(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 477 095 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.12.2024 Bulletin 2024/51

(21) Application number: **23202556.9**

(22) Date of filing: **10.10.2023**

(51) International Patent Classification (IPC):
A24F 40/10 *(2020.01)* ***A24F 40/44*** *(2020.01)*
A24F 40/485 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/485; A24F 40/10

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **15.06.2023 US 202318210627**

(71) Applicant: **Aspire North America LLC**
Los Angeles, CA 90291 (US)

(72) Inventors:
- **WANG, Michael**
Redondo Beach, 90277 (US)
- **LIU, Tuanfang**
Shenzhen, 518101 (CN)

(74) Representative: **Müller-Boré & Partner**
Patentanwälte PartG mbB
Friedenheimer Brücke 21
80639 München (DE)

(54) ATOMIZATION TUBE

(57) An atomization tube (116) is configured to be disposed within a liquid storage cavity (119) of an electronic cigarette device (20). The atomization tube (116) includes a tubular first portion configured to receive a heating core (118), and a tubular second portion. The tubular first portion includes an inlet hole (142) and an exhaust hole (141). Liquid enters the tubular first portion from the liquid storage cavity through the inlet hole to contact the heating core (118).

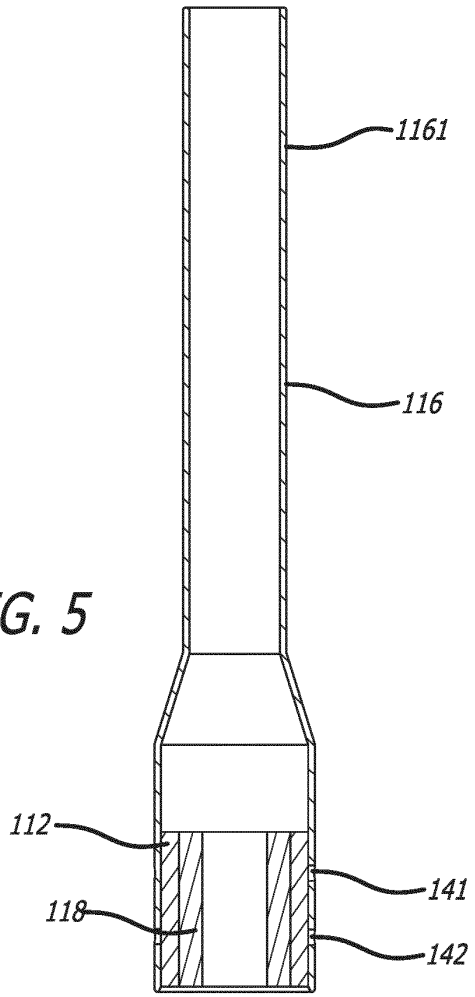


FIG. 5

EP 4 477 095 A1

Description

Technical Field

[0001] The present disclosure generally relates to atomization and vaporizing devices, and more particularly, to an atomization tube of an electronic cigarette device.

Background

[0002] Electronic cigarette (also known as "E-cigarette"), or vaping, devices can be used to deliver nicotine, cannabis (THC, CBD), flavorings, chemicals, and other substances. These devices are known by many different names and come in many shapes, sizes and device types. These devices may also be referred to as "E-cigs", "Vapes", "Vape pens," "dab pens," "dab rigs," "Tanks," "Mods," "Pod-Mods," and the like. Use of e-cigarette, or vaping, products is sometimes referred to as "vaping."

[0003] Typically, a conventional e-cigarette device or electronic cigarette device includes several basic components: a cartridge (also referred to as a reservoir or pod), a heating element or heating device (also referred to as an atomizer), a power source (e.g., a battery), and a mouthpiece. The cartridge (or reservoir or pod) can hold various substances. The cartridge may be pre-loaded with these substances, and sold with or separate from the rest of the e-cigarette device. One particular substance is a liquid solution (sometimes referred to as "e-liquid" or "e-juice"). In one particular example, the liquid solution may contain varying amounts of nicotine, cannabis (THC, CBD), flavorings, and/or other chemicals. Some conventional e-cigarette devices may not use a cartridge to hold the liquid solution. Instead, these e-cigarette devices include a reservoir built-into the device for containing the liquid solution, and into which the liquid solution can be filled. In many e-cigarettes, puffing activates the battery-powered heating element, which vaporizes the liquid in the cartridge. The user then inhales the resulting aerosol or vapor (called vaping) via the mouthpiece.

[0004] In a conventional electronic cigarette, e-liquid absorbed by an atomizer from an e-liquid reservoir can be prone to dripping and flowing out of the atomizer due to there being an excess amount of e-liquid. During storage and transportation, due to weather conditions such as high temperature and extreme cold, an air pressure in the e-liquid reservoir may be too high, causing e-liquid to flow into an atomization channel of the atomizer due to the effect of high air pressure in the e-liquid reservoir, and then flow out of the electronic cigarette device atomizer to cause pollution and waste.

[0005] Accordingly, there is a need for an improved electronic cigarette device. There is a need for an improved electronic cigarette device that reduces waste of e-liquid. There is a need for an improved electronic cigarette that reduces air pressure in an e-liquid storage cavity. There is a further need for an improved electronic cigarette device that is easier to manufacture, assemble, disassemble, adjust, and maintain. The present invention satisfies these needs and provides other related advantages.

Summary of the Invention

[0006] The present invention provides an improved electronic cigarette device. The present invention provides an improved electronic cigarette device that reduces waste of e-liquid. The present invention provides an improved electronic cigarette that reduces air pressure in an e-liquid storage cavity. The present invention provides an improved electronic cigarette device that is easier to manufacture, assemble, adjust, and maintain. The present invention satisfies these needs and provides other related advantages.

[0007] In accordance with an embodiment of the present invention, an atomization tube is configured to be disposed within a liquid storage cavity of an electronic cigarette device. The atomization tube includes a tubular first portion configured to receive a heating core, and a tubular second portion. The tubular first portion includes an inlet hole and an exhaust hole, and liquid enters the tubular first portion from the liquid storage cavity through the inlet hole to contact the heating core.

[0008] In accordance with another embodiment of the present invention, the exhaust hole is disposed on the tubular first portion adjacent an upper portion of the heating core.

[0009] In accordance with still another embodiment of the present invention, the inlet hole is disposed on the tubular first portion towards a bottom of the liquid storage cavity.

[0010] In accordance with yet another embodiment of the present invention, the tubular first portion includes cotton wrapped around the heating core.

[0011] In accordance with a further embodiment of the present invention, the atomization tube further includes a blocking member disposed in the tubular first portion between the heating core and the tubular second portion.

[0012] In accordance with a yet further embodiment of the present invention, the exhaust hole is disposed on the tubular first portion adjacent a portion of the blocking member.

[0013] In accordance with a still further embodiment of the present invention, the blocking member includes an exhaust portion and an abutment portion. The abutment portion is configured to abut against an inner wall of the atomization tube.

[0014] In accordance with an additional embodiment of the present invention, an outer diameter of the abutment potion is greater than an outer diameter of the exhaust portion.

[0015] In accordance with a yet additional embodiment of the present invention, a distance between an outer diameter of the exhaust portion and the inner wall of the atomization tube surrounding the exhaust portion defines a gap between the exhaust portion and a portion of the

atomization tube surrounding the exhaust portion.

[0016] In accordance with a still additional embodiment of the present invention, the abutment of the abutment portion against the inner wall of the atomization tube aligns the exhaust portion with the exhaust hole, and whereby gas flows between the exhaust portion and the exhaust hole.

[0017] In accordance with an additional embodiment of the present invention, the blocking member includes a central channel extends through which gas passes from the heating core into the tubular second portion.

[0018] In accordance with a further embodiment of the present invention, the blocking member further includes a protruding portion and a chamfer portion disposed between the protruding portion and the exhaust portion.

[0019] In accordance with another embodiment of the present invention, the protruding portion has a smaller outer diameter than the outer diameter of the exhaust portion.

[0020] In accordance with an embodiment of the present invention, liquid condenses on at least a portion of at least one of the protruding portion and the chamfer portion. The condensed liquid then moves towards the chamfer portion along a portion of the outer diameter of the exhaust portion.

[0021] In accordance with an additional embodiment of the present invention, the heating core is configured to vaporize liquid, and the tubular second portion is configured to guide vaporized liquid upwards.

[0022] An advantage of the exhaust hole in the atomization tube is that it helps to prevent a large amount of high-temperature vapor accumulating at a closed end of an atomization chamber, and causing e-liquid to flow into an atomization channel of the atomization tube due to the effect of high air pressure in an e-liquid storage cavity and then flow out of the atomizer to cause pollution and waste. The exhaust hole provides an air passage provides communication between the atomization chamber and a vapor discharging channel, and reduces, if not eliminates, high air pressure in the e-liquid storage cavity.

