

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.: 9,456,632

Issue Date: October 4, 2016

Title: Electronic Cigarette

Inter Partes Review No.: IPR2018-00634

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 9,456,632 PURSUANT TO
35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42**

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EXHIBITS LIST

Exhibit No.	Description
1001	U.S. Pat. No. 9,456,632 (“632 patent”)
1002	Expert Declaration of Robert Sturges, Ph.D.
1003	U.S. Pat. No. 4,947,874 (“Brooks”)
1004	U.S. Pat. No. 2,057,353 (“Whittemore”)
1005	U.S. Pat. No. 5,894,841 (“Voges”)
1006	Reserved
1007	Reserved
1008	U.S. Pat. No. 6,155,268 to Takeuchi
1009	Chinese Pat. No. 2719043Y (“Hon 043”) (including certified translation)
1010	U.S. Pat. No. 5,743,251 (“Howell”)
1011	U.S. Pat. No. 2,461,664 (“Smith”)
1012	U.S. Pat. No. 3,234,357 (“Seuthe”)
1013	<i>Contact</i> , Merriam-Webster’s Collegiate Dictionary, Merriam-Webster, Inc. (11th ed. 2003)
1014	U.S. Pat. Pub. No. 2004/0234916 (“Hale”)
1015	U.S. Pat. No. 4,922,901 (“Brooks 901”)
1016	U.S. Pat. No. 1,084,304 (“Vaughn”)
1017	Institution Decision dated Feb. 7, 2017 (Paper 9), <i>R.J. Reynolds Vapor Co. v. Fontem Holdings I B.V.</i> , IPR2016-01532 (P.T.A.B., petition filed Aug. 5, 2016)
1018	Institution Decision dated Mar. 6, 2017 (Paper 9), <i>R.J. Reynolds Vapor Co. v. Fontem Holdings I B.V.</i> , IPR2016-01691 (P.T.A.B., petition filed Aug. 30, 2016)
1019	U.S. Pat. No. 3,292,635 (“Kolodny”)
1020	U.S. Pat. No. 3,685,521 (“Dock”)
1021	Reserved

1022	Institution Decision dated Feb. 5, 2018 (Paper 9), <i>Cascades Canada ULC v. SCA Hygiene Prods AB</i> , IPR2017-01921 (P.T.A.B., petition filed Aug. 7, 2017)
1023	Institution Decision dated Jan. 19, 2018 (Paper 9), <i>Donghee America, Inc. v. Plastic Omnium Advanced Innovation and Research</i> , IPR2017-01654 (P.T.A.B., petition filed June 21, 2017)
1024	Institution Decision dated May 18, 2017 (Paper 9), <i>Limelight Networks, Inc. v. Mass. Inst. of Tech.</i> , IPR2017-00249 (P.T.A.B., petition filed Nov. 11, 2016)
1025	Institution Decision dated July 15, 2015 (Paper 10), <i>Microsoft Corp. v. Parallel Networks Licensing, LLC</i> , IPR2015-00483 (P.T.A.B., petition filed Dec. 23, 2014)
1026	Institution Decision dated Mar. 13, 2013 (Paper 19), <i>Micron Tech., Inc. v. Bd. of Trs. of the Univ. of Ill.</i> , IPR2013-00005 (P.T.A.B., petition filed Oct. 2, 2012)
1027	Institution Decision dated Jan. 24, 2013 (Paper 18), <i>Macauto U.S.A. v. BOS GMBH & KG</i> , IPR2012-00004 (P.T.A.B., petition filed Sept. 16, 2012)
1028	Institution Decision dated Feb. 6, 2018 (Paper 8), <i>Samsung Elecs. Am. v. Uniloc</i> , IPR2017-01801 (P.T.A.B., petition filed July 20, 2017)
1029	Institution Decision dated Jan. 4, 2017 (Paper 11), <i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> , IPR2016-01270 (P.T.A.B., petition filed July 2, 2016)
1030	U.S. Pat. Pub. No. 2005/0016550 (“Katase”)
1031	Reserved
1032	Reserved
1033	U.S. Pat. No. 4,941,486 (“Dube”)
1034	U.S. Pat. No. 7,337,782 (“Thompson”)
1035	Declaration of Kyle E. Yarberry
1036	WO00/28843 (“Pienemann”)
1037	Certified Translation of WO00/28843

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 14-16 and 18 of U.S. Pat. No. 9,456,632 to Lik Hon, titled “Electronic Cigarette” (“632 patent,” Ex. 1001). According to USPTO records, Fontem Holdings 1 B.V. is the patent owner (“PO”).

This Petition demonstrates a reasonable likelihood that claims 14-16 and 18 of the 632 patent are unpatentable under 35 U.S.C. § 103 based upon the combination of U.S. Pat. No. 4,947,874 (“Brooks,” Ex. 1003) and U.S. Pat. No. 2,057,353 (“Whittemore,” Ex. 1004).

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.

Accordingly, Petitioner respectfully requests that this petition be granted.

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 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. 48,756, 48,759-60 (Aug. 14, 2012) (codified at 37 C.F.R. pt. 42)), Reynolds American Inc. and its wholly owned subsidiaries (direct and indirect) nevertheless agree to be bound by any final written decision in these proceedings to the same extent as a real party-in-interest. *See* 35 U.S.C. § 315(e).

B. Related Matters

Petitioner is not aware of any reexamination certificates or pending prosecution concerning the 632 patent. Petitioner is a defendant in the following litigation involving the 632 patent: *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 1:17-cv-00175 (M.D.N.C., filed March 1, 2017) (consolidated with lead case 1:16-cv-01255 (M.D.N.C.)). Fontem has alleged that Reynolds infringes claims 14-16 and 18 of the 632 patent, as well as certain claims of U.S. Patent Nos. 8,375,957; 8,863,752; 9,364,027; 9,339,062; 9,326,550; 9,326,551; and 8,393,331. The above-referenced action is one of four related patent infringement actions filed by the Patent Owner against Petitioner. In the related action, *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No.

1:16-cv-01255 (M.D.N.C.) (filed as 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 another related action, *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 1:16-cv-01257 (M.D.N.C.) (filed as 2:16-cv-03049 (C.D. Cal., filed May 3, 2016)), the Patent Owner has asserted U.S. Patent Nos. 9,326,548 and 9,326,549. In a third related action, *Fontem Ventures B.V. et al. v. R.J. Reynolds Vapor Company*, No. 1:16-cv-01258 (M.D.N.C.) (filed as 2:16-cv-04534 (C.D. Cal., filed June 22, 2016)), the Patent Owner has asserted U.S. Patent No. 9,370,205. Petitioner has recently filed petitions for IPR against the 742 patent (IPR2016-01268 and IPR2016-01532), the 726 patent (IPR2016-01270, IPR2017-01117 and IPR2017-01180), the 239 patent (IPR2016-01272 and IPR2017-01120), the 628 patent (IPR 2016-01527, IPR2017-01118 and IPR2017-01119), the 548 patent (IPR2016-01691 and IPR2016-01692), the 549 patent (IPR2016-01859, IPR2017-01318 and IPR2017-01319), and the 205 patent (IPR2017-01641 and IPR2017-01642).

In addition to the foregoing, Petitioner is aware of the following additional matters involving or related to the 632 patent.

1. Related Proceedings Before the Board

The 632 patent was (or is) also the subject of, or related to, the following petitions for IPR:

Case Name	Case Number	Filed
<i>CB Distributors, Inc. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,156,944) (terminated)	IPR2013-00387	Jun. 25, 2013
<i>VMR Products LLC Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,365,742) (denied)	IPR2015-00859	Mar. 10, 2015
<i>JT International S.A. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,365,742) (terminated)	IPR2015-01587	Jul. 14, 2015
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,365,742) (terminated)	IPR2016-01303	Jun. 28, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,365,742) (on appeal)	IPR2016-01268	Jul. 2, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,365,742) (denied)	IPR2016-01532	Aug. 5, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,548) (terminated)	IPR2016-01641	Aug. 18, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,548) (denied)	IPR2016-01691	Aug. 30, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,548) (pending)	IPR2016-01692	Aug. 30, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,548) (terminated)	IPR2017-00204	Nov. 4, 2016
<i>Logic Technology Development, LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,375,957) (denied)	IPR2015-00098	Oct. 21, 2014
<i>JT International S.A. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,375,957) (terminated)	IPR2015-01513	Jun. 26, 2015
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,375,957) (denied)	IPR2016-01307	Oct. 26, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,370,205) (terminated)	IPR2016-01642	Aug. 18, 2016

Case Name	Case Number	Filed
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,370,205) (terminated)	IPR2017-00257	Nov. 11, 2016
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,370,205) (denied)	IPR2017-01641	Jun. 23, 2017
<i>R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,370,205) (denied)	IPR2017-01642	Jun. 26, 2017
<i>NJOY, Inc. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,863,752) (denied)	IPR2015-01301	May 29, 2015
<i>JT International S.A. v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,863,752) (terminated)	IPR2015-01604	Jul. 20, 2015
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 8,863,752) (denied)	IPR2016-01309	Jun. 28, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,550) (terminated)	IPR2016-01707	Aug. 31, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,550) (terminated)	IPR2017-00205	Nov. 4, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,551) (terminated)	IPR2016-01706	Aug. 31, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,326,551) (terminated)	IPR2017-00342	Nov. 28, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,339,062) (terminated)	IPR2016-01705	Aug. 31, 2016
<i>Nu Mark LLC v. Fontem Holdings I B.V.</i> (U.S. Pat. No. 9,339,062) (terminated)	IPR2017-00303	Nov. 18, 2016

2. Pending Patent Applications

The following pending patent applications are related to the 632 patent:

Serial No.	Filed
U.S. Patent Application No. 15/167,690, which claims priority to the 632 patent	May 27, 2016

Serial No.	Filed
U.S. Patent Application No. 15/634,698, which claims priority to the same foreign application as does the 632 patent	Jun. 27, 2017
U.S. Patent Re-Examination No. 95/002,235, which claims priority to the same international application as does the 632 patent	Sep. 13, 2012

C. Lead and Back-Up Counsel

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D. Service Information

Please address all correspondence to the lead and backup counsel at the contact information above. Petitioner also consents to service by email at the above-designated email addresses (rgabric@brinksgilson.com, rmallin@brinksgilson.com, and yfeng@brinksgilson.com).

III. GROUNDS FOR STANDING UNDER 37 C.F.R. § 42.104(A)

Petitioner certifies that the 632 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review on the ground 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 (the “Board”) review and find unpatentable claims 14-16 and 18 of the 632 patent based upon the following ground:

Ground 1: Claims 14-16 and 18 are unpatentable under 35 U.S.C. § 103 as obvious based on the combination of U.S. Pat. No. 4,947,874 (“Brooks,” Ex. 1003) in view of U.S. Pat. No. 2,057,353 (“Whittemore,” Ex. 1004).

The 632 patent is to be reviewed under pre-AIA 35 U.S.C. § 103.

Brooks and Whittemore are prior art under at least 35 U.S.C. § 102(b):

Exhibit	Description	Publication Date
1004	U.S. Patent No. 2,057,353 (“Whittemore”)	Oct. 13, 1936
1003	U.S. Patent No. 4,947,874 (“Brooks”)	Aug. 14, 1990

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 and the ground stated herein is supported by the Declaration of Dr. Robert Sturges (Ex. 1002).

Statement of Non-Redundancy: This is the first and only petition relating to the 632 patent filed by Petitioner or, to Petitioner's knowledge, by any party.

The invalidity ground presented in this petition is not redundant of grounds previously before the PTO. The combination of Brooks with Whittemore was not considered during prosecution. While Whittemore was cited in an IDS and listed on the 632 patent, Brooks was not cited. U.S. Patent No. 4,947,875 ("875 patent") and EP0358002A2 ("EP0002"), which are similar to Brooks, were cited and listed on the 632 patent. Nonetheless, even though cited on the face of the 632 patent, neither Whittemore nor the 875 patent nor EP0002 was used during prosecution to substantively reject any of the 632 patent claims. Further, the Examiner did not have other evidence, such as Dr. Sturges' expert declaration to consider. Under situations such as this, the Board has rejected arguments that institution should be denied under 35 U.S.C. § 325(d). Ex. 1022, Institution Decision dated Feb. 5, 2018 (Paper 9) at pp. 7-8, *Cascades Canada ULC v. SCA Hygiene Prods AB*, IPR2017-01921 (P.T.A.B., petition filed Aug. 7, 2017) (instituting IPR although Examiner considered both prior art references during prosecution because Petitioner's arguments "differ sufficiently from what was presented during prosecution, and have merit"); Ex. 1023, Institution Decision dated Jan. 19, 2018 at pp. 9-12, 17-19

(Paper 9), *Donghee America, Inc. v. Plastic Omnium Advanced Innovation and Research*, IPR2017-01654 (P.T.A.B., petition filed June 21, 2017) (instituting IPR based on prior art that formed the basis for rejection during prosecution because there was no evidence the Examiner considered “the unnumbered element in [prior art] Figure 1,” the petitioner’s “distinct arguments,” and the evidence presented in the petition including the expert declaration); Ex. 1024, Institution Decision dated May 18, 2017 at p. 7 (Paper 9), *Limelight Networks, Inc. v. Mass. Inst. of Tech.*, IPR2017-00249 (P.T.A.B., petition filed Nov. 11, 2016) (“We are not persuaded ... that a citation to prior art in an IDS, without substantive discussion of the reference by the Examiner, is sufficient reason to exercise our discretion under 35 U.S.C. § 325(d) to decline to institute an *inter partes* review”); Ex. 1025, Institution Decision dated July 15, 2015 at p. 15 (Paper 10), *Microsoft Corp. v. Parallel Networks Licensing, LLC*, IPR2015-00483 (P.T.A.B., petition filed Dec. 23, 2014) (“while [the reference] was listed on a lengthy Information Disclosure Statement initialed by the Examiner, the reference was not applied against the claims and there is no evidence that the Examiner considered the particular disclosures cited ... in the Petition.”); Ex. 1026, Institution Decision dated Mar. 13, 2013 at pp. 7, 20 (Paper 19), *Micron Tech., Inc. v. Bd. of Trs. of the Univ. of Ill.*, IPR2013-00005 (P.T.A.B., petition filed Oct. 2, 2012) (instituting IPR based on prior art that “was before the Office during prosecution,” and reasoning that “[t]he

present record differs from the one before the Examiner” in that the Board now “consider[s] the [reference] in view of the [Expert] declaration testimony [], which was not before the Examiner.”); *see also* Ex. 1027, Institution Decision dated Jan. 24, 2013 at pp. 16-19 (Paper 18), *Macauto U.S.A. v. BOS GMBH & KG*, IPR2012-00004 (P.T.A.B., petition filed Sept. 16, 2012) (explicitly rejecting examiner’s reasoning about prior art during prosecution).

As noted above, this is the first and only petition being filed by Petitioner or any party concerning the 632 patent. Further, even though PO previously addressed the prior art presented in this petition in other IPRs, any argument from PO about alleged prejudice or burden by being subjected to multiple petitions related to other patents is unwarranted in view of the different claim scope covered by the 632 patent claims, and in view of PO’s litigation activity. Indeed, in addition to numerous lawsuits against others, PO has filed four lawsuits against Petitioner alleging infringement of 15 patents, and this is Petitioner’s first and only petition concerning the 632 patent. Ex. 1028, Institution Decision dated Feb. 6, 2018 at pp. 26 (Paper 8), *Samsung Elec. Am. v. Uniloc*, IPR2017-01801 (P.T.A.B., petition filed July 20, 2017) (Patent Owner’s complaint about the multiple IPR petitions “is not persuasive when the volume appears to be a direct result of its own litigation activity.”).

