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- (54) Title: LIQUID CONTAINERS FOR ELECTRONIC SMOKING DEVICE

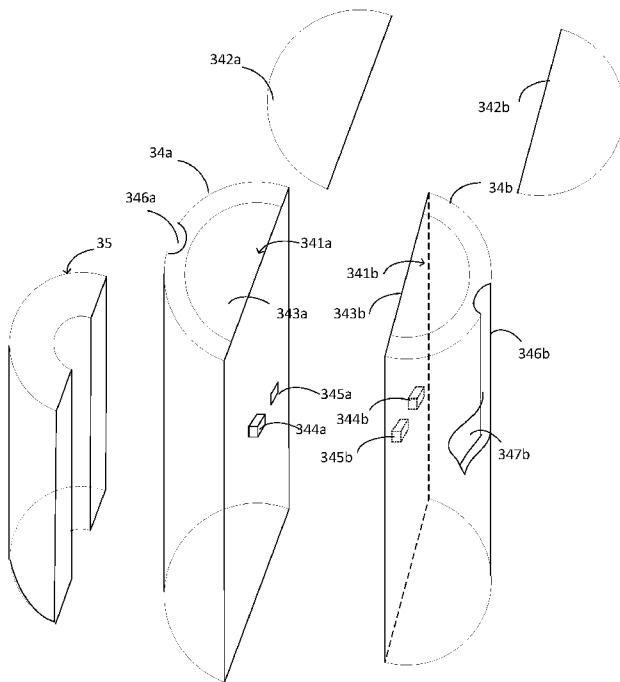


Fig. 1a

- (57) Abstract: An electronic smoking device includes a liquid supply (34) and an atomizer in a housing. The liquid supply (34) includes at least two container members (34a, 34b) attachable to one another through a connection mechanism to form a liquid supply main body. Each of the container members (34a, 34b) may have a first end (341a, 341b) sealed by a sealing member (342a, 342b) and a second end which is closed, and an aerosol channel (343a, 343b) formed between the container members.

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LIQUID CONTAINERS FOR ELECTRONIC SMOKING DEVICE

TECHNICAL FIELD

[0001] The invention relates to liquid supply of an electronic smoking device, such as an electronic cigarette or vaporizing device. More particularly the invention relates to An electronic smoking device having a liquid supply with more than one type or flavor of e-liquid.

BACKGROUND

[0002] Many electronic smoking or vaporizing devices use an open tank system which allows the tank holding the liquid supply to be opened and refilled by the user. However, open tank systems allow any liquid to be used, which has disadvantages. Refilling also risks the liquid contacting the users hands, which is otherwise better avoided. Other electronic vaporizing devices use a closed system, where the device is either not refillable, or is refillable using a closed or sealed container, which is opened only upon installation of the container into the device. Although the closed systems avoid many of the disadvantages of the open systems, engineering challenges remain in designing liquid containers for electronic smoking or vaporizing devices that are conveniently and easily used, and which may also allow for simultaneous use of more than one type of liquid.

SUMMARY OF THE INVENTION

[0003] An electronic smoking device includes a liquid supply and an atomizer in a housing. The liquid supply includes at least two container members attachable to one another through a connection mechanism to form a liquid supply main body. Each of

the container members may have a first end sealed by a sealing member and a second end which is closed, and an aerosol channel formed between the container members.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0004]** Figure 1a is a perspective exploded view of a liquid supply having two
5 container members;
- [0005]** Figure 1b is a perspective exploded view of a liquid supply having two container members and with aerosol channel in the center;
- [0006]** Figure 2a is a perspective view of an exemplary container member and the connection mechanism thereon;
- 10 **[0007]** Figure 2b illustrates an assembled liquid supply having two container members and a wick have two branches;
- [0008]** Figure 3a is a top view illustrating an assembled liquid supply within the housing and the guiding structure on the liquid supply and the housing;
- [0009]** Figure 3b illustrate the relative position of the assembled liquid supply
15 within the housing;
- [0010]** Figures 3c to 3e illustrate various guiding portion and locking mechanisms on the liquid supply;
- [0011]** Figure 4 is a side view of a liquid supply and an liquid guiding structure showing the bayonets within the liquid guiding structure for piecing and ripping
20 the sealing members on the liquid supply; and
- [0012]** Figure 5 is a schematic diagram of an electronic cigarette or smoking device.

DETAILED DESCRIPTION

Electronic Cigarettes In General

[0013] As shown in Figure 5, an e-cigarette 10 typically has a housing comprising a cylindrical hollow tube having an end cap 16. The cylindrical hollow tube may be
5 single piece or a multiple piece tube. In Figure 5 the cylindrical hollow tube is shown as a two piece structure having a battery portion 12 and an atomizer/liquid reservoir portion 14. Together the battery portion 12 and the atomizer/liquid reservoir portion 14 form a cylindrical tube which is approximately the same size and shape as a conventional cigarette, typically about 100 mm with a 7.5 mm diameter, although
10 lengths may range from 70 to 150 or 180 mm, and diameters from 5 to 20 mm.