[0023] This brief summary has been provided so that the nature of the invention may be understood quickly. Additional aspects and advantages of the present invention will be given in part in the following more detailed description, taken in conjunction with the accompanying drawings, which can become apparent from the following description, which illustrate, by way of example, the principles of the invention or be understood through practice of the present invention. Any drawings contained herein constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

Description of the Figures

[0024] The various present embodiments now will be discussed in detail with an emphasis on highlighting the advantageous features with reference to the drawings of various embodiments. The illustrated embodiments are intended to illustrate, but not to limit the invention. These drawings include the following figures, in which like numerals indicate like parts: The above and/or additional aspects and advantages of the present invention will be apparent and easily understood from the descriptions of the embodiments with reference to the following drawings, wherein:

FIGURE 1 illustrates a perspective view of an electronic cigarette assembly according to an embodiment of the present invention;

FIGURE 2 illustrates an exploded view of the electronic cigarette assembly of FIG. 1;

FIGURE 3 illustrates a cross-sectional view of the electronic cigarette assembly of FIG. 1;

FIGURE 4 illustrates a perspective view of the atomization tube seen in FIGS. 2 and 3;

FIGURE 5 illustrates a cross-sectional view of the atomization tube of FIG. 4;

FIGURE 6 illustrates an exploded, partial cross-sectional view of the e-liquid storage compartment and atomization tube of the electronic cigarette assembly of FIG. 1;

FIGURE 7 illustrates a cross-sectional view of an electronic cigarette assembly according to another embodiment of the present invention;

FIGURE 8 illustrates a cross-sectional side view of the e-liquid storage compartment, atomization tube, and lower sealing member of the electronic cigarette assembly of FIG. 7;

FIGURE 9 illustrates an exploded perspective view of the e-liquid storage compartment, atomization tube, and lower sealing member of the electronic cigarette assembly of FIG. 7;

FIGURE 10 illustrates a perspective view of the blocking member of the electronic cigarette assembly of FIG. 7; and

FIGURE 11 illustrates a cross-sectional side view of the blocking member of FIG. 10.

Detailed Description

[0025] The following description is provided to enable any person skilled in the art to make and use the invention and sets forth the best modes contemplated by the inventor of carrying out his invention. Various modifications, however, will remain readily apparent to those

skilled in the art, since the general principles of the present invention have been defined herein specifically to provide an electronic cigarette assembly. The following detailed description describes the present embodiments, with reference to the accompanying drawings. In the drawings, reference numbers label elements of the present embodiments. These reference numbers are reproduced below in connection with the discussion of the corresponding drawing features. It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the present invention, while eliminating, for the purpose of clarity, many other elements found in electronic cigarette assemblies. Those of ordinary skill in the pertinent arts may recognize that other elements and/or steps are desirable and/or required in implementing the present invention. However, because such elements and steps are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements and steps is not provided herein. The disclosure herein is directed to all such variations and modifications to such elements and methods known to those skilled in the pertinent arts.

[0026] Embodiments of the present invention are described in detail hereinafter, and illustrations of the embodiments are shown in the drawings, wherein identical or similar reference numerals denote identical or similar elements or elements having the same or similar functions. The embodiments described hereinafter with reference to the drawings are exemplary and only intended to explain the present invention, and cannot be understood as limiting the present invention.

[0027] With reference to FIGS. 1-11, embodiments of the present invention provide for an improved electronic cigarette. According to an embodiment of the present invention, as shown in FIGS. 1-6, an electronic cigarette assembly 20 includes an atomizer main body (or atomizer body assembly) 100 and a mouthpiece main body (or mouthpiece assembly) 200. The atomizer main body 100 includes an atomizer housing 101, an e-liquid cup bracket or e-liquid cup holder 110, and an atomizer protective sleeve 120. The e-liquid cup holder 110 includes a holder housing (or enclosure or support) 111, a battery assembly 113, a lower fixing base 114, a terminal 115, an atomization tube 116, a heating assembly or atomizing core (or atomization core) 118, and a lower sealing member 117. The lower fixing base 114 is a circuit board that acts as a mount for various components including, without limitation, the atomizing core 118 and the battery assembly 113. Electrode base 1165 are used for conducting electricity. Each electrode base 1165 is electrically connected to a wire or conductive line (not shown for clarity) and then electrically connected to the lower fixing member (or circuit board) 114 through the wire. The atomizing core or heating core 118 is electrically connected with the electrode base 1165. The atomizing core 118 is connected to the battery assembly 113 through the fixing base 114 to form a circuit. The charging terminal 115 is used for charging the battery assembly 113. The charging terminal 115 is riveted on the lower fixing base 114 through a lead. The lower sealing member 117 is used to support other elements and functions to locate the position tolerance of other elements. The lower sealing member 117 includes a wire hole, and a pin of the atomizing core 118 passes through the wire hole. The lower sealing member 117 further includes an air hole to make the air flow pass through the microphone when entering the electronic cigarette device 20 from outside of the electronic cigarette device 20. The holder housing (or enclosure) 111 of the e-liquid cup holder 110 is further provided with an e-liquid storage pipe 119 (which partially defines an e-liquid storage chamber or e-liquid storage cavity 121) and a battery compartment 123 (in which the battery 113 is disposed). The holder housing 111 is mounted on the lower fixing base 114. A seal ring 1164 is sleeved around the lower sealing member 117 to prevent the e-liquid from leaking out from the edge and corroding the circuit board 114. The atomizer protective sleeve 120 may be made from various materials including, without limitation, plastic (e.g., thermoplastic, thermoelastic, thermosetting, etc.), silicone, and the like. The atomizer protective sleeve 120 (or portions thereof) can be transparent, translucent, or opaque.

[0028] The e-liquid cup holder 110 includes an e-liquid storage cavity 121 defined by the lower sealing member 117, the lower fixing base 114, the e-liquid storage pipe 119, and the holder housing 111. As mentioned above, the "e-liquid" or "e-juice" is a liquid solution that may contain varying amounts of various substances (alone or in combination) that can include, without limitation, nicotine, cannabis (e.g., THC, CBD), flavorings, and/or other chemicals. The e-liquid storage cavity 121 is designed such that e-liquid is disposed within the e-liquid storage cavity 121. Depending on design requirements, storage capacity of the e-liquid storage cavity 121 can be configured, as required (e.g., 0.5 ml, 1 ml, 2 ml, etc.). An outer wrapping cotton 112 disposed around the atomization core or heating core 118 within the atomization tube 116 to absorb e-liquid subsequently introduced into the atomization tube 116. The atomizing tube 116 is generally disposed within in the e-liquid storage cavity 121. The e-liquid gets introduced into the atomizing core 116 from the e-liquid storage cavity 121 through at least one e-liquid inlet hole or e-liquid guide hole 142 into the interior of the atomization tube 116 and to the atomization core 118. The e-liquid flows obliquely from the bottom of the e-liquid storage cavity 121 to the e-liquid guide hole 142, then enters the atomization tube 116 from the e-liquid guide hole 142, where the ceramic atomization core 118 heats and atomizes the e-liquid. The holder housing 111 includes a receptacle 124 into which a bottom portion of the atomization tube 116 is disposed such that the e-liquid guide hole(s) 142 are disposed at or near the bottom of the e-liquid storage cavity 121.

[0029] The mouthpiece main body (or mouthpiece as-

sembly) 200 includes an upper fixing base 210, and an upper sealing member 212. A mouthpiece protective sleeve 220 is sleeved onto the periphery of the mouthpiece main body 200. The mouthpiece protective sleeve serves to seal the opening of the mouthpiece main body 200 to reduce/prevent foreign material from entering. The upper fixing base 210. The upper sealing member 212 provides a general seal between the upper fixing base 210 and the main body 100. The upper sealing member 212 may be made from various materials including, without limitation, silicone, plastic, and the like. The upper sealing member 212 is provided with at least one (1) blind hole or e-liquid filling port 2121 configured for providing access to the e-liquid storage cavity 121 for filling the e-liquid storage cavity 1111 with e-liquid (not shown for clarity). The e-liquid sealing member 2122 is disposed in the e-liquid filling port 2121 between ends of the e-liquid sealing port 2121 to seal the e-liquid filling port 2121. The e-liquid sealing member (or thin film membrane) 2122 can be punctured to fill the e-liquid into the e-liquid storage cavity 121. The e-liquid filing port 2121 can serve as a guide for an e-liquid injection needle (when a needle is used to add e-liquid to the e-liquid storage cavity 121). The thickness of the thin film membrane 2122 is about one millimeters to about five millimeters (1 mm-5mm). Preferably, the thickness of the thin film is about two millimeters to about three millimeters (2mm-3mm). During injection of e-liquid, the injection needle is inserted into through thin film membrane 2122 for e-liquid injection into the e-liquid storage cavity 121. When the injection needle is pulled out, the thin film membrane 2122 will return to its original state for sealing, and the e-liquid will not leak out through the thin film membrane 2122 from the e-liquid storage cavity 121. The e-liquid sealing member or thin film membrane 2122 is made from various materials including, without limitation, a colloid (that can be restored to its original state), silica gel, latex, rubber, resin, or the like that can be restored to its original shape. The puncture in the thin film membrane 2122 closes sufficiently to the point where e-liquid cannot backfill into the upper fixing base 210 from the e-liquid storage cavity 121.

[0030] The upper fixing base 210 is arranged at the other end of the e-liquid storage pipe 121. The atomization tube 116 is arranged on the lower sealing member 117 and provided with a hollow smoke guide tube 1161 in the direction of the mouthpiece main body 200. The smoke guide tube 1161 provides a path for vaporized e-liquid to travel to the mouthpiece main body 200 for inhalation by a user. An atomizing channel us formed in the smoke guide tube 1161. The heating core 118 is made from porous ceramic, and embedded with an electric heating element disposed around a central atomization channel. The electric heating element is connected to the lower fixing base 114 through a hole on the lower sealing member 117. The lower sealing member 117 is provided with a microphone 1151 that functions as an air flow sensor. The microphone 1151 is disposed between the lower fixing base 114 and the lower sealing member 117. Air holes are arranged around the microphone 1151, and the air holes are in communication with the atomizing channel.

