

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NJOY, LLC, NJOY HOLDINGS, INC.,
Petitioners,

v.

JUUL LABS, INC.,
Patent Owner

Patent No. 10,709,173

**EXPERT DECLARATION OF WILLIAM SINGHOSE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW**

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I. INTRODUCTION

1. I, William Singhose, have been retained as an independent expert by NJOY, LLC, NJOY Holdings, Inc., (collectively, “NJOY”) in connection with an *inter partes* review of U.S. Patent No. 10,709,173 (the “’173 patent”). I have prepared this declaration in connection with NJOY’s Petition for *Inter Partes* Review.
2. Specifically, this document contains my opinions about the technology described in claims 1-4, 6-7, 15-16, 18-25, 28, and 30 of the ’173 patent (the “Challenged Claims”) and the grounds against these claims that have been asserted by NJOY. I was not asked to provide any opinions that are not expressed herein.

II. SUMMARY OF OPINIONS

3. This declaration considers the Challenged Claims of the ’173 patent. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for these opinions and conclusions. I believe the statements contained in this declaration to be true and correct to the best of my knowledge.
4. Based on my experience, knowledge of the art at the time of the applicable priority date, analysis of Petitioners’ asserted grounds and references, and the understanding a person of ordinary skill in the art would have had of the

claims in light of the specification as of the applicable priority date, it is my opinion that the Challenged Claims of the '173 patent would have been obvious over the asserted grounds.

5. I am being compensated for my time at the rate of \$800 per hour. This compensation is in no way contingent upon the nature of my findings, the presentation of my findings in testimony, or the outcome of this proceeding.

III. BACKGROUND AND QUALIFICATIONS

6. I believe that I am well qualified to serve as a technical expert in this matter based upon my education and work experience.
7. A copy of my curriculum vitae is attached as Ex. 1004 to the Petition.
8. I am a Professor of Mechanical Engineering at the Georgia Institute of Technology ("Georgia Tech"). I received a B.S. in Mechanical Engineering from the Massachusetts Institute of Technology ("MIT") in 1990. I then received an M.S. in Mechanical Engineering from Stanford University in 1992. Finally, I received a Ph.D. in Mechanical Engineering from MIT in 1997. After receiving my Ph.D., I was a postdoctoral researcher at MIT before becoming a professor at Georgia Tech in 1998.
9. Based on my work experience, described in my curriculum vitae and in more detail below, I am knowledgeable about the subject matter of the '173 patent, and the related prior art. Specifically, my qualifications as an expert

in the general field of product design, and the more specific areas of consumer electronics, electronic nicotine delivery systems, and replaceable cartridges, stem from my prior industry work experience, as well as my experience as a Professor in the Woodruff School of Mechanical Engineering at Georgia Tech performing research, teaching, and consulting.

10. In my current position at Georgia Tech, I mainly teach courses in mechanical design, system dynamics, and controls. I also lead teams of professors, post-docs, graduate students, and undergraduate students that conduct research in mechanical design, dynamics, controls, automation, robotics, and product analysis. During my more than 25 years at Georgia Tech, I have also had visiting appointments at MIT, Stanford, the Polytechnic University of Madrid, and the Tokyo Institute of Technology.
11. At various times in my career I have also worked as a full-time mechanical engineer for several companies, including Walt Disney World, Apple Computers, Inc., Convoke, Inc., and Google. For Walt Disney World, I designed and developed a number of structures for the park's rides, including, but not limited to, support stands for Space Mountain control consoles and structural supports for Star Jets. For Apple Computers, I designed and developed computer monitors with built-in speakers and microphones. For Convoke, Inc., I developed control systems for

automation machinery and laser interferometer sensors. For Google, I designed several consumer electronic products that were either hand-held or in a “wearable” form factor. One of the projects was a hand-held device that utilized replaceable supply cartridges.

12. In addition to my engineering experience as a professor and an engineer, I have commercialized technology developed in my research group at Georgia Tech by founding two companies: CAMotion Cranes and InVekTek. CAMotion Cranes designed and installed crane control systems that decrease payload swing, automatically avoid obstacles, and improve crane safety. These improvements are achieved through sensor systems and control methods that my research group developed, patented, and deployed. CAMotion Cranes was acquired by PAR Systems in 2013. InVekTek develops and commercializes control systems for large robotic and industrial material-handling systems. InVekTek products include control systems that read sensor signals and accurately control machine actuators.
13. Finally, I also have previous litigation experience in the area of the '173 patent. I served as a technical expert in ITC Investigation No. 337-TA-1139, Certain Electronic Nicotine Delivery Systems and Components Thereof. My work on that matter involved analyzing the validity of e-cigarette patents, reviewing prior art, and conducting tests on more than 15 different

vaporizers. I wrote three (3) expert reports and was deposed on my opinions.

IV. MATERIALS CONSIDERED

14. My opinions are based on my experience, knowledge of the relevant art, the '173 patent and prosecution history, the documents identified in Appendix A, and the documents discussed in this declaration.

V. LEGAL STANDARDS

15. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents related to this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the Challenged Claims.

A. Claim Construction

16. I have been instructed that the terms appearing in the '173 patent should be interpreted in view of the claim language itself, the specification, the prosecution history of the patent, and any relevant extrinsic evidence. I understand that the words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art at the time of the invention, which I have

assumed here is February 10, 2014. While claim limitations cannot be “read in” from the specification, the specification is the single best guide to the meaning of claim terms. I have followed these principles in reviewing the claims of the ’173 patent and forming the opinions set forth in this declaration.

B. Level of Ordinary Skill

17. I understand a person of ordinary skill in the art is determined by considering factors such as: (1) educational level and any specialties of the applicants; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; (6) educational level and any specialties of active workers in the field; and (7) nature of any testing described in patent (and skills required of those doing such testing). I understand that these factors are not the only criteria that can be applied while determining a level of ordinary skill. For example, the claimed subject matter can be compared to subject matter that is typically taught in the relevant engineering curricula to provide guidance of what would constitute appropriate educational requirements for a person of ordinary skill in the art.
18. The first two inventors listed on the ’173 patent are James Monsees and Adam Bowen. These two inventors were students in a Masters-level

Product Design program when they developed their first electronic vaporizers.

19. The types of problems encountered in the field of electronic vaporizers include developing mechanisms to securely hold the replaceable cartridges, while simultaneously allowing the cartridges to be easily replaced. Another relevant problem is developing a sensing and control system that can quickly detect when a user desires the vaporizer to turn on its heater and supply an aerosol through the mouthpiece.
20. Given my consideration of the factors above, it is my opinion that a person of ordinary skill in the art (“POSA”) pertinent to the ’173 patent would have at least a B.S. degree in Mechanical Engineering, Electrical Engineering, Industrial Design, Product Design, or similar field, with at least two years of industry experience in one of these fields, and such a POSA would have been familiar with electrically powered vaporizing articles, their components or the underlying technologies.
21. I was at least a POSA as of the priority date of the ’173 patent.

C. Obviousness

22. I have been told that under 35 U.S.C. § 103, a patent claim may be obvious if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious

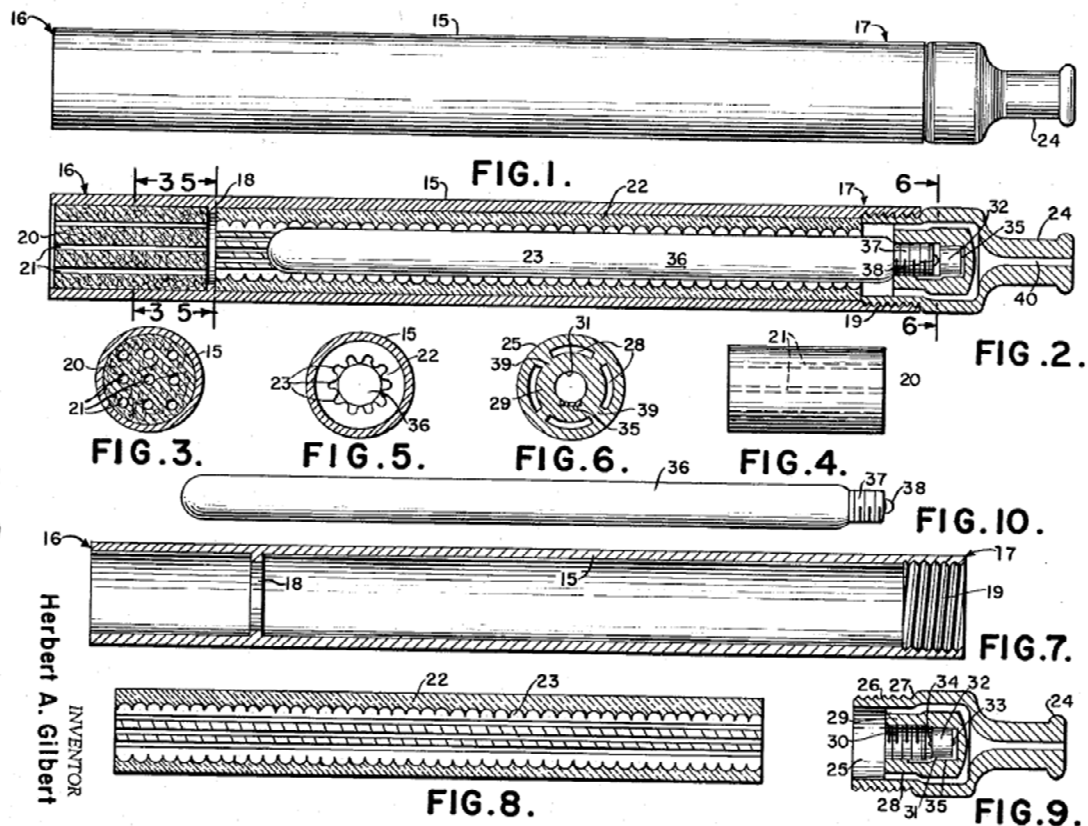
at the time the invention was made to a POSA to which the subject matter pertains.

23. I have been told that a proper obviousness analysis involves:
 - a. Determining the scope and content of the prior art;
 - b. Ascertaining the differences between the prior art and the claims at issue;
 - c. Resolving the level of ordinary skill in the pertinent art; and
 - d. Considering evidence of secondary indicia of non-obviousness (if available).
24. I have been told that the relevant time for considering whether a claim would have been obvious to a POSA is the time of invention. For my obviousness analysis, counsel for Petitioner instructed me to assume that the date of invention for the Challenged Claims is February 10, 2014. My opinions would not change if I assumed a later date of invention.
25. I have been told that a reference may be modified or combined with other references or with a POSA's own knowledge if the person would have found the modification or combination obvious. I have also been told that a POSA is presumed to know all the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a POSA would employ.

26. I have been told that whether a prior art reference renders a patent claim obvious is determined from the perspective of a POSA. However, suggestions to combine known elements to achieve the claimed invention may come from the prior art as a whole, or individually, and may consider the inferences and creative steps that a POSA would employ. I understand that obviousness grounds cannot be sustained by mere conclusory statements and must include some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.
27. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also have been told that the “teaching, suggestion, or motivation” test can be used in establishing a rationale for combining elements of the prior art. I have also been told to be aware of distortions caused by hindsight bias, and that reading into the prior art the teachings of the patent at issue is improper.
28. I understand that Petitioner bears the burden of proving that the challenged claims of the ’173 Patent are invalid, and must prove this by a preponderance of the evidence, which means that invalidity must be shown to be more likely than not.

VI. TECHNOLOGY OVERVIEW

29. The '173 Patent generally describes an apparatus for vaporizing liquid for the purpose of inhaling an aerosol containing the vapor. The vaporized liquid generally contains flavors or tobacco-related compounds, such as nicotine. These “electronic cigarettes” (e-cigarettes) are battery-powered vaporizers that attempt to simulate certain aspects of smoking, but without the actual burning of tobacco.
30. Smokeless cigarettes have been in existence for about sixty years. U.S. Patent No. 3,200,819 to Gilbert in 1965, entitled, “Smokeless Non-Tobacco Cigarette,” presents an invention that is remarkably similar in structure to present-day e-cigarettes. The figures from Gilbert’s patent are reproduced below.



Gilbert (Ex. 1012), Figures 1-9

31. The goal of Gilbert's invention was, "to provide a safe and harmless means for and method of smoking by replacing burning tobacco and paper with heated, moist, flavored air; or by inhaling warm medication into the lungs in case of a respiratory ailment under direction of a physician." [Gilbert (Ex. 1012), 1:7-12]. The patent describes the invention as "resembling a cigarette by which air may be drawn through a porous substance of a cartridge." [Gilbert (Ex. 1012), 1:15-16]. The device uses a process in which, "the moist and flavored air passes through a section of the device heated by a suitable heating element." [Gilbert (Ex. 1012), 1:19-21].

32. Rather than burning materials, vaporizers use a heating element to vaporize (atomize) the substance intended for inhalation. The vaporized material is then mixed with an air stream that is inhaled by the user. Typically, the heating element is activated by pressing a button or simply inhaling air through a mouthpiece. The act of inhalation can be sensed by, for example, a pressure sensor. The sensor then signals to a microcontroller that the heating element should be turned on in order to vaporize the liquid. Given a sufficiently large liquid storage compartment, the vaporizer can provide the user numerous “puffs” before additional supplies need to be added to the device.
33. Starting in approximately 2006, e-cigarettes began being imported into the US from China. A tariff classification ruling by US Customs in 2006 addressed two e-cigarette products: i) the Ruyan Electronic Cigarette and, ii) the Ruyan Electronic Cigarette cartridge. In the ruling, the e-cigarette was described as, “a spherical, metal tube with a plastic mouthpiece tip on the end which measures approximately 5 ½” in length. Inside the tube are a sensor, electronic atomizer, integrated circuits and a lithium ion battery.” The replacement cartridges were described as being, “attached to a plastic mouthpiece tip” and containing “nicotine and propylene glycol.” [August 22, 2006 Tariff Classification Ruling M85579 (Ex. 1027) at Page 1.] A

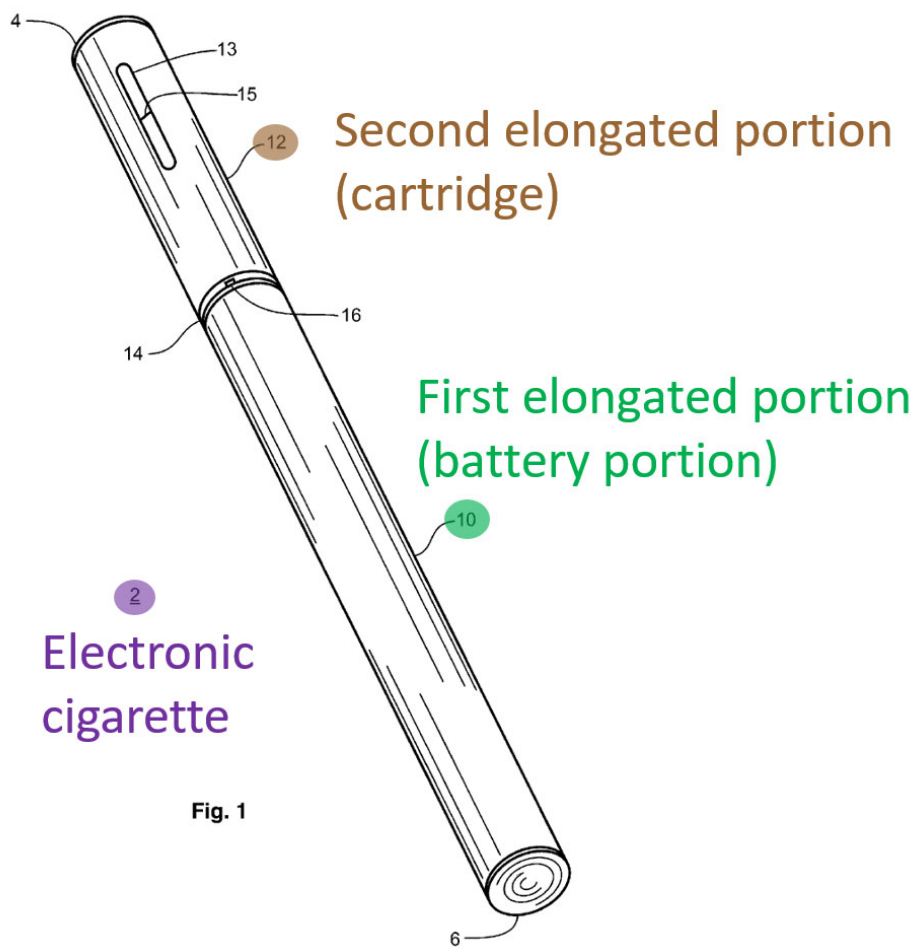
photograph in the ruling that shows the e-cigarette and cartridge has been reproduced below.



August 22, 2006 Tariff Classification Ruling M85579 (Ex. 1027)
at Page 1

34. Many vaporizers utilize the multi-part structure of the Ruyan electronic cigarette, wherein a main portion contains a battery that powers the device. The main portion may also house sensors and a microprocessor used by the device to trigger the vaporizing effect of the heating element. A separate portion of the device contains the vaporizable substance. This vaporizer “cartridge” is refillable or replaceable when the substance is used up. An additional part of the device is the mouthpiece through which the user inhales the aerosol containing the vapor. The mouthpiece can be removed from the device for cleaning, or it can be disposed with along with the cartridge after the supply has been depleted.

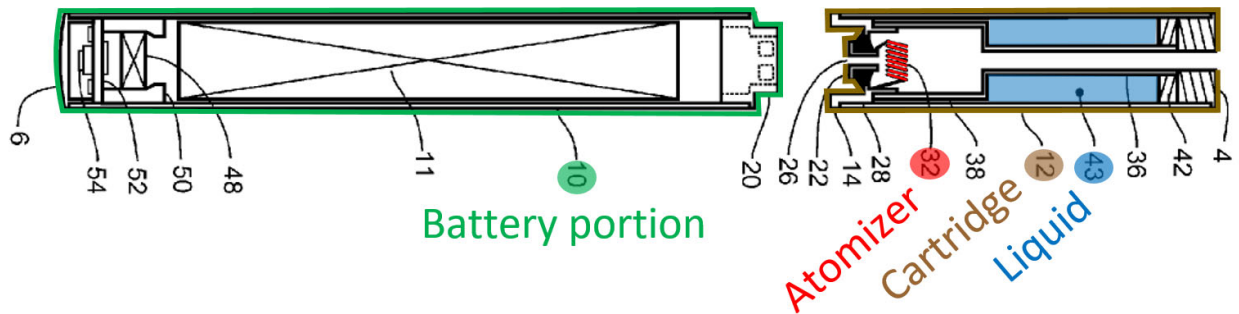
35. If vaporizable liquid in the cartridge becomes depleted, but the user keeps inhaling from the device, then the user can receive an undesirable “dry hit” that is hot and burnt tasting. This occurs because the user is still pulling air through the device, thereby triggering the heating element, but the wick does not contain liquid that can be vaporized. Therefore, the energy going into the heating element can only heat up the element itself and the dry air being pulled through the heating chamber. In order to minimize these undesirable “dry hits,” e-cigarettes with viewing windows into the liquid cartridge were developed. Such windows allow the user to monitor the liquid level within the cartridge and replace the liquid before a “dry hit” occurs.
36. U.S. Patent Publication No. 2013/0228191 to Newton, filed on June 28, 2011, discloses such a liquid-level viewing window. Figure 1 from Newton, which is reproduced below in annotated form, shows a perspective view of an elongated e-cigarette with a cartridge connected to a battery portion. In the Background of the Invention section, Newton describes the commonplace nature of replaceable cartridges by stating, “A replaceable cartridge with a liquid soaked porous material has been provided to enable consumers to replenish the supply of liquid as it is depleted during use by replacing the cartridge.” [Newton, (Ex. 1013), [0004].]



Newton (Ex. 1013), Figure 1 (annotated)

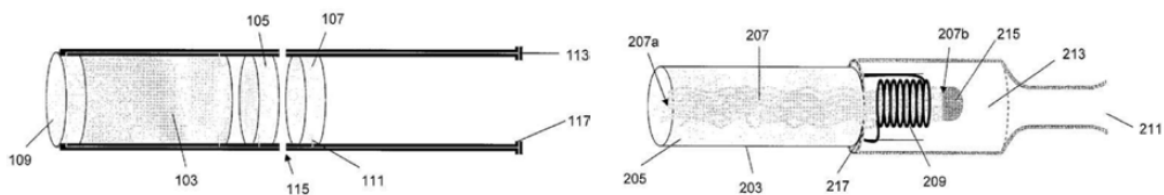
37. The vaporizable substance in an e-cigarette is often vaporized by an electrically-power heating element that heats a wick that draws liquid from a storage compartment. The combination of these elements is often referred to as a replaceable cartomizer, or simply cartridge. An example of such replaceable cartridges is shown in Figure 5 of Newton, which has been reproduced below in annotated form. The figure shows the detached cartridge on the right. The replaceable cartridge has a storage compartment

for vaporizable liquid 43 and an “atomizer” 32. The atomizer contains a heating coil wrapped around a wicking material that draws in liquid from the storage compartment.



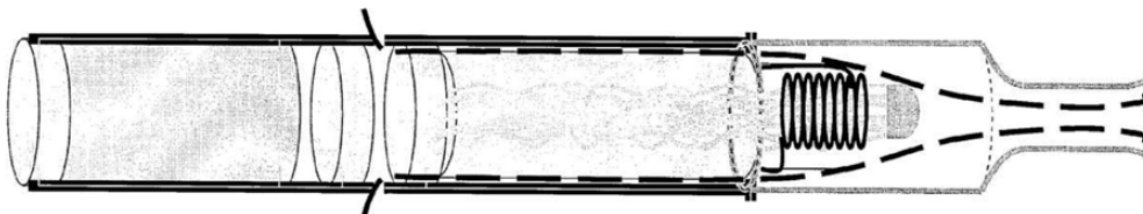
Newton (Ex. 1013), Figure 5 (annotated)

38. The replaceable cartridges used with e-cigarettes can be attached and detached by a variety of means such as screw connections, snap-fit, friction connectors, and magnets. Some e-cigarettes have receptacles in the main body wherein the cartridge slides into an outer housing. For example, U.S. Patent Publication No. 2009/0272379 to Thorens (“Thorens 379”) has a replaceable cartridge that slides into the housing of the main shell. The main shell of Thorens 379 is shown in Figure 1 and the replaceable cartridge (mouthpiece 201) is shown in Figure 2. Those figures have been reproduced below.



Thorens 379 (Ex. 1007), Figures 1 (left) and 2 (right)

39. The assembled apparatus is shown in Figure 3 of Thorens 379, which has been reproduced below. According to the disclosure in Thorens 379, after mouthpiece 201 (cartridge) on the right side has been slid into the shell on the left side, the shell and mouthpiece 201 are releasably locked together by a lock mechanism. [Thorens 379 (Ex. 1007), [0042]].



Thorens 379 (Ex. 1007), Figure 3

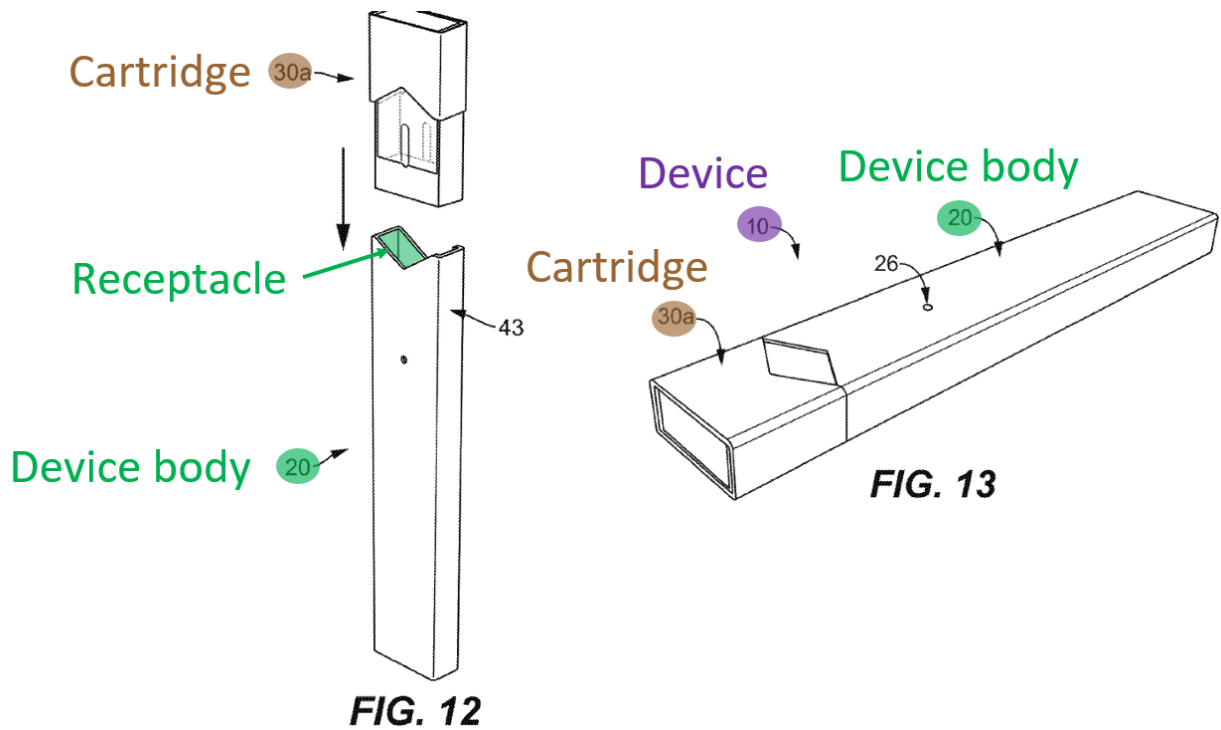
40. As mentioned above, the lock mechanism can be various types of friction-fit connections, various types of snap-fit connectors, or even magnets. For example, US Patent Application US2015/0128971 to Verleur discloses magnetic connectors. [Verleur (Ex. 1005), Abstract (“Magnets are also provided in order to secure the cartomizer or the charger to the shell.”)].

41. Cartridges with a great variety of flavors, colors, and shapes have been developed. Many of the cartridges are designed for ease of storage, insertion, and removal.
42. The '173 patent being analyzed in this declaration describes an electronic vaporizer with commonly-known cartridge structures, as well as commonly-known vaporizer bodies that receive replaceable cartridges.

VII. THE '173 PATENT

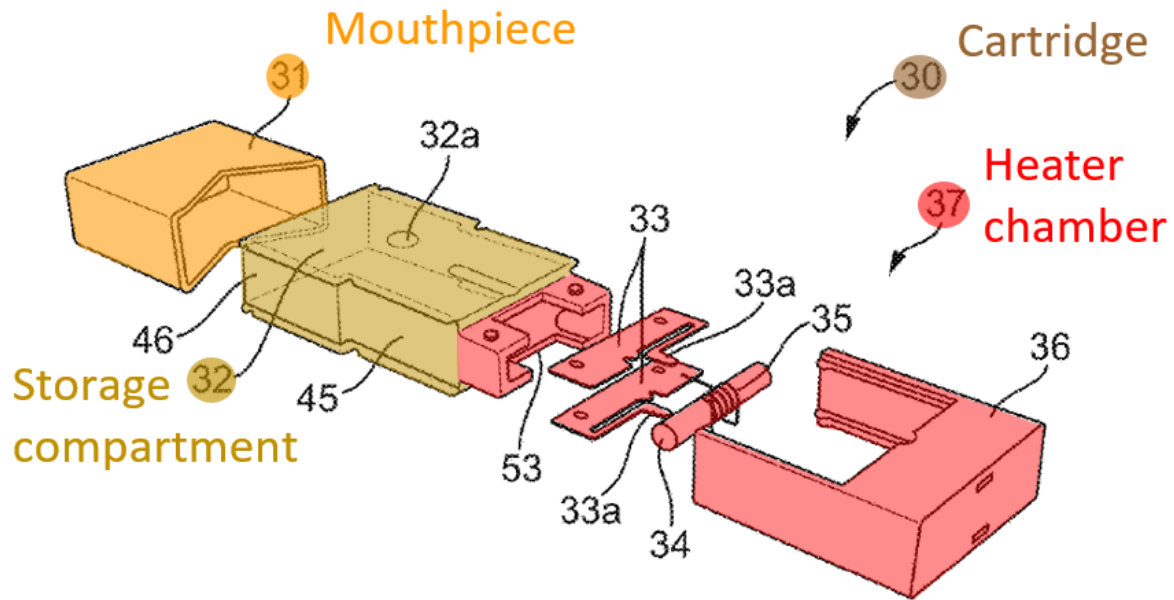
A. Specification

43. According to the summary of the disclosure, the '173 patent relates to apparatuses for vaporizing material to form an inhalable aerosol. ['173 Patent (Ex. 1001), 2:37-39]. Specifically, the '173 patent focuses on e-cigarette cartridges that are configured for use with a device body having a power supply and a cartridge receptacle.
44. Figures 11-13 of the '173 patent illustrate a “sequence for assembling the main components of the device.” ['173 Patent (Ex. 1001), 18:26-27]. As shown below in annotated versions of figures 12 and 13, the cartridge 30a can be connected to a cartridge receptacle on a device body 20 that holds the battery.