[0014] The battery portion 12 and atomizer/liquid reservoir portion 14 are typically made of metal or plastic and act together with the end caps to provide a housing to contain the components of the e-cigarette 10. The battery portion 12 and the atomizer/liquid reservoir portion 14 may be configured to fit together by a friction push
15 fit, a snap fit, or a bayonet attachment, magnetic fit, or screw threads. The end cap 16 is provided at the front end of the main body 12. The end cap 16 may be made from translucent plastic or other translucent material to allow an LED 20 positioned near the end cap to emit light through the end cap.

[0015] An air inlet may be provided in the end cap, at the edge of the end cap
20 next to the cylindrical hollow tube, anywhere along the length of the cylindrical hollow tube, or at the connection of the battery portion 12 and the atomizer/liquid reservoir portion 14. Figure 5 shows a pair of air inlets 38 provided at the intersection between the battery portion 12 and the atomizer/liquid reservoir portion 14 .

[0016] A battery 18, a light emitting diode (LED) 20, control electronics 22 and optionally an airflow sensor 24 are provided within the cylindrical hollow tube battery portion 12. The battery 18 is electrically connected to the control electronics 22, which is electrically connected to the LED 20 and the airflow sensor 24. In this example
5 the LED 20 is at the front end of the main body 12, adjacent to the end cap 16 and the control electronics 22 and airflow sensor 24 are provided at the other end of the battery portion 12, adjacent the atomizer/liquid reservoir portion 14.

[0017] The airflow sensor 24 acts as a puff detector, detecting a user puffing or sucking on the mouthpiece portion 14 of the e-cigarette 10. The airflow
10 sensor 24 can be any suitable sensor for detecting changes in airflow or air pressure such a microphone switch including a deformable membrane which is caused to move by variations in air pressure. Alternatively the sensor may be a Hall element or an electro-mechanical sensor.

[0018] The control electronics 22 are also connected to an atomizer 26. In
15 the example shown, the atomizer 26 includes a heating coil 28 which is wrapped around a wick 30 extending across a central passage 32 of the atomizer/liquid reservoir portion 14. The coil 28 may be positioned anywhere in the atomizer and may be transverse or parallel to the liquid reservoir. The wick 30 and heating coil 28 do not completely block the central passage 32. Rather an air gap is provided on either side of
20 the heating coil 28 enabling air to flow past the heating coil 28 and the wick 30. The atomizer may alternatively use other forms of heating elements, such as ceramic heaters, or fiber or mesh material heaters. Nonresistance heating elements such as

sonic, piezo and jet spray may also be used in the atomizer in place of the heating coil.

[0019] The central passage 32 is surrounded by a cylindrical liquid supply 34 with the ends of the wick 30 abutting or extending into the liquid supply 33. The wick 30
5 may be a porous material such as a bundle of fiberglass fibers, with liquid in the liquid supply 33 drawn by capillary action from the ends of the wick 30 towards the central portion of the wick 30 encircled by the heating coil 28.

[0020] The liquid supply 33 may alternatively include wadding soaked in liquid which encircles the central passage 32 with the ends of the wick 30 abutting the
10 wadding. In other embodiments the liquid supply 33 may comprise a toroidal cavity arranged to be filled with liquid and with the ends of the wick 30 extending into the toroidal cavity.

[0021] An air inhalation port 36 is provided at the back end of the atomizer/liquid reservoir portion 14. The inhalation port 36 may be formed in the
15 cylindrical hollow tube atomizer/liquid reservoir portion 14 or maybe formed in a separate mouthpiece attached to the atomizer/liquid reservoir portion 14.

[0022] In use, a user sucks on the e-cigarette 10. This causes air to be drawn into the e-cigarette 10 via one or more air inlets, such as air inlets 38 and to be drawn through the central passage 32 towards the air inhalation port 36. The change in air
20 pressure is detected by the airflow sensor 24 which generates an electrical signal that is passed to the control electronics 22. In response to the signal, the control electronics 22 activates the heating coil 28 which causes liquid present in the wick 30 to be vaporized creating an aerosol (which may comprise gaseous and liquid

components) within the central passage 32. As the user continues to suck on the e-cigarette 10, this aerosol is drawn through the central passage 32 and inhaled by the user. At the same time the control electronics 22 also activates the LED 20 causing the LED 20 to light up which is visible via the translucent end cap 16 simulating the appearance of a glowing ember at the end of a conventional cigarette. As liquid present in the wick 30 is converted into an aerosol more liquid is drawn into the wick 30 from the liquid supply 33 by capillary action and thus is available to be converted into an aerosol through subsequent activation of the heating coil 28.