[0031] The atomizer housing 101 can include a window or aperture 160 sized and shaped so as to allow the various components of the e-liquid cup holder 110 to be seen by a user when the housing 111 is covered by the atomizer housing 101. The atomizer housing 101 may be made from various materials including, without limitation, plastic (e.g., thermoplastic, thermoelastic), and the like. The atomizer housing 101 (or portions thereof) can be transparent, translucent, or opaque. The housing 111 of the e-liquid cup holder 110 may be made from various materials including, without limitation, plastic (e.g., thermoplastic, thermoelastic), and the like. The housing 111 (or portions thereof) of the e-liquid cup holder 110 can be transparent, translucent, or opaque.

[0032] The e-liquid cup holder 110 is further provided with a support column 1112 which functions to position the mouthpiece main body 200 (and provide additional strength to resist over-tension and bending). The support column 1112 extends through an aperture 1113 of the upper sealing member 212, and at least partially extends into a bore or guide 1114 of the upper fixing base 210 sized and shaped to receive the support column 1112. The aperture 1113 of the sealing member 212 is size and shaped to receive at least a portion of the bore or guide 1114 of the upper fixing base 210, and the bore or guide 1114 is sized and shaped to receive the support column 1112. The extension of the support column 1112 through the aperture 1113 and into the bore or guide 1114 assists in alignment and positioning of the smoke guide tube 1161 and the support column 1112 with the mouthpiece protective sleeve 220 and the upper fixing base 210.

[0033] The upper sealing member 212 is provided on one side of the mouthpiece main body 200 (i.e., the side facing the atomizer main body 100). An upper portion of the upper sealing member 212 is at least partially disposed within the upper fixing base 210. The mouthpiece main body 200 includes an e-liquid filling channel or passage 2124 defining a path to the e-liquid filling port 2121. The smoke guide tube 1161 of the atomization tube 116 extends through an aperture 2120 of the upper sealing member 212 such that vaporized liquid or smoke passes from the smoke guide tube 1161 into the passage 2124 for subsequent inhalation by the user. The upper fixing guide 210 includes an aperture or guide tube 2102 with the guide tube 1161 of the atomization tube 116 extending into the aperture 2102. The extension of the smoke guide tube 1161 through the apertures 2120, 2102 assists in alignment and positioning of the smoke guide tube 1161 with the mouthpiece protective sleeve 220 and the upper fixing base 210. The smoke guide tube 1161 and the support column 1112 are respectively arranged at two ends, so as to improve the stability of the electronic cigarette device 20.

[0034] The upper sealing member 212 is fixed on the e-

liquid cup holder 110 by the mouthpiece main body 200. The mouthpiece main body 200 is removably mounted and connected to the e-liquid cup holder 110 by means of a snap-fit structure or the like, such that the e-liquid can be directly filled into the e-liquid storage cavity 121 after the mouthpiece main body 200 and the upper sealing member 212 are removed. In the alternative, various other fastening mechanisms can be used including, without limitation, press-fit engagement, clips, magnets embedded at both ends for connection, etc. In another alternative, the main body 100 and the mouthpiece main body 200 are fixed to each other or otherwise permanently engaged with each other.

[0035] As set forth above, an outer wall of the atomization tube 116 is provided with the e-liquid guide hole 142, and the e-liquid guide hole is configured for allowing e-liquid to pass into the interior of the atomization tube 116 for atomization of the e-liquid by the heating core 118. The atomization tube 116 is fixed to the lower fixing base 114, and the lower fixing base 114 is provided with an air guide hole configured for allowing gas (e.g., air) to pass to an air intake of the atomization tube 116, and into the interior thereof. Likewise, the lower sealing member 117 has a corresponding air guide hole for allowing air to pass to the atomization tube 116.

[0036] When a user smokes from the mouthpiece main body 200, an air pressure is generated, and the air flow sensor (i.e., the microphone 1151) senses the air pressure difference which, in turn, activates the electric heating element within the heating core 118 and generates heat. The electric heating element heats and vaporizes e-liquid within the heating core 118 to form an aerosol. The aerosol and gas (i.e., air) are sucked together through the smoke guide tube 1161 towards and through the mouthpiece main body 200 to be inhaled by the user. However, e-liquid can accumulate at one end of the heating core 118 to form an e-liquid film to block the atomization channel of the heating core 118 which prevents the user's re-inhaled air flow from passing through the e-liquid film, and the gas flow sensor 1151 cannot sense the sucking action which, in turn, prevents the circuit of the heating core 118 from being triggered (that is, the heating core 118 cannot operate to heat, and the entire atomizer cannot be used).

[0037] To prevent build-up of e-liquid and reduce the potential for blockage of the atomization channel, the atomization tube 116 further includes an air exhaust hole 141. The exhaust hole 141 is provided in a side wall of the atomization tube 116 for providing gaseous communication between the atomization tube 116 and the e-liquid storage cavity 121 to balance air pressure in an atomization chamber. As shown in FIGS. 4-6, an atomizer core includes the atomization tube 116 and the heating core 118 (which may be a ceramic heating core) disposed within the atomization tube 116. The outside of the ceramic heating core 118 is wrapped with the wrapping cotton 112. The wrapping cotton 112 wraps the ceramic heating core 118 and is arranged in a gap between the ceramic hearing core 118 and an inner wall of the atomization tube 116. The e-liquid storage cavity 121 is connected to the mouthpiece assembly 200 via the atomization tube 116, enabling an air pressure in the e-liquid storage cavity 121 to be always balanced, so as to reduce the risk of e-liquid leakage. The e-liquid storage cavity 121 may be directly filled with e-liquid, or internally provided with e-liquid storage cotton (separate and distinct from the wrapping cotton 112) for retaining e-liquid (i.e., the e-liquid storage cotton absorbs e-liquid in the e-liquid storage cavity 121). The exhaust hole 141 balances the air pressure in the e-liquid storage cavity 121, and air pressure balance in the e-liquid storage cavity 121 reduces, if not prevents, e-liquid being squeezed out of the e-liquid storage cavity 121 due to the high pressure in the e-liquid storage cavity 121. The e-liquid storage cavity 121 can be supplemented with air through the exhaust hole 141 so as to make the e-liquid flow more smooth through the e-liquid inlet hole 142. The ceramic heating core 118 is a hollow structure, and the ceramic heating core 118 communicates with the atmosphere through the exhaust hole 141, smoke guide tube 1161 and the passage 2124 so the air pressure within the ceramic core 118 doesn't need to be balanced.

[0038] The e-liquid inlet hole(s) 142 and the exhaust hole 141 are provided in the side wall of the atomization tube 116. The exhaust hole 141 and the e-liquid inlet hole(s) 142 are located at positions corresponding to the ceramic heating core 118 and the wrapping cotton 112. The exhaust hole 141 is arranged towards the mouthpiece assembly 200, and the e-liquid inlet hole 142 is arranged towards the bottom of the e-liquid storage cavity 121. The wrapping cotton 112 is permeable to gas but impermeable to liquid. The e-liquid inlet hole 142 is arranged close to an end of the atomization tube 116 away from the passage 2124 (or mouthpiece). By means of the exhaust hole 141, an air pressure balance in the atomization tube 116 can be maintained, preventing e-liquid from flowing into the atomization channel of the atomization tube 116 due to the effect of high air pressure in the e-liquid storage cavity 121 and then flowing out of the atomizer core to cause pollution and waste. The e-liquid generally fills the e-liquid storage cavity 121, and the exhaust hole 141 is generally submerged under the level of e-liquid. As only air can pass through the exhaust hole 141, the e-liquid can't pass through the exhaust hole 141.

[0039] In accordance with another embodiment of the present invention, as shown in FIGS. 7-11, an electronic cigarette device 30 is similar in operation and structure to the electronic cigarette device 20 of FIGS. 1-6, with one particular difference being that the electronic cigarette device 30 further includes a generally cylindrical blocking member 150 provided inside the atomization tube 116 at a position corresponding to the exhaust hole 141. The blocking member 150 includes an abutment part or abutment portion 152 which abuts against the inner wall of the atomization tube 116. The blocking member 150 further

includes an exhaust part or exhaust portion 151. An outer diameter of the abutment potion 152 of the blocking member 150 is greater than an outer diameter of the exhaust portion 151 of the blocking member 150. The difference in the outer diameter of the exhaust portion 151 and the inner diameter of the corresponding portion of the side wall of the atomization tube 116 surrounding the exhaust portion 151 forms a gap between the outer diameter of the blocking member 150 at the exhaust portion 151 and the corresponding portion of the side wall of the atomization tube 116 surrounding the exhaust portion 151. The exhaust portion 151 is arranged at the end of the abutment portion 152 which is away from the ceramic core 118. The abutment portion 152 abuts against the inner wall of the atomization tube 116 and limits the exhaust portion 151 to the position of the exhaust hole 141, so that gases, air or the like can flow between the exhaust portion 151 and the exhaust hole 141, to communicate the ceramic heating core 118 with the e-liquid storage cavity 121. A central channel 153 extends through the blocking member 150 that allows aerosol, vaporized e-liquid or the like to pass from the ceramic heating core 118 up into the smoke guide tube 1161. Only air can pass through the air exhaust hole 141, and e-liquid cannot pass through the air exhaust hole 141. The outer diameter of the abutment portion 152 is about the same as the inner diameter of the atomization tube 116. The abutment portion 152 is tightly in press-fit engagement with the atomization tube 116, so that the blocking member 150 is fixed. The outer diameter of the exhaust portion 151 is slightly smaller than the inner diameter of the atomization tube 116, so that there is a gap between the exhaust portion 151 and the wall of the atomization tube 116. The gap is formed to allow for communication between the exhaust hole 141 and the atmosphere.

