



US 20150335075A1

(19) **United States**(12) **Patent Application Publication**
Minskoff et al.(10) **Pub. No.: US 2015/0335075 A1**(43) **Pub. Date: Nov. 26, 2015**(54) **CARTRIDGE AND FLUID RESERVOIR FOR A VAPORIZER****Publication Classification**(71) Applicant: **R.J. Reynolds Tobacco Company,**
Winston-Salem, NC (US)(51) **Int. Cl.**
A24F 47/00 (2006.01)(72) Inventors: **Noah Mark Minskoff,** Palo Alto, CA
(US); **Nathan Andrew Terry,** Lowman,
ID (US)(52) **U.S. Cl.**
CPC **A24F 47/008** (2013.01)(73) Assignee: **R.J. REYNOLDS TOBACCO**
COMPANY, Winston-Salem, NC (US)(57) **ABSTRACT**(21) Appl. No.: **14/720,422**(22) Filed: **May 22, 2015****Related U.S. Application Data**(60) Provisional application No. 62/002,148, filed on May
22, 2014.

A personal vaporizing unit (PVU) generates a vapor that is inhaled by a user. A substance (e.g. liquid) in a cartridge is vaporized or atomized by a heating element that heats the liquid. When the PVU is activated, and the user provides suction, the liquid to be vaporized is drawn out of the cartridge, through a wick, and is atomized by the wick into a cavity containing the heating element. The airflow through PVU may have airflow directed around the cartridge and using standoff features to create a more air-tight connection.

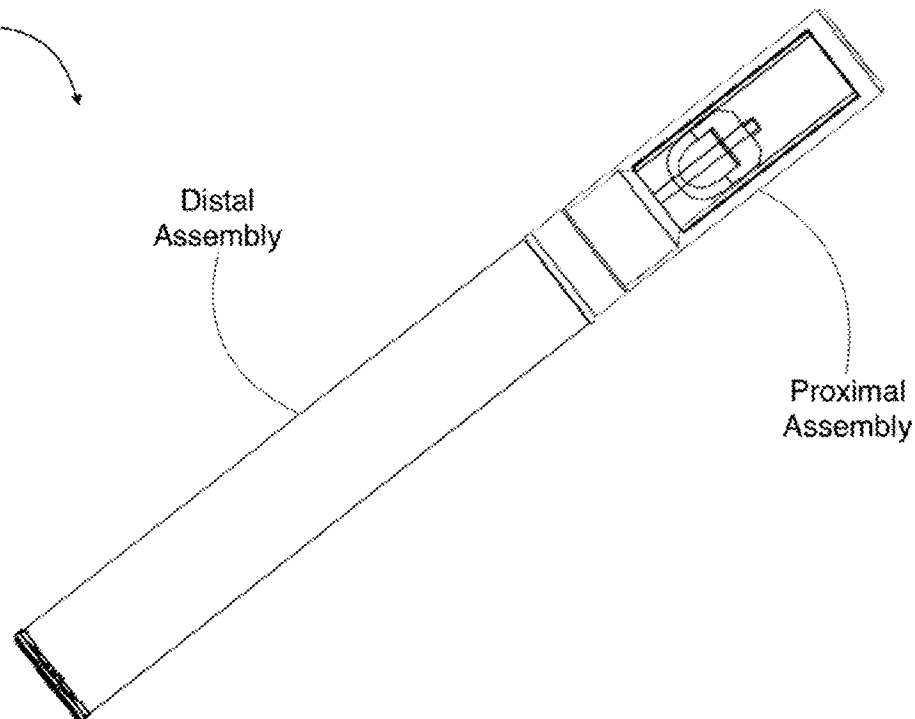
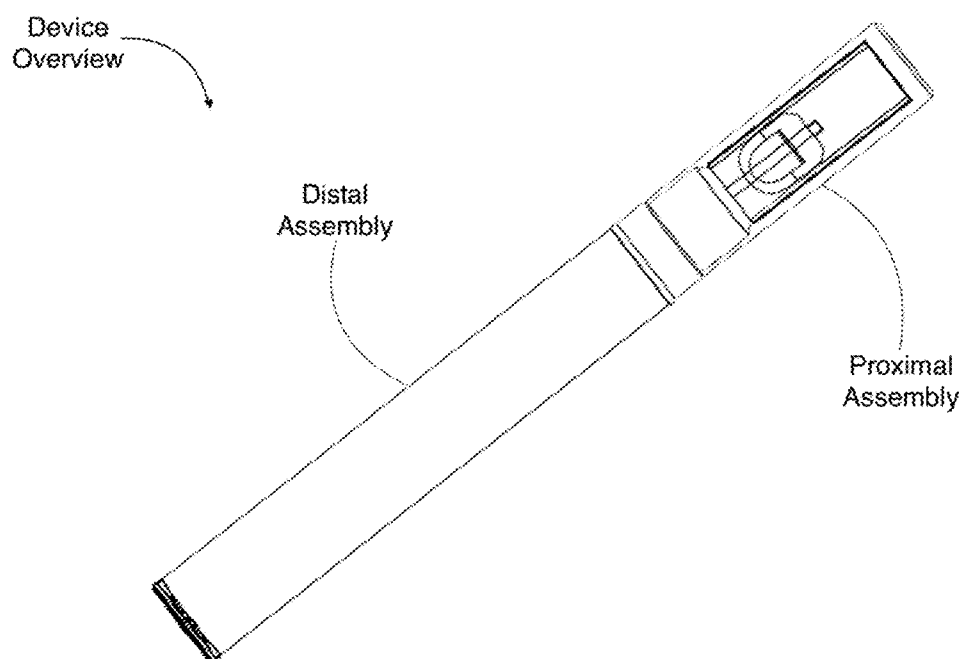
Device
Overview