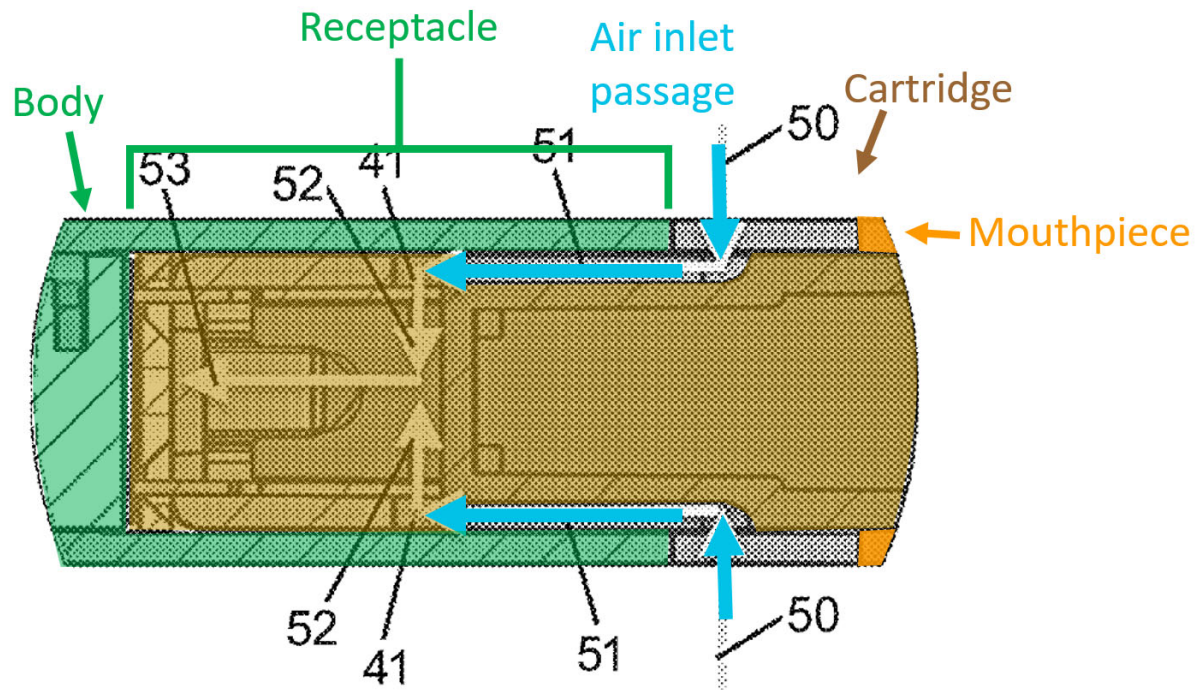
'173 Patent (Ex. 1001), Figures 12 and 13 (annotated)

45. The cartridge has a mouthpiece, a storage compartment, and a heater chamber that includes a resistive heating element (for generating an aerosol from vaporizable material and air) and a wick (for providing a capillary pathway for fluid from the tank to the heating chamber). ['173 Patent (Ex. 1001), Abstract, 49:60-61]. These major components are highlighted below in an annotated version of Figure 7B.



'173 Patent (Ex. 1001), Figure 7B (annotated)

46. The body has a receptacle designed to hold the cartridge. ['173 Patent (Ex. 1001), Abstract]. The airflow path of the device includes an air inlet passage that is formed by an exterior surface of the cartridge and an internal surface of the receptacle. ['173 Patent (Ex. 1001), Abstract]. The receptacle and air inlet passage are highlighted below in an annotated version of Figure 10A.



'173 Patent (Ex. 1001), Figure 10A (annotated)

B. Prosecution of the '173 Patent

47. The '173 Patent was filed on July 10, 2018 as U.S. Patent Application No. 16/032,009 (“the 009 application”) and claims priority to four provisional applications, the earliest of which was filed on February 10, 2014. I have been asked to assume that '173 Patent is entitled to a priority date of February 10, 2014 for the purposes of my analysis.
48. The Examiner, in a First Action Interview Pilot Program Pre-Interview Communication dated December 4, 2018, rejected the claims as having the same subject matter as claimed in Application No. 15/815,643 (“the '643 application”), noting that the “air flow path appears to be the only unique

feature being claimed over the prior art,” and therefore, “if claims 21 and 40 are allowable for the same reasons as application 15/815,643, a terminal disclaimer is required.” [’173 Patent File History at Page 193 (Ex. 1002.0193)]. The ’173 Patent issued on July 14, 2020 after the Applicant filed a Terminal Disclaimer with respect to application 15/815,643. [’173 Patent File History at Page 238 (Ex. 1002.0248)].

C. The Claims of the ’173 Patent

49. I understand that Petitioners’ are challenging claims 1-4, 6-7, 15-16, 18-25, 28, and 30 of the ’173 Patent.
50. The claims of the ’173 patent generally relate to the components of the cartridges, their physical properties, and the geometry of their construction, although there are also a few limitations on the device body. For example, claim 1 of the ’173 patent is directed to an apparatus that consists of two main components: a cartridge and a body. The cartridge includes a mouthpiece, a storage compartment for vaporizable material, and a heater chamber with a resistive heating element that heats this material to generate an aerosol. The body features a receptacle designed to securely hold and connect with the cartridge. The airflow path in this apparatus is defined by an air inlet passage, formed by the external surface of the cartridge and the internal surface of the receptacle, which delivers air to the heater chamber,

and a fluid connection within the cartridge linking the heater chamber and the mouthpiece.

51. Independent Claim 1 has the following elements:

[1.A]	An apparatus comprising:
[1.B]	a cartridge comprising
[1.C]	a mouthpiece,
[1.D]	a storage compartment configured to hold a vaporizable material, and
[1.E]	a heater chamber comprising a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an aerosol comprising the vaporizable material and air passing along an airflow path; and
[1.F]	a body comprising a receptacle configured to insertably receive and couple to the cartridge,
[1.G]	wherein the heater chamber is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge,
[1.H]	wherein the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge,
[1.I]	wherein the air inlet passage is configured to deliver the air to the heater chamber; and
[1.J]	a fluid connection in the cartridge, the fluid connection connecting the heater chamber and the mouthpiece.

52. Claim 2 has the following elements:

Claim 2. The apparatus of claim 1, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.

53. Claim 3 has the following elements:
3. The apparatus of claim 1, wherein the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at the proximal end, and wherein the heater chamber is disposed proximate to the distal end.
54. Claim 4 has the following elements:
4. The apparatus of claim 3, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.
55. Claim 6 has the following elements:
6. The apparatus of claim 3, wherein the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.
56. Claim 7 has the following elements:
7. The apparatus of claim 3, wherein the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.
57. Claim 15 has the following elements:
15. The apparatus of claim 1, wherein the cartridge comprises a first electrical contact and a second electrical contact at a distal end of the

cartridge, the mouthpiece disposed at a proximal end of the cartridge opposite the distal end, wherein the first electrical contact and the second electrical contact are electrically isolated and disposed in a plane substantially parallel to the distal end of the cartridge.

58. Claim 16 has the following elements:

16. The apparatus of claim 15, wherein the receptacle comprises a third electrical contact and a fourth electrical contact disposed in a second plane, the second plane substantially parallel to the distal end of the cartridge when the cartridge is received within the receptacle.

59. Claim 18 has the following elements:

18. The apparatus of claim 1, wherein the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.

60. Claim 19 has the following elements:

19. The apparatus of claim 1, wherein the storage compartment comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.

61. Independent Claim 20 has the following elements:

[20.A]	An apparatus comprising:
[20.B]	a cartridge comprising
[20.C]	a mouthpiece,

[20.D]	a storage compartment configured to hold a vaporizable material, and
[20.E]	a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an aerosol comprising the vaporizable material and air passing along an airflow path; and
[20.F]	a body comprising a receptacle configured to insertably receive and couple to the cartridge,
[20.G]	wherein the resistive heating element is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge,
[20.H]	wherein the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge,
[20.I]	wherein the air inlet passage is configured to deliver the air towards the resistive heating element; and
[20.J]	a fluid connection in the cartridge, the fluid connection connecting the resistive heating element and the mouthpiece.

62. Claim 21 has the following elements:

21. The apparatus of claim 20, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.

63. Claim 22 has the following elements:

22. The apparatus of claim 20, wherein the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at the proximal end, and wherein the resistive heating element is disposed proximate to the distal end.

64. Claim 23 has the following elements:

23. The apparatus of claim 22, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.
65. Claim 24 has the following elements:
- 24 The apparatus of claim 22, wherein the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.
66. Claim 25 has the following elements:
25. The apparatus of claim 22, wherein the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.
67. Claim 28 has the following elements:
28. The apparatus of claim 20, wherein the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.
68. Claim 30 has the following elements:

30. The apparatus of claim 20, wherein the storage compartment comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

69. As I discussed above in Section V.B, I understand that there are several factors that can be considered in determining the ordinary level of skill in the art. In determining the level of ordinary skill for the asserted patents, I have considered the above issues in light of the patent specification.
70. A person of ordinary skill in the art (“POSA”) would have at least a B.S. degree in Mechanical Engineering, Electrical Engineering, Industrial Design, Product Design, or similar field, with at least two years of industry experience in one of these fields, and such a POSA would have been familiar with electrically powered vaporizing articles, their components, or the underlying technologies.
71. Based on my education and experience, I have at least the necessary qualifications of a person having ordinary skill in the art. Furthermore, I frequently encounter, interact with, work with, supervise, and teach persons having these qualifications.

IX. CLAIM CONSTRUCTION

72. I understand that the words of the claims of a patent are generally given the ordinary and customary meaning as interpreted by a person of ordinary skill

in the art at the time of invention. I have been informed that patent claims are construed in light of the claim language, the specification (including the drawings), and the prosecution history (including the references cited during the prosecution of the patent).

73. I further understand that the parties to this IPR have exchanged proposed constructions for the term “mouthpiece” in the ’173 Patent.

A. “mouthpiece”

74. I understand that in the co-pending and related ITC investigation, Patent Owner contends that “mouthpiece” means “portion to be used by a mouth.” EX1026.002. Petitioners contend the term “mouthpiece” means a “separate component from the storage compartment to be used by a mouth.” The prior art analyzed below meet both proposed definitions and, therefore, the proposed constructions are not material to my analysis.

X. OVERVIEW OF THE PETITION GROUNDS

75. An overview of the Petition Grounds is provided below:

Ground 1	Claims 1-4, 6-7, 15-16, 18-25, 28, and 30 of the ’173 Patent are obvious under 35 U.S.C. § 103 based on U.S. Patent Publication No. 2015/0128971 to Verleur (“Verleur”) in view of the knowledge of a POSA.
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Ground 2	Claims 2, 4, 21, and 23 of the '173 Patent are obvious under 35 U.S.C. § 103 based on Verleur in view of the knowledge of a POSA and International Publication No. WO 2013/076098 (“Plojoux”; EX1016)
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XI. OVERVIEW OF THE PRIOR ART

A. Verleur (Ex. 1005) (Primary Reference)

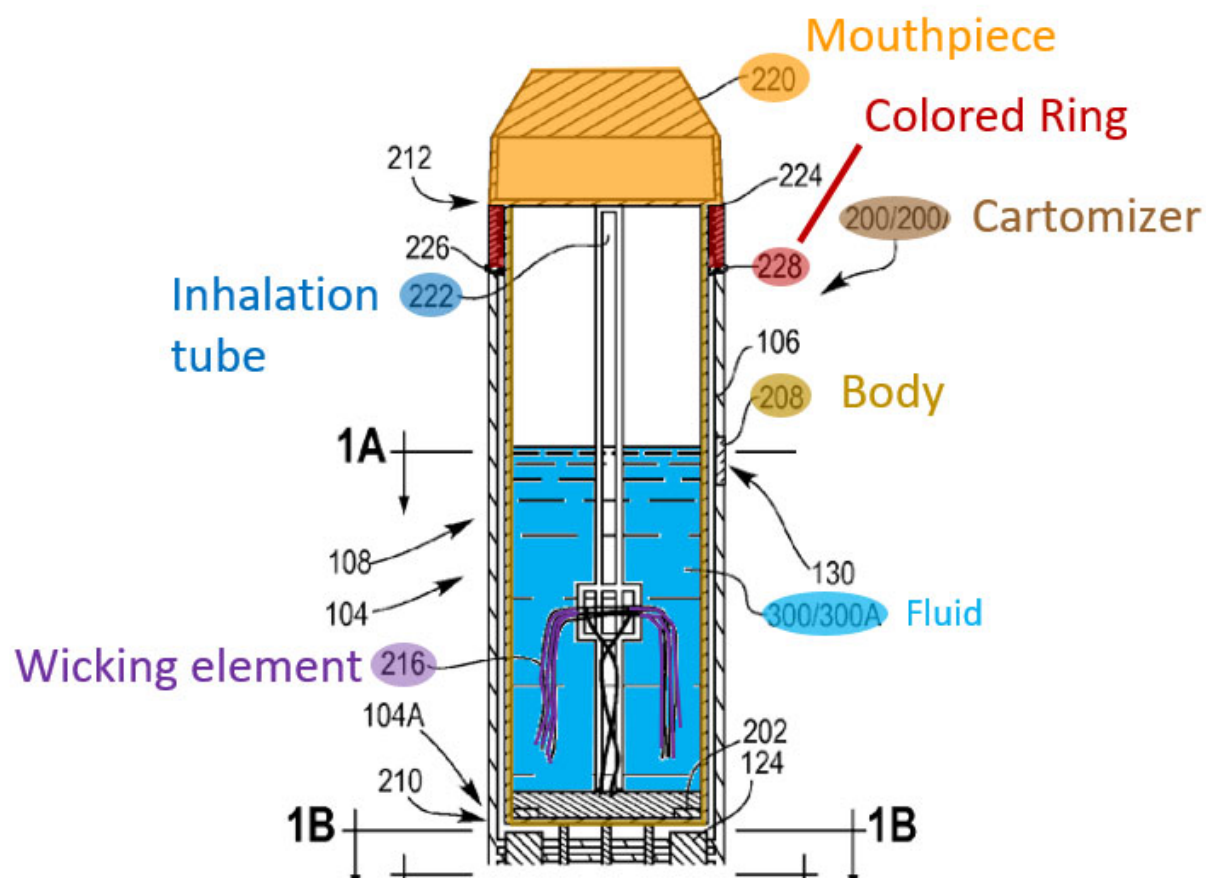
76. U.S. Patent Publication No. 2015/0128971 to Verleur, et al. (“Verleur”) relates to embodiments of “[a]n electronic cigarette or vaporizer.” [Verleur (Ex. 1005), Abstract; Verleur-Prov (Ex. 1006), [0022]]. Verleur is titled “Vaporizer” and names Jan Andries Verleur, Dan Recio, Yifeng Lu, Yinjun Zhang, Arturo Fajardo, and Hans Verleur as inventors.
77. I understand that a published patent application, such as Verleur, is prior art as of its effective filing date. I further understand that an application is considered to have been effectively filed, with respect to any subject matter described in the application, as of the filing date of the earliest application describing the subject matter to which the application is entitled to claim a right of priority. Verleur claims priority to provisional application 61/903,344 (“Verleur-Prov”) filed on November 12, 2013. The disclosure of Verleur-Prov is largely identical to the disclosure of Verleur. Throughout

this declaration, I cite to Verleur and provide a corresponding cite to Verleur-Prov to demonstrate support for the subject matter from Verleur in Verleur-Prov. Additionally, in Section XI.A.2., I show that at least one claim of Verleur is supported by Verleur-Prov.

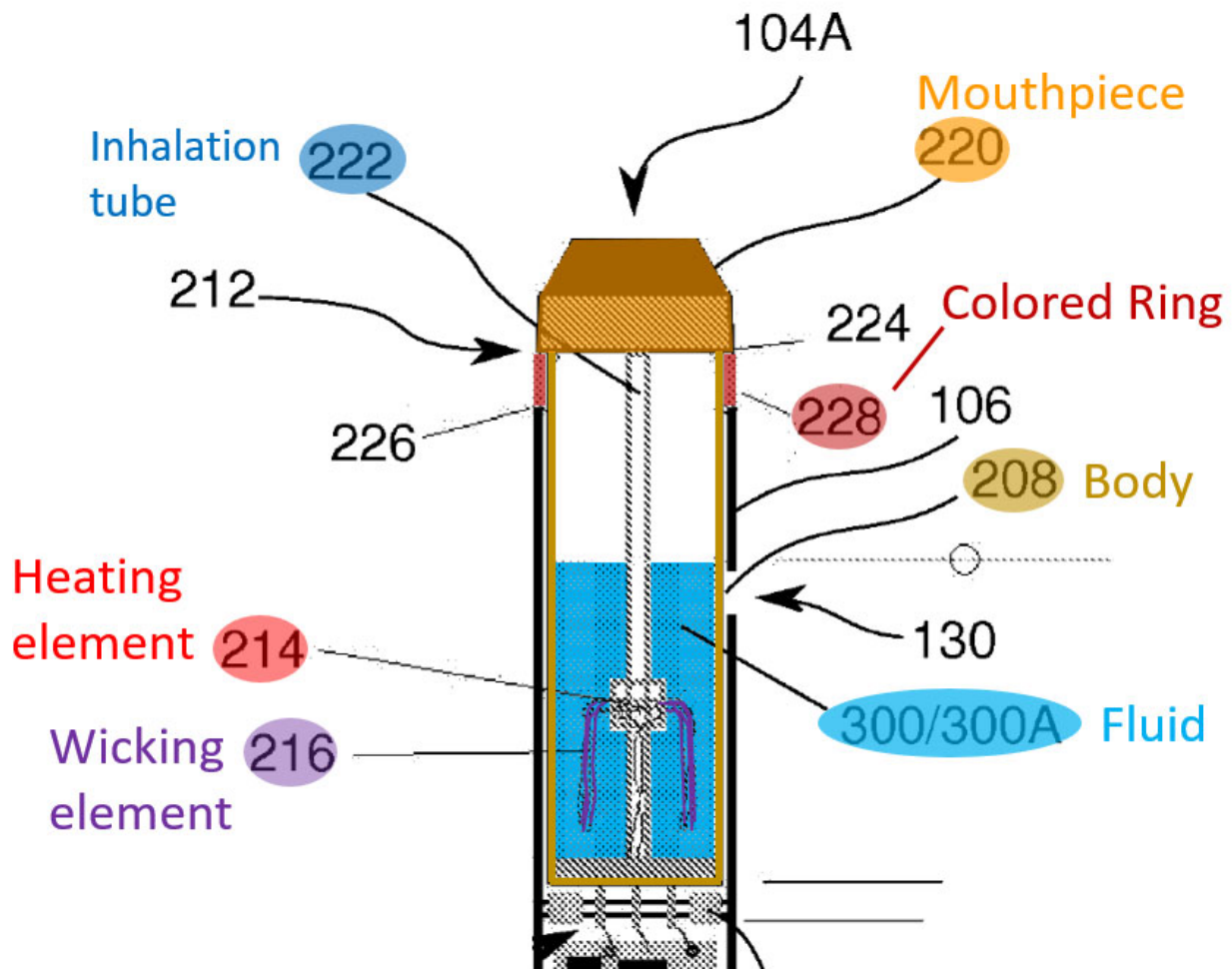
1. Overview of Verleur

78. U.S. Patent Publication No. 2015/0128971 to Verleur, et al. (“Verleur”; EX1005), titled “Vaporizer” was filed on March 4, 2014, claims priority to Provisional 61/903,344 (“Verleur-Prov”; EX1006) filed November 12, 2013.
79. Verleur discloses “[a]n electronic cigarette or vaporizer” that includes “a shell and a cartomizer receivable within a chamber within a portion of the shell.” [Verleur (Ex. 1005), Abstract; Verleur-Prov (Ex. 1006), [0022]]. The shell includes a battery segment and a cartomizer receiving segment defining a chamber dimensioned to receive a cartomizer inserted into the chamber. [Verleur (Ex. 1005), [0025]] (“a shell having a battery segment and a cartomizer receiving segment, the cartomizer receiving segment may define a chamber having an insertion end distal to the battery segment of said shell and a base end proximate to the battery segment, the chamber dimensioned to receive a cartomizer inserted into the chamber at the insertion end of the chamber.”); Verleur-Prov (Ex. 1006), [0022]].

80. As shown below in annotated versions of Verleur Figure 1 and Verleur-Prov Figure 1, the cartomizer includes several components, including a detachable mouthpiece 220, a liquid storage compartment for storing liquid (body 208 for holding fluid 300A), a heating element 214, a wicking element 216, a colored ring 228, and an inhalation tube 222. [Verleur (Ex. 1005), [0038]-[0040]; Verleur-Prov (Ex. 1006), [0029]-[0031]].

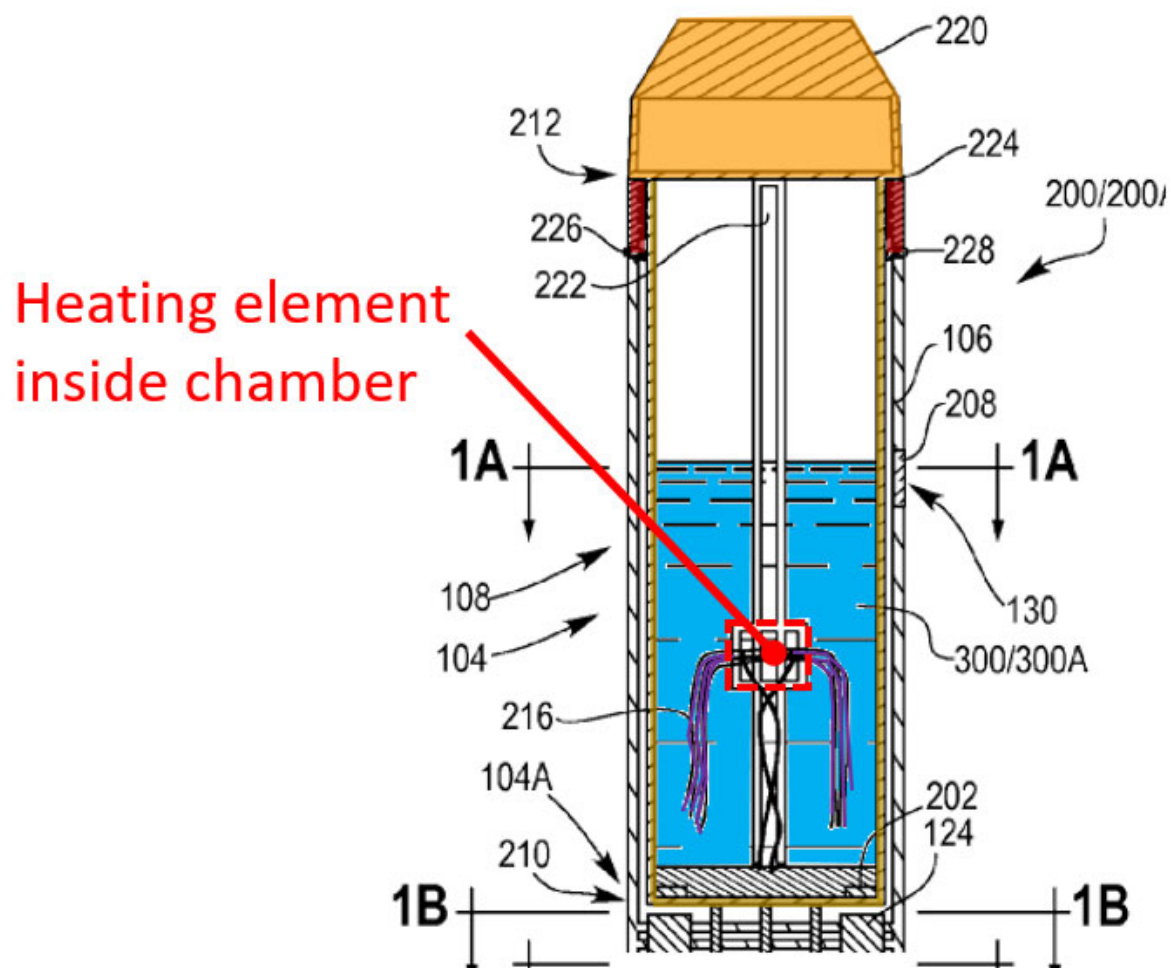


Verleur (Ex. 1005), Figure 1 (partial, annotated)



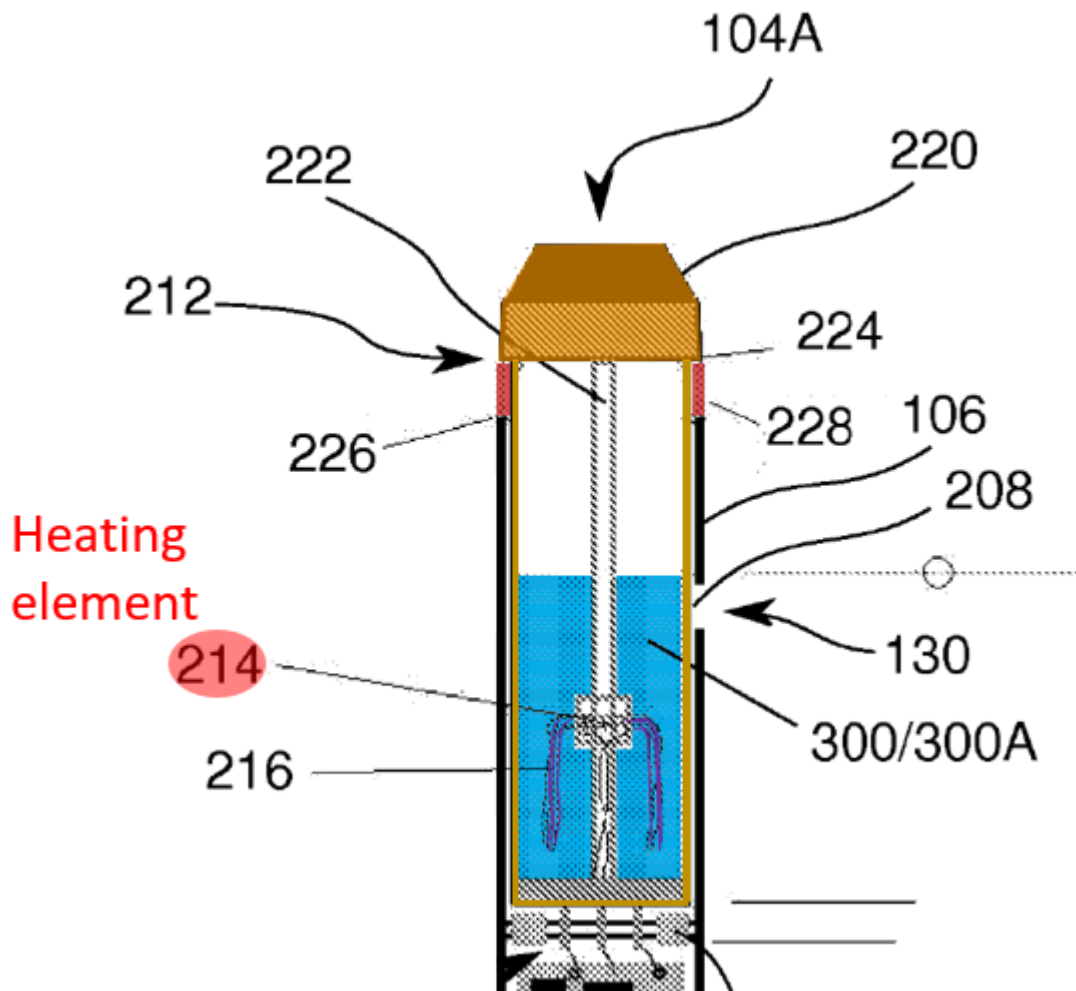
Verleur-Prov (Ex. 1006), Figure 1 (partial, annotated)

81. Verleur published without labeling the heating element 214 in Figure 1, a POSA would have understood, based on the description of heating element 214 in Verleur's disclosure, that the heating element 214 would be located within the chamber indicated below in a partial, annotated version of Figure 1.



Verleur (Ex. 1005), Figure 1 (partial, annotated)

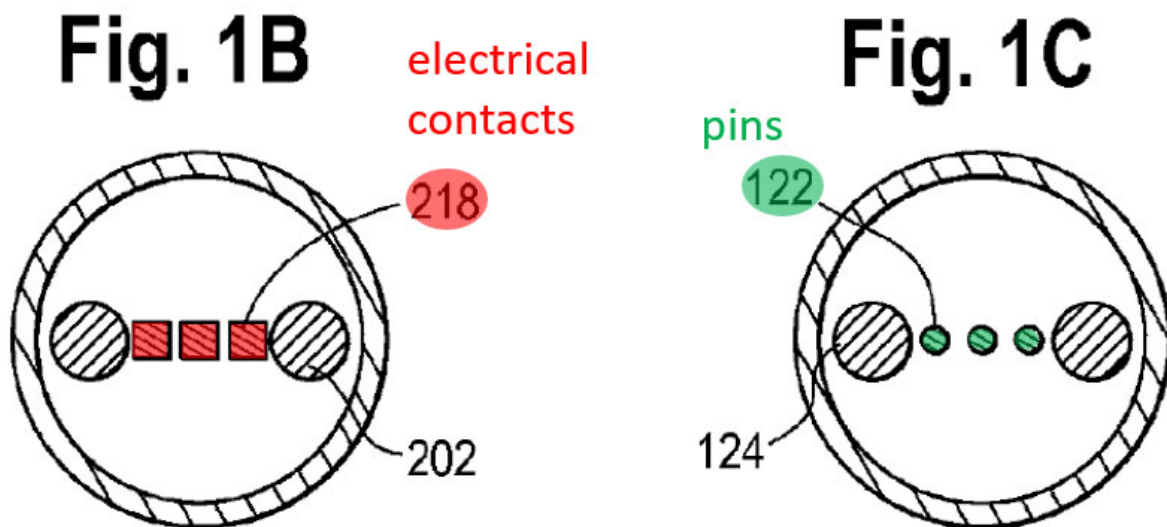
82. As shown below, this is also the location shown in Verleur-Prov Figure 1 as the location of heating element 214.



Verleur-Prov (Ex. 1006), Figure 1 (partial, annotated)

83. The cartomizer also includes electrical contacts located at the distal end of the cartomizer. These contacts enable an inserted cartomizer to receive electrical current by electrically connecting to pins located at the base of the cartomizer receiving chamber in the shell. This electrical current is what powers the heating element, allowing it to vaporize the fluid. [Verleur (Ex.