[0040] The blocking member 150 further includes a protruding part or protruding portion 154 having a smaller outer diameter than the outer diameter of the exhaust portion 151. The blocking member 150 also includes a chamfer portion 1541 between the protruding portion 154 and the exhaust portion 151. During use of the electronic cigarette device 30, a portion of the e-liquid cannot be fully discharged from the atomization tube 116 and this non-smoked e-liquid condenses on the upper part of the blocking member 150 and the chamfer portion 1541. The e-liquid is atomized to form a smoke in the atomization tube 116, and a portion of that smoke condenses on the wall of the atomization tube 116 to form a condensation. The condensation then flows along the wall of the atomization tube 116 to the chamfer portion 1541. It should be noted that the gap between the outer diameter of the exhaust portion 151 and the corresponding portion of the side wall of the atomization tube 116 surrounding the exhaust portion 151 has a width of about 0.035 mm to about 0.055 mm, and the blocking member 150 is preferably liquid impermeable and gas impermeable , and is preferably made from a metal with stable chemical properties (e.g., iron, copper, aluminum, and the like).

[0041] The e-liquid storage cavity 121 is connected to the e-liquid filling channel or passage 2124 of the mouthpiece assembly 200 by means of the atomization tube 116; enabling an air pressure in the e-liquid storage cavity 121 to be always balanced, so as to reduce the risk of e-liquid leakage. The e-liquid storage cavity 121 may be directly filled with e-liquid, or internally provided with an e-liquid storage cotton for e-liquid retaining. It should be noted that, in order to prevent e-liquid from permeating directly into the atomization tube 116 through the exhaust port or exhaust hole 141, an e-liquid storage cotton (not shown) may be disposed in the e-liquid storage cavity 121 such that the e-liquid in the e-liquid storage cavity 121 is retained in the e-liquid storage cavity 121 by the e-liquid storage cotton. In the alternative to the cotton, other absorbent materials may also be used (e.g., natural fibers capable of absorbing e-liquid, synthetic fibers (e.g., polymethacrylate fibers, etc.) capable of absorbing e-liquid, or a combination of natural and synthetic fibers capable of absorbing e-liquid). In the alternative, the gap between the outer diameter of the exhaust portion 151 and the corresponding portion of the side wall of the atomization tube 116 surrounding the exhaust portion 151 may be filled with a cotton material, an absorbent material, or the like. Due to the cotton material, the e-liquid in the e-liquid storage cavity 121 cannot enter the atomization tube 116, and gas can freely pass through the e-liquid storage cavity 121 and the atomization tube 116. The e-liquid generally fills the whole e-liquid storage cavity 121, and the exhaust hole 141 should be submerged under the level of e-liquid.

[0042] In addition, the claimed invention is not limited in size and may be constructed in various sizes in which the same or similar principles of operation as described above would apply. Furthermore, the figures (and various components shown therein) of the specification are not to be construed as drawn to scale.

[0043] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps. In other words, unless explicitly stated to the contrary, embodiments "comprising" or "having" an element or a plurality of elements having a particular property can include additional elements not having that property. In other words, the terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. In other words, the use of "including," "comprising," "having,"

"containing," "involving," and variations thereof, is meant to encompass the items listed thereafter and additional items. Further, references to "one embodiment" or "one implementation" are not intended to be interpreted as excluding the existence of additional embodiments or implementations that also incorporate the recited features. The term "exemplary" is intended to mean "an example of".

[0044] As used herein, the singular forms "a", "an" and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. In other words, an element or step recited in the singular and preceded by the word "a" or "an" should be understood as not necessarily excluding the plural of the elements or steps. Further, references to "one embodiment" or "one implementation" are not intended to be interpreted as excluding the existence of additional embodiments or implementations that also incorporate the recited features. Thus, when introducing elements of aspects of the disclosure or the examples thereof, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. In other words, the indefinite articles "a", "an", "the", and "said" as used in the specification and in the claims, unless clearly indicated to the contrary, should be understood to mean "at least one." The use of the expression "at least" or "at least one" suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

[0045] The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters, dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary. Any range or value given herein can be extended or altered without losing the effect sought, as will be apparent to the skilled person.

[0046] When an element or layer is referred to as being "on", "engaged to", "connected to" or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to", "directly connected to" or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0047] In the description of the present invention, several means one or more, a plurality of means more than two, greater than, less than, more than, and the like are understood as not including this number, while above, below, within, and the like are understood as including this number. If there are the descriptions of first and second, it is only for the purpose of distinguishing technical features, and should not be understood as indicating or implying relative importance, implicitly indicating the number of the indicated technical features or implicitly indicating the order of the indicated technical features.

[0048] In the description of the present invention, it should be noted that the terms "installation", "connected" and "connection" if any shall be understood in a broad sense unless otherwise specified and defined. For example, they may be fixed connection, removable connection or integrated connection; may be mechanical connection or electrical connection; and may be direct connection, or indirect connection through an intermediate medium, and connection inside two elements. The specific meanings of the above terms in the present invention can be understood in a specific case by those of ordinary skills in the art.

[0049] While various spatial and directional terms, such as "up", "down", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside", "upper," "lower," and the like are used to describe embodiments and implementations of the present disclosure, it is understood that such terms are merely used with respect to the orientations shown in the drawings. The orientations can be inverted, rotated, or otherwise changed, such that a top side becomes a bottom side if the structure is flipped 180 degrees, becomes a left side or a right side if the structure is pivoted 90°, and the like. In other words, spatially relative terms, such as "inner," "outer," "beneath", "below", "above", "lateral", "longitudinal" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0050] In the description of the present invention, it should be understood that the orientation or position relationship indicated by the terms is based on the orientation or position relationship shown in the accompanying drawings, it is only for the convenience of description of the present invention and simplification of the description, and it is not to indicate or imply that the indicated device or element must have a specific orientation, and be constructed and operated in a specific orientation. Therefore, the terms shall not be understood as limiting the present invention.

[0051] As used herein, a structure, limitation, or ele-

ment that is "configured to" perform a task or operation is particularly structurally formed, constructed, or adapted in a manner corresponding to the task or operation. For purposes of clarity and the avoidance of doubt, an object that is merely capable of being modified to perform the task or operation is not "configured to" perform the task or operation as used herein.

[0052] Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

[0053] It will be understood that the benefits and advantages described above can relate to one embodiment or can relate to several embodiments. The embodiments are not limited to those that solve any or all of the stated problems or those that have any or all of the stated benefits and advantages. It will further be understood that reference to 'an' item refers to one or more of those items.

[0054] The order of execution or performance of the operations in examples of the disclosure illustrated and described herein is not essential, unless otherwise specified. That is, the operations can be performed in any order, unless otherwise specified, and examples of the disclosure can include additional or fewer operations than those disclosed herein. For example, it is contemplated that executing or performing a particular operation before, contemporaneously with, or after another operation (e.g., different steps, etc.) is within the scope of aspects and implementations of the disclosure. In other words, the method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

[0055] The phrase "one or more of the following: A, B, and C" means "at least one of A and/or at least one of B and/or at least one of C." The phrase "and/or", as used in the specification and in the claims, should be understood to mean "either or both" of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Multiple elements listed with "and/or" should be construed in the same fashion, i.e., "one or more" of the elements so conjoined. Other elements may optionally be present other than the elements specifically identified by the "and/or" clause, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, a reference to "A and/or B", when used in conjunction with open-ended language such as "comprising" can refer, in one embodiment, to A only (optionally including elements other than B); in another embodiment, to B only (optionally including elements other than A); in yet another embodiment, to both A and B (optionally including other elements); etc.

[0056] As used in the specification and in the claims, "or" should be understood to have the same meaning as "and/or" as defined above. For example, when separating items in a list, "or" or "and/or" shall be interpreted as being inclusive, i.e., the inclusion of at least one, but also including more than one, of a number or list of elements, and, optionally, additional unlisted items. Only terms clearly indicated to the contrary, such as "only one of or "exactly one of," or, when used in the claims, "consisting of," will refer to the inclusion of exactly one element of a number or list of elements. In general, the term "or" as used shall only be interpreted as indicating exclusive alternatives (i.e., "one or the other but not both") when preceded by terms of exclusivity, such as "either," "one of "only one of or "exactly one of." "Consisting essentially of," when used in the claims, shall have its ordinary meaning as used in the field of patent law.

[0057] As briefly discussed above, as used in the specification and in the claims, the phrase "at least one," in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase "at least one" refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, "at least one of A and B" (or, equivalently, "at least one of A or B," or, equivalently "at least one of A and/or B") can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

[0058] Use of ordinal terms such as "first," "second," "third," etc., in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed. Ordinal terms are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term), to distinguish the claim elements.

[0059] Having described aspects of the disclosure in detail, it will be apparent that modifications and variations are possible without departing from the scope of aspects of the disclosure as defined in the appended claims. As various changes could be made in the above constructions, products, and methods without departing from the

scope of aspects of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

[0060] It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments (and/or aspects thereof) can be used in combination with each other. In addition, many modifications can be made to adapt a particular situation or material to the teachings of the various embodiments of the disclosure without departing from their scope. While the dimensions and types of materials described herein are intended to define the parameters of the various embodiments of the disclosure, the embodiments are by no means limiting and are example embodiments. Many other embodiments will be apparent to those of ordinary skill in the art upon reviewing the above description. The scope of the various embodiments of the disclosure should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted based on 35 U.S.C. § 112(f), unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

[0061] This written description uses examples to disclose the various embodiments of the disclosure, including the best mode, and also to enable any person of ordinary skill in the art to practice the various embodiments of the disclosure, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the various embodiments of the disclosure is defined by the claims, and can include other examples that occur to those persons of ordinary skill in the art. Such other examples are intended to be within the scope of the claims if the examples have structural elements that do not differ from the literal language of the claims, or if the examples include equivalent structural elements with insubstantial differences from the literal language of the claims.

