pat. No. 2719043Y to Lik Hon (“Hon ‘043,” Ex. 1002; “Hon ‘043 English translation,” Ex. 1003; Hon ‘043 PCT equivalent; Ex. 1005; and Hon ‘043 PCT equivalent English translation; Ex. 1006) with Whittemore, U.S. Pat. No. 2,057,353 (“Whittemore,” Ex. 1004), and, if necessary, in further view of Voges, U.S. Patent No. 5,894,841 (“Voges,” Ex. 1021) and/or Gehrler, U.S. Patent No. 5,703,633 (“Gehrler,” Ex. 1023).

Statement of Non-Redundancy: Petitioner is concurrently filing another Petition for IPR on the ‘548 patent. The present Petition is not redundant of the ground presented in the concurrently filed petition, which asserts one ground of unpatentability under § 102(b) and alleges that claims 1-14 are not entitled to a priority date any earlier than April 17, 2010. In contrast, this Petition assumes without conceding that claims 1-14 are entitled to the priority of the filing date of PCT/CN2007/001575, and asserts unpatentability under 35 U.S.C. § 103.

V. THRESHOLD REQUIREMENT FOR *INTER PARTES* REVIEW

This petition meets the threshold requirement 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, for the ground of unpatentability proposed 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

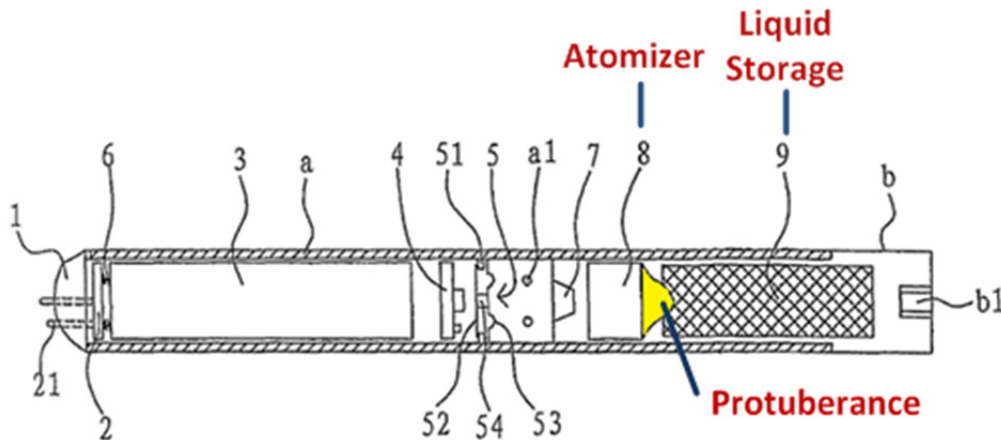
A. Summary of the Argument

As explained herein, the claimed invention is simply the obvious combination of prior art elements according to their predicted and well-established functions. Accordingly, Petitioner respectfully requests that the Board find that claims 1-14 of the ‘548 patent are invalid under 35 U.S.C. § 103.

B. Background of the '548 Patent

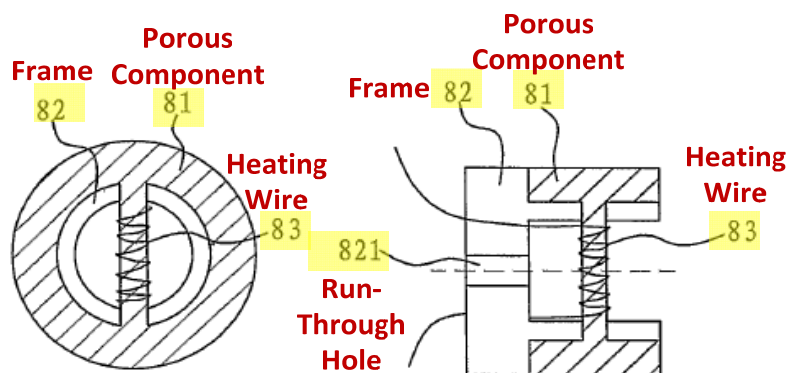
1. Summary of the '548 Patent

The '548 patent generally describes an electronic cigarette.



With respect to Fig. 1, the electronic cigarette includes an operating indicator 1, a battery 3, an atomizer assembly 8 and a liquid storage 9. Ex. 1001 at 2:48-56, 62-64; 3:25-27; 4:1-3; Fig. 1. The electronic cigarette also includes a shell (a) which is hollow and integrally formed. *Id.* at 2:48-51. The battery assembly connects with said atomizer assembly and both are located in said shell (a). *Id.* at 2:52-53. The shell (a) has through-air-inlets (a1). *Id.* at 2:55-56; Fig. 1. A porous component of the atomizer assembly 8, *i.e.*, protuberance/bulge 812, contacts the liquid storage 9 “to achieve the capillary impregnation for liquid supply.” *Id.* at 3:35-40; 4:1-14, 55-59.

Further details of the atomizer assembly 8 are illustrated in annotated Figs. 17 and 18, which are reproduced below. *Id.* at Figs. 17-18.



The atomizer assembly includes “a frame (82), the porous component (81) set on the frame (82), and the heating wire (83) wound on the porous component (81). The frame (82) has a run-through hole (821). The porous component (81) is wound with heating wire (83) in the part that is on the side in the axial direction of the run-through hole (821). One end of the porous component (81) fits with the cigarette bottle assembly.” *Id.* at 5:61-6:2.

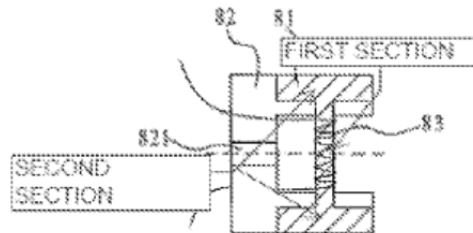
2. Prosecution History of the ‘548 Patent

The ‘548 patent issued from U.S. Appl. No. 14/244,376, filed on April 3, 2014. Ex. 1001 at 1; Ex. 1007 at 2-3. In an Office Action dated August 20, 2015, the Examiner rejected the then pending claims 1-15 based upon Susa (EP845220) alone or in combination with Brooks (U.S. Pat. No. 4,922,901). Ex. 1010 at 4-8. In an Amendment dated November 20, 2015, the Applicant amended claims 1-7, canceled claims 8-15, and added new claims 16-22. Ex. 1011 at 4-8. Independent claim 1 was amended to “include an operating indicator in the battery assembly” and a “porous component set on a frame having a run-through hole, an air flow

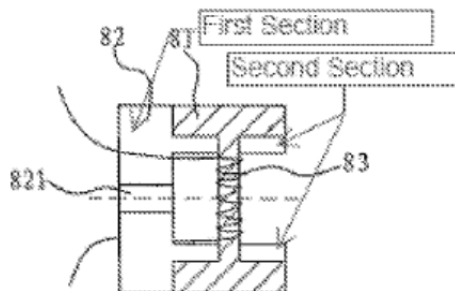
path parallel to the longitudinal axis of the housing and passing through the run-through hole, and the heating wire coil in the air flow path and perpendicular to the longitudinal axis.” *Id.* at 9. The Applicant stated that these changes are supported by paragraph [0052] and Fig. 17-18 of the application. *Id.*; Ex. 1007 at 18, 27.

New claims 16-22 included additional limitations, which according to the Applicant found support in the specification. Ex. 1011 at 9-10.

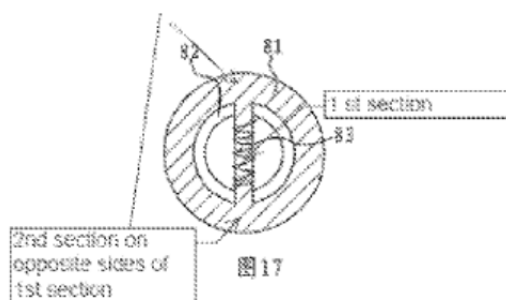
- “the porous component having a first section perpendicular to the longitudinal axis of the housing and having a second section parallel to the longitudinal axis, as shown in the marked up Fig. 18 below, wherein the dotted line represents the orientation of the longitudinal axis”



- “a frame having a cylindrical first section and a second section, with the second section between the first section and the outlet, and with the second section longer than the first section, as shown in the marked up Fig.18 below”



- “the second section of the porous component on opposite sides of the first section of the porous component, as shown in the marked up Fig. 18 below”



Application claims 1-7 and 16-22 were subsequently allowed, and issued as patent claims 1-14. *Id.* at 4-8; Ex. 1001 at 6:12-8:21. In the reasons for allowance, the Examiner stated that “[n]one of the prior art of record teaches nor reasonably suggests an electronic cigarette which includes a heating wire coil wound around a porous component (set on a frame having a run-through hole), provided in an air flow path, wherein the heating wire coil is oriented perpendicularly to the longitudinal axis of the housing of the electronic cigarette.” Ex. 1012 at 6.

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

The PHOSITA is a hypothetical person who is presumed to know the relevant prior art. Factors that guide the determination of level of ordinary skill in the art may include: the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art.

The PHOSITA for the ‘548 patent is a person with 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. 1015, ¶¶ 26-27.

D. 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*, 136 S. Ct. 2131, 579 U.S. ____ (2016).

1. “frame”

Claims 1, 3-4, 8, 10-11, and 14 of the ‘548 patent recite the term “frame.” Ex. 1001 at 6:20-21, 35-40, 56-60; 7:6-9, 17-18; 8:18-21. The Board previously

construed “frame” in the parent ‘742 patent to mean a “rigid structure.” IPR2015-00859, Ex. 1013 at pp. 7-8. For purposes of this petition, the Petitioner applies the Board’s prior construction of “frame.”

2. “porous component set on a frame having a run-through hole”

Independent claims 1 and 8 of the ‘548 patent recite the term “porous component set on a frame having a run-through hole.” Ex. 1001 at 6:20-21, 59-60. The specification of the ‘548 patent does not expressly define “set on.” However, Figs. 17-18 of the ‘548 patent (annotated below) illustrate that “the porous component (81) [is] set on the frame (82).” *Id.* at 5:61-64; Figs. 17-18.

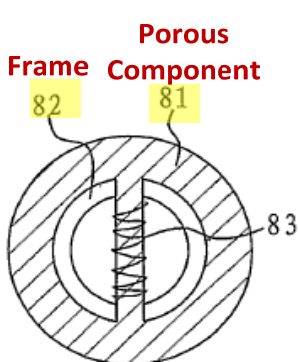


Fig. 17

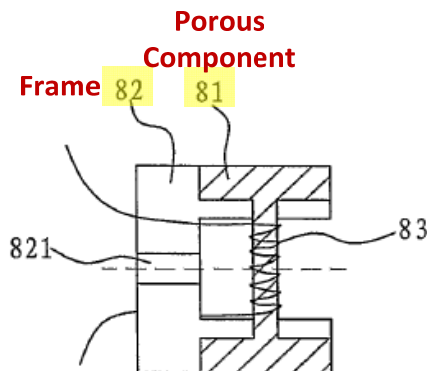


Fig. 18

The term “set” as used in the claims would be understood by the PHOSITA as having its plain and ordinary meaning, namely, that the porous component sits on the frame. Ex. 1015 at ¶ 33; Ex. 1017. For purposes of this Petition, “porous component *set on* a frame having a run-through hole” should be construed under

the BRI standard applicable here to mean that the porous component sits on the frame.

E. Description of the Prior Art

1. Hon '043 (Ex. 1002; Ex. 1003)

The '548 patent claims priority to PCT Application No. PCT/CN2007/001575, filed on May 15, 2007. Ex. 1001 at 1. Because Hon '043 published on August 24, 2005, it is prior art under 35 U.S.C. § 102(b).³

Hon '043 discloses an electronic cigarette, which is illustrated in Fig. 1 from Hon '043 below. Ex. 1003 at Fig. 1.

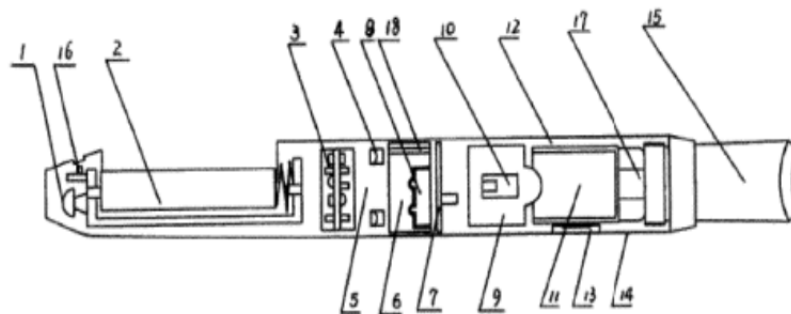
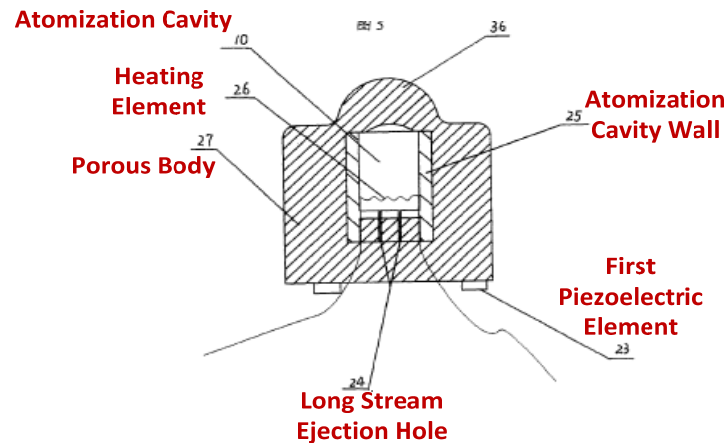


FIG. 1

³ PCT/CN2005/00337 is based upon Hon '043, and the '337 PCT application published on October 27, 2005 as WO2005/099494 (Exs. 1005 and 1006 (English translation)). Thus, the published PCT application, which has substantially the same disclosure as Hon '043, is also prior art to claims 1-14 of the '548 patent pursuant to 35 U.S.C. § 102(b).

Hon ‘043’s electronic cigarette includes “[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 ... sequentially provided within the shell 14.” Ex. 1003 at 9:3-6. “An air inlet 4 is provided on the external wall of the shell 14.” *Id.* at 9:3.

Details of Hon ‘043’s atomizer assembly 9 are illustrated in annotated Fig. 6 of Hon ‘043.

