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(54) ATOMIZER AND ELECTRONIC CIGARETTE COMPRISING THE SAME

(57) An atomizer includes an e-liquid tank and a seal member. The e-liquid tank includes an e-liquid chamber and the seal member seals the e-liquid chamber. The seal member includes at least one e-liquid inlet unit including an elastic material that is penetrable by a sharp object and is restorable to its original shape after the sharp object is removed.

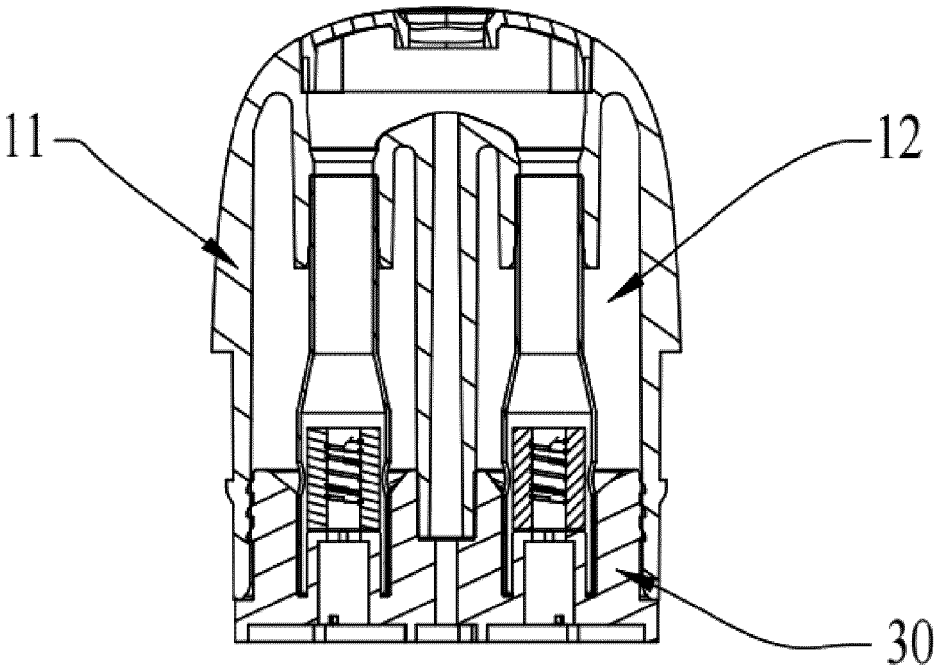

FIG. 1

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Description

[0001] The disclosure relates to an atomizer and an electronic cigarette comprising the same.

[0002] An electronic cigarette is a device that heats an e-liquid to produce an aerosol; the electronic cigarette includes a cartomizer (cartridge atomizer), which is connected to a battery that powers a heating element to heat up the e-liquid. The e-liquid is atomized to create the aerosol, which is then released from an e-liquid tank and inhaled by a user.

[0003] A conventional electronic cigarette is pre-filled with an e-liquid from original manufacturers, and then is packaged and transported for sale elsewhere. Generally, the conventional electronic cigarette includes only one seal ring for sealing an e-liquid tank. No seals are arranged in the gaps between an atomizing core and an air pipe, resulting in e-liquid leakage due to bumpy roads and external shocks during transportation. Dust and humid air may get into the atomizing core and the air pipe when the electronic cigarette is not in use. As a result, the e-liquid deteriorates and ash or rust grows on the atomizing core, all of which are hazardous to human body while smoking.

[0004] In addition, a conventional e-liquid filling method is time-consuming because it involves disassembly and reassembly of the atomizer.

[0005] To solve the aforesaid problems, the first objective of the disclosure is to provide an atomizer.

[0006] The atomizer comprises an e-liquid tank and a seal member; the e-liquid tank comprises an e-liquid chamber and the seal member seals the e-liquid chamber; the seal member comprises at least one e-liquid inlet unit comprising an elastic material that is penetrable by a sharp object and is restorable to its original shape after the sharp object is removed.

[0007] In a class of this embodiment, the at least one e-liquid inlet unit is a film.

[0008] In a class of this embodiment, the elastic material comprises rubber, silica gel, latex or plastic.

[0009] In a class of this embodiment, the e-liquid inlet unit is opposite to the e-liquid chamber.

[0010] In a class of this embodiment, the e-liquid inlet unit of the seal member comprises a bottom wall comprising a groove for receiving the sharp object.

[0011] In a class of this embodiment, the e-liquid inlet unit has a thickness ranging from 1 mm to 3 mm.

[0012] In a class of this embodiment, the e-liquid inlet unit has a thickness ranging from 1.5 mm to 2.5 mm.

[0013] In a class of this embodiment, the atomizer further comprises a heating core and a smoke pipe; the e-liquid tank comprises an opening functioning as a mouthpiece through which the vapor is inhaled; the smoke pipe is disposed in the e-liquid tank and comprises a first open end communicating with the mouthpiece.

[0014] In a class of this embodiment, the heating core is disposed in the smoke pipe and the smoke pipe comprises at least one e-liquid inlet; or the smoke pipe comprises a second open end away from the mouthpiece, and the heating core is disposed outside the second open end.

[0015] In a class of this embodiment, the seal member further comprises a top portion that is concaved to form a female connector; a residual area of the top portion slopes down to the female connector to form a sloped top surface; the female connector is opposite to the e-liquid chamber and is connected to the smoke pipe, so that the e-liquid inlet faces the sloped top surface.