[0023] Some e-cigarettes are intended to be disposable and the electric power in the battery 18 is intended to be sufficient to vaporize the liquid contained within the liquid supply 33 after which the e-cigarette 10 is thrown away. In other embodiments the battery 18 is rechargeable and the liquid supply is refillable. In the cases where the liquid supply 33 is a toroidal cavity, this may be achieved by refilling the liquid supply via a refill port . In other embodiments the atomizer/liquid reservoir portion 14 of the e-cigarette 10 is detachable from the battery portion 12 and a new atomizer/liquid reservoir portion 14 can be fitted with a new liquid supply 33 thereby replenishing the supply of liquid. In some cases, replacing the liquid supply 33 may involve replacement of the heating coil 28 and the wick 30 along with the replacement of the liquid supply 33.

[0024] The new liquid supply 33 may be in the form of a cartridge having a central passage 32 through which a user inhales aerosol. In other embodiments, aerosol may flow around the exterior of the cartridge 32 to an air inhalation port 36.

[0025] Of course, in addition to the above description of the structure and function of a typical e-cigarette 10, variations also exist. For example, the LED 20

may be omitted. The airflow sensor 24 may be placed adjacent the end cap 16 rather than in the middle of the e-cigarette. The airflow sensor 24 may be replaced with a switch which enables a user to activate the e-cigarette manually rather than in response to the detection of a change in air flow or air pressure.

5 **[0026]** Different types of atomizers may be used. Thus for example, the atomizer may have a heating coil in a cavity in the interior of a porous body soaked in liquid. In this design aerosol is generated by evaporating the liquid within the porous body either by activation of the coil heating the porous body or alternatively by the heated air passing over or through the porous body. Alternatively the atomizer may
10 use a piezoelectric atomizer to create an aerosol either in combination or in the absence of a heater.

[0027] A liquid supply 34 used in electronic smoking devices is disclosed. The liquid supply 34 has a first container member 34a and a second container member 34b complementary to the first container member to form a substantially cylindrical body.

15 **[0028]** Turning now to Figure 1a, an alternative first container member 34a and the second container member 34b both have an outlet 341a, 341b at an end thereof. The outlets are sealed by a respective sealing members 342a, 342b, such as metal foil or paper or plastic film that can be attached by adhering, bonding, or welding. These sealing members 342a, 342b can be removed, for example by tearing off before
20 installing the e- liquid supply 34 into the container holder of the electronic cigarette or can be pierced by at least one bayonet or spike provided within the housing of the electronic cigarette when the liquid supply is installed in the electronic cigarette in place.

[0029] In one embodiment, the first container member 34a and the second container member 34b each has a cut-off portion 343a, 343b, along the longitudinal axial of the members. The cut-off portion can be for example semi-cylinder shape as shown in Figure 1b. The two cut-off portions when brought together, form an aerosol channel, that is, the central channel 32, for the aerosol generated at the heating unit of the electronic cigarette to pass through.

[0030] Generally the container members are hollow and empty, so that they may be filled with bulk e-liquid. However, the first container member 34a and the second container member 34b may optionally contain wadding 35 to hold the e-liquid. The wadding can be of any shape. For example, the wadding 35 can be a semi-annular column as shown in Figure 1a so that an aerosol channel can be formed by the wadding 35 and the cut off portions 343a and 343b illustrated Figure 1b are no longer necessary. The e-liquid contained therein can be for example nicotine solutions with different concentrations or with different flavors.

[0031] The first and the second container members 34a, 34b can be made from translucent materials, such as translucent plastic such that the remaining content of the container member can be observed by the user. To help the user quantify the remaining amount of e-liquid in the container members, volume marks can be applied to the surface of the container members.

[0032] The wick 30 of the heater element can act as the bayonet when made from materials with sufficient stiffness. For example, the wick 30 can be made by braiding carbon fibers, glass fiber or a combination thereof. The wick 30 can also be

provided with a center rod made from rigid material such as metal, plastics, and being wound by carbon fibers or glass fibers.

[0033] The first and second container members 34a, 34b are configured to fit together by a protrusion 344a formed on one member and an indentation 345b formed
5 on the other member. The protrusion 344a and the indentation 345b can be shaped complementary to one another. As can be appreciated, the protrusion 344a and the indentation 345b are not necessarily complementary to one another, rather, a tight fit, or interference fit formed between the protrusion and the indentation would be sufficient. The protrusion 344a and the indentation 345b can be formed longitudinally along each
10 member or traverse to the longitudinal axial of the two members. In this arrangement, the aerosol channel formed by cut off portions 343a and 343b can be arranged offset from the protrusion 344a and indentation 345b pair in case of a central aerosol channel design, otherwise the liquid supply 34 can take a peripheral aerosol channel design.

[0034] In another embodiment, more than one protrusion 344a and indentation 345b are formed on both container members 34a, 34b. The protrusions and the indentations can be arranged in any pattern, for example, the first container member 34a can be formed with a protrusion 344a and an indentation 345a, while the second container member 34b can be formed with a protrusion 344b and an indentation 345b
20 that mate with those on the first container member. The protrusions and the indentions are preferably formed symmetrically along the longitudinal axial of the members. In the arrangement shown in Figure 1b, the aerosol channel are provided along the

longitudinal axial of the container formed by the two members so that the protrusions and the indentations have the same distance from the central axial.