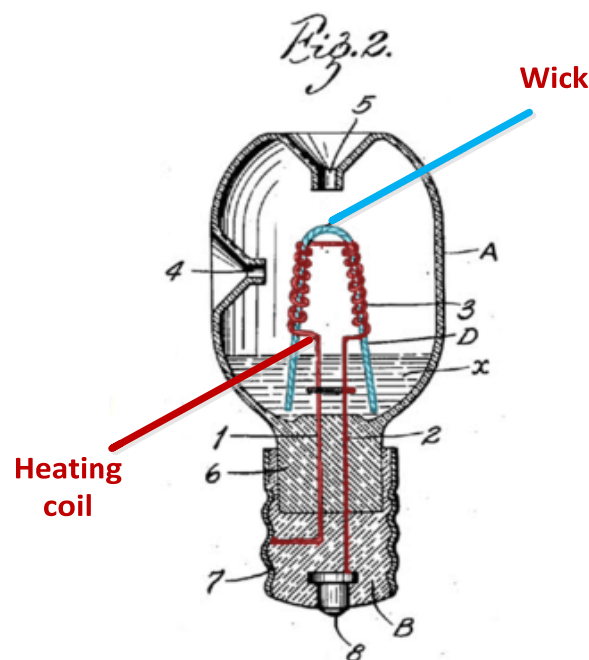


The atomizer has an atomization cavity wall 25 “surrounded with a porous body 27.” *Id.* at 9:22-23. The porous body 27 includes a bulge 36. *Id.* at 9:11-12; Fig. 6. The bulge 36 of the porous body 27 is in physical contact with the liquid supplying bottle 11. *See id.* at Fig. 1. A short stream ejection hole 30 or a long stream ejection hole 24 is provided. *Id.* at 9:16-22; Figs. 6-8. In use, “[t]he high speed stream passing through the ejection hole drives the nicotine solution in the porous body 27 to eject into the atomization cavity 10 in the form of droplet[s],

where the nicotine solution is subjected to the ultrasonic atomization by the first piezoelectric element 23 and is further atomized by the heating element 26.” *Id.* at 10:28-11:2. Hon ‘043 also explains that the piezoelectric element 23 may be omitted, and that atomization may be accomplished solely by the heating element 26. *Id.* at 11:16-18.

2. Whittemore (Ex. 1004)

Whittemore is prior art under 35 U.S.C. § 102(b). Whittemore discloses a vaporizing unit, which is illustrated in annotated Fig. 2.

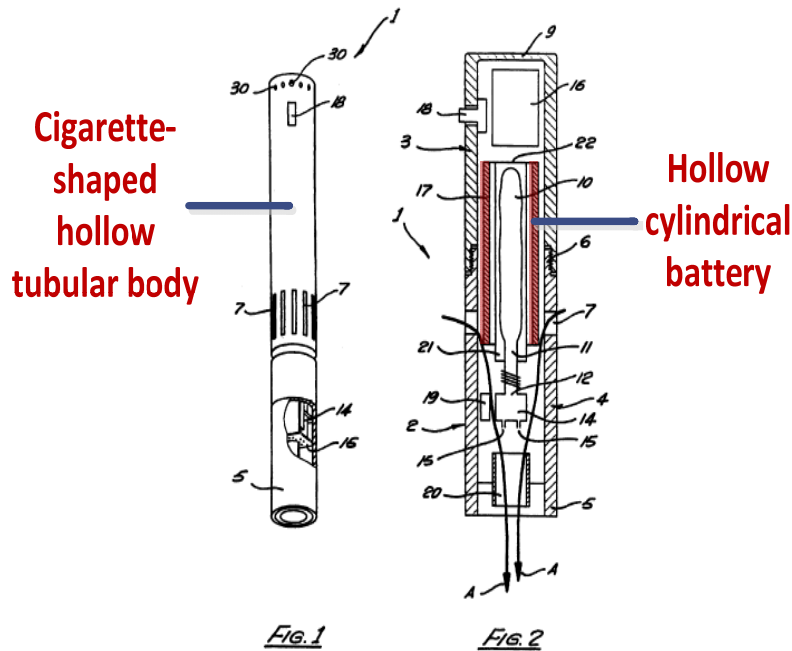


A vaporizing vessel A is “adapted to hold a liquid medicament x and provided with an electrically-operated heating means comprising two electrical conductors 1 and 2 and a filament or heating element 3 combined in such a way that when said conductors are energized by an electric current, the filament 3 will

become heated.” Ex. 1004 at 1:18-28. Whittemore also discloses that heating element 3 is wound on a part of wick D. According to Whittemore, “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.” *Id.* at 1:54-2:8. Whittemore also includes an air inlet orifice 4 and a vapor outlet 5. *Id.* at 1:31-33.

3. Voges (Ex. 1021)

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. 1021 at 1:4-8 and 3:7-15.

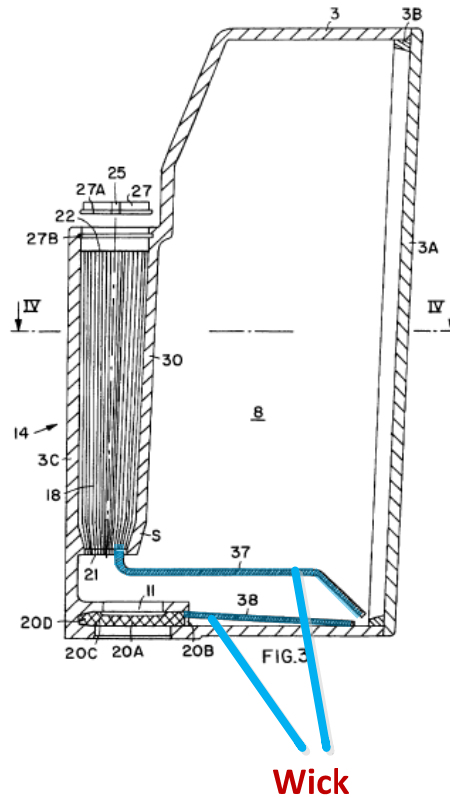


Voges's electronic cigarette substitute includes a cigarette-shaped hollow tubular body 1 comprising connected body parts 2 and 3, a hollow cylindrical battery 17, a liquid nicotine supply 10 and an atomizer comprising droplet ejection device 14, which can be of the type used in bubble jet printing. *Id.* at 5:48-6:1. When a person inhales, a stream of air is drawn into the tubular body via slots 7 in the body's sidewall. *Id.* at 6:2-5. A pressure sensor 19 detects a change in pressure due to inhalation and controls ejection of nicotine droplets from the atomizer (which includes at least droplet ejection device 14 with droplet ejection orifices 15). *Id.* at 5:58-65, 6:8-19. The nicotine droplets are vaporized and entrained in the inhalation airflow running from the slots 7 towards the outlet, mouthpiece 5. *Id.* at 6:19-23.

Burrowing from the ink jet printing field, Voges discloses that the atomizer may be a droplet ejection device using thermal bubble jet technology, such a used in ink jet printers to vaporize liquid nicotine within the electronic cigarette. *See, e.g., id.* at 3:62-4:5.

4. Gehrer (Ex. 1023)

Gehrer disclose a liquid container for ink jet printers. As shown in annotated Figure 3 below, Gehrer's container includes an ink reservoir 8. Gehrer 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 writing tip or the like. Ex. 1023 at 6:18-21, 8:59-67. The porous wicks 38 and 37 extend into the liquid supply to draw liquid and prevent the coupling member 20A and ink facing surface of the capillary body 18, respectively, from drying out. *Id.* at 5:14-29, 8:19-26.



The porous wicks 37 and 38, capillary body 18 and coupling member 20A are made from wicking materials such as fibers. *Id.* at 2:4-7, 2:17-22, 3:7-15, and 10:1-4; *see also* Ex. 1015 at ¶ 53. The capillary body 18 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 wicks 37 and 38 draw liquid (*i.e.*, ink) from the liquid supply 8 to the capillary body 18 and the coupling member 20A, respectively. *Id.* at 8:17-37, 8:58-62. *See also* Ex. 1015 ¶ 52.

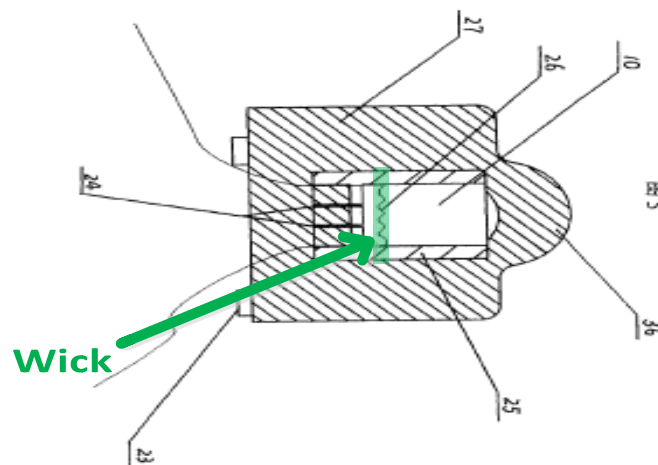
F. There Is a Reasonable Likelihood That Claims 1-14 Are Obvious Over the Combination of Hon ‘043 and Whittemore

As illustrated by the discussion, annotated figures and claim chart below, challenged claims 1-14 are unpatentable under 35 U.S.C. § 103 based upon the combination of Hon ‘043, Whittemore and, if necessary, in further view of Voges and/or Gehrler.

1. The PHOSITA Would Have Been Motivated To Combine Hon ‘043, Whittemore and, if Necessary, Voges and/or Gehrler

Hon ‘043 discloses an electronic cigarette with every element of claims 1-14 of the ‘548 patent, except that Hon ‘043’s heating wire coil 26 is not wound on the porous body 27. Ex. 1003 at Fig. 6. In Hon ‘043, the heating wire coil 26 is spaced apart from the porous body 27, and airflow through ejection holes 24 transports liquid from the porous body 27 into the atomization chamber 10 where the liquid is vaporized by heat emitted from the heating wire coil 26. *Id.* at 10:28-11:5. Whittemore is directed to a vaporizing unit with a heating wire coil 3 wound around a porous wick D. Ex. 1004 at Fig. 2. Whittemore’s porous wick D functions to transport liquid solution (medicament X) from a liquid reservoir to the heating coil 3 via capillary action where the liquid medicament is then vaporized. Specifically, a portion of the wick D is in contact with the heating coil 3 and a portion of the wick D is in contact with the liquid medicament X. *Id.* at col. 1:54-

2:8 (“a wick D made of any suitable material and combined with the heating element of 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.”) It would have been obvious to incorporate Whittemore’s wick D into the electronic cigarette of Hon ‘043 for transporting liquid via capillary action from the porous body 27 to the heating coil 26. The proposed combination is illustrated below in annotated Fig. 6 from Hon ‘043.



Specifically, it would have been obvious to include a porous wick in Hon ‘043 for transporting the liquid nicotine solution from porous body 27 to heating wire coil 26. As taught by Whittemore, the PHOSITA would include a portion of the wick in contact with the liquid contained within the porous body 27 while

another portion of the wick is wrapped in heating coil 26. The predicted result would be the transport of liquid nicotine solution via capillary action from the porous body 27 to the heating coil 26 where the liquid is then vaporized; the same transporting and vaporizing function that the porous wick D/heating coil wire 3 perform in Whittemore. Ex. 1015 at ¶¶ 55-69.

It would have been obvious to make the porous wick from fiber material. Whittemore discloses that the porous wick, which transports liquid via capillary action, may be made from any suitable porous material. Ex. 1004 at 1:54-2:6 (“wick D made from any suitable material” and carries medicament via “capillary action.”) Gehrler discloses that “readily available inexpensive capillary wicking materials [include] fibers, especially linear fiber materials.” Ex. 1023 at 2:4-7. The PHOSITA would have considered Gehrler’s “inexpensive capillary wicking materials,” because Gehrler addresses the transport of liquid from a liquid reservoir to a spaced apart location where the liquid is consumed, which is the same function performed by the porous wick of Whittemore. In short, it would have been a matter of routine design choice to make the wick in Hon ‘043 from fiber material. Ex. 1015 at ¶¶ 52-53, 85.⁴

⁴ In granting *inter partes* review of U.S. Patent No. 8,490,628 based upon Voges in view of Gehrler, the Board rejected the Patent Owner’s argument that Gehrler is

There are numerous Patent Office and Supreme Court endorsed rationales for Petitioner’s proposed combination, which calls for using a wick as taught by Whittemore to transport liquid from the porous body 27 directly to the heating wire coil 26 in the electronic cigarette of Hon ‘043. *See* MPEP § 2143 (I) (listing exemplary rationales that may support a conclusion of obviousness); *KSR Int’l v. Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”)

First, the proposed combination is the combination of prior art elements according to known methods to yield predictable results. *See* MPEP § 2143 (I)(A). The combination of Whittemore’s porous wick with Hon ‘043’s heating coil is the combination of prior art elements to yield the predicted result of transporting a liquid solution via capillary action from a liquid source to a spaced apart heating element for subsequent vaporization. Ex. 1015 at ¶ 57.

Second, the proposed combination is the simple substitution of one known element for another to obtain predictable results. *See* MPEP § 2143 (I)(B). The

not analogous art. *See* Ex. 1024 at 17-18. As further confirmed by Voges, the PHOSITA would have consulted the ink jet printing art. *See* Ex. 1021 at 3:62-4:5 (incorporating bubble jet printing technology in an electronic cigarette).

substitution of Whittemore's porous wick/heating coil configuration for Hon '043's heating coil is the substitution of one known element for another to obtain the predicted result of transporting liquid solution via capillary action from Hon '043's porous body 27 to a spaced apart heating coil for subsequent vaporization. Ex. 1015 at ¶ 58.

Third, the proposed combination is the use of a known technique to improve similar devices in the same way. *See* MPEP § 2143 (I)(C). Specifically, the use of Whittemore's porous wick improves the device of Hon '043 in the same way as it improves the vaporizing unit of Whittemore. The porous wick provides a reliable means for transporting liquid from a liquid supply to a heating element for subsequent vaporization. Ex. 1015 at ¶ 59.

Fourth, the proposed combination is the application of a known technique to a known device ready for improvement to yield predictable results. *See* MPEP § 2143 (I)(D). Specifically, using Whittemore's technique of transporting liquid via the capillary action of a porous wick is nothing more than the use of a known technique for improving Hon '043's electronic cigarette, which the PHOSITA would have appreciated was ready for such an improvement to yield predictable results. Ex. 1015 at ¶ 60.