[0016] In a class of this embodiment, the seal member further comprises a base and a boss; the boss protrudes from the base and comprises one end away from the base; the female connector and the sloped top surface are disposed on the one end of the boss; the base is inserted into the e-liquid chamber, so that an outer wall of the base abuts against the inner wall of the e-liquid tank.

[0017] In a class of this embodiment, the atomizer further comprises at least one partition; the at least one partition is disposed in and divides the e-liquid tank into a plurality of separate e-liquid chambers; each smoke pipe is disposed in a corresponding e-liquid chamber; the base comprises a plurality of bosses each corresponding to a separate e-liquid chamber; and each boss is inserted into the corresponding e-liquid chamber.

[0018] In a class of this embodiment, the seal member further comprises a first air inlet; each partition or smoke pipe comprises an air passage communicating with the first air inlet and the mouthpiece.

[0019] In a class of this embodiment, the air passage communicates with the first air inlet; or the seal member further comprises a second air inlet communicating with the air passage.

[0020] The second objective of the disclosure is to provide an electronic cigarette comprising the atomizer.

[0021] The following advantages are associated with the atomizer and the electronic cigarette of the disclosure: the atomizer comprises an e-liquid inlet unit made of an elastic material that allows the electronic cigarette to be filled with e-liquid after transport. The e-liquid is separated from the atomizing core and the air outlet, preventing e-liquid leakage during transportation and allowing users to fill the electronic cigarette with their preferred flavor of e-liquid. The e-liquid injection component reduces e-liquid waste while increasing sales.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. **1** is a cross sectional view of an atomizer according to one example of the disclosure;

FIG. **2** is a top view of a seal member according to one example of the disclosure;

FIG. **3** is a perspective view of a seal member ac-

cording to one example of the disclosure;

FIG. **4** is a sectional view taken from line A-A in FIG. **3;**

FIG. **5** is a projection of an e-liquid chamber and an e-liquid inlet unit onto a bottom surface of a seal member according to one example of the disclosure;

FIG. **6** is a perspective view of a seal member with two smoke pipes according to one example of the disclosure;

FIG. **7** is a cross sectional view of a seal member according to one example of the disclosure;

FIG. **8** shows other structures in FIG. **3;**

FIG. **9** shows other structures in FIG. **1;**

FIG. **10** is a cross sectional view of an atomizer comprising only one e-liquid chamber according to one example of the disclosure; and

FIG. **11** is a cross sectional view of an atomizer comprising two e-liquid chambers according to one example of the disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0023] To further illustrate the disclosure, embodiments detailing an atomizer and an electronic cigarette comprising the same are described below. It should be noted that the following embodiments are intended to describe and not to limit the disclosure.

[0024] Before a conventional electronic cigarette leaves its factory, it is pre-filled with an e-liquid only from original manufacturers, and then is packaged and transported for sale elsewhere. The conventional electronic cigarette generally includes only one seal ring for sealing an e-liquid tank. No seals are arranged in the gaps between an atomizing core and an air pipe, resulting in e-liquid leakage due to road bumps and external shocks during transportation. Dust and humid air may get into the atomizing core and the air pipe while user is not using the conventional electronic cigarette. As a result, the e-liquid deteriorates and ash rusts the atomizing core, all of which are hazardous to human body during smoking.

[0025] As shown in FIGS. **1** and **2,** an atomizer comprises an e-liquid tank **11** and a seal member **30;** the e-liquid tank **11** comprises an e-liquid chamber **12;** the seal member **30** is used to seal the e-liquid chamber **12;** the seal member **30** comprises at least one e-liquid inlet unit comprising an elastic material that is penetrable and capable of restoring its original shape after deformation.

[0026] The elastic material comprises rubber, silica gel, latex or plastic. The term "elastic material" as used herein refers to a material capable of restoring its original shape after deformation when the external forces are removed. The at least one e-liquid inlet unit **31** comprises rubber, silica gel, latex, plastic, or sponge. Preferably, the seal member 30 comprises rubber, silica gel or latex.

[0027] In certain examples, the at least one e-liquid inlet unit **31** is formed integrally with the seal member **30** and hence both comprise the same material, such as rubber, silica gel, latex, plastic, or sponge.

[0028] In certain examples, the at least one e-liquid inlet unit **31** is a film; preferably, the film is transparent so that users can observe whether the e-liquid is injected into the atomizer.

[0029] In certain examples, the seal member **30** has a thickness h1 ranging from 5 mm to 20 mm, such as 5 mm, 7 mm, 9 mm, 11 mm, 13 mm, 15 mm, 17 mm, 19 mm, and 20 mm. In an alternative preferred embodiment of the disclosure, the seal member **30** has a thickness ranging from 7.0 mm to 15 mm, such as 7 mm, 9 mm, 11 mm, 13 mm, and 15 mm.

[0030] FIG. **3** is a perspective view of the seal member **30,** and FIG. **4** is a sectional view taken from line A-A in FIG. **3.** In certain examples, the e-liquid is injected through the at least one e-liquid inlet unit **31** without leaking out of the seal member; when the at least one e-liquid inlet unit **31** is too thick, it is unable to be pierced by a needle; when the at least one e-liquid inlet unit **31** is too thin, it is unable to go back to its original shape, causing e-liquid leakage. The e-liquid inlet unit **31** has a thickness h2 ranging from 1 mm to 3 mm, such as 1.0 mm, 1.5 mm, 2.0 mm, 2.5 mm, and 3.0 mm.

[0031] In an alternative preferred embodiment of the disclosure, the e-liquid inlet unit **31** has a thickness h2 ranging from 1.5 mm to 2.5 mm, such as 1.5 mm, 1.7 mm, 1.9 mm, 2.1 mm, 2.3 mm, and 2.5 mm.