Finally, the Board’s determination in IPR2016-01270 concerning U.S. Patent No. 8,893,726 should not preclude institution. In IPR2016-01270, the Board determined that Brooks’ embodiment of “porous substrates in intimate contact with resistance heating components” did not disclose a “liquid storage body in physical contact with the atomizer” as required in the challenged 726 patent claims. Ex. 1029, Institution Decision dated Jan. 4, 2017 at pp. 10-13 (Paper 11), *R.J. Reynolds Vapor Company v. Fontem Holdings I B.V.*, IPR2016-01270 (P.T.A.B., petition filed July 2, 2016). The 632 patent claims do not include any such limitation. Further, the Board did not have the evidence presented here to consider during IPR2016-01270. For example, the Board did not have Dr. Sturges’ testimony expressly explaining that a PHOSITA would have understood that Brooks’ “porous substrates in intimate contact with resistance heating components” are distinct structures. Ex. 1002, ¶¶44-46, 74. As Dr. Sturges explains, the plain meaning of the word “contact” requires that the porous substrate and resistance heating component be separate structures. *Id.*, ¶45. Further, Brooks’ claims and description support that they are separate. *Id.*, ¶¶44-46, 74; Ex. 1003, 6:45-52, claims 53, 57, 104, 105, 131, 132. Indeed, the porous substrate and resistance heating components of Brooks’ “intimate contact” embodiment are necessarily separate structures because something cannot be in intimate contact with itself. *See ICHL, LLC v. NEC Corp. of Am.*, No. 5:08-CV-65, No. 5:08-CV-

175, No. 5:08-CV-177, 2010 U.S. Dist. LEXIS 38942, at *30-31 (E.D. Tex. Apr. 20, 2010), *aff'd*, 455 Fed. Appx. 978 (Fed. Cir. 2011) (“in intimate contact” requires “the touching of two or more distinct parts”); *see also Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1255 (Fed. Cir. 2010) (“If the ‘hinged arm’ and the ‘spring means’ are one and the same, then the hinged arm must be ‘connected to’ itself . . . a physical impossibility.”) (internal quotations added).

Accordingly, this Petition is not redundant.

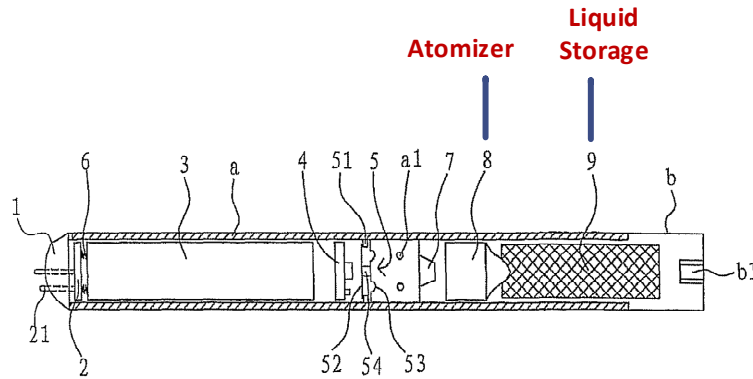
V. THRESHOLD REQUIREMENT FOR *INTER PARTES* REVIEW

This petition meets the threshold requirement for *inter partes* review because the asserted ground of unpatentability 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).

VI. STATEMENT OF REASONS FOR THE RELIEF REQUESTED

A. Background Information for the 632 Patent

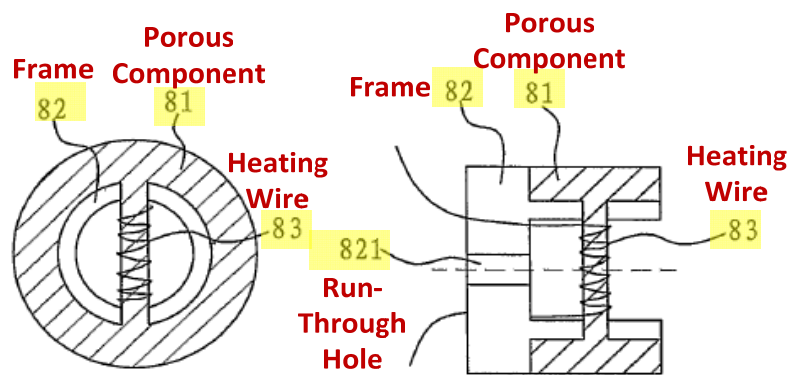
The 632 patent generally describes an electronic cigarette.



Ex. 1001, Fig. 1 (Annotated)

With respect to Figs. 1 and 10, the electronic cigarette includes an operating indicator 1, a battery 3, an atomizer assembly 8, a restriction component 10 and a liquid storage 9. Ex. 1001, 2:51-63, 2:65-3:1, 3:28-30, 4:5-7, 5:23-34, Figs. 1, 10. The electronic cigarette also includes a shell (a) which is hollow and integrally formed. *Id.*, 2:51-54. The battery assembly connects with said atomizer assembly and both are located in said shell (a). *Id.*, 2:54-56. The shell (a) has through-air inlets (a1). *Id.*, 2:58-59, Fig. 1.

Further details of the atomizer assembly 8 are illustrated in annotated Figs. 17 and 18 below. *Id.*, 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.*, 6:1-10.

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

A PHOSITA for the 632 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. 1002, ¶¶22-25.

C. Claim Construction

Pursuant to 37 C.F.R. § 42.100(b), a claim in an unexpired patent is given its broadest reasonable construction in light of the specification in which it appears. *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278-79 (Fed. Cir. 2015), *aff’d*, *Cuozzo Speed Techs. v. Lee*, 136 S. Ct. 2131, 579 U.S. ____ (2016). Any ambiguity regarding the “broadest reasonable construction” of a claim term should be resolved in favor of the broader construction absent amendment by the patent owner, who can resolve ambiguities during *inter partes* review by amending the

claims. *See*, Patent Trial Practice Guide, 77 Fed. Reg., at 48,764. Petitioner’s construction of claim terms is for purposes of this IPR petition only and is not binding upon Petitioner in any other proceeding related to the 632 patent.

Independent claim 14 of the 632 patent recites the term “elongated cylindrical housing.” Ex. 1001, 7:20-8:8. The Board previously construed “housing” in the parent 742 patent and child 548 patent to be not limited to a one-piece shell in IPR2016-01532 and IPR2016-01691, respectively. Ex. 1017, Institution Decision dated Feb. 7, 2017 at pp. 7-9 (Paper 9), *R.J. Reynolds Vapor Co. v. Fontem Holdings I B.V.*, IPR2016-01532 (P.T.A.B., petition filed Aug. 5, 2016); Ex. 1018, Institution Decision dated Mar. 6, 2017 at pp. 6-8 (Paper 9), *R.J. Reynolds Vapor Co. v. Fontem Holdings I B.V.*, IPR2016-01691 (P.T.A.B., petition filed Aug. 30, 2016). For purposes of this petition only and under the applicable BRI standard, Petitioner applies the Board’s prior construction of “housing.”

D. Description of the Prior Art

1. Brooks (Ex. 1003)

Brooks is titled “Smoking Articles Utilizing Electrical Energy” and discloses “cigarettes and other smoking articles such as cigars, pipes, and the like, which employ an electrical resistance heating element and an electrical power source to produce a tobacco-flavored smoke or aerosol.” Ex. 1003, 1:6-10. Brooks’

preferred smoking articles are capable of providing the user with sensations of smoking without burning tobacco. *Id.*, 1:6-16.

Brooks discloses an electrically powered device that includes: (1) a reusable component containing batteries and also housing the control circuitry and sensors and (2) a disposable cartridge or “cigarette” that includes an electric heating component, aerosol liquid, and an air passageway for inhaling the aerosol. *Id.*, 4:7-12, 7:15-25; Ex. 1002, ¶70.

Brooks’ reusable portion (“controller 14”) includes “a case 26, a puff actuated current actuation mechanism 28 having the form of a pressure sensitive switch, a time-based current control circuit 30, and a chamber 32 into which battery power supply 34 (shown as batteries 34A and 34B) is inserted.” Ex. 1003, 7:20-25. Brooks explains that the reusable controller can have “a variety of shapes” and take on many different forms including a pipe, a cigarette holder, a hand-held unit “or other portable form.” *Id.*, 4:46-50, 9:39-41. A PHOSITA would have readily understood that a “cigarette holder” as disclosed in Brooks is an elongated cylindrical structure with an extended open portion for receiving a cigarette. *See e.g.*, Ex. 1019, US3,292,635 (“Kolodny”) at 4:25-26, Figs. 1-2 (disclosing “a cylindrical cigarette holder”); Ex. 1020, US3,685,521 (“Dock”) at 3:17-4:3 (disclosing a “substantially cylindrical cigarette holder”); Ex. 1005, US5,894,841 (“Voges”) at 5:48-50, Figs. 1-2; *see also* Ex. 1030 U.S. Pat. Pub. No.

2005/0016550 (“Katase”) at Fig. 1; Ex. 1002 at ¶70. Indeed, WO00/28843 (“Pienemann,” Ex. 1036; English translation, Ex. 1037) discloses that a hand-held controller, such as the controller shown in Brooks’ Fig. 2, can be incorporated into a cylindrical cigarette shape. Ex. 1037, *compare* Figs. 4a-4b with Fig. 5, *see also* p. 8; Ex. 1002, ¶70. Moreover, as disclosed by Voges and other prior art, cylindrical housings in smoking articles were well known, and thus it would have been a matter of routine design choice to use a cylindrical housing in the combination of Brooks and Whittemore. *See e.g.*, Ex. 1005, Voges at Fig. 1 (Voges disclosing a cigarette substitute, which includes a cylindrically shaped battery in a cigarette-shaped hollow tubular body); Ex. 1002, ¶70. *See Gardner v. TEC Sys., Inc.*, 725 F.2d 1338, 1349 (Fed. Cir. 1984) (affirming obviousness determination because “the dimensional limitations did not specify a device which performed and operated any differently from the prior art”). This is especially the case here where Brooks discloses different shapes for the battery assembly housing (*i.e.*, the controller 14). Thus, when the controller housing takes on the form of a cigarette holder, it will be an elongated cylindrical housing.

Brooks’ disposable portion 12 includes “an air permeable high surface area electrical resistance heating element that normally carries aerosol forming and/or tobacco flavor substances prior to use.” Ex. 1003, 4:7-12. Brooks explains that while the heating element preferably carries the aerosol-forming substance prior to

use, it can take on many other forms. *Id.*, 4:22-25, 7:65-8:3. This heating element may include metal wires, and may include a variety of porous substances for storing liquid. *Id.*, 7:65-8:3. In one embodiment, the heating element may be a “porous substrate in intimate contact with resistance heating components.” *Id.*, 8:1-2; *see also* Ex. 1002, ¶¶44-46, 74. The “intimate contact embodiment” forms the basis for the unpatentability analysis in this petition.

A PHOSITA would have understood that this alternative “intimate contact” embodiment necessarily includes a separate porous substrate (that may hold at least some liquid to be vaporized) and a separate resistance heating component that is touching the substrate for several reasons. *Id.* First, a resistance heater in contact with a separate porous substrate (or body) was known. For example, in the Background of The Invention section, Brooks describes Whittemore, which is an example of a resistance heating component (*i.e.*, filament coil) in intimate contact with a separate porous substrate (*i.e.*, the wick). Ex. 1003, 1:57-61; Ex. 1002, ¶45. Second, the word “contact” means the “union or junction of two surfaces.” Ex. 1013, (*Contact*, Merriam-Webster's Collegiate Dictionary (11th ed. 2003)). If the resistance heating component and porous substrate were not two distinct and separate parts, then use of the word “contact” in the specification would make no sense because something cannot be in (intimate) contact with itself. Ex. 1002, ¶45. *See ICHL, LLC*, 2010 U.S. Dist. LEXIS 38942, at *30-31 (“in intimate contact”

requires “the touching of two or more distinct parts”); *see also Becton, Dickinson & Co.*, 616 F.3d at 1255 (“If the ‘hinged arm’ and the ‘spring means’ are one and the same, then the hinged arm must be ‘connected to’ itself . . . a physical impossibility.”) (internal quotations added). Indeed, consistent with this plain meaning and common understanding, other prior art uses the word “contact” to indicate the relationship between a heating element and a separate porous body. Ex. 1004, 1:50-2:6 (“[A] portion of the wick is always *in contact* or approximate contact with the heating element or filament 3...”) (emphasis added); Ex. 1011, US2,461,664 (“Smith”) at 18:22-24 (“said heating element comprises a length of electrical resistance wire held *in surface contact* with said wick”) (emphasis added).

A PHOSITA would further have understood that the “intimate contact” embodiment includes a separate porous substrate and separate resistance heating component based on the description in the specification and the claims which distinguish between the preferred embodiment and the “intimate contact” embodiment. Brooks’ specification teaches that the aerosol forming substance can be located either “on the resistance heating element or elsewhere in the article.” Ex. 1003, 6:45-52. A PHOSITA would have understood that “on the resistance heating element” refers to the preferred embodiment where the aerosol forming substance is impregnated on and carried by the heating element prior to use; while

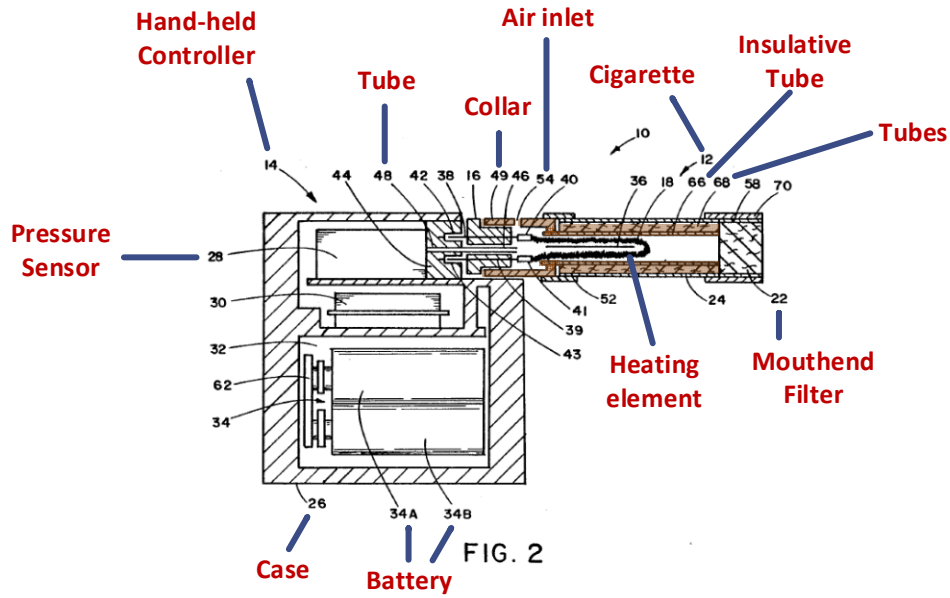
“elsewhere in the article” would have included the separate porous substrate of the “intimate contact” embodiment or some other location in the device.

Brooks’ claims are also consistent with this disclosure and a PHOSITA’s understanding. For example, independent claims 53, 104, and 131 require “an electrical heating element” and “an aerosol forming substance” without any requirement that the aerosol forming substance be carried by the electrical resistance heating element. Ex. 1003, claims 53, 104, 131. In contrast, claims 57, 105 and 132 depend from claims 53, 104 and 131, respectively, expressly add the limitation that the “aerosol forming substance is carried by the heating element prior to use.” *Id.* at claims 57, 105, 132. A PHOSITA would have understood that the independent claims cover *both* the “intimate contact” embodiment and the preferred embodiment where the aerosol is carried by the heating component whereas the dependent claims cover only the preferred embodiment. Ex. 1002, ¶46. Indeed, there is no other distinction between the independent and dependent claims. Ex. 1003, claims 53, 57, 104-105, 131-132; Ex. 1002, ¶46. Also in contrast to claims 53, 104, and 131, the resistance heating elements recited in claims 1, 26 and 75 all require that there be an “aerosol forming substance carried by the [electrical resistance] heating element prior to use.” *Id.* at claims 1, 26, 75. This difference relating to the electrical resistance heating element recited in claims 53, 104, and 131 (*i.e.*, not required to carry the aerosol forming substance)

as compared to the electrical resistance heating element in 1, 26, 57, 75, 105 and 132 (*i.e.*, required to carry the aerosol forming substance prior to use) further confirms that the “intimate contact” embodiment includes a separate porous structure and resistance heating components, and is different from the preferred embodiment where the heating element carries the aerosol forming substance prior to use. Ex. 1002, ¶46; *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (“[T]he presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.”).

In operation, when a person inhales on the device, pressure changes cause electrical current to run through the heating component, which generates heat for volatilizing the liquid in the porous substrate. Ex. 1003, 10:40-48. The volatilized liquid mixes with air and is inhaled through mouthend filter 22, located at an end of the disposable portion. *Id.*, 10:48-53.