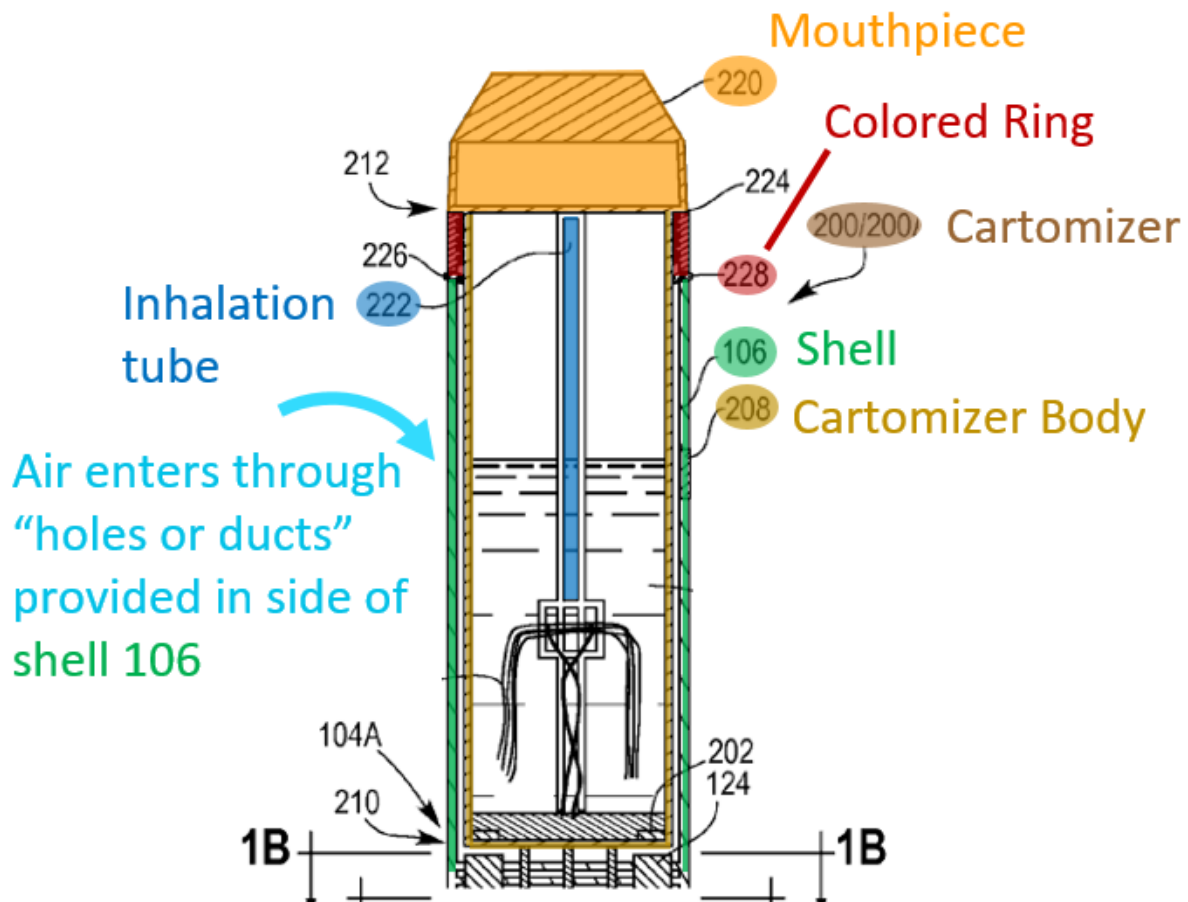
1005), [0006], [0033], [0039]; *see also* Verleur-Prov (Ex. 1006), [0025], [0030]]. These electrical contacts and corresponding pins are shown below in annotated versions of Figures 1B and 1C.



Verleur (Ex. 1005), Figures 1B and 1C (annotated); *see also* Verleur-Prov, Figures 1B and 1C

84. During operation, air is drawn in through holes or ducts on the shell, between the chamber and cartomizer, passes the heating element, and continues along an inhalation tube to exit the mouthpiece. [Verleur (Ex. 1005), [0039] (“Inhalation tube 222 may also be in fluid communication with one or more holes or ducts provided, for instance, in sides of outer shell 106 in order to permit air flow through cartomizer body 208.”); Verleur-Prov (Ex. 1006), [0030] (“Inhalation tube 222 may also be in fluid communication with one or more holes or ducts provided, for instance, in

sides of shell 106 in order to permit air flow through cartomizer body 208.”)]. These air inlets are represented on the annotated version of Figure 1 below.



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also* Verleur-Prov, Figure 1

2. Verleur-Prov Supports At Least One Claim of Verleur

85. As I set forth in the following table, Verleur-Prov provides sufficient details to enable one reasonably skilled in the art to make or use the invention described in claim 1.

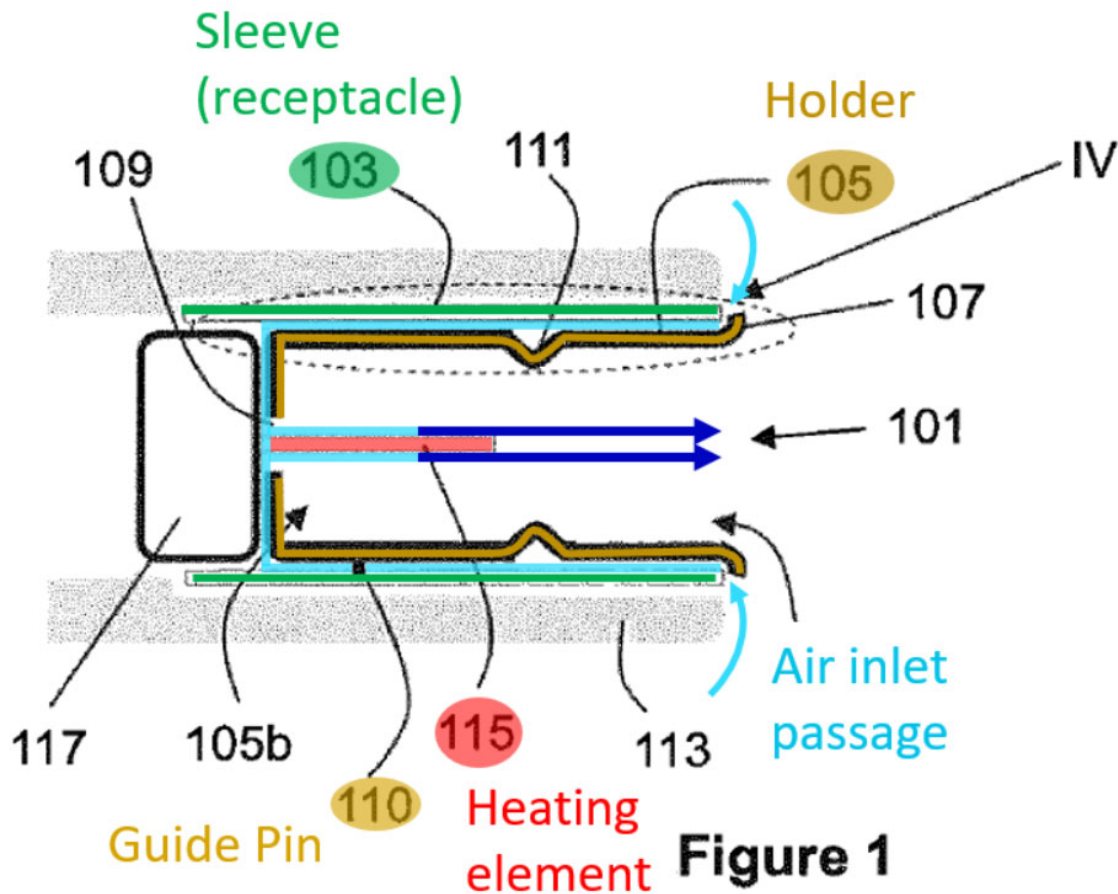
Verleur	Support in Verleur-Prov (Ex. 1006)
Claim 1. A vaporizer comprising:	[Verleur-Prov (Ex. 1006), [0001], [0002], [0022], [0029]]
a shell having a battery segment and a cartomizer receiving segment, the cartomizer receiving segment defining a chamber having an insertion end distal to the battery segment of said shell and a base end proximate to the battery segment, the chamber dimensioned to receive a cartomizer inserted into the chamber at the insertion end of the chamber;	[Verleur-Prov (Ex. 1006), [0022], [0028], [0029], [0031], Figures 1, 1C]
a battery housed within the battery segment;	[Verleur-Prov (Ex. 1006), [0002], [0022], [0023], [0029], Figure 1]
electrical contacts provided between the base end of the chamber and the battery segment, the electrical contacts including a positive contact and a negative contact insulated from the positive contact; and	[Verleur-Prov (Ex. 1006), [0025], [0030], Figures 1, 1A, 1B]

electronic circuitry housed within the battery segment of said shell and operable to direct an electrical current between the battery and the electrical contacts;	[Verleur-Prov (Ex. 1006), [0002], [0023], [0030], Figure 1, 1A]
wherein said electrical contacts and battery each in electrical connection with said electronic circuitry, and	[Verleur-Prov (Ex. 1006), [0002], [0023], [0030], Figure 1, 1A, 1B]
wherein the cartomizer is securable within the chamber as a cartomizer surface and a magnetically attracted chamber surface are placed adjacent to one another.	[Verleur-Prov (Ex. 1006), [0026], [0027], [0038], Figures 1, 1A]

B. Plojoux (Ex. 1016) (Secondary Reference)

86. International Publication No. WO 2013/076098 (“Plojoux”), titled “Extractor for an Aerosol-Generating Device,” was filed on November 20, 2012 and published on May 30, 2013.
87. Plojoux is relied upon for its disclosure of an aerosol-forming device, which includes an air inlet passage extending from the proximal end of a receptacle to the distal end of a cartridge, as shown in the annotated figure below.
- [Plojoux (Ex. 1016), 13:29-33]. Plojoux is also relied upon for its disclosure of a protrusion on the cartridge that aligns with an alignment groove on the receptacle. [Plojoux (Ex. 1016), (“The holder 105 also includes a guide pin

110 which protrudes out of the holder 105 and into a slot or groove (not shown) in the inside wall of sleeve 103.”)].



Plojoux (Ex. 1016), Figure 1 (annotated)

XII. ANALYSIS OF THE PETITION GROUNDS

A. GROUND 1: Claims 1-4, 6-7, 15-16, 18-25, 28 and 30 Are Obvious over Verleur

1. Claim 1

a. [1.A] An apparatus comprising:

88. To the extent the preamble is limiting, Verleur discloses *an apparatus*.
89. Verleur discloses “[a]n electronic cigarette or vaporizer,” which is an apparatus. [Verleur (Ex. 1005), Abstract; *see also* Verleur-Prov (Ex. 1006), [0001], [0022]].

b. [1.B] a cartridge comprising

90. Verleur discloses *a cartridge*.
91. Verleur discloses electronic cigarette 10, which includes cartomizer 200, which is a cartridge. [Verleur (Ex. 1005), [0030] (“Electronic cigarette 10 may include a battery portion connectable with a vaporization unit or cartomizer 200 for holding a vaporizable substance 300.”); *see also* Verleur-Prov (Ex. 1006), [0022]; *see also* ’173 Patent, 2:51-55 (“Generally, the cartridges (which may also referred to as cartomizers) ...”). As more fully explained with the remaining limitations of claim 1, cartomizer 200 is a cartridge at least because it comprises a mouthpiece, a liquid storage compartment for storing liquid, a wicking element, a heating element, and is insertable in a body having a receiving segment.

c. [1.C] [a cartridge comprising] a mouthpiece,

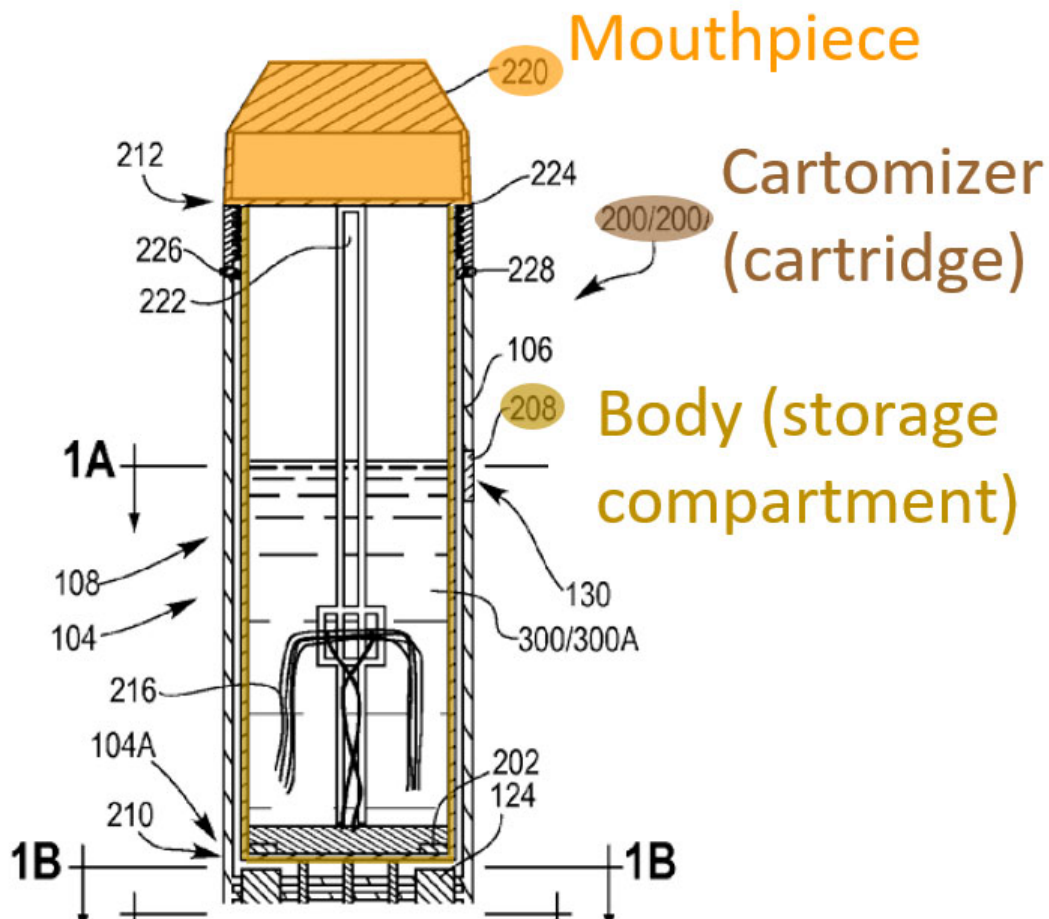
92. Verleur discloses *a cartridge comprising a mouthpiece*.
93. Verleur discloses cartomizer 200 (cartridge) that comprises mouthpiece 220, which is placed into the user’s mouth to inhale vaporized fluid. Specifically,

once the fluid inside the cartomizer reaches an optimal vaporizing temperature, the user can draw in an aerosol containing the vapor through this mouthpiece. [See, e.g., Verleur (Ex. 1005), [0039] (“Once fluid 300A is heated to an optimal vaporizing temperature, the user may inhale the vaporized fluid 300A through a mouthpiece 220 provided on body 208”); see also Verleur-Prov (Ex. 1006), [0030] (“Once fluid 300A is heated to an optimal vaporizing temperature, the user may inhale the vaporized fluid 300A through a mouthpiece 220 provided on body 208 at or proximate to mouthpiece end 212.”)].

94. Verleur also teaches that the mouthpiece may be removable (i.e., a separate component) that can be detached in order to refill the storage compartment of the cartomizer. [See, e.g., Verleur (Ex. 1005), *Id.* at [0040] (“So that a user may refill fluid 300A held in body 208, mouthpiece 220 may be removable from body 208. Mouthpiece 220 may include a screw thread 224 so that mouthpiece 220 may be threadably engaged with mouthpiece end 212 of body 208 or, alternatively, may be press fit onto or into mouthpiece end 212 of body 208.”); see also Verleur-Prov (Ex. 1006), [0031] (“So that a user may refill fluid 300A held in body 208, mouthpiece 220 may be removable from body 208. Mouthpiece 220 include a screw thread 224 so that mouthpiece 220 may be threadably engaged with mouthpiece end 212 of

body 208 or, alternatively, may be press fit onto or into mouthpiece end 212 of body 208.”)].

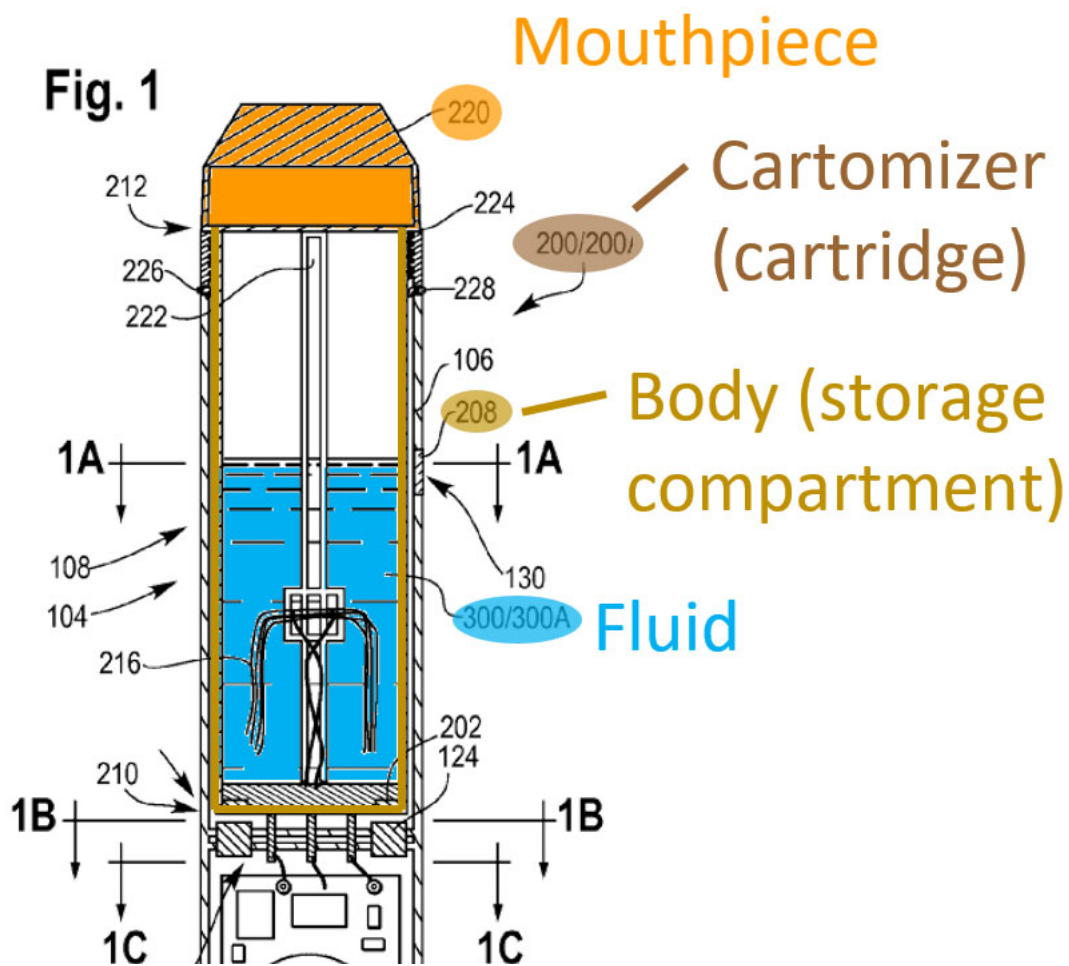
95. In the version of Verleur Figure 1 provided below, I have added annotations to show mouthpiece 220 and body 208 (which is the claimed storage compartment as described below) of the cartomizer (cartridge).



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

- d. [1.D] [a cartridge comprising] a storage compartment configured to hold a vaporizable material, and

96. Verleur discloses a cartridge comprising *a storage compartment configured to hold a vaporizable material*.
97. Verleur discloses “embodiment of cartomizer 200 for holding vaporizable material 300 is cartomizer 200A for holding a vaporizable fluid 300A, an embodiment of which is illustrated in FIG. 1.” [Verleur (Ex. 1005), [0038]; *see also* Verleur-Prov (Ex. 1006), [0029]]. In this embodiment, Cartomizer 200A includes “body 208 for holding fluid 300A,” which is a *storage compartment configured to hold a vaporizable material*.” [Verleur (Ex. 1005), [0038]; *see also* Verleur-Prov (Ex. 1006), [0029]].
98. In the version of Verleur Figure 1 provided below, I have added annotations to show body 208 (storage compartment) and fluid 300/300A (vaporizable substance) of the cartomizer (cartridge)



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

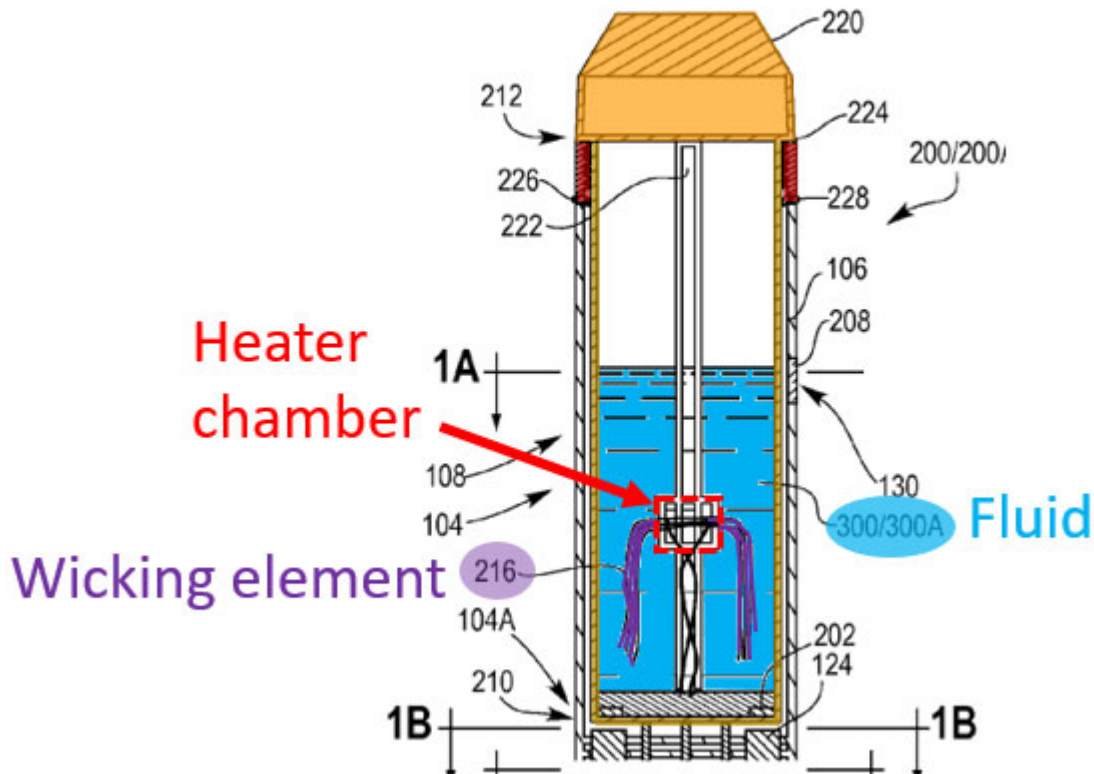
- e. [1.E] [a cartridge comprising] a heater chamber comprising a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an aerosol comprising the vaporizable material and air passing along an airflow path; and

99. Verleur renders obvious a *cartridge comprising a heater chamber comprising a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an*

aerosol comprising the vaporizable material and air passing along an airflow path.

100. Verleur discloses that the cartomizer (cartridge) includes both a heating element 214 and a wicking element 216 to facilitate vaporization of fluid 300A. Verleur further discloses that the heating element receives electrical current via circuitry that is in electrical communication with electrical contacts, which connect to pins 122. For example, Verleur discloses that “[i]n order to vaporize fluid 300A, a heating element 214 and a wicking element 216 may be provided within cartomizer body 208,” and further discloses that “[a]n electrical current may be transmitted to the heating element 214 through electrical circuitry in electrical communication with electrical contacts, which contact pins 122.” [Verleur (Ex. 1005), [0039]; Verleur-Prov (Ex. 1006), [0030]].
101. A POSA would have understood that Verleur discloses a heater chamber having a heating element and that wicking element 216 draws liquid into the heater chamber. Exemplary embodiments of Verleur’s heater chamber are illustrated in Figures 4, 5, 12, and 15, which depict a wick extending from an enclosed area (chamber). Fluid in the liquid storage compartment is drawn into that chamber by a wick, employing capillary action to draw the liquid into the heater chamber, which is the box shown below in annotated Figure

1. Capillary action is a physical effect wherein liquid flows through a narrow space, such as the fibers of a wick, without external forces applied to the fluid.

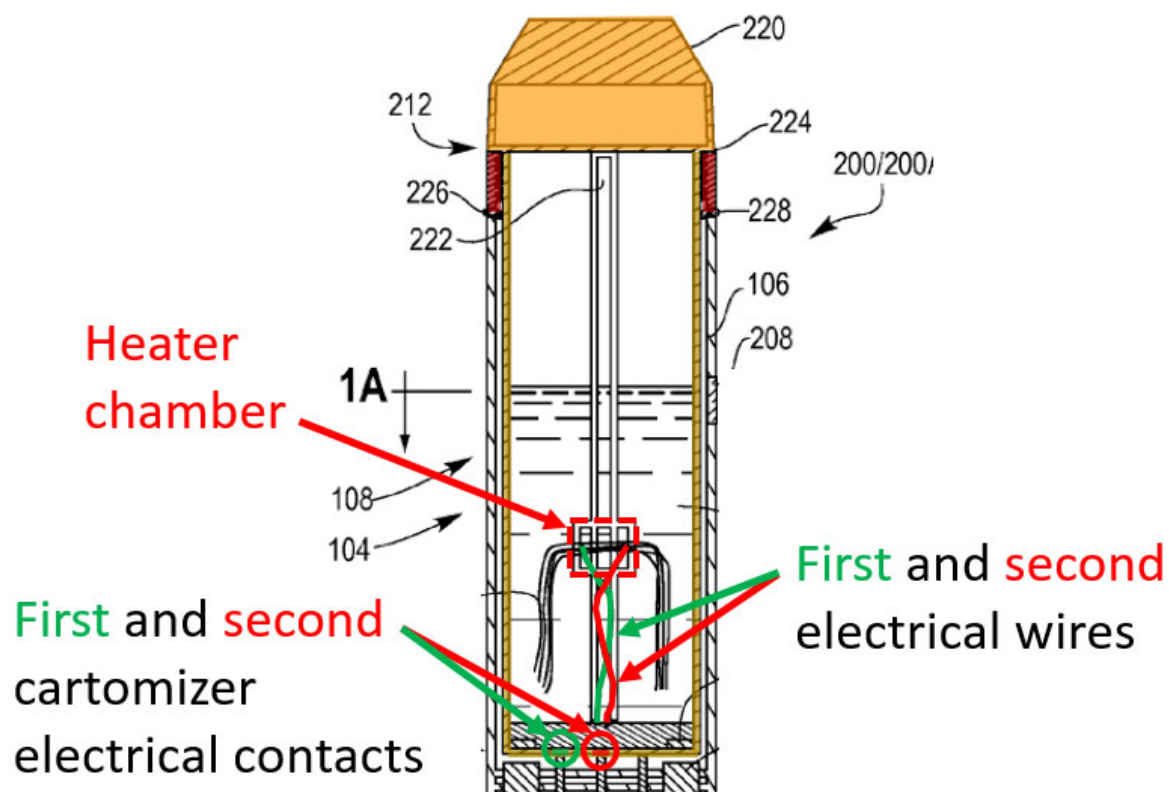


Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

102. Once the liquid is absorbed into the wick via capillary action, it is then transported to the vicinity of the heating element 214. When electrical current is supplied to the heating element through wires connected to the electrical contacts 218, which are connected to the battery via pins 122, the element heats up. This heat vaporizes the liquid that has been drawn into the

chamber by the wick. The use of capillary action in the wicking element ensures a consistent and efficient transfer of the liquid to the heating source, enabling continuous vapor production and the effective functioning of Verleur's vaporizer.

103. I have added annotations to Verleur's Figure 1 below to show the electrical wires that connect the heating element to electrical contacts 218 (which are connected to the battery portion via pins 122). [Verleur (Ex. 1005), [0033], Figs. 1, 1B, 1C; *see also* Verleur-Prov (Ex. 1006) [0025], Figs. 1, 1B, 1C]. While I have only annotated two electrical wires and identified two electrical contacts in the annotated figure below, Verleur discloses three connections between the cartomizer and the cartridge – “one for establishing positive current connection, one for establishing a negative current connection, and one for establishing a ground current connection.” [Verleur (Ex., 1005), [0033]; *see also* Verleur (Ex. 1005), [0034] (“In one embodiment, connector 120 includes three pins 122: a positive pin, a ground pin, and a controlling pin. A controlling pin may also serve a dual function in that communication between a sensor 260 may also occur through a controlling pin 122. Other known or to be developed devices or connectors are contemplated within the disclosure for establishing an electrical current between PCB 112 and cartomizer 200.”); *see also* Verleur-Prov (Ex. 1006) [0025]].



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

104. I note that Verleur does not disclose the specific structure of the heating element 214 with respect to the fluid embodiment of Fig. 1. However, it would have been obvious to a POSA to use a *resistive* heating element. Verleur discloses that “electrical current is transmitted to the heating element 214,” which would motivate a POSA to use a resistive heating element that operates by passing current through it. A POSA would have

understood that when current is passed through a resistive heating element heat is generated due to the element's electrical resistance.

105. As of 2014, the use of resistive heating elements in electronic vaporizers was not only common but also represented a well-established practice in the industry. This is evidenced by multiple references, such as Thorens 379, which describes an e-cigarette employing a heating element made from an electrically resistive material. [Thorens 379 (Ex. 1007), [0010]]. Thorens 933 and Worm 041 also describe the use of resistive heating elements, like coil heaters, in direct contact with capillary wicks. Thorens 933 (Ex. 1008), [0053], [0074] (“The heater is in the form of a resistive heating element, such as a coil heater, in contact with the capillary wick.”); Worm 041 (Ex. 1030), [0013] (“The heating member can specifically be a resistance wire that generates heat as an electrical current passes therethrough.”), [0087]; *see also, e.g.*, Plojoux 899 (Ex. 1031), 3:53-54; Counts 594 (Ex. 1014), 3:34-35; Pan 622 (Ex. 1010), 2:57-60].
106. There are several factors that contributed to the widespread adoption of resistive heating elements in vaporizers: First, as Thorens 379 notes, resistive heating elements allow for precise control over operating temperatures. This precision is crucial in preventing the degradation of vaporizable liquids and the associated wicks, as overheating can lead to

undesirable chemical changes in the substance being vaporized and damage the wicks.