[0062] The above description presents the best mode contemplated for carrying out the present invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains to make and use this invention. This invention is, however, susceptible to modifications and alternate constructions from that discussed above that are fully equivalent. Moreover, features described in connection with one embodiment of the invention may be used in conjunction with other embodiments, even if not explicitly stated above. Consequently, this invention is not limited to the particular embodiments disclosed. On the contrary, this invention covers all modifications and alternate constructions coming within the spirit and scope of the invention as generally expressed by the following claims, which particularly point out and distinctly claim the subject matter of the invention.

[0063] The following claims are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, what can be obviously substituted and also what essentially incorporates the essential idea of the invention. Those skilled in the art will appreciate that various adaptations and modifications of the just-described preferred embodiment can be configured without departing from the scope of the invention. The illustrated embodiment has been set forth only for the purposes of example and that should not be taken as limiting the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

[0064] Various technical features of the above embodiments may be combined randomly, and in order to simplify the description, possible combinations of various technical features in the above embodiments are not all described. However, as long as the combinations of these technical features have no contradiction, the combinations of these technical features should be considered as falling into the scope recorded by the specification.

[0065] The present disclosure provides an atomization tube which is configured to be disposed within a liquid storage cavity of an electronic cigarette device. The atomization tube includes a tubular first portion configured to receive a heating core, and a tubular second portion. The tubular first portion includes an inlet hole and an exhaust hole. Liquid enters the tubular first portion from the liquid storage cavity through the inlet hole to contact the heating core.

[0066] Although the embodiments of the present invention have been shown and described, those of ordinary skills in the art may understand that various changes, modifications, substitutions and variations may be made to these embodiments without departing from the principle and purpose of the present invention, and the scope of the present invention is defined by the claims and their equivalents.

[0067] The following claims are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, what can be obviously substituted and also what incorporates the essential idea of the invention. Those skilled in the art will appreciate that various adaptations and modifications of the just-described preferred embodiment can be configured without departing from the scope of the invention. The illustrated embodiment has been set forth only for the purposes of example and that should not be

taken as limiting the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

Claims

1. An atomization tube configured to be disposed within a liquid storage cavity of an electronic cigarette device, comprising:

   a tubular first portion configured to receive a heating core; and
   a tubular second portion;
   wherein the tubular first portion includes an inlet hole and an exhaust hole; and wherein liquid enters the tubular first portion from the liquid storage cavity through the inlet hole to contact the heating core.

2. The atomization tube of Claim 1, wherein the exhaust hole is disposed on the tubular first portion adjacent an upper portion of the heating core.

3. The atomization tube of any one of the preceding Claims, wherein the inlet hole is disposed on the tubular first portion towards a bottom of the liquid storage cavity.

4. The atomization tube of any one of the preceding Claims, wherein tubular first portion includes cotton wrapped around the heating core.

5. The atomization tube of any one of the preceding Claims, further comprising a blocking member disposed in the tubular first portion between the heating core and the tubular second portion.

6. The atomization tube of Claim 5, wherein the exhaust hole is disposed on the tubular first portion adjacent a portion of the blocking member.

7. The atomization tube of Claim 5 or 6, wherein the blocking member includes an exhaust portion and an abutment portion; and wherein the abutment portion is configured to abut against an inner wall of the atomization tube.

8. The atomization tube of Claim 7, wherein an outer diameter of the abutment potion is greater than an outer diameter of the exhaust portion.

9. The atomization tube of Claim 7 or 8, wherein a distance between an outer diameter of the exhaust portion and the inner wall of the atomization tube surrounding the exhaust portion defines a gap between the exhaust portion and a portion of the atomization tube surrounding the exhaust portion.

10. The atomization tube of Claim 7, 8 or 9, wherein abutment of the abutment portion against the inner wall of the atomization tube aligns the exhaust portion with the exhaust hole, and whereby gas flows between the exhaust portion and the exhaust hole.

11. The atomization tube of any one of the preceding Claims 5 to 10, wherein the blocking member includes a central channel extends through which gas passes from the heating core into the tubular second portion.

12. The atomization tube of any one of the preceding Claims 5 to 11, wherein the blocking member further includes a protruding portion and a chamfer portion disposed between the protruding portion and the exhaust portion.

13. The atomization tube of Claim 12, wherein the protruding portion has a smaller outer diameter than the outer diameter of the exhaust portion.

14. The atomization tube of Claim 12 or 13, wherein liquid condenses on at least a portion of at least one of the protruding portion and the chamfer portion, and wherein the condensed liquid then moves towards the chamfer portion along a portion of the outer diameter of the exhaust portion.

15. The atomization tube of any one of the preceding Claims, wherein the heating core is configured to vaporize liquid, and the tubular second portion is configured to guide vaporized liquid upwards.

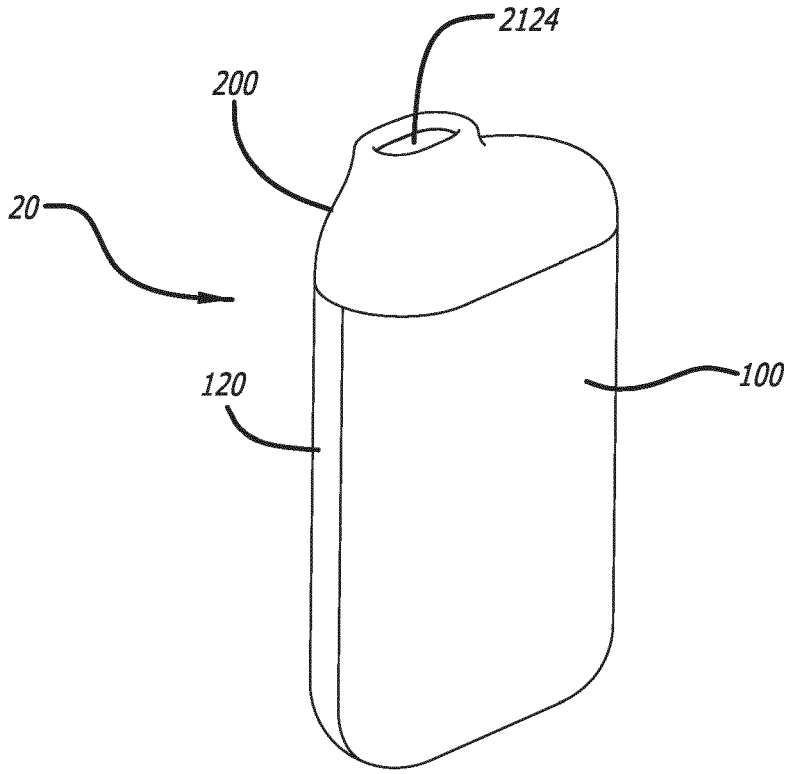


FIG. 1

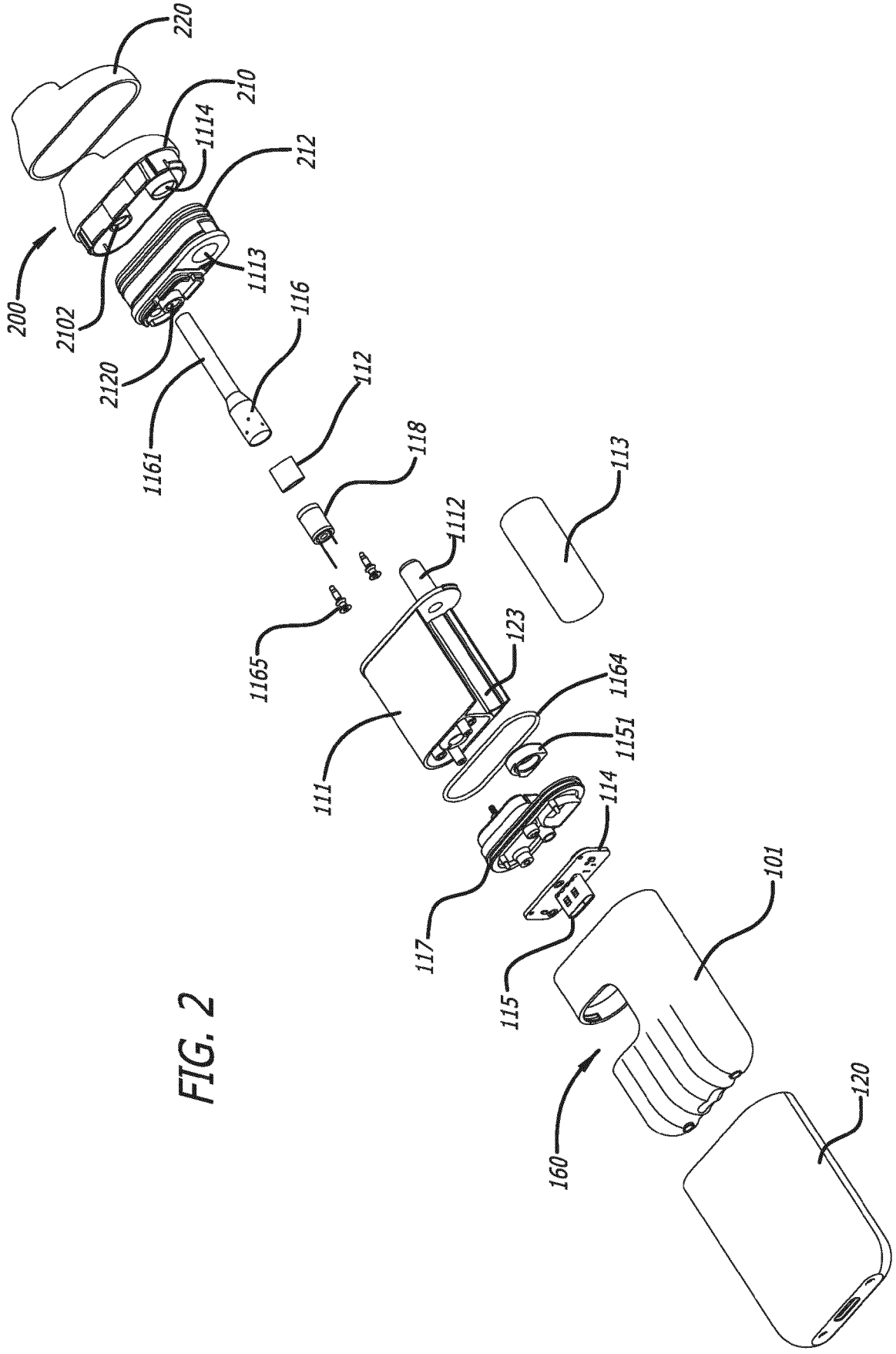

220
210
1114
212
200
2102
1113
116
2120
1161
112
118
113
1112
1165
123
1164
111
1151
114
117
115
101
160
120