FIG. 1



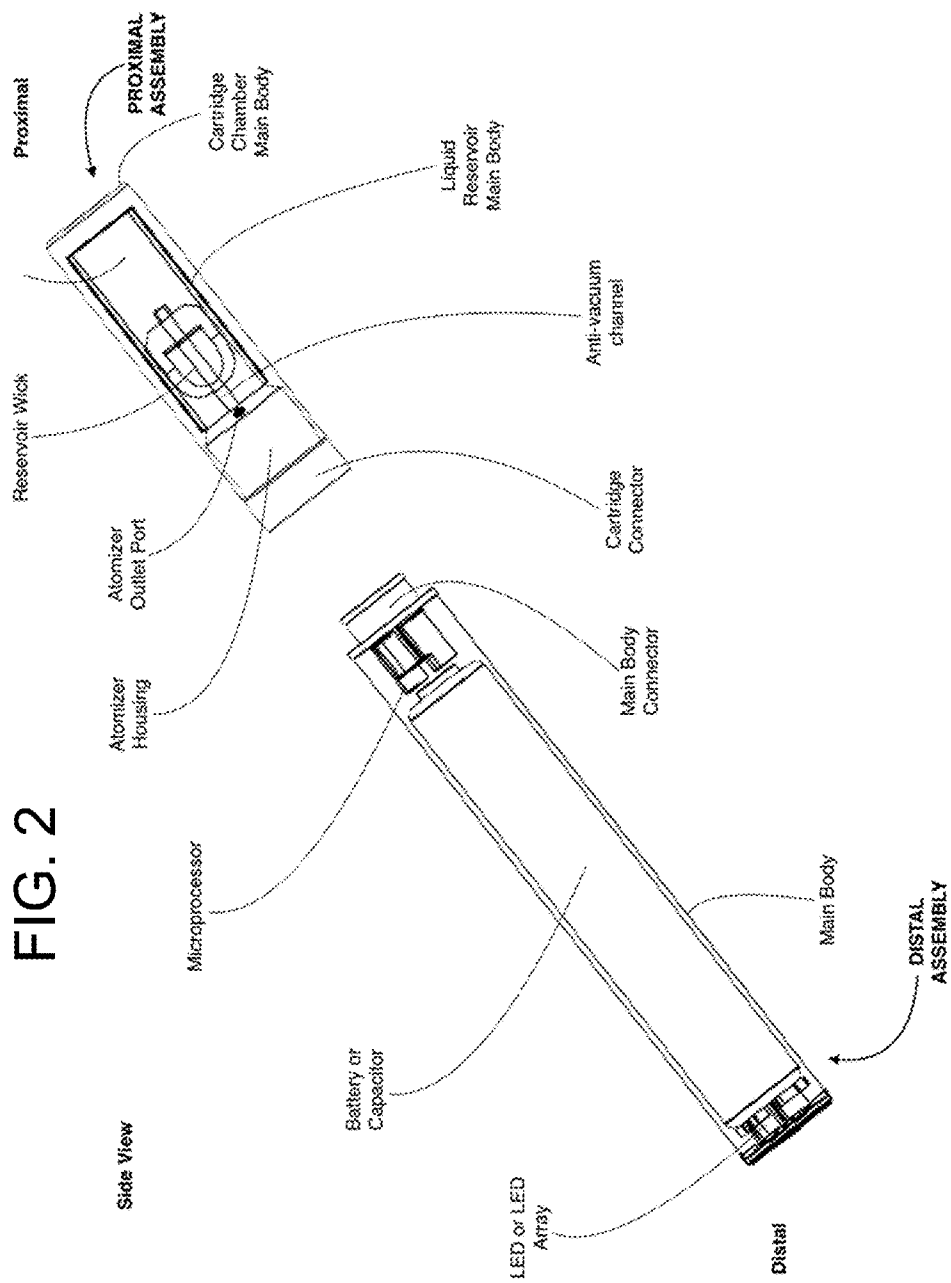
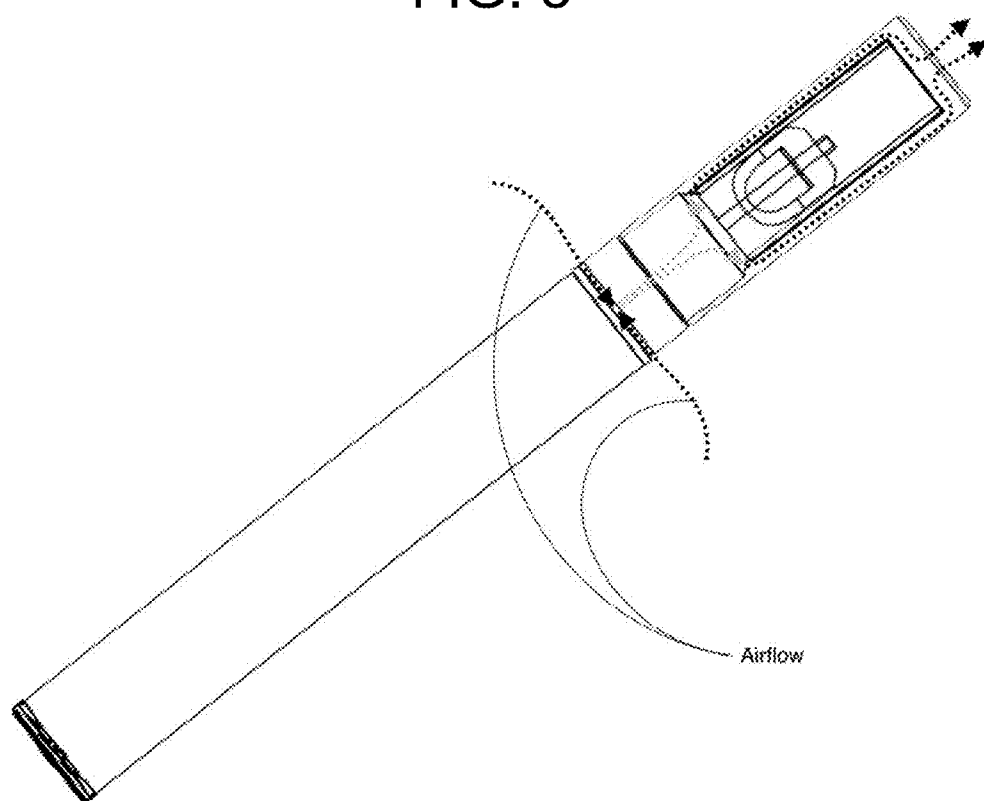