Fifth, it would have been obvious to try Whittemore's wick in the electronic cigarette of Hon '043 for transporting liquid from the porous body 27 to the

heating wire coil for subsequent vaporization. *See* MPEP § 2143 (I)(E). The proposed combination merely involves choosing from a finite number of identified, predictable solutions for transporting – and ultimately vaporizing – a liquid from a liquid source to a spaced apart heating element with a reasonable expectation of success. With respect to transporting liquid from a liquid source to a heating element in devices such as those claimed, Hon ‘043 discloses transporting the liquid in droplet form via airflow. Ex. 1003 at 10:27-11:2. Whittemore, on the other hand, discloses transporting liquid via capillary action through porous wick D. Ex. 1004 at 1:53-2:8. Takeuchi discloses transporting liquid via capillary action, either through a capillary tube 36, spaced apart plates 362 or via intercommunicating pore structure 302. *See* Ex. 1018 at Figs. 1, 10-11, 14-15. Thus, there were finite number of identified, predictable solutions for transporting liquid from a liquid source to a heating element in devices of the type claimed, Whittemore’s wick being one of them. Ex. 1015 at ¶ 61.

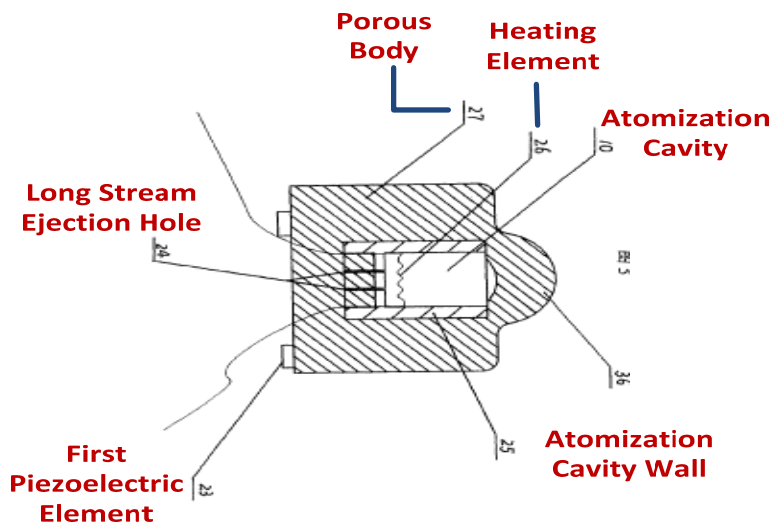
Similarly, there were a finite number of identified, predictable solutions for vaporizing liquid in devices of the type claimed. Hon ‘043 discloses a heating wire for convectively heating liquid droplets contained within an atomization chamber. Ex. 1003 at Fig. 6. Whittemore discloses a porous wick/heating wire coil configuration for directly heating the liquid. Ex. 1004 at Fig. 2. Similarly, Brooks discloses suitable heating elements for electronic cigarettes may include “porous

metal wires or films, carbon yarns, cloths, fibers, discs or strips; graphite cylinders, fabrics or paints; microporous high temperature polymers having moderate resistivities; **porous substrates in intimate contact with resistive heating components**; and the like. Ex. 1019 at 7:65-8:3. Ex. 1015 at ¶ 61.

Thus, it would have been obvious to try Whittemore's porous wick/heating coil wire configuration in the electronic cigarette of Hon '043, as this configuration was one of a finite number of identified, predictable solutions in devices of the type claimed for transporting a liquid source to a spaced apart heating element for subsequent vaporization.

Although no further rationales are required to support the proposed combination, any of the above-referenced rationales standing alone being sufficient, the PHOSITA would have nonetheless been motivated to combine Hon '043 with Whittemore for yet another reason. **As the PHOSITA would have readily appreciated, the porous wick/heating coil wire configuration of Whittemore provides more efficient heating than the arrangement disclosed in Hon '043. The PHOSITA would have readily understood that the Hon '043 configuration is thermally inefficient.** In Hon '043, the liquid nicotine droplets are expelled via airflow into the atomization cavity 10 and heated by convection from the heat given off by heating element 26. In other words, the nicotine droplets are heated in

the atomization cavity via the heat transfer through air gaps between the heating element and the nicotine droplets. Ex. 1015 at ¶ 62.



However, air is a good insulator, *i.e.*, a very poor thermal conductor, and the PHOSITA would have immediately appreciated the thermal inefficiencies associated with the configuration of Hon '043. For example, to compensate for the poor thermal transfer properties of air, the PHOSITA would have appreciated that the heating coil wire 26 would need to be at relatively higher temperatures to vaporize the nicotine droplets than would be required with respect to nicotine solution in direct contact with the heating element. Ex. 1015 at ¶¶ 62-66.

In contrast to the configuration of Hon '043, the PHOSITA would have recognized that the configuration disclosed in Whittemore (*i.e.*, a heating wire coil wound on a porous wick) is thermally more efficient, because the liquid (which is contained in the porous wick) comes into direct contact with the heating element.

Thus, in the Whittemore configuration, the heating element can be run at lower temperatures as compared to the configuration in Hon ‘043, where there are air gaps between the nicotine droplets and the heating element. An obvious benefit to running at lower temperatures, of course, is that less energy is required to vaporize the liquid. Thus, for this additional reason, the PHOSITA would have been highly motivated to modify Hon ‘043 to include the porous wick of Whittemore to achieve the predicted result of more efficient heating, lower heating temperatures, and improved battery life. Ex. 1015 at ¶¶ 63-65.

Modifying Hon ‘043 to use Whittemore’s heating wire/porous wick configuration in place of heating wire alone would not have destroyed the operation of the electronic cigarette of Hon ‘043. To the contrary, and as noted above, the proposed modification would improve the electronic cigarette of Hon ‘043, providing for more efficient heating of the liquid solution. Ex. 1015 at ¶ 66. Moreover, rather than relying on the airflow to deliver the liquid solution from the porous component 27 into the atomization cavity 10 for relatively thermally inefficient convective heating of the liquid solution (*i.e.*, nicotine droplets) by the heating wire 26, the proposed modification, which involves adding a porous wick across the atomization cavity 10 in direct contact with, and wrapped in, the heating wire coil 26, allows for transporting the liquid solution so that it is in direct contact

with the heating wire 26, which is a thermally more efficient way to atomize the liquid than the convective heating on which unmodified Hon ‘043 relies.

Moreover, the Patent Owner may argue that the proposed modification would fundamentally change the operation of Hon ‘043, because the proposed modification, which transports liquid via capillary action of the wick directly to the heater, would prevent ultrasonic atomization of the liquid by the first piezoelectric element 23. *See* Ex. 1003 at Fig. 6 and 11:1-2. However, any such argument would be misplaced. As Hon ‘043 expressly discloses, the piezoelectric element 23 may be omitted, atomization accomplished solely by the heating wire coil 26. *Id.* at 11:15-20; Ex. 1015 at ¶ 66.

Finally, and as noted by Dr. Sturges, the PHOSITA would have understood that the electronic cigarette of Hon ‘043 includes a cylindrical housing and a cylindrical battery. Ex. 1015 at ¶¶ 84-85. However, to the extent the Patent Owner argues to the contrary, or the Board otherwise determines that there is any ambiguity about whether the housing and battery of Hon ‘043 are “cylindrical,” it nonetheless would have been obvious to modify Hon ‘043 to include a cylindrical housing to mimic the shape of a conventional cigarette as taught by Voges. Ex. 1021 at Figs. 1 and 2, 5:48-50; *see also* Ex. 1022 (Katase) at Fig. 1; Ex. 1015 at ¶¶ 84-85. Moreover, as disclosed by Voges and other prior art, cylindrical batteries were well known, and thus it would have been a matter of routine design choice to

use a cylindrical battery in the combination of Hon ‘043 and Whittemore. Ex. 1020 (Matsuo disclosing cylindrical batteries generally); Ex. 1021 (Voges disclosing cylindrical battery in an electronic cigarette); Ex. 1015 at ¶¶ 84-85.

2. Claim 1 Is Obvious

a. “an electronic cigarette”

To the extent that the preamble is considered a claim limitation, as illustrated in the claim chart below, Hon ‘043 discloses an electronic cigarette. Ex. 1003 at 5:3-4; Ex. 1015 at ¶ 85.

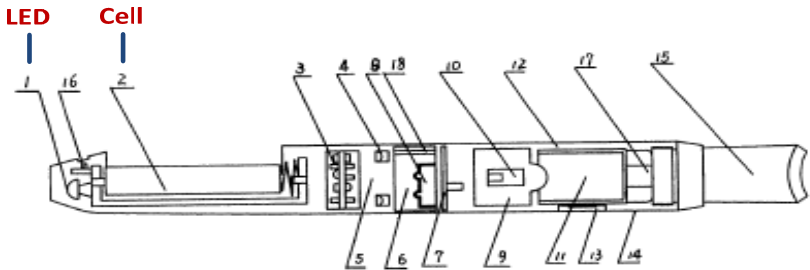
Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
An electronic cigarette, comprising:	“The present utility model relates to an electronic cigarette ...” Ex. 1003 at 5:3-4.

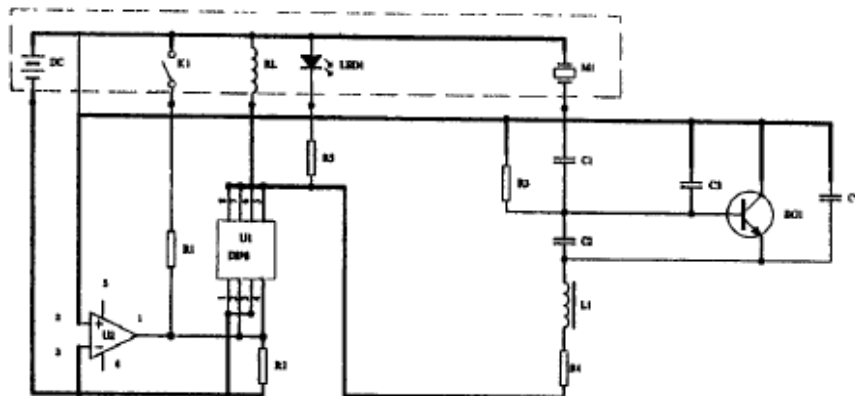
b. “a battery assembly having a cylindrical battery and an operating indicator”

As illustrated in annotated figures and claim chart below, these features are found in Hon ‘043. Hon ‘043 has a battery assembly that includes cell 2 (*i.e.*, a battery), and a Light Emitting Diode (“LED”) 1 (*i.e.*, an operating indicator). Ex. 1003 at 9:3-6; 10:7-11, 22-26; Figs. 1-2, 12. As illustrated in Fig. 1 of Hon ‘043, the battery (“cell 2”) is cylindrical. *Id.* at Fig. 1; Ex. 1015 at ¶ 85. Moreover, to the extent the Patent Owner disputes whether the battery 2 is cylindrical, cylindrical batteries were well known in the art generally (*see* Ex. 1020), and Voges specifically discloses a cylindrical battery in an electronic cigarette (*see* Ex.

1021 at Fig. 2, 5:32-34; 5:66-6:2). Thus, it would have been obvious to use a cylindrical battery in the electronic cigarette of Hon ‘043.

The LED 1 of Hon ‘043 is lit when the liquid molecules of the nicotine solution are atomized (“the automatic fine-adjusting element in the circuit resonates with the first piezoelectric element 23 in the form of a ring to supply power to liquid molecules, and the LED 1 can be lit under the supply of the rechargeable battery 2”), thus functioning as an operating indicator. *Id.* at 10:22-26; Ex. 1015 at ¶ 85.

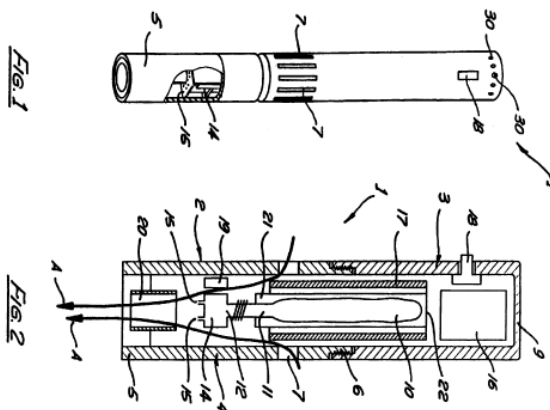
Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
a battery assembly having a cylindrical battery and an operating indicator;	<u>Hon ‘043</u>  Ex. 1003 at Fig. 1 (annotated). “A LED 1, a cell 2, an electronic circuit board 3, a normal pressure cavity 5, a sensor 6, a vapor-liquid separator 7, an atomizer 9, a liquid-supplying bottle 11 and a mouthpiece 15 are sequentially provided within the shell 14.” <i>Id.</i> at 9:3-6; Figs. 1-2. “As shown in the functional diagram of the circuit in Fig. 12 ... LED1 refers to the Light Emitting Diode 1 ...” <i>Id.</i> at 10:7-11; Fig. 12.



Id. at Fig. 12.

“The high frequency oscillator uses the Colpitts oscillator with the frequency between 550KHz and 8KHz; the automatic fine-adjusting element in the circuit resonates with the first piezoelectric element 23 in the form of a ring to supply power to liquid molecules, and the LED 1 can be lit under the supply of the rechargeable battery 2.” *Id.* at 10:22-26; Fig. 12.

Voges



Ex. 1021 at Figs. 1, 2.

“FIG. 1 is a schematic part sectional perspective view of one embodiment of a dispenser (cigarette substitute) according to the invention.” *Id.* at 5:32-34.