107. Second, resistive heating elements have a rapid response time that minimizes the lag between the activation of the vaporizer and the production of aerosol. This rapid response is emphasized as a benefit in Worm 041 and Thorens 379, pointing out that resistive elements, due to their low mass and moderate resistivity, can quickly heat and cool, thereby efficiently utilizing energy and preventing waste of the vaporizable substance. [Worm 041 (Ex. 1030), [0013] (“In certain embodiments, the electrical heating member is a resistance heating element. Useful heating elements can be those having low mass, low density, and moderate resistivity and that are thermally stable at the temperatures experienced during use. Useful 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. Rapid cooling prevents substantial volatilization (and hence waste) of the aerosol-forming substance during periods when aerosol formation is not desired. Such heating elements also permit relatively precise control of the temperature range experienced by the aerosol forming substance, especially when time based current control is employed.”); Thorens 379 (Ex. 1007), [0051] (“The arrangement shown in the Figures can

operate within this temperature range, and may also provide a rapid response time (time between the user puffing on the system and the aerosol entering the user's mouth from the air outlet this may be referred to as “time to puff) of between about 10 and about 500 milliseconds, ms.”)].

108. Third, resistive heating elements are efficient in converting electrical energy into heat. This efficiency is vital for portable devices like vaporizers, where battery life is a key consideration.
109. Fourth, resistive heating elements are simple and reliable. The design of resistive heating elements is straightforward, involving few components that could potentially fail. This simplicity translates to lower manufacturing costs and enhanced reliability, making them a popular choice for mass-produced devices.
110. Fifth, resistive heating elements are also easy to implement into e-cigarette devices. Given Verleur’s disclosure of an electrical current passing through a heating element, it would have been a routine and logical step for a POSA to implement a resistive heating element in modifying Verleur’s design, and a POSA would have had a reasonable expectation of success in doing so.
111. Sixth, resistive heating elements can promote effective aerosol generation. Verleur’s disclosure that the heating element vaporizes liquid to generate an aerosol aligns well with the capabilities of resistive heating elements. Upon

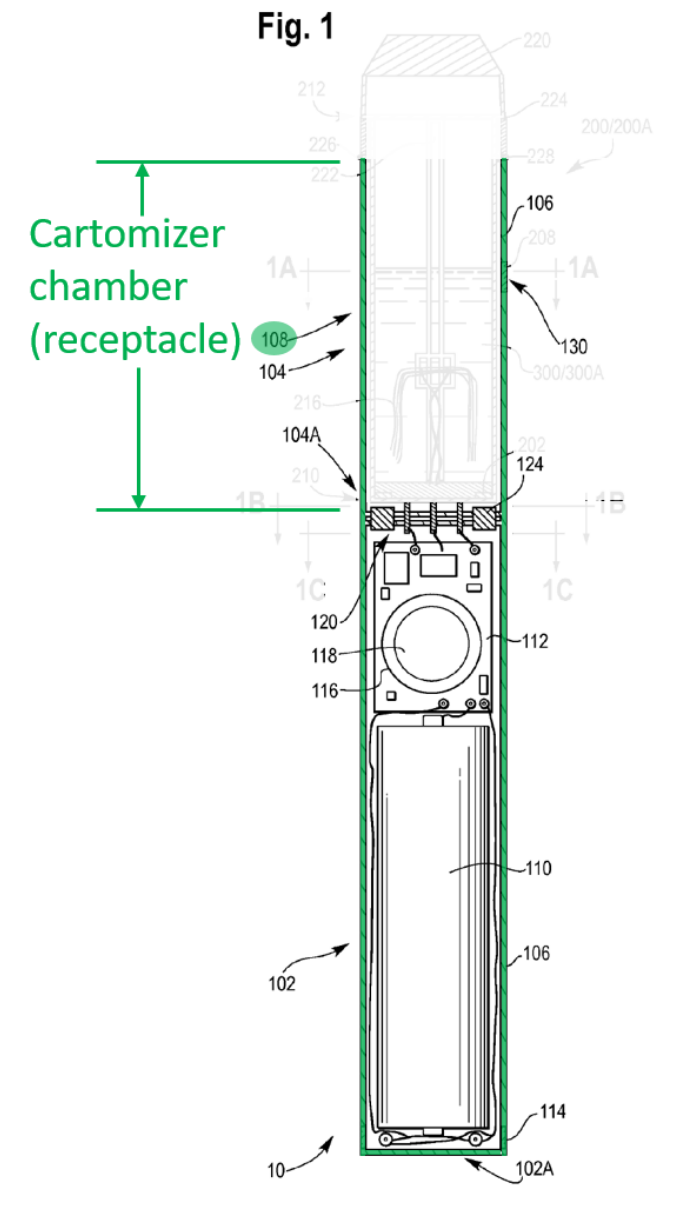
reaching the optimal vaporizing temperature, the liquid quickly transforms into a vapor that mixes with the air flow to produce an aerosol that the user can inhale through a mouthpiece. This process is facilitated by the rapid heating characteristic of resistive elements, ensuring that the vapor is generated quickly.

112. Thus, a POSA would have recognized the benefits of using a resistive heating element in an electronic vaporizer like Verleur, considering its efficiency, response time, simplicity, and compatibility with the requirements of effective vaporization. The industry's prevalent use of such elements at the time further supports this choice as a standard and expected practice.

f. [1.F] a body comprising a receptacle configured to insertably receive and couple to the cartridge,

113. Verleur discloses *a body comprising a receptacle configured to insertably receive and couple to the cartridge.*
114. Verleur discloses a battery portion (body) comprising a battery segment and a cartomizer receiving segment. Verleur's cartomizer receiving segment 104 has a cartomizer chamber 108 (receptacle) for receiving cartomizer 200 (cartridge). [Verleur (Ex. 1005), [0030] ("The battery portion may include a battery housing segment 102 provided proximate to the first end 102A of the battery portion, and a second cartomizer receiving segment 104 provided

proximate a second end 104A of the battery portion.... A cartomizer chamber 108 may be provided within at least a portion of cartomizer receiving segment 104. A cartomizer 200 may be insertable into the cartomizer chamber 108....”); *see also* Verleur-Prov (Ex. 1006), [0022]]. I have annotated cartomizer chamber 108 in Verleur Figure 1 below.



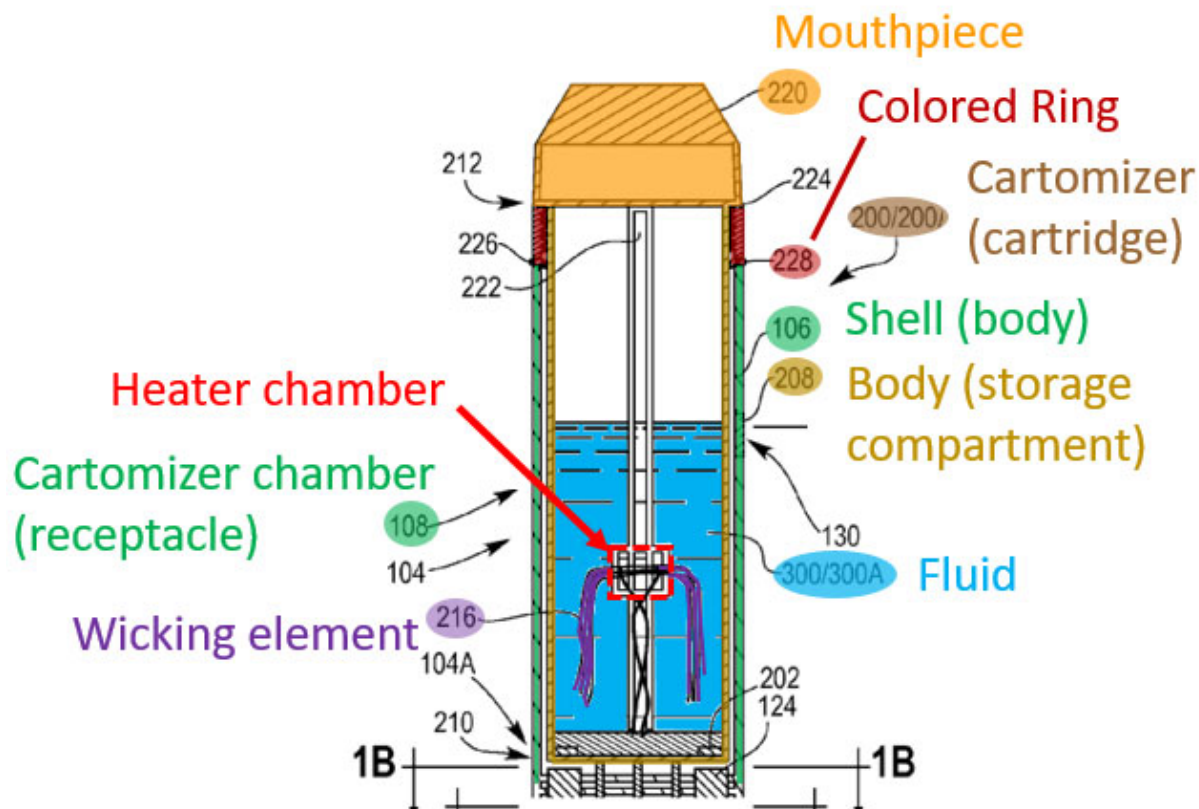
Verleur (Ex. 1005), Figure 1 (modified, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

115. The cartomizer chamber 108 (receptacle) is configured to couple to the cartomizer both mechanically and electrically. First, the cartomizer chamber is configured to magnetically couple to cartomizer 200 (cartridge). Verleur discloses that the “cartomizer is securable within the chamber as a cartomizer surface and a magnetically attracted chamber surface are placed adjacent to one another.” [Verleur (Ex. 1005), [0005]]. The cartomizer chamber 108 (receptacle) is also configured to electrically couple to cartomizer 200 (cartridge). As I have noted elsewhere, Verleur discloses pins (battery electrical contacts) provided at a base end of the chamber that are configured to couple to contacts provided on the cartomizer in order to transmit electrical current and/or signals to the cartomizer. [Verleur (Ex. 1005), [0028]; *see also* Verleur-Prov (Ex. 1006), [0022], [0025], [0027], [0028]].

g. [1.G] wherein the heater chamber [of the cartridge] is disposed within the receptacle [of the body] when the receptacle insertably receives and couples to the cartridge,

116. Verleur discloses *the heater chamber [of the cartridge] is disposed within the receptacle [of the body] when the receptacle insertably receives and couples to the cartridge.*

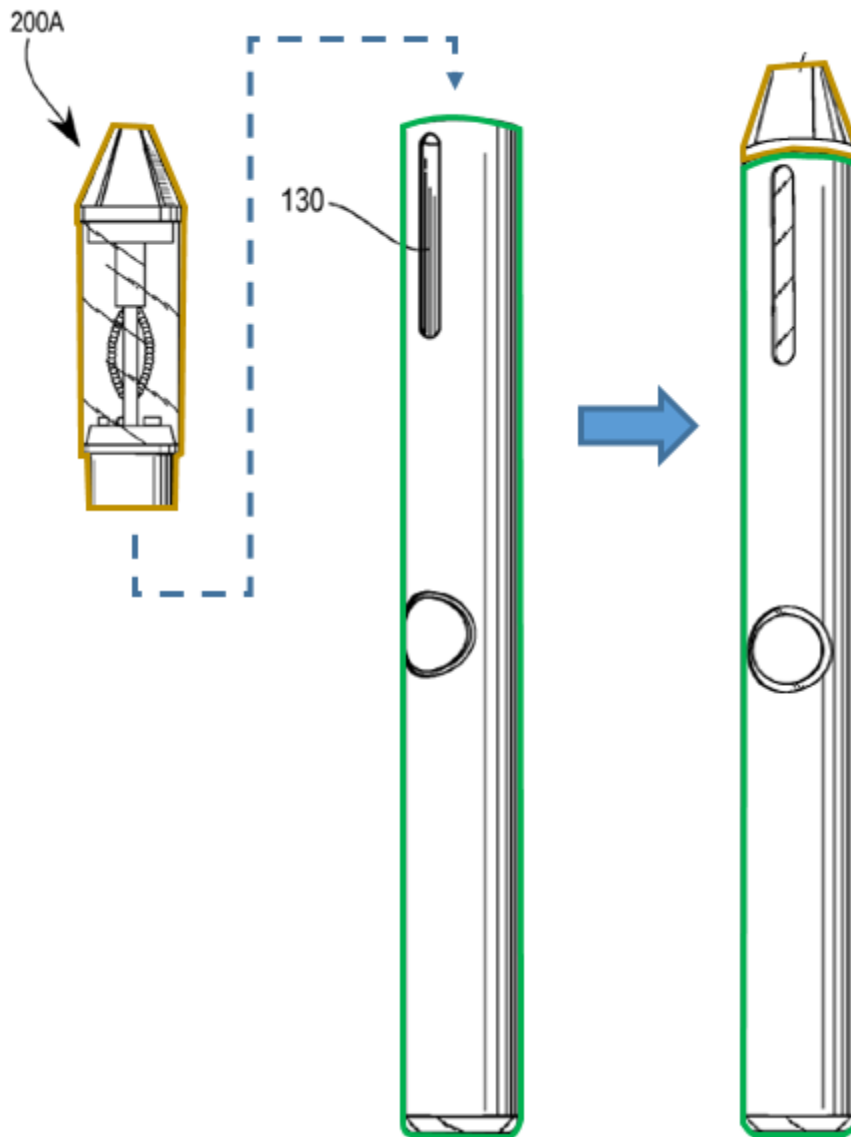
117. As I described above with respect to limitation [1.E], Verleur discloses a cartomizer (cartridge) having a heater chamber including heating element 214. As can be clearly seen from annotated Figure 1 below, the heater chamber in the cartomizer is disposed within cartomizer chamber 108 when the cartomizer is inserted into cartomizer chamber 108 (receptacle) of Verleur's shell, such that the cartomizer is protected by the receptacle of the shell. [Verleur (Ex. 1005), [0030] ("A cartomizer 200 may be insertable into the cartomizer chamber 108 in accordance with embodiments of the disclosure. Shell 106 may cover cartomizer chamber 108 thereby protecting an inserted or received cartomizer 200."); *see also* Verleur-Prov (Ex. 1006), [0022]].



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

118. Figure 4 illustrates an embodiment of the electronic cigarette 10 of Verleur.

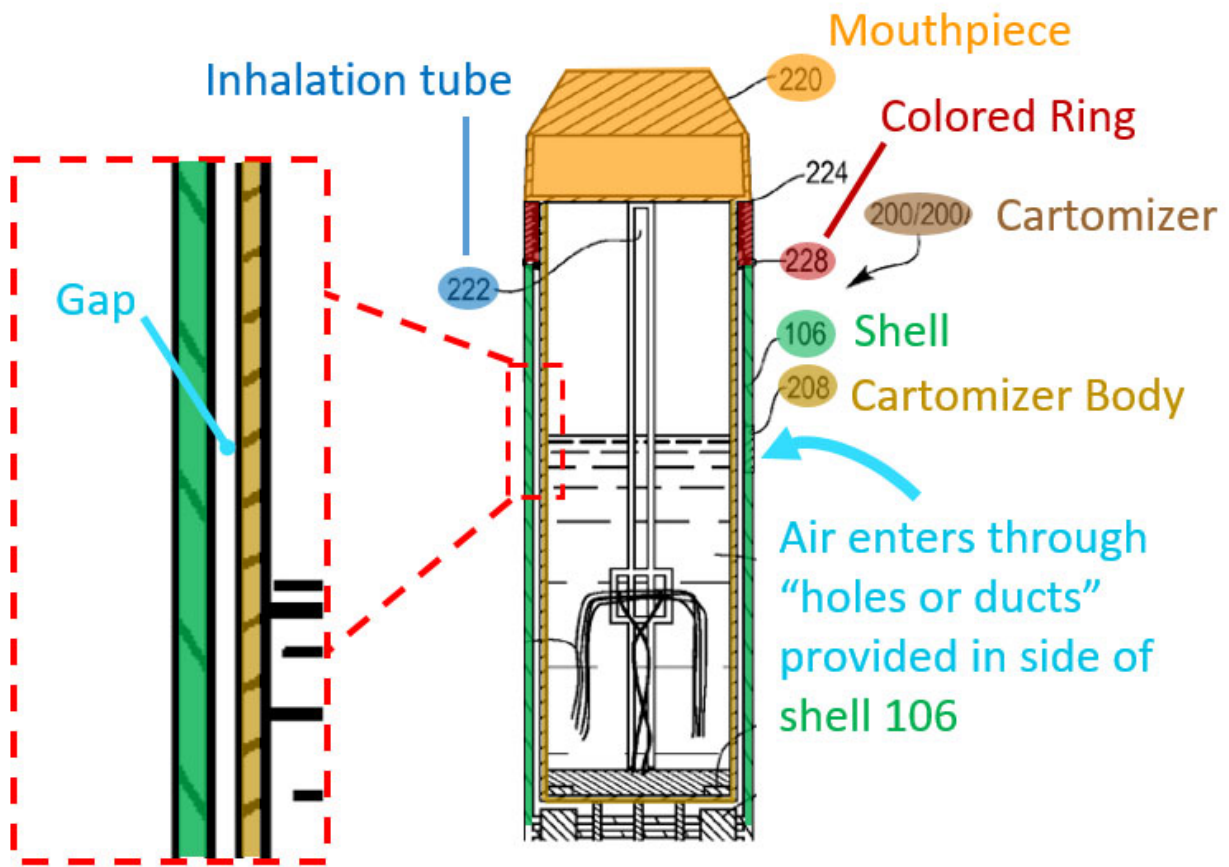
In the annotated figure below, I illustrate how cartomizer 200A (cartridge) is inserted into cartomizer chamber 108 (receptacle) of shell 106 (body) to form the complete apparatus.



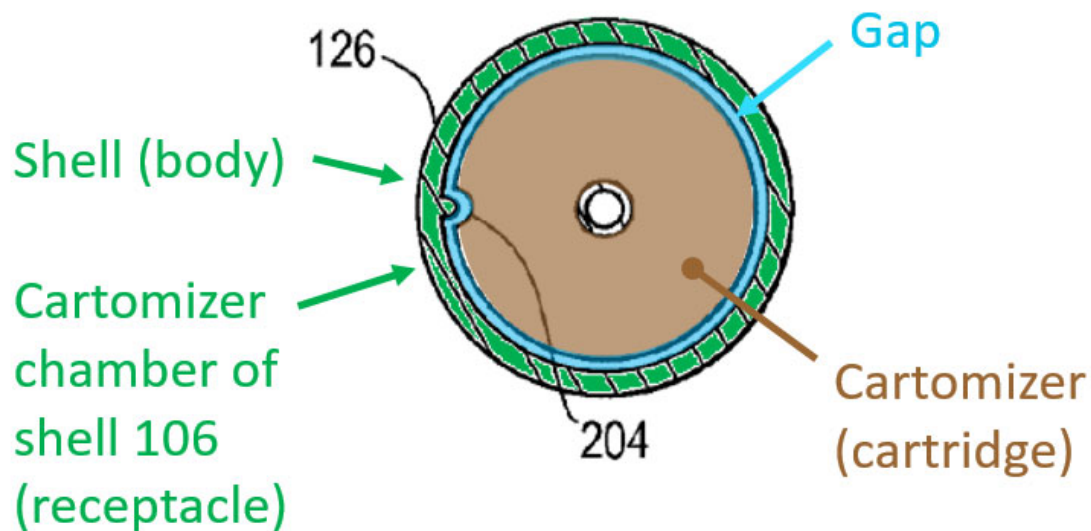
Verleur (Ex. 1005), Figure 4 (annotated); *see also* Verleur-Prov (Ex. 1006), Figure 4

- h. [1.H] wherein the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge,

119. Verleur discloses *the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge.*
120. Verleur discloses two distinct embodiments of a vaporizer. The first embodiment is designed for vaporizing fluid, which is depicted in Figure 1, while the second focuses on heating solid matter, which is illustrated in Figure 2.
121. In the fluid vaporization embodiment, Verleur details a specific airflow mechanism within the apparatus. Air is drawn in from outside the device, up through the heater chamber, continues along the inhalation tube 222, and exits the apparatus at mouthpiece 220. This airflow is facilitated by holes or ducts located in the outer shell of the battery portion (body) of the device. These holes or ducts, as described in Verleur, are placed to allow air to flow through the cartomizer body 208. As shown below in annotated versions of Figure 1 and 1A, Verleur also provides a depiction of a gap between the cartomizer 200/200A and the outer shell 106 in Figures 1 and 1A.

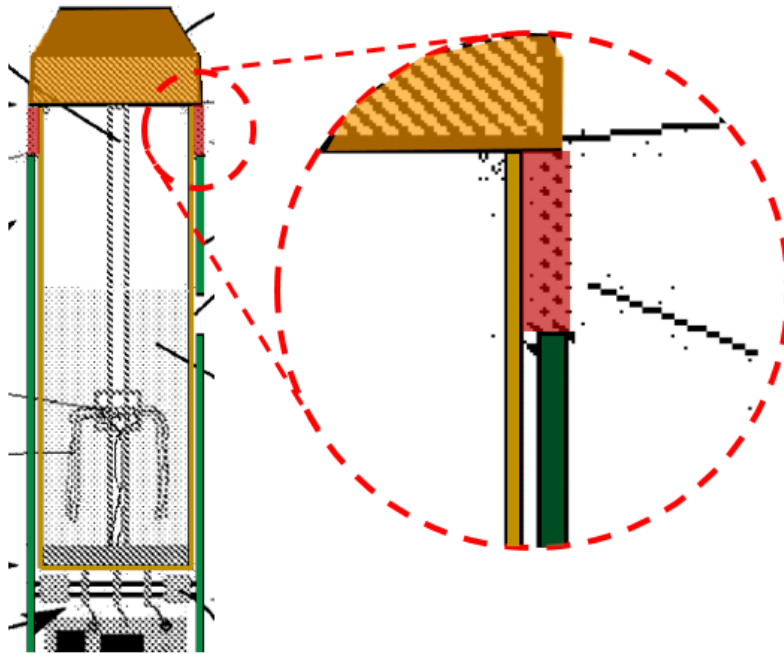


Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

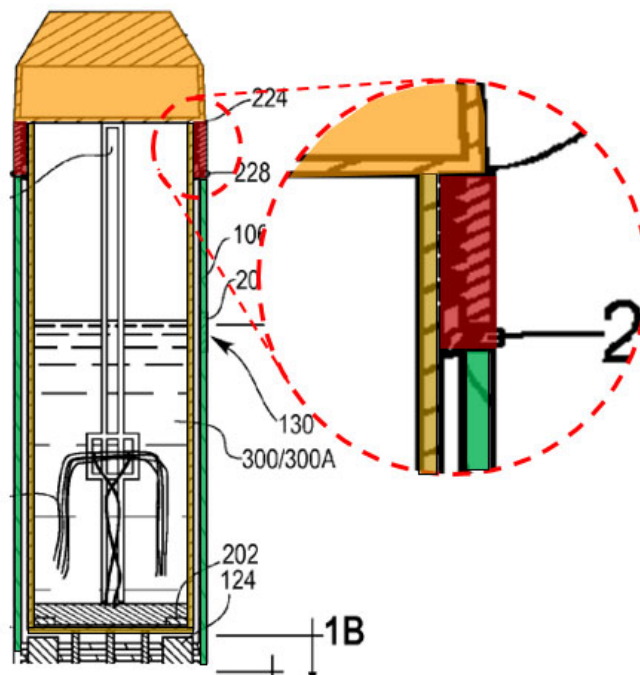


Verleur (Ex. 1005), Figure 1A (annotated); *see also* Verleur-Prov (Ex. 1006), Figure 1A

122. Notably, the gap between outer shell 106 and cartomizer 200/200A extends the entire length of the receptacle of the outer shell 106. As shown below in annotated versions of Verleur Figure 1 and Verleur-Prov Figure 1, that gap extends to the distal end of colored ring 228, which is a component provided on the cartomizer (cartridge). [Verleur (Ex. 1005), [0040]; Verleur-Prov (Ex. 1006), [0031]]. Therefore, the gap extends the entire length of the portion of the cartomizer (cartridge) that is inserted into the cartomizer chamber (receptacle) of the shell.

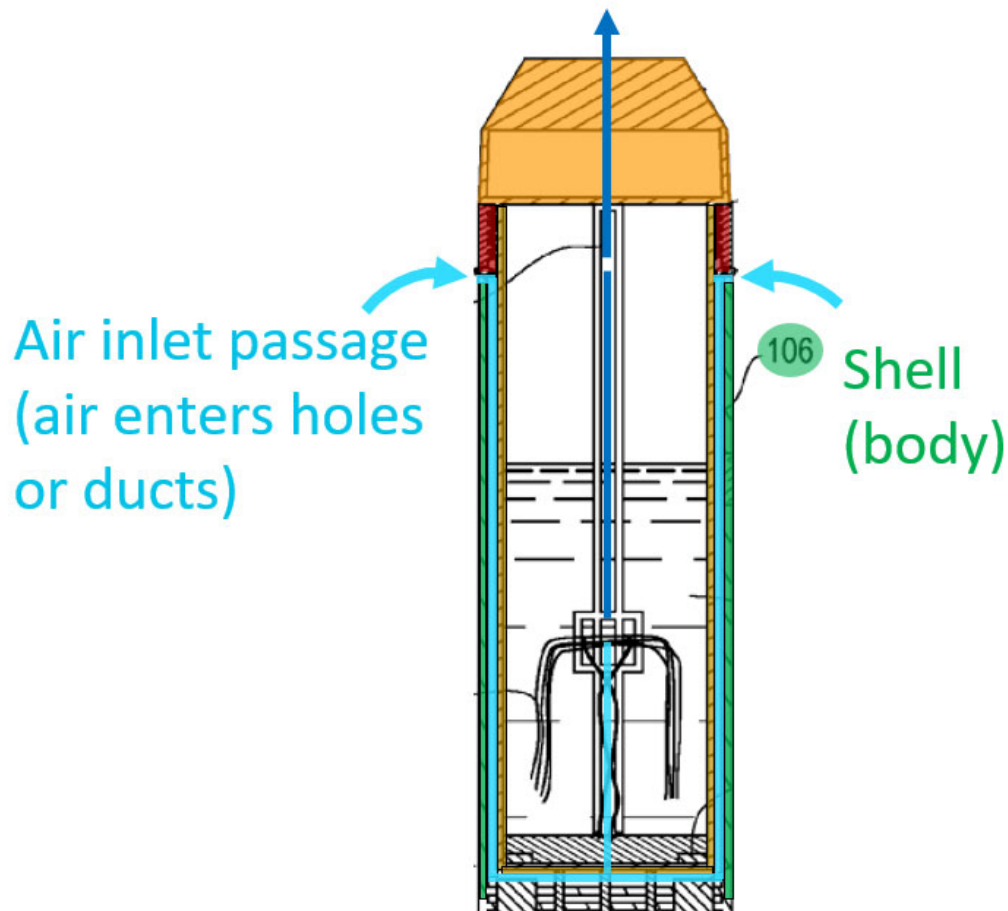


Verleur-Prov (Ex. 1006), Figure 1 (partial, annotated)



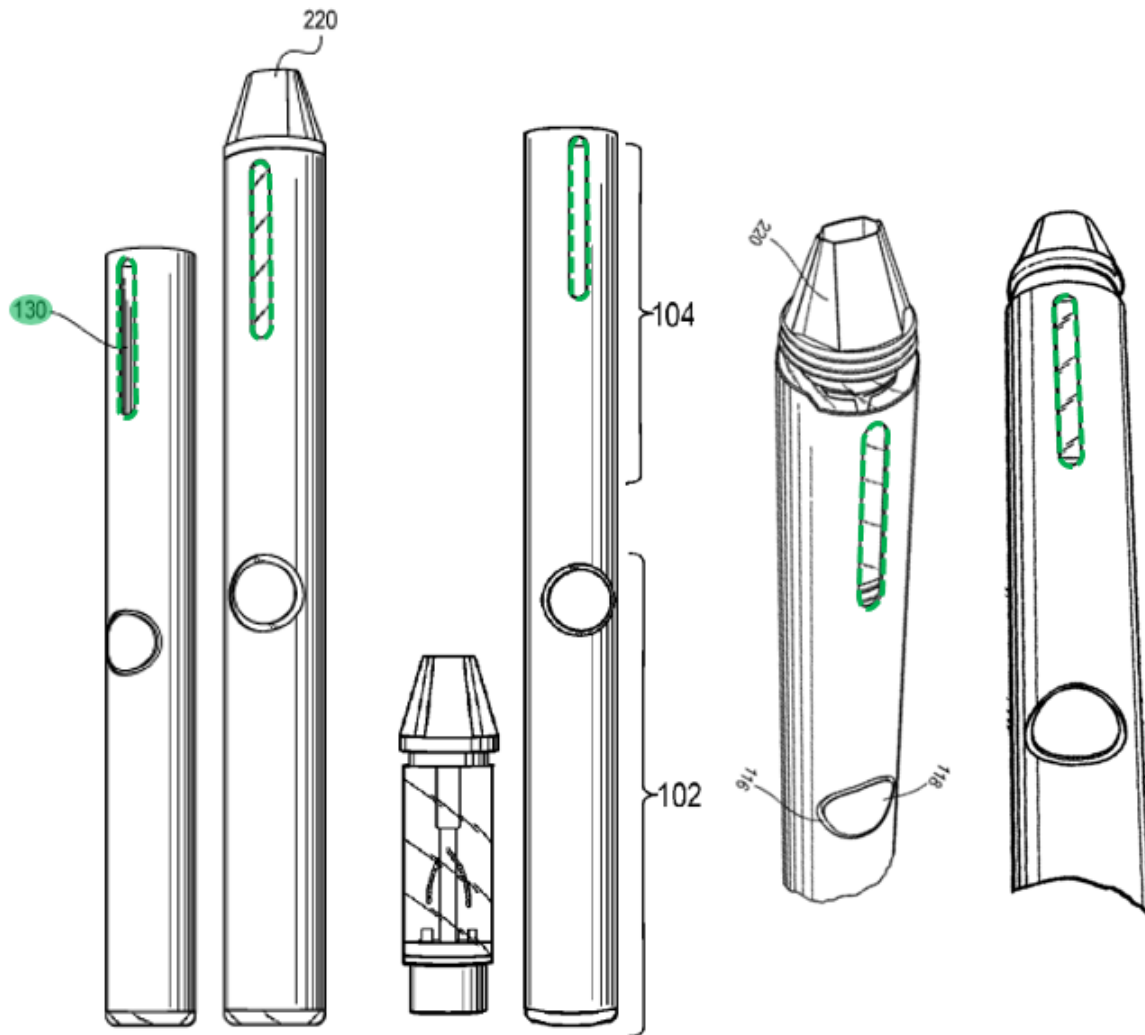
Verleur (Ex. 1005), Figure 1 (partial, annotated)

123. A POSA would understand that due to the gap extending along the entire interface between the cartomizer and the shell, the holes or ducts could be located anywhere along the outer shell. As illustrated below, the gap (in **blue**) forms an air inlet passage having a first side formed by an exterior surface of the cartridge (in **brown**) and a second side formed by an internal surface of the receptacle (in **green**) when the receptacle insertably receives and couples to the cartridge.



