(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 August 2017 (17.08.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/137928 A1

(51) International Patent Classification:
A24F 15/08 (2006.01)

(21) International Application Number:
PCT/IB2017/050722

(22) International Filing Date:
9 February 2017 (09.02.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
15/042,868 12 February 2016 (12.02.2016) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: ADAPTERS FOR REFILLING AN AEROSOL DELIVERY DEVICE

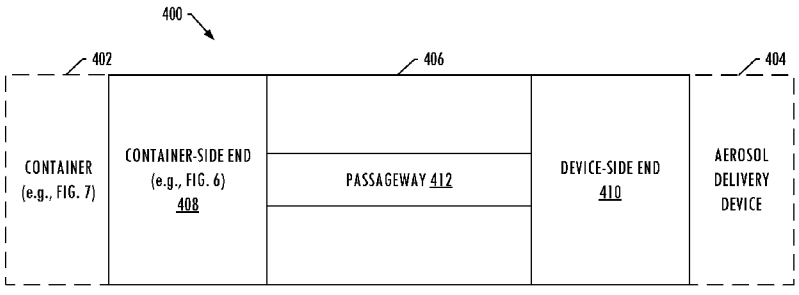


FIG. 4

(57) Abstract: Adapters for refilling an aerosol delivery device are provided. The adapters comprise a body having a container-side end and an opposing, device-side end that are sealably connectable with respectively a container of aerosol precursor composition and an aerosol delivery device having a refillable reservoir. The body defines a passageway between the ends for transfer of aerosol precursor composition from the container into the refillable reservoir. In one adapter, the container-side end is configured to engage a valve of the container during refilling of the reservoir, and thereby defines separate and distinct filling and mating ports. In another adapter, the device- side end includes a valve configured to engage the aerosol delivery device during refilling of the reservoir in which the airflow port of the aerosol delivery device is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port.

WO 2017/137928 A1

ADAPTERS FOR REFILLING AN AEROSOL DELIVERY DEVICE

TECHNOLOGICAL FIELD

The present disclosure relates to aerosol delivery devices such as smoking articles that may utilize electrically generated heat for the production of aerosol (e.g., smoking articles commonly referred to as electronic cigarettes). The smoking articles may be configured to heat the aerosol precursor, which may incorporate materials that may be made or derived from tobacco or otherwise incorporate tobacco, the precursor being capable of forming an inhalable substance for human consumption.

BACKGROUND

Many smoking devices have been proposed through the years as improvements upon, or alternatives to, smoking products that require combusting tobacco for use. Many of those devices purportedly have been designed to provide the sensations associated with cigarette, cigar or pipe smoking, but without delivering considerable quantities of incomplete combustion and pyrolysis products that result from the burning of tobacco. To this end, there have been proposed numerous smoking products, flavor generators and medicinal inhalers that utilize electrical energy to vaporize or heat a volatile material, or attempt to provide the sensations of cigarette, cigar or pipe smoking without burning tobacco to a significant degree. See, for example, the various alternative smoking articles, aerosol delivery devices and heat generating sources set forth in the background art described in U.S. Pat. Nos. 7,726,320 to Robinson et al. and 8,881,737 to Collett et al., which are incorporated herein by reference. See also, for example, the various types of smoking articles, aerosol delivery devices and electrically-powered heat generating sources referenced by brand name and commercial source in U.S. Pat. Pub. No. 2015/0216232 to Bless et al., which is incorporated herein by reference. Additionally, various types of electrically powered aerosol and vapor delivery devices also have been proposed in U.S. Pat. Pub. Nos. 2013/0056013 to Terry et al., 2013/0192618 to Li et al., 2014/0096781 to Sears et al. and 2014/0283859 to Minskoff et al., as well as U.S. Pat. App. Ser. Nos. 14/282,768 to Sears et al., filed May 20, 2014; 14/286,552 to Brinkley et al., filed May 23, 2014; 14/327,776 to Ampolini et al., filed July 10, 2014; and 14/465,167 to Worm et al., filed August 21, 2014; all of which are incorporated herein by reference. Moreover, various types of systems and methods for refilling electrically powered aerosol and vapor delivery devices have been proposed in U.S. Pat Nos. 8,757,169 to Gysland and 9,022,039 to Hearn; U.S. Pat. Pub. Nos. 2007/0267031 to Hon, 2011/0315152 to Hearn et al., and 2014/0076310 to Newton; and PCT Pub. Nos. 2015/157224 to Johnson et al. and 2014/155095 to Hearn et al.; all of which are incorporated herein by reference.

It would be desirable to provide adapters to mate non-compatible components (e.g., a non-compatible aerosol delivery device and container of aerosol precursor composition) for refilling an aerosol delivery device.

SUMMARY OF THE DISCLOSURE

The present disclosure relates to aerosol delivery devices, methods of forming such devices, and elements of such devices. The present disclosure thus includes, without limitation, the following example implementations.

Example Implementation 1: An adapter for mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir, the adapter comprising a body having a container-side end and an opposing device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir, wherein the container-side end is configured to engage a valve of the container during refilling of the reservoir, the container-side end defining separate and distinct filling and mating ports, the filling port being for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the container-side end and valve, and the mating port defining an inner cavity sized to receive therein a matching portion of the valve for connection therewith.

Example Implementation 2: The adapter of the preceding or any subsequent example implementation, or any combination thereof, wherein the container-side end includes an adapter protrusion defining the mating port therein, and the container includes a nozzle within which the valve is movably positioned, the nozzle including a cavity sized to receive therein at least a portion of the valve when the container-side end and valve are disengaged, and the adapter protrusion when the container-side end and valve are engaged.

Example Implementation 3: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the nozzle includes a spout containing a micro-patterned internal surface therein for transfer of aerosol precursor composition from the container into the reservoir, and the filling port is sized to receive the spout when the container-side end and valve are engaged.

Example Implementation 4: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the container-side end further includes a slot mateable with a matching tab of the container to align the container-side end with the container for connection therewith.

Example Implementation 5: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the device-side end defines an intermediary reservoir between the passageway and the aerosol delivery device upon engaging the aerosol delivery device, the intermediary reservoir defining a compressible body configured to receive aerosol precursor composition from the container via the passageway, and in response to being compressed, force at least some of the aerosol precursor composition from the intermediary reservoir into the refillable reservoir.

Example Implementation 6: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the device-side end is internally threaded, and the device-side end is sealably connectable with the aerosol delivery device includes being threadable onto an externally threaded portion of the aerosol delivery device, the externally threaded portion defining an opening to the refillable reservoir of the aerosol delivery device.

Example Implementation 7: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein at least an inner cavity of the device-side end defines a sheath sized to receive at least a portion of the aerosol delivery device therein.

Example Implementation 8: An adapter for mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir, the adapter comprising a body having a container-side end and an opposing device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir, wherein the device-side end includes a valve configured to engage the aerosol delivery device during refilling of the reservoir, the aerosol delivery device defining separate and distinct filling and airflow ports, the filling port being for transfer aerosol precursor composition from the container into the refillable reservoir during engagement of the valve and the aerosol delivery device in which the airflow port is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port, and the airflow port being for a flow of air through a portion of the aerosol delivery device when the valve and aerosol delivery device are disengaged.

Example Implementation 9: The adapter of the preceding or any subsequent example implementation, or any combination thereof, wherein the valve includes a depressible valve body including a first valve member and a second valve member, the first valve member being for opening a passageway to aerosol precursor composition within the container, and the second valve member being for closing the airflow port, when the valve body is depressed, and wherein the airflow port defines an inner cavity, and the second valve member includes a matching portion, the inner cavity being sized to receive therein the matching portion of the second valve member.

Example Implementation 10: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the aerosol delivery device includes an adapter protrusion defining the airflow port, and the device-side end includes a nozzle within which the valve is movably positioned, the nozzle includign a cavity sized to receive therein at least a portion of the valve when the valve and aerosol delivery device are disengaged, and the adapter protrusion when the valve and aerosol delivery device are engaged.

Example Implementation 11: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the nozzle includes a spout containing a micro-patterned internal surface for transfer of aerosol precursor composition from the container into the aerosol delivery device, and the filling port is sized to receive the spout when the valve and aerosol delivery device are engaged.

Example Implementation 12: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the device-side end further includes a tab mateable with a matching slot of the aerosol delivery device to align the device-side end with the aerosol delivery device for connection therewith.

Example Implementation 13: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the device-side end defines one or more liquid ports configured to allow the transfer of aerosol precursor composition from the passageway into the device-side end.

Example Implementation 14: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the container-side end defines an intermediary reservoir between the passageway and the container upon connection with the container, the intermediary reservoir defining a compressible body configured to receive aerosol precursor composition from the container, and in response to being compressed, force at least some of the aerosol precursor composition from the intermediary reservoir into the device-side end via the passageway.

Example Implementation 15: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein the container-side end is internally threaded, and the container-side end is sealably connectable with the container includes being threadable onto an externally threaded portion of the container, the externally threaded portion defining an opening to a reservoir of aerosol precursor composition of the container.

Example Implementation 16: The adapter of any preceding or any subsequent example implementation, or any combination thereof, wherein at least an inner cavity of the container-side end defines a sheath sized to receive the container therein.

Example Implementation 17: A method of mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir for refilling the aerosol delivery device, the method comprising sealably connecting an adapter with the container and aerosol delivery device, the adapter comprising a body having a container-side end and an opposing device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side end and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir; and transferring aerosol precursor composition from the container through the passageway and into the reservoir to thereby refill the reservoir, wherein the container-side end is configured to engage a valve of the container during refilling of the reservoir, the container-side end defining separate and distinct mating and filling ports, the mating port defining an inner cavity sized to receive therein a matching portion of the valve for connection therewith, the filling port being for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the container-side end and valve.

Example Implementation 18: The method of the preceding or any subsequent example implementation, or any combination thereof, wherein the container-side end includes an adapter protrusion defining the mating port therein, and the container includes a nozzle within which the valve is movably positioned, the nozzle including a cavity sized to receive therein at least a portion of the valve when the container-side end and valve are disengaged, and the adapter protrusion when the container-side end and valve are engaged.

Example Implementation 19: A method for refilling an aerosol delivery device of mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir for refilling the aerosol delivery device, the method comprising sealably connecting an adapter with the container and aerosol delivery device, the adapter comprising a body having a container-side end and an opposing device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defines a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir; and transferring aerosol precursor composition from the container through the passageway and into the reservoir to thereby refill the reservoir, wherein the device-side end includes a valve configured to engage the aerosol delivery device during refilling of the reservoir, the aerosol delivery device defining separate and distinct airflow and filling ports, the airflow port being for a flow of air through a portion of the aerosol delivery device when the valve and aerosol delivery device are disengaged, the filling port being for transfer aerosol precursor composition from the container into the refillable reservoir during engagement of the

valve and the aerosol delivery device in which the airflow port is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port.

Example Implementation 20: The method of the preceding or any subsequent example implementation, or any combination thereof, wherein the valve includes a depressible valve body including a first valve member and a second valve member, the first valve member being for opening a passageway to aerosol precursor composition within the container, and the second valve member being for closing the airflow port, when the valve body is depressed, wherein the airflow port defines an inner cavity, and the second valve member includes a matching portion in which the inner cavity is sized to receive therein the matching portion of the second valve member.

These and other features, aspects, and advantages of the present disclosure will be apparent from a reading of the following detailed description together with the accompanying drawings, which are briefly described below. The present disclosure includes any combination of two, three, four or more features or elements set forth in this disclosure, regardless of whether such features or elements are expressly combined or otherwise recited in a specific example implementation described herein. This disclosure is intended to be read holistically such that any separable features or elements of the disclosure, in any of its aspects and example implementations, should be viewed as combinable, unless the context of the disclosure clearly dictates otherwise.

It will therefore be appreciated that this Brief Summary is provided merely for purposes of summarizing some example implementations so as to provide a basic understanding of some aspects of the disclosure. Accordingly, it will be appreciated that the above described example implementations are merely examples and should not be construed to narrow the scope or spirit of the disclosure in any way. Other example implementations, aspects and advantages will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of some described example implementations.