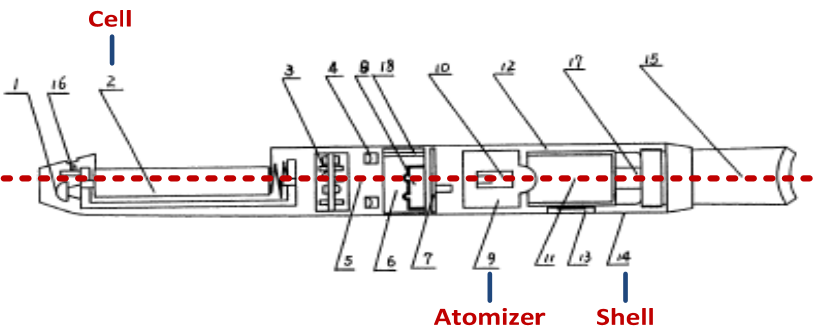
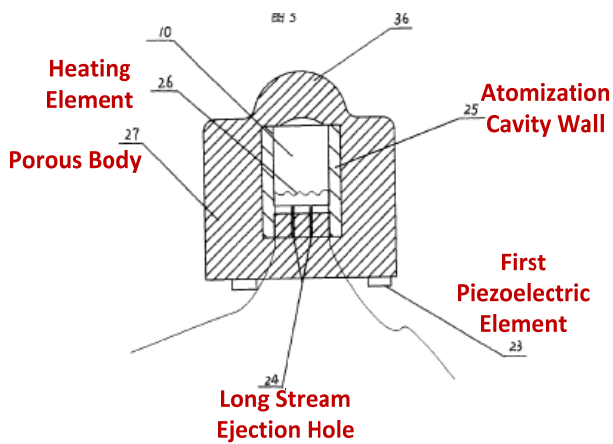
“Device 14 and control means 16 as well as other

	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.
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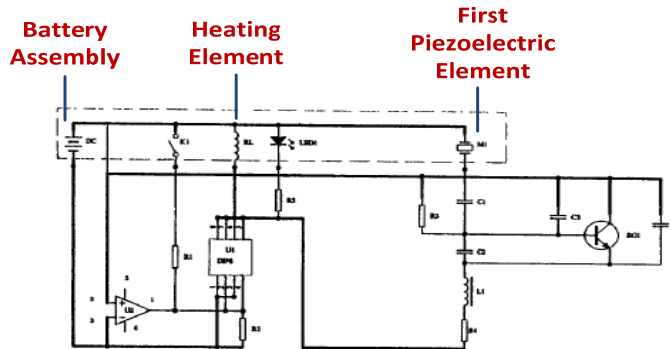
c. “an atomizer assembly in an elongated cylindrical housing, with the battery assembly electrically connected to the atomizer assembly, and with the cylindrical battery coaxial with the atomizer assembly”

As illustrated in annotated figures and claim chart below, these features are found in Hon ‘043. Hon ‘043 has an atomizer assembly that includes atomizer 9 within an elongated cylindrical housing that comprises shell 14. Ex. 1003 at 9:3-6; Figs. 1-2, 6; Ex. 1015 at ¶ 85. To the extent the Patent Owner disputes that the shell 14 is cylindrical, cylindrical housings for electronic cigarettes and similar devices were known in the art. Ex. 1021 (Voges) at Fig. 1; Ex. 1022 at Fig. 1, ¶¶ 56, 58. As illustrated in annotated Fig. 1 of Hon ‘043 (dashed line), the cylindrical battery/cell 2 is coaxial with the atomizer assembly comprising atomizer 9. *Id.* at Fig. 1; *see also* Ex. 1015 at ¶ 85. The atomizer assembly includes a porous body 27 and a heating wire 26, among other structure. *Id.* at 9:14-16, 22-24; Fig. 6.

As illustrated in annotated Fig. 12 of Hon ‘043, the battery assembly is electrically connected with the heating element 26 (shown as RL in FIG. 12) and the first piezoelectric element 23 (shown as M1 in FIG. 12) of the atomizer assembly. *Id.* at 9:24-25; 10:7-11; Figs. 6, 12; *see also* Ex. 1015 at ¶ 85.

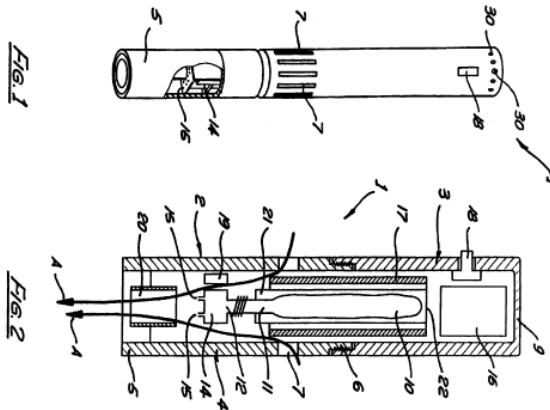
Claim 1	Hon '043, Whittemore, Voges and Gehrer
an atomizer assembly in an elongated cylindrical housing, with the battery assembly electrically connected to the atomizer assembly, and with the cylindrical battery coaxial with the atomizer assembly;	Hon '043  Ex. 1003 at Fig. 1 (annotated). “A LED 1, 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.” <i>Id.</i> at 9:3-6; Figs. 1-2, 6.  <i>Id.</i> at Fig. 6 (annotated). “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 ...” <i>Id.</i> at 9:14-16; Fig. 6. “As shown in the functional diagram of the circuit in Fig.

12 ... RL refers to the heating element 26 ... M1 refers to the first piezoelectric element 23 ...” *Id.* at 10:7-11; Fig. 12.



Id. at Fig. 12 (annotated).

Voges

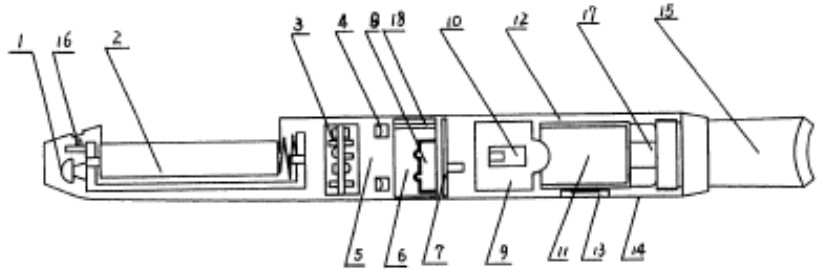


Ex. 1021 at Figs. 1, 2.

“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 ...” *Id.* at 5:48-51.

d. “a liquid storage component in the housing”

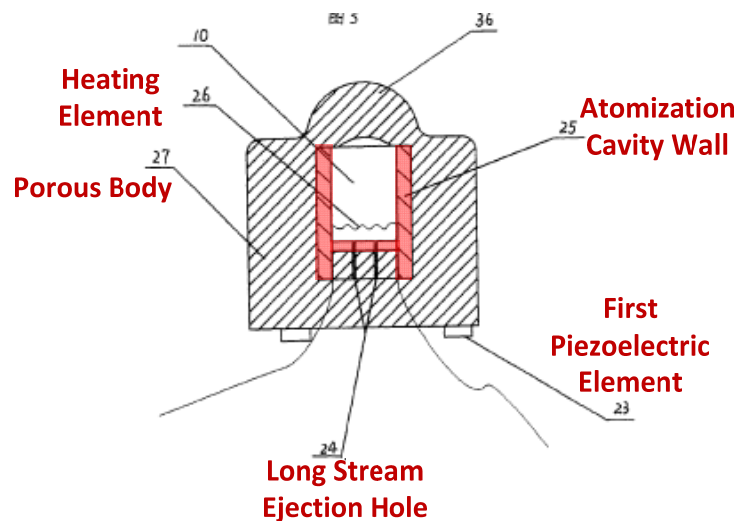
As illustrated in the claim chart below, Hon ‘043 discloses a liquid storage component (“liquid-supplying bottle 11”) in the housing (“shell 14”). Ex. 1003 at 9:3-6; Figs. 1-2; Ex. 1015 at ¶ 85.

Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
a liquid storage component in the housing;	 Ex. 1003 at Fig. 1. “A LED 1 ... a liquid-supplying bottle 11 ... are sequentially provided within the shell 14.” <i>Id.</i> at 9:3-6; Figs. 1-2.

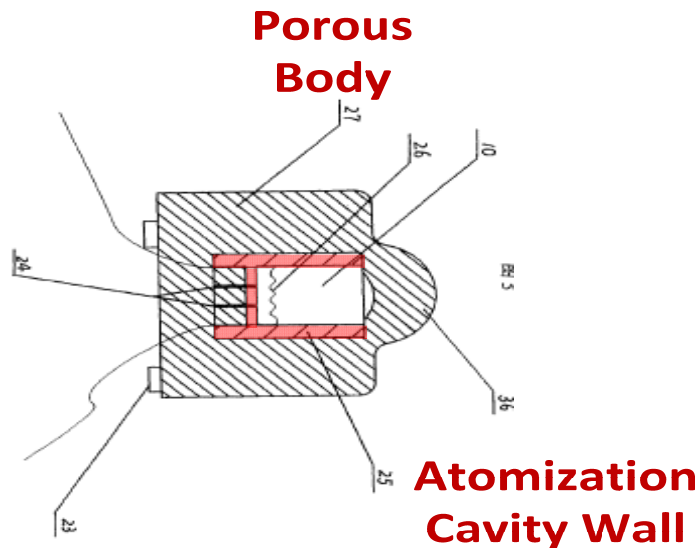
e. “the atomizer assembly including a porous component set on a frame having a run-through hole”

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses these claim elements. As illustrated in annotated Fig. 6 of Hon ‘043, the atomizer assembly includes a porous body 27 and an atomization cavity wall 25, among other structure. Ex. 1003 at 9:11-14, 22-24; Fig. 6. As the Board determined in IPR2015-00859 concerning the parent ‘742 patent, the atomization cavity wall 25 in Hon ‘043 is a “frame.” Ex. 1013 at 15. Hon ‘043 discloses that

the cavity wall (*i.e.*, “frame”) 25 includes structure having short stream ejection hole 30 or long stream ejection hole 24 (*i.e.*, “a run-through hole.”). Ex. 1003 at 9:17-22; 10:28-11:2; Fig. 6.



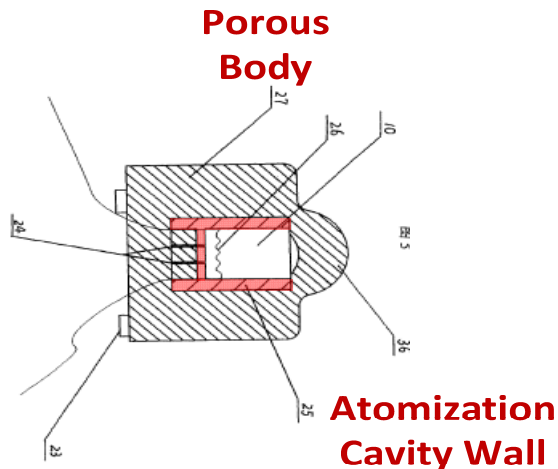
As noted above in Section VI.D., the claim term “set on” should be construed to mean sitting on. As illustrated in the annotated figure below, Hon ‘043 discloses that the porous body 27 (*i.e.*, “porous component.”) is sitting on the frame, cavity wall 25 at the interfaces where the porous body 27 is in physical contact with the frame 25. *Id.* at 9:22-24; Fig. 6.



Ex. 1003 at Fig. 6

As explained in the accompanying declaration of Dr. Sturges, the porous body 27 is attached to the cavity wall 25 either by a friction fit or bonding material to prevent axial displacement of the porous body relative to the cavity wall under the shear forces at the interface of the cavity wall 25 and porous body 27 when the porous body is inserted into the solution storage body 28 (see Fig. 11 of Hon ‘043) of the liquid supplying bottle 11. Ex. 1015 at ¶¶ 73-82. Thus, the PHOSITA would certainly have understood that the porous body 27 is “set on” the cavity wall 25 of Hon ‘043.

Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
the atomizer assembly including a porous component set on a frame having a run-through hole;	<u>Hon 043</u>



Ex. 1003 at Fig. 6 (annotated).

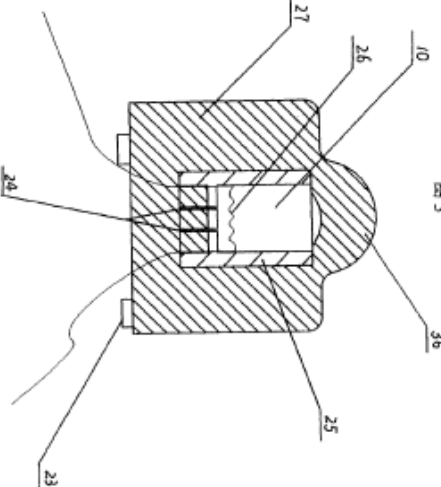
“The atomizer 9 is in contact with the liquid-supplying bottle 11 via the bulge 36, and an atomization cavity 10 is provided in the atomizer 9. As shown in FIGS. 6 and 7, an overflow hole 29 is provided on the atomization cavity wall 25 of the atomization cavity 10.” *Id.* at 9:11-14; Fig. 6.

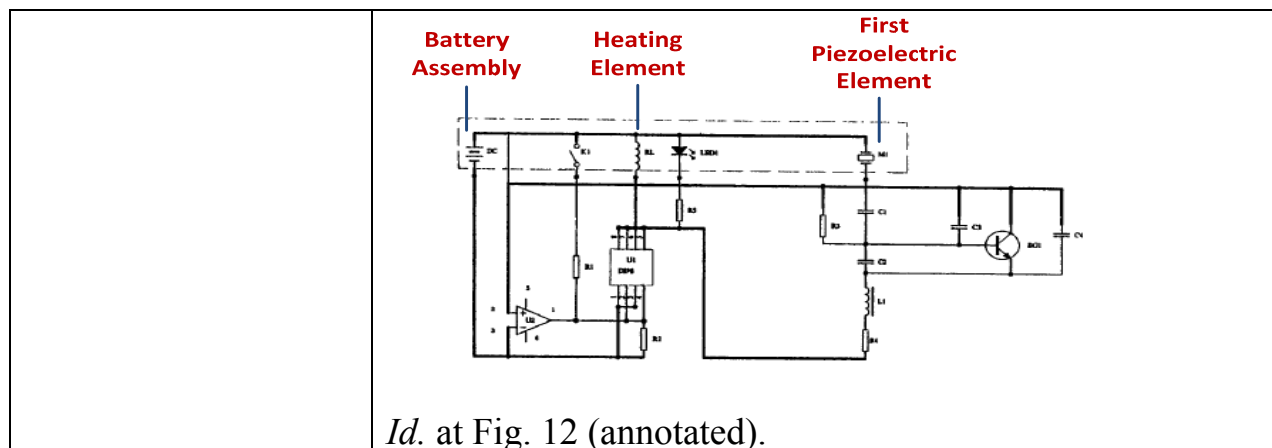
“An ejection hole is provided on the side opposite to the heating element 26 and the ejection hole can be determined to select either a long stream ejection hole 24 or a short stream ejection hole 30, depending on the material used for the atomization cavity wall 25 ... The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” *Id.* at 9:17-26; Figs. 6-8.