FIG. 3



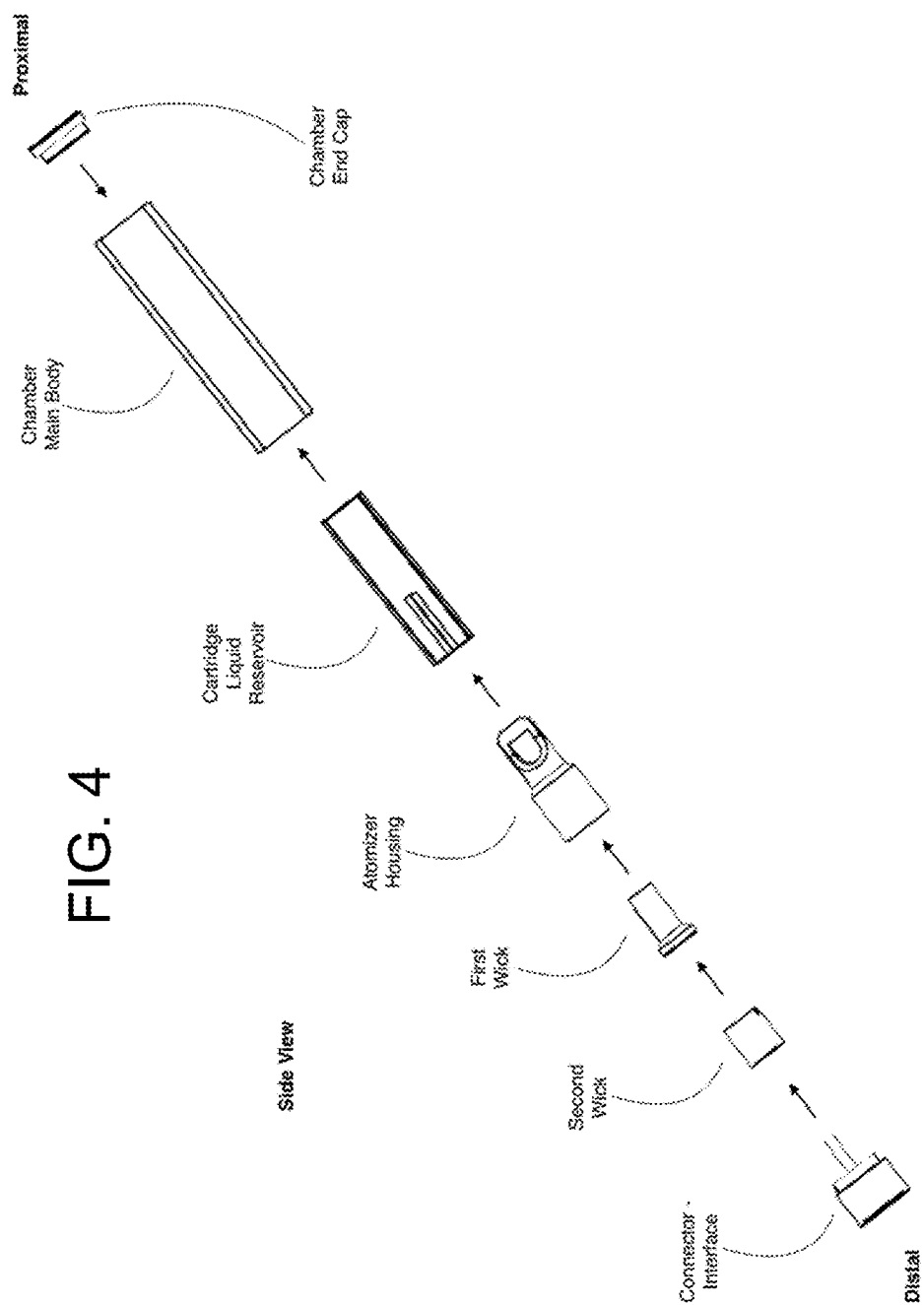


FIG. 5

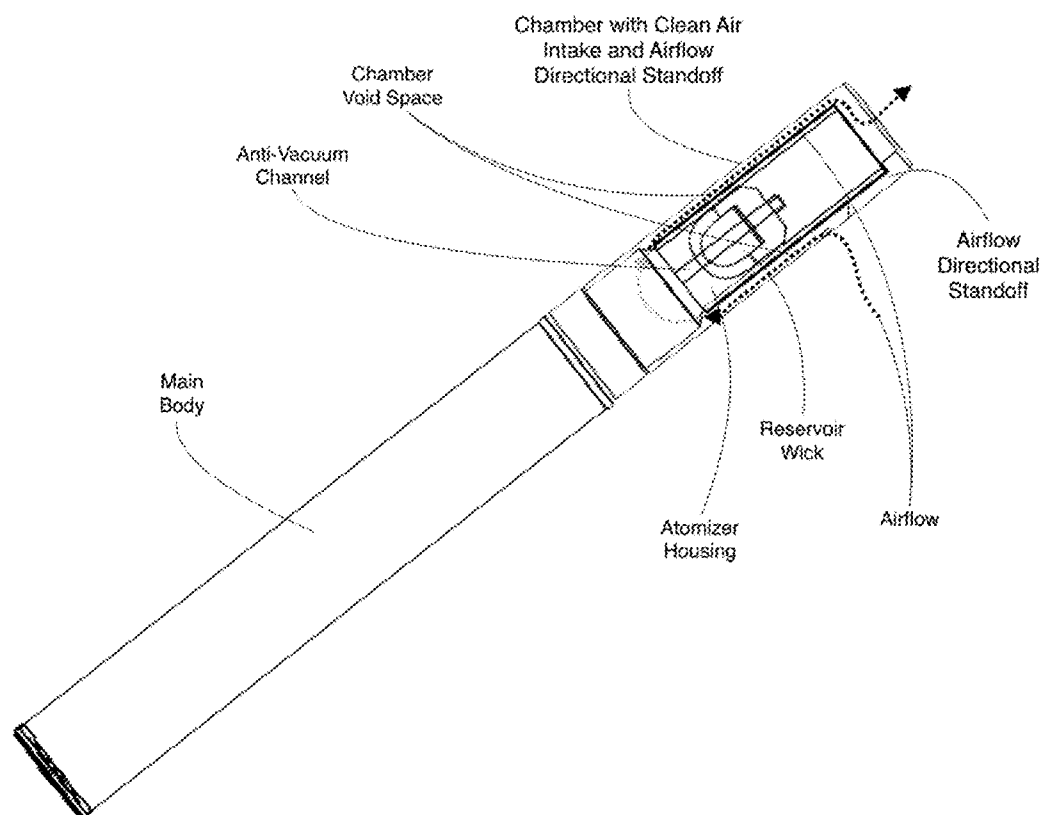
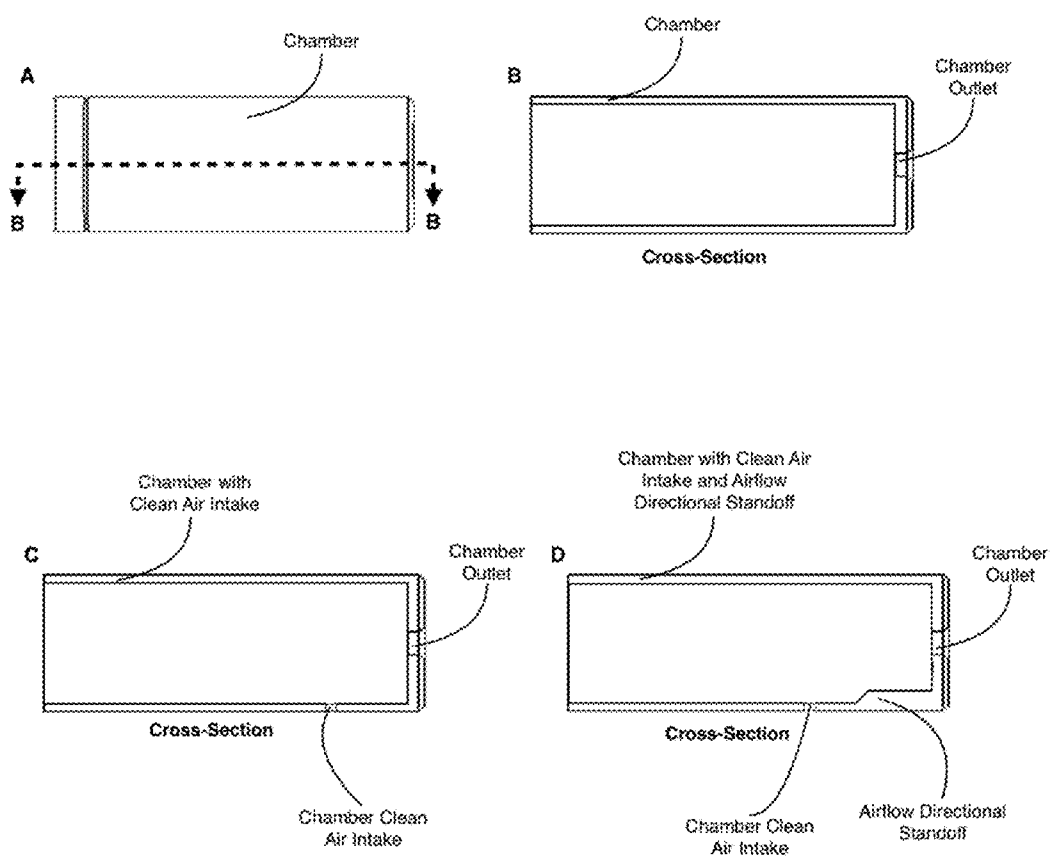
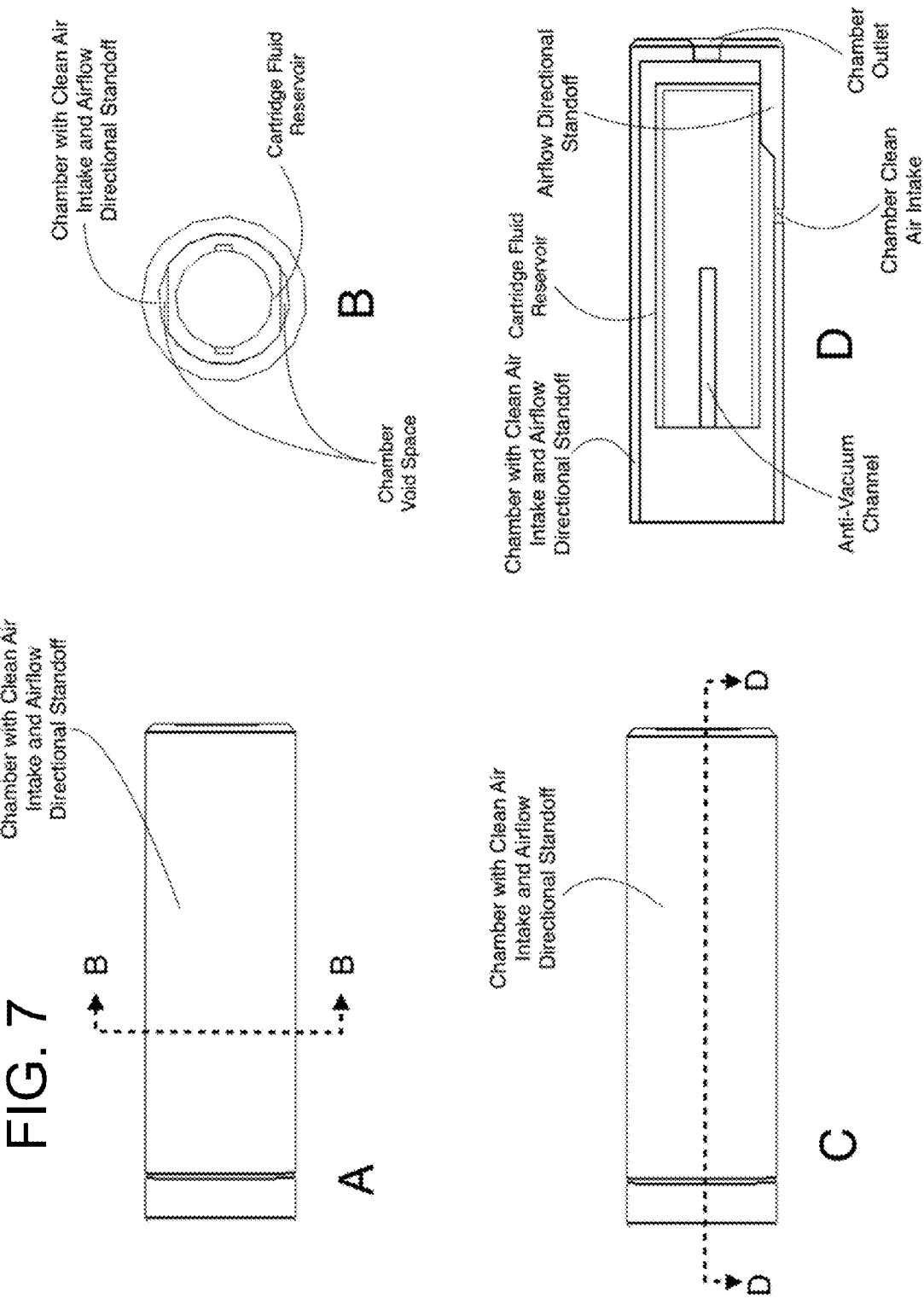