These components are depicted in Figure 2:

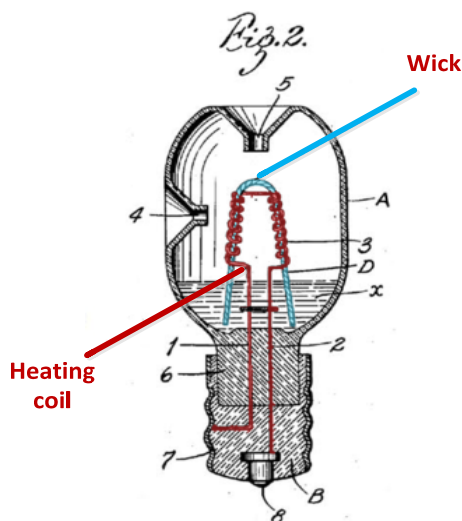


Ex. 1003, Fig. 2 (Annotated)

Brooks discloses that the controller and the disposable portion are mechanically and electrically connected several different ways. In Figs. 1, 2 and 4 a plug-in connection (plug 16) at the end of the cigarette, which is inserted into an opening (receptacle 44) on the controller, mechanically and electrically connects the disposable portion 12 and the controller 14. *Id.*, 9:41-46. There is an airflow passage (tube 48) that runs through both components of the plug connection (plug 16 and receptacle 44) such that the current actuation mechanism 28 can detect the low pressure created when a person has inhaled on the mouthpiece of the disposable portion. *Id.*, 9:46-50.

2. Whittemore (Ex. 1004)

Whittemore discloses a vaporizing unit, shown below in annotated Fig. 2.

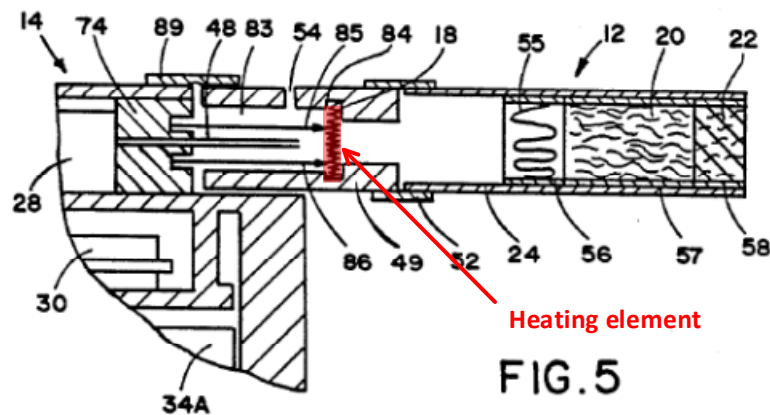


A vaporizing vessel A is “adapted to hold a liquid medicament x and provided with an electrically-operated heating means comprising two electrical conductors 1 and 2 and a filament or heating element 3 combined in such a way that when said conductors are energized by an electric current, the filament 3 will become heated.” Ex. 1004, 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.*, 1:54-2:8. Whittemore also includes an air inlet orifice 4 and a vapor outlet 5. *Id.*, 1:31-33.

E. There Is a Reasonable Likelihood That Claims 14-16 And 18 Are Obvious Over the Combination of Brooks and Whittemore

1. A PHOSITA Would Have Been Motivated To Combine Brooks and Whittemore

Brooks discloses that its heating element can constitute a “metal wire,” and further discloses that the heating element can be a resistance heating component in “intimate contact” with a separate “porous substrate.” Ex. 1003, 7:65-8:3. Brooks additionally depicts embodiments in which the heating component takes a coil form:

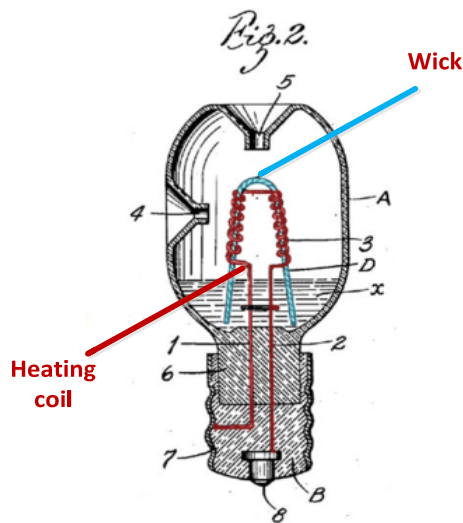


Ex. 1003, Fig. 5 (Annotated)

Indeed, Brooks’ heating element has been described as a coil. *See e.g.*, Ex. 1014, U.S. Pat. Pub. No. 2004/0234916 (“Hale”) at ¶[0004] (describing the heating element in US4,922,901 to Brooks (Ex. 1015), which is substantially identical to the Brooks patent (Ex. 1003) relied in this petition, as an “electrical resistance coil”). Brooks thus discloses, or, at a minimum, renders obvious to a PHOSITA,

that the intimate contact atomizer may comprise a heating wire coil wound around a porous component (the porous substrate). Ex. 1002, ¶¶55, 44-46, 74.

To the extent that it is disputed that Brooks discloses or renders obvious a heater wire coil wound on a porous component, Whittemore describes and illustrates that a heater wire may be wound around a porous component and it would have been obvious to a PHOSITA to adapt Brooks to include such a structure in view of Whittemore. *Id.*, ¶¶57-67, 74. Whittemore describes a wick D made of thread or string that is surrounded by “coiled or looped portions” of a “filament 3,” which acts as a heater when electric current passes through it. Ex. 1004 at 1:53-2:18; *see also id.* at 1:49-50 (claiming a “porous wick entwined in the filament”).



Ex. 1004, Fig. 2 (Annotated)

Whittemore expressly states that wick D is a “porous wick” and shows the heater coil (filament 3) wound around the wick. Ex. 1004, 3:49-52 (claim 9), Fig. 2.

Accordingly, Whittemore discloses that a heater coil (filament 3) is wound around a porous component (wick D). Ex. 1002, ¶¶57-60.

It would have been obvious to a PHOSITA to modify the Brooks device so that “intimate contact” is obtained by coiling the resistance heating component around the porous substrate in view of Whittemore’s teachings. Ex. 1002, ¶¶57-67. First, winding a heating wire around a porous component had been known in the art of electronic vaporizing devices for decades. *See e.g.*, Ex. 1004, 1:53-2:18; Ex. 1011, 20:36-40 (disclosing a heating element “compris[ing] loops of a coil of electrical resistance wire and the said capillary feeder comprises a stretch of wick passing axially through said coil of wire”); Ex. 1012, 4:73-75 (“The wire 71 is advantageously coiled around a wick or mandrel 63 which is easily wetted.”); Ex. 1002, ¶61. Using heater wires or coils wound around liquid containers for the purpose of generating vapor was also well-known to a PHOSITA. *See e.g.*, Ex. 1016, US1,084,304 (“Vaughn”) at 1:39-43; Ex. 1002, ¶61.

Brooks confirms the conventional nature of heater coils by identifying “coil” heaters in three references reviewed in its background section. *See* Ex. 1003, 1:62-66 (“U.S. Pat. No. 2,104,266 to McCormick proposed an article having a pipe bowl or cigarette holder which included *a resistance coil*...”), 2:40-43 (“In supplemental West German Patent Application No. 2,704,218, Kovacs described the use of a vacuum or draw-actuated switch to switch “on” the *battery operated heating*

coil.”), 3:4-6 (“The article [in Nilsson PCT Publication No. WO86/02528] resembled a cigarette holder and reportedly included a *battery operated heating coil* to heat an untipped cigarette inserted therein.”).¹ Adapting Brooks to include a wire wound around a porous component would be nothing more than the application of known techniques (winding a heater wire around a porous body) to a similar structure (Brooks’ intimate contact embodiment where the resistance heating component is in intimate contact with a separate porous substrate) to obtain a predictable result (using a heating element that vaporizes an aerosol forming substance). Ex. 1002, ¶¶62-63.

Second, a PHOSITA would have been motivated to adapt Brooks to include a heating wire coil wound around a porous component because coiled wires promote efficient heat transfer. *Id.*, ¶¶64-66. US5,743,251 to Howell et al. (filed May 15, 1996) (“Howell”) expressly teaches that using tight wire coils promotes effective heat transfer. Ex. 1010, 11:20-22 (“The wire was wrapped in a fashion that produced close, tight coils to insure good heat transfer to the tube.”); *see also* Ex. 1012, Seuthe at 4:73-5:2 (stronger heating effect obtained by winding heater coil around wick in tighter coils). Accordingly, a PHOSITA would have understood that using Whittemore’s efficient wick/coil would have been consistent with Brooks’ desire to have efficient heating. Ex. 1002, ¶¶64-66. Thus,

¹ All emphasis added unless otherwise noted.

Whittemore's configuration is consistent with Brooks' emphasis on the importance of rapid and efficient heating:

Preferred heating elements normally have low mass, low density, and moderate resistivity, and are thermally stable at the temperatures experienced during use. *Such heating elements heat and cool rapidly, and thus provide for the efficient use of energy.* Rapid heating of the element also provides almost immediate volatilization of the aerosol forming substance.

Ex. 1003, 7:34-40. Brooks specifically recommends that "the aerosol forming substance is in a heat exchange relationship with the electrical heating element." *Id.*, 8:4-8. This is the exact arrangement disclosed by Whittemore: the medicament on the wick is in a direct heat exchange relationship with the filament. Ex. 1004, 1:50-2:8 ("a portion of the wick is always in contact or approximate contact with the heating element or filament 3"); Ex. 1002, ¶57. The proposed combination is the simple substitution of one known element (Whittemore's coiled heating wire/wick) for another known element (Brooks' heating element) to obtain predictable results (holding and atomizing aerosol forming liquid). Ex. 1002, ¶63; *KSR Int'l v. Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("When a patent claims a structure already known in the prior art that is altered by the mere substitution of

one element for another known in the field, the combination must do more than yield a predictable result.”); *see also* MPEP §2143 (I)(B).

Accordingly, it would have been obvious for a PHOSITA to adapt Brooks’ heating component to coil around the substrate as taught by Whittemore. This modification would not adversely alter Brooks’ operation and would have had a predictable result: a heating component that efficiently vaporizes stored liquid. Ex. 1002, ¶¶57-67.

2. Claim 14 Is Obvious

a. “a vaporizing device”

To the extent that the preamble is considered a claim limitation, as illustrated in the claim chart below, Brooks discloses a vaporizing device. Brooks is a vaporizing device because it is directed to “[s]moking articles [that] employ an electrical resistance heating element and an electrical power source to provide a tobacco-flavored smoke or aerosol and other sensations of smoking.” Ex. 1003, Abstract; Ex. 1002, ¶69.

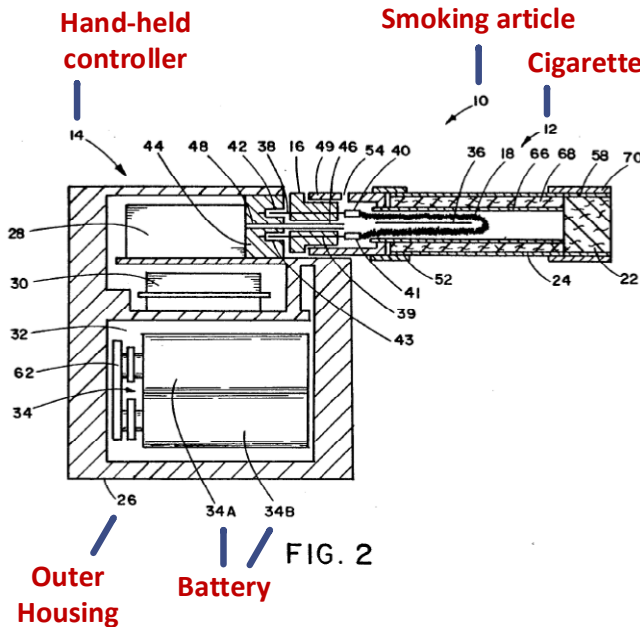
Claim 14.[a]	Brooks and Whittemore
14. A vaporizing device, comprising:	<u>Brooks:</u> “Smoking articles employ an electrical resistance heating element and an electrical power source to provide a tobacco-flavored smoke or aerosol and other sensations of smoking.” Ex. 1003 at Abstract.

	“The present invention relates to cigarettes and other smoking articles such as cigars, pipes, and the like, which employ an electrical resistance heating element and an electrical power source to produce a tobacco-flavored smoke or aerosol.” <i>Id.</i>, 1:6-10. Ex. 1002, ¶69.
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b. “a battery assembly and an atomizer assembly within an elongated cylindrical housing with the battery assembly electrically connected to the atomizer assembly”

As illustrated in annotated figures and claim chart below, these features are found in Brooks. Brooks discloses a device having two discrete components: (1) a reusable controller 14 that contains batteries and other electronic components and (2) a disposable portion 12 that includes the heating component and liquid. The controller 14 includes batteries 34A and 34B and thus constitutes “a battery assembly.” Ex. 1003, 7:15-25; Ex. 1002, ¶70. The controller 14 further comprises “a case 26 or outer housing” that houses batteries 34A and 34B. Ex. 1003, 9:37-41; Ex. 1002, ¶70. Therefore, Brooks teaches a battery assembly (controller 14 including batteries 34A and 34B) within a battery assembly housing (case 26 or outer housing). *Id.*

Brooks discloses that controller 14 may be in the form of a hand-held unit. One embodiment of a hand-held controller 14 is illustrated in, *e.g.*, Fig. 2.



Ex. 1003, Fig. 2 (Annotated)

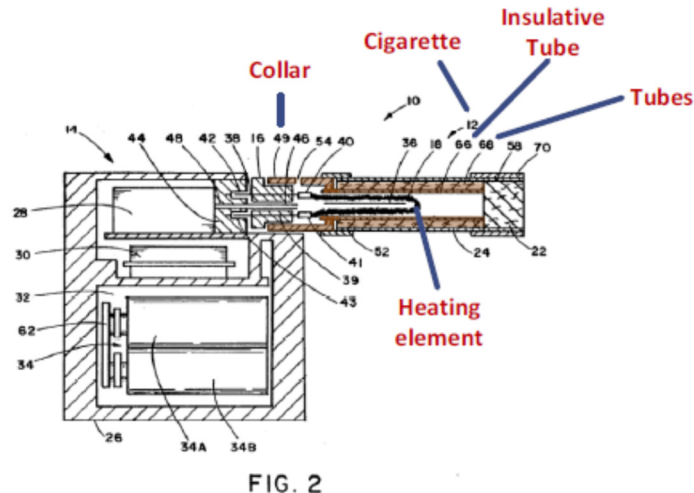
Brooks further discloses that the controller 14 can “have a variety of shapes” and take on other forms including a tubular shape such as a cigarette holder. Ex. 1003, 4:46-49 (“The reusable controller can be *in the form of* a pipe, *a reusable cigarette holder*, or a hand-held unit or other portable form into which the disposable portion can be inserted.”), 9:39-41 (controller “can have a variety of shapes”). As explained above in Section VI.D.1., a PHOSITA would have readily understood that a “cigarette holder” shaped controller as described in Brooks is an elongated cylindrical structure. Ex. 1002, ¶70. A cigarette holder is also a cylindrical structure with an extended open portion for receiving a cigarette. *See e.g.* Ex. 1019, Kolodny at 4:25-26 (“An integral, completely expendable, cigarette-cigarette holder [comprises] a *cylindrical cigarette holder*.”), Figs. 1-2; Ex. 1020, Dock at

3:17-4:3 (“A *substantially cylindrical cigarette holder* of resilient waterproof material, said holder at one end being of a size such as to form a socket designed to accommodate a cigarette ...”); *see also* Ex. 1005, Voges at 5:49-51, 5:66-6:2, Figs. 1-2 (disclosing a cigarette substitute, which includes a cylindrically shaped battery in a cigarette-shaped hollow tubular body); Ex. 1037, *compare* Figs. 4a-4b with Fig. 5, and p. 8 (a hand-held controller, such as the controller shown in Brooks’ Fig. 2, can be incorporated into a cylindrical cigarette shape); Ex. 1002, ¶70.

To the extent that PO disputes whether the exterior (case 26 or outer housing) of controller 14 is cylindrical, elongated cylindrical housings for smoking articles were well known in the art generally (*see* Ex. 1005), and Kolodny (Ex. 1019) and Dock (Ex. 1020) specifically disclose a cylindrical cigarette holder. Thus, it would have been obvious, as a matter of design choice, to use an elongated cylindrical housing for the controller portion of Brooks’ smoking article. Ex. 1002, ¶70.