“The high speed stream passing through the ejection hole drives the nicotine solution in the porous body 27 to eject into the atomization cavity 10 in the form of droplet, where the nicotine solution is subjected to the ultrasonic atomization by the first piezoelectric element 23 and is further atomized by the heating element 26.” *Id.* at 10:28-11:2; Fig. 6.

f. “a heating wire coil electrically connected to the battery”

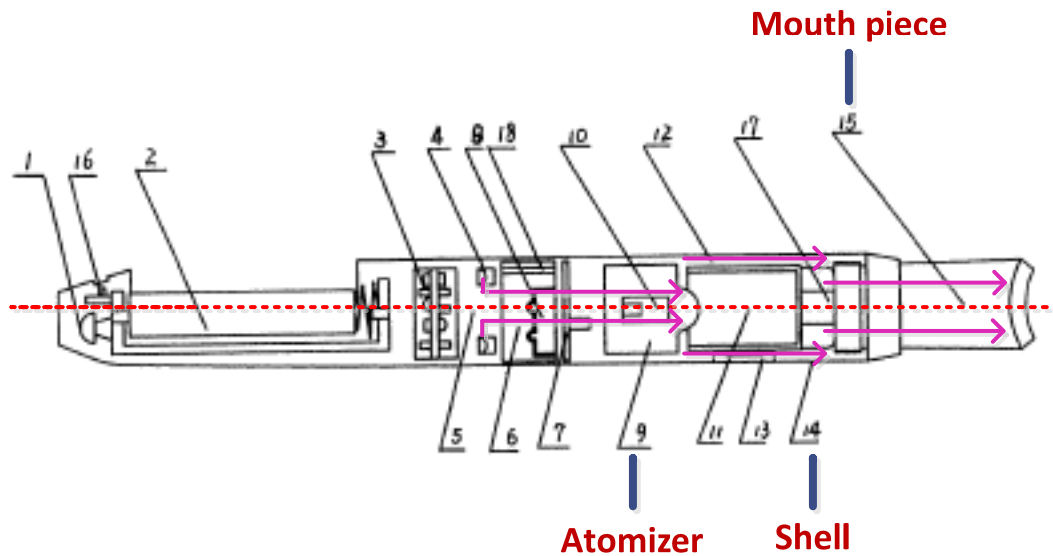
Hon ‘043 discloses a heating element 26, which can be made of metal wire (*i.e.*, “heating wire coil”). Ex. 1003 at 9:14-16; Fig. 6. As illustrated in annotated Fig. 12 of Hon ‘043, the heating element 26 (*i.e.*, “heating wire coil,” shown as RL in FIG. 12) is electrically connected to the battery (shown as DC in FIG. 12). *Id.* at 10:7-11; Figs. 6, 12.

Claim 1	Hon ‘043, Whittemore, Voges and Gehrler
a heating wire coil electrically connected to the battery;	<u>Hon ‘043</u>  Ex. 1003 at Fig. 6. “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 ...” <i>Id.</i> at 9:14-16; Fig. 6. “As shown in the functional diagram of the circuit in FIG. 12, K1 refers to the Reed switch 19, RL refers to the heating element 26 ...” <i>Id.</i> at 10:7-11; Fig. 12.

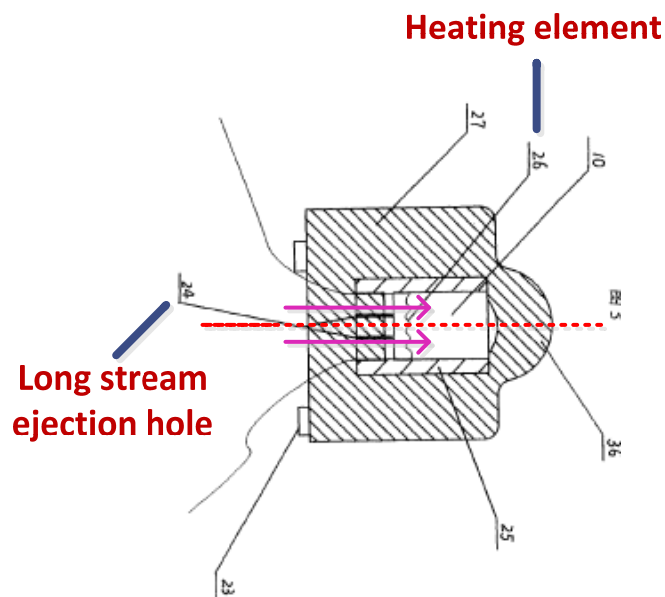


- g. **“an air flow path in the atomizer assembly parallel to a longitudinal axis of the housing, with the air flow path through the run-through hole to an outlet, with the heating wire coil wound on the porous component and in the air flow path and with the heating wire coil oriented perpendicular to the longitudinal axis”**

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses that air flows from the air inlet 4 into the atomization cavity 10 of the atomizer 9 through the ejection hole 24 into the atomizer chamber, and then to the mouth piece 15 (*i.e.*, “outlet”). Ex. 1003 at 10:26-11:6; Figs. 1, 6. In the annotated Figs. 1 and 6 below, the pink lines show the air flow paths through the long stream ejection hole 24 and into the atomizer 9 (*i.e.*, “the run-through hole”) and then to the mouth piece 15 (*i.e.*, “outlet”); the red dashed lines show the longitudinal axis of the shell 14 (*i.e.*, “housing”). *Id.* at Figs. 1, 6. The air flow path in the atomizer 9 is parallel to the longitudinal axis of the shell 14 (*i.e.*, “housing”). Ex. 1015 at ¶ 85.



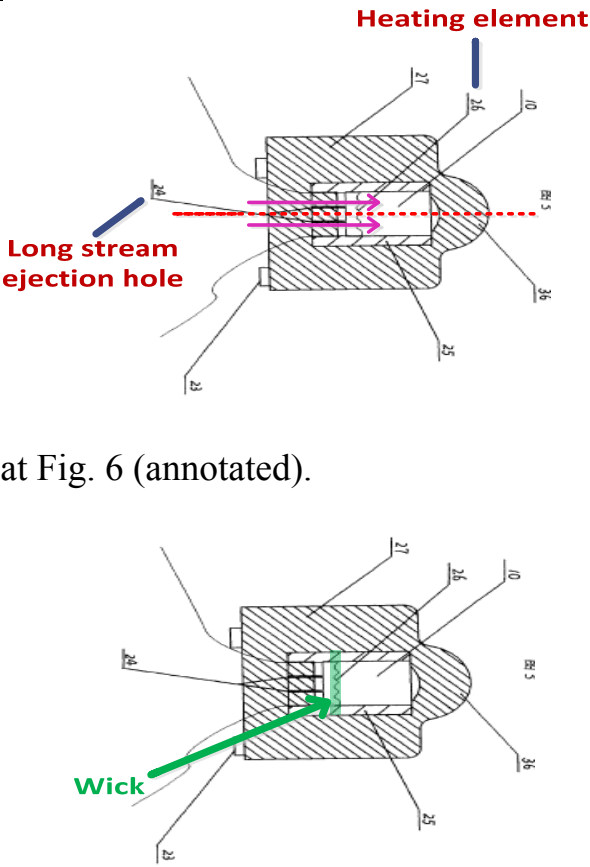
Ex. 1003 at Fig. 1



Ex. 1003 at Fig. 6

As illustrated in annotated Fig. 6 of Hon '043, the heating element 26 (*i.e.*, “heating wire coil”) is in the air flow path (pink lines) and oriented perpendicular to the longitudinal axis (red dashed line). *Id.* at Fig. 6.

The only feature that is not expressly disclosed in Hon ‘043 is the heating wire coil wound on the porous body. However, as discussed above in Section VI.F.1, based upon the teachings of Whittemore it would have been obvious to modify Hon ‘043 by wrapping heating wire coil 26 around a section of porous body 27 extending across the atomization chamber 10 and perpendicular to the flow of airflow through the atomizer assembly. The predicted result, transport of liquid via capillary action from the porous body 27 to the heating coil wire 26 for subsequent vaporization. Ex. 1015 at ¶¶ 54-69; Ex. 1016.

Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
an air flow path in the atomizer assembly parallel to a longitudinal axis of the housing, with the air flow path through the run-through hole to an outlet, with the heating wire coil wound on the porous component and in the air flow path and with the heating wire coil oriented perpendicular to the longitudinal axis; and	<u>Hon ‘043</u>  Ex. 1003 at Fig. 6 (annotated).

Id. at Fig. 6 (annotated).

“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 ...” *Id.* at 9:14-16; Fig. 6.

“An ejection hole is provided on the side opposite to the heating element 26 and the ejection hole can be determined to select either a long stream ejection hole 24 or a short stream ejection hole 30, depending on the material used for the atomization cavity wall 25. . . .” *Id.* at 9:18-25.

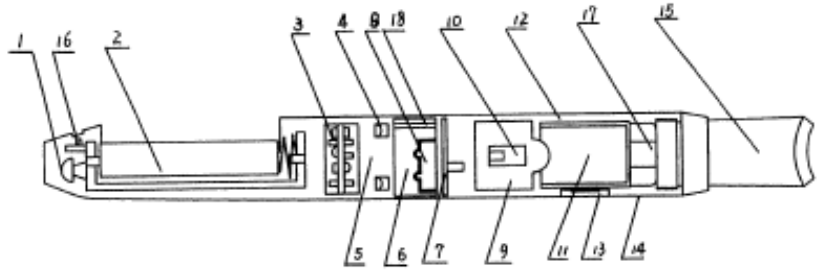
“The air enters the normal pressure cavity 5 through the air inlet 4, passes through the air passage 18 of the sensor and then the through hole in the vapor-liquid separator 7, and flows into the atomization cavity 10 in the atomizer 9. The high speed stream passing through the ejection hole drives the nicotine solution in the porous body 27 to eject into the atomization cavity 10 in the form of droplet, where the nicotine solution is subjected to the ultrasonic atomization by the first piezoelectric element 23 and is further atomized by the heating element 26. After the atomization, the large diameter droplets stick to the wall under the action of eddy flow and are reabsorbed by the porous body 27 via the overflow hole 29, whereas the small diameter droplets float in stream and forms aerosols, which are sucked out via the aerosol passage 12, gas vent 17 and mouthpiece 15.” *Id.* at 10:26-11:6; Figs. 1, 6.

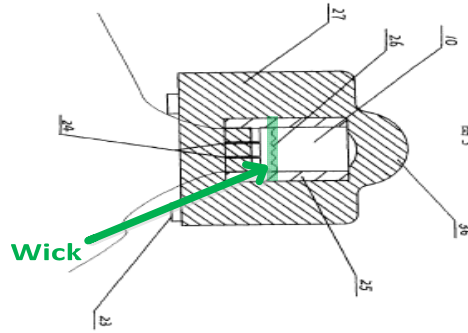
Whittemore

	“A therapeutic vaporizing unit adapted to be plugged into a conventional socket terminal of an electric circuit, comprising . . . a porous wick entwined within the filament for lifting the medicament by capillary attraction whereby the liquid becomes vaporized upon the filament becoming heated. <i>Id.</i> at Claim 9.
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h. “the porous component in contact with the liquid storage component”

As illustrated in the claim chart below, the combination of Hon ‘043 and Whittemore disclose the porous component in contact with the liquid storage component. Specifically, and as noted above in Section VI.F.1, it would have been obvious to include a section of porous body 27 (*i.e.*, a porous wick) extending across the atomization cavity of Hon ‘043 with a portion of the porous body section in contact with the liquid contained in porous body 27, which in turn is in contact with the liquid storage container, liquid supplying bottle 11. Ex. 1003 at 9:11-13; 9:22-24; Figs. 1, 6-9; Ex. 1015 at ¶ 85.

Claim 1	Hon ‘043, Whittemore, Voges and Gehrer
the porous component in contact with the liquid storage component.	 Ex. 1003 at Fig. 1.



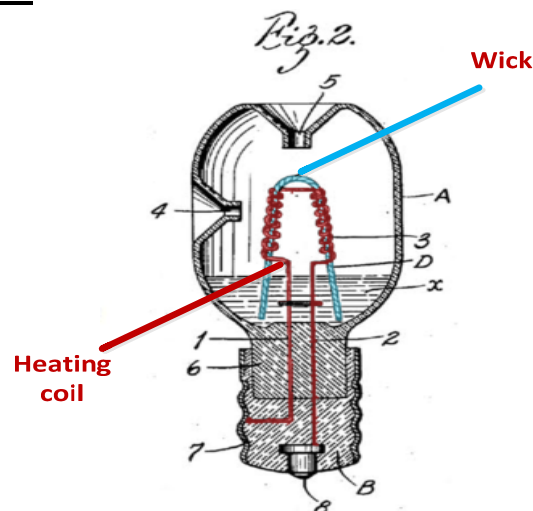
Id. at Fig. 6 (annotated).

“The atomizer 9 is in contact with the liquid-supplying bottle 11 via the bulge 36, and an atomization cavity 10 is provided in the atomizer 9.” *Id.* at 9:11-13; Figs. 1, 6-9.

“The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” *Id.* at 9:22-24; Figs. 1, 6-9.

“The solution storage porous body 28 in the liquid-supplying bottle 11 will be in contact with the bulge 36 on the atomizer 9, thereby achieving the capillary infiltration liquid-supplying.” *Id.* at 11:6-8.

Whittemore



Ex. 1004 at Fig. 2 (annotated).

	“In the drawing A designates the vaporizing vessel of my improved unit, said vessel being preferably constructed in the form of a hollow glass container adapted to hold a liquid medicament <i>x</i> and provided with an electrically-operated heating means comprising two electrical conductors 1 and 2 and a filament or heating element 3 combined in such a way that when said conductors are energized by an electric current, the filament 3 will become heated.” <i>Id.</i> at 1:19-28. “In order that the unit will function properly, even though the heating element or filament 3 is spaced a considerable distance above or away from the medicament <i>x</i>, the unit is equipped with 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 1:50-2:8.
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3. Claim 2 Is Obvious

- a. **“the porous component having a first section perpendicular to the longitudinal axis and having a second section parallel to the longitudinal axis”**

As illustrated in the annotated figures and claim chart below, the combination of Hon ‘043 and Whittemore discloses that the porous component has a first section (green highlighting) perpendicular to the longitudinal axis (red dashed line) and a second section (red highlighting) parallel to the longitudinal

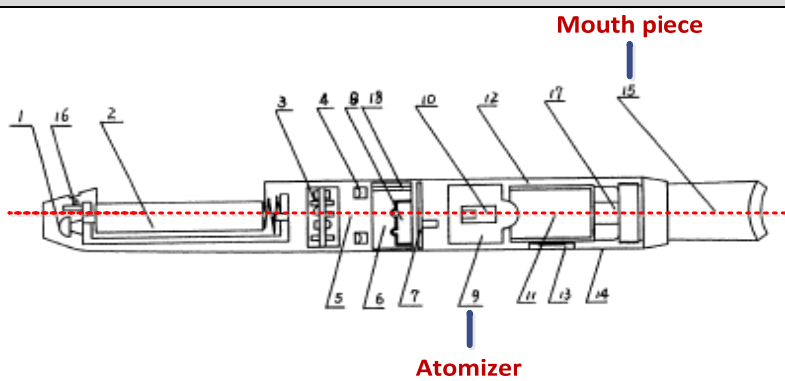
axis. The first section is where, as taught by Whittemore, a section of porous body 27 would be provided to effectively provide a porous wick for transporting liquid from the porous body 27 to the heating coil wire 26 via capillary action. Ex. 1003 at 9:22-24; Fig. 6; Ex. 1015 at ¶ 85.