FIG. 6





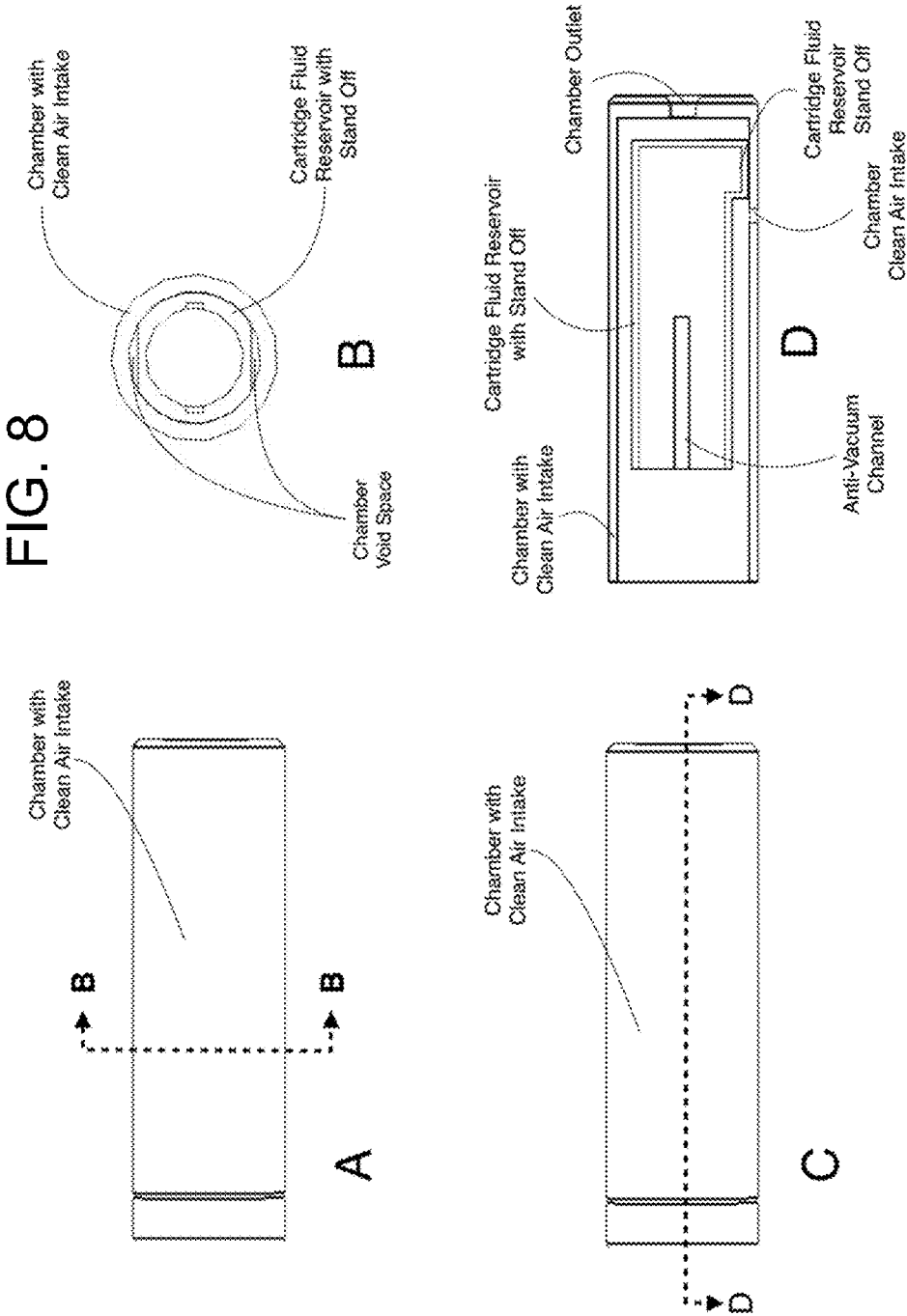


FIG. 9

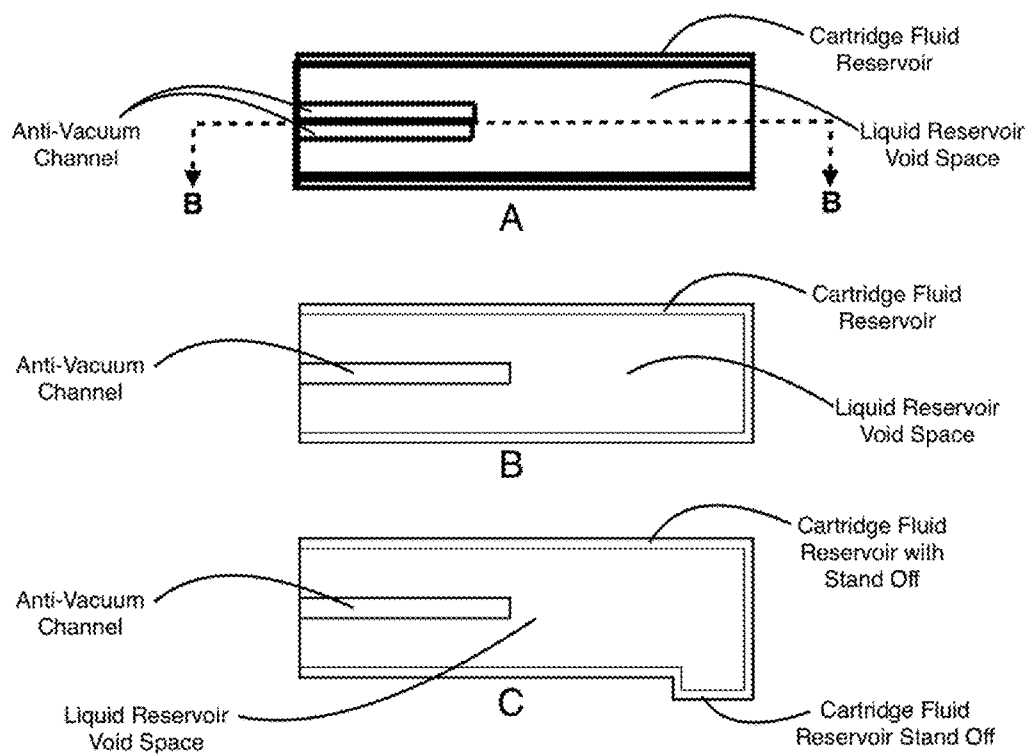


FIG. 10

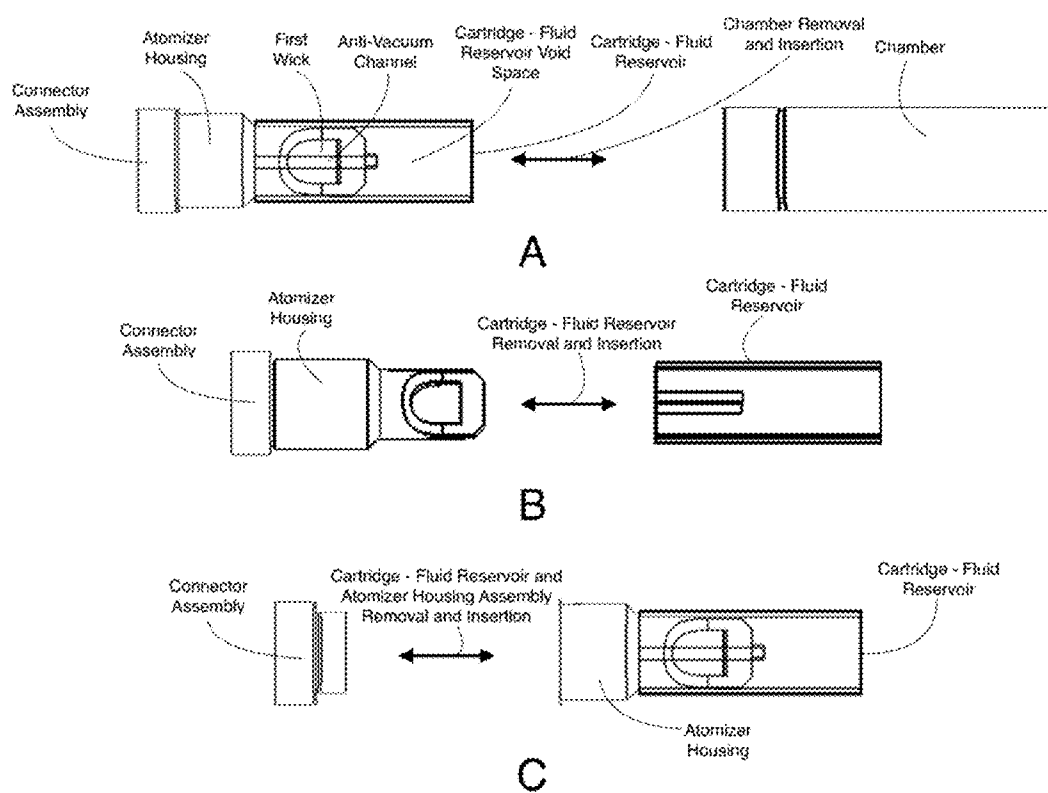


FIG. 11

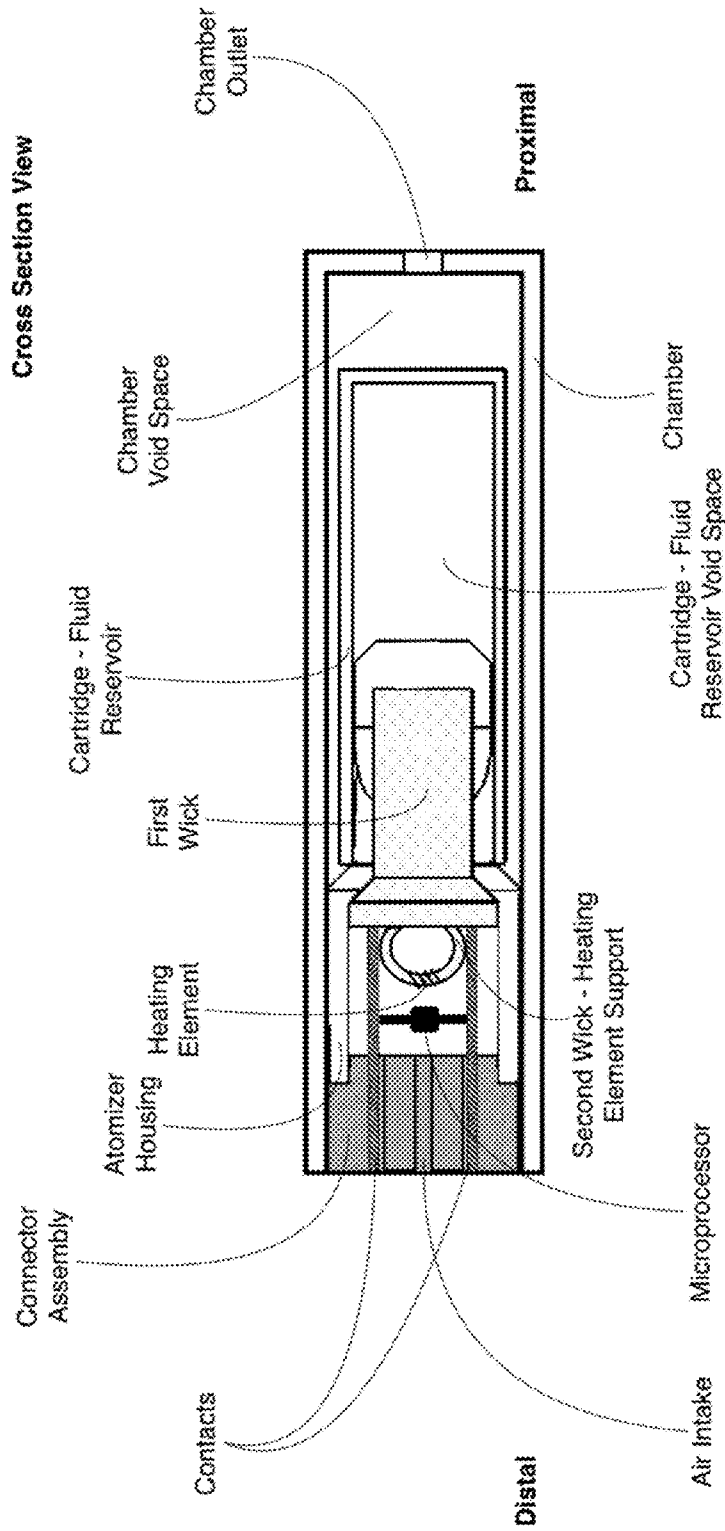


FIG. 12

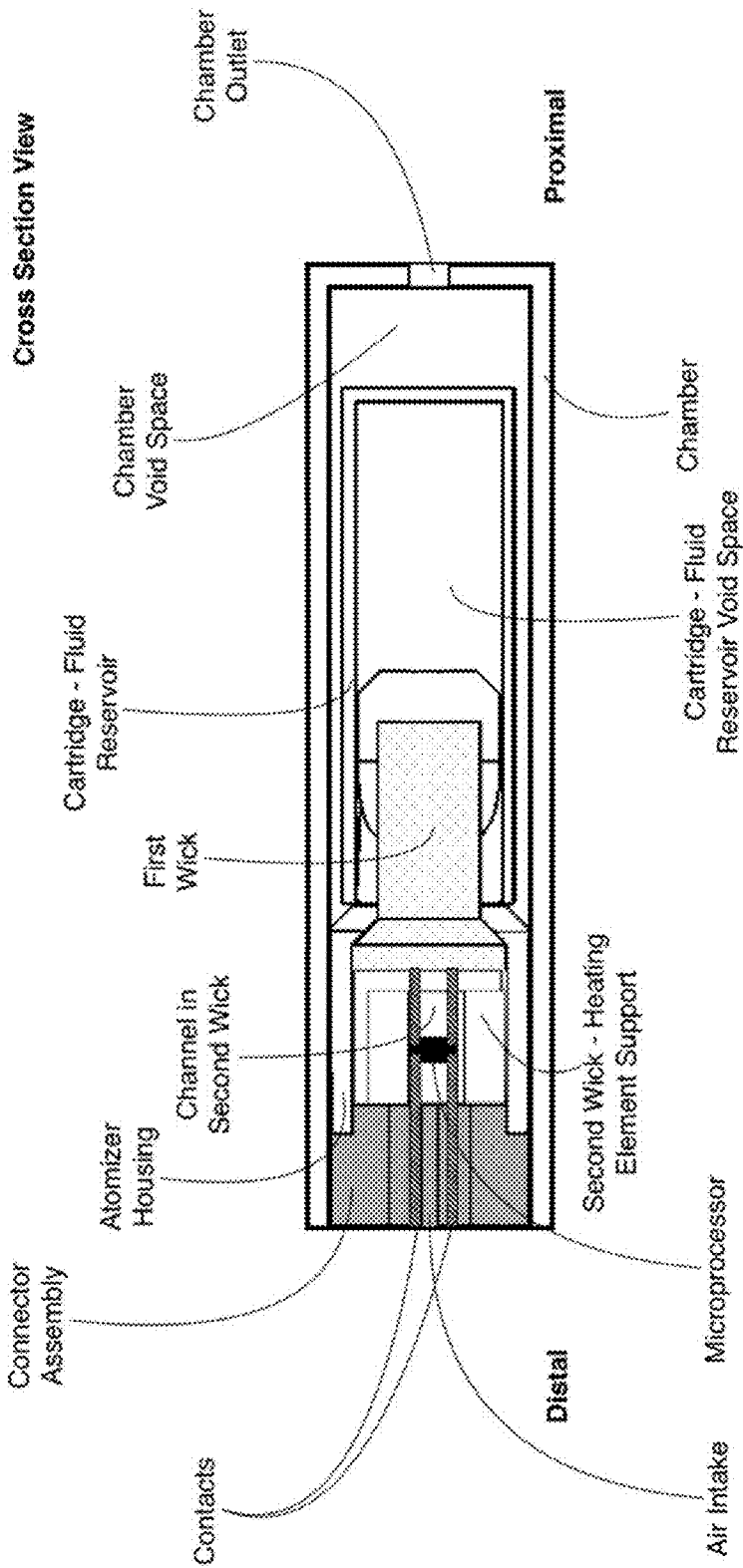


FIG. 13

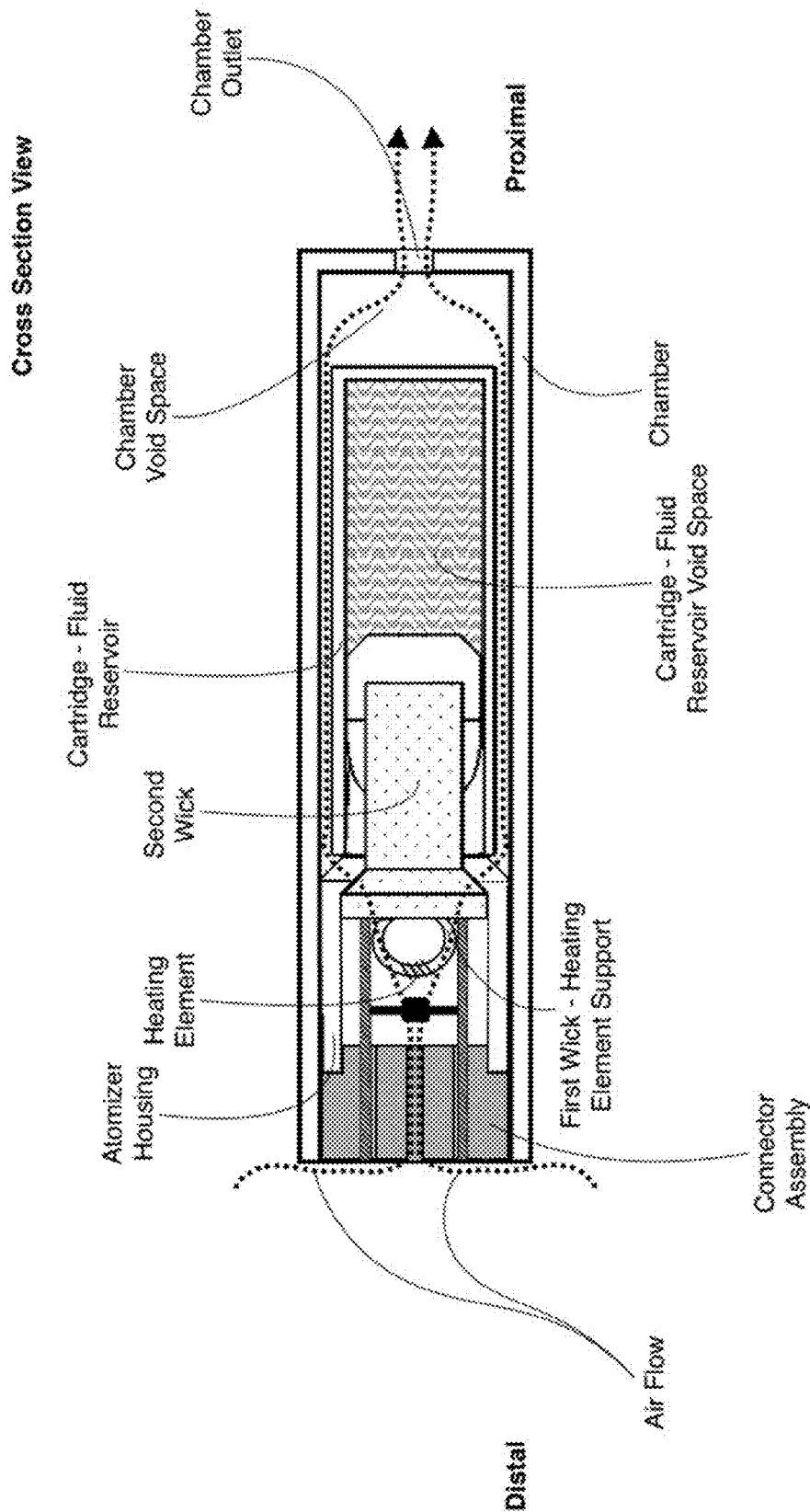


FIG. 14



FIG. 15



CARTRIDGE AND FLUID RESERVOIR FOR A VAPORIZER

PRIORITY

[0001] This application claims priority to U.S. Provisional Application No. 62/002,148, entitled "VAPORIZER RELATED CARTRIDGES, FLUID RESERVOIRS, METHODS, AND APPARATUS," filed on May 22, 2014, the entire disclosure of which is hereby incorporated by reference.

TECHNICAL FIELD

[0002] This application relates generally to personal vapor inhaling units, which are also referred to as personal vaporizing units (PVU), vaporizers, or electronic cigarettes.

BACKGROUND