BRIEF DESCRIPTION OF THE FIGURES

Having thus described the disclosure in the foregoing general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

Figure 1A illustrates a front view of aerosol delivery device including a tank coupled to a control body according to an example implementation of the present disclosure;

Figure 1B illustrates a sectional view of the aerosol delivery device of Figure 1;

Figure 2 illustrates a perspective view of an aerosol delivery device, according to an example implementation of the present disclosure;

Figure 3 illustrates a container of aerosol precursor composition including a reservoir according to an example implementation of the present disclosure;

Figure 4 illustrates an adapter for mating a container of aerosol precursor composition with an otherwise incompatible aerosol delivery device according to an example implementation of the present disclosure;

Figure 5 illustrates an adapter for mating an aerosol delivery device with an otherwise incompatible container of aerosol precursor composition according to an example implementation of the present disclosure;

Figure 6 illustrates an apparatus defining structural elements of at least a portion of a suitable aerosol delivery device or the adapter of Figure 4, according to an example implementation of the present disclosure;

Figures 7A – 7D illustrate an apparatus defining structural elements of at least a portion of a suitable container or the adapter of Figure 5; and

Figure 8 illustrates various operations in a method for implementing a contained liquid system for use with a refillable aerosol delivery device, according to an example implementation of the present disclosure.

DETAILED DESCRIPTION

The present disclosure will now be described more fully hereinafter with reference to example implementations thereof. These example implementations are described so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those skilled in the art. Indeed, the disclosure may be embodied in many different forms and should not be construed as limited to the implementations set forth herein; rather, these implementations are provided so that this disclosure will satisfy applicable legal requirements. As used in the specification and the appended claims, the singular forms "a," "an," "the" and the like include plural referents unless the context clearly dictates otherwise.

As described hereinafter, example implementations of the present disclosure relate to aerosol delivery systems. Aerosol delivery systems according to the present disclosure use electrical energy to heat a material (preferably without combusting the material to any significant degree) to form an inhalable substance; and components of such systems have the form of articles most preferably are sufficiently compact to be considered hand-held devices. That is, use of components of preferred aerosol delivery systems does not result in the production of smoke in the sense that aerosol results principally from by-products of combustion or pyrolysis of tobacco, but rather, use of those preferred systems results in the production of vapors resulting from volatilization or vaporization of certain components incorporated therein. In some example

implementations, components of aerosol delivery systems may be characterized as electronic cigarettes, and those electronic cigarettes most preferably incorporate tobacco and/or components derived from tobacco, and hence deliver tobacco derived components in aerosol form.

Aerosol generating pieces of certain preferred aerosol delivery systems may provide many of the sensations (e.g., inhalation and exhalation rituals, types of tastes or flavors, organoleptic effects, physical feel, use rituals, visual cues such as those provided by visible aerosol, and the like) of smoking a cigarette, cigar or pipe that is employed by lighting and burning tobacco (and hence inhaling tobacco smoke), without any substantial degree of combustion of any component thereof. For example, the user of an aerosol generating piece of the present disclosure can hold and use that piece much like a smoker employs a traditional type of smoking article, draw on one end of that piece for inhalation of aerosol produced by that piece, take or draw puffs at selected intervals of time, and the like.

Aerosol delivery systems of the present disclosure also can be characterized as being vapor-producing articles or medicament delivery articles. Thus, such articles or devices can be adapted so as to provide one or more substances (e.g., flavors and/or pharmaceutical active ingredients) in an inhalable form or state. For example, inhalable substances can be substantially in the form of a vapor (i.e., a substance that is in the gas phase at a temperature lower than its critical point). Alternatively, inhalable substances can be in the form of an aerosol (i.e., a suspension of fine solid particles or liquid droplets in a gas). For purposes of simplicity, the term "aerosol" as used herein is meant to include vapors, gases and aerosols of a form or type suitable for human inhalation, whether or not visible, and whether or not of a form that might be considered to be smoke-like.

Aerosol delivery systems of the present disclosure generally include a number of components provided within an outer body or shell, which may be referred to as a housing. The overall design of the outer body or shell can vary, and the format or configuration of the outer body that can define the overall size and shape of the aerosol delivery device can vary. Aerosol delivery devices are often configured in a manner that mimics aspects of certain traditional smoking devices such as cigarettes or cigars. In this regard, aerosol delivery devices typically define a substantially cylindrical configuration. Typically, an elongated body resembling the shape of a cigarette or cigar can be a formed from a single, unitary housing or the elongated housing can be formed of two or more separable bodies. For example, an aerosol delivery device can comprise an elongated shell or body that can be substantially tubular in shape and, as such, resemble the shape of a conventional cigarette or cigar. Aerosol delivery devices often include a control body and a cartridge which attach in an end-to-end relationship to define the substantially cylindrical configuration.

While such configurations may provide a look and feel that is similar to traditional smoking articles, these configurations may suffer from certain detriments. For example, cylindrically-

configured aerosol delivery devices may not define attachment points usable to retain the aerosol delivery device in a desired position when not in use. Further, the cylindrical configuration may result in the mouthpiece being exposed to the surrounding environment and therefore susceptible to contamination. Accordingly, it may be desirable to provide aerosol delivery devices in configurations that differ from shapes associated with traditional smoking articles.

In one example, all of the components of the aerosol delivery device are contained within one housing. Alternatively, an aerosol delivery device can comprise two or more housings that are joined and are separable. For example, an aerosol delivery device can possess at one end a control body comprising a housing containing one or more reusable components (e.g., an accumulator such as a rechargeable battery and/or capacitor, and various electronics for controlling the operation of that article), and at the other end and removably coupleable thereto, an outer body or shell containing a disposable portion (e.g., a disposable flavor-containing cartridge).

Aerosol delivery systems of the present disclosure most preferably comprise some combination of a power source (i.e., an electrical power source), at least one control component (e.g., means for actuating, controlling, regulating and ceasing power for heat generation, such as by controlling electrical current flow the power source to other components of the article – e.g., a microprocessor, individually or as part of a microcontroller), a heater or heat generation member (e.g., an electrical resistance heating element or other component, which alone or in combination with one or more further elements may be commonly referred to as an "atomizer"), an aerosol precursor composition (e.g., commonly a liquid capable of yielding an aerosol upon application of sufficient heat, such as ingredients commonly referred to as "smoke juice," "e-liquid" and "e-juice"), and a mouthend region or tip for allowing draw upon the aerosol delivery device for aerosol inhalation (e.g., a defined airflow path through the article such that aerosol generated can be withdrawn therefrom upon draw).

In various examples, an aerosol delivery device can comprise a reservoir configured to retain the aerosol precursor composition. The reservoir particularly can be formed of a porous material (e.g., a rigid porous material or primarily fibrous material) and thus may be referred to as a porous substrate.

A fibrous substrate useful as a reservoir in an aerosol delivery device can be a woven or nonwoven material formed of a plurality of fibers or filaments and can be formed of one or both of natural fibers and synthetic fibers. For example, a fibrous substrate may comprise a fiberglass material. In particular examples, a cellulose acetate material can be used. In other example implementations, a carbon material can be used. In further example implementations, organic cotton, polyethylene terephthalate, regenerated cellulose, porous ceramic or glass, or porous

sintered ceramic or glass can be used. A reservoir may be substantially in the form of a container and may include a fibrous material included therein.

In some implementations, the aerosol delivery device can include an indicator, which may comprise one or more light emitting diodes or a graphical user interface via a display. The indicator can be in communication with the control component through a connector circuit and illuminate, for example, during a user draw on the mouthend as detected by the flow sensor.

More specific formats, configurations and arrangements of components within the aerosol delivery systems of the present disclosure will be evident in light of the further disclosure provided hereinafter. Additionally, the selection and arrangement of various aerosol delivery system components can be appreciated upon consideration of the commercially available electronic aerosol delivery devices, such as those representative products referenced in background art section of the present disclosure.

Figure 1A illustrates a front view of an aerosol delivery device **100**, and Figure 1B illustrates a modified sectional view through the aerosol delivery device (collectively Figure 1), according to an example implementation of the present disclosure. As illustrated, the aerosol delivery device may include a control body **102** and a tank **104**. In particular, Figure 1 illustrates the control body and the tank coupled to one another. The control body and the tank may be permanently or detachably aligned in a functioning relationship. Various mechanisms may connect the tank to the control body to result in a threaded engagement, a press-fit engagement, an interference fit, a magnetic engagement or the like. In some examples, the aerosol delivery device may be substantially rod-like, substantially tubular shaped, or substantially cylindrically shaped in some example implementations when the tank and the control body are in an assembled configuration. In other examples, further shapes and dimensions are encompassed – e.g., a rectangular or triangular cross-section, multifaceted shapes, or the like. The tank and control body may include a unitary housing or outer body or separate, respective housings or outer bodies, which may be formed of any of a number of different materials. The housing may be formed of any combination of suitable, structurally-sound materials. In some examples, the housing may be formed of at least one of a metal or alloy, such as stainless steel, aluminum or the like. Other suitable materials include various plastics (e.g., polycarbonate or a copolyester), substantially biodegradable plastics (e.g. polyhydroxyalkonates), metal-plating over plastic, glass, and the like.

In some example implementations, one or both of the control body **102** or the tank **104** of the aerosol delivery device **100** may be referred to as being disposable or as being reusable. The aerosol delivery device may include various other components disposed within the control body or tank or otherwise coupled thereto. These components may be distributed between the control body and the tank in any of various manners. For example, the control body may have a replaceable

battery or replaceable battery or a rechargeable battery and thus may be combined with any type of recharging technology, including connection to a typical alternating current electrical outlet, connection to a car charger (i.e., a cigarette lighter receptacle), connection to a computer, such as through a universal serial bus (USB) cable or connector, or connection to a photovoltaic cell (sometimes referred to as a solar cell) or solar panel of solar cells. For example, an adaptor including a USB connector at one end and a control body connector at an opposing end is disclosed in U.S. Pat. Pub. No. 2014/0261495 to Novak et al., which is incorporated herein by reference in its entirety.

In one example implementation, the control body **102** and tank **104** forming the aerosol delivery device **100** may be permanently and/or removably coupled to one another. Examples of aerosol delivery devices that may be configured to be disposable and/or which may include first and second outer bodies that are configured for permanent coupling are disclosed in U.S. Pat. App. No. 2015/0216232 to Bless et al., which is incorporated herein by reference in its entirety. In another example implementation, the tank and control body may be configured in a single-piece, non-detachable form and may incorporate the components, aspects, and features disclosed herein. However, in another example implementation, the control body and tank may be configured to be separable such that, for example, the tank may be refilled or replaced.

Figure 1B illustrates a more particular example of the aerosol delivery device **100** in which the components are representative of the components that may be present in a suitable control body **102** and a tank **104** and are not intended to limit the scope of control body and tank components that are encompassed by the present disclosure.

The tank **104** can be formed of a tank shell **106** enclosing a reservoir **108** configured to retain the aerosol precursor composition, and including a heater **110** (sometimes referred to as a heating element). In various configurations, this structure may be referred to as a cartridge; and accordingly, the terms "tank," "cartridge" and the like may be used interchangeably to refer to a shell or other housing enclosing a reservoir for aerosol precursor composition, and including a heater.

In some examples, the reservoir **108** of the tank **104** may comprise a refillable reservoir. The reservoir may be configured to retain the aerosol precursor composition. In some example implementations, the reservoir particularly can be formed of a porous material (e.g., a fibrous material) and thus may be referred to as a porous substrate (e.g., a fibrous substrate). A fibrous substrate useful as a reservoir in an aerosol delivery device can be a woven or nonwoven material formed of a plurality of fibers or filaments and can be formed of one or both of natural fibers and synthetic fibers. For example, a fibrous substrate may comprise a fiberglass material. In particular examples, a cellulose acetate material, regenerated cellulose, organic cotton, or polyethylene

terephthalate can be used. In other example implementations, a carbon material can be used. A reservoir may be substantially in the form of a container and may include a fibrous material included therein. In other implementations, the reservoir may be formed of a glass, plastic, or other materials not explicitly set forth herein.