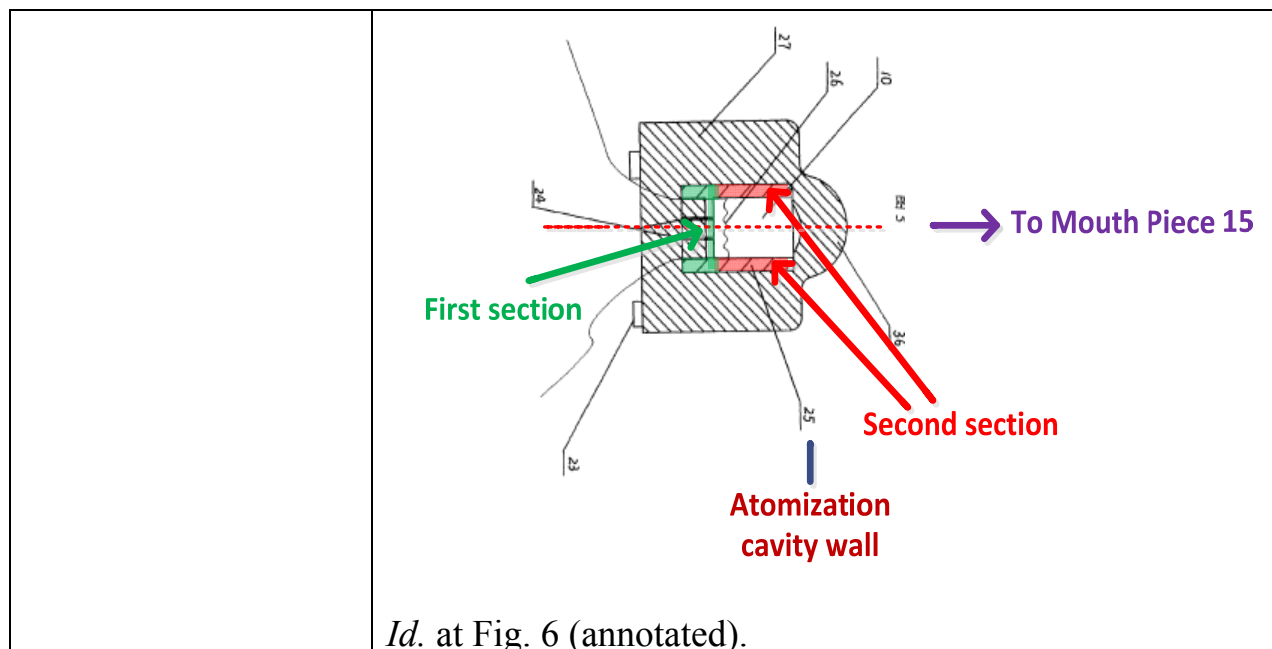
Claim 2	Hon '043, Whittemore, Voges and Gehrler
2. The electronic cigarette of claim 1 with the porous component having a first section perpendicular to the longitudinal axis and having a second section parallel to the longitudinal axis.	Ex. 1003 at Fig. 6 (annotated). “The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” <i>Id.</i> at 9:22-24. <u>Whittemore</u> See claim 1 above for evidence.

4. Claim 3 Is Obvious

- a. **“the frame having a cylindrical first section and a second section, with the second section between the first section and the outlet, and with the second section longer than the first section”**

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses that the frame (“the atomization cavity wall 25”) has a first section (green highlighting) and a second section (red highlighting), with the second section between the first section and the outlet (“mouth piece 15”). Ex. 1003 at Figs. 1, 6; Ex. 1015 at ¶ 85. As illustrated in annotated Figs. 1 and 6, the first section of the atomization cavity wall 25 is cylindrical, and the second section is longer than the first section. *Id.* Moreover, to the extent there is any ambiguity about the shape of the frame, it would have been a matter of routine design choice to use a cylindrical shaped frame in a cylindrical shaped electronic cigarette. *Id.*

Claim 3	Hon ‘043, Whittemore, Voges and Gehrler
3. The electronic cigarette of claim 1 with the frame having a cylindrical first section and a second section, with the second section between the first section and the outlet, and with the second section longer than the first section.	 Ex. 1003 at Fig. 1 (annotated).

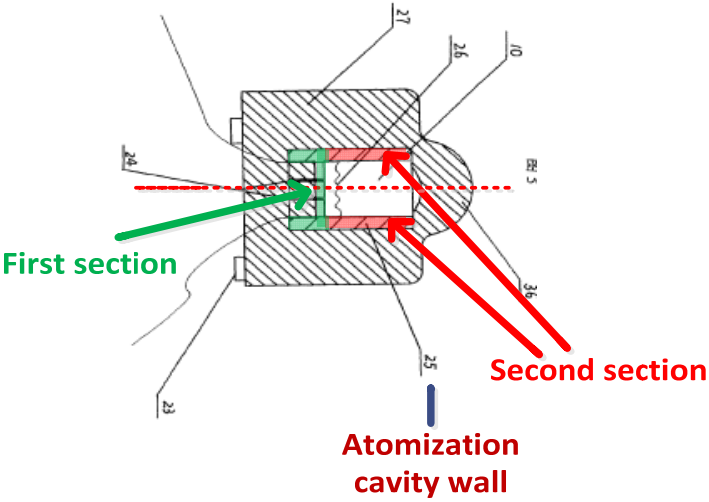


5. Claim 4 Is Obvious

a. “the first section of the frame is a cylindrical base section”

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses that the first section (green highlighting) of the frame (“the atomization cavity wall 25”) is a cylindrical base section. Ex. 1003 at Fig. 6; Ex. 1015 at ¶ 85. To the extent there is any ambiguity about the shape of the base section, it would have been a matter of routine design choice to use a cylindrical frame having a cylindrical base section in a cylindrical shaped electronic cigarette. *Id.*

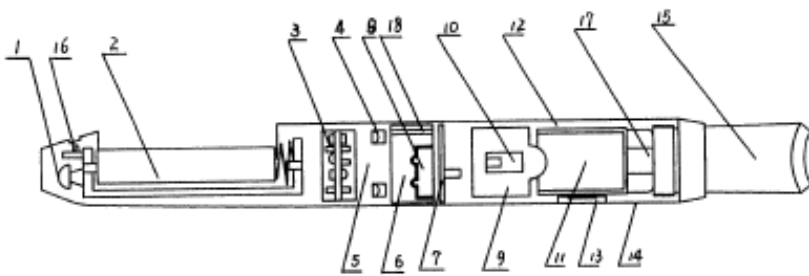
Claim 4	Hon ‘043, Whittemore, Voges and Gehrer
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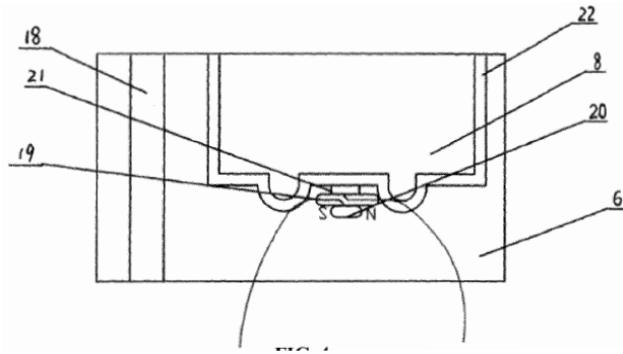
4. The electronic cigarette of claim 3 wherein the first section of the frame is a cylindrical base section.	 Ex. 1003 at Fig. 6 (annotated).
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6. Claim 5 Is Obvious

a. “the battery assembly further including an air flow sensor”

As illustrated in the claim chart below, Hon ‘043 discloses that battery assembly includes a sensor 6 (*i.e.*, “an air flow sensor”). Ex. 1003 at 9:3-11; 10:15-22; Figs. 1, 4.

Claim 5	Hon ‘043, Whittemore, Voges and Gehrer
5. The electronic cigarette of claim 1 with the battery assembly further including an air flow sensor.	 Ex. 1003 at Fig. 1.



Id. at Fig. 4.

“A LED 1 ... a sensor 6 ... are sequentially provided within the shell 14 ... As shown in FIG. 4, a negative pressure cavity 8 is provided in the sensor 6 and is separated from the sensor 6 by a ripple film 22. A first magnetic steel 20, a second magnetic steel 21, and a Reed switch 19 arranged between them are also provided within the sensor 6, and the second magnetic steel 21 is attached to the ripple film 22.” *Id.* at 9:3-11; Figs 1, 4.

“When a smoker smokes, the mouthpiece 15 is under negative pressure, the air pressure difference or high speed stream between the normal pressure cavity 5 and the negative pressure cavity 8 will cause the sensor 6 to output an actuating signal; the electronic circuit board 3 connected therewith goes into operation. Now the ripple film 22 in the sensor 6 is deformed to take the second magnetic steel 21 away from the Reed switch 19, and the Reed switch 19 is then closed (i.e., K1 is closed) under the effect of the excessive magnetic line of force from the first magnetic steel 20, starting the field effect power transistor switch (i.e. U1 starts).” *Id.* at 10:15-22.

7. Claim 6 Is Obvious

- a. **“the battery assembly further comprising an electronic circuit board electrically connected to the air flow sensor”**

As illustrated in the claim chart below, Hon ‘043 discloses the battery assembly includes an electronic circuit board 3 electrically connected to the sensor 6 (*i.e.*, “an air flow sensor”). Ex. 1003 at 9:3-6; 10:15-18.

Claim 6	Hon ‘043, Whittemore, Voges and Gehrler
6. The electronic cigarette of claim 5 with the battery assembly further comprising an electronic circuit board electrically connected to the air flow sensor.	“A LED 1 ... an electronic circuit board 3 ... are sequentially provided within the shell 14.” Ex. 1003 at 9:3-6. “When a smoker smokes, ... the negative pressure cavity 8 will cause the sensor 6 to output an actuating signal; the electronic circuit board 3 connected therewith ...” <i>Id.</i> at 10:15-18.

8. Claim 7 Is Obvious

- a. **“the porous component is cylindrical”**

As illustrated in the claim chart below, Hon ‘043 discloses this claim limitation. As illustrated in Fig. 6, the porous component (“porous body 27”) is cylindrical. Ex. 1003 at Fig. 6. Moreover, to the extent there is any ambiguity about the shape of the porous component, it would have been a matter of routine design choice to use a cylindrical shaped porous component in a cylindrical shaped electronic cigarette. Ex. 1015 at ¶ 85.

Claim 7	Hon '043, Whittemore, Voges and Gehrler
7. The electronic cigarette of claim 1 wherein the porous component is cylindrical.	Porous Body Atomization Cavity Wall Ex. 1003 at Fig. 6.

9. Claim 8 Is Obvious

a. “an electronic cigarette”

To the extent that the preamble is considered a claim limitation, Hon ‘043 discloses an electronic cigarette. Ex. 1015 at ¶ 85. *See* claim 1 above at *supra* Section VI.F.2.a.

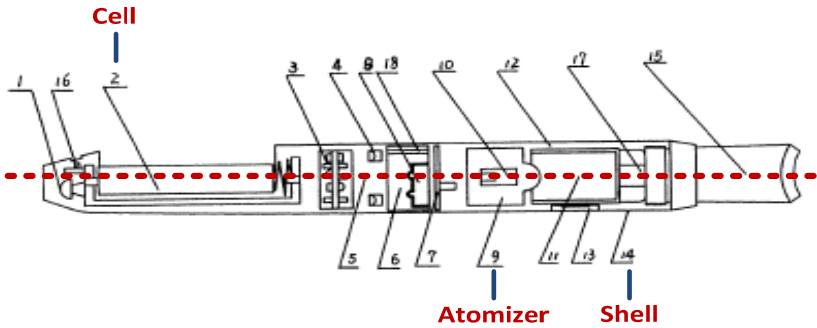
b. “a battery assembly having a cylindrical battery and an operating indicator”

Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85. *See* claim 1 above at *supra* Section VI.F.2.b.

- c. **“an atomizer assembly in an elongated cylindrical housing having a longitudinal axis, with the battery assembly electrically connected to the atomizer assembly, and with the cylindrical battery coaxial with the atomizer assembly”**

For the reasons discussed in claim 1 at *supra* Section VI.F.2.c, Hon ‘043 discloses “an atomizer assembly in an elongated cylindrical housing, with the battery assembly electrically connected to the atomizer assembly, and with the cylindrical battery coaxial with the atomizer assembly.” Ex. 1015 at ¶ 85.

As illustrated in the annotated figures and the claim chart below, Hon ‘043 discloses the housing (“shell 14”) has a longitudinal axis (dashed line). Ex. 1003 at Fig. 1. The battery (cell 2) is co-axial with the atomizer assembly. *Id.*

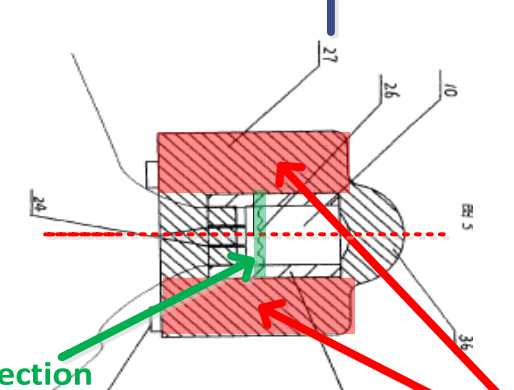
Claim 8	Hon ‘043, Whittemore, Voges and Gehrer
an atomizer assembly in an elongated cylindrical housing having a longitudinal axis, with the battery assembly electrically connected to the atomizer assembly, and with the cylindrical battery coaxial with the atomizer assembly;	<u>Hon ‘043</u>  Ex. 1003 at Fig. 1 (annotated). <i>Also see claim 1 above at Section VI.F.2.c for evidence.</i>

- d. **“the atomizer assembly including a porous component having a first section perpendicular to the longitudinal axis and a second section parallel to the**

longitudinal axis, with the porous component set on a frame having a run-through hole”

For the reasons discussed in claim 1 at *supra* Section VI.F.2.e and as illustrated in the claim chart below, Hon ‘043 discloses “the atomizer assembly including a porous component, with the porous component set on a frame having a run-through hole.” Ex. 1015 at ¶ 85.