Moreover, Brooks discloses an atomizer assembly in the form of disposable portion or cigarette 12. Ex. 1003, 4:7-12, 7:15-16, Fig. 2; Ex. 1002, ¶70. As illustrated in Figs. 1-6, the cigarette 12 has a cylindrical shape and includes an atomizer assembly housing in the form of tube 68 and collar 49, which houses an atomizer formed by heating element 18 surrounded by insulative tube 66. Ex. 1003, 8:43-46, 11:6-16, 17:28-35, Fig. 2; Ex. 1002, ¶70. Brooks discloses that the

collar 49 is formed from a cylinder. Ex. 1003, 8:43-50, 11:42-53, 17:21-22 (“A 9 mm long Delrin tube 49 was fabricated from an 8 mm diameter *cylinder*.”), 22:1-6 (“An insulative collar 49 was formed from a Delrin *cylinder* ...”), 21-31, Fig. 4; Ex. 1002, ¶70. As illustrated in annotated Fig. 2 below, a PHOSITA would have understood that the tube 68 and collar 49 jointly form an atomizer assembly housing that is an elongated cylindrical structure, as they provide the exterior structure of the atomizer assembly. *Id.*



Ex. 1003, Fig. 2 (Annotated)

Therefore, Brooks discloses an elongated cylindrical housing comprising a first elongated cylindrical housing (case 26 of, for example, the disclosed “cigarette holder”-shaped embodiment of controller 14) within which the battery assembly (controller 14 including batteries 34A and 34B) is located, and a second elongated cylindrical housing (tube 68 and collar 49) within which the atomizer

assembly (disposable portion or cigarette 12 including heating element 18 surrounded by insulative tube 66) is located. Ex. 1002, ¶70.

Brooks further discloses that the battery assembly (controller 14 including batteries 34A and 34B) is electrically connected to the atomizer assembly (disposable portion or cigarette 12 including heating element 18). Ex. 1003, 10:34-38 (“In use, the user inserts the plug 16 of the cigarette 12 into the receptacle 44 of the controller 14. Such action provides *electrical connection of the resistance heating element 18 with* the switch 28, the control circuit 30 and *the batteries 34A and 34B.*”), 12:39-46, 14:38-42 (“The transistor 110 acts to control *the relatively large current which passes through the resistance element 18 from the power source 34 ...*”), 15:28-35; Ex. 1002, ¶70. The electrical connection between the battery assembly and the atomizer assembly is also shown in Figs. 9-10 (showing that the heating element 18 and the power source/battery 34 is electrical connected). *Id.*

Claim 14.[b]	Brooks and Whittemore
a battery assembly and an atomizer assembly within an elongated cylindrical housing with the battery assembly electrically connected to the atomizer assembly;	<u>Brooks:</u>

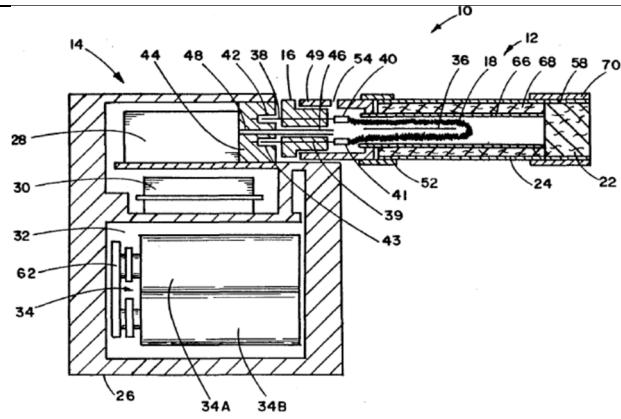


FIG. 2

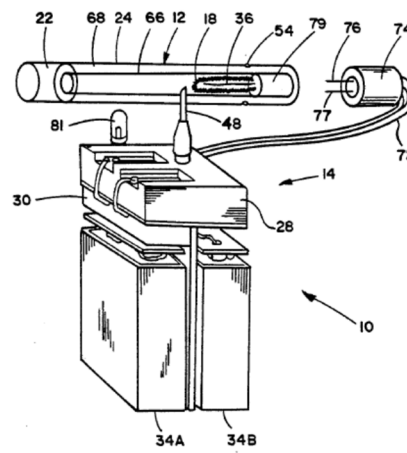


FIG. 3

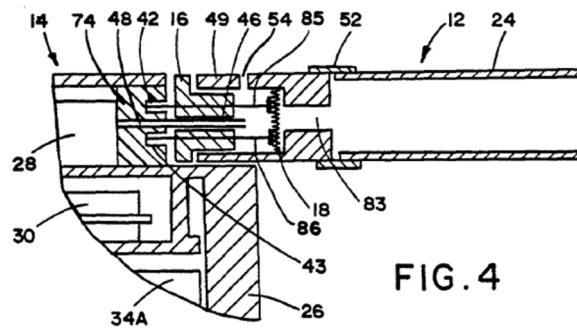


FIG. 4

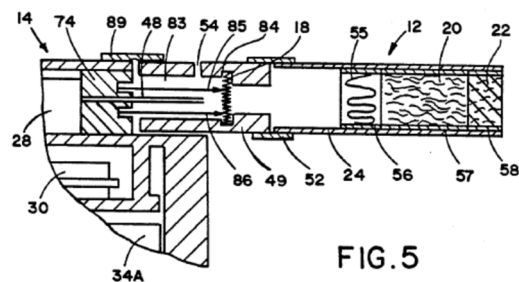


FIG. 5

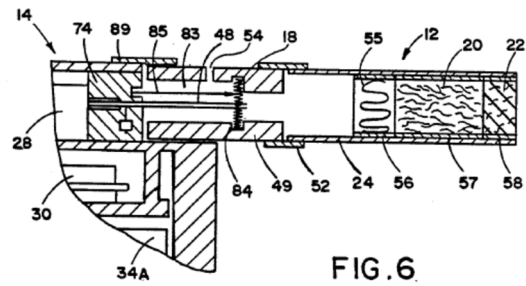


FIG. 6

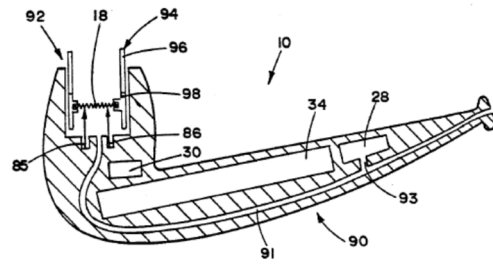


FIG. 7

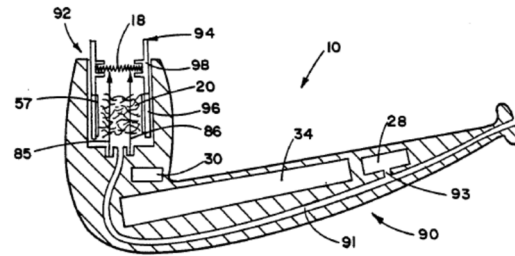


FIG. 8

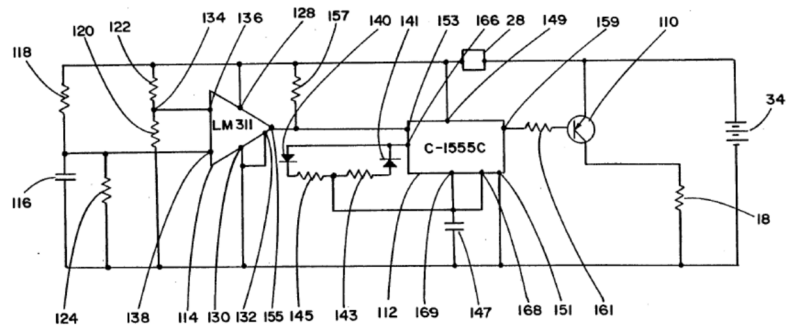


FIG. 9

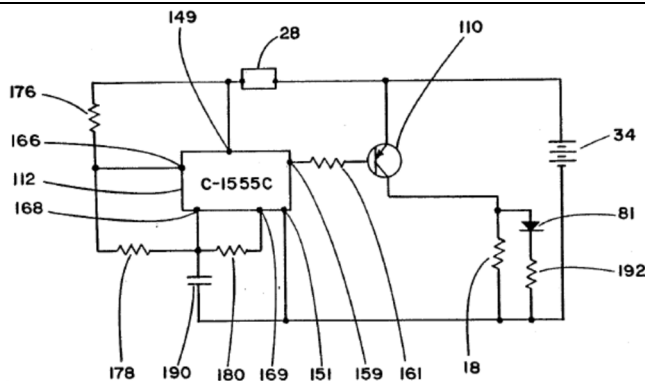


FIG. 10

Ex. 1003 at Figs. 2-6, 7-10.

“Referring to FIG. 1, smoking article 10 includes a cigarette 12 and a reusable, hand-held controller 14. The cigarette 12 includes electrical connection plug 16, resistance heating element 18 carrying an aerosol forming substance, a roll of tobacco 20, mouth end filter 22, and a resilient overwrap 24. The preferred controller 14 includes a case 26, a puff actuated current actuation mechanism 28 having the form of a pressure sensitive switch, a time-based current control circuit 30, and a chamber 32 into which battery power supply 34 (shown as batteries 34A and 34B) is inserted.” *Id.*, 7:15-25.

“The reusable controller 14 includes a case 26 or outer housing which provides a convenient and aesthetic holder for the user. The outer housing 26 can have a variety of shapes and can be manufactured from plastic, metal, or the like.” *Id.*, 9:37-41.

“The reusable controller can be in the form of a pipe, a reusable cigarette holder, or a hand-held unit or other portable form into which the disposable portion can be inserted.” *Id.*, 4:46-49.

“In one aspect of the invention, the smoking article includes a cigarette or a disposable portion (eg., a cartridge) which utilizes an air permeable high surface

	area electrical resistance heating element that normally carries aerosol forming and/or tobacco flavor substances prior to use.” <i>Id.</i>, 4:7-12. “The embodiment illustrated in FIG. 2 is generally similar to the embodiment of FIG. 1, except that the heating element 18 is positioned within a heat resistant, insulative tube 66. The insulative tube 66 preferably is manufactured from a high temperature plastic such as a polyimide, a ceramic, a heat resistant cellulosic, an extruded tobacco material, an aluminum tube having a surface coating of aluminum oxide, or the like. Preferably, a plasticized cellulose acetate tube 68 circumscribes the insulative tube 66, and is itself circumscribed by paper overwrap 24. This embodiment also includes tipping overwrap 70 circumscribing the mouthend of the cigarette in order to attach filter element 22 to the remaining portion of the cigarette.” <i>Id.</i>, 11:6-19. “A 39 mm long, 4 mm outer diameter Kapton polyimide tube 66 was slipped over the resistance element 18 and inserted about 4 mm into the 4 mm I.D. end of the Delrin tube 49. A 36 mm length of a 8 mm O.D. plasticized cellulose acetate tube 68, SCS-1 from American Filtrona Corp., was slipped over the polyimide tube. This tube 68 was then overwrapped with a layer of Kimberly-Clark P-850-192-2 paper 24.” <i>Id.</i>, 17:28-35. “In use, the user inserts the plug 16 of the cigarette 12 into the receptacle 44 of the controller 14. Such action provides electrical connection of the resistance heating element 18 with the switch 28, the control circuit 30 and the batteries 34A and 34B.” <i>Id.</i>, 10:34-38. “The foregoing embodiments preferably incorporate the preferred circuit shown schematically in FIG. 9. In particular, the circuit of FIG. 9 includes a power source 34, the electrical resistance heating element 18, a current actuation mechanism 28, and a preferred current
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	regulating circuit or means for controlling the passage of current through the resistance element during periods of current actuation.” <i>Id.</i>, 12:39-46. “The transistor 110 acts to control the relatively large current which passes through the resistance element 18 from the power source 34 by switching "on" and "off" in response to current flow from the timer.” <i>Id.</i>, 14:38-42. “Controllers and smoking articles of the invention also can incorporate the alternate time-based circuit shown schematically in FIG. 10. In particular, the circuit of FIG. 10 includes a power source 34, the electrical resistance heating element 18, a current actuation mechanism 28, and a current regulating circuit or means for controlling the passage of current through the resistance element during current actuation.” <i>Id.</i>, 15:28-35. “A portion of the length of the electrical connection plug 16 preferably is circumscribed by a collar 49 having the form of a thermoplastic tube, which preferably is friction fit around a portion of the length of the plug. The collar 49 in turn is secured to the remaining portion of the cigarette via overwrap 24 using tipping paper 52 or other appropriate means such as adhesive, a friction fit, or the like.” <i>Id.</i>, 8:43-50. “Referring to FIG. 4, the illustrated embodiment is generally similar to the embodiment of FIG. 2, except that the heating element 18 is a circular disc or pad, preferably formed from an American Kynol carbon felt. The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18. Electrical connection pins 85, 86 from plug 74 contact the heating element and help hold it in place against collar 49. In this embodiment, the collar 49 can be a thermoplastic material, a thermally stable plastic material, a ceramic, or the like.
--	--

The embodiment illustrated in FIG. 5 is generally similar to the embodiment of FIG. 1. In this embodiment, the heating element 18 is a circular disc or pad of carbon felt disposed across an air passageway 83 extending through tubular collar 49. The pad is held in place by shoulder 84 on the collar 49. In addition, the cigarette does not have an electrical connect plug. Instead, electrical connection pins 85, 86 for the heating element extend from a plug 74 located on the controller 14. The cigarette 12 is held in place relative to the controller 14 via a clip 89 extending from the controller, or other suitable connection means.” *Id.*, 11:42-65.

“A 9 mm long Delrin tube 49 was fabricated from an 8 mm diameter cylinder. One section, 6 mm long, had a 7 mm inner diameter (I.D.), and a second section, 3 mm long, had a 4 mm I.D. A single air inlet hole 54 was made about 4 mm from the 4 mm I.D. end of the tube using a No. 64 drill bit. The 7 mm I.D. end of the tube 49 was then friction fit over the 7 mm end of plug 16.” *Id.*, 17:21-27.

“An insulative collar 49 was formed from a Delrin cylinder having a length of 9 mm and a diameter of 8 mm to a tubular form having a 3 mm segment of 4.5 mm I.D. and a 6 mm segment of 6 mm I.D. A single air inlet 54 was made about 4 mm from the 6 mm I.D. end of the collar.

...

The resistance element 18 was inserted into the 6 mm I.D. end of the collar 49 to abut against the 4.5 mm I.D. portion of the collar.

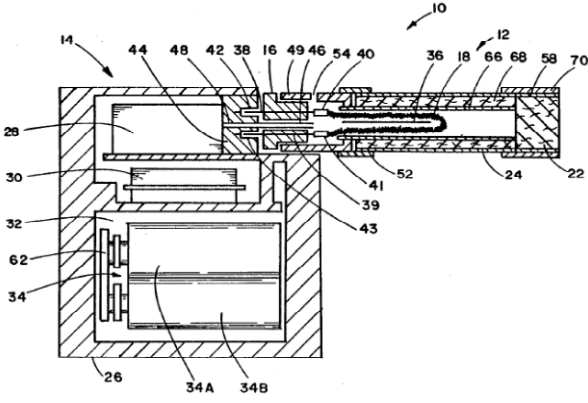
The 6 mm I.D. end of the collar 48 then was fit over the narrow end of plug 16 such that the flattened silver solder ends of pins 38 and 39 each contacted the resistance element 18.