[0032] As shown in FIG. **7,** in certain examples, the seal member **30** comprises a groove **32** for locating an injection site; the groove **32** comprises a bottom surface functioning as the e-liquid inlet unit **31;** the groove **32** is in the shape of a blind hole and has a depth ranging from 6.0 mm - 7.0 mm, such as 3.0 mm, 6.5 mm, and 7.0 mm. The groove **32** facilitates aligning a needle with the e-liquid inlet unit, preventing e-liquid leakage.

[0033] As shown in FIG. **5,** in certain examples, the atomizer further comprises at least one smoke pipe **322,** and e-liquid inlet unit is opposite to the e-liquid chamber. A first projection H1 of the e-liquid inlet unit **31** in the direction of a longitudinal axis Y falls in a second projection H2 of the e-liquid chamber **12** in the direction of the longitudinal axis Y. The e-liquid chamber **12** is formed by the inner wall of the e-liquid chamber **11,** the outer wall of at least one smoke pipe **322,** and the top portion of the seal member **3,** and is projected onto the bottom surface of the seal member to form a third projection H3. When the e-liquid is injected directly into the at least one smoke pipe, it may leak out of the e-liquid chamber.

[0034] In an alternative preferred embodiment of the disclosure, as shown in FIGS. **2** and **6,** the seal member further comprises a top portion that is concaved to form

at least one female connector **3220;** a residual area of the top portion slopes down to the at least one female connector to form at least one sloped top surface; the at least one female connector is opposite to the e-liquid chamber and is connected to the smoke pipe **322,** so that the at least one e-liquid inlet faces the sloped top surface.

[0035] The sloped top surface comprises a bottom edge opposite to the at least one e-liquid inlet **321,** so that the e-liquid collects at the bottom edge and flows through the at least one e-liquid inlet **321,** thereby improving the utilization of the e-liquid.

[0036] In an alternative preferred embodiment of the disclosure, the atomizer further comprises a heating core **320** disposed in the at least one smoke pipe **322** and used to heat the e-liquid; and the at least one smoke pipe **322** comprises at least one e-liquid inlet **321.**

[0037] In an alternative preferred embodiment of the disclosure, the atomizer further comprises a heating core **320** disposed on one end of the at least one smoke pipe **322** that is away from a mouthpiece.

[0038] In an alternative preferred embodiment of the disclosure, the heating core **320** further comprises a heating element **326** and an e-liquid guide member **325.** The heating element **326** is used to heat the e-liquid. The e-liquid in the e-liquid chamber **12** flows through the at least one e-liquid inlet **321** and the e-liquid guide chamber **325** successively, and is heated by the heating element **326.** The heating element **326** is heated by electricity or electromagnetic induction. The heating element **326** is wrapped in or around the e-liquid guide member **325.** The heating element **326** is in the shape of a wire, a mesh, a sheet, a needle, a rod, or a cup. The heating element **326** comprises metal or a carbonaceous material. The e-liquid guide chamber **325** comprises cotton, an e-liquid absorption material, a porous ceramic, or mica.

[0039] In an alternative preferred embodiment of the disclosure, the heating element **326** is disposed in or on the e-liquid guide chamber **325.**

[0040] In certain examples, the cross section of the e-liquid inlet unit **31** is a geometric shape such as circle, square and trapezoid, preferably, circle. The circular cross section is easy to create, has a larger area than other shapes with the same perimeter, and provides better utilization of space than others.

[0041] In an alternative preferred embodiment of the disclosure, the e-liquid inlet unit **31** has a circular cross section and a diameter φ ranging from 1.0 mm to 2.0 mm, such as 1.0 mm, 1.2 mm, 1.4 mm, 1.6 mm, 1.8 mm, and 2.0 mm.

[0042] Understandably, the term "thickness h2" as used herein refers to an average thickness of the e-liquid inlet unit **31.**

[0043] As shown in FIG. **8,** in an alternative preferred embodiment of the disclosure, the seal member **30** comprises a base and a boss **33** disposed on the base; the boss **33** abuts against the inner wall of the e-liquid tank **11;** at least one seal ring **331** is disposed between the boss **33** and the e-liquid tank **11** to improve the sealing effect of the seal member **30.**

[0044] In an alternative preferred embodiment of the disclosure, the boss **33** is detachably connected to the e-liquid tank **11,** which allows for an easy disassembly of the atomizer.

[0045] In an alternative preferred embodiment of the disclosure, as shown in FIG. **8,** the boss **33** protrudes from the base **332** and comprises one end away from the base; the at least one female connector and the at least one sloped top surface are disposed on the one end of the boss; the base is inserted into the e-liquid chamber, so that an outer wall of the base abuts against the inner wall of the e-liquid tank. The seal member **30** is an elastic member for sealing the e-liquid chamber.

[0046] In an alternative preferred embodiment of the disclosure, a seal ring **331** is disposed between the boss **33** and the e-liquid tank **11** to improve the sealing effect of the seal member **30.**

[0047] In an alternative preferred embodiment of the disclosure, the boss **33** comprises a side wall comprising an elastic fastener for easy assembly and disassembly of the atomizer.

[0048] In an alternative preferred embodiment of the disclosure, as shown in FIG. **11,** the seal member **30** further comprises a first air inlet **324;** the atomizer comprises at least one partition **327;** the at least one partition is disposed in the e-liquid tank to create the plurality of separate e-liquid chambers; each smoke pipe is disposed in a corresponding e-liquid chamber; each partition or smoke pipe comprises an air passage for communicating with the first air inlet and the mouthpiece. A microphone head is triggered in the mouthpiece whether the smoking pipe is blocked.