The reservoir **108** may be in fluid communication with a liquid transport element adapted to wick or otherwise transport an aerosol precursor composition stored in the reservoir housing to the heater **110**. In some examples, a valve may be positioned between the reservoir and heater, and configured to control an amount of aerosol precursor composition passed or delivered from the reservoir to the heater.

Various examples of materials configured to produce heat when electrical current is applied therethrough may be employed to form the heater **110**. The heater in these examples may be resistive heating element such as a coil. Example materials from which the coil may be formed include Titanium (Ti), Platinum (Pt), Kanthal (FeCrAl), Nichrome, Molybdenum disilicide ($MoSi_2$), molybdenum silicide (MoSi), Molybdenum disilicide doped with Aluminum ($Mo(Si,Al)_2$), Silver Palladium (Ag/Pd) conductive inks, graphite and graphite-based materials (e.g., carbon-based foams and yarns) and ceramics (e.g., positive or negative temperature coefficient ceramics). Example implementations of heaters or heating members useful in aerosol delivery devices according to the present disclosure are further described below, and can be incorporated into devices described herein.

A mouthpiece **112** having an opening defined therein may be coupled to the tank shell **106** (e.g., at the mouthend) to allow for egress of formed aerosol from the tank **104**.

The tank **104** may also include one or more electronic components, which may include an integrated circuit, a memory component, a sensor, or the like. The electronic components may be adapted to communicate with a control component of the control body and/or with an external device by wired or wireless means. The electronic components may be positioned anywhere within the tank or a base **114** thereof.

As illustrated in Figure 1B, the control body **102** can be formed of a control body shell **116** that can include a control component **118** (e.g., a printed circuit board (PCB), an integrated circuit, a memory component, a microprocessor, individually or as part of a microcontroller, and the like), a power source **120**, and one or more indicators **122** such as light-emitting diodes (LEDs), and such components can be variably aligned. The power source may include, for example, a battery (single-use or rechargeable), supercapacitor or the like. Further indicators (e.g., a haptic feedback component, an audio feedback component, or the like) can be included in addition to or as an alternative to the LED. Additional representative types of components that yield visual cues or indicators, such as light emitting diode (LED) components, and the configurations and uses thereof,

are described in U.S. Pat. Nos. 5,154,192 to Sprinkel et al.; 8,499,766 to Newton and 8,539,959 to Scatterday; and U.S. Pat. App. Ser. No. 14/173,266, filed February 5, 2014, to Sears et al.; which are incorporated herein by reference.

The control component **118** may be configured to direct electrical power from the power source **120** to the heater **110** to heat aerosol precursor composition retained in the tank **104** to produce a vapor, which may occur during a user draw on a mouthpiece **112** of the tank. The control component **118** may include a number of electronic components, and in some examples may be formed of an electronic or printed circuit board (PCB) that supports and electrically connects the electronic components. Examples of suitable electronic components include a microprocessor or processor core, an integrated circuit (IC), a memory, and the like.

In some examples, the control component **118** may include a microcontroller with an integrated processor core and memory, and which may further include one or more integrated input/output peripherals. In some examples, the control component may be coupled to a communication interface to enable wireless communication with one or more networks, computing devices or other appropriately-enabled devices. Examples of suitable communication interfaces are disclosed in U.S. Pat. App. Ser. No. 14/638,562, filed March 4, 2015, to Marion et al., the content of which is incorporated by reference in its entirety. And examples of suitable manners according to which the aerosol delivery device may be configured to wirelessly communicate are disclosed in U.S. Pat. App. Ser. No. 14/327,776, filed July 10, 2014, to Ampolini et al., and U.S. Pat. App. Ser. No. 14/609,032, filed January 29, 2015, to Henry, Jr. et al., each of which is incorporated herein by reference in its entirety.

The control body **102** and the tank **104** may include components adapted to facilitate a fluid engagement therebetween. As illustrated in Figure 1B, the control body can include a connector **124**. The base **114** of the tank can be adapted to engage the connector and can include a projection adapted to fit within the connector. Such engagement can facilitate a stable connection between the control body and the tank as well as establish an electrical connection between the battery **120** and control component **118** in the control body, and the heater **110** in the tank. Further, the control body shell **116** can include an air intake, which may be a notch in the shell where it connects to the connector that allows for passage of ambient air around the connector and into the shell where it then passes through the connector and into the tank through the projection.

A connector and a base useful according to the present disclosure are described in U.S. Pat. App. Pub. No. 2014/0261495 to Novak et al., which is incorporated herein by reference in its entirety. However, various other examples of structures, shapes and components may be employed to couple the base to the connector. In some examples the connection between the base of the tank **104** and the connector of the control body **102** may be substantially permanent, whereas in other

examples the connection therebetween may be releasable such that, for example, the control body may be reused with one or more additional tanks that may be disposable and/or refillable.

The reservoir **108** illustrated in Figure 1B can be a container or can be a reservoir, as presently described. For example, the reservoir can be substantially formed into the shape of a tube encircling the interior of the tank shell **106**, in this example. An aerosol precursor composition can be retained in the reservoir. Liquid components, for example, can be retained by the reservoir. The reservoir can be in fluid connection with the liquid transport element. The liquid transport element can transport the aerosol precursor composition stored in the reservoir via capillary action to the heater **110** that is in the form of a metal wire coil in this example. As such, the heater is in a heating arrangement with the liquid transport element. Example implementations of reservoirs and transport elements useful in aerosol delivery devices according to the present disclosure are further described below, and such reservoirs and/or transport elements can be incorporated into devices as described herein. In particular, specific combinations of heating members and transport elements as further described below may be incorporated into devices.

In use, when a user draws on the aerosol delivery device **100**, airflow is detected by a flow sensor, and the heater **110** is activated to vaporize components of the aerosol precursor composition. Drawing upon the mouthpiece **112** of the aerosol delivery device causes ambient air to enter the air intake and pass through the connector **124** and a central opening in a projection of the base **114**. In the tank **104**, the drawn air combines with the formed vapor to form an aerosol. The aerosol is whisked, aspirated or otherwise drawn away from the heater and out the opening in the mouthpiece of the aerosol delivery device.

An input element **126** may be included with the aerosol delivery device **100**. The input element may be included to allow a user to control functions of the device and/or for output of information to a user. For example, a user may utilize the input element to vaporize an aerosol precursor composition and/or activate an on/off function. The input element may comprise a pushbutton or other switch configured to receive an input from a user. When the input element is actuated, the aerosol delivery device may produce an output corresponding to a status of the aerosol delivery device. For example, the aerosol delivery device may output sound, vibration, or light. Any component or combination of components may be utilized as an input for controlling the function of the device. For example, one or more pushbuttons may be used as described in U.S. Pat. App. Ser. No. 14/193,961, filed February 28, 2014, to Worm et al., which is incorporated herein by reference. Likewise, a touchscreen may be used as described in U.S. Pat. App. Ser. No. 14/643,626, filed March 10, 2015, to Sears et al., which is incorporated herein by reference. As a further example, components adapted for gesture recognition based on specified movements of the

aerosol delivery device may be used as an input. See U.S. Pat. App. Ser. No. 14/565,137, filed December 9, 2014, to Henry et al., which is incorporated herein by reference.

In some example implementations, a computing device such as a mobile computer (e.g., smartphone, tablet computer) may be used as an input element in addition to or in lieu of an input element **126** on the aerosol delivery device itself. In particular, the aerosol delivery device **100** may be wired to the computer or other device, such as via use of a USB cord or similar protocol. The aerosol delivery device also may communicate with a computer or other device acting as an input via wireless communication. See, for example, the systems and methods for controlling a device via a read request as described in U.S. Pat. App. Ser. No. 14/327,776, filed July 10, 2014, to Ampolini et al., the disclosure of which is incorporated herein by reference. In such implementations, application software may be used in connection with the computing device to input control instructions to the aerosol delivery device, such control instructions including, for example, the ability to form an aerosol of specific composition by choosing the nicotine content and/or content of further flavors to be included.

In some examples, the aerosol delivery device **100** may include a number of additional hardware-implemented or software-controlled functions. For example, the aerosol delivery device may include a battery protection circuit configured to detect battery input, loads on the battery terminals, and charging input. The battery protection circuit may include short-circuit protection and under-voltage lock out. The aerosol delivery device may also include components for ambient temperature measurement, and its control component **118** may be configured to control at least one functional element to inhibit battery charging if the ambient temperature is below a certain temperature (e.g., 0 °C) or above a certain temperature (e.g., 45 °C) prior to start of charging or during charging.

Power delivery from the battery **120** may vary over the course of each puff on the device **100** according to a power control mechanism. The device may include a "long puff" safety timer such that in the event that a user or an inadvertent mechanism causes the device to attempt to puff continuously, the control component **118** may control at least one functional element to terminate the puff automatically after some period of time (e.g., four seconds). Further, the time between puffs on the device may be restricted to less than a period of time (e.g., one hundred (100) seconds). A watchdog safety timer may automatically reset the aerosol delivery device if its control component or software running on it becomes unstable and does not service the timer within an appropriate time interval (e.g., eight seconds). Further safety protection may be provided in the event of a defective or otherwise failed flow sensor, such as by permanently disabling the aerosol delivery device in order to prevent inadvertent heating. A puffing limit switch may

deactivate the device in the event of a pressure sensor fail causing the device to continuously activate without stopping after the four second maximum puff time.

The various components of an aerosol delivery device according to the present disclosure can be chosen from components described in the art and commercially available. Examples of batteries that can be used according to the disclosure are described in U.S. Pat. Pub. No. 2010/0028766 to Peckerar et al., the disclosure of which is incorporated herein by reference in its entirety.

The aerosol delivery device **100** most preferably incorporates the control component **118** or another control mechanism for controlling the amount of electric power to the heater **110** during draw. Representative types of electronic components, structure and configuration thereof, features thereof, and general methods of operation thereof, are described in U.S. Pat. No. 4,735,217 to Gerth et al., U.S. Pat. No. 4,947,874 to Brooks et al., U.S. Pat. No. 5,372,148 to McCafferty et al., U.S. Pat. No. 6,040,560 to Fleischhauer et al., U.S. Pat. No. 7,040,314 to Nguyen et al., U.S. Pat. No. 8,205,622 to Pan, U.S. Pat. App. Pub. No. 2009/0230117 to Fernando et al., U.S. Pat. App. Pub. No. 2014/0060554 to Collet et al., U.S. Pat. App. Pub. No. 2014/0270727 to Ampolini et al., and U.S. Pat. App. Ser. No. 14/209,191 to Henry et al., filed March 13, 2014, all of which are incorporated herein by reference in their entireties.

The aerosol delivery device **100** can also incorporate the flow sensor or another sensor or detector for control of supply of electric power to the heater **110** when aerosol generation is desired (e.g., upon draw during use). As such, for example, there is provided a manner or method of turning off the power supply to the heating element when the aerosol delivery device is not be drawn upon during use, and for turning on the power supply to actuate or trigger the generation of heat by the heating element during draw. Additional representative types of sensing or detection mechanisms, structure and configuration thereof, components thereof, and general methods of operation thereof, are described in U.S. Pat. No. 5,261,424 to Sprinkel, Jr., U.S. Pat. No. 5,372,148 to McCafferty et al., and PCT Pat. App. Pub. No. WO 2010/003480 to Flick, all of which are incorporated herein by reference in their entireties.

Representative types of substrates, reservoirs or other components for supporting the aerosol precursor are described in U.S. Pat. No. 8,528,569 to Newton, U.S. Pat. App. Pub. No. 2014/0261487 to Chapman et al., U.S. Pat. App. Ser. No. 14/011,992 to Davis et al., filed August 28, 2013, and U.S. Pat. App. Ser. No. 14/170,838 to Bless et al., filed February 3, 2014, all of which are incorporated herein by reference in their entireties. Additionally, various wicking materials, and the configuration and operation of those wicking materials within certain types of electronic cigarettes, are set forth in U.S. Pat. App. Pub. No. 2014/0209105 to Sears et al., which is incorporated herein by reference in its entirety.