	A resilient paperboard tube having an 8 mm O.D. and a length of 75 mm was abutted against the end of collar 49 opposite plug 16, and the two tubes were held in place using adhesive tape 52.” <i>Id.</i>, 22:1-6, 21-32. Ex. 1002, ¶70.
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c. “a liquid storage component in the elongated cylindrical housing”

Brooks discloses *two* liquid storage components in the elongated cylindrical housing. First, Brooks discloses that the “aerosol forming substance” is a solution as it is a liquid with several components. Ex. 1003, 4:22-25, *see also* 17:6-9. A PHOSITA would have understood that because Brooks’ device uses liquid, there must be “a liquid storage component” for the liquid. Ex. 1002, ¶71. Indeed, as Brooks makes clear, the aerosol forming substances (*i.e.*, liquid) are “located on the resistance element *or elsewhere in the article*.” Ex. 1003, 6:45-52; *see also* 17:6-9. A PHOSITA would have understood that the phrase “elsewhere in the article” refers to elsewhere in the disposable portion 12 (*i.e.*, the atomizer assembly) because that is the portion that is replaced every 6-10 puffs. *Id.*, 4:29-31, 6:32-36, 10:66-11:5; Ex. 1002, ¶71. Thus, a PHOSITA would have understood that while liquid could be stored on the heating element, there also could be a liquid storage component located elsewhere in the disposable portion 12 other than the heating element. *Id.*

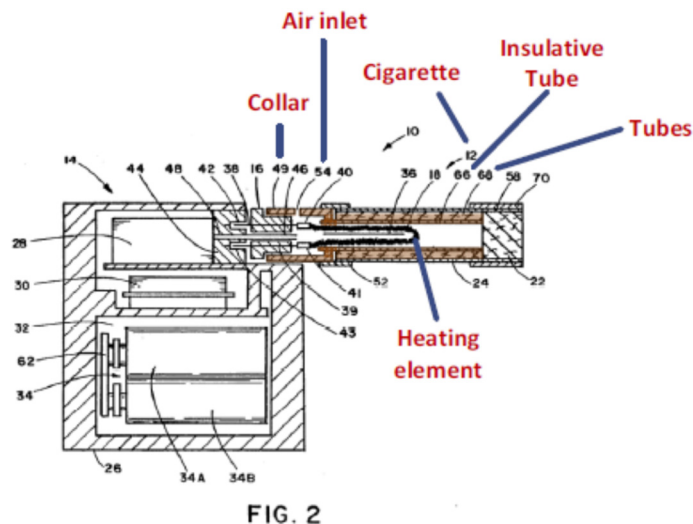
Brooks also discloses a second liquid storage component. Specifically, the tobacco roll/charge 20 in Brooks is a liquid storage component located in the atomizer assembly housing (disposable portion 12). Ex. 1003, 8:58-60, 9:1-15, Fig. 1. Brooks explains that the tobacco roll 20 can be tobacco filler or “[e]xtruded tobacco materials and other forms of tobacco, such as tobacco extracts, tobacco dust, or the like,” and includes various solutions, such as “[t]obacco extracts; tobacco flavor modifiers such as levulinic acid; and other flavoring agents such as menthol, vanillin, chocolate, licorice, and the like.” *Id.*, 9:1-15. The tobacco charge is overwrapped with a paper overwrap 57. *Id.*, 9:6-8. A PHOSITA would have known that tobacco charges such as the one described in Brooks contain liquid solutions. Ex. 1002, ¶71; *see e.g.*, Ex. 1033, US4,941,486 (“Dube”) at 7:1-11 (describing a charge of tobacco as a blend with reconstituted tobacco where, the “blend has a water, flavoring and glycerin casing applied thereto”); and Ex. 1034, US7,337,782 (“Thompson”) at 1:27-31, 4:42-48 (describing tobacco extract as aqueous). Thus, Brooks discloses two liquid storage components in the atomizer assembly housing of the elongated cylindrical housing: one liquid storage component for storing the aerosol forming substance and a second liquid storage component being the tobacco charge holding liquid that overwrapped with a paper overwrap. Both of these liquid storage components satisfy the claim limitation. Ex. 1002, ¶71.

Claim 14.[c]	Brooks and Whittemore
a liquid storage component in the elongated cylindrical housing;	<u>Brooks:</u>  FIG. 2 Ex. 1003, Fig. 2. “Other suitable heating elements 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 resistance heating components; and the like. Preferably, the heating element 18 is impregnated with or otherwise carries the aerosol forming substance in order that the aerosol forming substance is in a heat exchange relationship with the electrical heating element. The aerosol forming substance can be, for example, a polyhydric alcohol, such as glycerin, propylene glycol, or a mixture thereof; water; a tobacco material such as a tobacco aroma oil, a tobacco essence, a spray dried tobacco extract, a freeze dried tobacco extract, tobacco dust, or the like, in order to provide tobacco flavor; or a combination thereof. Other suitable aerosol forming substances are well known in the art.” <i>Id.</i>, 7:65-8:15. “While the loading of the aerosol forming substance can vary from substance to substance and from heating element to heating element, the amount of liquid aerosol forming substance used typically will be greater than

	about 15 mg and preferably ranges from about 25 mg to about 50 mg.” <i>Id.</i>, 8:16-22. “...the heating element experiences an increase in temperature which in turn heats and volatilizes the aerosol forming substance. The volatilized aerosol forming substance mixes with the drawn air and forms an aerosol. The volatilized aerosol forming substance (in aerosol or vapor form) passes through the tobacco roll 20 where it elutes tobacco flavor from the tobacco, and exits the mouthend filter 22 into the mouth of the user.” <i>Id.</i>, 10:45-53. “The cigarette can include a plug spacer member 55 positioned between the heating element 18 and the roll or charge of tobacco 20.” <i>Id.</i>, 8:58-60. “The tobacco charge 20 can be tobacco filler such as strands or shreds of tobacco laminae, reconstituted tobacco, volume expanded tobacco, processed tobacco stems, or blends thereof. Extruded tobacco materials and other forms of tobacco, such as tobacco extracts, tobacco dust, or the like, also can be employed. Preferably, the tobacco charge 20 is overwrapped with a paper overwrap 57. Tobacco extracts; tobacco flavor modifiers such as levulinic acid; and other flavoring agents such as menthol, vanillin, chocolate, licorice, and the like; can be carried by the heating element, placed between the heating element and the spacer member, applied to the spacer member, blended with the tobacco charge, or applied to the mouthend filter.” <i>Id.</i>, 9:1-15. Ex. 1002, ¶71.
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d. “with the elongated cylindrical housing having one or more air inlets”

As illustrated in the annotated figure and claim chart below, Brooks discloses that “the collar 49 includes one or more peripheral air inlet openings 54 which provide a flow of ambient air through the cigarette during draw.” Ex. 1003, 8:50-57, 10:40-53 (“When the user puffs on the mouthend of the cigarette, ambient air enters the cigarette through air inlet 54.”), 11:46-49, Figs. 2, 4-6; Ex. 1002, ¶72. Therefore, Brooks discloses the elongated cylindrical housing (including at least collar 49) having one or more air inlets (one or more peripheral air inlet openings 54). *Id.*



Ex. 1003, Fig. 2 (Annotated)

Claim 14.[d]	Brooks and Whittemore
with the elongated cylindrical housing having one or more air inlets;	<u>Brooks:</u>

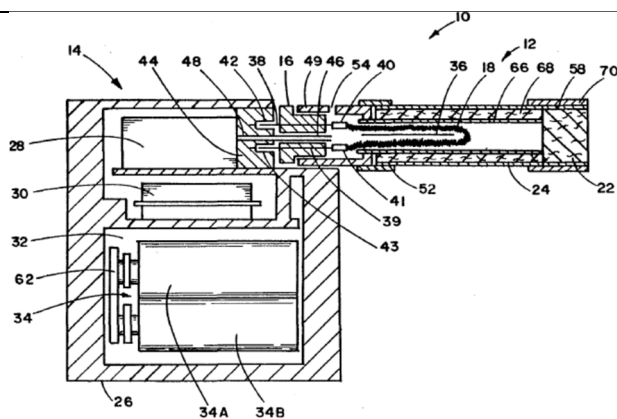


FIG. 2

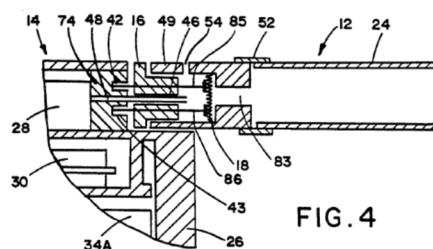


FIG. 4

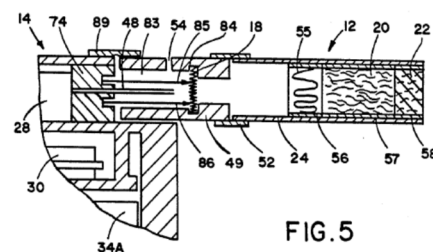


FIG. 5

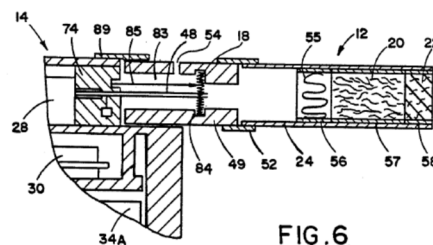


FIG. 6

Ex. 1003, Figs. 2, 4-6.

“A portion of the length of the electrical connection plug 16 preferably is circumscribed by a collar 49 having the form of a thermoplastic tube, which preferably is friction fit around a portion of the length of the plug. The collar 49 in turn is secured to the remaining portion of the cigarette via overwrap 24 using tipping paper 52 or other

appropriate means such as adhesive, a friction fit, or the like. Preferably, the collar 49 includes one or more peripheral air inlet openings 54 which provide a flow of ambient air through the cigarette during draw. Alternatively, the air inlet can be positioned through the extreme inlet end of the cigarette or elsewhere through the periphery of the cigarette, such that drawn ambient air passing through the cigarette to the mouth of the user passes the resistance element.” *Id.*, 8:43-57.

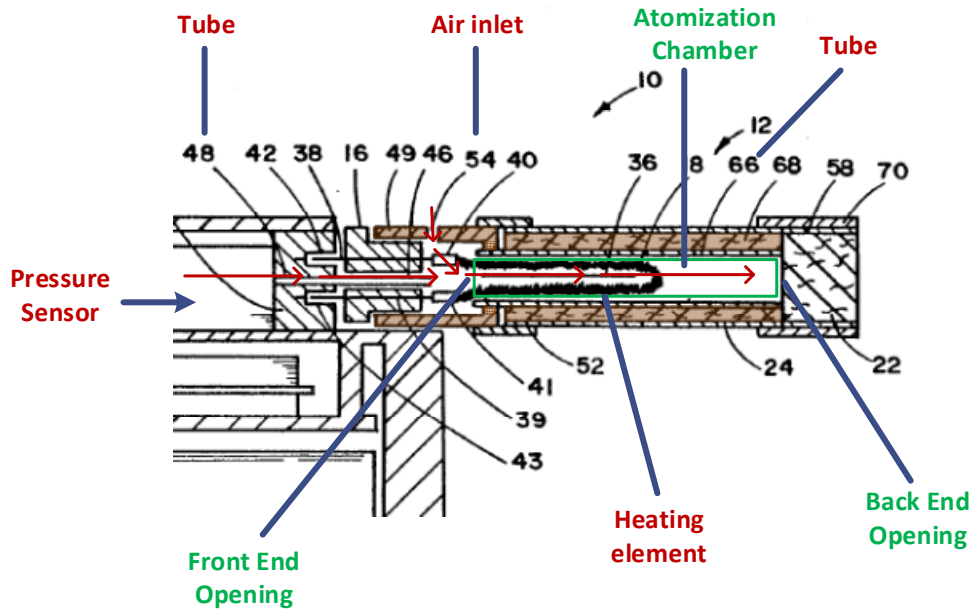
“In use, the user inserts the plug 16 of the cigarette 12 into the receptacle 44 of the controller 14. Such action provides electrical connection of the resistance heating element 18 with the switch 28, the control circuit 30 and the batteries 34A and 34B. Such action also provides for airflow communication between the switch 28 and the inner portion of the cigarette. When the user puffs on the mouthend of the cigarette, ambient air enters the cigarette through air inlet 54. The pressure actuated switch 28 responds to a sensed change in air pressure within the cigarette during draw and permits current flow through the heating element 18. As a result, the heating element experiences an increase in temperature which in turn heats and volatilizes the aerosol forming substance. The volatilized aerosol forming substance mixes with the drawn air and forms an aerosol. The volatilized aerosol forming substance (in aerosol or vapor form) passes through the tobacco roll 20 where it elutes tobacco flavor from the tobacco, and exits the mouthend filter 22 into the mouth of the user. During the puff, the preferred current control circuit (described in detail hereinafter) regulates the flow of current to control the temperature experienced by the heating element and the amount of aerosol forming substance which is volatilized.” *Id.*, 10:34-58.

“The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18.” *Id.*, 11:46-49.

- e. **“the atomizer assembly including an atomization chamber having a front end opening and a back end opening to allow air to flow into the atomization chamber from the front end opening and out from the back end opening”**

As illustrated in the annotated figures and claim chart below, Books discloses these claim elements. First, as discussed in claim 14.[b] above, Brooks discloses an atomizer assembly (“disposable portion 12” or “cigarette 12”) that includes insulative tube 66. The hollow space surrounded by tube 66 is an atomization chamber. Ex. 1002, ¶73.

As illustrated in annotated Fig. 2 below, the atomization chamber inside tube 66 (highlighted in green) includes a front end opening on the left side where air enters the tube, and a back end opening on the right side where air exits the tube into the mouthend filter. Ex. 1003, 11:6-19; Ex. 1002, ¶73. Tube 66 is hollow inside and heating element 18 is positioned within the hollow space inside tube 66. Ex. 1003, 11:6-9, 17:28-35. Brooks discloses that heating element 18 generates aerosol or vapor when electric current runs through it and, accordingly, constitutes an “atomizer.” *Id.*, 10:42-49; Ex. 1002, ¶73. Thus, atomization occurs inside the hollow tube 66, which therefore is an atomization chamber. *Id.*

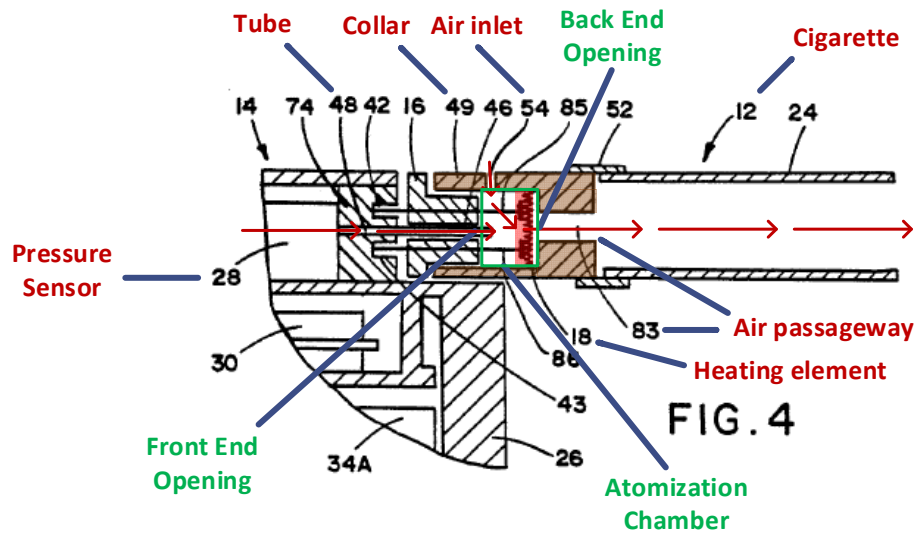


Ex. 1003, Fig. 2 (Annotated)

Annotated Fig. 4 illustrates an alternative embodiment of an atomization chamber highlighted in green (Fig. 4 is a partial sectional view of the smoking article with the mouthend filter 22 (and other parts) omitted). Ex. 1002, ¶73. The atomization chamber is the hollow space surrounded by the collar 49. There is an opening in the front end of the chamber formed by the pressure sensing tube 48 and an opening in the back end of the chamber that leads out of the chamber to passageway 83. Ex. 1002, ¶73. As Brooks explains, tube 48 has one end that is in airflow communication with the internal region of the disposable portion and another end that is in airflow communication with the pressure sensor. Ex. 1003, 9:43-50. When a user inhales, air flows from the pressure sensor through tube 48 into the atomization chamber and generates a change in air pressure that actuates

the flow of current to the heating element. *Id.*, 10:40-45; Ex. 1002, ¶73. The air from the tube 48 will travel through the chamber and out the back end opening to passageway 83. *Id.* Also, air inlet 54 is located at the front corner of the atomization chamber, and thus constitutes an alternative front end opening. *Id.*

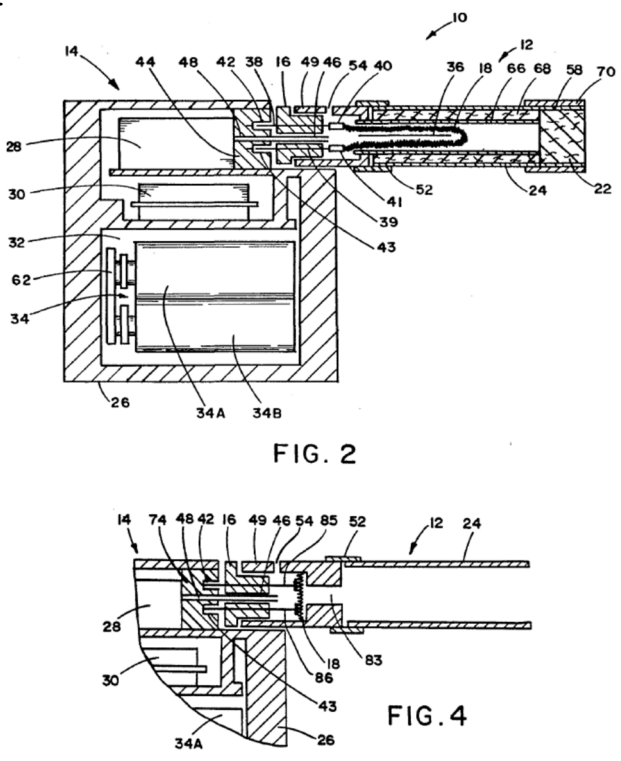
The chamber highlighted in green houses the atomizer (heating element 18), and therefore is an atomization chamber. *Id.*



Ex. 1003, Fig. 4 (Annotated)

As Dr. Sturges explains and as shown in annotated Figures 2 and 4, the red arrows illustrate an airflow path in the cylindrical atomizer assembly housing from both the inlet 54 and pressure sensing tube 48, flowing into the atomization chamber from front end opening, across the heating element 18, and out the atomization chamber from back end opening before exiting mouthend filter 22 (omitted in Fig. 4). Ex. 1002, ¶73.