[0049] In an alternative preferred embodiment of the disclosure, the first air inlet **324** communicates with the air passage; optionally, the seal member further comprises a second air inlet **328** communicating with the air passage.

[0050] The second air inlet **328** allows more air to flow smoothly into the atomizer, facilitating the flow of the e-liquid.

[0051] To further illustrate the disclosure, embodiments detailing the atomizer and the electronic cigarette are described below.

[0052] As shown in FIG. **9,** an atomizer comprises an e-liquid tank **11** and a seal member **30;** the e-liquid tank **11** comprises an e-liquid chamber **12;** the seal member **30** is used to seal the e-liquid chamber **12;** the e-liquid tank **11** comprises an opening functioning as a mouthpiece **323;** the atomizer further comprises at least one smoke pipe **322** disposed in the e-liquid tank; the at least one smoke pipe comprises a first open end communicating with the mouthpiece **323;** the at least one smoke pipe **322** comprises at least one e-liquid inlet **321;** the seal member **30** is disposed between the at least one smoke pipe **322** and the e-liquid tank **11** to seal the e-liquid chamber **12;** the seal member **30** comprises at least one e-

liquid inlet unit **31.**

[0053] The atomizer further comprises a heating core **320.**

[0054] The heating core **320** is disposed in the at least one smoke pipe **322** and the at least one e-liquid inlet **321** is disposed on the at least one smoke pipe **322;** or the at least one smoke pipe comprises a second open end away from the mouthpiece, and the heating core is disposed outside the second open end. The heating core comprises a hollow ceramic core and a helix heating wire disposed in the hollow ceramic core; the hollow ceramic core functions as an e-liquid guide member **325;** and the helix heating wire functions as a heating element **326.** In use, by using a needle, the e-liquid is injected through the e-liquid inlet unit **31** into the e-liquid chamber **12,** flows through the at least one e-liquid inlet **321** and the e-liquid guide member **325** successively, and is heated by the heating element **326;** the e-liquid evaporates to a vapor state and inhaled through the mouthpiece **323** by the user.

[0055] In an alternative preferred embodiment of the disclosure, the atomizer comprises one or more e-liquid chambers **12,** and are described below.

[0056] In certain examples, the e-liquid tank comprises a plurality of separate e-liquid chambers; the atomizer further comprises at least one partition; the at least one partition is disposed in the e-liquid tank to create the plurality of separate e-liquid chambers; each smoke pipe is disposed in a corresponding e-liquid chamber; the base comprises a plurality of bosses each corresponding to a separate e-liquid chamber; and each boss is inserted into the corresponding e-liquid chamber.

Example 1

[0057] As shown in FIG. **10,** the atomizer comprises an e-liquid tank **11** and a seal member **30;** only one e-liquid chamber **12** is formed in the e-liquid tank **11;** the seal member **30** comprises an e-liquid inlet unit **31** opposite to the e-liquid chamber **12;** the e-liquid chamber **12** is formed by the e-liquid tank **11** and a smoke pipe **322;** the e-liquid inlet unit **31** is disposed on a projection of the e-liquid chamber onto a bottom part of the seal member.

Example 2

[0058] A second example of the atomizer is illustrated and similar to Example **1,** except for the following specific differences: a partition **327** is disposed in the e-liquid tank **11** to create two separate e-liquid chambers **12** that is parallel to the at least one smoke pipe; one or two types of e-liquid are injected into the two separate e-liquid chambers to meet consumer taste.

[0059] Understandably, the number of the e-liquid chamber increases with increases in the partition **327** (not shown in figures), and hence is not described in greater detail herein.

[0060] The atomizer is used in an electronic cigarette.

[0061] An electronic cigarette comprises a cigarette rod and the atomizer of the disclosure.

[0062] The following advantages are associated with the atomizer and the electronic cigarette of the disclosure: the atomizer comprises an e-liquid inlet unit made of an elastic material that allows the electronic cigarette to be filled with e-liquid after transport. The e-liquid is separated from the atomizing core and the air outlet, preventing e-liquid leakage during transportation and allowing users to fill the electronic cigarette with their preferred flavor of e-liquid. The e-liquid injection component reduces e-liquid waste while increasing sale.

Claims

1. An atomizer, comprising: an e-liquid tank and a seal member; wherein the e-liquid tank comprises an e-liquid chamber and the seal member seals the e-liquid chamber; the seal member comprises at least one e-liquid inlet unit comprising an elastic material that is penetrable by a sharp object and is restorable to its original shape after the sharp object is removed.

2. The atomizer of claim 1, wherein the at least one e-liquid inlet unit is a film.

3. The atomizer of claim 1, wherein the elastic material comprises rubber, silica gel, latex, or plastic.

4. The atomizer of claim 3, wherein the e-liquid inlet unit is opposite to the e-liquid chamber.

5. The atomizer of claim 1, wherein the e-liquid inlet unit of the seal member comprises a bottom wall comprising a groove for receiving the sharp object.

6. The atomizer of claim 2, wherein the e-liquid inlet unit has a thickness ranging from 1 mm to 3 mm.

7. The atomizer of claim 6, wherein the e-liquid inlet unit has a thickness ranging from 1.5 mm to 2.5 mm.

8. The atomizer of claim 1, wherein

the atomizer further comprises a heating core and a smoke pipe; the e-liquid tank comprises an opening functioning as a mouthpiece through which the vapor is inhaled; the smoke pipe is disposed in the e-liquid tank and comprises a first open end communicating with the mouthpiece; and

the heating core is disposed in the smoke pipe and the smoke pipe comprises at least one e-liquid inlet; or the smoke pipe comprises a second open end away from the mouthpiece, and the heating core is disposed outside the second

open end.