For aerosol delivery systems that are characterized as electronic cigarettes, the aerosol precursor composition most preferably incorporates tobacco or components derived from tobacco. In one regard, the tobacco may be provided as parts or pieces of tobacco, such as finely ground, milled or powdered tobacco lamina. In another regard, the tobacco may be provided in the form of an extract, such as a spray dried extract that incorporates many of the water soluble components of tobacco. Alternatively, tobacco extracts may have the form of relatively high nicotine content extracts, which extracts also incorporate minor amounts of other extracted components derived from tobacco. In another regard, components derived from tobacco may be provided in a relatively pure form, such as certain flavoring agents that are derived from tobacco. In one regard, a component that is derived from tobacco, and that may be employed in a highly purified or essentially pure form, is nicotine (e.g., pharmaceutical grade nicotine).

The aerosol precursor composition, also referred to as a vapor precursor composition, may comprise a variety of components including, by way of example, a polyhydric alcohol (e.g., glycerin, propylene glycol, or a mixture thereof), nicotine, tobacco, tobacco extract, and/or flavorants. Various components that may be included in the aerosol precursor composition are described in U.S. Pat. No. 7,726,320 to Robinson et al., which is incorporated herein by reference in its entirety. Additional representative types of aerosol precursor compositions are set forth in U.S. Pat. No. 4,793,365 to Sensabaugh, Jr. et al., U.S. Pat. No. 5,101,839 to Jakob et al., U.S. Pat. No. 6,779,531 to Biggs et al., U.S. Pat. App. Pub. No. 2013/0008457 to Zheng et al., and *Chemical and Biological Studies on New Cigarette Prototypes that Heat Instead of Burn Tobacco*, R. J. Reynolds Tobacco Company Monograph (1988), all of which are incorporated herein by reference in their entireties.`

Representative types of aerosol precursor components and formulations also are set forth and characterized in U.S. Pat. No. 7,217,320 to Robinson et al.; 2013/0213417 to Chong et al.; 2014/0060554 to Collett et al.; 2015/0020823 to Lipowicz et al.; and 2015/0020830 to Koller, as well as WO 2014/182736 to Bowen et al, the disclosures of which are incorporated herein by reference. Other aerosol precursors that may be employed include the aerosol precursors that have been incorporated in the VUSE® product by R. J. Reynolds Vapor Company, the BLU™ product by Imperial Tobacco Group PLC, the MISTIC MENTHOL product by Mistic Ecigs, and the VYPE product by CN Creative Ltd. Also desirable are the so-called "smoke juices" for electronic cigarettes that have been available from Johnson Creek Enterprises LLC.

The amount of aerosol precursor that is incorporated within the aerosol delivery system is such that the aerosol generating piece provides acceptable sensory and desirable performance characteristics. For example, it is highly preferred that sufficient amounts of aerosol forming material (e.g., glycerin and/or propylene glycol), be employed in order to provide for the generation

of a visible mainstream aerosol that in many regards resembles the appearance of tobacco smoke. The amount of aerosol precursor within the aerosol generating system may be dependent upon factors such as the number of puffs desired per aerosol generating piece. Typically, the amount of aerosol precursor incorporated within the aerosol delivery system, and particularly within the aerosol generating piece, is less than about 2 g, generally less than about 1.5 g, often less than about 1 g and frequently less than about 0.5 g.

Additional representative types of components that yield visual cues or indicators may be employed in the aerosol delivery device **100**, such as LEDs and related components, auditory elements (e.g., speakers), vibratory elements (e.g., vibration motors) and the like. Examples of suitable LED components, and the configurations and uses thereof, are described in U.S. Pat. No. 5,154,192 to Sprinkel et al., U.S. Pat. No. 8,499,766 to Newton, U.S. Pat. No. 8,539,959 to Scatterday, and U.S. Pat. App. Ser. No. 14/173,266 to Sears et al., filed February 5, 2014, all of which are incorporated herein by reference in their entireties.

Yet other features, controls or components that can be incorporated into aerosol delivery devices of the present disclosure are described in U.S. Pat. No. 5,967,148 to Harris et al., U.S. Pat. No. 5,934,289 to Watkins et al., U.S. Pat. No. 5,954,979 to Counts et al., U.S. Pat. No. 6,040,560 to Fleischhauer et al., U.S. Pat. No. 8,365,742 to Hon, U.S. Pat. No. 8,402,976 to Fernando et al., U.S. Pat. App. Pub. No. 2005/0016550 to Katase, U.S. Pat. App. Pub. No. 2010/0163063 to Fernando et al., U.S. Pat. App. Pub. No. 2013/0192623 to Tucker et al., U.S. Pat. App. Pub. No. 2013/0298905 to Leven et al., U.S. Pat. App. Pub. No. 2013/0180553 to Kim et al., U.S. Pat. App. Pub. No. 2014/0000638 to Sebastian et al., U.S. Pat. App. Pub. No. 2014/0261495 to Novak et al., and U.S. Pat. App. Pub. No. 2014/0261408 to DePiano et al., all of which are incorporated herein by reference in their entireties.

Figure 2 illustrates a perspective view of a suitable aerosol delivery device **200** that in some examples may correspond to the aerosol delivery device **100** of Figure 1. As shown, the aerosol delivery device can comprise a control body **202** and a tank **204**, which may correspond to respectively the control body **102** and tank **104** of Figure 1. The control body may define an ergonomic shape configured to comfortably fit within a user's hand. The shape of the housing, however, is not limited and may be any shape that accommodates the various elements as described herein. In some implementations, the housing may be expressly non-cylindrical.

As previously explained, the tank **204** can be formed of a tank shell **206** enclosing a reservoir **208** therein. In some example implementations, the reservoir may be a refillable reservoir, and a container of aerosol precursor composition may be provided for refilling the reservoir. The tank and container may be removably, sealably connectable to one another such that

the sealed coupling between the tank and the container may be configured to enable the transfer of aerosol precursor composition between the container and the aerosol delivery device.

Figure 3 illustrates a perspective view of a container **300** of aerosol precursor composition, according to various example implementations of the present disclosure. As shown, the container includes a container shell **302** that may comprise a reservoir **304** configured to contain an aerosol precursor composition, and a cap **306** that may be configured to cover a passageway to the reservoir. In particular, Figure 3 illustrates the container shell and the cap coupled to one another. The container shell and the cap may be removably coupled to one another. Various mechanisms may connect the container shell to the cap to result in a threaded engagement, a press-fit engagement, an interference fit, a magnetic engagement or the like. In some examples, the container may be substantially rod-like, substantially tubular shaped, or substantially cylindrically shaped. In other examples, further shapes and dimensions are encompassed – e.g., a rectangular or triangular cross-section, multifaceted shapes, or the like.

The container **300** may be formed of any of a number of different materials. The container shell **302** and cap **306** may be formed of any combination of suitable, structurally-sound materials, and may be formed of the same or different materials. In some examples, the container shell and cap may be formed of at least one of a metal or alloy, such as stainless steel, aluminum or the like. Other suitable materials include various plastics (e.g., polycarbonate), metal-plating over plastic, glass, and the like.

In various contained liquid systems for refilling aerosol delivery devices, a container for refilling an aerosol delivery device may be configured to mate with only a corresponding tank of a compatible aerosol delivery device, and vice versa. Figure 4 illustrates an adapter to allow a user to mate their container with an otherwise incompatible aerosol delivery device. And Figure 5 conversely illustrates an adapter to allow a user to mate their aerosol delivery device with an otherwise incompatible container.

In particular, Figure 4 illustrates an adapter **400** for mating a container **402** of aerosol precursor composition with an aerosol delivery device **404** having a refillable reservoir. More particularly, the adapter may be for mating the container with an otherwise incompatible aerosol delivery device. In some examples, the container and aerosol delivery device may correspond to respectively the container **300** of Figure 3 and aerosol delivery device **100** of Figure 1 (one example of which may be aerosol delivery device **200** of Figure 2). An example of a suitable container **402** to which the otherwise incompatible aerosol delivery device **404** may be mated is disclosed in U.S. Pat. App. Ser. No. 14/802,667, filed July 7, 2015, to O'Brien et al., which is incorporated herein by reference in its entirety.

The adapter **400** may comprise a body **406** having a container-side end **408** and an opposing, device-side end **410** that are sealably connectable with respectively the container **402** and the aerosol delivery device **404**. The body may define a passageway **412** between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir of the aerosol delivery device.

As described above, the device-side end **410** of the adapter **400** may be sealably connectable with the aerosol delivery device **404**. Although not separately shown, in some example implementations, the device-side end defines an intermediary reservoir between the passageway **412** and the aerosol delivery device upon engaging the aerosol delivery device. The intermediary reservoir may define a compressible body configured to receive aerosol precursor composition from the container via the passageway. In response to being compressed, the intermediary reservoir may force at least some of the aerosol precursor composition from the intermediary reservoir into the refillable reservoir of the aerosol delivery device.

The device-side end **410** may be configured to sealably connect with the aerosol delivery device **404** in any of a number of different manners. In some implementations, for example, the device-side end is internally threaded, and thereby threadable onto an externally threaded portion of the aerosol delivery device. The externally threaded portion of the aerosol delivery device may define an opening to the refillable reservoir of the aerosol delivery device. In another example implementation, at least an inner cavity of the device-side end defines a sheath sized to receive at least a portion of the aerosol delivery device therein for connection therewith.

As indicated above, Figure 5 illustrates an adapter **500** for mating a container **502** of aerosol precursor composition with an aerosol delivery device **504** having a refillable reservoir. More particularly, the adapter may be for mating the aerosol delivery device with an otherwise incompatible container. In some examples, the container and aerosol delivery device may correspond to respectively the container **300** of Figure 3 and aerosol delivery device **100** of Figure 1 (one example of which may be aerosol delivery device **200** of Figure 2). An example of a suitable aerosol delivery device **504** to which the otherwise incompatible container **502** may be mated is disclosed in U.S. Pat. App. Ser. No. 14/802,667, filed July 7, 2015, to O'Brien et al., which is incorporated herein by reference in its entirety.

The adapter **500** may comprise a body **506** having a container-side end **508** and an opposing device-side end **510** that are sealably connectable with respectively the container and the aerosol delivery device. The body may define a passageway **512** between the container-side end and device-side end for transfer of aerosol precursor composition from the container into the refillable reservoir. The adapter **500** may be coupled to an opening in a shell of the container. As such, the adapter may be shaped and sized to match the opening of the container shell.

As described above, the container-side end **508** of the adapter **500** may be sealably connectable with the container **502** of aerosol precursor composition. Although not separately shown, in some example implementations, the container-side end defines an intermediary reservoir between the passageway **512** and the container upon connection with the container. The intermediary reservoir may define a compressible body configured to receive aerosol precursor composition from the container. In response to being compressed, the intermediary reservoir may force at least some of the aerosol precursor composition from the intermediary reservoir into the device-side end via the passageway.

The container-side end **508** may be configured to sealably connect with the container **502** in any of a number of different manners. In some implementations, for example, the container-side end is internally threaded, and thereby threadable onto an externally threaded portion of the container. The externally threaded portion of the container may define an opening to a reservoir of aerosol precursor composition of the container. In another example implementation, at least an inner cavity of the container-side end defines a sheath sized to receive at least a portion of the container therein for connection therewith.

Figures 6 and 7 (including Figures 7A – 7D) illustrate respective apparatuses **600**, **700** that may be configured to mate with one another, and function as various elements of the adapters **400**, **500**, containers **402**, **502** and aerosol delivery devices **404**, **504** of Figures 4 and 5, according to some example implementations. For example, the apparatus **600** of Figure 6 may function as the container-side end **408** of the adapter **400** of Figure 4, and the apparatus **700** of Figure 7 may form a portion of the container **402** configured to mate with the apparatus **600** (container-side end **408**). Likewise, for example, the apparatus **700** of Figure 7 may function as the device-side end **510** of the adapter **500** of Figure 5, and the apparatus **600** of Figure 6 may form a portion of the aerosol delivery device **504** configured to mate with the apparatus **700** (device-side end **510**).