Therefore, as depicted in annotated Figs. 2 and 4 above, Brooks discloses the atomizer assembly (disposable portion 12 or cigarette 12) including an atomization chamber (highlighted in green in annotated Figs. 2 and 4) having a front end opening and a back end opening to allow air to flow into the atomization chamber from the front end opening and out from the back end opening (red arrows illustrating an airflow path in the cylindrical atomizer assembly housing from both the inlet 54 and pressure sensing tube 48, flowing into the atomization chamber from front end opening, across the heating element 18, and out the atomization chamber from back end opening before exiting mouthend). *Id.*

Claim 14.[e]	Brooks and Whittemore
the atomizer assembly including an atomization chamber having a front end opening and a back end opening to allow air to flow into the atomization chamber from the front end opening and out from the back end opening; and	<u>Brooks:</u>  FIG. 2 FIG. 4

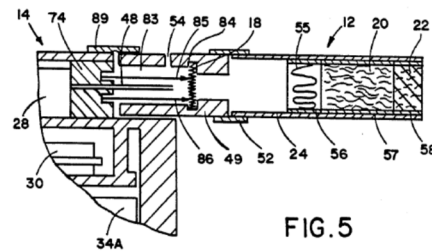


FIG. 5

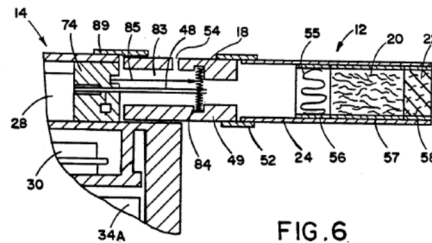


FIG. 6

Ex. 1003, Figs. 2, 4-6.

“When the user puffs on the mouthend of the cigarette, ambient air enters the cigarette through air inlet 54. The pressure actuated switch 28 responds to a sensed change in air pressure within the cigarette during draw and permits current flow through the heating element 18. As a result, the heating element experiences an increase in temperature which in turn heats and volatilizes the aerosol forming substance. The volatilized aerosol forming substance mixes with the drawn air and forms an aerosol. The volatilized aerosol forming substance (in aerosol or vapor form) passes through the tobacco roll 20 where it elutes tobacco flavor from the tobacco, and exits the mouthend filter 22 into the mouth of the user.” *Id.*, 10:40-53.

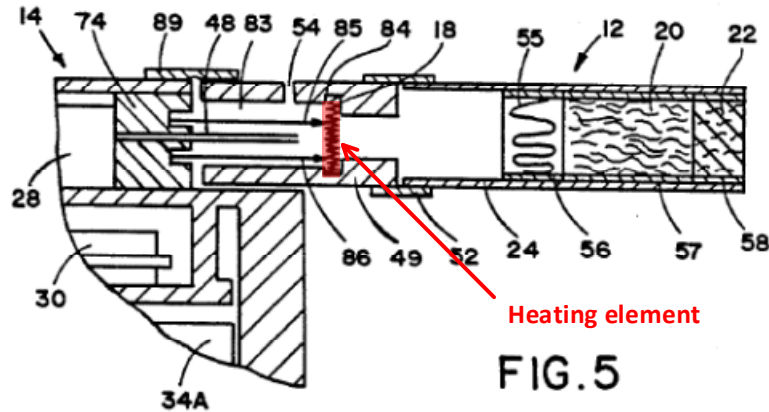
“The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18.” *Id.*, 11:46-49.

“Alternatively, the air inlet can be positioned through the extreme inlet end of the cigarette or elsewhere through the periphery of the cigarette, such that drawn ambient air

	passing through the cigarette to the mouth of the user passes the resistance element.” <i>Id.</i>, 8:53-57. “10. The cigarette of claim 1, wherein the cigarette includes an air passageway at least partially therethrough, and the heating element comprises an air permeable heating element positioned in the passageway.” <i>Id.</i>, 23:7-10 (claim 10). “55. The disposable article of claim 53, wherein the heating element substantially fills the cross sectional area of the air passageway.” <i>Id.</i>, 25:19-21 (claim 55). <i>Also see</i> evidence in claim 14.[b] above. Ex. 1002, ¶73.
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- f. **“a heating wire coil wound on a porous component that is perpendicular to a longitudinal axis of the elongated cylindrical housing, with the heating wire coil in an air flow path between the front end opening and the back end opening of the atomization chamber”**

Brooks in view of Whittemore discloses this feature. Specifically, Brooks discloses that its heating element may comprise a “metal wire,” and depicts embodiments in which the heating element takes the form of a coil.

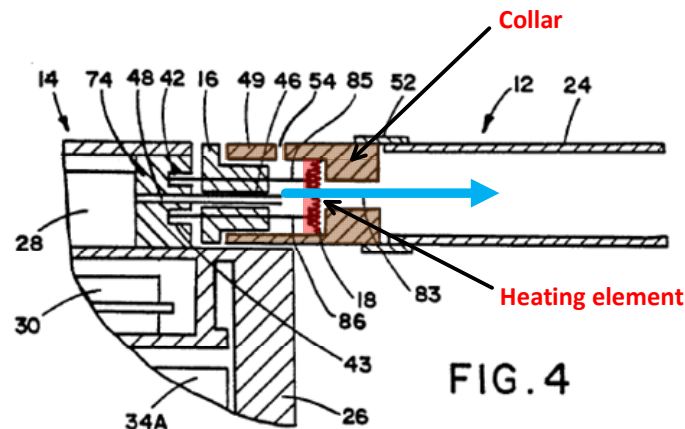


Ex. 1003, Fig. 5 (Annotated)

Indeed, Brooks' device has been described by others as including an "electrical resistance coil." See Ex. 1014, Hale at ¶[0004] (describing the heating element in U.S. Patent No. 4,922,901² (Ex. 1015) as an "electrical resistance coil"). As Dr. Sturges explains and as discussed in Sections VI.D.1 and VI.E.1 above, Brooks further discloses that the heating element may comprise a "resistance heating component" that can be in "intimate contact" with a distinct "porous substrates." Ex. 1003, 7:65-8:3; Ex. 1002, ¶¶74, 44-46. As illustrated in annotated Fig. 5 above, Brooks thus discloses that the atomizer may comprise a heating wire coil (the resistance heating component) and a porous component (the porous substrate), with the heating wire coil wound on a part of the porous component. *Id.*

² Ex. 1015, U.S. Patent No. 4,922,901 discloses substantially the same embodiments and figures as Brooks, names the same inventors, and was filed on the same day as Brooks. Compare Ex. 1003 with Ex. 1015.

Brooks further discloses that the heating element may be perpendicular to the longitudinal axis of the disposable portion. Ex. 1003, 12:19-23. Indeed, this orientation is claimed. *Id.*, claims 11, 36, 54, 135. Brooks illustrates one embodiment of a perpendicular heating element. As illustrated in annotated Fig. 4 below, the part of the porous component (the porous substrate) on which the heating wire coil is wound is perpendicular to a longitudinal axis (shown by the blue arrow) of the elongated cylindrical housing. Ex. 1002, ¶¶74, 50.



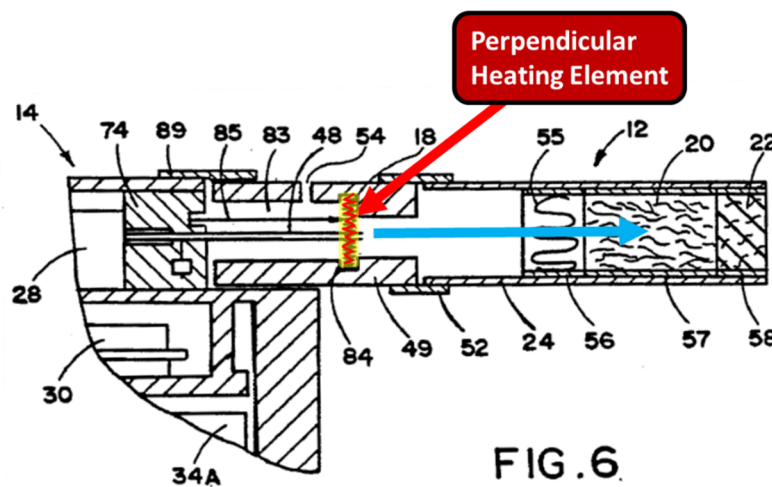
Ex. 1003, Fig. 4 (Annotated)

A PHOSITA would have understood that the perpendicular heating element could be applied to any of the embodiments, including Fig. 2. Ex. 1002, ¶74. Indeed, the claims recite a perpendicular heating element independent of any particular type of disposable portion structure. Ex. 1003, claims 11, 36, 54, 135.

To the extent that Brooks is deemed not to disclose this limitation, it would have been obvious for the reasons set forth in Sections VI.D.1 and VI.E.1 above for a PHOSITA to modify Brooks' resistance wire to be wound around the porous

substrate, as taught by Whittemore. Ex. 1002, ¶¶57-67, 74. When Brooks is modified in this manner, the part of the porous substrate on which the resistance heating component is wound is perpendicular to a longitudinal axis of the elongated cylindrical housing. Ex. 1002, ¶74.

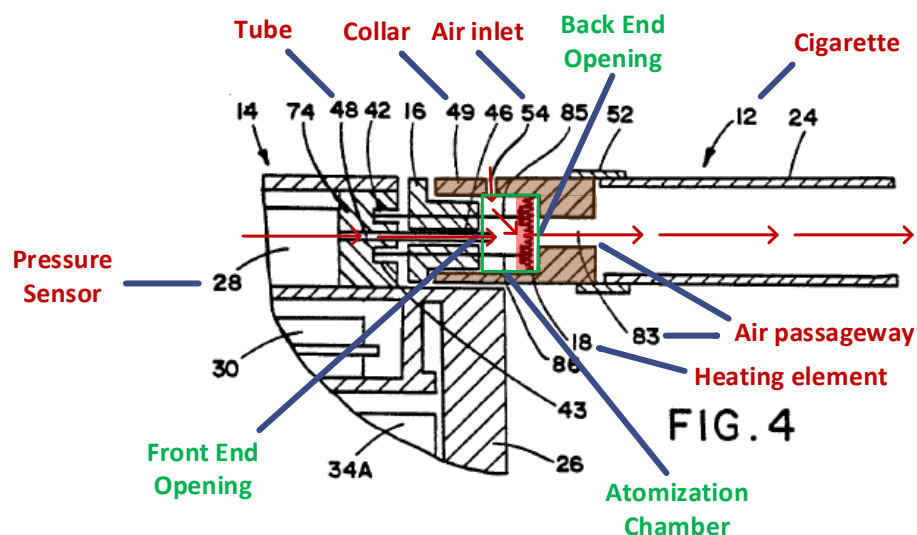
As shown below, the atomizer assembly housing has a longitudinal axis as illustrated by the blue arrow (*id.*):



Ex. 1003, Fig. 6 (Annotated)

The modified heating element 18 comprises a heater wire (shown in red) wound on a porous substrate (shown in yellow). Because the porous substrate is vertically oriented in the housing, it is perpendicular to the longitudinal axis. Ex. 1002, ¶74. As mentioned, this perpendicular orientation is expressly claimed in Brooks. Ex. 1003, *see* claims 11, 36, 54, 135. Moreover, as discussed in claim 14.[e] above, Brooks discloses the atomizer assembly including an atomization chamber having a front end opening and a back end opening. Ex. 1002, ¶73.

Therefore, as illustrated in annotated Fig. 4 below, Brooks discloses a heating wire coil (the heating component of heating element 18 in wire form as taught by Whittemore's filament 3) wound on a porous component (Brooks' porous substrate) that is perpendicular to a longitudinal axis of the elongated cylindrical housing (the horizontal axis of the disposable portion housing created by Brooks' tube 68 and collar 49), with the heating wire coil in an air flow path (red arrows) between the front end opening and the back end opening of the atomization chamber. Ex. 1002, ¶74.



Ex. 1003, Fig. 4 (Annotated)

Claim 14.[f]	Brooks and Whittemore
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a heating wire coil wound on a porous component that is perpendicular to a longitudinal axis of the elongated cylindrical housing, with the heating wire coil in an air flow path between the front end opening and the back end opening of the atomization chamber.

Brooks:

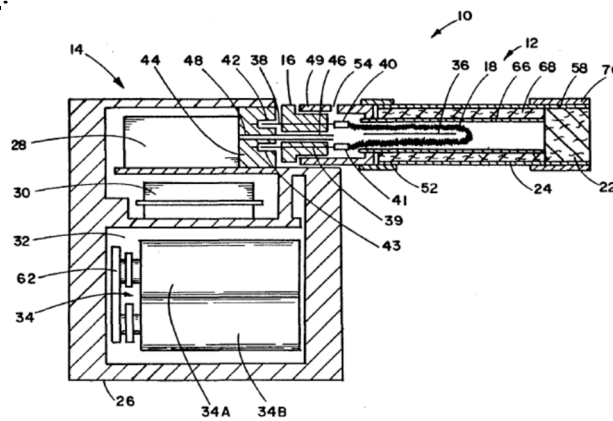


FIG. 2

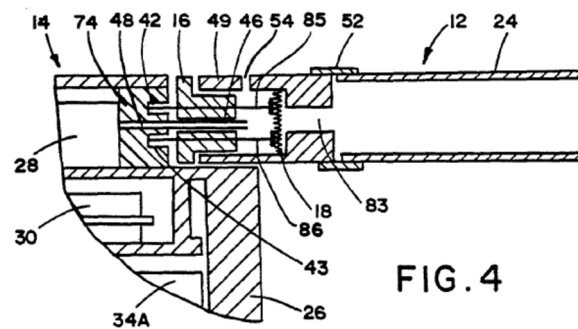


FIG. 4

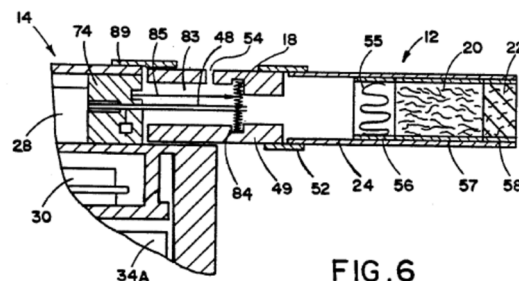


FIG. 6

Ex. 1003, Figs. 2, 4, 6.

“Other suitable heating elements 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 resistance heating components; and the like.” *Id.*, 7:65-8:3.

“Preferably, the heating element 18 is impregnated with or otherwise carries the aerosol forming substance in

order that the aerosol forming substance is in a heat exchange relationship with the electrical heating element. The aerosol forming substance can be, for example, a polyhydric alcohol, such as glycerin, propylene glycol, or a mixture thereof; water; a tobacco material such as a tobacco aroma oil, a tobacco essence, a spray dried tobacco extract, a freeze dried tobacco extract, tobacco dust, or the like, in order to provide tobacco flavor; or a combination thereof. Other suitable aerosol forming substances are well known in the art. See, for example, U.S. Pat. Nos. 4,714,092 and 4,756,318. While the loading of the aerosol forming substance can vary from substance to substance and from heating element to heating element, the amount of liquid aerosol forming substance used typically will be greater than about 15 mg and preferably ranges from about 25 mg to about 50 mg.” *Id.*, 8:4-22.

“As used herein, and only for the purposes of this application, "aerosol" is defined to include vapors, gases, particles, and the like, both visible and invisible, and especially those components perceived by the user to be "smoke-like," generated by action of heat from the resistance heating element upon aerosol forming substances and/or tobacco flavor substances located on the resistance element or elsewhere in the article.” *Id.*, 6:45-52.