[0003] An alternative to smoked tobacco products, such as cigarettes, cigars, or pipes is a personal vaporizer. Inhaled doses of heated and atomized flavor provide a physical sensation similar to smoking. However, because a personal vaporizer is typically electrically powered, no tobacco, smoke, or combustion is usually involved in its operation. For portability, and to simulate the physical characteristics of a cigarette, cigar, or pipe, a personal vaporizer may be battery powered. In addition, a personal vaporizer may be loaded with a nicotine bearing substance and/or a medication bearing substance. The personal vaporizer may provide an inhaled dose of nicotine and/or medication by way of the heated and atomized substance. Thus, personal vaporizers may also be known as electronic cigarettes, or e-cigarettes. Personal vaporizers may be used to administer flavors, medicines, drugs, or substances that are vaporized and then inhaled.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0004]** FIG. 1 is a personal vaporizing unit (PVU).
- [0005]** FIG. 2 is an embodiment of components of the PVU.
- [0006]** FIG. 3 is a diagram of airflow through the PVU.
- [0007]** FIG. 4 is a side view of components of the PVU.
- [0008]** FIG. 5 is a diagram of an alternative embodiment of airflow through the PVU.
- [0009]** FIG. 6 is a diagram of an embodiment of a chamber.
- [0010]** FIG. 7 is a diagram of another embodiment of the chamber.
- [0011]** FIG. 8 is a diagram of an embodiment of a fluid reservoir and chamber.
- [0012]** FIG. 9 is another diagram of a fluid reservoir component.
- [0013]** FIG. 10 is a diagram of the removal and insertion of the chamber, fluid reservoir, and atomizer assembly.
- [0014]** FIG. 11 is a diagram of an embodiment of the proximal assembly.
- [0015]** FIG. 12 is a diagram of another embodiment of the proximal assembly.
- [0016]** FIG. 13 is a diagram of another embodiment of the proximal assembly showing airflow.
- [0017]** FIG. 14 is a diagram of the PVU and connection interface.
- [0018]** FIG. 15 illustrates an assemble PVU.