In some example implementations, the apparatus **600** (e.g., container-side end **408** or aerosol delivery device **504**) may be configured to engage a valve **702** of the corresponding apparatus **700** (e.g., container **402** or device-side end **510**) during refilling of the reservoir. The apparatus may define a separate and distinct first **602** and second port **604**. In some example implementations, in which the apparatus functions as the container-side end, the first and second port may respectively correspond to a mating port and filling port. In other example implementations, in which the apparatus functions as a portion of the aerosol delivery device, the first and second ports may respectively correspond to an airflow port and filling port. In these example implementations, the airflow port may be for the flow of air through a portion of the aerosol delivery device when the valve and the aerosol delivery device are disengaged, such as during use of the aerosol delivery device.

As used herein, a port may refer to a narrow and elongated passageway through which liquid, air, and the like may be transported. As illustrated in Figure 6, in one example implementation, the ports may be substantially cylindrically shaped so as to allow for the smooth transfer of liquid and/or air. In other example implementations, further shapes and dimensions may be encompassed – e.g., a rectangular or triangular cross-section, multifaceted shapes, or the like. In further examples, the internal walls of the port may contain a micropatterned surface as to promote wettability and fluid flow through the port.

The first port **602** of the apparatus **600** may define an inner cavity sized to receive therein a matching portion **704** of the valve **702** of the corresponding apparatus **700** for connection therewith. The first port may be closed by the valve during engagement between the valve and the apparatus to prevent the aerosol precursor composition from passing through the first port.

In some example implementations, the apparatus **600** may include an adapter protrusion **606** in which the first port **602** may be defined. Upon sealably connecting the apparatus and the corresponding apparatus **700**, the adapter protrusion may be brought into direct engagement with at least a portion of the corresponding apparatus such that the two mate with one another. In some examples, the corresponding apparatus includes a nozzle **706** within which the valve **702** is movably positioned. The nozzle may include a cavity **708** sized to receive therein at least a portion of the valve when the apparatus and valve are disengaged, and the adapter protrusion when the apparatus and valve are engaged.

In some example implementations, in which the apparatus **600** functions as a portion of the aerosol delivery device **504**, the adapter protrusion may be positioned beneath a removably coupleable mouthpiece of the aerosol delivery device when the mouthpiece is coupled to the aerosol delivery device.

The second port **604** of the apparatus **600** may be for transfer of aerosol precursor composition from the container into a refillable reservoir of the aerosol delivery device during engagement of the apparatus and a valve **702** of the corresponding apparatus **700**. In some examples, the nozzle **706** of the corresponding apparatus may also include a spout **710** therein for transfer of aerosol precursor composition from the container into the reservoir, in which the second port may be sized to receive the spout when the apparatus and valve are engaged. In some example implementations, the spout contains a micro-patterned internal surface.

The apparatus **600** may further include one or more seals to secure the connection with and between the corresponding apparatus **700**. In particular, a first seal **608a** may be positioned around the perimeter of the apparatus such that it provides a seal between the nozzle **706** and the apparatus during engagement with the corresponding apparatus. Similarly, a second seal **608b** may be positioned around the perimeter of the apparatus (beneath a slot **610** of the apparatus) such that it

provides a seal between the valve **702** and the apparatus during engagement with the corresponding apparatus. The seal may be formed of any combination of suitable, structurally-sound materials. In some examples, the seal may be formed of at least one of a gasket material, elastomeric material, or the like.

The valve **702** of the corresponding apparatus **700** may include a depressible valve body including a first valve member **712a** and a second valve member **712b**. The first valve member may open or close a passageway **714** to aerosol precursor composition stored within the container. In particular, the first valve member may include a projection that is sized to fit and/or sealably engage the passageway thereby further restricting the release of aerosol precursor composition from a reservoir of the container when the valve is not depressed during engagement with the aerosol delivery device.

The second valve member **712b** may close the first port **602** of the apparatus **600** when the valve body is depressed during engagement with the apparatus. As previously indicated, the first port may define an inner cavity, and the second valve member may include the matching portion **704** in which the inner cavity of the first port may be sized to receive therein the matching portion of the second valve member.

In some example implementations, the apparatus **600** and corresponding apparatus **700** may include one or more interface features. For example, the apparatus may include a slot **610** mateable with a matching tab **716** of the corresponding apparatus to align the apparatus for connection therewith. In particular, the slot may align the second port **604** of the apparatus and the spout **710** of the corresponding apparatus to ensure proper engagement between the two. Similarly, the second valve member **712b** of the valve **702** may also comprise a slot **718** mateable with the tab such that the valve may be movably positioned within the valve cavity **708** around the tab.

In particular, a housing **720** of the nozzle **706** may be coupled with the valve **702** via a spring **722** in which the spring may be configured to compress when the valve is depressed and extend when the valve is not depressed. The spring may be positioned within a spring cavity **724a** of the second valve member **706b** and a spring cavity **724b** of the nozzle housing such that the valve may be movably positioned within the valve cavity around the tab **714**. The nozzle may be positioned over the valve within at least a portion of the nozzle housing such that a sealed connection is provided between the nozzle and the nozzle housing.

The housing **720** of the nozzle **706** may define one or more liquid ports **726** configured to allow the transfer of aerosol precursor composition from a passageway (e.g., passageway **512**) into the corresponding apparatus **700**. The base of the valve may be shaped such that it allows for fluid engagement between the passageway of the adapter and the interior of the nozzle to allow the aerosol precursor composition to pass from the container (e.g., container **502**) reservoir through the

bottom of the nozzle via the passageway. In some example implementations, the base of the valve may be cross-shaped so as to allow the passage of aerosol precursor composition throughout the valve cavity of the nozzle.

Figure 8 illustrates various operations in a method **800** of mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir for refilling the aerosol delivery device according to an example implementation of the present disclosure. As shown in block **802**, the method may include sealably connecting an adapter with the container and aerosol delivery device. The adapter may comprise a body having a container-side end and an opposing device-side end that are sealably connectable with respectively the container and aerosol delivery device. The body may define a passageway therebetween for transfer of aerosol precursor composition from the container into the refillable reservoir. As shown at block **804**, the method may also include transferring aerosol precursor composition from the container through the passageway and into the reservoir to thereby refill the reservoir.

In one example implementation of the method **800**, the container-side end may be configured to engage a valve of the container during refilling of the reservoir. The container-side end may define separate and distinct filling and mating ports. The mating port may define an inner cavity sized to receive therein a matching portion of the valve for connection therewith. The filling port may be for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the container-side end and valve.

In another example implementation of the method **800**, the device-side end may include a valve configured to engage the aerosol delivery device during refilling of the reservoir. The aerosol delivery device may define separate and distinct filling and airflow ports. The airflow port may be for a flow of air through a portion of the aerosol delivery device when the valve and aerosol delivery device are disengaged. The filling port may be for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the valve and the aerosol delivery device in which the airflow port is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port.

The foregoing description of use of the article(s) can be applied to the various example implementations described herein through minor modifications, which can be apparent to the person of skill in the art in light of the further disclosure provided herein. The above description of use, however, is not intended to limit the use of the article but is provided to comply with all necessary requirements of disclosure of the present disclosure. Any of the elements shown in the article(s) illustrated in Figures 1A – 7 or as otherwise described above may be included in an aerosol delivery device according to the present disclosure.

Many modifications and other implementations of the disclosure set forth herein will come to mind to one skilled in the art to which these disclosure pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the disclosure are not to be limited to the specific implementations disclosed and that modifications and other implementations are intended to be included within the scope of the appended claims. Moreover, although the foregoing descriptions and the associated drawings describe example implementations in the context of certain example combinations of elements and/or functions, it should be appreciated that different combinations of elements and/or functions may be provided by alternative implementations without departing from the scope of the appended claims. In this regard, for example, different combinations of elements and/or functions than those explicitly described above are also contemplated as may be set forth in some of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

WHAT IS CLAIMED IS:

1. An adapter for mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir, the adapter comprising:

a body having a container-side end and an opposing, device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir,

wherein the container-side end is configured to engage a valve of the container during refilling of the reservoir, the container-side end defining separate and distinct filling and mating ports, the filling port being for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the container-side end and valve, and the mating port defining an inner cavity sized to receive therein a matching portion of the valve for connection therewith.

2. The adapter of Claim 1, wherein the container-side end includes an adapter protrusion defining the mating port therein, and the container includes a nozzle within which the valve is movably positioned, the nozzle including a cavity sized to receive therein at least a portion of the valve when the container-side end and valve are disengaged, and the adapter protrusion when the container-side end and valve are engaged.

3. The adapter of Claim 2, wherein the nozzle includes a spout containing a micro-patterned internal surface therein for transfer of aerosol precursor composition from the container into the reservoir, and the filling port is sized to receive the spout when the container-side end and valve are engaged.

4. The adapter of Claim 1, wherein the container-side end further includes a slot mateable with a matching tab of the container to align the container-side end with the container for connection therewith.

5. The adapter of Claim 1, wherein the device-side end defines an intermediary reservoir between the passageway and the aerosol delivery device upon engaging the aerosol delivery device, the intermediary reservoir defining a compressible body configured to receive aerosol precursor composition from the container via the passageway, and in response to being

compressed, force at least some of the aerosol precursor composition from the intermediary reservoir into the refillable reservoir.

6. The adapter of Claim 1, wherein the device-side end is internally threaded, and the device-side end being sealably connectable with the aerosol delivery device includes being threadable onto an externally threaded portion of the aerosol delivery device, the externally threaded portion defining an opening to the refillable reservoir of the aerosol delivery device.

7. The adapter of Claim 1, wherein at least an inner cavity of the device-side end defines a sheath sized to receive at least a portion of the aerosol delivery device therein.

8. An adapter for mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir, the adapter comprising:

a body having a container-side end and an opposing, device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir,

wherein the device-side end includes a valve configured to engage the aerosol delivery device during refilling of the reservoir, the aerosol delivery device defining separate and distinct filling and airflow ports, the filling port being for transfer aerosol precursor composition from the container into the refillable reservoir during engagement of the valve and the aerosol delivery device in which the airflow port is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port, the airflow port being for a flow of air through a portion of the aerosol delivery device when the valve and aerosol delivery device are disengaged.

9. The adapter of Claim 8, wherein the valve includes a depressible valve body including a first valve member and a second valve member, the first valve member being for opening a passageway to aerosol precursor composition within the container, and the second valve member being for closing the airflow port, when the valve body is depressed, and

wherein the airflow port defines an inner cavity, and the second valve member includes a matching portion, the inner cavity being sized to receive therein the matching portion of the second valve member.

10. The adapter of Claim 8, wherein the aerosol delivery device includes an adapter protrusion defining the airflow port, and the device-side end includes a nozzle within which the

valve is movably positioned, the nozzle including a cavity sized to receive therein at least a portion of the valve when the valve and aerosol delivery device are disengaged, and the adapter protrusion when the valve and aerosol delivery device are engaged.

11. The adapter of Claim 10, wherein the nozzle includes a spout containing a micro-patterned internal surface for transfer of aerosol precursor composition from the container into the aerosol delivery device, and the filling port is sized to receive the spout when the valve and aerosol delivery device are engaged.

12. The adapter of Claim 8 wherein the device-side end further includes a tab mateable with a matching slot of the aerosol delivery device to align the device-side end with the aerosol delivery device for connection therewith.

13. The adapter of Claim 8, wherein the device-side end defines one or more liquid ports configured to allow the transfer of aerosol precursor composition from the passageway into the device-side end.

14. The adapter of Claim 8, wherein the container-side end defines an intermediary reservoir between the passageway and the container upon connection with the container, the intermediary reservoir defining a compressible body configured to receive aerosol precursor composition from the container, and in response to being compressed, force at least some of the aerosol precursor composition from the intermediary reservoir into the device-side end via the passageway.

15. The adapter of Claim 8, wherein the container-side end is internally threaded, and the container-side end being sealably connectable with the container includes being threadable onto an externally threaded portion of the container, the externally threaded portion defining an opening to a reservoir of aerosol precursor composition of the container.

16. The adapter of Claim 8, wherein at least an inner cavity of the container-side end defines a sheath sized to receive the container therein.