[0035] Alternatively or additionally, the indentation can be in fluid communication with the internal space of the container member it is on. In such case, the indentation 345a, 345b can be sealed by a sealing member 36a (36b) as shown in Figure 2a such as a plastic film or a metal foil to avoid volatilization of e-liquid within the member. The complementary protrusion on the other container member then has a projection or bayonet 3441a (3441b) that is in fluid communication with the container member it is on and is made from wicking materials with sufficient stiffness, such as carbon fiber, glass fiber braids, cotton fibers or a combination thereof. The wicking material may be supported on or attached to a metal or plastic projection, with the projection piercing the sealing member and the wicking material then moving the liquid by capillary action. In this case the wicking material can be soft and/or flexible and without substantial stiffness. The protrusion is sized and shaped so that when the two container members are brought together, the protrusions 344a,344b and the indentations 345a, 345b are mated and engaged to one another, the bayonet in the protrusion penetrates the sealing member on the indentation and reached the internal space of the container member that has the indentation. A fluid connection is established between the two container members through the bayonet.

[0036] In the embodiment shown in Figure 2b, the wick 30 extending from the atomizer 24 is bifurcated into two branches 301, 302 with one branch extendable into the first container member and the other branch extendable into the second container member. The wick draws liquid from both container members through the two branches

301 and 302. A blend of liquids of different flavors from the two container members 34a and 34b can be conveyed to the atomizer for vaporization.

[0037] In the embodiment shown in Figure 4, a liquid guiding structure 50 is provided within the housing for conducting liquid to the atomizer. The liquid guiding structure has at least two projections or bayonets 51 and 52 to pierce the seal members of the container members when the liquid supply is directed into the housing. The bayonets 51 and 52 further puncture the sealing member when the liquid supply is fixed in housing by the locking mechanism.

[0038] Referring back to Figures 1a and 1b, each of the container member 34a or 34b can have a first groove 346a or 346b provided longitudinally along the outer surface of the container member. The first grooves 346a and 346b can be used for guiding the container members into the electronic cigarette. For example the first groove 346a or 346b can operatively mate with guiding members, such as rails or protrusions 121 and 122 provided on the inner surface of the main body 12 of the electronic cigarette so that the container members 34a and 34b can be installed in the housing of the electronic cigarette by inserting them into the housing and sliding along the guiding member.

[0039] Each of the container members can have locking mechanism to fix the container members to the housing. In the embodiment shown in Figure 3c, the locking mechanism can include a second groove 347a or 347b that joins with the first groove 346a or 346b. The container members can be held within the housing by rotating the container members from engaging the first groove to engaging the second groove. For container members that are made from inflexible materials, a transvers slot 348a or 348b connecting the first groove and the second groove, as shown in Figure 3d can

be provided by for example removing a portion of the container member between the first groove 346a or 346b and the second groove 347a or 347b so that the guiding members can move from the first groove to the second groove via the transvers slot 348a or 348b.

5 **[0040]** Alternatively, as shown in Figure 3e, the locking mechanism can be a arcuate slot 349a or 349b extending from the first groove. The arcuate slot can have a locking profile 350a or 350b at an end of the arcuate slot. To fix the container members in the housing of the electronic cigarette, the container members are guided into the housing along the first groove and when reaches the arcuate slot the
10 container members are turned so that the guiding members, for example the protrusions move along the arcuate slot and reaches the locking profile.

[0041] In some embodiments, the container are made from flexible materials. These container members can be held within the housing by guiding the container members into the housing and turning them to a predetermined angle so that the
15 container members are deformed and are held by the elastic restoration force of the container members.

[0042] The number of container members can be more than two. For example, an e-liquid supply may have three container members connected to each other by above mentioned indentations and protrusions. In this case, each container member is
20 a section of a cylinder of about 120 degrees.

[0043] Each container member can be manufactured from translucent materials such as Acrylic or other plastic and at least partially coated with a color or wrapped with a colored package to indicate the flavor of e-liquid contained with the container member.

[0044] From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

CLAIMS

1. A liquid supply comprising
at least two container members attachable to one another through a connection mechanism to form a main body of the liquid supply;
each of the container members having a first end sealed by a sealing member and a second end; and
an aerosol channel formed between the containers.
2. The liquid supply of Claim 1 wherein each container member has a semicircular cross section.
3. The liquid supply of Claim 1 with the connection mechanism comprising at least one indentation provided on one container member and at least one protrusion provided on the other container member.
4. The liquid supply of Claim 1 wherein the container members each have a cut-off portion extending from the first end to the second end, the cut-off portions of the container members forming the aerosol channel when the container members are attached to one another by the connection mechanism.
5. The liquid supply of Claim 1 wherein the aerosol channel is provided on the perimeter of at least one of the container member.
6. The liquid supply of Claim 1 wherein the at least one of the container members has a guiding portion for directing the container member into a housing an electronic smoking device.
7. The liquid supply of Claim 6 wherein the guiding portion is at least one guiding groove provided on the surface of the container member.