9. The atomizer of claim 8, wherein the seal member further comprises a top portion that is concaved to form a female connector; a residual area of the top portion slopes down to the female connector to form a sloped top surface; the female connector is opposite to the e-liquid chamber and is connected to the smoke pipe, so that the e-liquid inlet faces the sloped top surface.

10. The atomizer of claim 9, wherein the seal member further comprises a base and a boss; the boss protrudes from the base and comprises one end away from the base; the female connector and the sloped top surface are disposed on the one end of the boss; the base is inserted into the e-liquid chamber, so that an outer wall of the base abuts against the inner wall of the e-liquid tank.

11. The atomizer of claim 10, wherein the atomizer further comprises at least one partition; the at least one partition is disposed in and divides the e-liquid tank into a plurality of separate e-liquid chambers; each smoke pipe is disposed in a corresponding e-liquid chamber; the base comprises a plurality of bosses each corresponding to a separate e-liquid chamber; and each boss is inserted into the corresponding e-liquid chamber.

12. The atomizer of claim 11, wherein the seal member further comprises a first air inlet; each partition or smoke pipe comprises an air passage communicating with the first air inlet and the mouthpiece.

13. The atomizer of claim 12, wherein the air passage communicates with the first air inlet; or the seal member further comprises a second air inlet communicating with the air passage.