17. A method of mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir for refilling the aerosol delivery device, the method comprising:

sealably connecting an adapter with the container and aerosol delivery device, the adapter comprising a body having a container-side end and an opposing, device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir; and

transferring aerosol precursor composition from the container through the passageway and into the reservoir to thereby refill the reservoir,

wherein the container-side end is configured to engage a valve of the container during refilling of the reservoir, the container-side end defining separate and distinct mating and filling ports, the mating port defining an inner cavity sized to receive therein a matching portion of the valve for connection therewith, the filling port being for transfer of aerosol precursor composition from the container into the refillable reservoir during engagement of the container-side end and valve.

18. The method of Claim 17, wherein the container-side end includes an adapter protrusion defining the mating port therein, and the container includes a nozzle within which the valve is movably positioned, the nozzle including a cavity sized to receive therein at least a portion of the valve when the container-side end and valve are disengaged, and the adapter protrusion when the container-side end and valve are engaged.

19. A method of mating a container of aerosol precursor composition with an aerosol delivery device having a refillable reservoir for refilling the aerosol delivery device, the method comprising:

sealably connecting an adapter with the container and aerosol delivery device, the adapter comprising a body having a container-side end and an opposing, device-side end that are sealably connectable with respectively the container and aerosol delivery device, and the body defining a passageway between the container-side and device-side ends for transfer of aerosol precursor composition from the container into the refillable reservoir; and

transferring aerosol precursor composition from the container through the passageway and into the reservoir to thereby refill the reservoir,

wherein the device-side end includes a valve configured to engage the aerosol delivery device during refilling of the reservoir, the aerosol delivery device defining separate and distinct airflow and filling ports, the airflow port being for a flow of air through a portion of the aerosol delivery device when the valve and aerosol delivery device are disengaged, the filling port being for transfer aerosol precursor composition from the container into the refillable reservoir during

engagement of the valve and the aerosol delivery device in which the airflow port is closed by the valve to prevent the aerosol precursor composition from passing through the airflow port.

20. The method of Claim 19, wherein the valve includes a depressible valve body including a first valve member and a second valve member, the first valve member being for opening a passageway to aerosol precursor composition within the container, and the second valve member being for closing the airflow port, when the valve body is depressed, and

wherein the airflow port defines an inner cavity, and the second valve member includes a matching portion, the inner cavity being sized to receive therein the matching portion of the second valve member.