8. The liquid supply of Claim 1 wherein the at least one of the container members has a locking portion for fixing the container member to a housing of an electronic cigarette.

9. The liquid supply of Claim 8 wherein the locking portion is a locking profile.

10. The liquid supply of Claim 1 wherein the container members are mirror images of each other.

11. The liquid supply of Claim 1 including wadding in a semi-annular column in each container member.

12. An electronic smoking device, comprising
a liquid supply to store and provide e-liquid;
an atomizer to vaporize the e-liquid provided by the liquid supply;
an housing to accommodate the liquid supply and the atomizer;
wherein the liquid supply comprises at least two container members attachable to one another through a connection mechanism to form a main body of the liquid supply;

each of the container members has a first end sealed by a sealing member and a second end which is closed; and

an aerosol channel communicating at least one of the opening ends with at least one of the closed ends.

13. The electronic smoking device of claim 12 further comprising a guiding mechanism to directing the liquid supply into a housing an electronic smoking device, the guiding mechanism comprising a first guiding portion provided at least one of the container members; and a second guiding portion provided

on the housing has a corresponding guiding portion.

14. The electronic smoking device of claim 12 further comprising a locking mechanism to fix the liquid supply to the housing by turning the liquid supply at a certain angle relative to the housing.

15. The electronic smoking device of claim 12 further comprising a liquid guiding structure to guiding liquid within the liquid supply to the atomizer, wherein the liquid guiding structure comprising at least two projections to pierce the seal members of the container members.

16. The electronic smoking device of claim 15 wherein the projections pierce the sealing member when the liquid supply is fixed in housing by the locking mechanism.