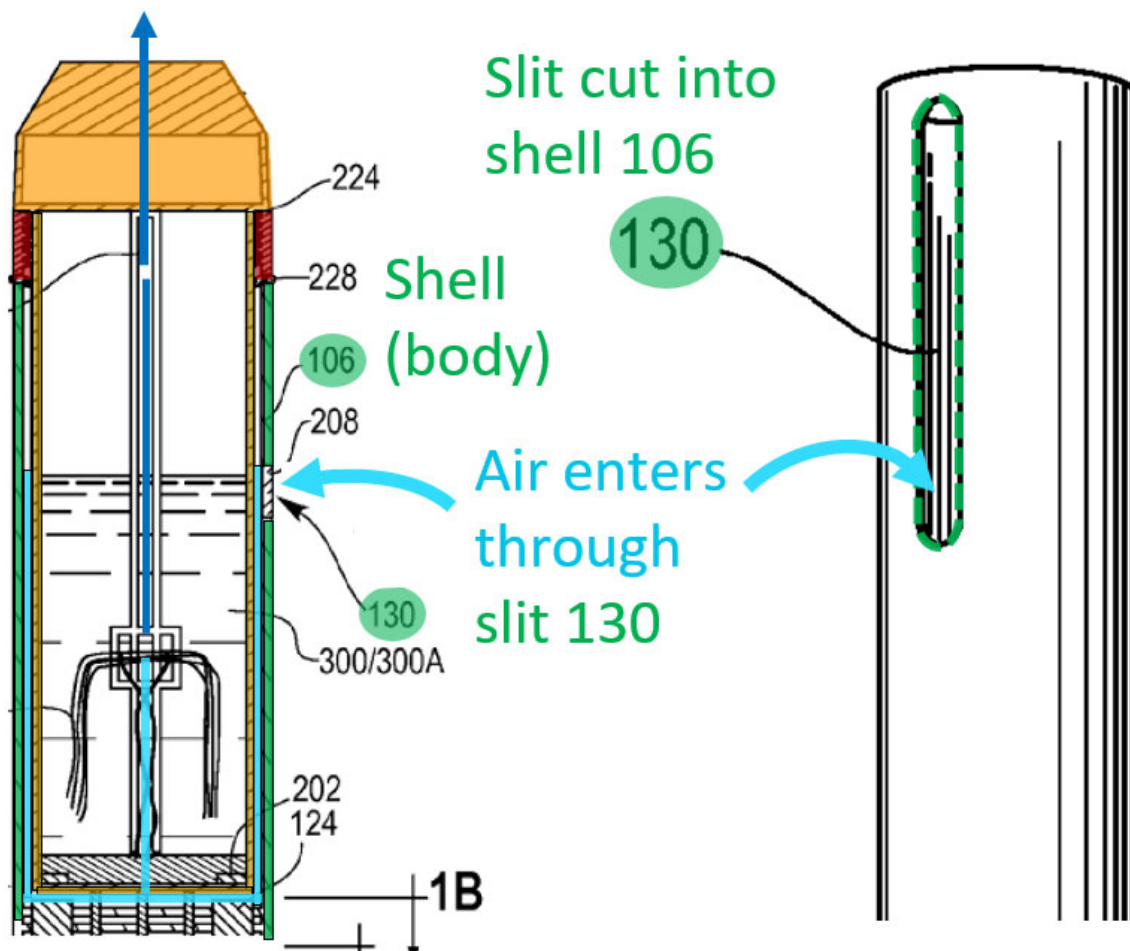
Verleur (Ex. 1005), Figure 1 (partial, modified to show example of possible air inlet location, annotated); *see also* Verleur-Prov (Ex. 1006), Figure 1

124. Additionally, Figures 4, 5, 6, and 7 of the Verleur patent shows slits through the outer shell 106 to permit a view of the cartridge inserted within. This slit, as described, may serve as a window made from a translucent material like glass or clear plastic, offering visibility of the internal components of the battery portion. Even when window 130 comprises glass or plastic, a hole or duct would still need to be provided elsewhere in the shell to permit air into the gap between the cartomizer and outer shell. [Verleur (Ex. 1005), [0039] *see also* Verleur-Prov (Ex. 1006) [0030]]. Alternatively, the window may not be made of any solid material; it may simply be a slit cut into the shell. [Verleur (Ex. 1005), [0037] (“One or more windows 130 may be provided in outer shell 106 (see FIG. 1). Windows 130 may be made of a translucent material, such as glass or substantially clear plastic, in order to view internal components of battery portion 100. Window 130 may also be a slit cut into shell 106.”); *see also* Verleur-Prov (Ex. 1006), [0028], Figure 1]. Annotated versions of these figures highlighting the slits are provided below.

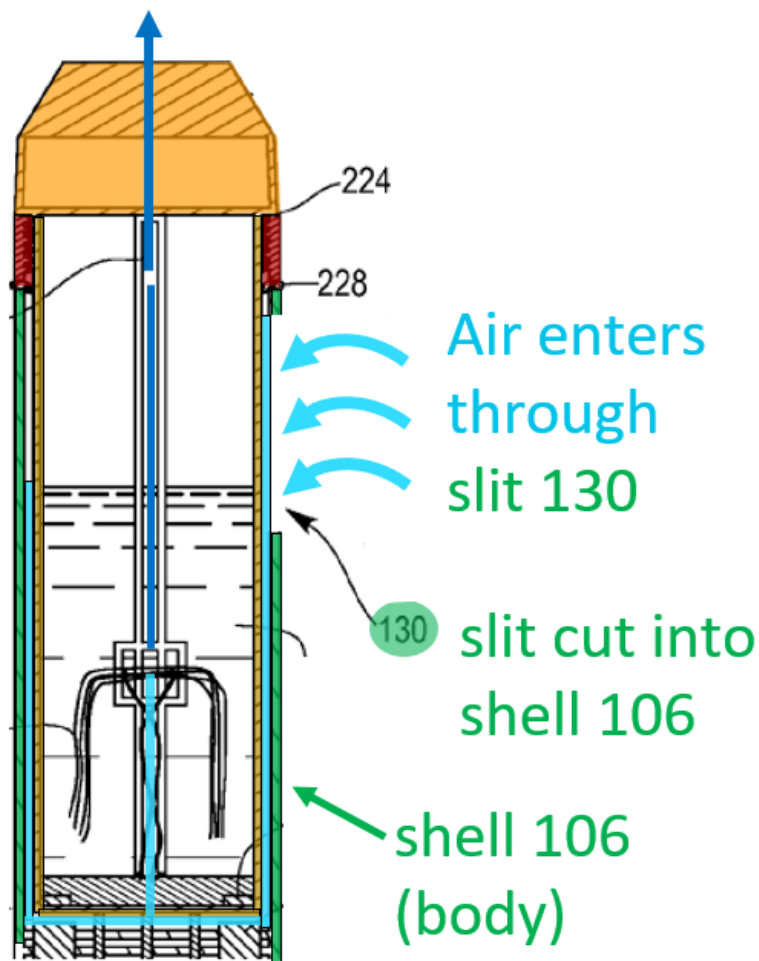


Verleur (Ex. 1005), Figures 4-7 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figures 4-7

125. Furthermore, the slit could also function as an air entry point into the gap between the cartomizer and the shell, contributing to the airflow into the cartomizer body. In the case of a slit, air would enter the gap between the cartomizer and the shell and travel into the cartomizer body. The annotated versions of Figures 1 and 4 below indicate the air flow paths through the slit windows.

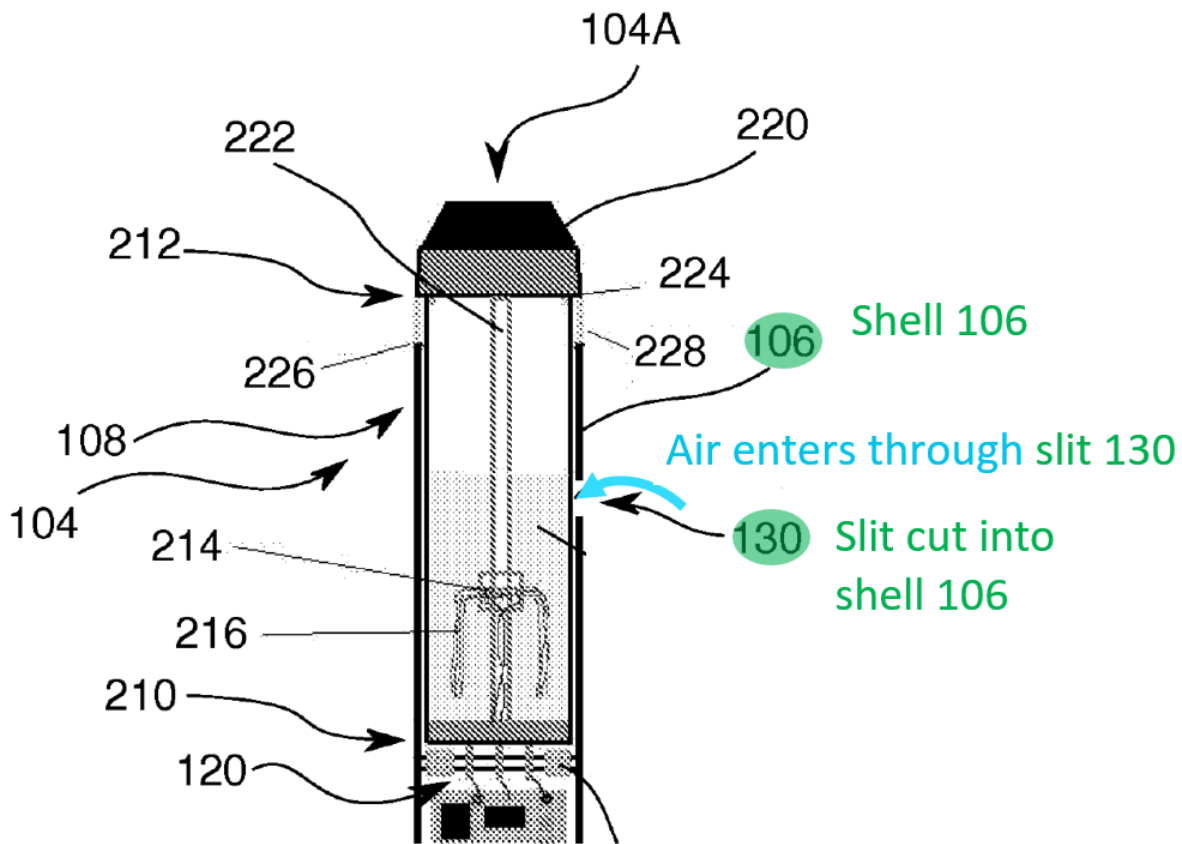


Verleur (Ex. 1005), Figures 1, 4 (partial, annotated) *see also*
 Verleur-Prov (Ex. 1006), Figures 1, 4



Verleur (Ex. 1005), Figure 1 (edited to illustrate a larger slit in the shell that roughly matches Fig. 4, partial, annotated); *see also* Verleur-Prov (Ex. 1006), Figure 1

126. As shown below, Verleur-Prov also shows window 130 as a slit, in which air would enter the gap between the cartomizer and the shell and travel into the cartomizer body.



Verleur-Prov (Ex. 1006), Figure 1 (partial, annotated)

127. It is important to note that my analysis does not focus on the solid matter embodiment of Verleur's design. This second embodiment, as shown in Figure 2, differs significantly in its air intake mechanism. It features holes 252 that align with corresponding holes on the outer shell to facilitate air access. This embodiment does not have the same considerations regarding potential leakage as the first embodiment, which handles liquid. In the fluid embodiment, the positioning of the inlet holes is crucial, especially considering that the liquid tends to move towards the distal end of the cartomizer under gravity, when held in an upright position. Placing an inlet

hole at the distal end of the receptacle increases the risk of leakage, a concern absent in the solid matter embodiment.

i. [1.I] wherein the air inlet passage is configured to deliver the air to the heater chamber; and

128. Verleur discloses *the air inlet passage is configured to deliver the air to the heater chamber.*

129. As I described above with respect to limitation [1.h], Verleur discloses an air inlet passage. When a user inhales through mouthpiece 220 of the vaporizer, a specific airflow process is initiated. Air enters the device through various openings in the outer shell 106 - these could be holes, ducts, or window slits. Once inside, the air moves over the heating element 214 located within the heater chamber. This action heats the air, which then picks up vapor from the heated fluid. The resulting aerosol continues through the inhalation tube 222 and ultimately exits the device via the mouthpiece 220. This inhalation process not only facilitates the vaporization of the fluid 300A but also ensures that the vaporized fluid is efficiently delivered to the user. The inhalation tube 222 is in direct fluid connection with both the heating element 214 and the wicking element 216, ensuring a seamless transition from vapor generation to inhalation. Additionally, the inhalation tube's connection to the various air entry points on the outer shell 106 is crucial for maintaining a consistent and smooth airflow through the cartomizer body

208. [Verleur (Ex. 1005), [0039] (“Once fluid 300A is heated to an optimal vaporizing temperature, the user may inhale the vaporized fluid 300A through a mouthpiece 220 provided on body 208 at or proximate to mouthpiece end 212. The vaporized fluid may travel through an inhalation tube 222 in fluid connection with heating element 214 and wick 216. Inhalation tube 222 may also be in fluid communication with one or more holes or ducts provided, for instance, in sides of outer shell 106 in order to permit air flow through cartomizer body 208.”); see also Verleur-Prov (Ex. 1006) [0030]]. This design element is vital for the effective functioning of the vaporizer, allowing for the optimal vaporizing temperature and the subsequent inhalation of the vaporized fluid. Accordingly, the air inlet passage is configured to deliver the air to the heater chamber.

j. [1.J] a fluid connection in the cartridge, the fluid connection connecting the heater chamber and the mouthpiece.

130. Verleur discloses *a fluid connection in the cartridge, the fluid connection connecting the heater chamber and the mouthpiece.*
131. As discussed above in connection with [1.I], Verleur discloses that inhalation tube 222 in body 208 fluidly connects heating element 214 (within the heater chamber) with mouthpiece 220. [Verleur (Ex. 1005), [0039] (“Once fluid 300A is heated to an optimal vaporizing temperature,

the user may inhale the vaporized fluid 300A through a mouthpiece 220 provided on body 208 at or proximate to mouthpiece end 212. The vaporized fluid may travel through an inhalation tube 222 in fluid connection with heating element 214 and wick 216.”); *see also* Verleur-Prov (Ex. 1006) [0030]].

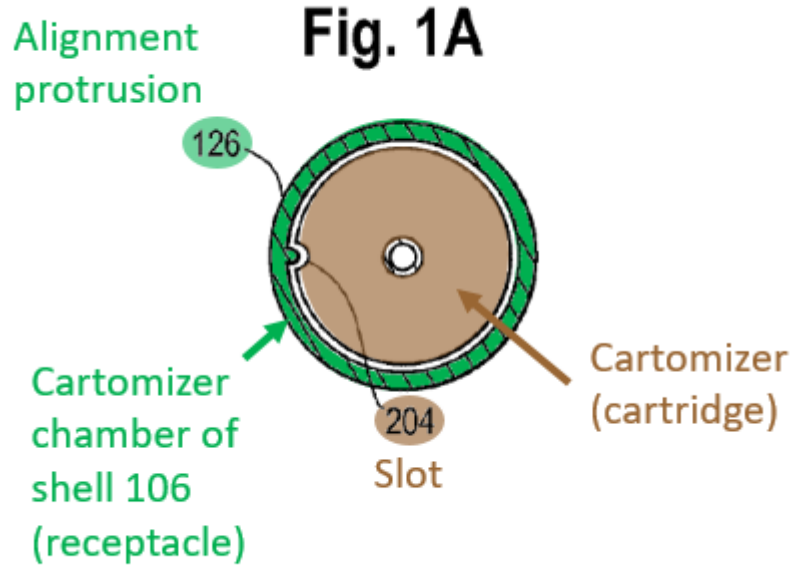
132. Since Verleur explicitly discloses limitations [1.A] – [1.D] and [1.F] – [1.J], and renders obvious limitation [1.E], it is my opinion that claim 1 of the ’173 patent is invalid as obvious.

2. Claim 2: The apparatus of claim 1, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.

133. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. Verleur further discloses *the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.*
134. Verleur discloses an alignment mechanism between the cartomizer (cartridge) and the cartomizer receiving segment of the battery portion. This mechanism comprises an alignment protrusion on the cartomizer designed to correspond with a slot on the receiving segment. [Verleur (Ex. 1005), [0036]

(“In another embodiment, a slit, crevice, or cutout may be provided on a portion of shell 106, with a matching protrusion provided on a portion of cartomizer 200. For instance, a cutout may be provided on an upper rim of shell 106 at cartomizer receiving segment 104, while a matching protrusion may be provided on a portion of cartomizer 200 proximate to insertion end 210, with battery portion cutout engageable with the cartomizer protrusion when the cartomizer is properly aligned so as to ensure proper orientation of cartomizer 200 within chamber 108.”).]

135. The alignment protrusion on the cartridge is disposed within the receptacle when the cartridge is inserted and is important for the correct positioning of the cartomizer within the device. As illustrated below in Figure 1A, which depicts the inverse configuration of a protrusion on the receptacle and the cutout on the cartridge, the alignment protrusion on the cartridge is disposed within the receptacle when the cartridge is inserted. [Verleur (Ex. 1005), [0036]; *see also* Verleur-Prov (Ex. 1006) [0027].]



Verleur (Ex. 1005), Figure 1 (annotated); *see also* Verleur-Prov (Ex. 1006), Figure 1

136. Although Verleur-Prov does not explicitly describe a cartridge with a protrusion extending from its exterior surface that fits within the receptacle upon insertion, such a design would have been obvious to a POSA. Both Verleur and Verleur-Prov discuss the importance of alignment features for ensuring the correct placement of the cartomizer in the receptacle. [Verleur (Ex. 1005), [0036]; Verleur-Prov (Ex. 1006) [0027].] A POSA would have recognized that there are only a finite number of ways to align and orient a cartridge within a receptacle.
137. Verleur and Verleur-Prov at Fig. 1A depict the reverse configuration (the protrusion on the receptacle and the cutout on the cartridge) of what is

required by this limitation. [Verleur (Ex. 1005), [0036] (“An alignment protrusion or peg 126 (see [*sic*] FIG. 1C) may be provided on a portion of an interior surface of chamber 108, and an alignment slit or slot 204 may be provided on a portion of cartomizer 200. Alignment protrusion 126 may be dimensioned to fit or slid along slit 204 so that cartomizer 200 may only be inserted in a particular, proper orientation”); *see also* Verleur-Prov (Ex. 1006) [0027].]

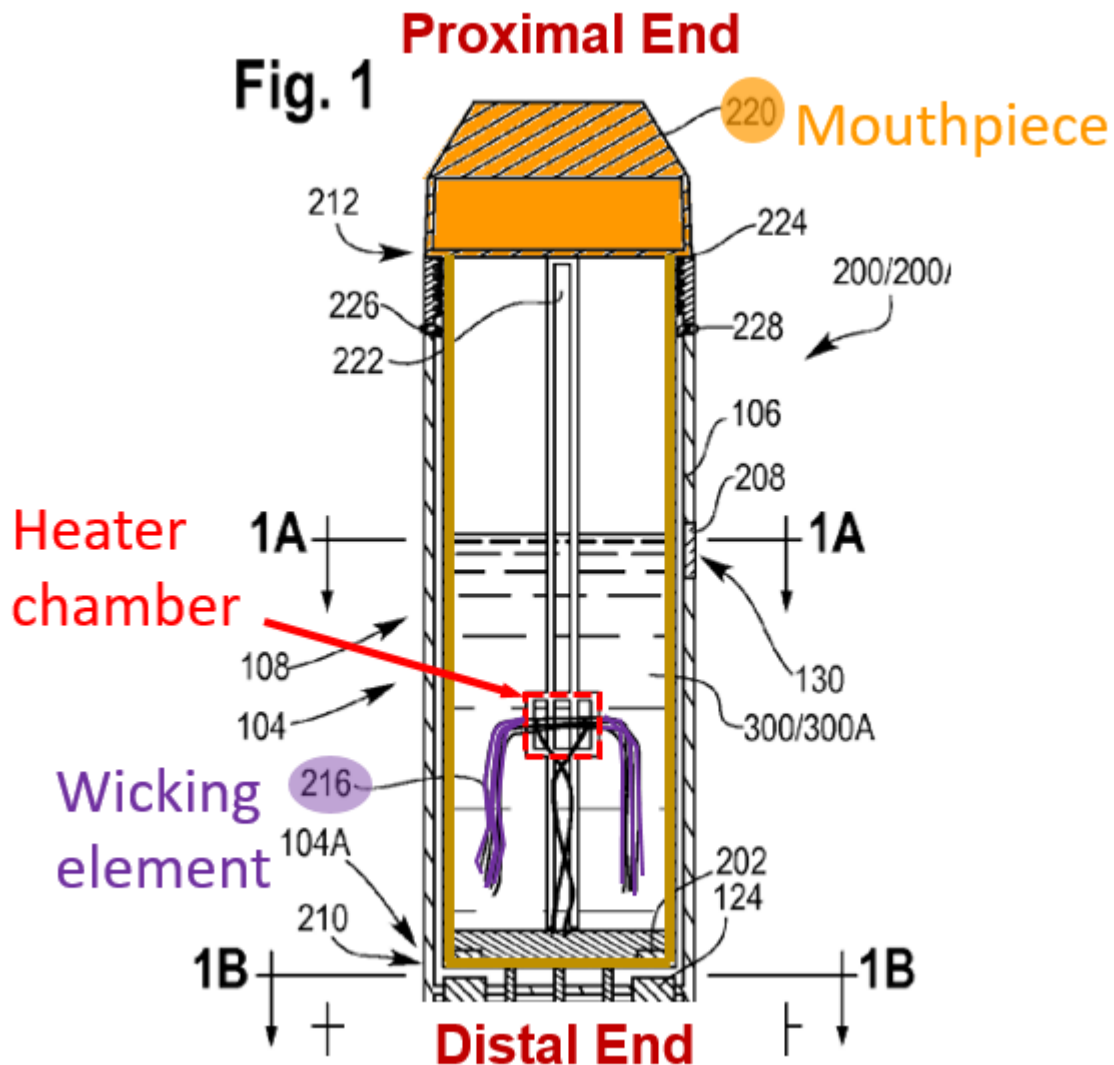
138. Verleur and Verleur-Prov show that these features, whether a protrusion on the cartridge or the receptacle, are interchangeable and represent a design choice with predictable outcomes. [Verleur-Prov (Ex. 1006), [0027]; Verleur (Ex. 1005), [0036].] A POSA would recognize that swapping the locations of the alignment protrusion and the alignment slot/slit is a straightforward design modification, one that would not affect the fundamental operation or efficiency of the device.

3. Claim 3: The apparatus of claim 1, wherein the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at the proximal end, and wherein the heater chamber is disposed proximate to the distal end.

139. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. Verleur further discloses *the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at*

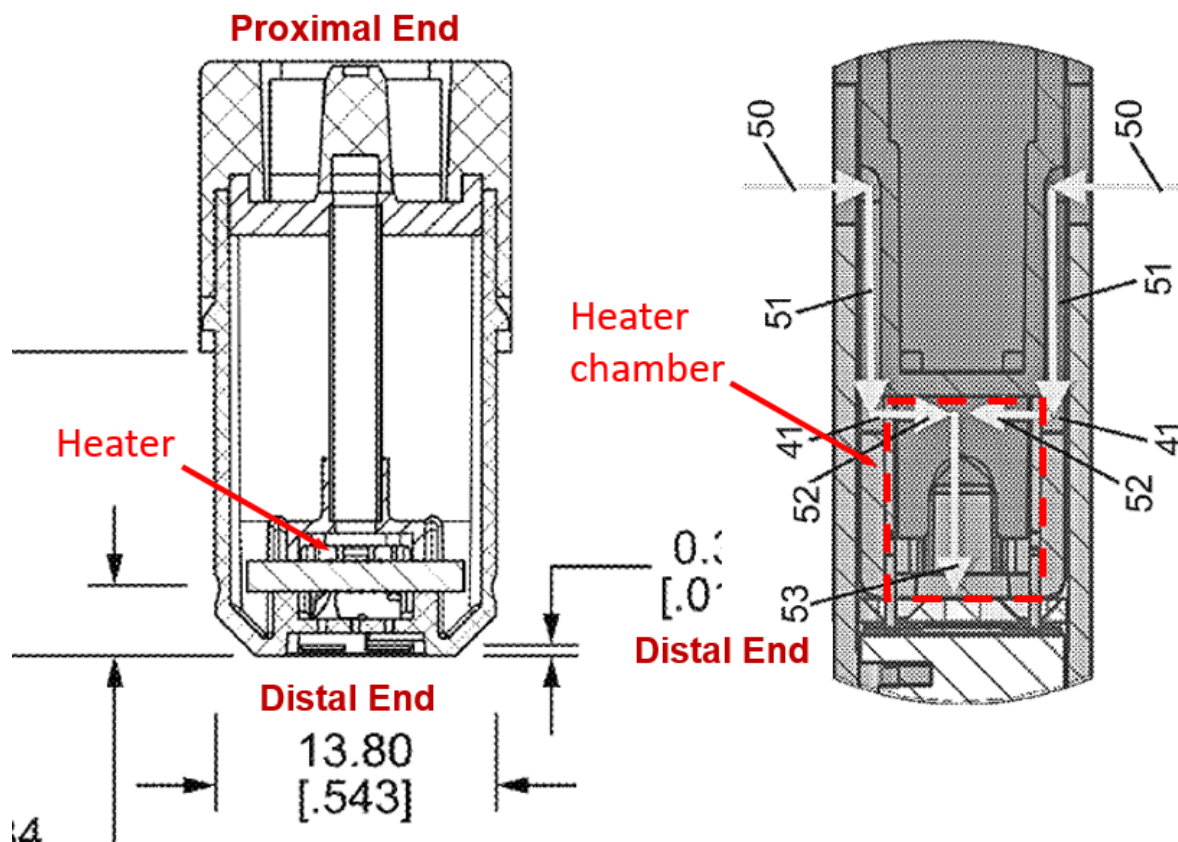
the proximal end, and wherein the heater chamber is disposed proximate to the distal end.

140. As can be seen in the annotated figure below, mouthpiece 220 is disposed at the proximate end while the heater chamber is disposed proximate to the distal end. Note that this limitation requires that the mouthpiece is ***disposed at the proximal end***, while the heater chamber must only be located ***proximate to the distal end***.



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

141. This is similar to the position of the heater chamber depicted in the '173 Patent, where the heater chamber is not *at* the distal end, but *proximate to* the distal end. Examples from the '173 patent showing locations of the heating chamber are provided below in annotated versions of Figures 26A and 10A. [See '173 Patent (Ex. 1001), Figs. 26A, 10A.].



'173 Patent (Ex. 1001), Figures 26A and 10A (annotated)

142. As shown in the annotated version of Verleur Figure 1 provided above, Verleur illustrates that the heating chamber is positioned near the distal end of the cartridge, making it proximate to this end.
143. To the extent it is argued that the heater chamber in Verleur is not sufficiently close to the distal end to meet the “proximate” requirement as stated in Claim 3, it would have been obvious for a POSA to include a heater chamber proximate to the distal end of the cartridge. By 2014, it was a well-recognized and common practice to position the heater chamber near the distal end of the cartridge, as evidenced by multiple examples in the industry, including patents such as Qiu 633 (Ex. 1015), Youm (Ex. 1020), and Yeom (Ex. 1022). These examples all demonstrate heater chambers positioned close to the distal end of the cartridges. [*See, e.g.*, Qiu 633 (Ex. 1015), Figure 1 (showing heater chamber with heater 311, (*see* Figure 2 for use of the 311 label) proximate the distal end of the cartridge); Youm (Ex. 1020), Figure 3 (showing heater chamber with heater 52 proximate to the distal end of the cartridge); Yeom (Ex. 1022), Figure 3 (showing heater chamber with heater 28 proximate to the distal end of the cartridge).]
144. There are several key reasons why this positioning is advantageous.

145. First, positioning the heater chamber proximate the distal end of the cartridge minimizes the aerosol temperature at the outlet, thus preventing the consumer from being scalded by hot aerosol.
146. Second, positioning the heater chamber—and by extension, its heating element—closer to the distal end streamlines the electrical architecture of the device. This proximity reduces the necessary length of electrical wiring connecting the heating element to the power source. Consequently, this leads to a more cost-effective and less complex manufacturing process for the cartridge, enhancing both its economic and technical efficiency.
147. Third, by positioning the heater chamber at the proximate end, there is an improved mixing of vapor particles with the airflow. This arrangement facilitates a more uniform aerosol mixture, resulting in an inhalable aerosol that is more homogeneous and consistent. Such a configuration ensures a reliable and high-quality vaping experience for the consumer.
148. A POSA would have had a reasonable expectation of success modifying Verleur to move the heater chamber closer to the distal end of the cartomizer, as it is a predictable use of electronic vaporizer components according to its established function and would have been routine to implement.