FIG. 2

FIG. 3

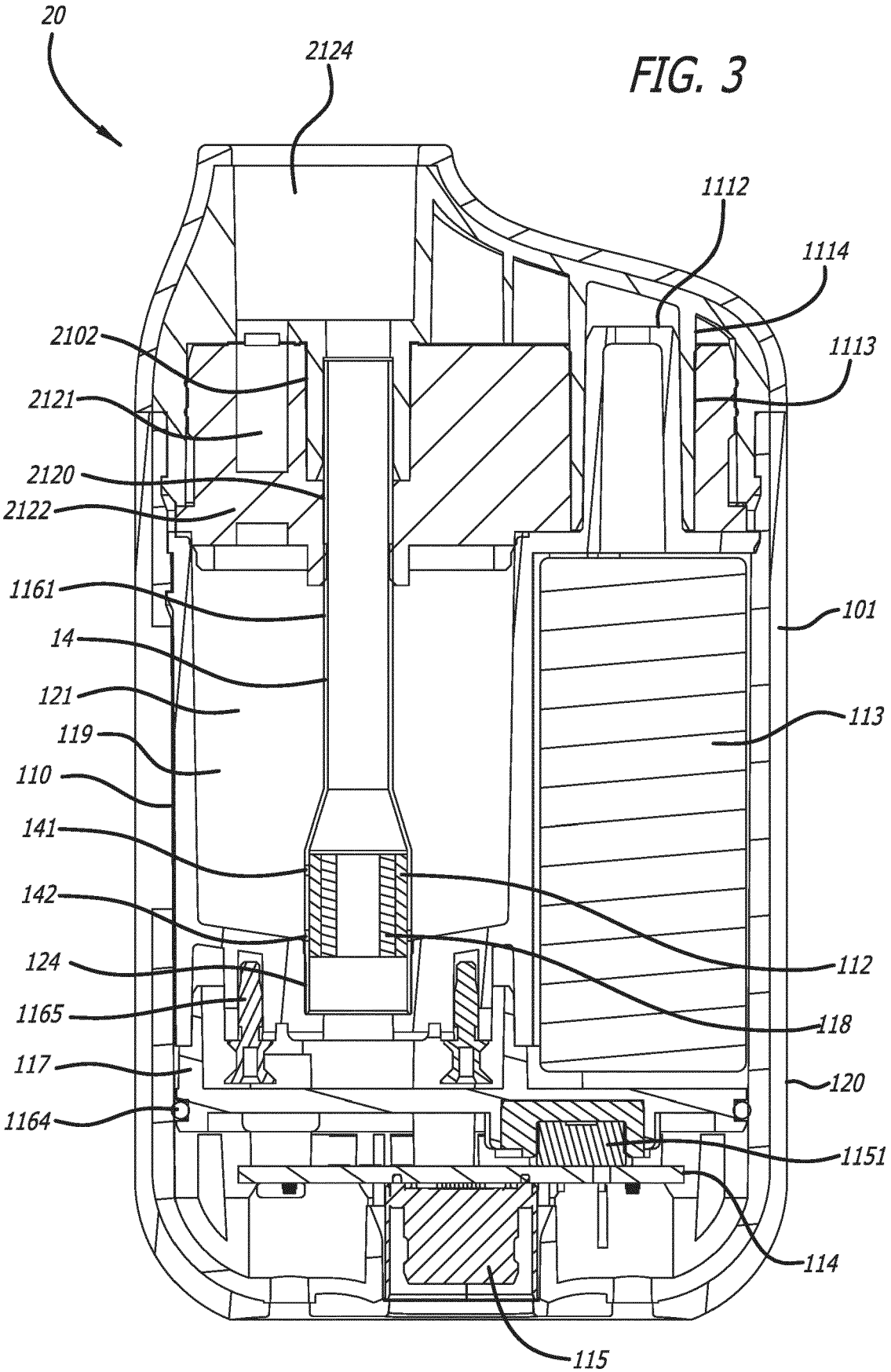

20
2124
1112
1114
2102
1113
2121
2120
2122
1161
101
14
121
113
119
110
141
142
112
124
118
1165
117
120
1164
1151
114
115