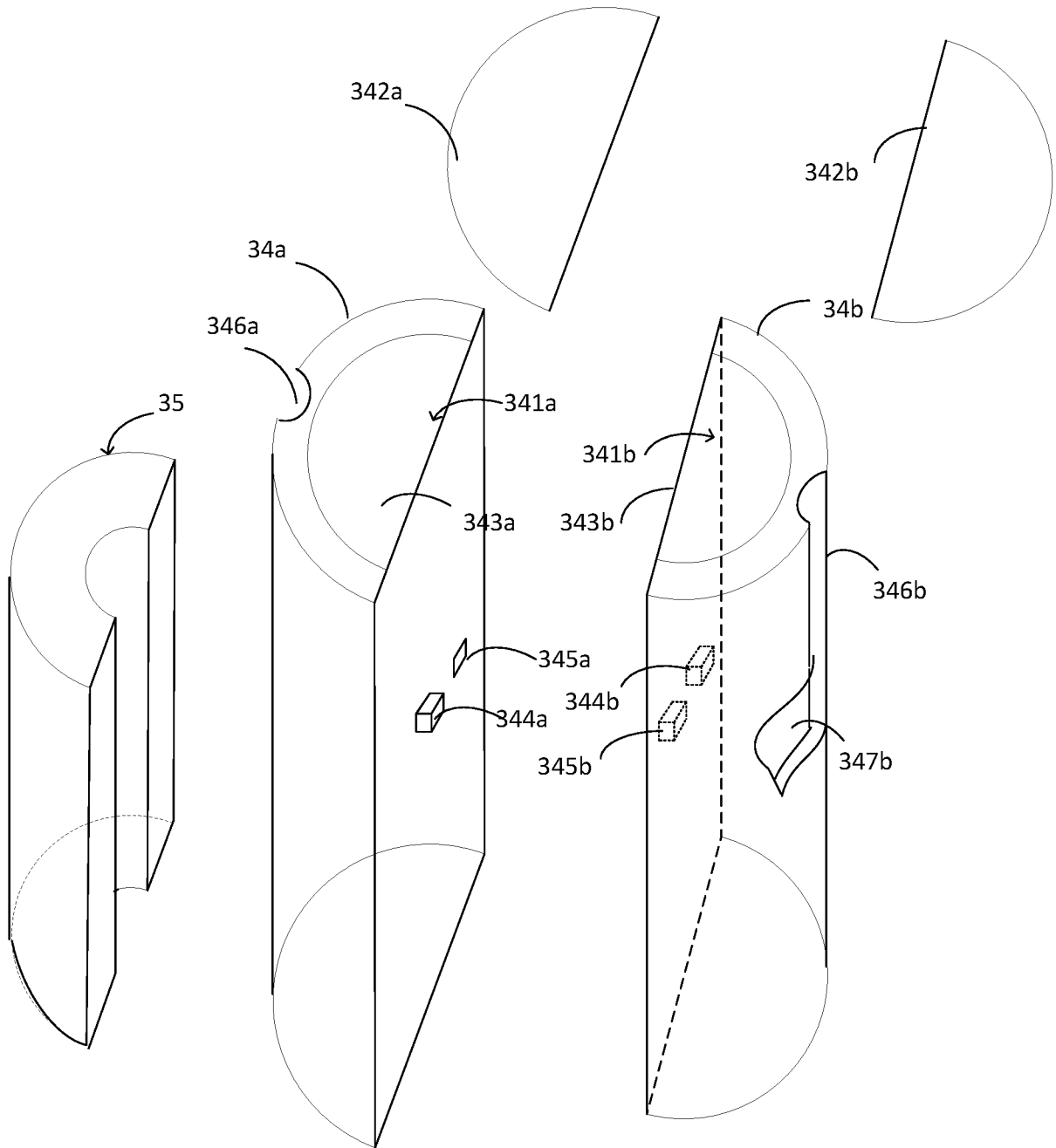


Fig. 1a

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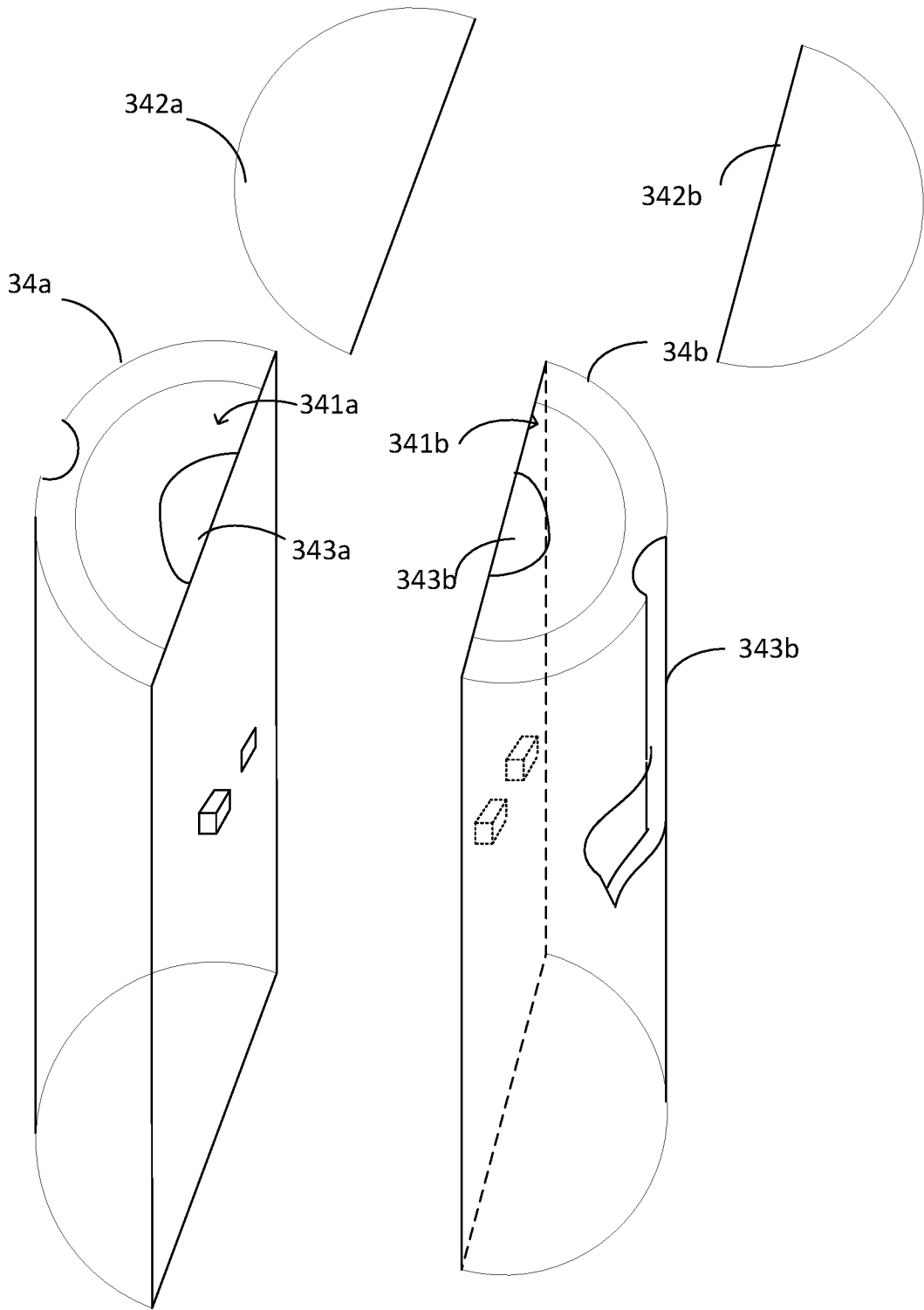