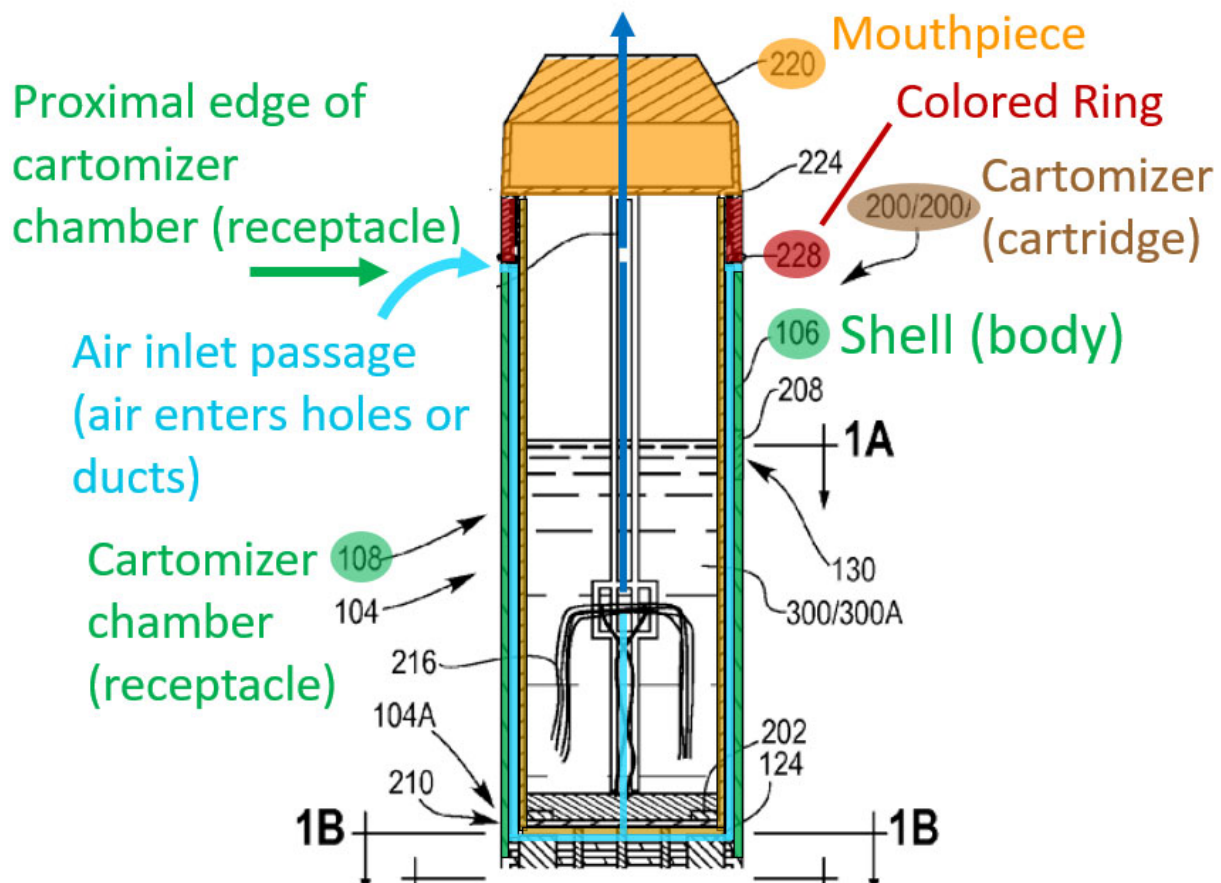
4. **Claim 4: The apparatus of claim 3, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.**

149. As shown above, Verleur renders obvious claim 3. [See analysis above [1.A]

– [1.J], Claim 3]. Verleur further discloses and renders obvious *the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.*

150. As described above in [1.H], Verleur describes an airflow path (**blue**, below in annotated Figure 1) that can initiate at various entry points – holes, ducts, or slits – located in the sides of the outer shell 106. From those initial entry locations, air travels down the outside surface of the cartridge, up through the heater chamber, continues along the inhalation tube 222, and exits the apparatus at mouthpiece 220. The design of this airflow path includes an air inlet passage, characterized by a dual-sided structure: a first side formed by an exterior surface of the cartomizer (cartridge, in **brown**) and a second side formed by an internal surface of the cartomizer chamber (receptacle, in **green**) when the cartomizer chamber (receptacle) insertably receives and couples to the cartomizer (cartridge). [Verleur (Ex. 1005), [0039]

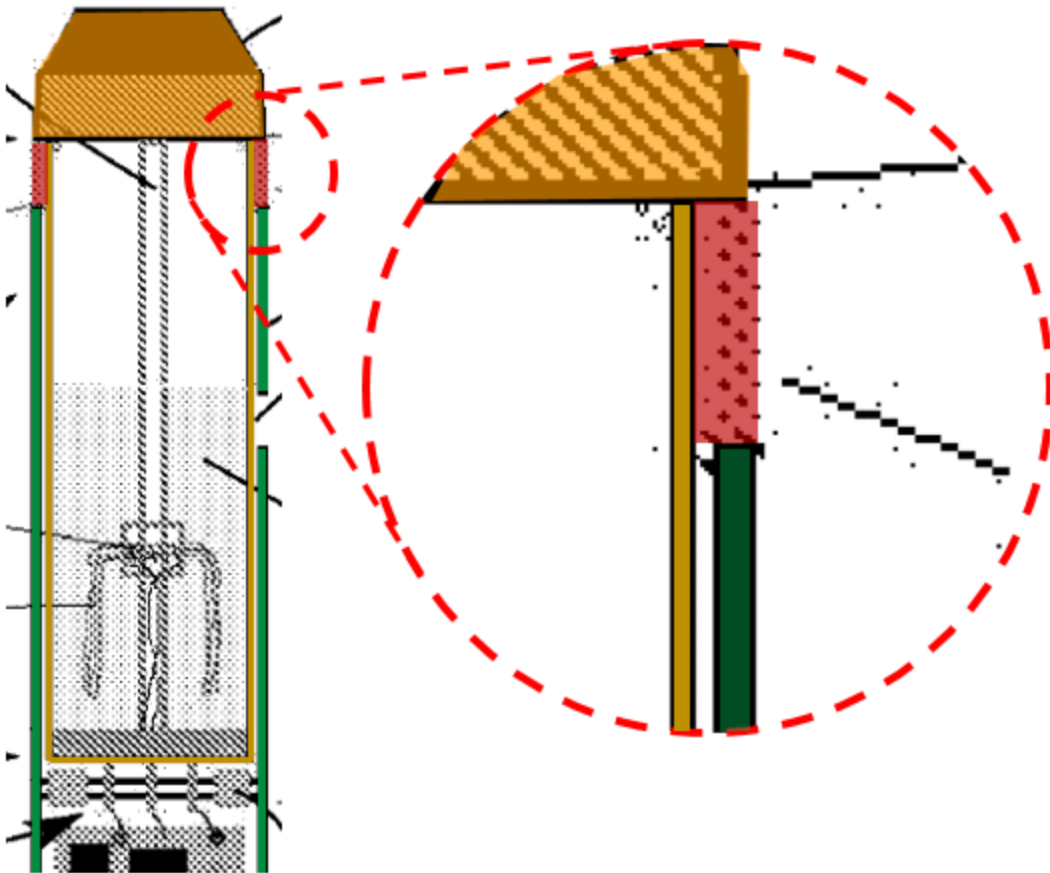
(“Inhalation tube 222 may also be in fluid communication with one or more holes or ducts provided, for instance, in sides of outer shell 106 in order to permit air flow through cartomizer body 208.”); *see also* Verleur-Prov (Ex. 1006), [0030]].



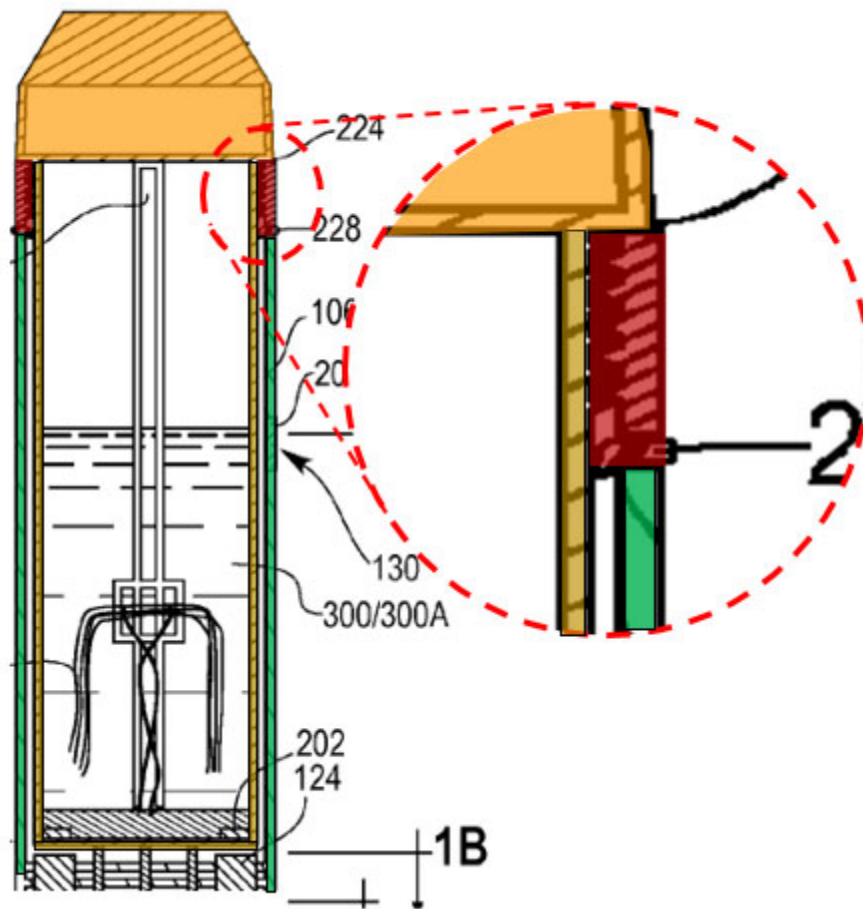
Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also* Verleur-Prov (Ex. 1006), Figure 1

151. Notably, Verleur does not specify a fixed location for the air inlets in the outer shell 106. This versatility in the placement of the holes, ducts, or slits

allows for adaptability in design, functionality, and aesthetics, ensuring efficient airflow through the cartomizer body (208) regardless of the specific positioning of these air entry points. This non-specificity also implies that the placement of the holes or ducts is variable along the entire length of the receptacle of shell 106. As shown below in annotated versions of Verleur-Prov Figure 1 and Veleur Figure 1, the gap between outer shell 106 and cartomizer 200/200A extends to the proximal edge of outer shell 106, suggesting that the holes or ducts could feasibly be located at the outer shell's proximal edge and distal to the colored ring provided on the cartomizer (cartridge).



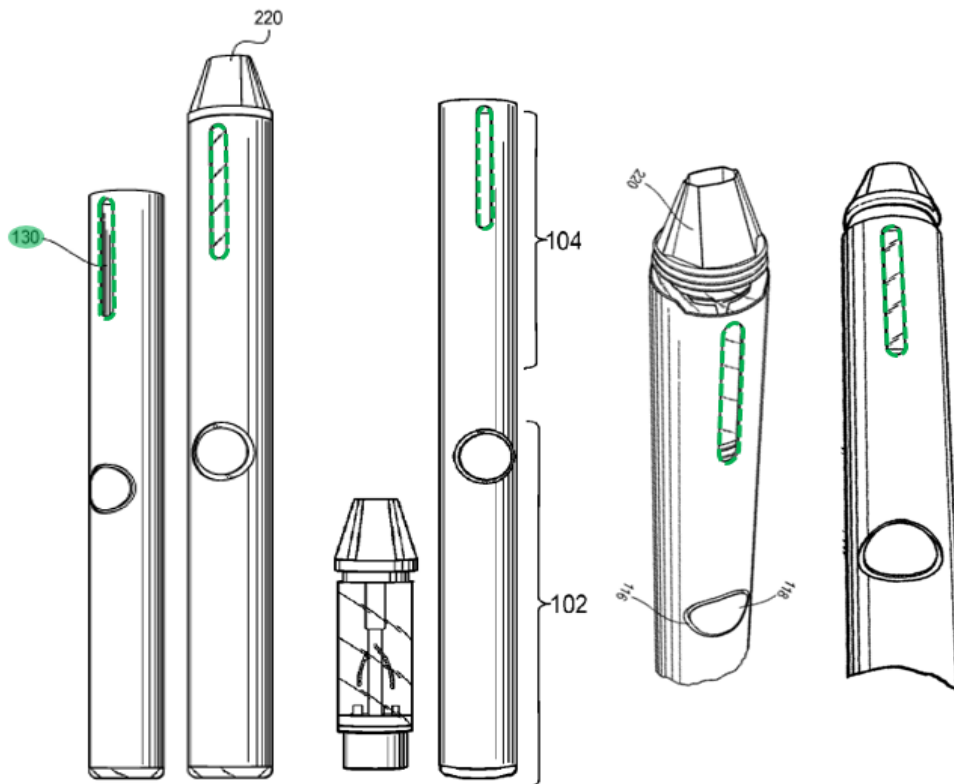
Verleur-Prov (Ex. 1006), Figure 1 (partial, annotated)



Verleur (Ex. 1005), Figure 1 (partial, annotated)

152. Furthermore, as discussed in [1.H], Verleur discloses one or more windows that may be located on the cartomizer receiving section. [Verleur (Ex. 1005), [0037]; *see also* Verleur-Prov (Ex. 1006), [0028]]. Verleur also discloses that the window may simply be a slit cut into the shell 106. [Verleur (Ex. 1005), [0037] (“Window 130 may also be a slit cut into shell 106”); *see also* Verleur-Prov (Ex. 1006), [0028], Figure 1]. A POSA would, therefore, understand that Verleur contemplates a slit at the proximal edge of the

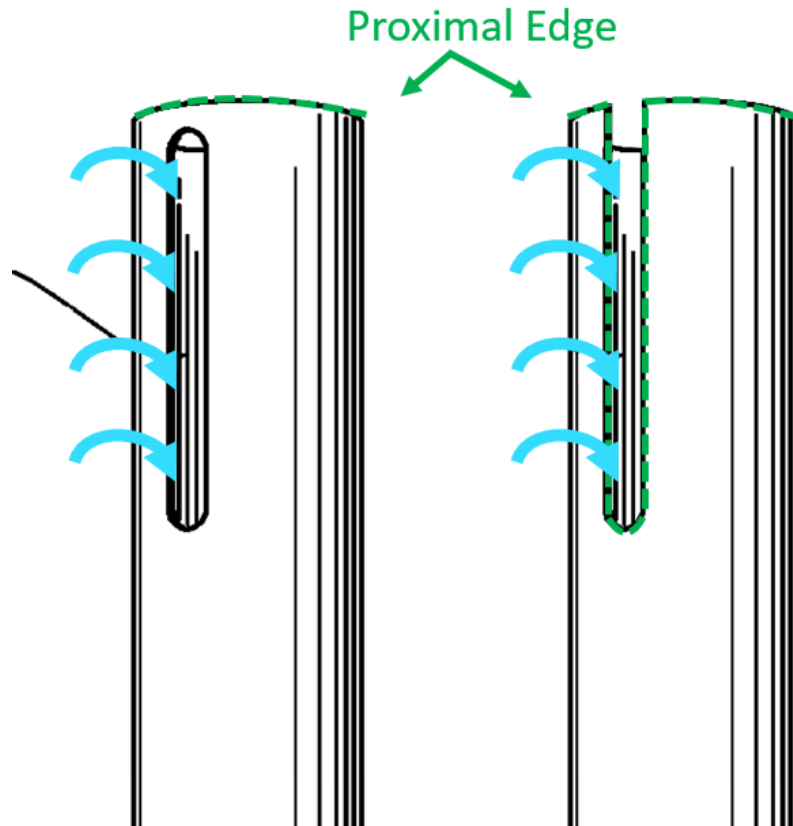
cartomizer receiving section; and thus, the air inlet would begin at the proximal edge. Verleur provides several depictions of window 130, including embodiments depicting window 130 near the proximal edge of the outer shell. Examples of these slits are shown below in annotated versions of Figures 4-7.



Verleur (Ex. 1005), Figs. 4-7 (partial, annotated); *see also* Verleur-Prov (Ex. 1006), Figs. 4-7

153. For example, annotated Figure 4 below has the slit right up very close to the proximal edge and air would enter there. In my opinion, a POSA would have recognized that a “slit” could also extend slightly further than the figures depict. That is, the slits could go all the way to the proximal end of

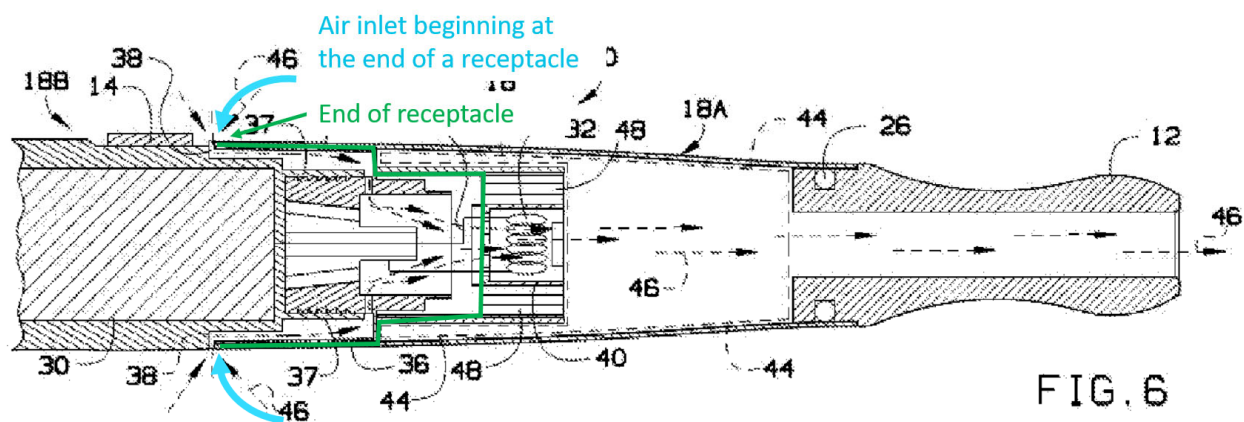
the receptacle, as seen in modified Figure 4, below on the right. Also in this circumstance, air would enter at the new proximal edge of the receptacle. In my opinion, it would be trivial to extend any of these slits to the proximal edge.



Verleur (Ex. 1005), Figure 4 (partial, annotated)

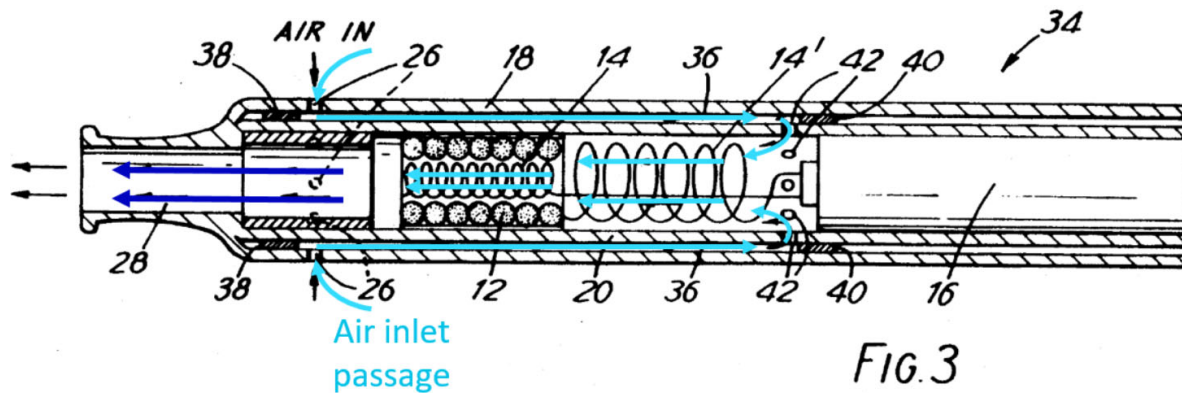
154. To the extent Verleur does not explicitly disclose this limitation, it would have been obvious based on Verleur in view of the knowledge of a POSA.
155. A POSA would have recognized that there are a multitude of different ways to admit outside air into the cartridge of an e-cigarette and the placement of

the air inlet openings for the air inlet passage is a design choice. [*See, e.g.,* Newton (Ex. 1017), 5:1-2 (“The air inlet openings 16 can be located elsewhere on the electronic cigarette 2, and is a matter of design choice.”)]. As already described above, Verleur discloses holes or ducts are provided in the shell to permit airflow through the cartomizer. It would have been obvious to a POSA that the inlet holes or ducts in the shell would be placed such that the air inlet passage extends from a proximal edge of the receptacle towards the distal end of the cartridge. Having an air inlet passage that begins at the end of a receptacle and extends down and between the receptacle and the component received into the receptacle was well known. For example, U.S. Pat. Pub. No. 2014/0174458 to Katz teaches an air inlet passage beginning at the end of a receptacle (in Katz, end of the cartridge) that extends between the receptacle and the component received into the receptacle (in Katz, end of the battery). Katz Figure 6 provided below in annotated form, illustrates this air inlet passage.



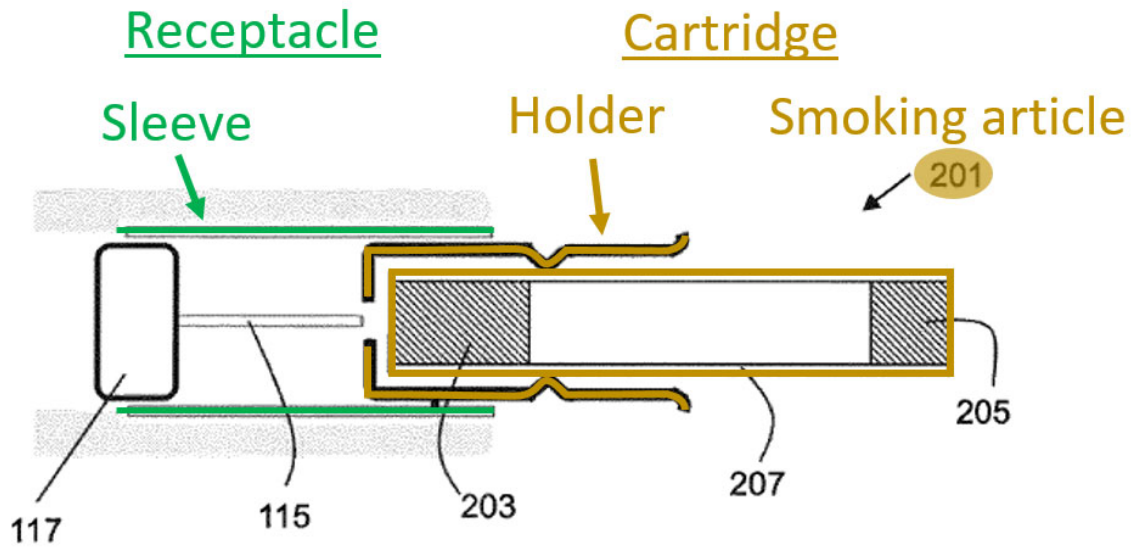
Katz (Ex. 1028), Figure. 6 (annotated)

156. Having an air inlet passage that initiates at the proximal end of the device and extends distally was also well known. For example, Counts 962 discloses an air inlet passageway that begins at the proximal end of the device, extends distally to the end of the cartridge, and reverses back through the cartridge to the mouthpiece at the proximal end. Counts 962 Figure 3, provided below in annotated form, illustrates this air inlet passage.

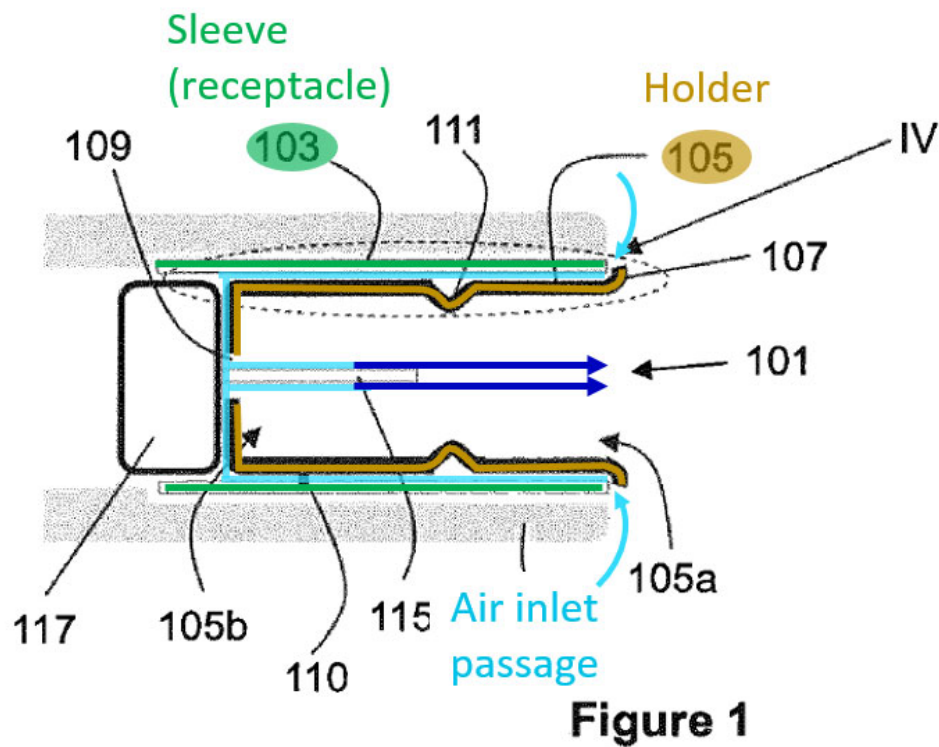


Counts 963 (Ex. 1029), Figure 3 (annotated)

157. Additionally, the concept of an air inlet passage extending from a proximal edge of a receptacle to the distal end of a cartridge was also a well-established and commonly implemented design in the e-cigarettes as of 2014. For example, as shown in annotated Figures 1 and 3 below, Plojoux discloses a system having an air inlet passage that extends from a proximal end of the receptacle (**green**) to the distal end of the cartridge (**brown**). [Plojoux (Ex. 1016), 13:29-433 (“**air may flow from the right side, entering** in the space between the housing 113 and the sleeve 103 or **in the space between the sleeve 103 and the holder 105**, passing to the left and then entering the inner end 105b through aperture 109.”)].