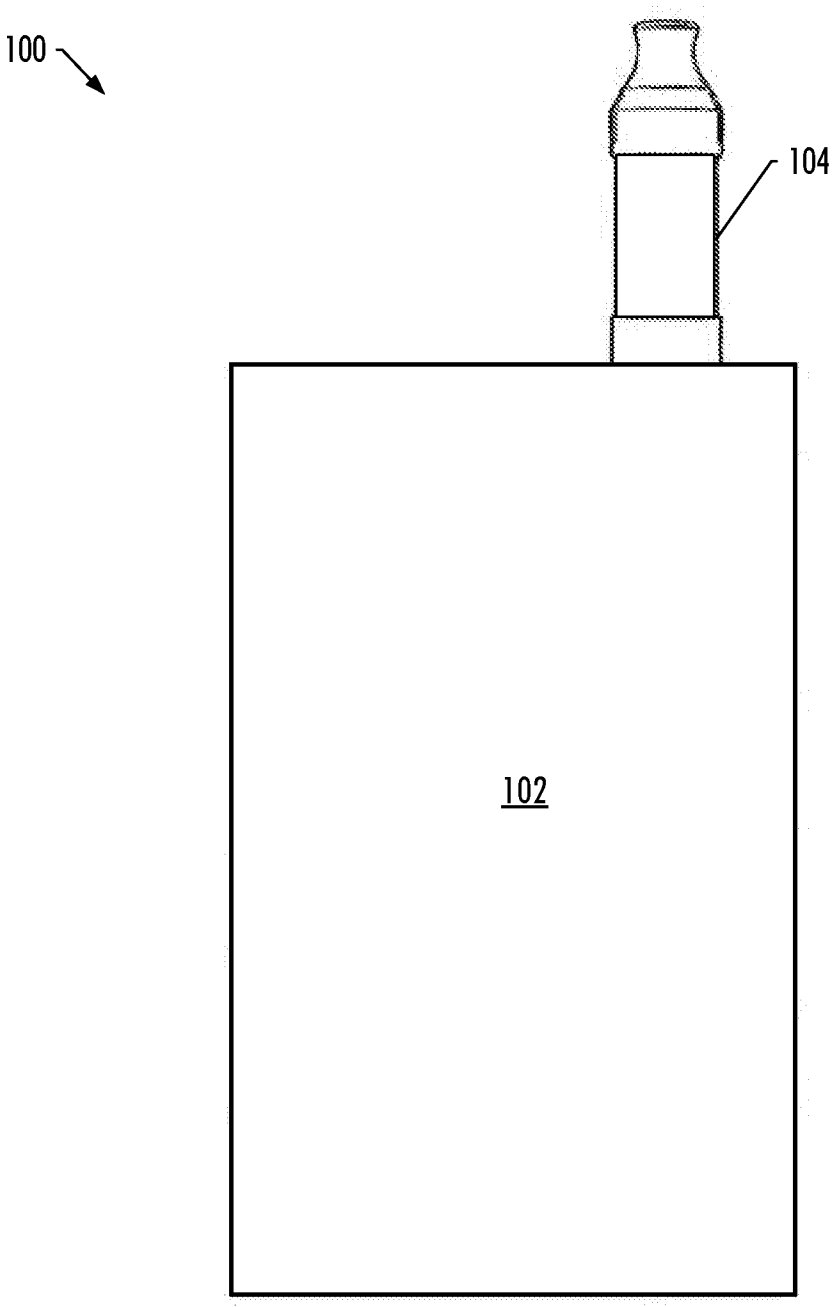


FIG. 1A

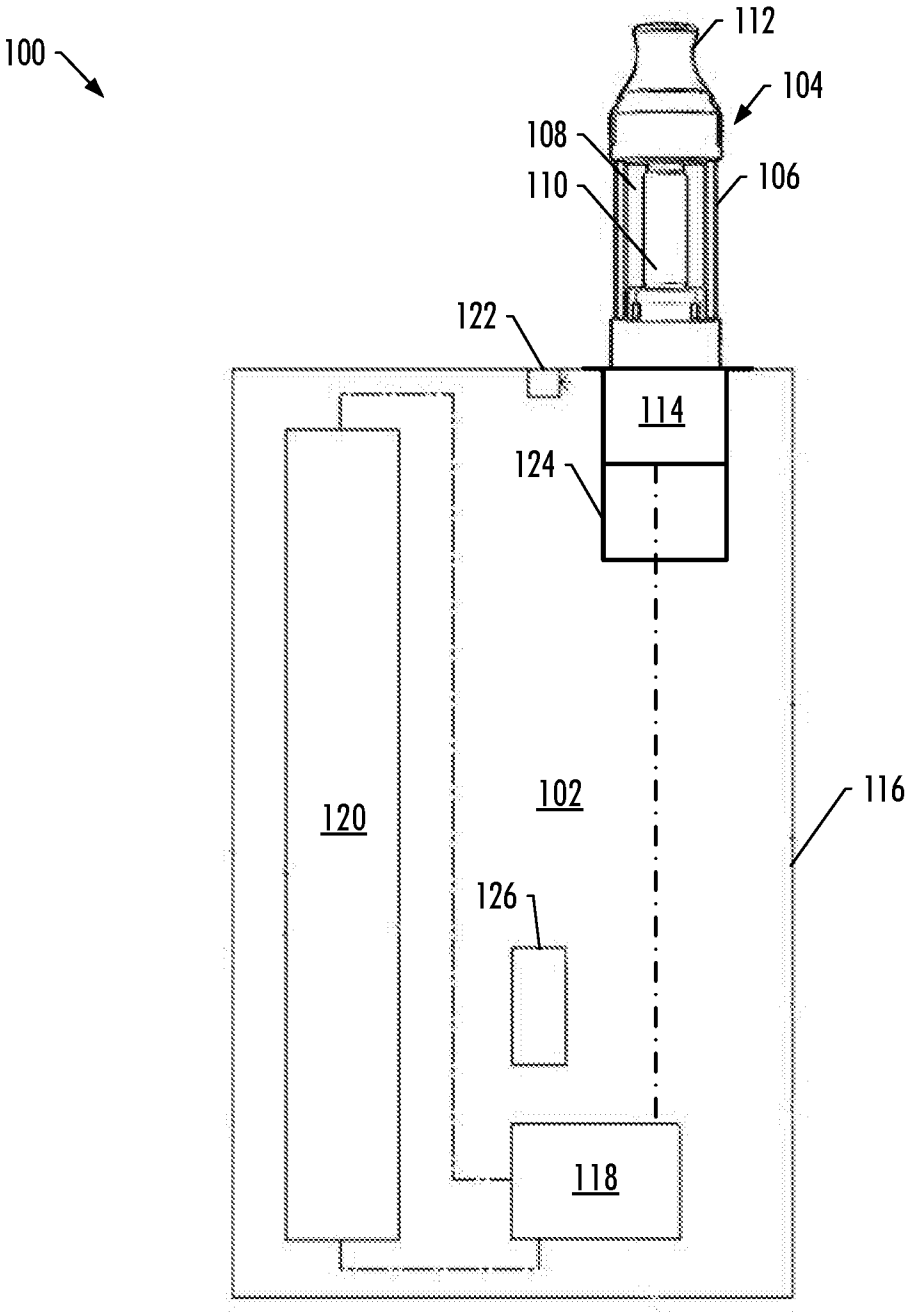


FIG. 1B

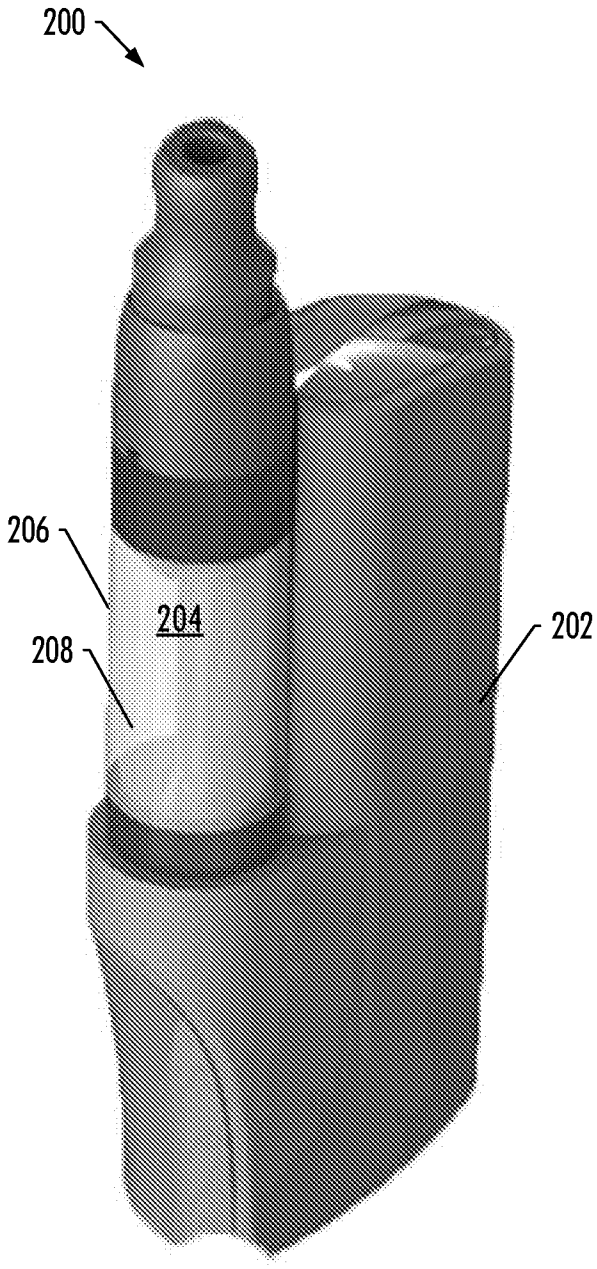


FIG. 2

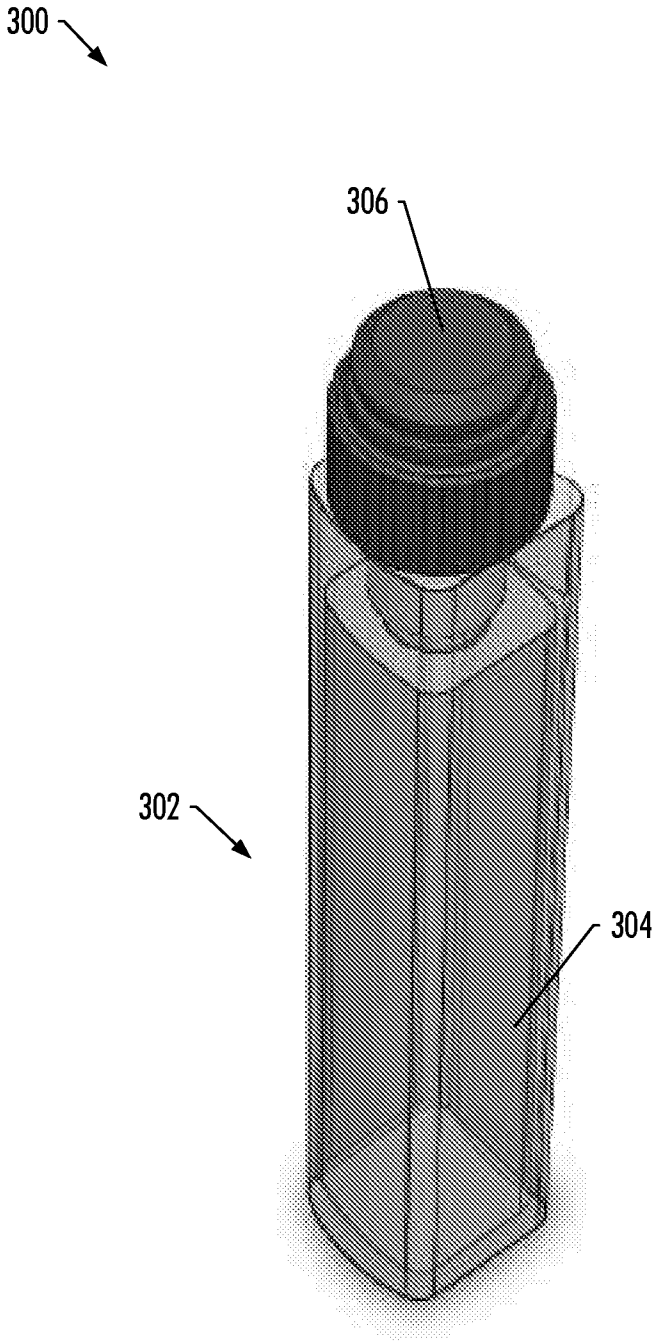


FIG. 3

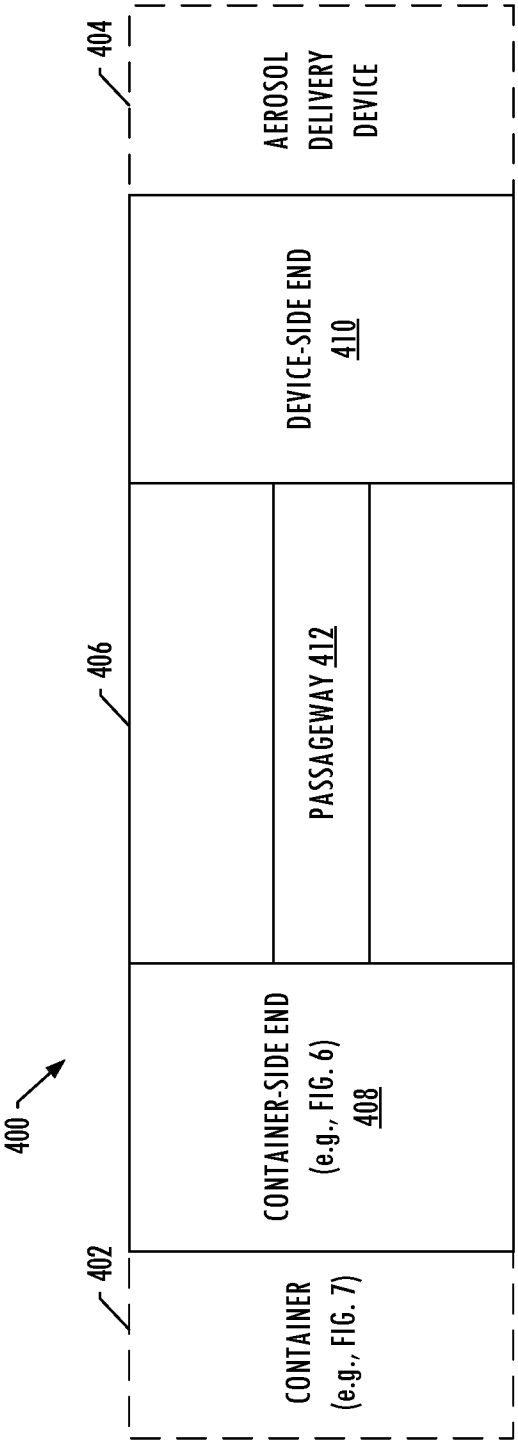

400
402
CONTAINER
(e.g., FIG. 7)
CONTAINER-SIDE END
(e.g., FIG. 6)
408
406
PASSAGEWAY 412
DEVICE-SIDE END
410
404
AEROSOL
DELIVERY
DEVICE

FIG. 4

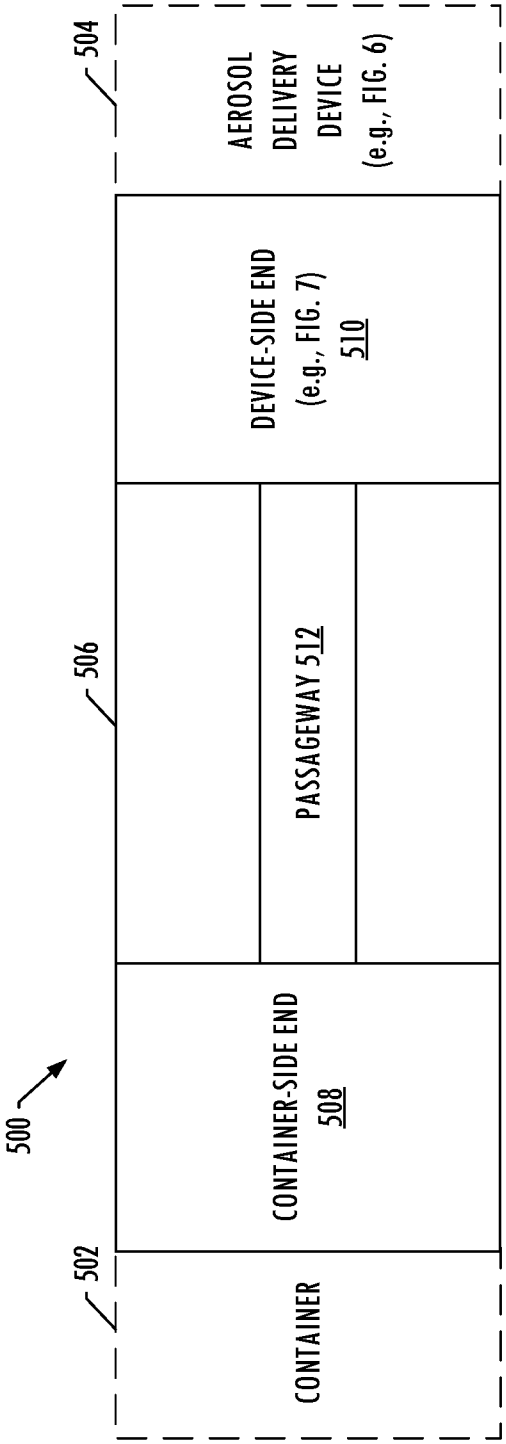

500
502
CONTAINER
CONTAINER-SIDE END
508
506
PASSAGEWAY 512
DEVICE-SIDE END
(e.g., FIG. 7)
510
504
AEROSOL
DELIVERY
DEVICE
(e.g., FIG. 6)