DETAILED DESCRIPTION

[0019] FIG. 1 is a personal vaporizing unit (PVU). FIG. 1 illustrates a two piece PVE with a distal end (distal assembly)

and a proximal end (proximal assembly). The distal assembly may include the battery and microprocessor, while the proximal assembly may be the cartridge and atomizer. The components are further illustrated in FIG. 2.

[0020] FIG. 2 is an embodiment of components of the PVU. The distal assembly interfaces with the proximal assembly by a connection interface such that energy from a power source such as a battery or capacitor may be transmitted to the proximal assembly. A connector interface may serve to transmit, receive, or otherwise exchange data between the distal assembly and proximal assembly. The distal assembly may include a main body that houses a battery or capacitor, one or a plurality of microprocessors, an LED or light at the distal aspect of the device. The upper assembly may include a connector or interface to engage with the main body connector or interface. A main body connector on the distal assembly may connect with the cartridge connector on the proximal assembly. These may be threaded type connectors, or recessed type connectors. Alternatively, the connection may include magnetic connections, or the connections may be a latching type connection or interface. The upper assembly may include an atomizer housing which houses a secondary wick and heating element or elements. The atomizer housing may include connections from the connector or interface for integrating a microprocessor, the power source, and the heating element. The atomizer housing may also include a first wick element that is in contact with the fluid to be vaporized. The upper assembly may include a fluid reservoir with the fluid to be vaporized. The atomizer housing and fluid reservoir may be disposed in a chamber housing, which also functions as the mouthpiece of the PVU.

[0021] FIG. 3 illustrates the airflow through the PVU in one embodiment. Clean outside air enters through the segmental gap which may be radial at the point of the connector interfaces between the distal and proximal assembly. The air may then flow through a flow galley or galley in the proximal assembly connector and into the atomizer housing. The airflow may pass over or through the second wick assembly and heating element where some or all of the fluid included in the second wick is vaporized. The vapor may then exit the atomizer housing ports and enter into a flow galley or galleys that is comprised of the space between the outer diameter or surface of the fluid reservoir and the inner diameter or surface of the chamber and then exits through the chamber orifice on the proximal surface of the chamber.

[0022] FIG. 4 is a side view of components of the PVU. In particular, FIG. 4 illustrates an exploded view of the upper assembly. In this embodiment the chamber main body has a chamber end cap on the proximal end. The PVU is illustrated as being substantially tubular in shape and a chamber end cap is used to provide an orifice at the proximal aspect of the component. A cartridge liquid reservoir is disposed into the chamber main body. The cartridge includes an atomizer assembly, which may include an atomizer housing with a first and second wick. A connector interface may be located at the distal end. In other embodiments, the chamber may comprised of a single piece in which the proximal aspect has a small orifice.

[0023] FIG. 5 is a diagram of an alternative embodiment of airflow through the PVU. Clean outside air enters through an air intake port on the lateral aspect of the chamber main body. A stand off on one or more aspects of the internal surface of the chamber main body may serve to increase the internal diameter of the chamber such that at one or more points the

inner diameter of the chamber is the same or in close tolerance to the outer diameter of the fluid reservoir to produce an air tight seal that directs the airflow from proximal to distal down a flow galley. The flow galley is comprised of the space between the outer surface or diameter of the fluid reservoir and the inner surface of the chamber main body. The vacuum pressure that causes the airflow is a result of the pressure generated through inhalation of the user. The airflow enters into the atomizer assembly where it may either pass directly over a second wick element or may pass through a second wick element that may be porous such that liquid is displaced from the second wick element in proportion to the amount of airflow. The airflow passes over or through the second wick assembly and heating element where some or all of the fluid contained in the second which is vaporized. The vapor then exits the atomizer housing ports and enters into a flow galley (or galleys) that is comprised of the space between the outer diameter or surface of the fluid reservoir and the inner diameter or surface of the chamber and then exits through the chamber orifice on the proximal surface of the chamber.

[0024] FIG. 6 is a diagram of an embodiment of a chamber. In FIG. 6, the “A” diagram shows the chamber. The “B” diagram is a cross section of the chamber (as shown from the cut lines in the “A” diagram). The cross section in “B” illustrates the chamber and a chamber outlet. The “C” diagram shows the clean air intake on a lateral surface. This embodiment facilitates the use of a fluid reservoir with a standoff that increases the outer diameter of the fluid reservoir at one or more areas to match the inner diameter of the chamber in order to create an air tight seal. The air flows from proximal to distal from the clean air intake port to the air intake ports or port on the atomizer assembly. The “D” diagram shows the chamber with clean air intake and an airflow directional standoff. The airflow direction standoff may be disposed near the chamber outlet on an outside of the chamber. This embodiment of the chamber includes a standoff on one or more aspects of the internal surface of the chamber main body which serves to increase the internal diameter of the chamber such that at one or more points the inner diameter of the chamber is the same or similar to the outer diameter of the fluid reservoir to cause a air tight seal that directs the airflow from proximal to distal down a flow galley. The flow galley is comprised of the space between the outer surface or diameter of the fluid reservoir and the inner surface of the chamber main body.

[0025] FIG. 7 is a diagram of another embodiment of the chamber. FIG. 7 illustrates the arrangement between the fluid reservoir and the chamber that allows for direction airflow through the components that begins with clean air entering through the clean air intake port on the chamber lateral surface and through a flow galley or galleys between the outer surface of the fluid reservoir and the inner surface of the chamber, then the airflow enters the atomizer housing (not shown) and exits the atomizer housing to another flow galley or galleys that is also created by the space or spaces between the outer surface of the fluid reservoir and the inner surface of the chamber and exits the chamber orifice to the user.

[0026] In FIG. 7, the “A” diagram is a side view the chamber that houses the fluid reservoir. The “B” diagram is a cross section of the chamber (as shown from the cut lines in the “A” diagram). The “B” diagram illustrates an embodiment where the geometry of the fluid reservoir is such that when positioned in the chamber there is an airtight seal between the surfaces. The airtight seal may not exist where the geometry

of the fluid reservoir result in two galleys being created. One galley may serve to deliver clean air from the chamber intake port to the atomizer housing and the other galley may deliver vapor from the atomizer housing to the chamber orifice and to the user. The “C” diagram illustrates a side view of the chamber housing the fluid reservoir, with cut line indication the cross-sectional view outlined in the “D” diagram. The “D” diagram shows the arrangement of the fluid reservoir and chamber such that a standoff that increases the inner diameter of the chamber at one or more areas to match the inner diameter of the chamber can create an air tight seal in at least one section when in contact with the fluid reservoir to direct the clean air flow to travel from proximal to distal from the clean air intake port to the air intake ports or port on the atomizer assembly.

[0027] FIG. 8 is a diagram of an embodiment of a fluid reservoir and chamber. FIG. 8 illustrates the arrangement between the fluid reservoir and the chamber that allows for direction airflow through the components that begins with clean air entering through the clean air intake port on the chamber lateral surface and through a flow galley or galleys between the outer surface of the fluid reservoir and the inner surface of the chamber, then the airflow enters the atomizer housing (not shown) and exits the atomizer housing to another flow galley or galleys that is also created by the space or spaces between the outer surface of the fluid reservoir and the inner surface of the chamber and exits the chamber orifice to the user.