For the reasons discussed in claim 2 at *supra* Section VI.F.3.a and as illustrated in the claim chart below, the combination of Hon ‘043 and Whittemore discloses “a porous component having a first section perpendicular to the longitudinal axis and a second section parallel to the longitudinal axis.” The first section of the porous component is a section of porous body 27 extending across the atomization chamber 10, and wrapped in heating coil wire 26, as taught by Whittemore. *Id.*

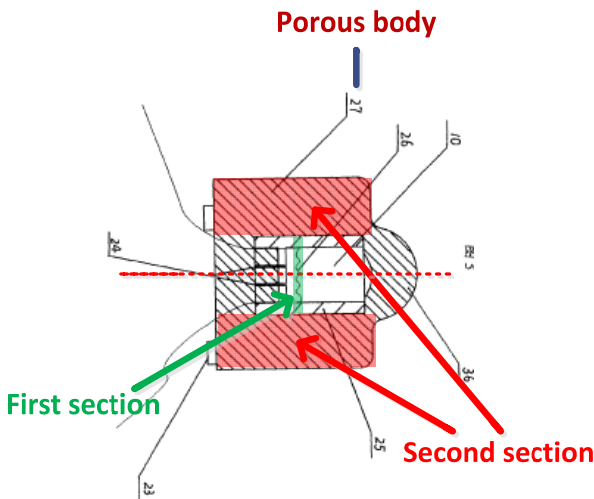
Claim 8	Hon '043, Whittemore, Voges and Gehrer
the atomizer assembly including a porous component having a first section perpendicular to the longitudinal axis and a second section parallel to the longitudinal axis, with the porous component set on a frame having a run-through hole;	 The diagram is a cross-sectional view of an atomizer assembly. It features a central porous body, which is a red hatched rectangular block. This body is mounted on a frame, represented by a black hatched structure. A dashed line runs horizontally through the center of the assembly, representing the longitudinal axis. The porous body has two distinct sections: a 'First section' (indicated by a green arrow) which is perpendicular to the longitudinal axis, and a 'Second section' (indicated by a red arrow) which is parallel to the longitudinal axis. Various numbered parts are labeled: 27 points to the top of the porous body, 26 points to the top of the frame, 10 points to the top of the frame, 25 points to the bottom of the frame, 22 points to the bottom of the frame, 24 points to the left side of the frame, 36 points to the right side of the frame, and 23 points to the right side of the frame. A small circular component is visible on the right side of the frame, labeled 36. The entire assembly is labeled 'Fig. 5'.

	Ex. 1003 at Fig. 6 (annotated). <i>See also</i> claims 1 and 2 above at Sections VI.F.2.e and VI.F.3.a for evidence.
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- e. **“a heating wire coil wound on the first section of the porous component and electrically connected to the battery”**

For the reasons discussed in claim 1 at *supra* Section VI.F.2.f above, Hon ‘043 discloses “a heating wire coil electrically connected to the battery.”

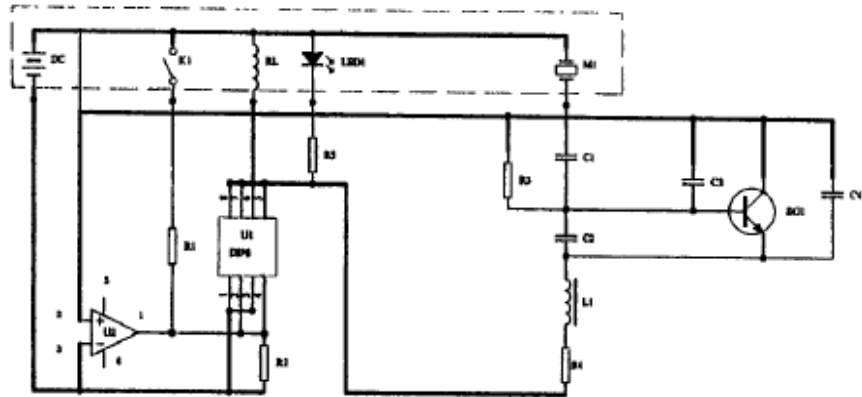
Moreover, for the reasons explained above (*see supra* Section VI.F.2.g), it would have been obvious to substitute Whittemore’s porous wick/heating wire coil configuration for the heating wire coil of Hon ‘043. The combination of Hon ‘043 and Whittemore thus discloses a heating wire coil wound on a first section of the porous component. Ex. 1015 at ¶ 85.

Claim 8	Hon ‘043, Whittemore, Voges and Gehrer
a heating wire coil wound on the first section of the porous component and electrically connected to the battery;	<u>Hon ‘043</u> 

Ex. 1003 at Fig. 6.

“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 ...” Ex. 1003 at 9:14-16; Fig. 6.

“As shown in the functional diagram of the circuit in FIG. 12, K1 refers to the Reed switch 19, RL refers to the heating element 26 ...” *Id.* at 10:7-11; Fig. 12.



Id. at Fig. 12.

Whittemore

See claim 1 above at *supra* Section VI.F.2.g.

- f. “an air flow path in the atomizer assembly parallel to the longitudinal axis, with the air flow path through the run-through hole to an outlet, and the heating wire coil in the air flow path and oriented perpendicular to the longitudinal axis”

As discussed in claim 1 above at *supra* Section VI.F.2.g, Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85.

g. “a liquid storage component in the housing in contact with the porous component”

As discussed in claim 1 above at *supra* Sections VI.F.2.d and VI.F.2.h, Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85.

10. Claim 9 Is Obvious

a. “the second section of the porous component on opposite sides of the first section of the porous component”

As illustrated in the annotated figures and claim chart below, adding a wick to Hon ‘043 based upon the teachings of Whittemore results in the porous component (“the porous body 27”) having a first section (wick in green highlighting) and a second section (red highlighting), the second section of the porous component on opposite sides of the first section of the porous component. Ex. 1003 at 9:22-24; Fig. 6; Ex. 1015 at ¶ 85.

Claim 9	Hon ‘043, Whittemore, Voges and Gehrer
9. The electronic cigarette of claim 8 with the second section of the porous component on opposite sides of the first section of the porous component.	Ex. 1003 at Fig. 6 (annotated).

	“The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” <i>Id.</i> at 9:22-24.
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11. Claim 10 Is Obvious

- a. **“the frame having a cylindrical first section and a second section, with the second section between the first section and the outlet, and with the second section longer than the first section”**

Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85. *See* claim 3 above at *supra* Section VI.F.4.a.

12. Claim 11 Is Obvious

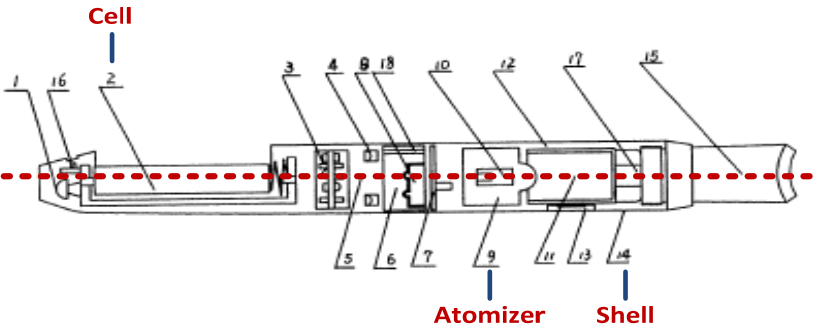
- a. **“an electronic cigarette”**

To the extent that the preamble is considered a claim limitation, Hon ‘043 discloses an electronic cigarette. Ex. 1015 at ¶ 85. *See* claim 1 above at *supra* Section VI.F.2.a.

- b. **“an atomizer assembly and a liquid storage component in an elongated cylindrical housing having a longitudinal axis”**

For the reasons discussed in claim 1 at *supra* Sections VI.F.2.c-d, Hon ‘043 discloses “an atomizer assembly and a liquid storage component in an elongated cylindrical housing.” As illustrated in the annotated figures and the claim chart

below, Hon ‘043 discloses the housing (“shell 14”) has a longitudinal axis (dashed line). Ex. 1003 at Fig. 1; Ex. 1015 at ¶ 85.

Claim 11	Hon ‘043, Whittemore, Voges and Gehrer
an atomizer assembly and a liquid storage component in an elongated cylindrical housing having a longitudinal axis;	<u>Hon ‘043</u>  Ex. 1003 at Fig. 1 (annotated). <i>Also see claim 1 at supra Sections VI.F.2.c-d.</i>

- c. **“battery assembly electrically connected to the atomizer assembly, and with the battery assembly including a cylindrical battery coaxial with the atomizer assembly”**

For the reasons discussed in claim 1 at *supra* Sections VI.F.2.b-c, Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85.

- d. **“the atomizer assembly including: a frame comprising a cylindrical base having a run-through hole”**

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses this claim limitation. As illustrated in annotated Fig. 6 of Hon ‘043, the atomizer assembly includes an atomization cavity wall 25, among other structure.

Ex. 1003 at 9:11-14; Fig. 6. As the Board determined in IPR2015-00859 concerning the parent ‘742 patent, the atomization cavity wall 25 in Hon ‘043 is a “frame.” Ex. 1013 at 15. Hon ‘043 discloses that the cavity wall (*i.e.*, “frame”) 25 has short stream ejection hole 30 or long stream ejection hole 24 (*i.e.*, “a run-through hole.”) Ex. 1003 at 9:17-22; 10:28-11:2; Fig. 6. As illustrated in annotated Fig. 6 of Hon ‘043, the cavity wall (*i.e.*, “frame”) 25 has a cylindrical base (blue highlighting.) *Id.* at Fig. 6. Moreover, to the extent there is any ambiguity about the shape of the base, it would have been a matter of routine choice to use a cylindrical shaped frame in a cylindrical shaped electronic cigarette. Ex. 1015 at ¶ 85.

Claim 11	Hon ‘043, Whittemore, Voges and Gehrer
the atomizer assembly including: a frame comprising a cylindrical base having a run-through hole;	Atomization Cavity Wall Long Stream Ejection Hole Ex. 1003 at Fig. 6 (annotated). “The atomizer 9 is in contact with the liquid-supplying bottle 11 via the bulge 36, and an atomization cavity 10 is provided in the atomizer 9. As shown in FIGS. 6 and 7, an

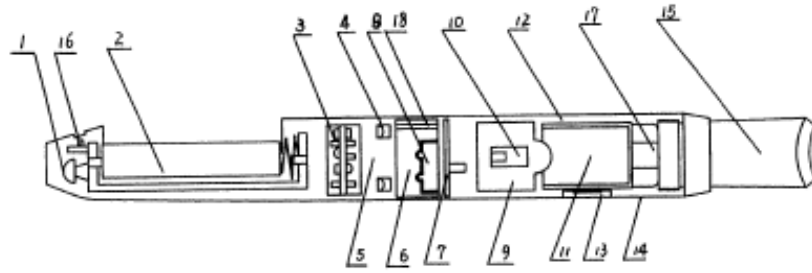
	overflow hole 29 is provided on the atomization cavity wall 25 of the atomization cavity 10.” <i>Id.</i> at 9:11-14. “An ejection hole is provided on the side opposite to the heating element 26 and the ejection hole can be determined to select either a long stream ejection hole 24 or a short stream ejection hole 30, depending on the material used for the atomization cavity wall 25 ... The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” <i>Id.</i> at 9:17-26; Figs. 6-8. “The high speed stream passing through the ejection hole drives the nicotine solution in the porous body 27 to eject into the atomization cavity 10 in the form of droplet, where the nicotine solution is subjected to the ultrasonic atomization by the first piezoelectric element 23 and is further atomized by the heating element 26.” <i>Id.</i> at 10:28-11:2; Fig. 6.
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e. “the atomizer assembly including: ...; a fiber member in contact with the liquid storage component;”

As illustrated in the claim chart below, the combination of Hon ‘043 and Whittemore discloses the atomizer assembly including a porous body 27, “which can be made of ... stainless steel fiber felt ...” (*i.e.*, “a fiber member”), in contact with the liquid storage component (“liquid-supplying bottle 11”). Ex. 1003 at 9:3-6, 22-24; Figs. 1-2; Ex. 1015 at ¶ 85.

Claim 11	Hon ‘043, Whittemore, Voges and Gehrer
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the atomizer assembly including:
...;
a fiber member in contact with the liquid storage component;



Ex. 1003 at Fig. 1.

“A LED 1, ... a liquid-supplying bottle 11, ... are sequentially provided within the shell 14.” *Id.* at 9:3-6; Figs. 1-2.

“The atomizer 9 is in contact with the liquid-supplying bottle 11 via the bulge 36 ...” *Id.* at 9:11-14; Fig. 6.