“Over the years, there have been proposed numerous smoking products, flavor generators and medicinal inhalers which utilize electrical energy to vaporize or heat a volatile material, or attempt to provide the sensations of cigarette or pipe smoking without burning tobacco.

U.S. Pat. No. 2,057,353 to Whittemore, Jr. proposed a vaporizing unit. In particular, a wick reportedly carried liquid medicament by capillary action to a point where the liquid was vaporized by an electrical resistance heating element.

U.S. Pat. No. 2,104,266 to McCormick proposed an article having a pipe bowl or cigarette holder which included a resistance coil (i) wound on an insulating and heat resisting material, and (ii) contained in an insulated chamber. Prior to use of the article, the pipe bowl was filled with tobacco or the holder was fit with a cigarette. Current then was passed through the resistance coil. Heat produced by the resistance coil was transmitted to the tobacco in the bowl or holder, resulting in the volatilization of various ingredients from the tobacco. A thermostatic switch was employed to maintain a predetermined temperature range to which the tobacco was heated.

U.S. Pat. No. 3,200,819 to Gilbert proposed a smokeless, non-tobacco cigarette having a flavor cartridge, such as a porous substrate impregnated with mentholated water. The article included a battery for powering a tube or bulb which was illuminated before assembly. The bulb was placed in a tubular liner, which was in turn located within a tube of plastic having the size, color and form of a cigarette. In use, the illuminated bulb reportedly heated the flavored air drawn through passages formed between the bulb and the tubular liner. As such, warm, moist, flavored air was delivered to the user.” *Id.*, 1:51-2:18.

“1. A cigarette for use with a source of electrical power comprising:

- (a) an electrical resistance heating element having a surface area greater than $1 \text{ m}^2/\text{g}$;
- (b) aerosol forming substance carried by the heating element prior to use; and
- (c) tobacco.” *Id.*, claim 1.

“26. A disposable portion of a smoking article for use with a source of electrical power comprising:

- (a) an electrical resistance heating element having a surface area greater than $1 \text{ m}^2/\text{g}$; and
- (b) aerosol forming substance carried by the heating element prior to use.” *Id.*, claim 26.

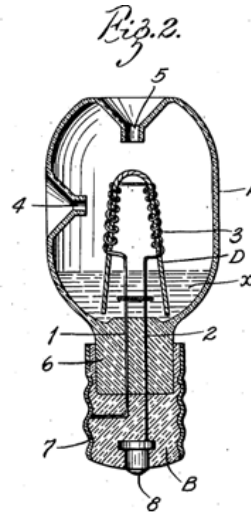
	“53. A disposable portion of a smoking article for use with a source of electrical power comprising: (a) an air passageway at least partially through the disposable portion; (b) an air permeable electrical heating element located in the air passageway; and (c) an aerosol forming substance.” <i>Id.</i>, claim 53. “57. The disposable article of claim 53, 54, 55 or 56, wherein the aerosol forming substance is carried by the heating element prior to use.” <i>Id.</i>, claim 57. “75. A smoking article for use with a source of electrical power comprising: (a) an electrical resistance heating element having a surface area greater than 1 m²g; (b) aerosol forming substance carried by the heating element prior to use; and (c) puff actuated control means for permitting current flow through the heating element during draw by the user.” <i>Id.</i>, claim 75. “104. A smoking article for use with a source of electrical power comprising: (a) an electrical resistance heating element; (b) aerosol forming substance; (c) switch means for actuating and deactuating current flow through the heating element; and (d) time based means for (i) permitting unrestricted current flow through the heating element for an initial predetermined time period upon current actuation, and (ii) for subsequently regulating current flow until current deactuation. 105. The smoking article of claim 104, wherein the aerosol forming substance is carried by the heating element prior to use.” <i>Id.</i>, claims 104-105.
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	“131. A smoking delivery article for use with a source of electrical power comprising: ((a) an air passageway at least partially through the article; ((b) an air permeable electrical resistance heating element located in the air passageway; ((c) an aerosol forming substance; ((d) puff actuated control means for permitting current flow through the heating element during draw by the user; and ((e) a mouth end. 132. The smoking article of claim 131, wherein the aerosol forming substance is carried by the heating element.” <i>Id.</i>, claims 131-132. “11. The cigarette of claim 10, wherein the heating element is positioned substantially perpendicularly to the longitudinal axis of the air passageway.” <i>Id.</i>, claim 11. “36. The disposable article of claim 35, wherein the heating element is positioned substantially perpendicularly to the longitudinal axis of the air passageway.” <i>Id.</i>, claim 36. “54. The disposable article of claim 53, wherein the heating element is positioned substantially perpendicularly to the longitudinal axis of the air passageway.” <i>Id.</i>, claim 54. “134. The smoking article of claim 133, wherein the aerosol forming substance is carried by the heating element. 135. The smoking article of claim 131, 132, 133 or 134, wherein the heating element is positioned substantially perpendicularly to the longitudinal axis of the air
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passageway.” *Id.*, claims 134-135.

Also see evidence in claim 14.[e] above.

Whittemore



Ex. 1004, Fig. 2.

“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.*, 1:19-28.

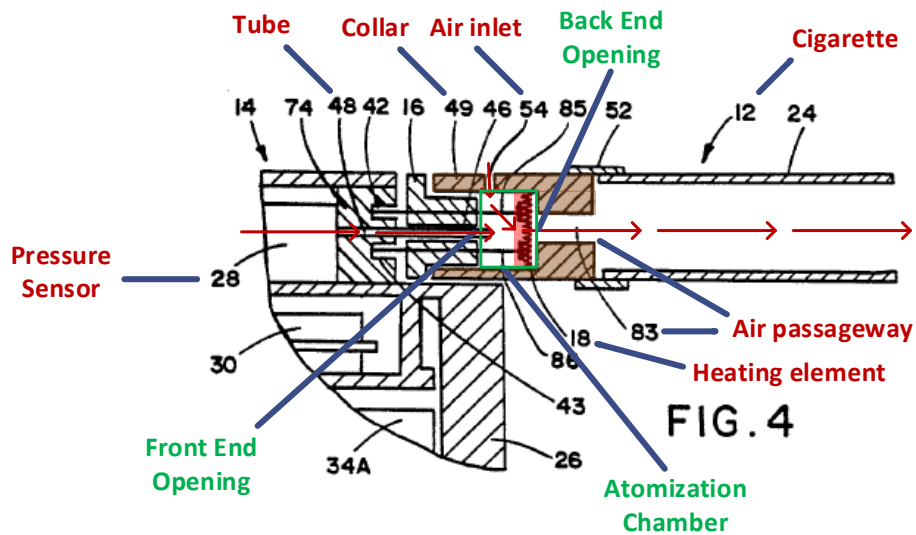
“In order that the unit will function properly, even though the heating element or filament 3 is spaced a considerable distance above or away from the medicament *x*, the unit is equipped with a wick D made of any suitable material and combined with the heating element or filament 3 in such a way that 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.” <i>Id.</i>, 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. <i>Id.</i>, Claim 9. Ex. 1002, ¶74.
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3. Claim 15 Is Obvious

a. **“with the atomization chamber having a uniform diameter along the length of the atomization chamber”**

As illustrated in the annotated figures and claim chart below, Brooks discloses this feature. As discussed in claim 14.[e] above, Brooks discloses an atomization chamber as depicted by the green line in annotated Fig. 4 below. Brooks teaches that the collar 49 has “the form of a thermoplastic tube,” and may be formed “from a Delrin cylinder.” Ex. 1003, 8:43-50, 11:42-53, 17:21-22, 22:1-6, 21-32, Fig. 4. As illustrated in annotated Fig. 4 below, the atomization chamber has a uniform diameter along the length of the atomization chamber (cylindrical collar 49). *Id.*; Ex. 1002, ¶75.



Ex. 1003, Fig. 4 (Annotated)

Similarly, tube 66, which defines the atomization chamber in the Fig. 2 embodiment, has a uniform diameter along its length. Ex. 1002, ¶75. For example, Brooks discloses that in one embodiment, tube 66 is 39 mm long and has a 4 mm outer diameter. Ex. 1003, 17:28-31. Indeed, tube 66 is shown as having a consistent diameter in Fig. 2 and Fig. 3 as shown below. Ex. 1002, ¶75.

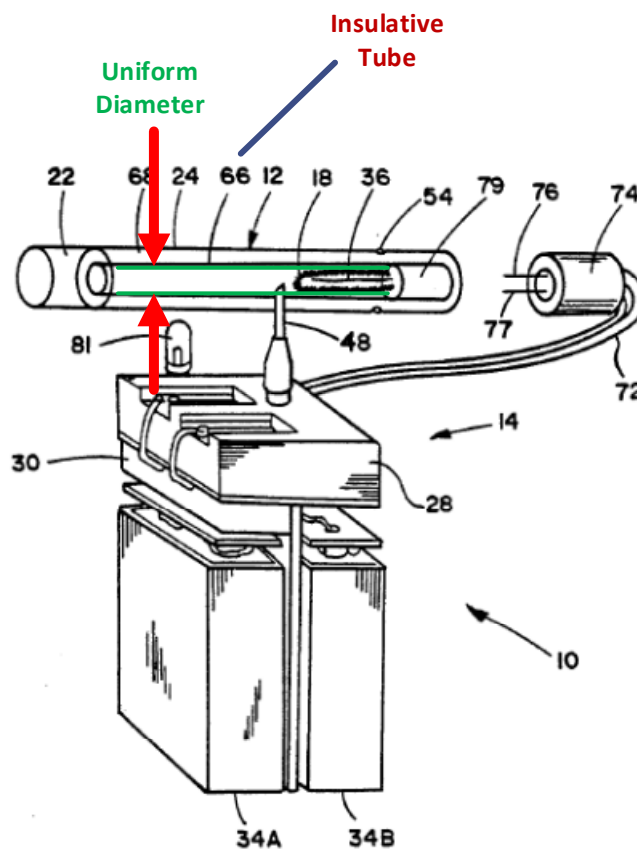
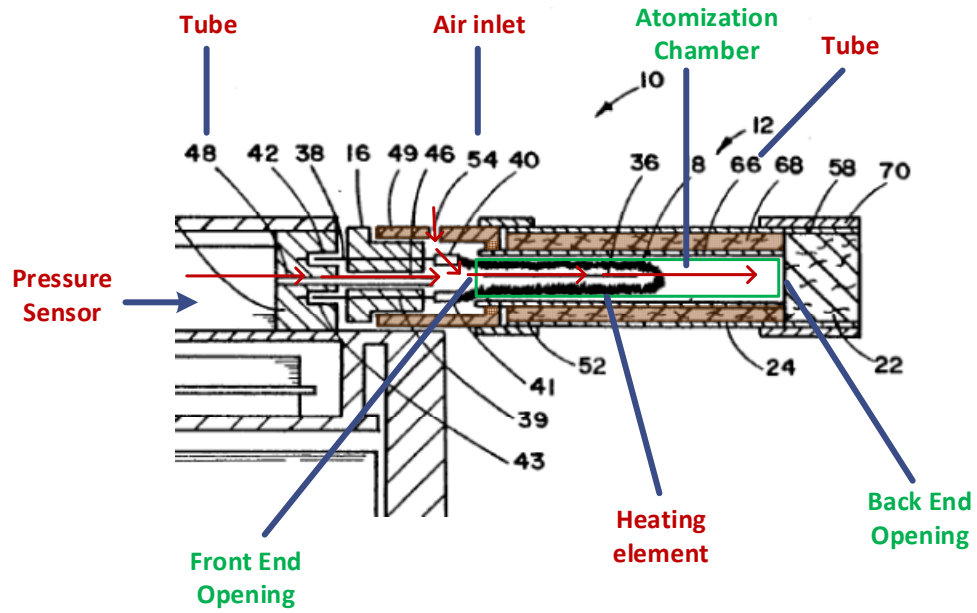
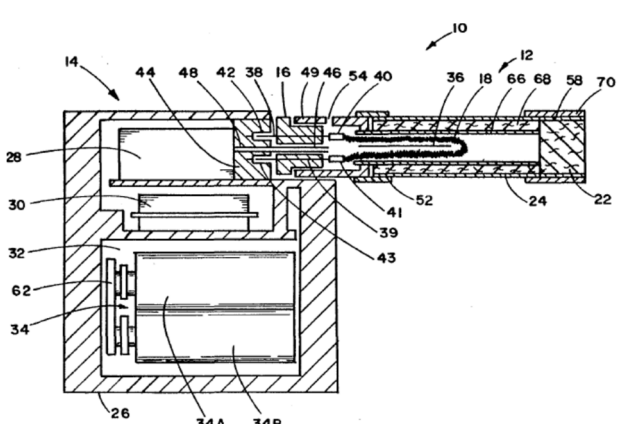
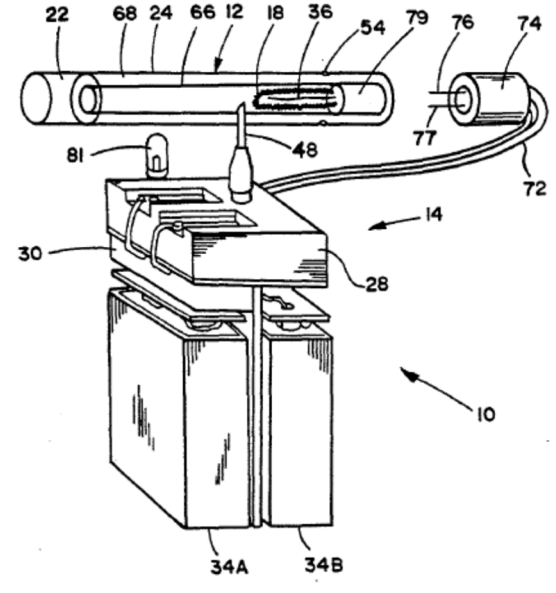
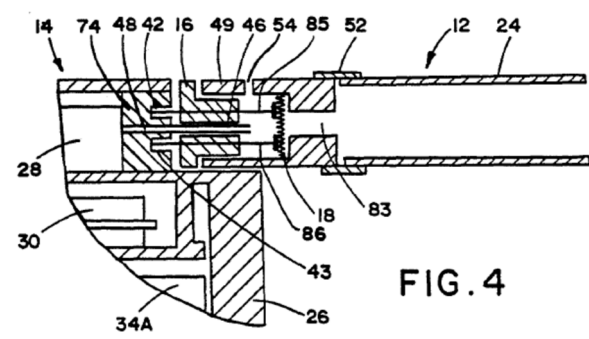


FIG. 3

Ex. 1003, Figs. 2-3 (Annotated)

Claim 15	Brooks and Whittemore
The device of claim 14 with the atomization chamber having a uniform diameter along the length of the atomization chamber.	<u>Brooks:</u>  FIG. 2  FIG. 3  FIG. 4

Ex. 1003, Figs. 2-4.

“A portion of the length of the electrical connection plug 16 preferably is circumscribed by a collar 49 having the form of a thermoplastic tube, which preferably is friction fit around a portion of the length of the plug. The collar 49 in turn is secured to the remaining portion of the cigarette via overwrap 24 using tipping paper 52 or other appropriate means such as adhesive, a friction fit, or the like.” *Id.*, 8:43-50.

“Referring to FIG. 4, the illustrated embodiment is generally similar to the embodiment of FIG. 2, except that the heating element 18 is a circular disc or pad, preferably formed from an American Kynol carbon felt. The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18. Electrical connection pins 85, 86 from plug 74 contact the heating element and help hold it in place against collar 49. In this embodiment, the collar 49 can be a thermoplastic material, a thermally stable plastic material, a ceramic, or the like.

The embodiment illustrated in FIG. 5 is generally similar to the embodiment of FIG. 1. In this embodiment, the heating element 18 is a circular disc or pad of carbon felt disposed across an air passageway 83 extending through tubular collar 49. The pad is held in place by shoulder 84 on the collar 49. In addition, the cigarette does not have an electrical connect plug. Instead, electrical connection pins 85, 86 for the heating element extend from a plug 74 located on the controller 14. The cigarette 12 is held in place relative to the controller 14 via a clip 89 extending from the controller, or other suitable connection means.” *Id.*, 11:42-65.

“A 9 mm long Delrin tube 49 was fabricated from an 8

mm diameter cylinder. One section, 6 mm long, had a 7 mm inner diameter (I.D.), and a second section, 3 mm long, had a 4 mm I.D. A single air inlet hole 54 was made about 4 mm from the 4 mm I.D. end of the tube using a No. 64 drill bit. The 7 mm I.D. end of the tube 49 was then friction fit over the 7 mm end of plug 16.” *Id.*, 17:21-27.