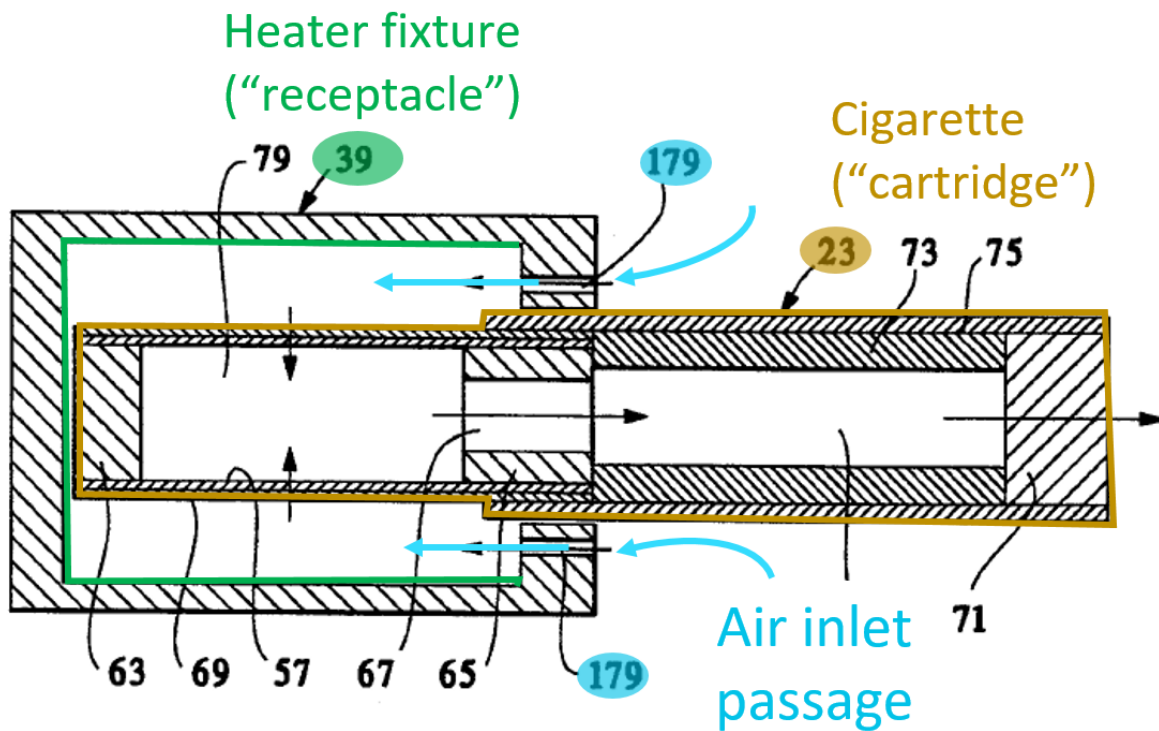


Plojoux (Ex. 1016), Figure 3 (annotated)



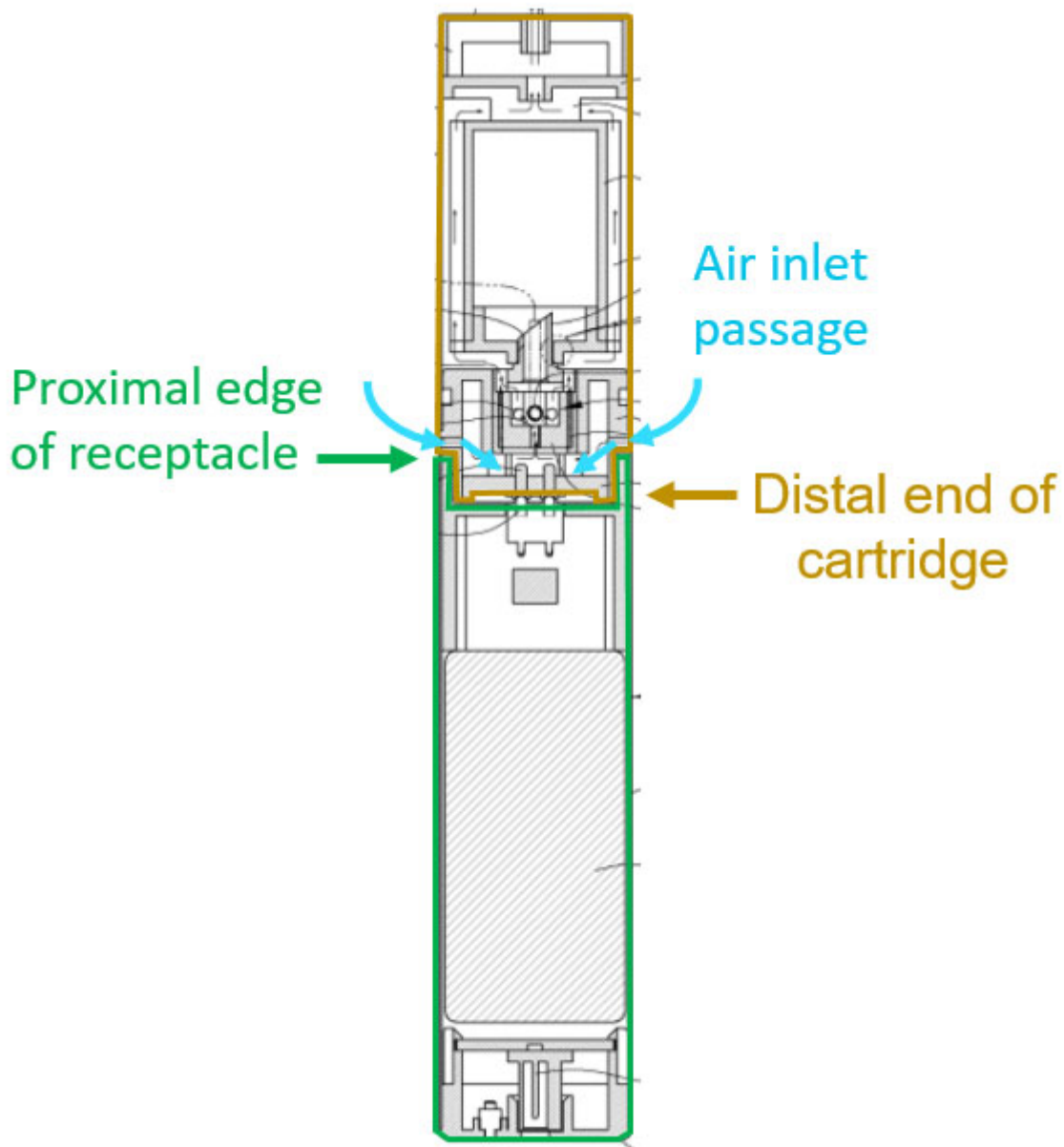
Plojoux (Ex. 1016), Figure 1 (annotated)

158. Plojoux also describes this configuration has desirable results, including “manag[ing] the air flow and consequently the characteristics of the aerosol.” [Plojoux (Ex. 1016), 13:29-41].
159. As shown in annotated Figure 16 below, Counts 594 also discloses a system having an air inlet passage that extends from a proximal end of the receptacle (**heater fixture 39**) that receives a cartridge (**cigarette 23**). [See also Counts 594 (Ex. 1014), 19:65-20:5 (“The cap 83A is formed with a plurality longitudinal holes or passages 179A extending through the cap from the rounded or beveled forward end 93A to a rear face 181A for providing a flow of air into the space in the heater fixture 39A for receiving the cigarette 23, between the cigarette and the air channel sleeve 87 so that a transverse (i.e., radially inward) flow of air passes through the tobacco web 57 by the footprints 131 of the heater elements 43.”)].



Counts (Ex. 1014), Figure 16 (annotated)

160. As shown in annotated Figure 3 below, Yeom also discloses a system that includes an air inlet passage extending from an area near the proximal end of the receptacle (green) towards the distal end of the cartridge (brown).

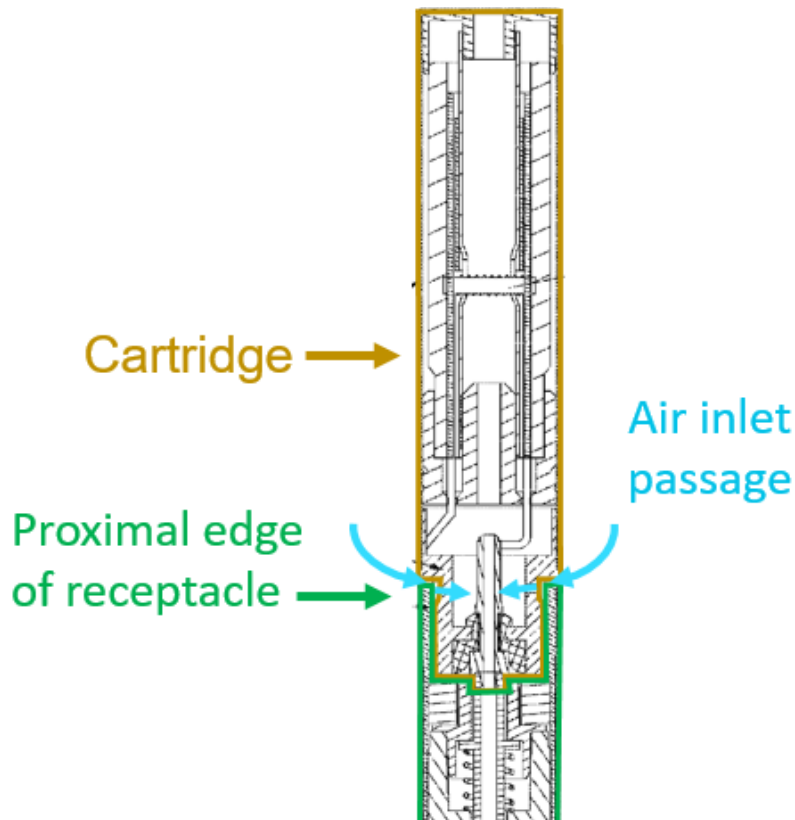


Yeom (Ex. 1022), Figure 3 (annotated)

161. As shown in annotated Figure 2 below, Liu 787 also discloses a system that includes a receptacle that insertably receives a cartridge (**brown**) and an air inlet passage extending from the proximal end of the receptacle (**green**).

[Liu 787 (Ex. 1018) at 6:64-67 (“fixed flange 614 radially extends outwards

from an end sidewall of the second connector 6, and the fixed flange 614 radially defines a thorough air inlet 615.”); *see also Id.* at 4:56-58 (“The lower shell 512 defines an annular air groove 515 near the positioning flange 513, and an air inlet 516 is defined radially through the annular air groove 515.”)].

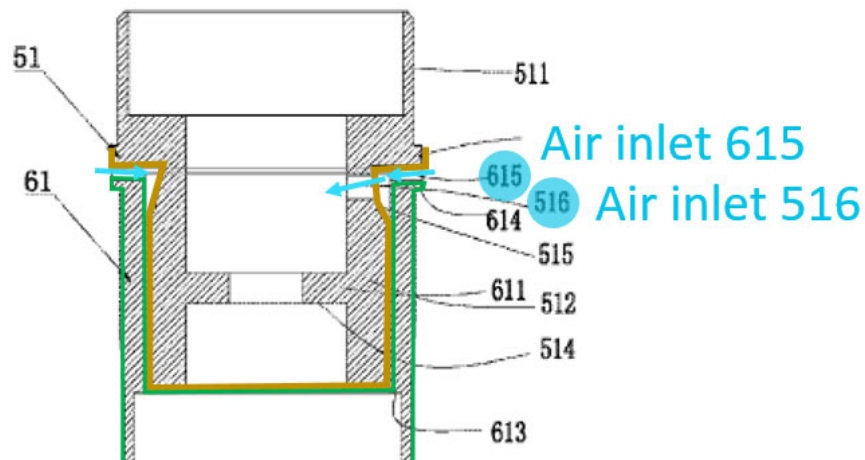


Liu 787 (Ex. 1018), Figure 2 (partial, annotated)

162. The figure below is a combination of Figures 7 and 8 of Liu 787. Figure 7 depicts the connector at the distal end of the cartridge that includes air inlet 516. [Liu 787 (Ex. 1018), 4:42-58 (“As shown in FIGS. 3 and 7, the first seat 51 is located at the second end of the inhaling tube 1 ... The lower shell

512 defines an annular air groove 515 near the positioning flange 513, and an air inlet 516 is defined radially through the annular air groove 515.”)].

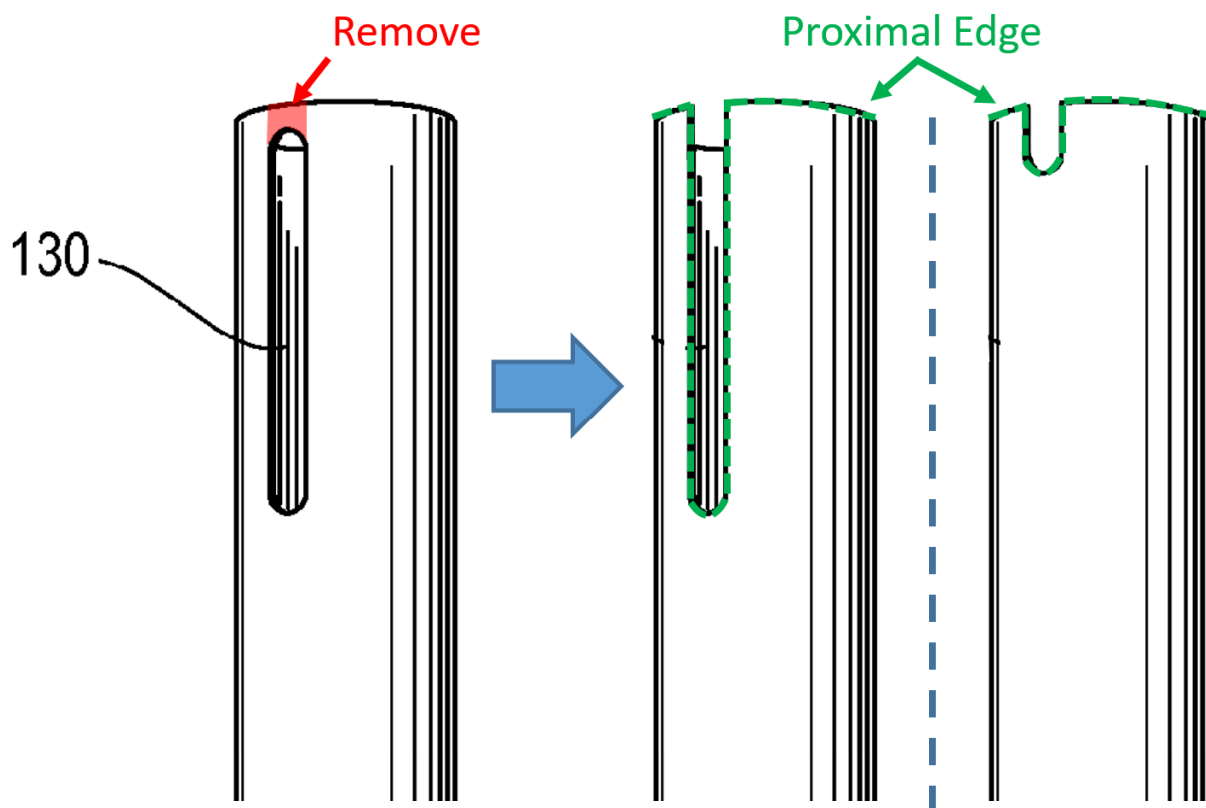
Figure 8 depicts that receptacle of the battery that receives the cartridge’s connector and includes air inlet 615. [Liu 787 (Ex. 1018), 6:52-67 (“As shown in FIG. 8, the second seat 61 is shaped about a hollow cylinder ... A fixed flange 614 radially extends outwards from an end sidewall of the second connector 6, and the fixed flange 614 radially defines a thorough air inlet 615.”)]. In the modified figure below, I have combined Figures 7 and 8 to show the air inlets that are formed when these components are coupled.



Liu 787 (Ex. 1018), Figures 7 and 8 (edited to combine figures, annotated)

163. Thus, it would have been well known to a POSA that Verleur could be modified to include an air inlet at the proximal edge of the receptacle. As I discussed above, Verleur’s window slit in outer shell 106 would provide an inlet to the gap between the exterior of the cartomizer body and the interior

of the cartomizer chamber. Having a slit extending from the proximal edge of the shell has advantages, such as allowing the consumer to see the entirety of the liquid storage portion. If allowing the consumer to be able to see the liquid storage portion is not important, then the slit can be sized only to permit air to enter the device. Once this design choice is made, the air passage extends from the proximal edge of the cartomizer chamber (receptacle) to the distal end of the cartomizer (cartridge). Examples of these potential configurations are shown in the modified version of Figure 4 below.



Verleur (Ex. 1005), Figure 4 (modified, annotated)

164. From the standpoint of a POSA, it would have been a well-understood principle that Verleur's design could be adapted to incorporate an inlet at the proximal edge of the receptacle. Indeed, as discussed above, Verleur's disclosure includes the possibility of creating a slit in the outer shell 106, effectively introducing an inlet to the gap. The implementation of a slit extending from the proximal edge (towards the distal end of the receptacle) allows for maximum visibility of the liquid storage portion for the consumer. Moreover, a POSA would understand that this modification would have no effect on the ability to secure the cartomizer (cartridge) to the cartomizer chamber (receptacle). For example, Verleur discloses chamber magnets "operable to secure a cartomizer received within the chamber." [Verleur (Ex. 1005), [0005]; *see also* Verleur-Prov (Ex. 1006), [0026]].
165. A POSA would have been motivated to have Verleur's airflow passage extend from the proximal edge of the cartomizer chamber (receptacle) to the distal end of the cartomizer (cartridge) because this configuration provides several benefits.
166. First, as noted above, this design enhances the visibility of the liquid storage portion, allowing for maximum visibility of the remaining liquid in the cartomizer which can be an important consideration for the consumer. Additionally, by extending the airflow passage in this manner, the risk of

unintentional obstruction during use, such as by the user's fingers, is significantly minimized. Another critical benefit is the reduction in leakage risk; moving the airflow away from direct contact with the battery not only prevents vaporizable material from seeping into the battery compartment, thereby extending the device's lifespan, but also decreases the likelihood of material backflowing out of the inlet. This configuration thus helps in maintaining device integrity and user safety. Moreover, the extended length of the airflow path in this design broadens the engineering 'design space,' thereby enabling more precise control over the airflow characteristics. This expanded scope for adjustment allows for fine-tuning the draw resistance, which, if desired, could be optimized to provide a draw resistance that more accurately simulates the sensory experience of smoking a traditional cigarette. Additionally, the placement of the air inlet at the proximal edge introduces a self-cleaning feature each time the cartridge is replaced, ensuring sustained airflow efficiency and preventing clogging issues over time. These factors collectively contribute to a design that not only enhances user experience but also improves the overall functionality and reliability of the device.

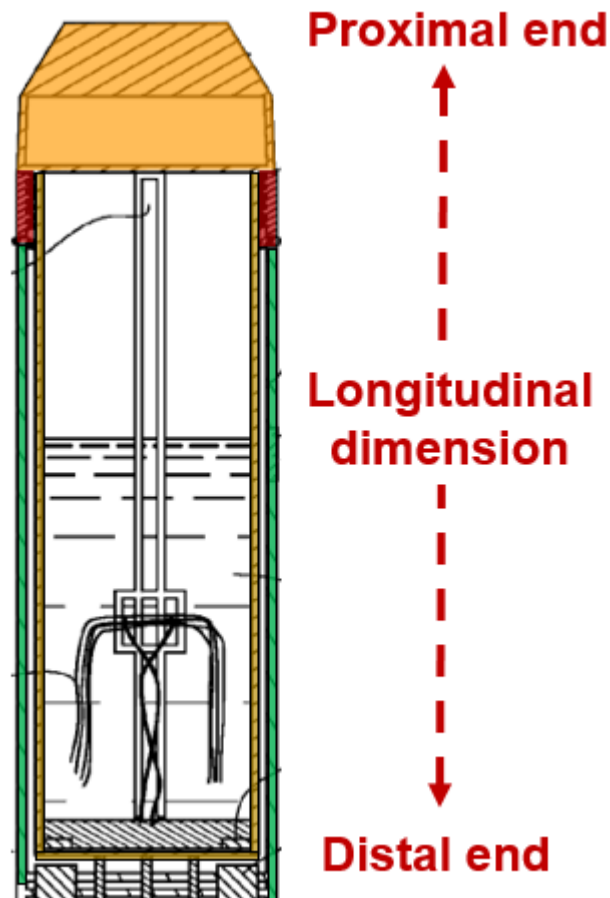
167. Given these considerations, a POSA would have been motivated to include an air inlet passage that begins at the proximal edge of the cartomizer

chamber (receptacle) in Verleur. A POSA would have also had a reasonable expectation of success in implementing this design choice and making this modification. For example, it would have been trivial to make this modification and include an air inlet passage that begins at the proximal edge of the cartomizer chamber (receptacle), especially given the existing design of Verleur, where the gap between the cartridge and the receptacle extends the length of the receptacle, and the inclusion of an air inlet is already contemplated.

5. **Claim 6: The apparatus of claim 3, wherein the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.**

168. As shown above, Verleur renders obvious claim 3. [See analysis above [1.A] – [1.J], Claim 3]. Verleur further discloses *the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.*

169. It is clear from the figures in Verleur that the cartomizer 200/200A (cartridge) has a longitudinal dimension extending from the proximal end of the cartomizer to the distal end of the cartomizer. Furthermore, as shown below in annotated Figure 1, the exterior surface of the cartomizer and the internal surface of the cartomizer chamber (receptacle) are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartomizer.



Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

6. Claim 7: The apparatus of claim 3, wherein the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.

170. As shown above, Verleur renders obvious claim 3. [See analysis above [1.A] – [1.J], Claim 3]. Verleur further discloses *the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.*
171. As I described with respect to [1.H], Verleur discloses an airflow path through the apparatus that comprises an air inlet passage having a first side formed by an exterior surface of the cartomizer (cartridge), which is the external surface of the storage compartment, and a second side formed by an internal surface of the cartomizer chamber (receptacle).

7. Claim 15: The apparatus of claim 1, wherein the cartridge comprises a first electrical contact and a second electrical contact at a distal end of the cartridge, the mouthpiece disposed at a proximal end of the cartridge opposite the distal end, wherein the first electrical contact and the second electrical contact are electrically isolated and disposed in a plane substantially parallel to the distal end of the cartridge.

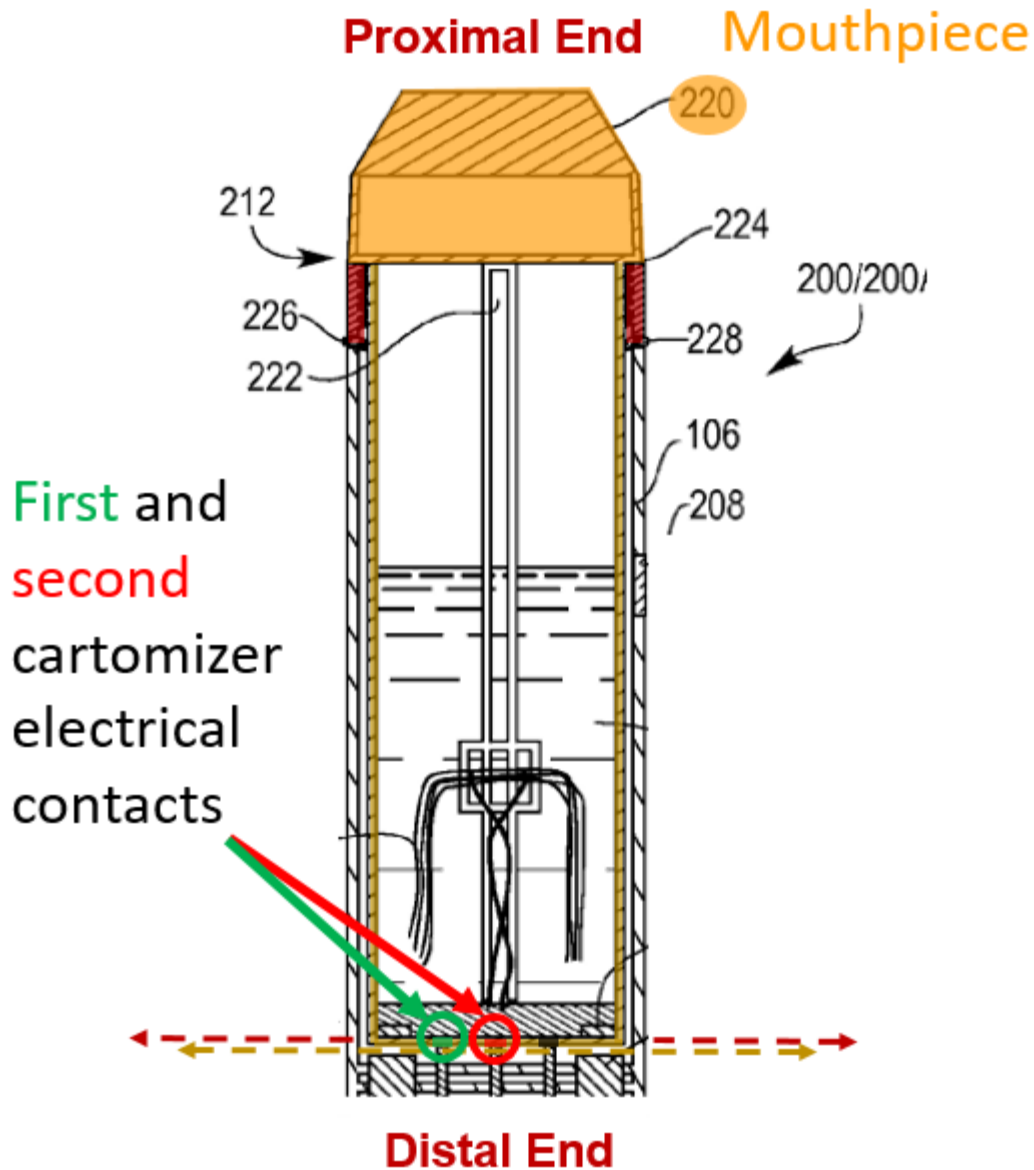
172. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. Verleur further discloses *the cartridge comprises a first electrical contact and a second electrical contact at a distal end of the cartridge, the mouthpiece disposed at a proximal end of the cartridge opposite the distal end, wherein the first electrical contact and the second electrical contact are*

electrically isolated and disposed in a plane substantially parallel to the distal end of the cartridge.

173. Verleur discloses cartomizer 200/200A (cartridge) comprises “cartomizer electrical contacts” at the distal end of the cartridge. [Verleur (Ex. 1005), [0006]]; *see also* [Verleur (Ex. 1005), [0005] (“electrical contacts provided between the base end of the chamber and the battery portion, the electrical contacts including a positive contact and a negative contact insulated from the positive contact.”); Verleur (Ex. 1005), [0006] (“the cartomizer may include ... cartomizer electrical contacts.”); Verleur (Ex. 1005), [0039] (“An electrical current may be transmitted to heating element 214 through circuitry in electrical communication with electrical contacts, which contact pins 122 (see FIG. 1A) when cartomizer 200A is inserted into chamber 108.”); *see also* Verleur-Prov (Ex. 1006), [0025]].
174. Verleur’s disclosure that the first and second contacts are electrically isolated, is paramount to ensure safe and effective electrical operation within the device. [Verleur (Ex. 1005), [0005] (“electrical contacts provided between the base end of the chamber and the battery portion, the electrical contacts including a positive contact and a negative contact insulated from the positive contact.”); *see also* Verleur-Prov (Ex. 1006), [0025]]. A POSA would have understood that this insulation is critical to prevent electrical

short circuits and maintain the integrity of the power transfer between the battery and the heating element.

175. Verleur further discloses that the first and second electrical contacts on the cartomizer are disposed in a plane substantially parallel to the distal end of the cartomizer (cartridge), as shown below in annotated Figure 1. This parallel arrangement is not just a structural detail, it also plays an important role in promoting good electrical connectivity with the corresponding electrical contacts at the bottom of the receptacle.



Verleur (Ex. 1005), Figure 1 (annotated)

176. Additionally, as shown above in annotated Figure 1, Verleur discloses that the mouthpiece 220 is situated at the proximal end of the cartomizer, effectively opposite the distal end. This spatial arrangement of the mouthpiece relative to the electrical contacts is a critical design feature, that

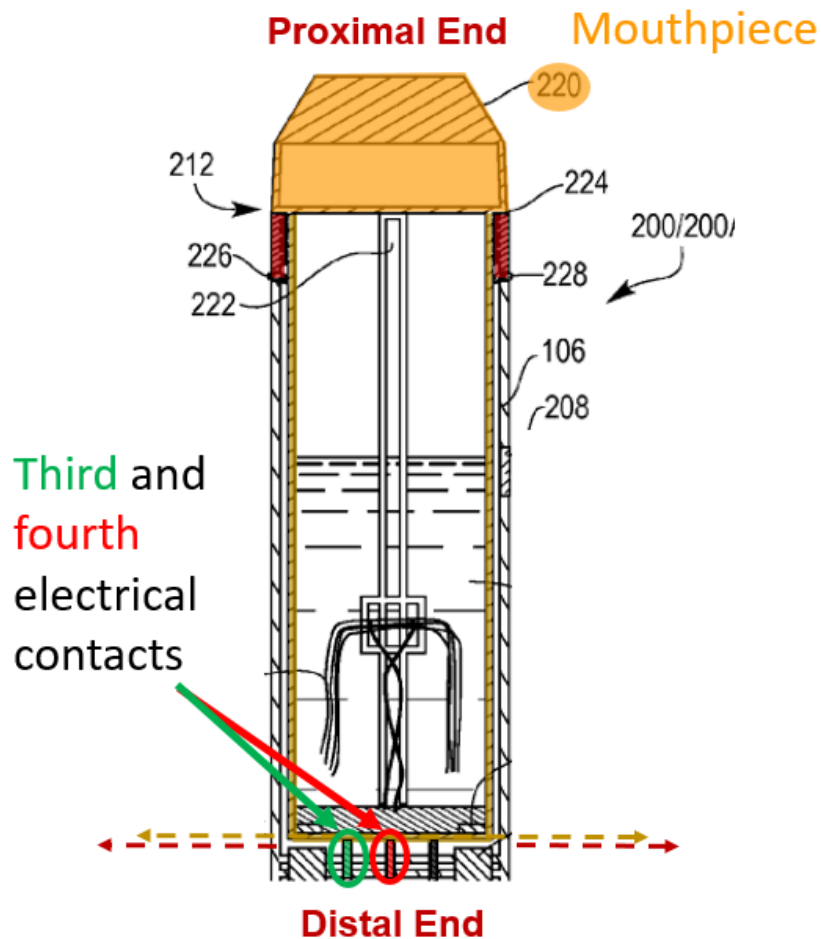
provides functional benefits. For example, locating the mouthpiece as far as possible away from the electrical contacts promotes good electrical isolation from the moisture of the user's mouth. Furthermore, the mouthpiece opening is a possible pathway for external debris, such as pocket lint, to enter the apparatus. Therefore, placing the mouthpiece opening a large distance away from the electrical contacts provides an additional safeguard against contamination of the electrical contacts.

8. Claim 16: The apparatus of claim 15, wherein the receptacle comprises a third electrical contact and a fourth electrical contact disposed in a second plane, the second plane substantially parallel to the distal end of the cartridge when the cartridge is received within the receptacle.

177. As shown above, Verleur renders obvious claim 15. [See analysis above [1.A] – [1.J], Claim 15]. Verleur further discloses *the receptacle comprises a third electrical contact and a fourth electrical contact disposed in a second plane, the second plane substantially parallel to the distal end of the cartridge when the cartridge is received within the receptacle.*

178. Verleur discloses battery electrical contacts that practice this element. [Verleur (Ex. 1005), [0006] (“The vaporizer may also include battery electrical contacts provided between the base end of the chamber and the battery segment, the battery electrical contacts positioned to contact the cartomizer electrical contacts when the cartomizer is inserted in the

chamber.”)]. The battery electrical contacts may include a plurality of pogo pins 120, that are “used to establish connections between two circuits... each retractable upon compression, for instance by cartomizer 200 when it is inserted in cartomizer chamber 108.” [Verleur (Ex. 1005), [0033]; *see also* Verleur-Prov (Ex. 1006), [0025]]. As shown in annotated Figure 1 below, the pogo pins (third and fourth electrical contacts) are disposed in a second plane substantially parallel to the distal end of the cartomizer (cartridge) to engage the cartomizer electrical contacts when cartomizer 200 is inserted into the cartomizer chamber.