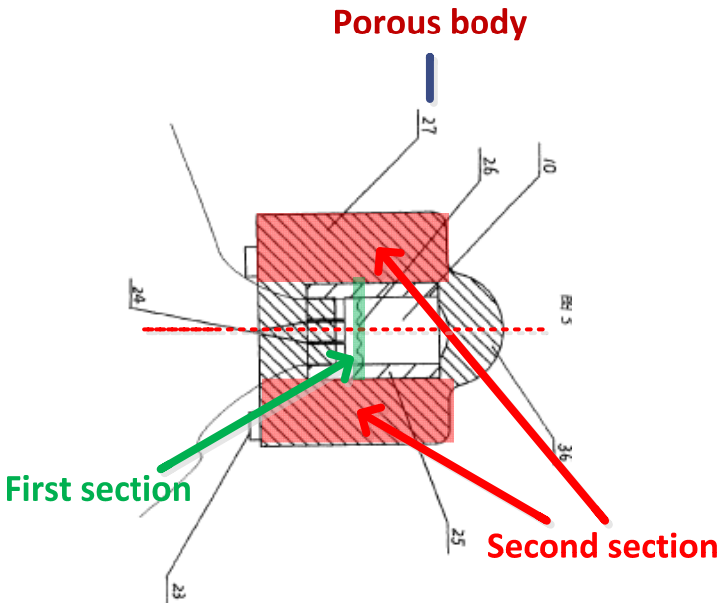
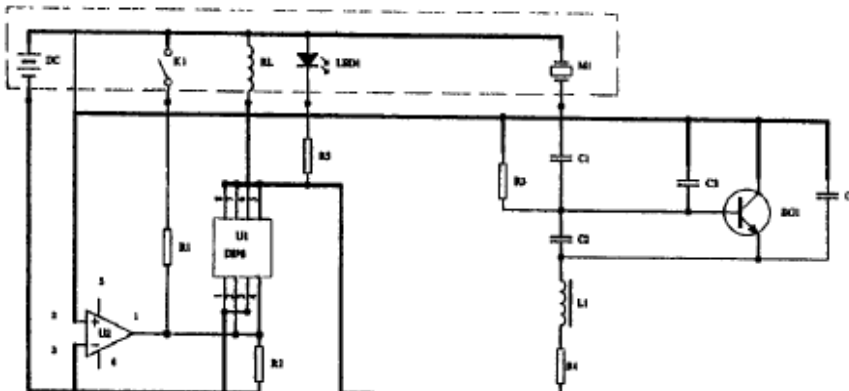
“The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” *Id.* at 9:22-24; Figs. 6-8.

- f. **“the atomizer assembly including: ...; a heating wire coil wound on the fiber member and oriented perpendicular to the longitudinal axis, and the heating wire coil electrically connected to the battery, with the fiber member moving liquid from the liquid storage component to the heating wire coil by capillary action”**

For the reasons discussed in claim 1 at *supra* Sections VI.F.2.f-g and as illustrated in the claim chart below, Hon ‘043 discloses “a heating wire coil (“heating element 26”) oriented perpendicular to the longitudinal axis, and the heating wire coil electrically connected to the battery”. Ex. 1015 at ¶ 85.

Hon ‘043 discloses that the bulge 36 of the porous body 27 (*i.e.*, “the fiber member”) moves nicotine solution from the liquid-supplying bottle 11 (*i.e.*, “the liquid storage component”) to and through the porous body 27 by capillary action (“The solution storage porous body 28 in the liquid-supplying bottle 11 will be in contact with the bulge 36 [of porous body 27] on the atomizer 9, thereby achieving the capillary infiltration liquid-supplying.”) Ex. 1003 at 11:6-8, 9:23-24 (“porous body 27, which can be made of . . . stainless steel fiber felt . . .”).

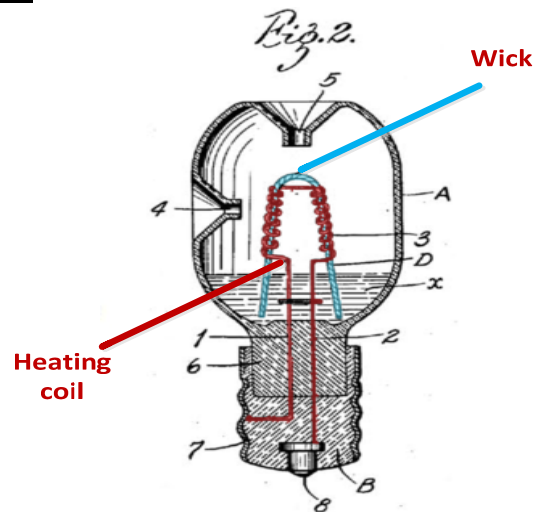
Moreover, for the reasons explained above (*see supra* Section VI.F.2.g), it would have been obvious to include a porous wick extending across the atomization cavity for transporting liquid from the porous body 27 to the heating wire coil 26 of Hon ‘043, as taught by Whittemore. Whittemore teaches that the wick may be made from any suitable material. Ex. 1004 at 1:4. Gehrler discloses that “readily available inexpensive capillary wicking materials [include] fibers, especially linear fiber materials.” Ex. 1023 at 2:4-7. It would have been a matter of routine design choice to include a fiber-containing porous wick in Hon ‘043, as taught by Whittemore in view of Gehrler. Ex. 1015 at ¶¶ 85. As taught by Whittemore, the proposed modification of Hon ‘043 would transport liquid solution from the porous body 27 to the heating wire coil 26 via capillary action through the porous wick. *Id.*

Claim 11	Hon '043, Whittemore, Voges and Gehrler
the atomizer assembly including: ...; a heating wire coil wound on the fiber member and oriented perpendicular to the longitudinal axis, and the heating wire coil electrically connected to the battery, with the fiber member moving liquid from the liquid storage component to the heating wire coil by capillary action; and	Hon '043  Ex. 1003 at Fig. 6 (annotated). “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 ...” <i>Id.</i> at 9:14-16; Fig. 6. “As shown in the functional diagram of the circuit in FIG. 12, K1 refers to the Reed switch 19, RL refers to the heating element 26 ...” <i>Id.</i> at 10:7-11; Fig. 12. 

Id. at Fig. 12.

“The solution storage porous body 28 in the liquid-supplying bottle 11 will be in contact with the bulge 36 on the atomizer 9, thereby achieving the capillary infiltration liquid-supplying.” *Id.* at 11:6-8.

Whittemore



Ex. 1004 at Fig. 2 (annotated).

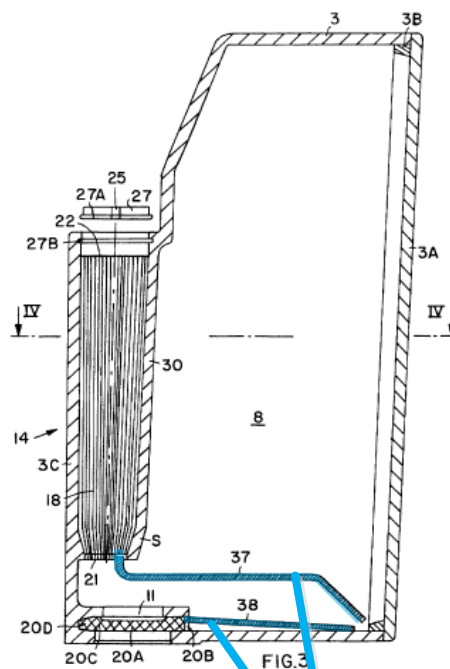
“In the drawing A designates the vaporizing vessel of my improved unit, said vessel being preferably constructed in the form of a hollow glass container adapted to hold a liquid medicament *x* and provided with an electrically-operated heating means comprising two electrical conductors 1 and 2 and a filament or heating element 3 combined in such a way that when said conductors are energized by an electric current, the filament 3 will become heated.” *Id.* at 1:19-28.

“In order that the unit will function properly, even though the heating element or filament 3 is spaced a considerable distance above or away from the medicament *x*, the unit is equipped with 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.” *Id.* at 1:50-2:8.

“A therapeutic vaporizing unit adapted to be plugged into a conventional socket terminal of an electric circuit, comprising . . . a porous wick entwined within the filament for lifting the medicament by capillary attraction whereby the liquid becomes vaporized upon the filament becoming heated. *Id.* at Claim 9.

Gehrer



Wick

“In a further preferred embodiment of the invention at least one, preferably both, capillary components, namely the capillary coupling member [20A] and the capillary

	body [18] in the chamber are connected with their ink contacting surfaces to a common or a respective ink conducting member such as a wick [37, 38] so that ink even from remote volume portions of the ink reservoir is conducted to the inlet or intake surfaces of the coupling element and the capillary body. Thus, the inlet area of the capillary body and the entire coupling member will always remain wetted with ink and thereby operational As mentioned, the wicking ink conducting member may be provided for the coupling member and the capillary body in common or each of these components may have its own wicking member that reaches to the lowest spot in the reservoir.” Ex. 1023 at 5:14-29 “ . . . 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.
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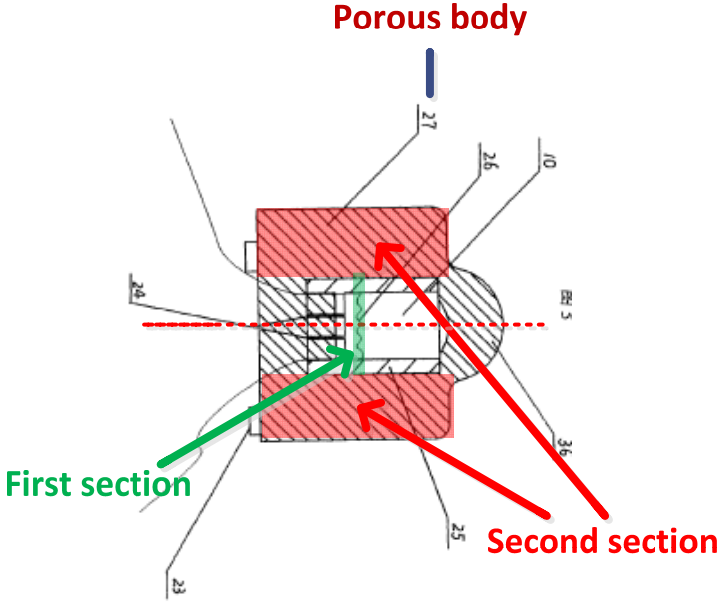
- g. “an air flow path parallel to the longitudinal axis through the atomizer assembly, with the air flow path passing through the run-through hole, and with the heating wire coil in the air flow path and perpendicular to the longitudinal axis”**

For the reasons discussed in claim 1 at *supra* Section VI.F.2.g, Hon ‘043 discloses this claim limitation. Ex. 1015 at ¶ 85.

13. Claim 12 Is Obvious

- a. “a first part of the fiber member perpendicular to the longitudinal axis and the heating wire coil wrapped on the first part”**

For the reasons discussed in claim 8 at *supra* Section VI.F.9.e and as illustrated in the claim chart below, Hon ‘043 in combination with Whittemore discloses this claim limitation. Ex. 1015 at ¶ 85.

Claim 12	Hon ‘043, Whittemore, Voges and Gehrer
12. The electronic cigarette of claim 11 with a first part of the fiber member perpendicular to the longitudinal axis and the heating wire coil wrapped on the first part.	<u>Hon ‘043</u>  Ex. 1003 at Fig. 6 (annotated). <u>Whittemore</u> See claim 1 above at <i>supra</i> Section VI.F.2.g. <u>Gehrer</u> “... readily available inexpensive capillary wicking material such as open cell foam materials, felts, fibers, especially linear fiber materials.” Ex. 1023 at 2:4-7.

14. Claim 13 Is Obvious

- a. “the fiber member having a first section perpendicular to the longitudinal axis and having a second section parallel to the longitudinal axis”

As illustrated in the annotated figures and claim chart below, Hon ‘043 discloses that the fiber member (“the porous body 27”) has a first section (green highlighting) perpendicular to the longitudinal axis (red dashed line) and a second

section (red highlighting) parallel to the longitudinal axis. Ex. 1003 at 9:22-24; Fig. 6; Ex. 1015 at ¶ 85. In the proposed modification of Hon ‘043 with Whittemore’s wick/heating wire coil configuration, the wick constitutes the (or part of the) first section.

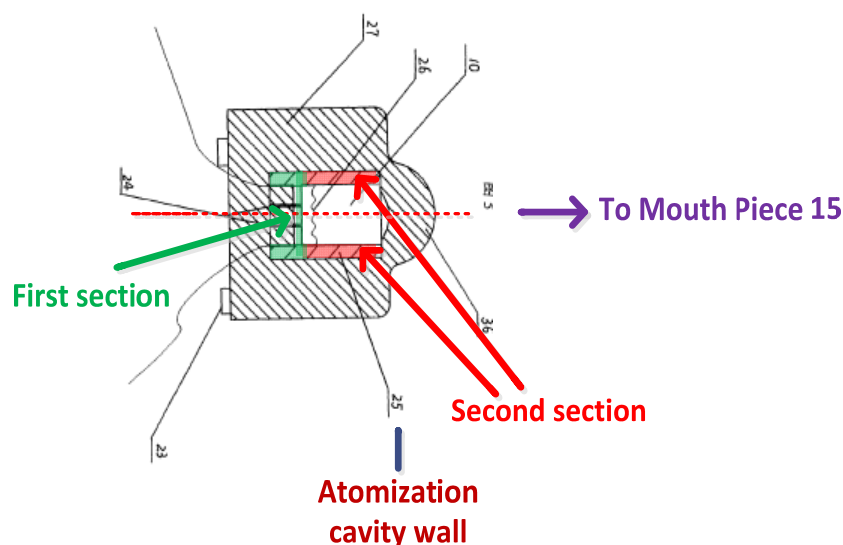
Claim 13	Hon ‘043, Whittemore, Voges and Gehrer
13. The electronic cigarette of claim 11 with the fiber member having a first section perpendicular to the longitudinal axis and having a second section parallel to the longitudinal axis.	Ex. 1003 at Fig. 6 (annotated). “The atomization cavity wall 25 is surrounded with a porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.” <i>Id.</i> at 9:22-24. <u>Whittemore</u> “In order that the unit will function properly, even though the heating element or filament 3 is spaced a considerable distance above or away from the medicament x, the unit is equipped with 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 1:50-2:8. <i>Also see claim 1 above at supra Section VI.F.2.g.</i> <u>Gehrer</u> “... readily available inexpensive capillary wicking material such as open cell foam materials, felts, fibers, especially linear fiber materials.” Ex. 1023 at 2:4-7.
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15. Claim 14 Is Obvious

- a. **“the frame having a cylindrical first section and a second section, with the second section between the first section and the outlet, and with the second section longer than the first section”**

Hon ‘043 discloses this limitation. Ex. 1015 at ¶ 85. *See claim 3 above at supra Section VI.F.4.a.*



VII. CONCLUSION

Petitioner has demonstrated a reasonable likelihood that claims 1-14 of the ‘548 patent are unpatentable as obvious in view of the prior art identified herein.

Petitioner therefore requests that the Board grant *inter partes* review for each of those claims.

Dated: August 30, 2016

Respectfully submitted,

/s/Ralph J. Gabric

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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, excluding a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, contains 13,039 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 30, 2016

BRINKS GILSON & LIONE

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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 30, 2016, a complete and entire copy of this Petition for *Inter Partes* Review, and all supporting exhibits, were served by EXPRESS MAIL® to the Patent Owner by serving the correspondent of record, as indicated below:

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