“An insulative collar 49 was formed from a Delrin cylinder having a length of 9 mm and a diameter of 8 mm to a tubular form having a 3 mm segment of 4.5 mm I.D. and a 6 mm segment of 6 mm I.D. A single air inlet 54 was made about 4 mm from the 6 mm I.D. end of the collar.

...

The resistance element 18 was inserted into the 6 mm I.D. end of the collar 49 to abut against the 4.5 mm I.D. portion of the collar.

The 6 mm I.D. end of the collar 48 then was fit over the narrow end of plug 16 such that the flattened silver solder ends of pins 38 and 39 each contacted the resistance element 18.

A resilient paperboard tube having an 8 mm O.D. and a length of 75 mm was abutted against the end of collar 49 opposite plug 16, and the two tubes were held in place using adhesive tape 52.” *Id.*, 22:1-6, 21-32.

“A 39 mm long, 4 mm outer diameter Kapton polyimide tube 66 was slipped over the resistance element 18 and inserted about 4 mm into the 4 mm I.D. end of the 30 Delrin tube 49.” *Id.*, 17:28-31.

Also see evidence in claim 14.[e] above.

Ex. 1002, ¶75.

4. Claim 16 Is Obvious

- a. **“with the heating wire coil having an outer diameter less than an inner diameter of the atomizing chamber”**

As illustrated in the claim chart below, Brooks discloses this feature. As discussed in claim 14.[e] above, Brooks discloses an atomization chamber or atomizing chamber³ as depicted by the green line in annotated Figs. 2 and 4. As discussed above, the atomization chamber in Fig. 2 is the hollow space surrounded by tube 66 and the atomization chamber in Fig. 4 is the area surrounded by the collar 49. In both embodiments, the heating wire is located inside the atomizing chamber. Ex. 1003, 11:6-9, 42-45; Ex. 1002, ¶76. This means that the wire must have an outer diameter that is less than the inner diameter of the atomization chamber. Indeed, if it did not, then the atomizers would not fit inside them. Ex. 1002, ¶76. Notably, in every figure in Brooks, the heating element fits inside the atomization chamber. *Id.*

Claim 16	Brooks and Whittemore
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³ Independent claim 14 recites “*an* atomization chamber” while dependent claim 16 recites “*the* atomizing chamber.” For the purposes of this petition only, Petitioner assumes that the “atomization chamber” and “atomizing chamber” recited in claims 14 and 16, respectively, refer to the same component.

The device of claim 14 with the heating wire coil having an outer diameter less than an inner diameter of the atomizing chamber.

Brooks:

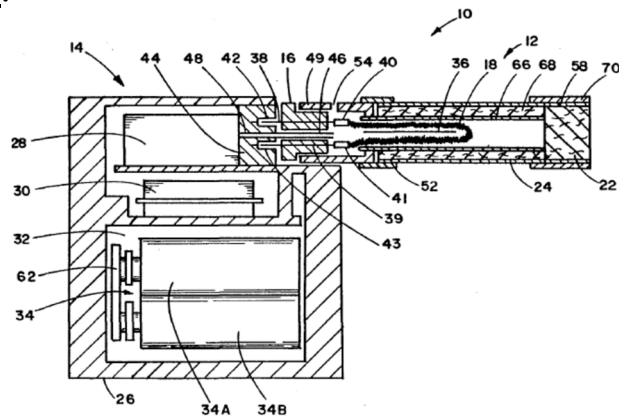


FIG. 2

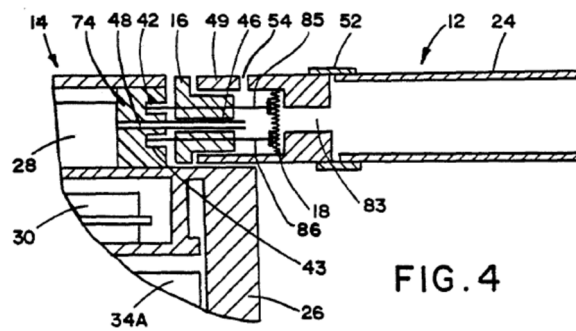


FIG. 4

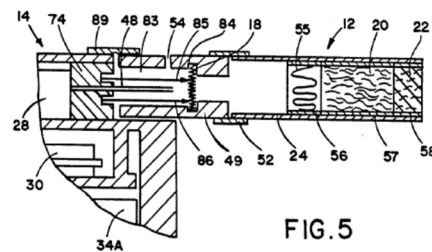


FIG. 5

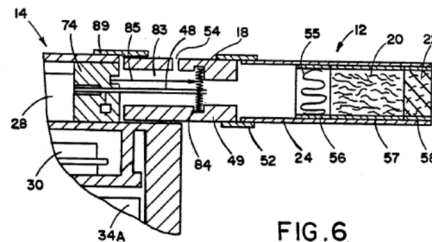


FIG. 6

Ex. 1003, Figs. 2, 4-6.

“The embodiment illustrated in FIG. 2 is generally similar to the embodiment of FIG. 1, except that the

	heating element 18 is positioned within a heat resistant, insulative tube 66.” <i>Id.</i>, 11:6-9. “Referring to FIG. 4, the illustrated embodiment is generally similar to the embodiment of FIG. 2, except that the heating element 18 is a circular disc or pad, preferably formed from an American Kynol carbon felt. The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18. Electrical connection pins 85, 86 from plug 74 contact the heating element and help hold it in place against collar 49. In this embodiment, the collar 49 can be a thermoplastic material, a thermally stable plastic material, a ceramic, or the like. The embodiment illustrated in FIG. 5 is generally similar to the embodiment of FIG. 1. In this embodiment, the heating element 18 is a circular disc or pad of carbon felt disposed across an air passageway 83 extending through tubular collar 49. The pad is held in place by shoulder 84 on the collar 49. In addition, the cigarette does not have an electrical connect plug. Instead, electrical connection pins 85, 86 for the heating element extend from a plug 74 located on the controller 14. The cigarette 12 is held in place relative to the controller 14 via a clip 89 extending from the controller, or other suitable connection means. The embodiment illustrated in FIG. 6 is generally similar to the embodiment of FIG. 5, except that the pressure sensing tube 48 also is used as one of the connecting pins (e.g., in lieu of connection pin 86 of FIG. 5).” <i>Id.</i>, 11:42-12:2. <i>Also see</i> evidence in claim 14.[e, f] above. Ex. 1002, ¶76.
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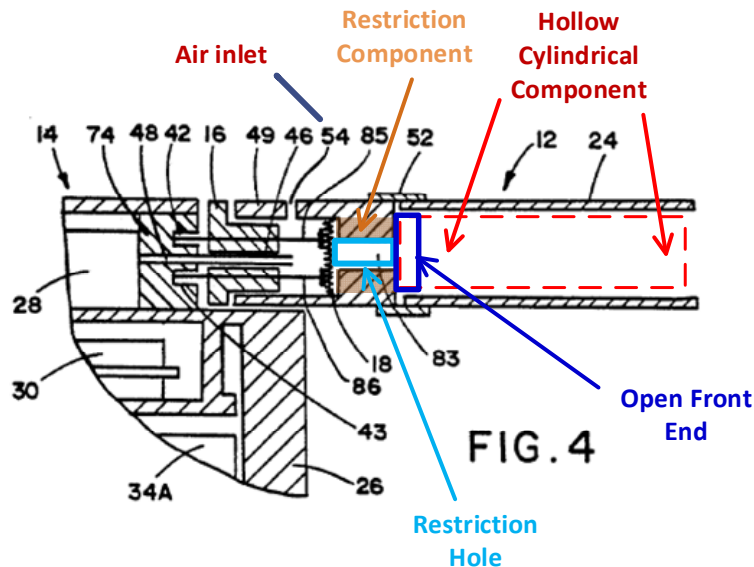
5. Claim 18 Is Obvious

- a. **“further including a restriction component between the hollow cylindrical component and the at least one air inlet, with the restriction component having a restriction hole smaller than the open front end of the hollow cylindrical component”**

In claim 18, the terms “*the* hollow cylindrical component,” “*the* at least one air inlet” and “*the* open front end of the hollow cylindrical component” lack antecedent basis as none of them are included in claim 14 from which claim 18 depends. *See* Ex. 1001, claims 14, 18. However, for purposes of this petition only, Petitioner assumes that claim 18 requires “*a* hollow cylindrical component” and “*an* at least one air inlet” and “*an* open front end of the hollow cylindrical component” when these terms are recited for the first time in claim 18.

With reference to annotated Fig. 4 below, Brooks discloses each of these limitations. Brooks discloses a collar 49 circumscribing electrical connection plug 16 at one end and including “one or more peripheral air inlet openings 54.” Ex. 1003, 8:43-57, Figs. 2, 4. Air inlet 54 thus corresponds to the “at least one air inlet” in claim 18. Brooks discloses a hollow component identified by overwrap tube 24 in Fig. 4. As can be seen, the tube 24 has a front end opening (shown in blue) at its leftmost edge that is the same size as the inner diameter of overwrap tube 24. Ex. 1002, ¶77. Thus, a PHOSITA would have recognized and understood

that Brooks Fig. 4 discloses “a hollow cylindrical component,” “an at least one air inlet” and “an open front end of the hollow cylindrical component.” *Id.*



Ex. 1003, Fig. 4 (Annotated)

Brooks Fig. 4 also discloses a restriction component having a restriction hole smaller than the front end opening of the hollow cylindrical component. Ex. 1002, ¶76. The restriction component is a necked portion (highlighted in light brown color in annotated Fig. 4 above) which narrows the space immediately after the heating element 18 and defines an air passageway 83. Ex. 1003, 11:42-53, 22:21-23, Fig. 4; Ex. 1002, ¶76. This restriction component (necked portion) is located between the air inlet 58 and the hollow cylindrical component 24. *Id.* As discussed in claim 15 above, the collar 49 has a cylindrical shape. Drawn air enters the cigarette 12 through air inlet 54 and tube 48, passes through heating element 18, and then into air passageway 83 defined by the necked, narrow portion of

cylindrical collar 49. *Id.* As Dr. Sturges explains, the necked, narrow portion of cylindrical collar 49 constitutes a restriction component (highlighted in light brown color in annotated Fig. 4 above) because it restricts the air flow from the atomization chamber to the hollow tube 24. Ex. 1002, ¶76. The restriction component includes a restriction hole (the front end opening, back end opening and the internal hollow space between them formed by the necked portion highlighted in light blue in annotated Fig. 4 above). *Id.* As can readily be seen, the front and back end openings of the restriction hole, and passageway 83 all have smaller diameters than the front end opening of the hollow component 26. *Id.* Similarly, the front and back end openings of the restriction hole, and passageway 83 all have smaller diameters than the atomization chamber before the restriction component. *Id.*

Thus, as illustrated in annotated Fig. 4 above, Brooks discloses a restriction component (necked, narrow portion of cylindrical collar 49 highlighted in light brown color) that located between a hollow cylindrical component (tube 24 highlighted in red) and the at least one air inlet (air inlet openings 54), and the

restriction hole (highlighted in light blue) is smaller than the open front end (highlighted in dark blue) of the hollow cylindrical component.⁴ *Id.*

Claim 18	Brooks and Whittemore
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⁴ While Fig. 4 does not include the tobacco charge 20, plug spacer 55 and mouthend filter 20 overwrapped with paper plug wrap 58 at the exit end of hollow cylindrical component 24, Brooks shows that they may be included as shown in Figs. 5-6. Ex. 1003, 8:58-9:25, Figs. 5-6. Nonetheless, even if a tobacco charge is placed in tube 24, it is still hollow and has an open front end to the restriction component.

The device of claim 14 further including a restriction component between the hollow cylindrical component and the at least one air inlet, with the restriction component having a restriction hole smaller than the open front end of the hollow cylindrical component.

Brooks:

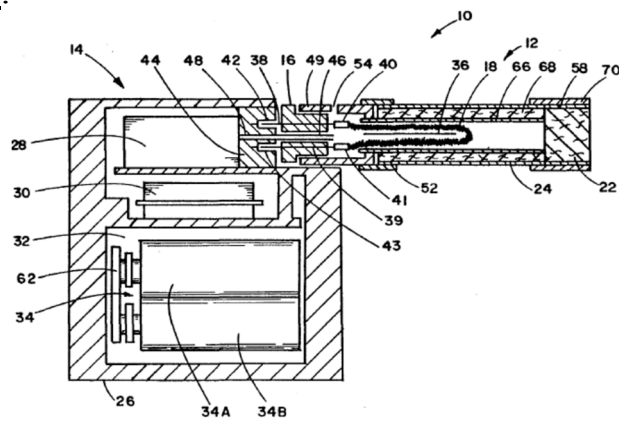


FIG. 2

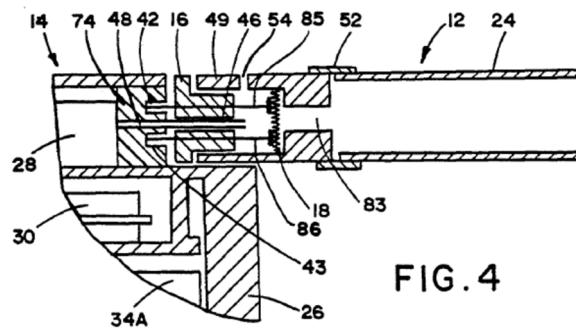


FIG. 4

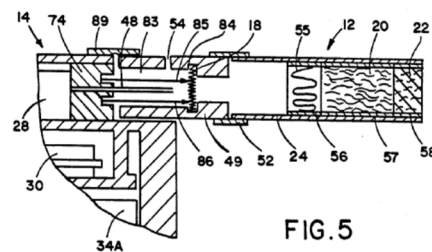


FIG. 5

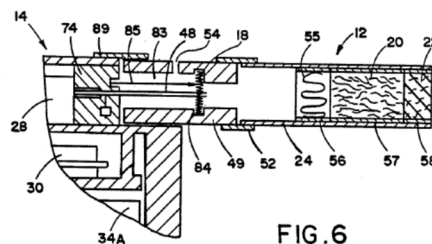


FIG. 6

Ex. 1003, Figs. 2, 4-6.

“A portion of the length of the electrical connection plug 16 preferably is circumscribed by a collar 49 having the form of a thermoplastic tube, which preferably is friction

	fit around a portion of the length of the plug. The collar 49 in turn is secured to the remaining portion of the cigarette via overwrap 24 using tipping paper 52 or other appropriate means such as adhesive, a friction fit, or the like. Preferably, the collar 49 includes one or more peripheral air inlet openings 54 which provide a flow of ambient air through the cigarette during draw. Alternatively, the air inlet can be positioned through the extreme inlet end of the cigarette or elsewhere through the periphery of the cigarette, such that drawn ambient air passing through the cigarette to the mouth of the user passes the resistance element. The cigarette can include a plug spacer member 55 positioned between the heating element 18 and the roll or charge of tobacco 20. The plug spacer member 55 conveniently permits passage of aerosol therethrough, while preventing tobacco filler from contacting the heating element. The plug spacer member can be a cylindrical plug of pleated tobacco paper (eg., pleated tobacco paper of the type commercially available from Kimberly-Clark Corp. as P144-185-GAPF Reconstituted Tobacco Sheet). Preferably, the spacer member is overwrapped with a paper overwrap 56.” <i>Id.</i>, 8:43-68. “Referring to FIG. 4, the illustrated embodiment is generally similar to the embodiment of FIG. 2, except that the heating element 18 is a circular disc or pad, preferably formed from an American Kynol carbon felt. The pad is permeable to airflow, and is disposed across an air passageway 83 in tubular collar 49 so that drawn air entering the cigarette 12 through opening 54 passes through the heating element 18. Electrical connection pins 85, 86 from plug 74 contact the heating element and help hold it in place against collar 49. In this embodiment, the collar 49 can be a thermoplastic material, a thermally stable plastic material, a ceramic, or the like.” <i>Id.</i>, 11:42-53. “The resistance element 18 was inserted into the 6 mm
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	I.D. end of the collar 49 to abut against the 4.5 mm I.D. portion of the collar.” <i>Id.</i>, 22:21-23. <i>Also see</i> evidence in claim 15 above. Ex. 1002, ¶76.
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VII. CONCLUSION

Petitioner has demonstrated a reasonable likelihood that claims 14-16 and 18 of the 632 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: March 1, 2018

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 13,879 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: March 1, 2018

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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 March 1, 2018, a complete and entire copy of this Petition for *Inter Partes* Review, and all supporting exhibits, were served EXPRESS MAIL® to the Patent Owner by serving the correspondent of record, as indicated below:

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