Fig. 1b

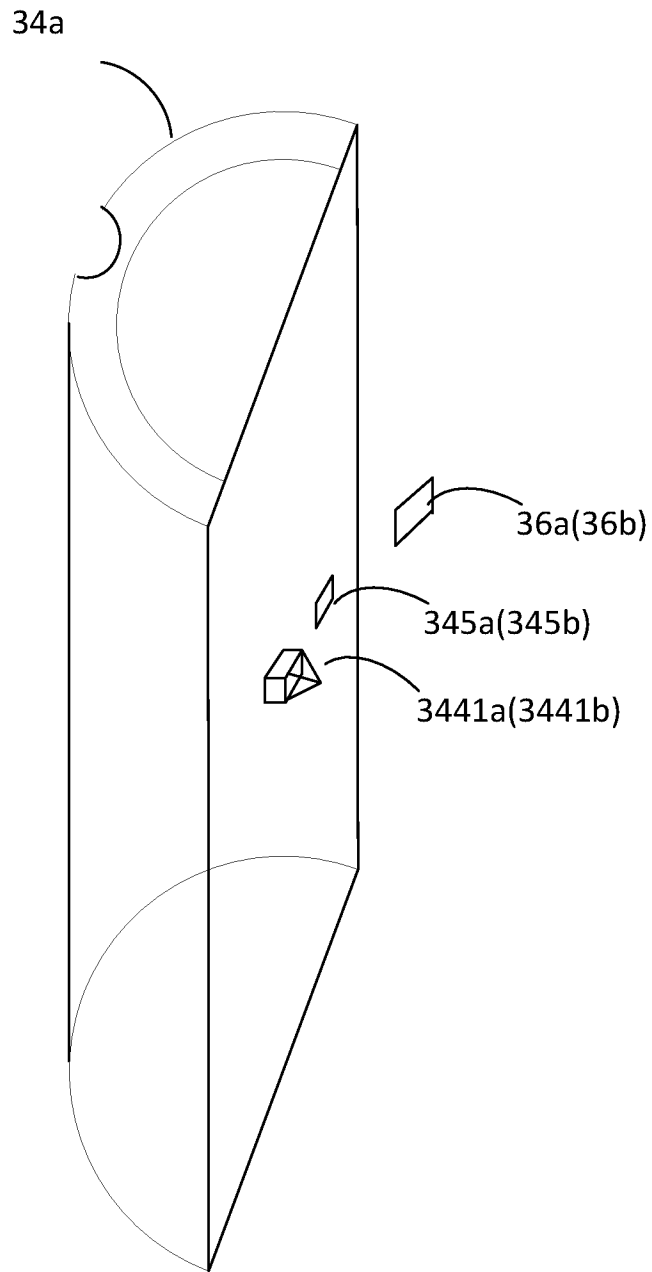


Fig.2a

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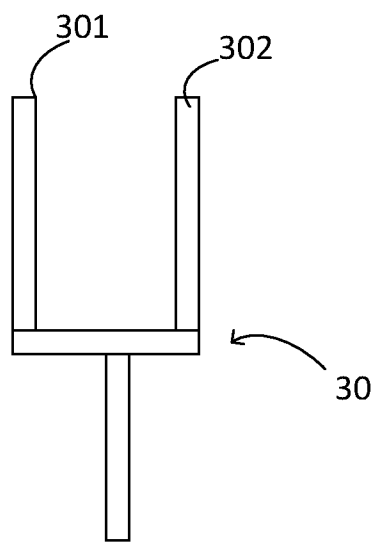
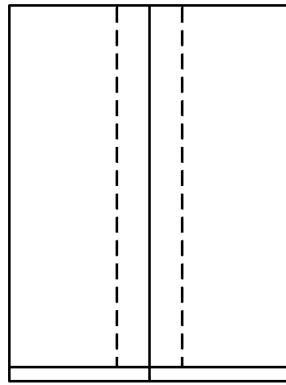