FIG. 5

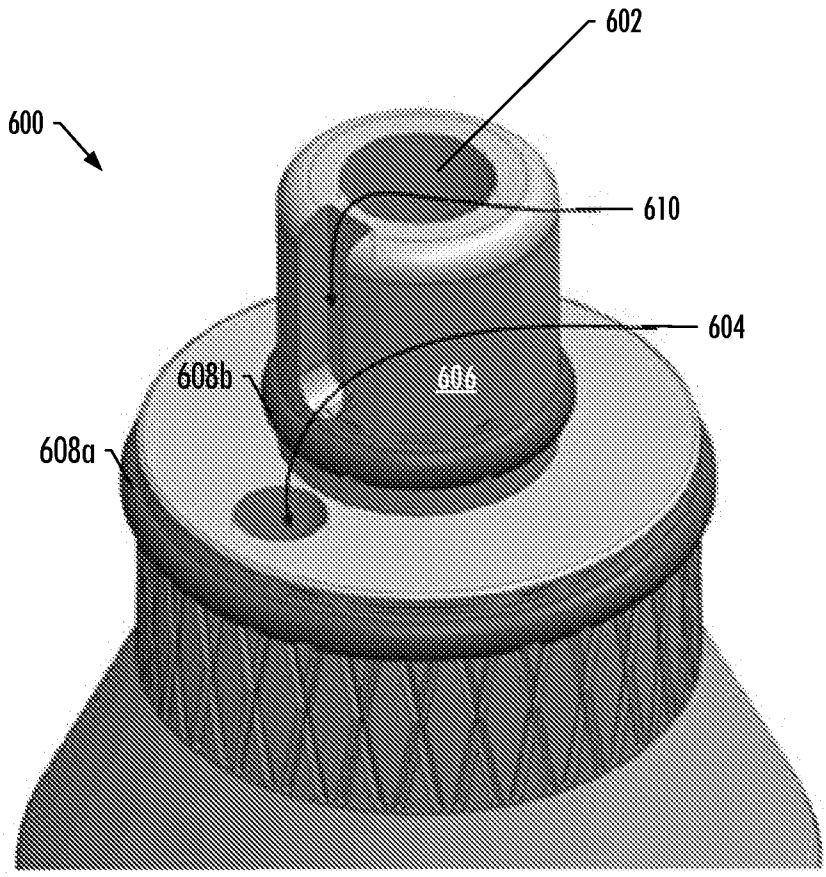


FIG. 6

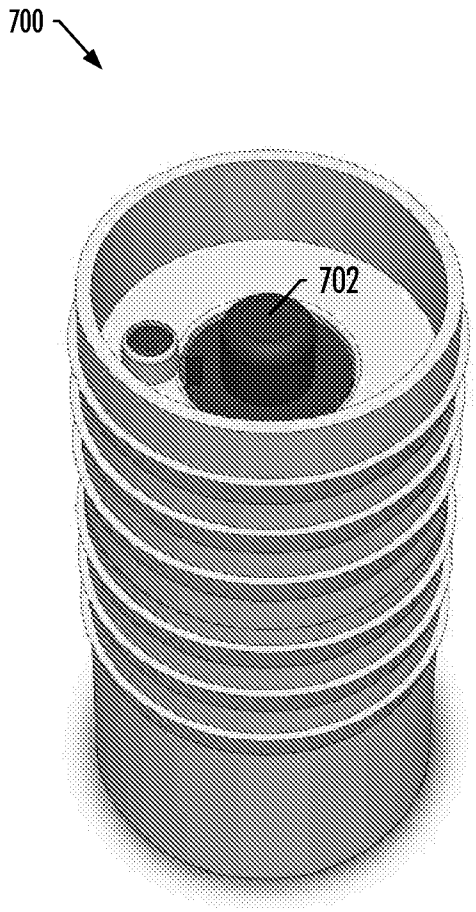


FIG. 7A

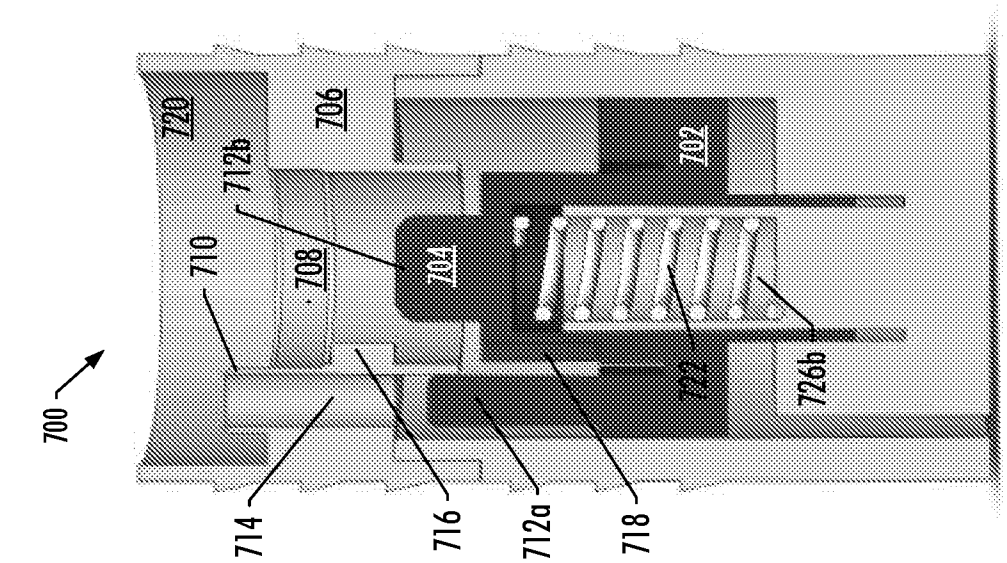

700
714
716
712a
718
712b
710
708
720
706
704
702
722
726b

FIG. 7C

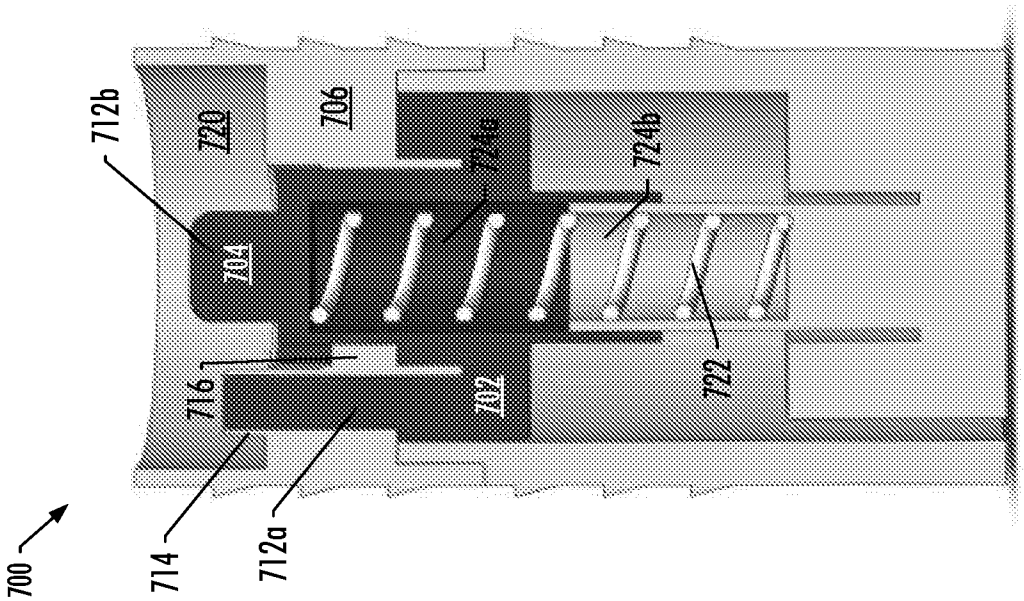

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712a
716
712b
720
706
704
702
724a
724b
722

FIG. 7B

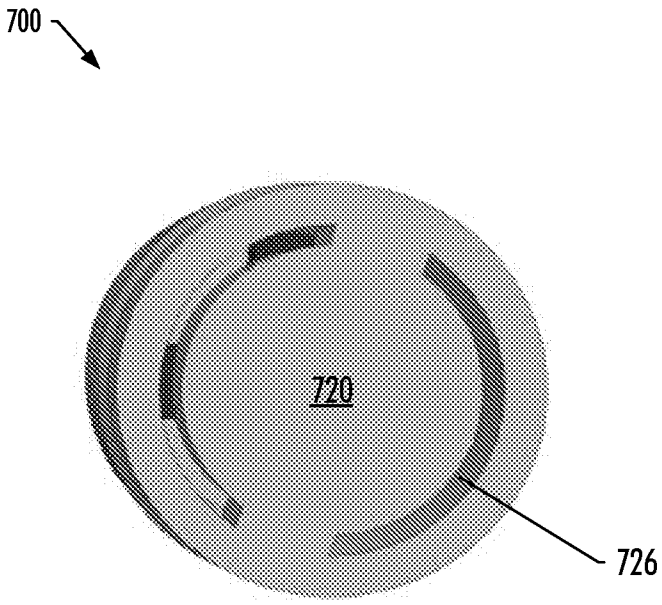


FIG. 7D

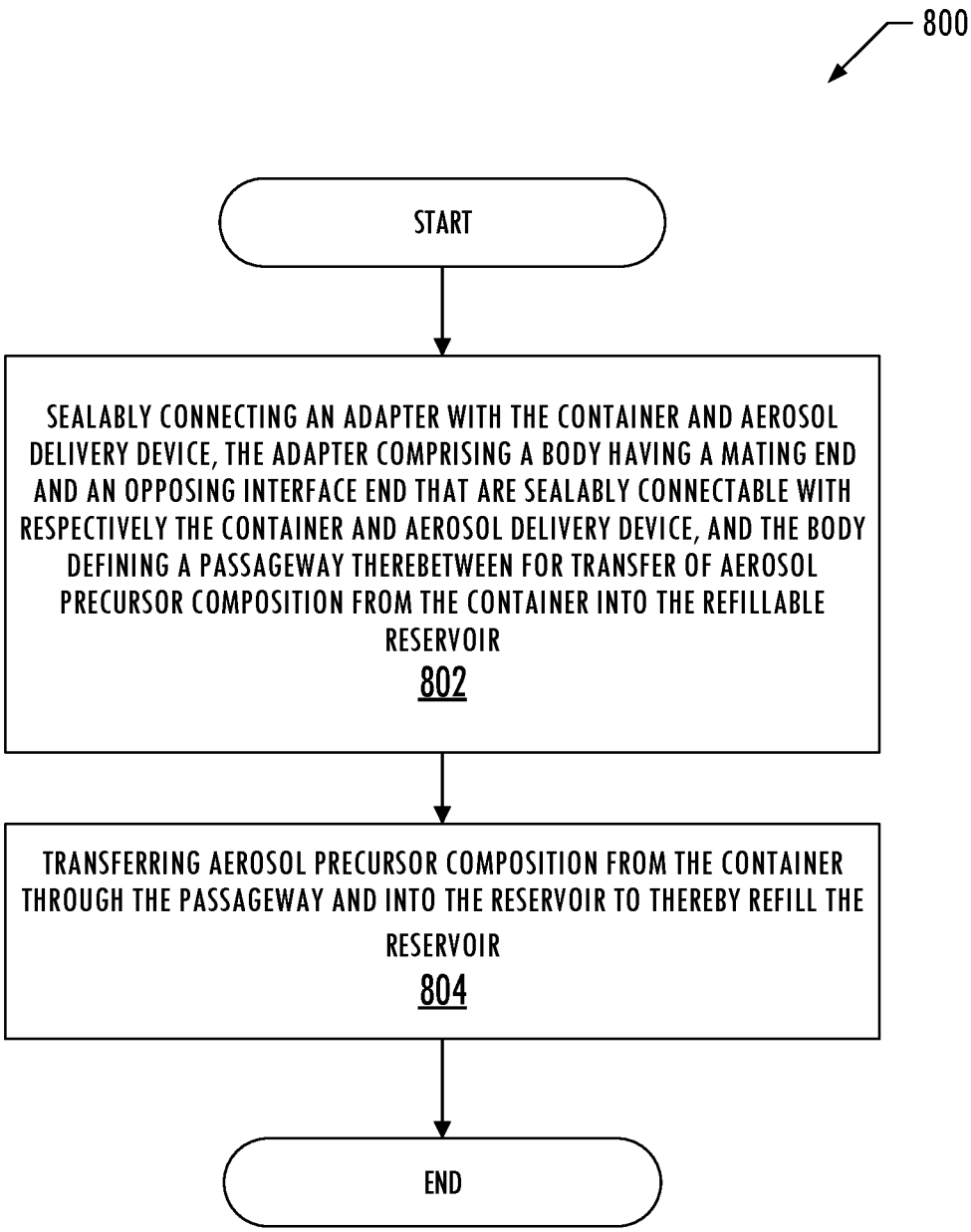

800
START
SEALABLY CONNECTING AN ADAPTER WITH THE CONTAINER AND AEROSOL DELIVERY DEVICE, THE ADAPTER COMPRISING A BODY HAVING A MATING END AND AN OPPOSING INTERFACE END THAT ARE SEALABLY CONNECTABLE WITH RESPECTIVELY THE CONTAINER AND AEROSOL DELIVERY DEVICE, AND THE BODY DEFINING A PASSAGEWAY THEREBETWEEN FOR TRANSFER OF AEROSOL PRECURSOR COMPOSITION FROM THE CONTAINER INTO THE REFILLABLE RESERVOIR
802
TRANSFERRING AEROSOL PRECURSOR COMPOSITION FROM THE CONTAINER THROUGH THE PASSAGEWAY AND INTO THE RESERVOIR TO THEREBY REFILL THE RESERVOIR
804
END

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/050722

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F15/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/167906 A1 (GYSLAND DAVID [US]) 5 July 2012 (2012-07-05) paragraphs [0021], [0023], [0068] - [0080]; figures 2,4,5,11	1-20
X	US 2014/283946 A1 (KRIBS DAVID [US]) 25 September 2014 (2014-09-25)	1,4,6,7
A	paragraphs [0001], [0018] - [0027]; figures	8,17,19
A	WO 2009/001082 A1 (KIND CONSUMER LTD [GB]; HEARN ALEX [GB]) 31 December 2008 (2008-12-31) abstract; figures	1-20
A	US 2013/269684 A1 (PATTON RYAN S [US]) 17 October 2013 (2013-10-17) abstract; figures	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 April 2017	18/04/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kock, Søren

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2017/050722

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012167906 A1	05-07-2012	NONE	
US 2014283946 A1	25-09-2014	NONE	
WO 2009001082 A1	31-12-2008	DK 2162025 T3	01-09-2014
		EP 2162025 A1	17-03-2010
		ES 2490819 T3	04-09-2014
		HK 1141411 A1	30-01-2015
		PT 2162025 E	01-09-2014
		US 2010229881 A1	16-09-2010
		WO 2009001082 A1	31-12-2008
US 2013269684 A1	17-10-2013	CN 104470567 A	25-03-2015
		EP 2838592 A1	25-02-2015
		RU 2014145836 A	10-06-2016
		US 2013269684 A1	17-10-2013
		WO 2013158353 A1	24-10-2013

Abstract: 提供了用于再充填气溶胶释放装置的适配器。适配器包括主体，主体具有容器侧端部和相反的装置侧端部，容器侧端部和相反的装置侧端部分别可与气溶胶前体组合物容器和具有可再充填储存器的气溶胶释放装置密封地连接。主体限定各端部之间的通道，用于气溶胶前体组合物从容器输送入可再充填储存器。在一个适配器中，容器侧端部构造成在储存器的再充填期间接合容器的阀，且因此限定了分离且不同的充填端口和匹配端口。在另一适配器中，装置侧端部包括阀，该阀构造成在储存器的再充填期间接合气溶胶释放装置，其中，气溶胶释放装置的空气流端口被阀关闭，以防止气溶胶前体组合物穿过空气流端口。