14. An electronic cigarette, comprising the atomizer of any one of claims 1-13.

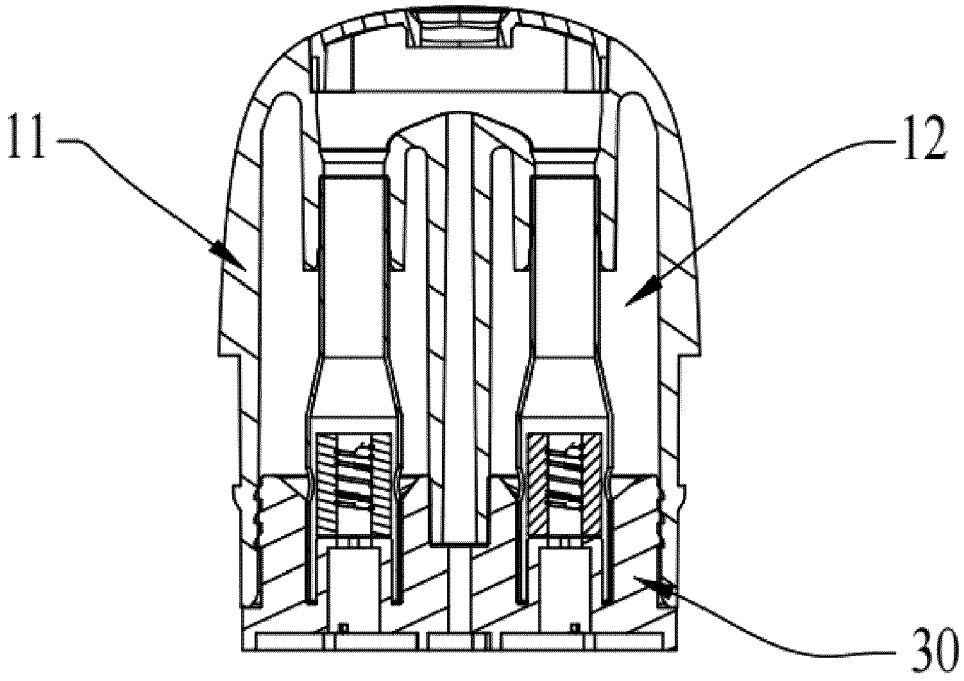

FIG. 1

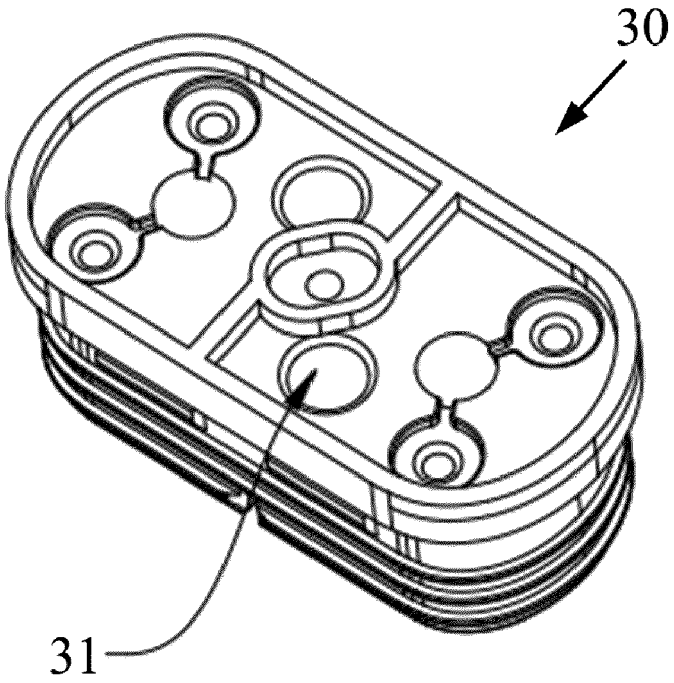

FIG. 2

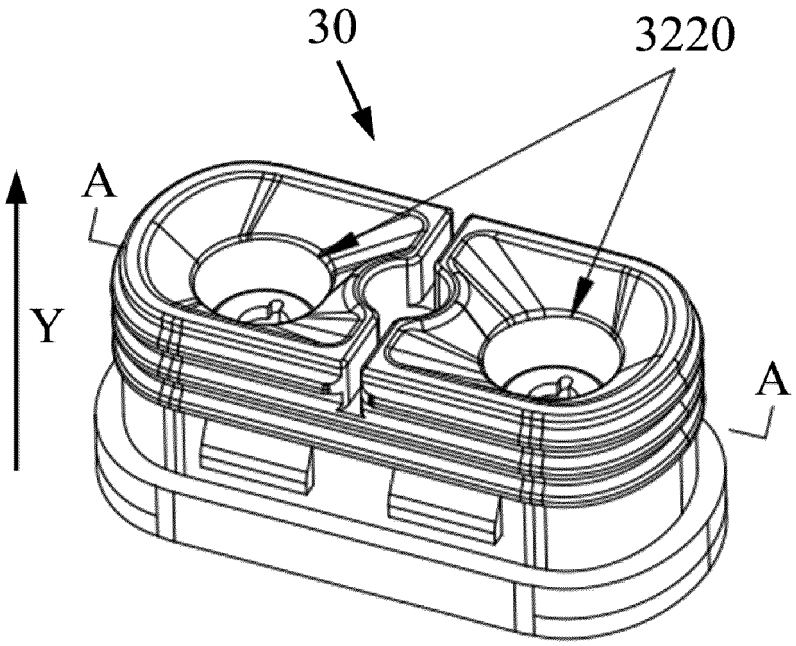

FIG. 3

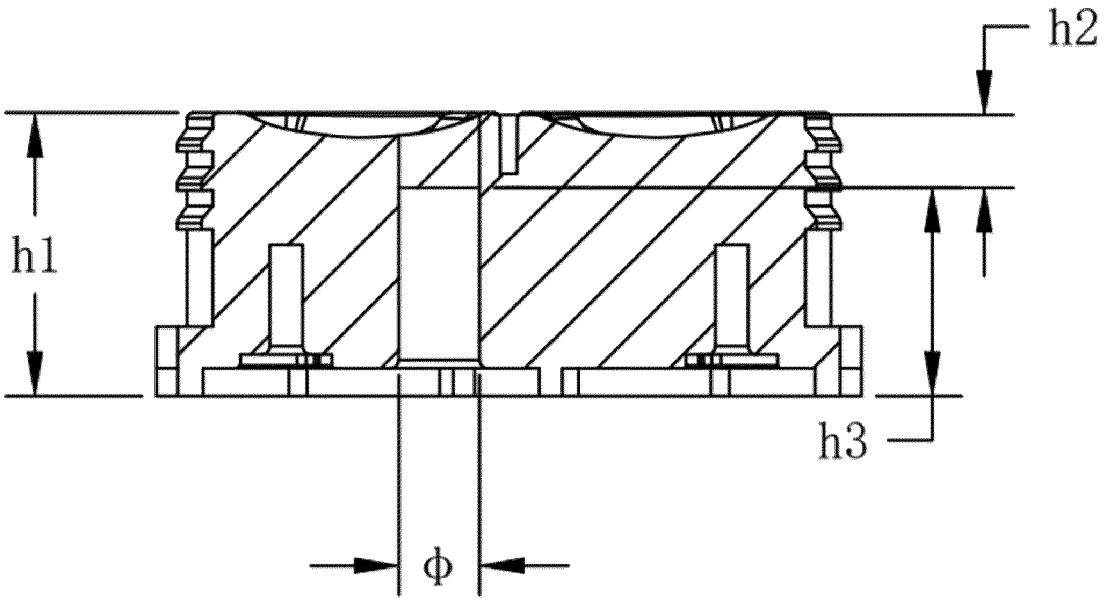

FIG. 4

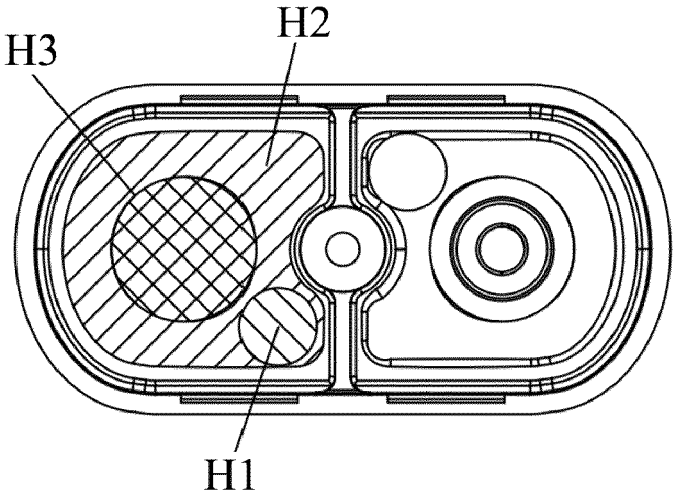

FIG. 5

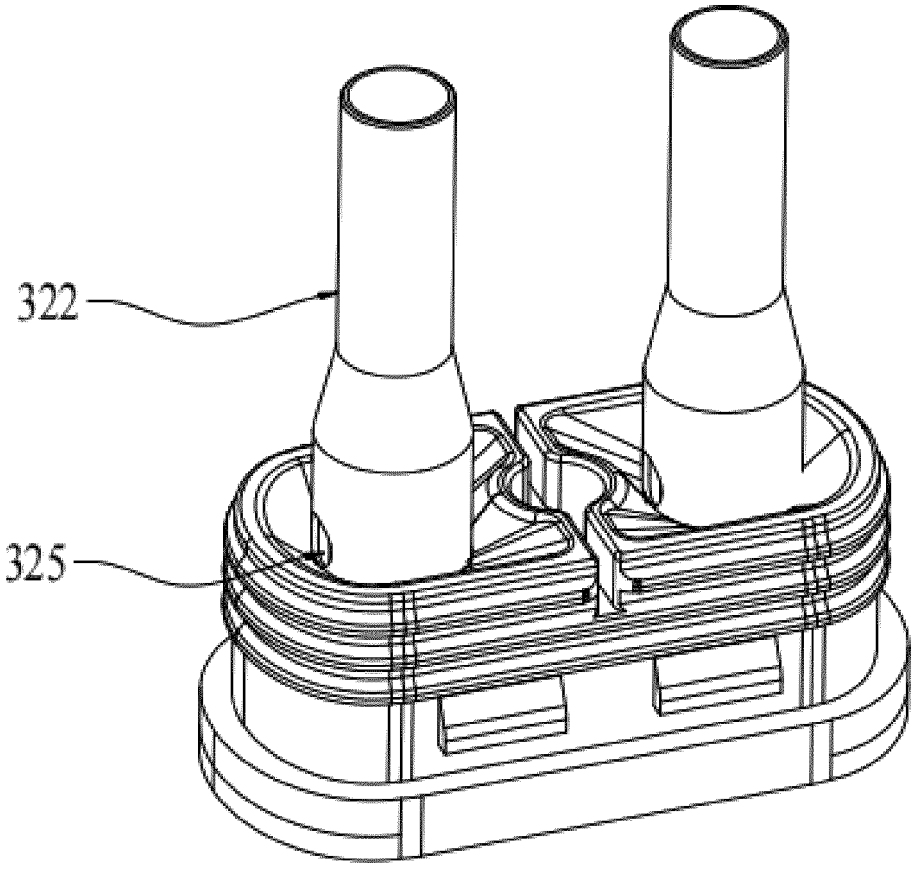

FIG. 6

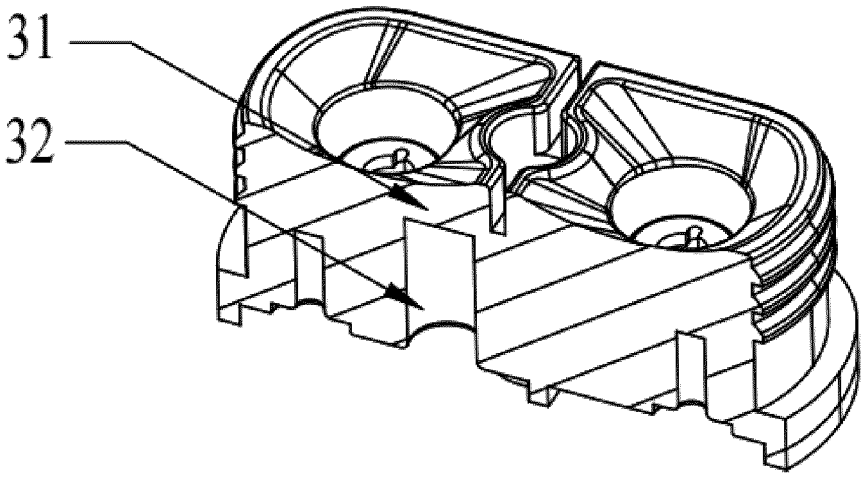

FIG. 7

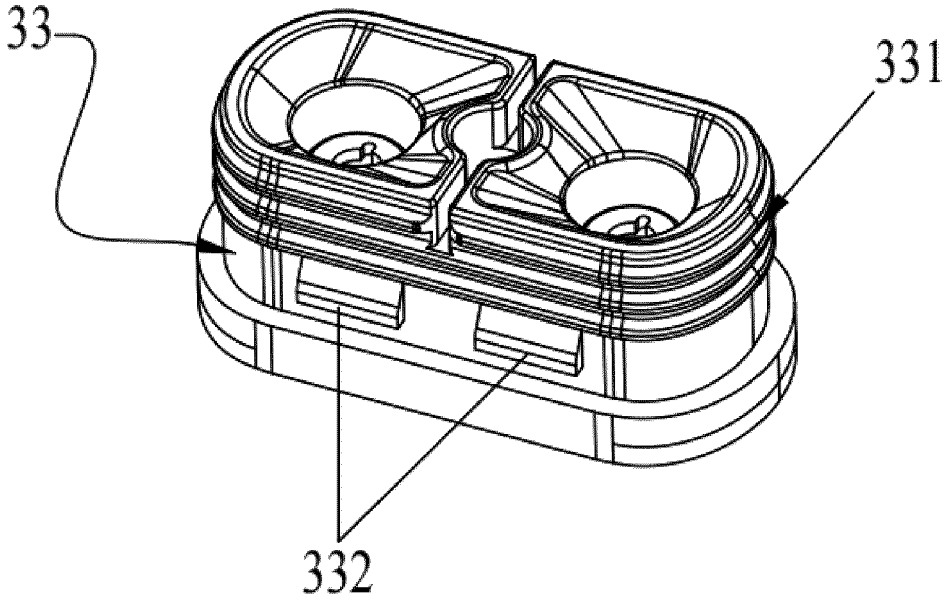