FIG. 4

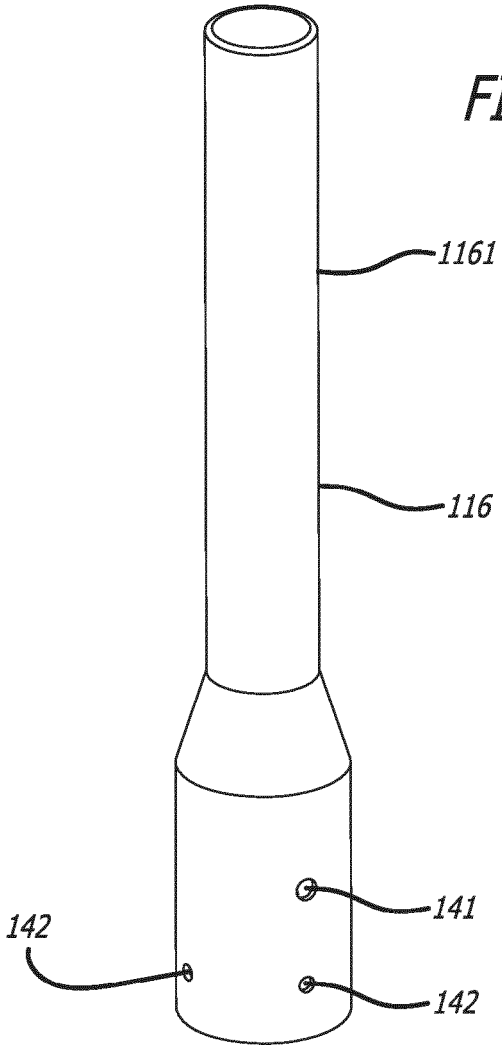


FIG. 5

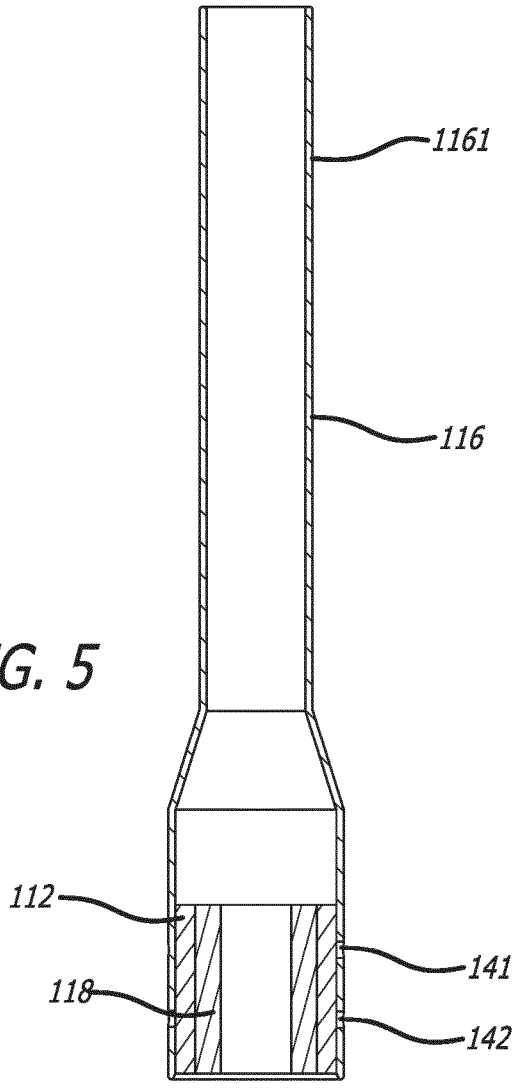


FIG. 6

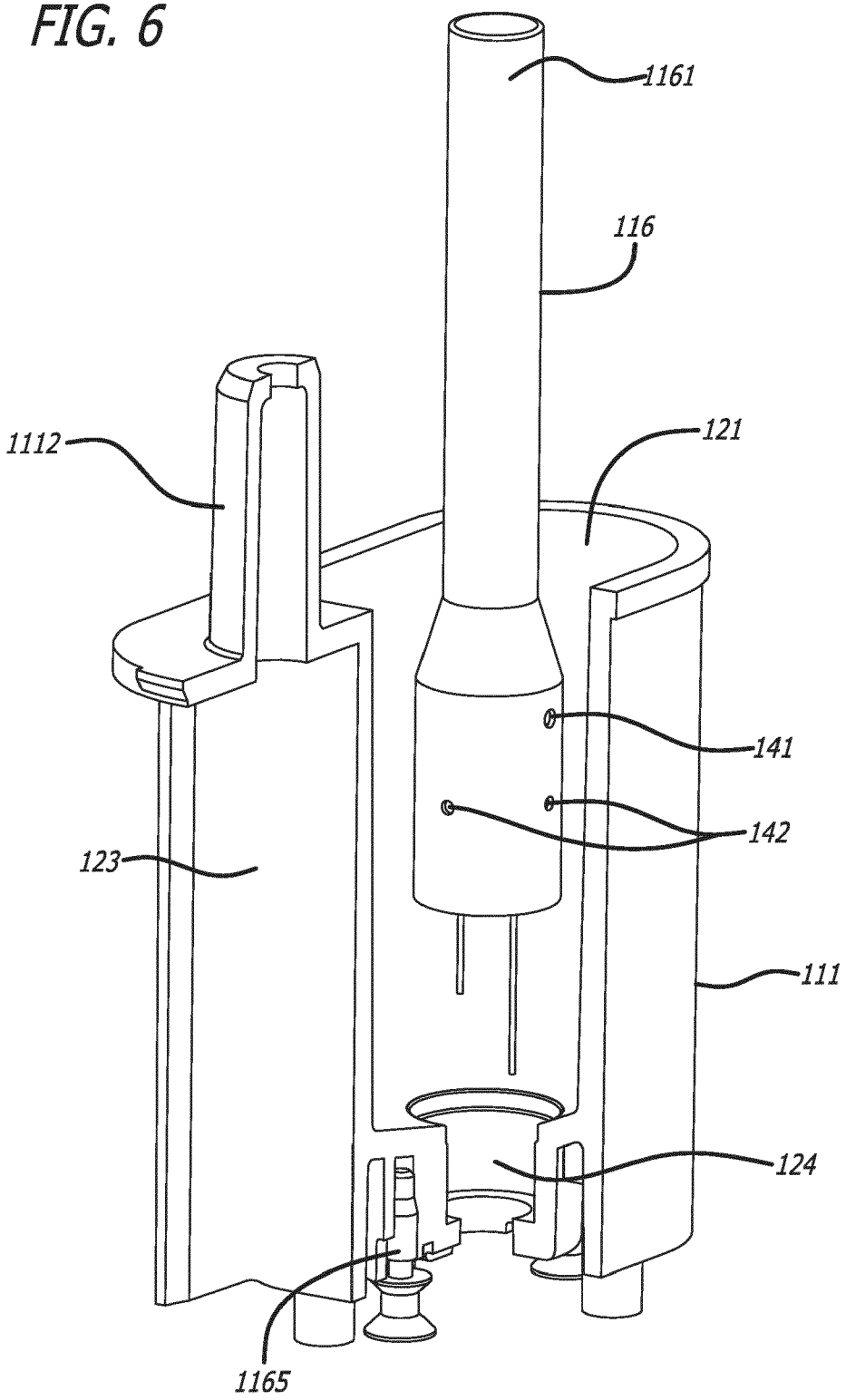


FIG. 7

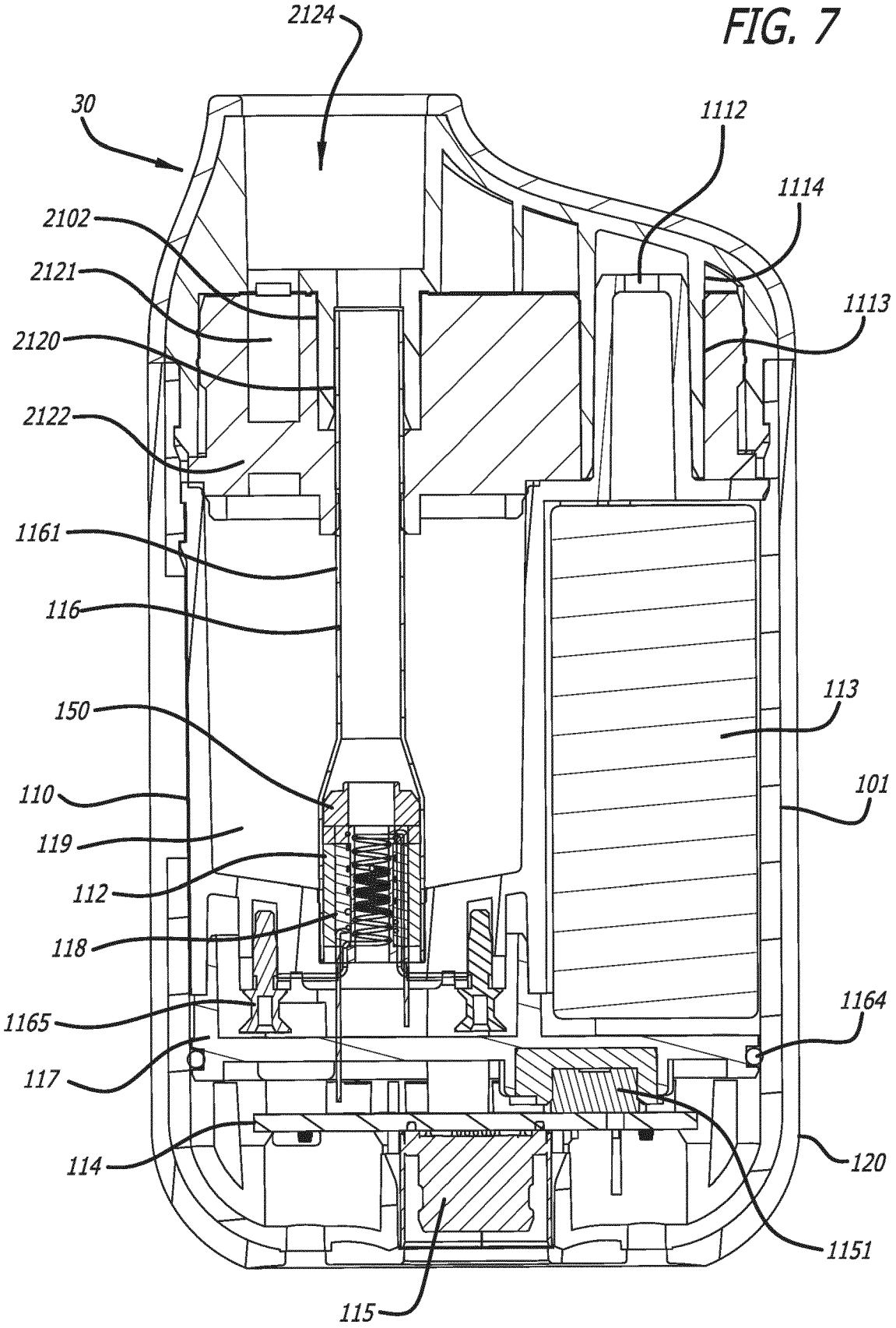
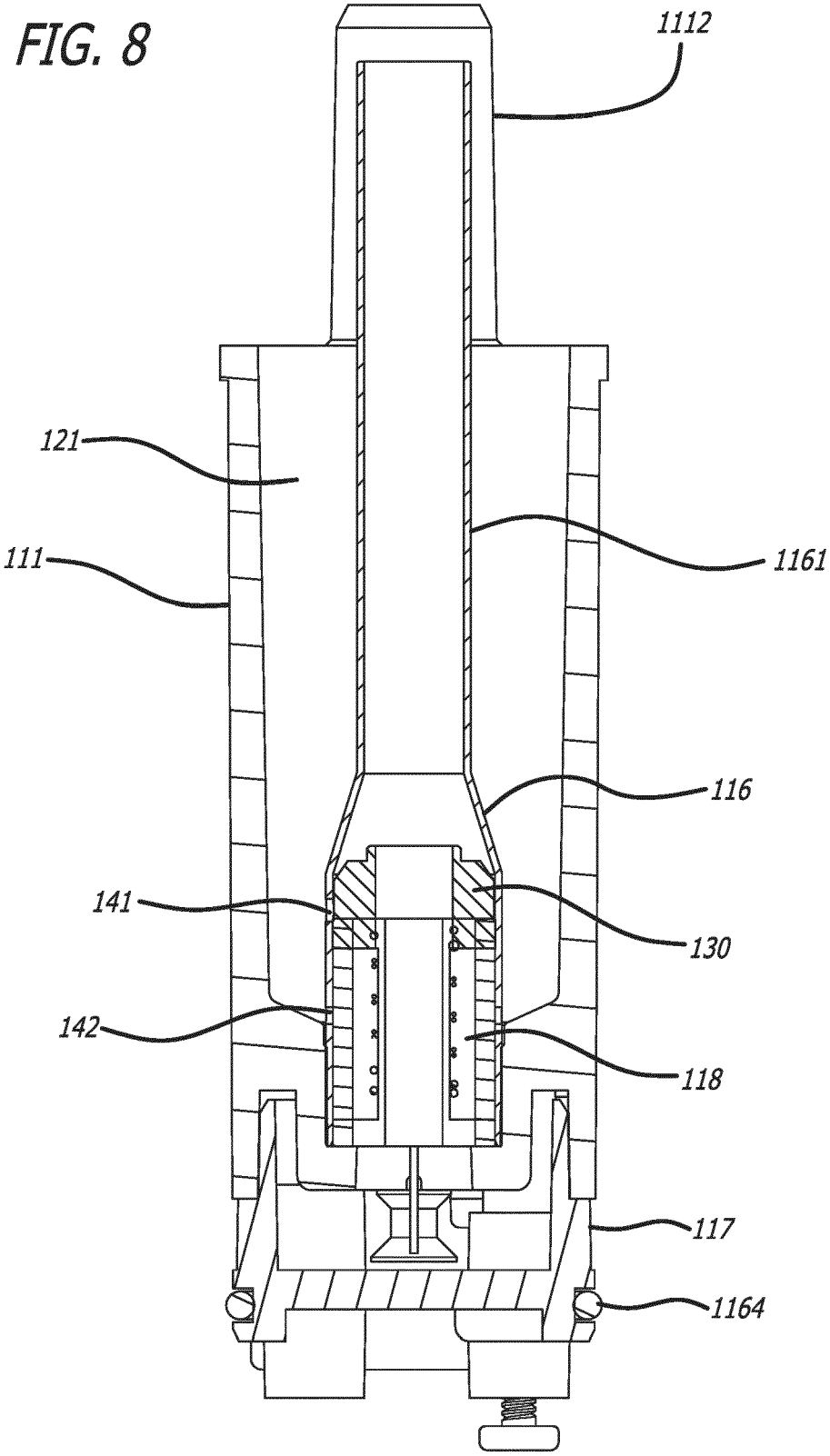