Fig.2b

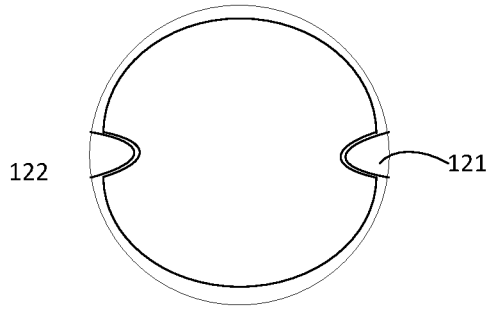


Fig. 3a

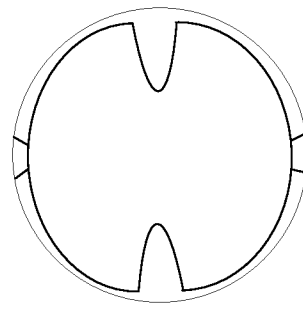


Fig. 3b

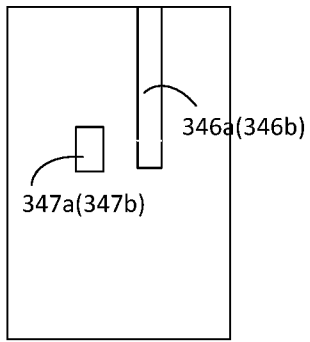


Fig. 3c

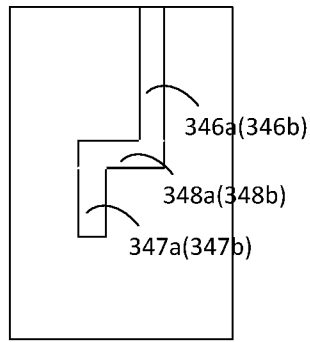


Fig. 3d

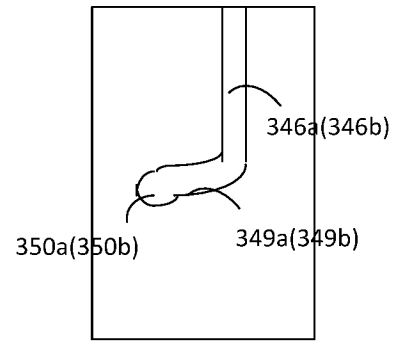


Fig. 3e

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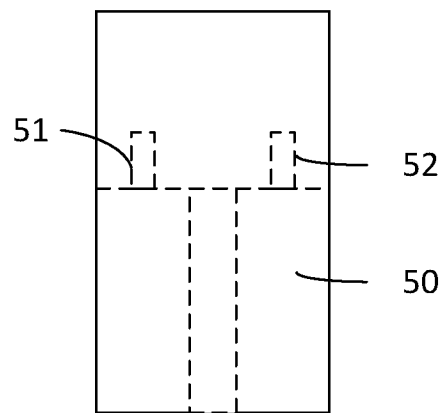
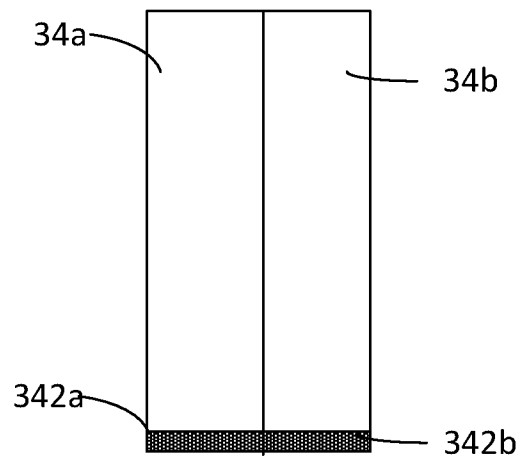


Fig. 4

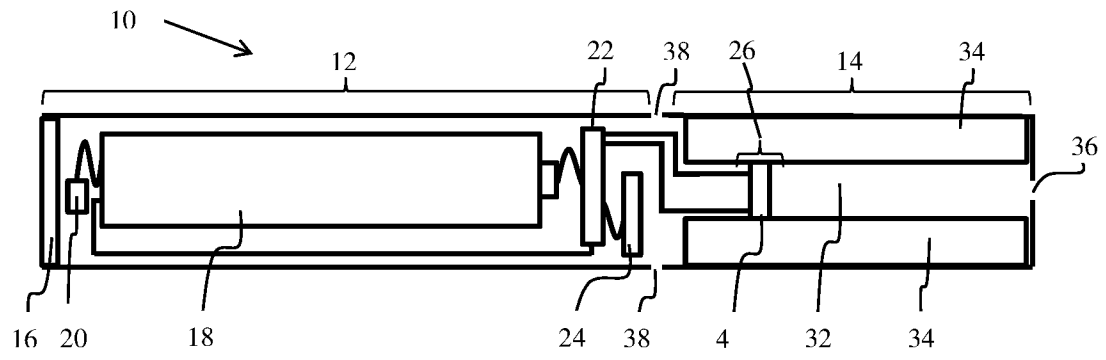


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/085058

A. CLASSIFICATION OF SUBJECT MATTER		
A24F 47/00(2006.01)i		
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 47,A61M 15		
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)		
CNABS,VEN,EPODOC,WPI liquid supply,detachable,seal,semicircula,pierce		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2014261490 A1 (ALTRIA CLIENT SERVICES INC) 18 September 2014 (2014-09-18) the whole document	1-16
A	CN 202233007 U (SHENZHEN JIESHIBO TECHNOLOGY CO LTD) 30 May 2012 (2012-05-30) the whole document	1-16
A	CN 204070555 U (SHENZHEN HEYUAN SCI & TECHNOLOGY CO LTD) 07 January 2015 (2015-01-07) the whole document	1-16
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
21 April 2016		27 April 2016
Name and mailing address of the ISA/CN		Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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