[0028] In FIG. 8, the “A” diagram is a side view the chamber that houses the fluid reservoir. The “B” diagram is a cross section of the chamber (as shown from the cut lines in the “A” diagram). The “B” diagram illustrates an embodiment where the geometry of the fluid reservoir is such that when positioned in the chamber there is an airtight seal between the surfaces excepts where the geometry of the fluid reservoir result in two galleys being created, one galley serves to deliver clean air from the chamber intake port to the atomizer housing and the other delivering vapor from the atomizer housing to the chamber orifice and to the user. The “C” diagram illustrates a side view of the chamber housing the fluid reservoir, with cut line indication the cross-sectional view outlined in diagram “D”. Diagram “D” illustrates an arrangement of the fluid reservoir and chamber such that a standoff that increases the outer diameter of the fluid reservoir at one or more areas to match the inner diameter of the chamber such as to create an air tight seal at least one section when in contact with the fluid reservoir to direct the clean air flow to travel from proximal to distal from the clean air intake port to the air intake ports or port on the atomizer assembly.

[0029] FIG. 9 is another diagram of a fluid reservoir component. In FIG. 9, the “A” diagram is a side view of the fluid reservoir component. The “B” diagram is a cross section of the component (as shown from the cut lines in the “A” diagram). The “B” diagram illustrates a cross-sectional view of the fluid reservoir with the anti-vacuum channels that allow for airflow into the fluid reservoir to prevent the fluid reservoir from becoming vacuumed locked and allowing for flow of fluid from the reservoir to the first wick element. The “C” diagram illustrates an alternative embodiment of the fluid reservoir. The fluid reservoir and chamber are arranged such that a standoff increases the outer diameter of the fluid reservoir at one or more areas to match the inner diameter of the chamber to create an air tight seal at a section when in contact with the fluid reservoir to direct the clean air flow to travel

from proximal to distal from the clean air intake port to the air intake ports or port on the atomizer assembly.

[0030] FIG. 10 is a diagram of the removal and insertion of the chamber, fluid reservoir, and atomizer assembly. The “A” diagram shows how the chamber is removable. The chamber may be held in place by a friction fit with the atomizer housing or connector assembly. Alternatively, a magnetic, threaded, rotational locking, or latching type attachment may be used with the atomizer housing or connector assembly. The “B” diagram illustrates that the cartridge may be removable from the atomizer housing and the cartridge may be held in place with the atomizer housing by a friction fit, magnetic attachment, threaded attachment, rotational locking, or latching type engagement with the atomizer housing. The “C” diagram illustrates an embodiment where the fluid reservoir and atomizer housing are an assembly and may be removed and or replaced together. The fluid reservoir and atomizer housing (i.e. the “assembly”) may be held in place by a friction fit, a magnetic attachment, a threaded attachment, a rotational locking engagement, or a latching type engagement with the connector assembly.

[0031] FIG. 11 is a diagram of an embodiment of the proximal assembly. The chamber outlet is adjacent a chamber void space. The cartridge may include fluid reservoir void space with a first wick to receive a liquid that is passed to a second wick. The second wick may include a heating element support. This heating support element may be part of the second wick and may support the heating element. The heating element in the atomizer housing may vaporize the liquid on the second wick. The distal end with the atomizer housing may include a connector assembly and contacts. The air intake is from the distal end of the PVU.

[0032] FIG. 12 is a diagram of another embodiment of the proximal assembly. FIG. 12 illustrates a proximal assembly that is similar to the proximal assembly in FIG. 11, except the proximal assembly in FIG. 12 illustrates a channel in the second wick. This embodiment includes a second wick element that serves to surround and support the heating element (not shown). The channel in the second wick may be between the contacts at the distal end.

[0033] FIG. 13 is a diagram of another embodiment of the proximal assembly showing airflow. FIG. 13 illustrates another arrangement of the proximal assembly similar to the assemblies shown in FIGS. 11-12. The assembly in FIG. 13 illustrates a first and second wick although the notification of a first wick and a second wick in FIG. 13 is different from FIG. 11. In other words, the designation of a first and second between the wicks can be switched. The first wick is shown to be supporting the heating element. The airflow shown in FIG. 13 enters the PVU on the distal end and travels through a channel at the distal end to pass by the heating element and the wick supporting the heating element. The airflow then passes along an outside of the cartridge to the chamber void space and out of the chamber outlet on the proximal end.

[0034] FIG. 14 and FIG. 15 are illustrations of the PVU. FIG. 14 is a diagram of the PVU and connection interface. FIG. 15 illustrates the assemble PVU ready for use. In particular, FIG. 14 illustrates the PVU showing the proximal and distal assemblies and the connection interface that engages the two assemblies together. There may be a silicone or similar plug that occludes the chamber orifice to preserve freshness of the fluid reservoir components.

[0035] It is intended that the foregoing detailed description be understood as an illustration of selected forms that the

invention can take and not as a definition of the invention. It is only the following claims, including all equivalents that are intended to define the scope of the claimed invention. Finally, it should be noted that any aspect of any of the preferred embodiments described herein can be used alone or in combination with one another.

We claim:

1. A personal vaporizing unit comprising:
 - a distal assembly that includes a battery;
 - a proximal assembly coupled with the distal assembly and comprising:
 - a liquid reservoir fluid tank holding a liquid to be vaporized;
 - a heating element that heats liquid; and
 - one or more reservoir wicks for receiving the liquid adjacent the heating element, wherein one of the reservoir wicks supports the heating element.
2. The personal vaporizing unit of claim 1 wherein the liquid reservoir fluid tank is part of a cartridge.
3. The personal vaporizing unit of claim 2 wherein the cartridge includes a connector assembly for connecting with the distal assembly.
4. The personal vaporizing unit of claim 2 wherein the cartridge includes a mouthpiece for air flow.
5. The personal vaporizing unit of claim 4 wherein the cartridge comprises an airflow directional standoff to cause an air tight seal that directs the air flow.
6. The personal vaporizing unit of claim 5 wherein the directional standoff comprises a change in a radius of the liquid reservoir fluid tank to modify or block one path of the air flow.
7. The personal vaporizing unit of claim 1 wherein the wicks are part of an atomizer that heats the liquid for vaporization
8. The personal vaporizing unit of claim 7 wherein the atomizer further comprises the heating element that heats droplets of the liquid to form a vapor of the liquid that is mixed with air.
9. The personal vaporizing unit of claim 1 wherein the distal assembly comprises a processor coupled with the battery.
10. The personal vaporizing unit of claim 1 wherein the one or more reservoir wicks comprises two wicks wherein a first wick supports the heating element and a second wick transfers liquid towards the heating element.
11. The personal vaporizing unit of claim 10 wherein a channel is disposed through the first wick.
12. The personal vaporizing unit of claim 10 wherein the first wick is surrounded by the heating element.
13. A personal vaporizing unit, comprising:
 - a main body portion comprising a battery for powering the personal vaporizing unit;
 - a cartridge that includes a fluid reservoir for holding fluid and an atomizer for vaporizing the fluid; and
 - an air flow path through the cartridge that passes by the atomizer and outside of the fluid reservoir to an outlet, wherein the cartridge includes a directional standoff to cause an air tight seal that directs the air flow.
14. The personal vaporizing unit of claim 13 wherein the directional stand off blocks at least a portion of the air flow path.

15. The personal vaporizing unit of claim **13** wherein the directional stand off comprises a portion of the fluid reservoir having a smaller radius to improve the air flow by changing a shape of the air flow path.

16. The personal vaporizing unit of claim **13** wherein the directional stand off comprises a portion of the fluid reservoir having a larger radius to improve the air flow by changing a shape of the air flow path.

17. The personal vaporizing unit of claim **13** wherein the cartridge further comprises:

a heating element that is part of the atomizer.

18. The personal vaporizing unit of claim **17** wherein the cartridge further comprises:

a wick that exposes the liquid to the heating element, wherein the air flow path passes the wick and includes the vaporized fluid.

19. The personal vaporizing unit of claim **13** wherein the air flow path comprises a clean air intake on a side of the personal vaporizing unit.

20. A cartridge in an electronic cigarette comprising:

a chamber that establishes an air flow path that includes a directional standoff in the airflow path;

a liquid reservoir fluid tank within the chamber and holding a liquid to be vaporized;

a wick for receiving the liquid; and

a heating element that heats liquid from the wick, wherein the wick supports the heating element.

* * * * *