2124
30
1112
1114
2102
2121
1113
2120
2122
1161
116
113
150
101
110
119
112
118
1164
1165
117
114
120
1151
115

FIG. 8



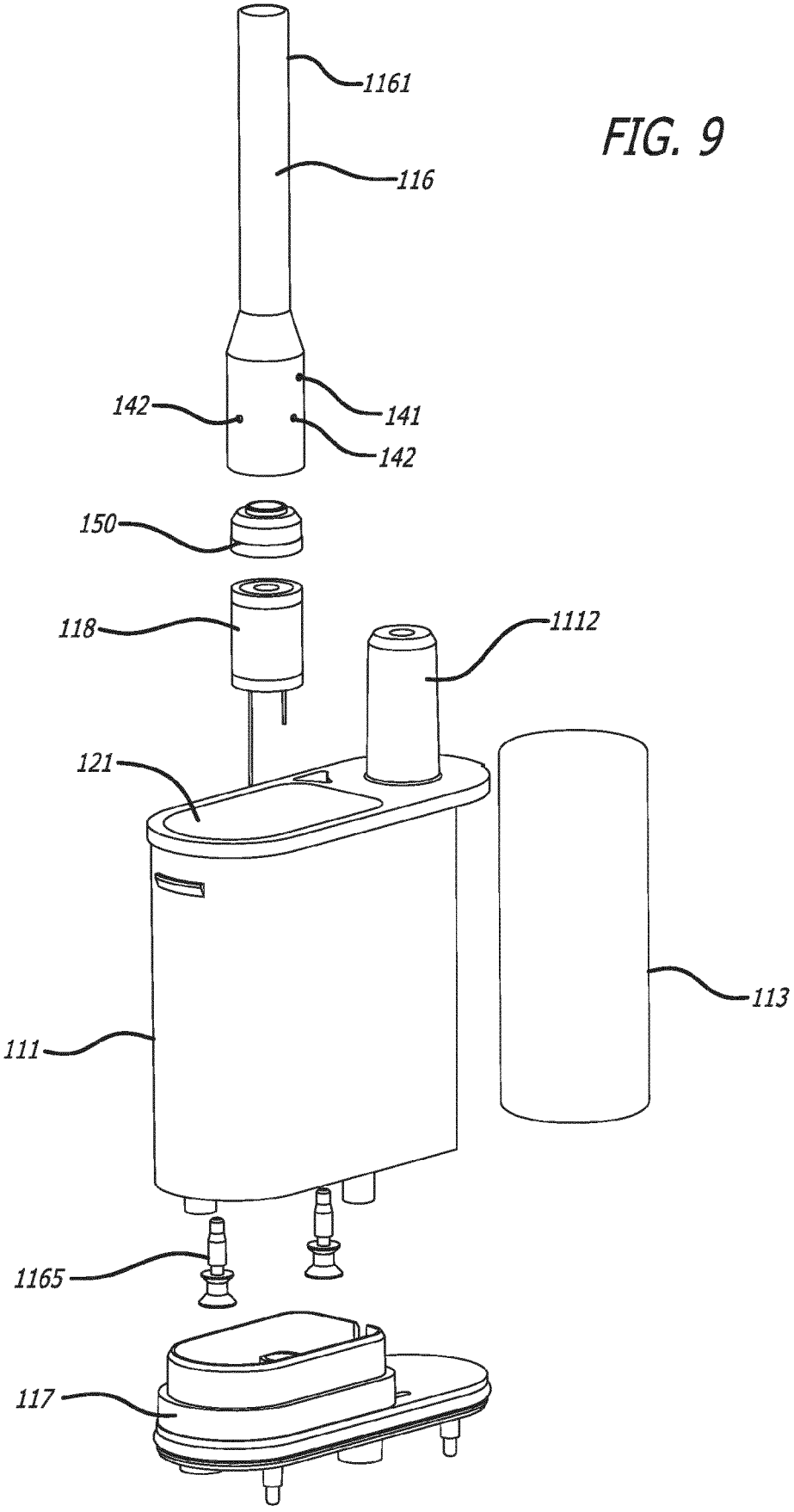


FIG. 9

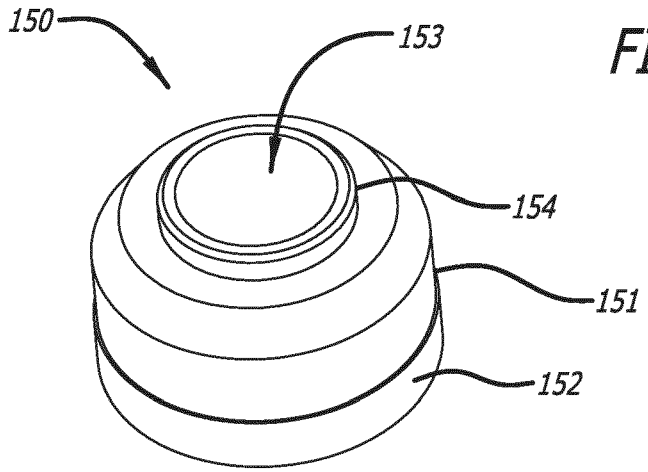


FIG. 10

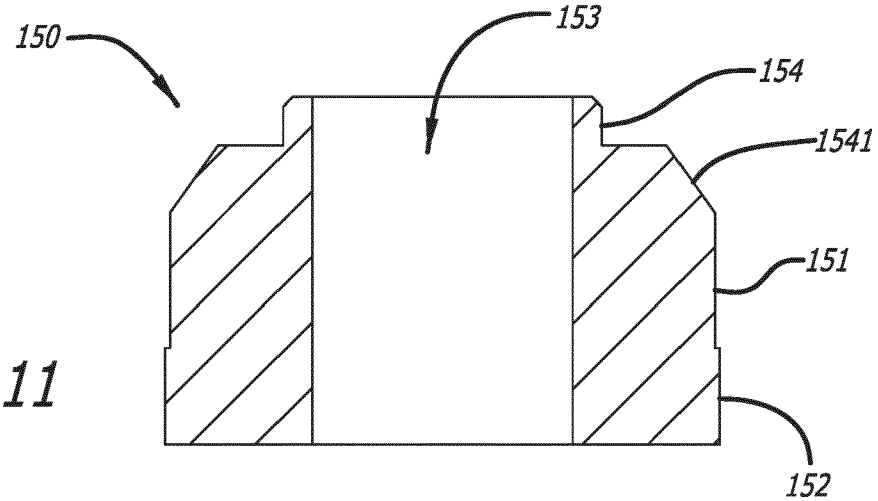


FIG. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 20 2556

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2022/378104 A1 (LIU TUANFANG [CN]) 1 December 2022 (2022-12-01) * paragraph [0025]; figures 3-5 *	1-8, 10-12,15 13,14	INV. A24F40/10 A24F40/44 A24F40/485
X A	WO 2022/252576 A1 (SHENZHEN WUXIN TECH CO LTD [CN]) 8 December 2022 (2022-12-08) * paragraph [0069]; figures 3, 4 * * paragraph [0076] *	1-9,15 13,14	
X	WO 2022/048697 A1 (SHENZHEN EIGATE TECH CO LTD [CN]) 10 March 2022 (2022-03-10) * paragraph [0037] - paragraph [0038]; figures 6, 7 *	1-3,15	
X	CN 214 207 199 U (DONGGUAN LIYUAN TECH CO LTD) 17 September 2021 (2021-09-17) * paragraph [n0032]; figure 3 * * paragraph [n0033] *	1-4,15	
A	US 2019/328039 A1 (ROMMING NIKLAS [DE] ET AL) 31 October 2019 (2019-10-31) * paragraph [0064]; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

A24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 March 2024	Sodtke, Christof

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 20 2556

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

06-03-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2022378104 A1	01-12-2022	CA 3140470 A1	28-11-2022
		EP 4094600 A1	30-11-2022
		US 2022378104 A1	01-12-2022
		WO 2022247516 A1	01-12-2022
WO 2022252576 A1	08-12-2022	CN 115474708 A	16-12-2022
		WO 2022252576 A1	08-12-2022
WO 2022048697 A1	10-03-2022	EP 4212031 A1	19-07-2023
		WO 2022048697 A1	10-03-2022
CN 214207199 U	17-09-2021	NONE	
US 2019328039 A1	31-10-2019	CN 110403245 A	05-11-2019
		DE 102018206647 A1	31-10-2019
		EP 3560363 A1	30-10-2019
		EP 3834642 A1	16-06-2021
		JP 7091281 B2	27-06-2022
		JP 2019188151 A	31-10-2019
		KR 20190125176 A	06-11-2019
		PL 3560363 T3	13-09-2021
		US 2019328039 A1	31-10-2019

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82