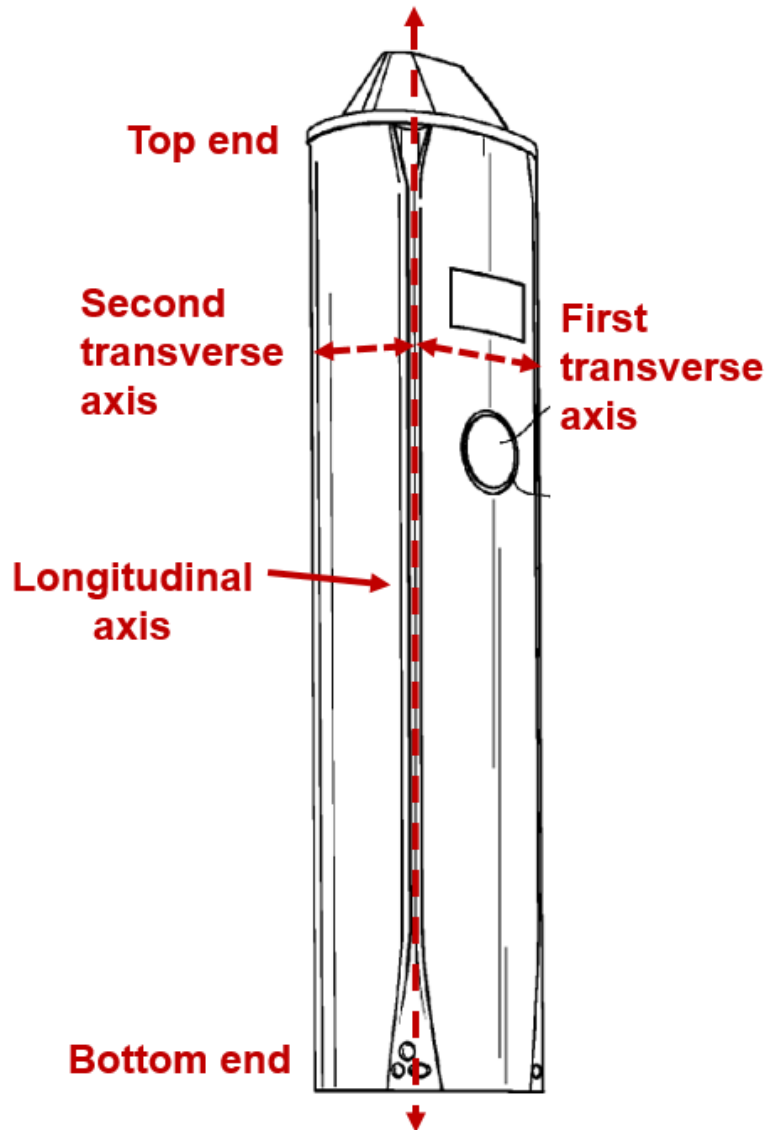


+

Verleur (Ex. 1005), Figure 1 (partial, annotated); *see also*
Verleur-Prov (Ex. 1006), Figure 1

9. **Claim 18:** The apparatus of claim 1, wherein the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.

179. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. Verleur further discloses *the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.*
180. Note that despite its verbose description, this element can be practiced simply by a body that has a non-circular cross section. As can be clearly seen in the annotated versions of Figure 15 below, Verleur discloses the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.



Verleur (Ex. 1005), Figure 15; *see also* Verleur-Prov (Ex. 1006), Figure 15 (annotated)

10. **Claim 19: The apparatus of claim 1, wherein the storage compartment comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.**

181. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. Verleur further discloses *the storage compartment comprises the*

vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.

182. Verleur discloses cartomizer 200A (cartridge) includes body 208 (storage compartment) configured to hold vaporizable fluid 300A, wherein the vaporizable material comprises a nicotine formulation. [Verleur (Ex. 1005), [0038] (“One embodiment of cartomizer 200 for holding vaporizable material 300 is cartomizer 200A for holding a vaporizable fluid 300A, an embodiment of which is illustrated in FIG. 1. Vaporizable fluid 300A may be, for example, any known or to be developed fluid useful to vaporize, for inhalation nicotine, flavor or other desired ingredients in an electronic cigarette, such fluids include propylene glycol (PG), vegetable glycerin (VG), or polyethylene glycol 400 (PEG400), as well as their mixtures to which a flavor and/or nicotine has been added.”); *see also* Verleur-Prov (Ex. 1006), [0002], [0003]].

11. Claim 20:

183. Claim 20 is virtually identical to Claim 1, except that instead of a “heater chamber comprising a resistive heating element,” Claim 20 only requires a “resistive heating element.”

a. [20.A] An apparatus comprising:

184. As explained and shown above, and to the extent the preamble is limiting, Verleur discloses *an apparatus*. [See analysis above [1.A]].

b. [20.B] a cartridge comprising

185. As explained and shown above, Verleur discloses *a cartridge*. [See analysis above [1.B]].

c. [20.C] [a cartridge comprising] a mouthpiece,

186. As explained and shown above, Verleur discloses a cartridge comprising *a mouthpiece*. [See analysis above [1.C]].

d. [20.D] [a cartridge comprising] a storage compartment configured to hold a vaporizable material, and

187. As explained and shown above, Verleur discloses a cartridge comprising *a storage compartment configured to hold a vaporizable material*. [See analysis above [1.D]].

e. [20.E] [a cartridge comprising] a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an aerosol comprising the vaporizable material and air passing along an airflow path; and

188. As explained and shown above, Verleur renders obvious a cartridge comprising *a resistive heating element configured to heat the vaporizable material, wherein the heating of the vaporizable material generates an aerosol comprising the vaporizable material and air passing along an airflow path*. [See analysis above [1.E]].

- f. **[20.F] a body comprising a receptacle configured to insertably receive and couple to the cartridge,**

189. As explained and shown above, Verleur discloses *a body comprising a receptacle configured to insertably receive and couple to the cartridge*. [See analysis above [1.F]].

- g. **[20.G] wherein the resistive heating element is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge,**

190. As explained and shown above, Verleur discloses *the resistive heating element is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge*. [See analysis above [1.G]].

- a. **[20.H] wherein the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge,**

191. As explained and shown above, Verleur discloses *the airflow path comprises: an air inlet passage having a first side formed by an exterior surface of the cartridge and a second side formed by an internal surface of the receptacle when the receptacle insertably receives and couples to the cartridge*. [See analysis above [1.H]].

- b. **[20.I] wherein the air inlet passage is configured to deliver the air towards the resistive heating element; and**

192. As explained and shown above, Verleur discloses *the air inlet passage is configured to deliver the air towards the resistive heating element*. [See analysis above [1.I]].

c. **[20.J] a fluid connection in the cartridge, the fluid connection connecting the resistive heating element and the mouthpiece.**

193. As explained and shown above, Verleur discloses *a fluid connection in the cartridge, the fluid connection connecting the resistive heating element and the mouthpiece*. [See analysis above [1.J]].

12. Claim 21: The apparatus of claim 20, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.

194. As shown above, Verleur renders obvious claim 20. [See analysis above [20.A] – [20.J], [1.A] – [1.J]]. Verleur further discloses *the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge*. [See analysis above for Claim 2].

13. Claim 22: The apparatus of claim 20, wherein the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at the proximal end, and wherein the resistive heating element is disposed proximate to the distal end.

195. As shown above, Verleur renders obvious claim 20. [See analysis above [20.A] – [20.J], [1.A] – [1.J]]. Verleur further discloses *the cartridge has a proximal end and a distal end opposite the proximal end, wherein the mouthpiece is disposed at the proximal end, and wherein the resistive heating element is disposed proximate to the distal end. See [See analysis above for Claim 3].*

14. Claim 23: The apparatus of claim 22, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.

196. As shown above, Verleur renders obvious claim 22. [See analysis above [20.A] – [20.J], [22], [1.A] – [1.J], Claim 3]. Verleur further discloses *the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge. [See analysis above for Claim 4].*

15. Claim 24: The apparatus of claim 22, wherein the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.

197. As shown above, Verleur renders obvious claim 22. [See analysis above [20.A] – [20.J], [22], [1.A] – [1.J], Claim 3]. Verleur further discloses *the cartridge has a longitudinal dimension extending from the proximal end of the cartridge to the distal end of the cartridge, and wherein the exterior surface of the cartridge and the internal surface of the receptacle are substantially parallel to the longitudinal dimension when the receptacle insertably receives and couples to the cartridge.* [See analysis above for Claim 6].

16. Claim 25: The apparatus of claim 22, wherein the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.

198. As shown above, Verleur renders obvious claim 22. [See analysis above [20.A] – [20.J], [22], [1.A] – [1.J], Claim 3]. Verleur further discloses *the storage compartment comprises the exterior surface of the cartridge forming the first side of the air inlet passage.* [See analysis above for Claim 7].

17. Claim 28: The apparatus of claim 20, wherein the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.

199. As shown above, Verleur renders obvious claim 20. [See analysis above [20.A] – [20.J], [22], [1.A] – [1.J]]. Verleur further discloses *the body has a top end and a bottom end opposite the top end, wherein the receptacle is disposed at the top end, wherein a body longitudinal axis extends from the top end to the bottom end, and wherein a first body transverse axis and a second body transverse axis extend substantially perpendicular to the body longitudinal axis, the body having a greater dimension along the first body transverse axis than along the second body transverse axis.* [See analysis above for Claim 18].

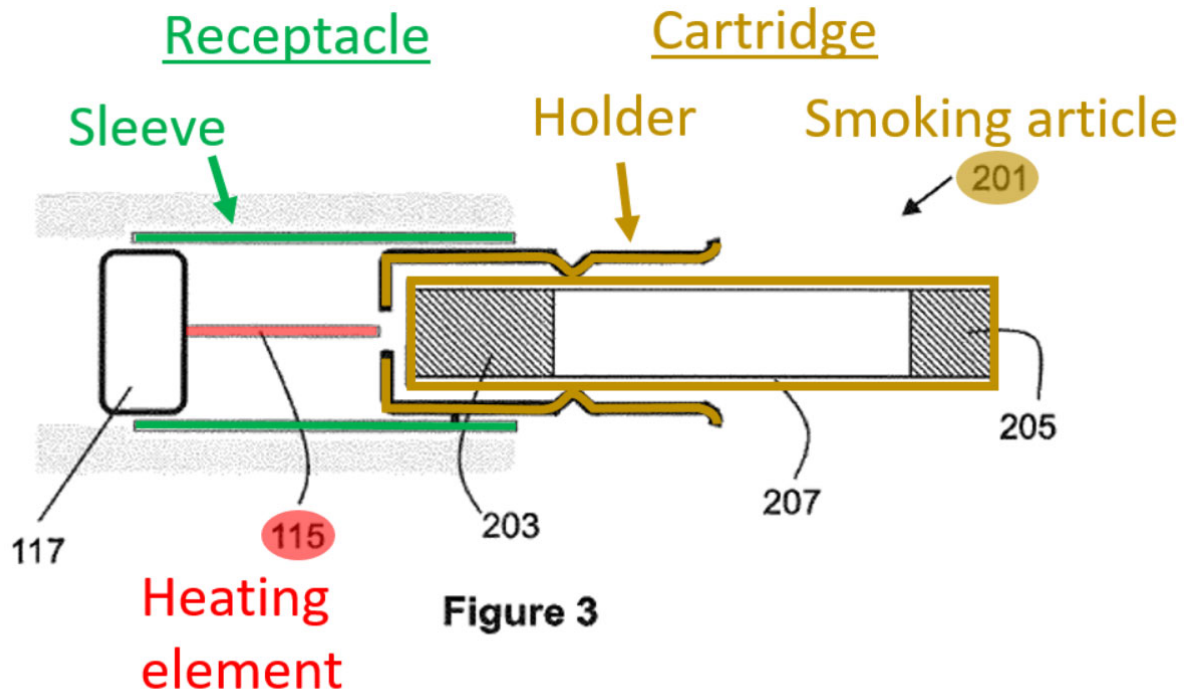
18. Claim 30: The apparatus of claim 20, wherein the storage compartment comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.

200. As shown above, Verleur renders obvious claim 20. [See analysis above [20.A] – [20.J], [1.A] – [1.J]]. Verleur further discloses *the storage compartment comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.* [See analysis above for Claim 19].

B. GROUND 2: Claims 2, 4, 21, and 23 Are Obvious over Verleur in view of Plojoux

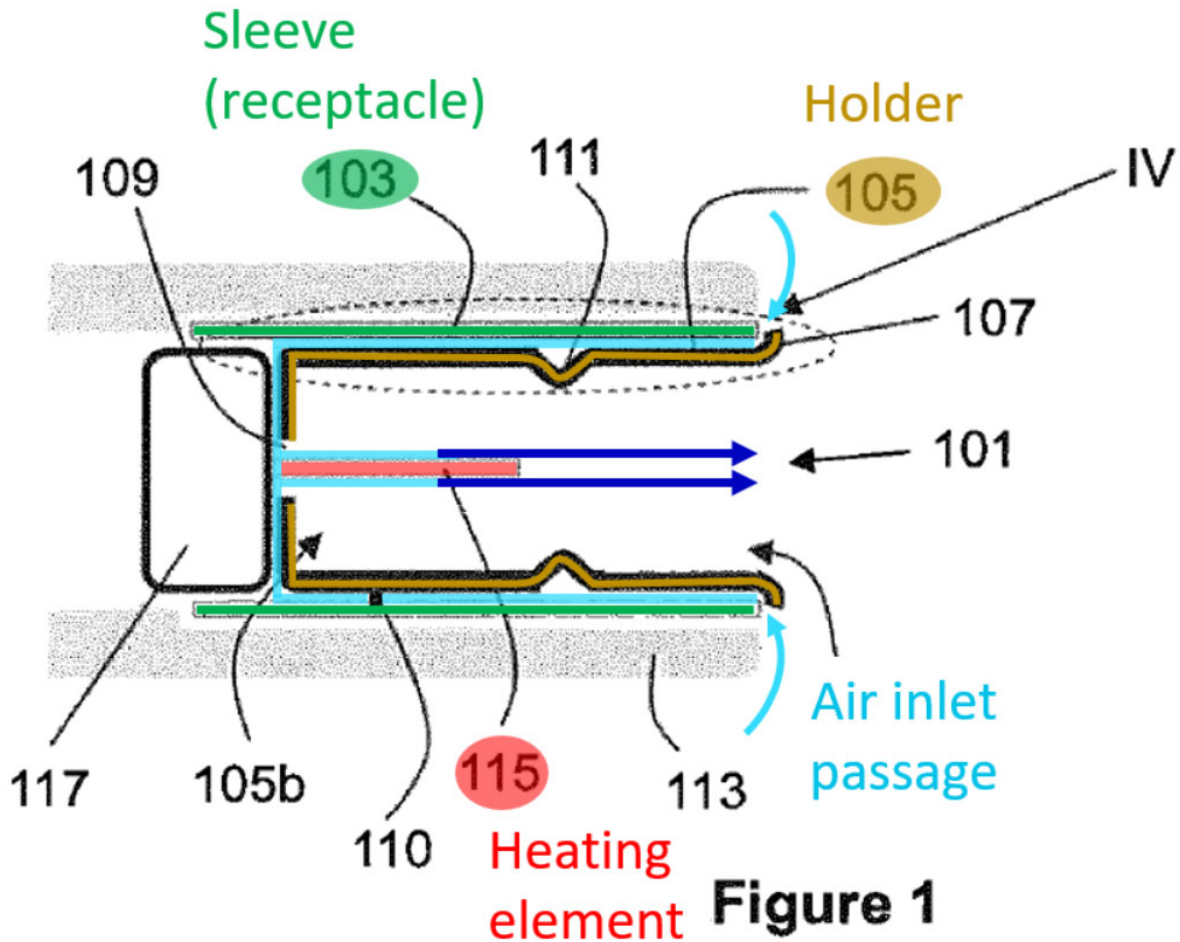
1. Motivation to Combine Verleur and Plojoux

201. In my opinion, it is clearly within the knowledge of a POSA to provide an air inlet at the proximal edge of the body disclosed in Verleur. To the extent it is argued that it was not within the knowledge of a POSA to provide an air inlet at the proximal edge of the body, Plojoux discloses this limitation. [Plojoux (Ex. 1016) , 15:20-22 (“air may flow from the right side, entering in the space between the housing 113 and the sleeve 103 or in the space between the sleeve 103 and the holder 105, passing to the left and then entering the inner end 105b through aperture 109.”)].
202. Plojoux discloses a “smoking article [that] is a heated smoking article, which is a smoking article comprising an aerosol-forming substrate that is intended to be heated rather than combusted in order to release volatile compounds that can form an aerosol.” [Plojoux (Ex. 1016), 2:7-9. Plojoux further discloses that, “[t]he aerosol-generating device may be an electrically heated smoking system comprising an electric heater.” [Plojoux (Ex. 1016), 4:22-23].
203. The heating element is shown below in an annotated version of Plojoux Figure 3.



Plojoux (Ex. 1016), Figure 3 (annotated)

204. Plojoux also discloses that its air inlet passage extends from a proximal end of the receptacle (**green**) to the distal end of the cartridge (**brown**). This air inlet passage is noted on the annotated version of Plojoux Figure 1 provided below.



Plojoux (Ex. 1016), Figure 1 (annotated)

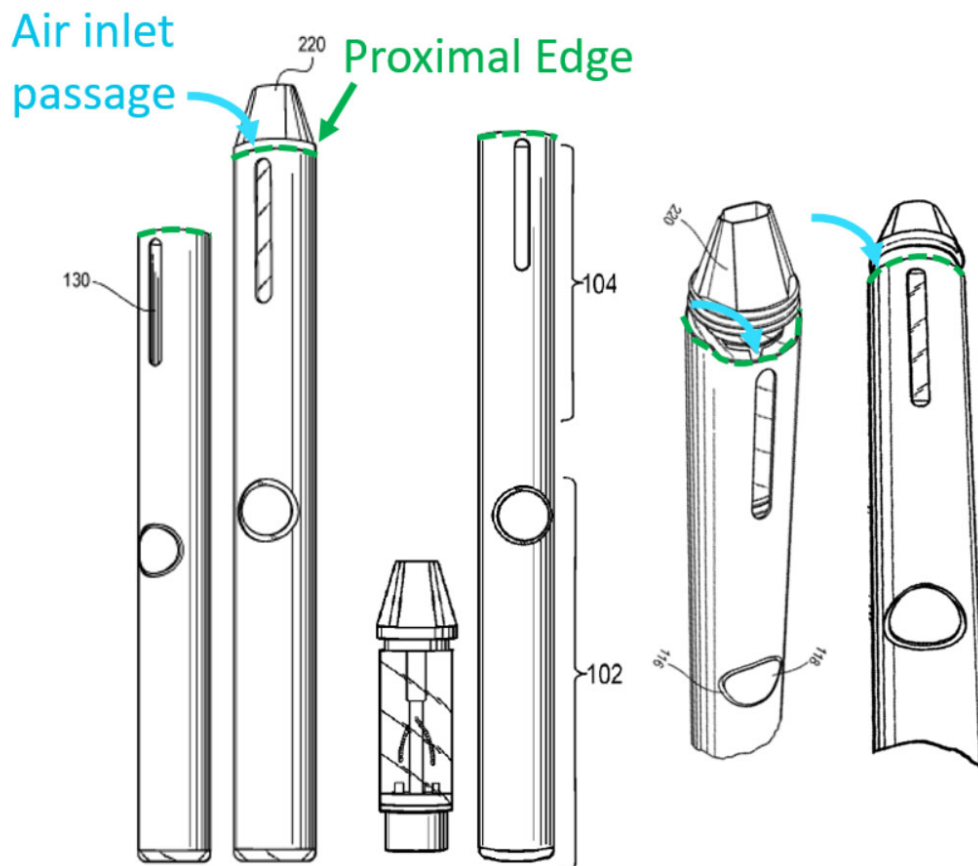
205. During use, the smoking article 201 is first placed into the holder 105.

[Plojoux (Ex. 1016), 14:17-19]. The holder 105, along with the smoking article 201 which has a diameter slightly smaller than the receptacle, is then inserted into the receptacle 103. [Plojoux (Ex. 1016), 14:14-17]. With this insertion, the heating element 115 on the receptacle 103 engages with the smoking article 201, effectively stabbing it. [Plojoux (Ex. 1016), 15:16-17]. When a user inhales, air is drawn in at the proximal edge of the receptacle

103, moves down the gap between the receptacle 103 and the holder 105, passes by the heating element 115, and subsequently enters the user's mouth [Plojoux (Ex. 1016), 15:18-27]. This airflow mechanism is critical for the optimal functioning of the device, ensuring a smooth and consistent draw for the user.

206. A POSA would have been motivated to modify Verleur's design based on Plojoux's teachings for several reasons, as outlined in Section XII.A.4. (Ground 1, claim 4). These reasons include practicality, safety, and precise control over the airflow. Additionally, having the air inlet at the proximal edge would decrease manufacturing costs since a hole or duct in Verleur's outer shell would no longer be needed.
207. A POSA would have looked to Plojoux because Plojoux shares many similarities with Verleur. Both devices are directed to devices to heat vaporizable substances. In addition, in both devices, the airflow follows a similar path: air travels through a gap between the cartridge and the receptacle, flows around the base of the inserted cartridge, enters an inlet at the base of the cartridge, moves past a heating element, and then exits towards the consumer's mouth. This parallel in airflow dynamics is evident when comparing Plojoux's Figure 1 with Verleur's Figures 1 and 1A. Furthermore, Plojoux also reveals a similar gap alignment mechanism as

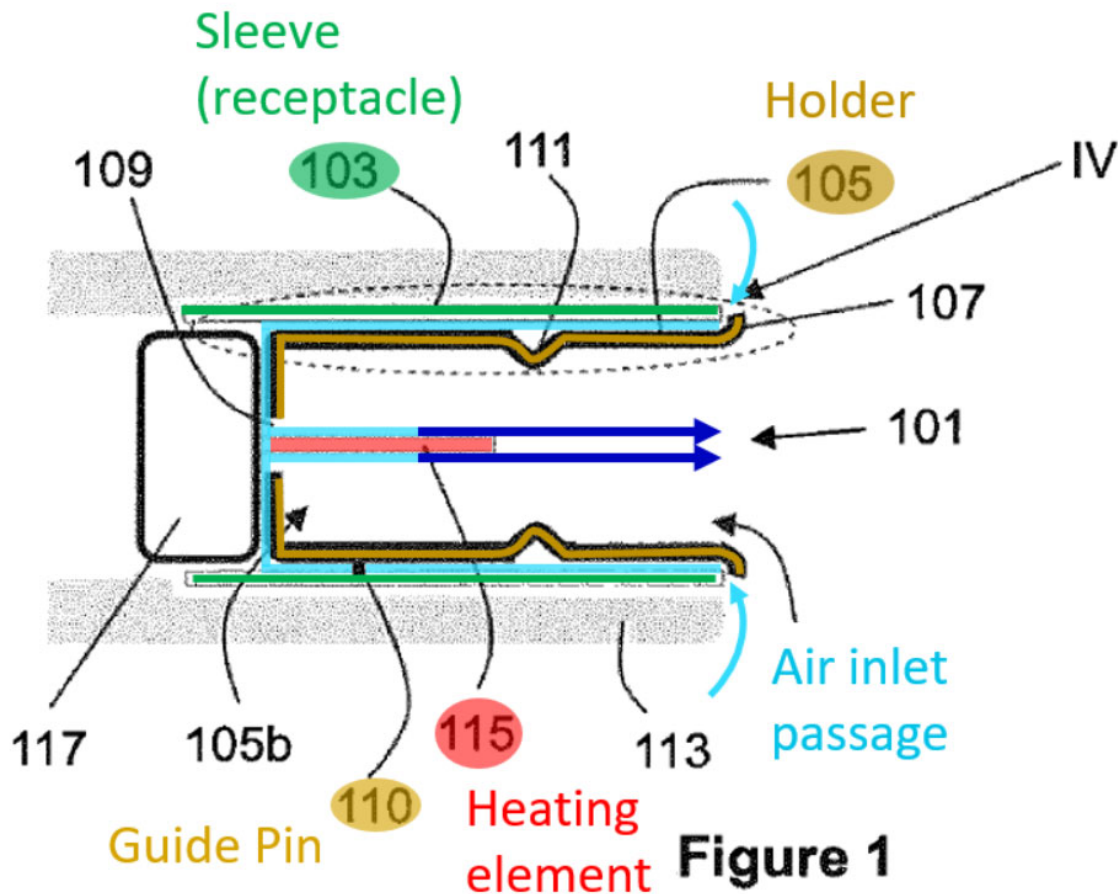
Verleur, featuring a protrusion on the cartridge that aligns with a groove on the receptacle. [Plojoux (Ex. 1016), 14:22-23 (“The holder 105 also includes a guide pin 110 which protrudes out of the holder 105 and into a slot or groove (not shown) in the inside wall of sleeve 103.”); *see* Verleur (Ex. 1005, Fig. 1A)]. Given the similarities between the devices, a POSA would have been motivated to apply the teachings of Plojoux to Verleur, such that the air inlet passage begins at the proximal edge of the receptacle, as shown in annotated Figures 4-7 below.



Verleur (Ex. 1005), Figures 4, 5, 6, 7 (annotated)

208. In my opinion, a POSA would have a reasonable expectation of success making this modification. Verleur's design already includes spatial separation between cartomizer 200/200A and outer shell 106 (i.e., the gap identified above). It would have been trivial to provide access to that gap at the proximal edge of outer shell 106. And because Verleur uses magnets to couple cartomizer 200/200A to the outer shell 106, there is no need for other types of connecting mechanism at the proximal edge. This magnetic connection obviates the need for a connecting mechanism, such as threaded connection, at the proximal edge, which could otherwise complicate the integration of an air inlet passage. Thus, this beneficial airflow path could be implemented in Verleur with minimal modification to the overall operation of the device.
209. To the extent it is argued that Verleur does not explicitly disclose a protrusion on cartomizer 200/200A that is disposed within the receptacle when the receptacle insertably receives the cartomizer, this disclosure is provided by Plojoux. In particular, Plojoux discloses a guide pin 110 on the holder 105 (i.e., part of the cartridge), that is designed to extend into a slot or groove within the sleeve 103 (receptacle). [Plojoux (Ex. 1016, 14:22-23 ("The holder 105 also includes a guide pin 110 which protrudes out of the

holder 105 and into a slot or groove (not shown) in the inside wall of sleeve 103.”)]. This guide pin is highlighted below in annotated Plojoux Figure 1.



Plojoux (Ex. 1016), Figure 1 (annotated)

210. In my opinion, a POSA would have been motivated to modify Verleur to include such a protrusion for several reasons. First, Verleur and Verleur-Prov already disclose the inverse arrangement for aligning the cartridge with the receptacle. [Verleur (Ex. 1005), [0036]; Verleur-Prov (Ex. 1006), [0027]]. A POSA would have recognized from Plojoux that the features could easily be reversed. Moreover, there are a limited number of

arrangements for alignment pins and grooves. Accordingly, it would have been a simple design choice from a limited set of choices.

211. A POSA would have had a reasonable expectation of success making such a modification because it would have been straightforward to reverse the alignment features. With this configuration, Plojoux also demonstrates that air would be able to flow unimpeded between the cartridge and the receptacle.

2. Claim 2: The apparatus of claim 1, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.

212. As shown above, Verleur renders obvious claim 1. [See analysis above [1.A] – [1.J]]. For the reasons described above in Section XII.B.1, it would have been obvious to modify Verleur with the teachings of Plojoux to include *the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.*

3. **Claim 4: The apparatus of claim 3, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.**

213. As shown above, Verleur renders obvious claim 3. [See analysis above [1.A] – [1.J], Claim 3]. For the reasons described above in Section XII.B.1, it would have been obvious to modify Verleur with the teachings of Plojoux to include *the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.*

4. **Claim 21: The apparatus of claim 20, wherein the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.**

214. As shown above, Verleur renders obvious claim 20. [See analysis above [20.A] – [20.J], [1.A] – [1.J]]. For the reasons described above, Verleur combined with the teachings of Plojoux renders obvious *the cartridge further comprises a protrusion extending from the exterior surface of the cartridge, and wherein at least part of the protrusion is disposed within the receptacle when the receptacle insertably receives and couples to the cartridge.* [See analysis above Claim 2]

5. **Claim 23: The apparatus of claim 22, wherein the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge.**

215. As shown above, Verleur renders obvious claim 22. [See analysis above [20.A] – [20.J], Claim 22, [1.A] – [1.J], Claim 3]. For the reasons described above, Verleur combined with the teachings of Plojoux renders obvious *the receptacle terminates in a proximal edge, wherein the air inlet passage extends from the proximal edge of the receptacle towards the distal end of the cartridge when the receptacle insertably receives and couples to the cartridge*. [See analysis above Claim 4].

XIII. DECLARATION

216. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.


217. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

218. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Date:

11/21/23

By:


William Singhose

APPENDIX A – MATERIALS CONSIDERED

U.S. Patent No. 10,709,173 to Monsees et al. (“the ’173 patent”) (Ex. 1001)

File History for U.S. Patent 10,709,173 (Ex. 1002)

U.S. Patent Publication No. 2015/0128971 (“Verleur”) (Ex. 1005)

U.S. Provisional Application No. 61/903,344 (“Verleur-Prov”) (Ex. 1006)

U.S. Patent Publication No. 2009/0272379 (“Thorens 379”) (Ex. 1007)

U.S. Patent Publication No. 2016/0021933 (“Thorens 933”) (Ex. 1008)

U.S. Patent No. 8,205,622 (“Pan 622”) (Ex. 1010)

U.S. Patent No. 3,200,819 (“Gilbert”) (Ex. 1012)

U.S. Patent Publication No. 2013/0228191 (“Newton 191”) (Ex. 1013)

U.S. Patent No. 5,388,594 (“Counts”) (Ex. 1014)

U.S. Patent Publication No. 2012/0199663 (“Qiu 663”) (Ex. 1015)

International Application No. WO 2013/076098A2 (“Plojoux”) (Ex. 1016)

U.S. Patent No. 9,332,787 (“Liu 787”) (Ex. 1018)

Certified Translation of KR200457694 (“Youn”) (Ex. 1020)

Certified Translation of KR200462610 (“Yeom”) (Ex. 1022)

U.S. Patent No. 11,606,981 (“Verleur 981”) (Ex. 1023)

U.S. Patent No. 11,134,722 (“Verleur 722”) (Ex. 1024)

U.S. Patent Publication No. 2011/0094523 (“Thorens 523”) (Ex. 1025)

337-TA-1368 Joint Claim Construction Chart (Ex. 1026)

August 22, 2006 Tariff Classification Ruling M85579, available at <https://rulings.cbp.gov/search?term=m85579> (Ex. 1027)

U.S. Patent Publication No. 2014/0174458 (“Katz”) (Ex. 1028)

U.S. Patent No. 5,144,962 (“Counts 962”) (Ex. 1029)

U.S. Patent Publication No. 2013/0037041 (“Worm 041”) (Ex. 1030)