FIG. 8

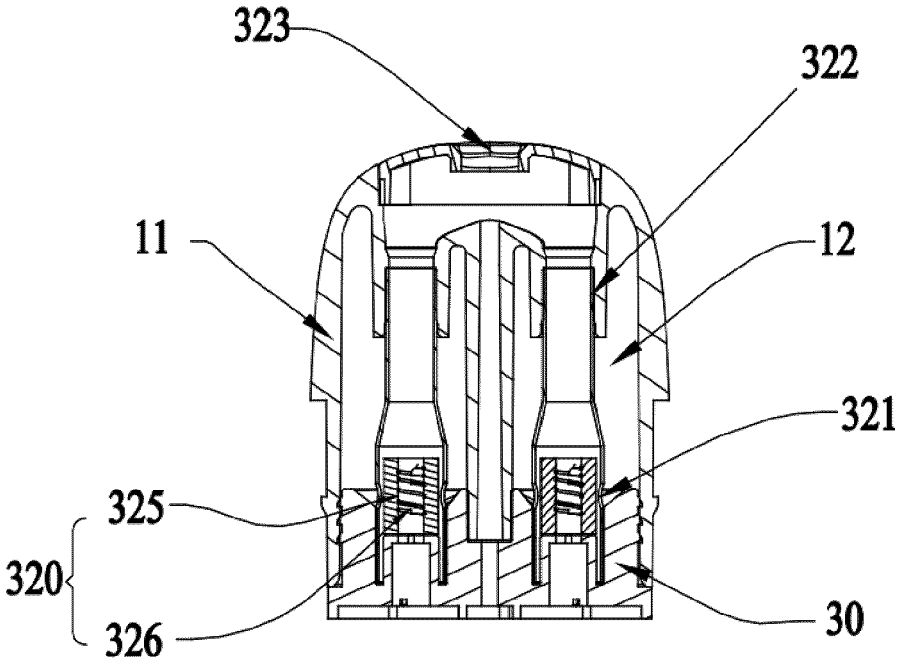

FIG. 9

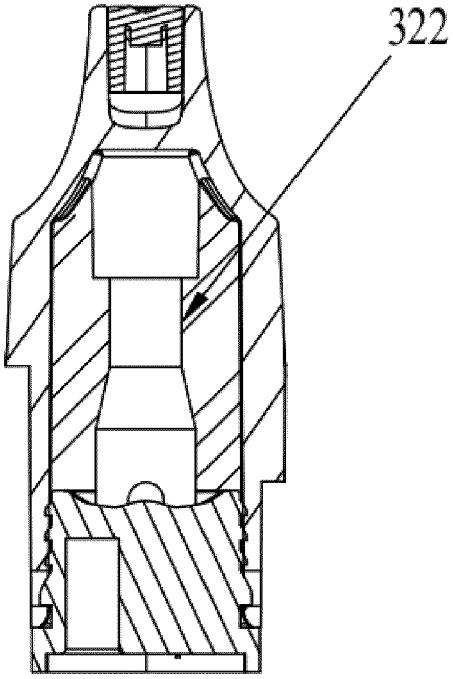

FIG. 10

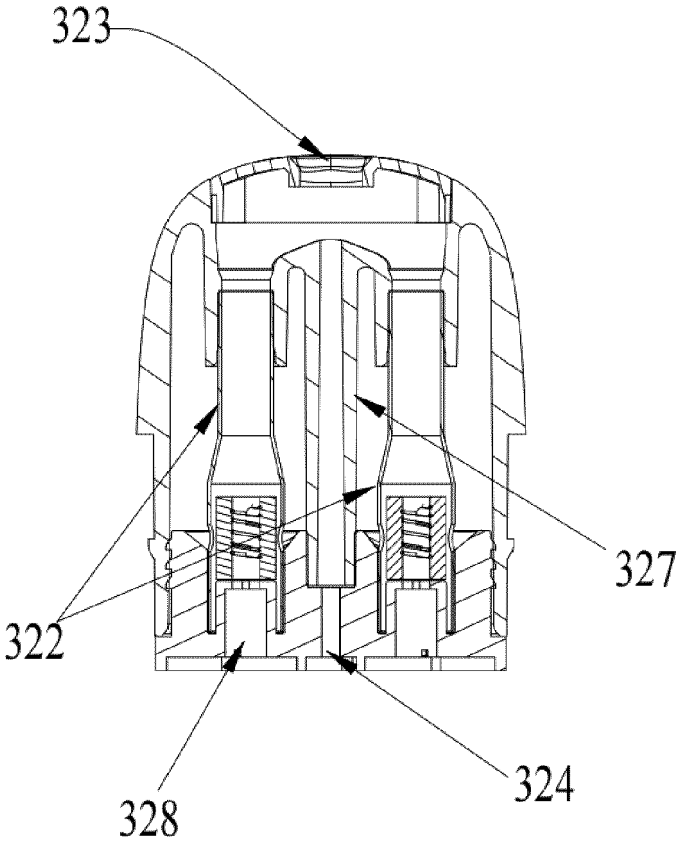

FIG. 11

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 1133

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2017/233114 A1 (CHRISTENSEN STEVEN [US] ET AL) 17 August 2017 (2017-08-17)	1,3-8,14	INV. A24F40/10
Y	* figures 11A,11B *	2	A24F40/42
A	* paragraph [0013] *	9-13	A24F40/485
	* paragraph [0062] - paragraph [0064] *		
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A	* figure 2 *	9-13	
	* paragraph [0028] *		
	* paragraph [0033] *		
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	* figure 2 *		

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A24F

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Place of search	Date of completion of the search	Examiner
Munich	4 May 2023	Schwertfeger, C

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