



(11)

EP 2 946 679 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.11.2015 Bulletin 2015/48

(51) Int Cl.:
A24F 47/00 (2006.01)

(21) Application number: **15164152.9**

(22) Date of filing: **17.04.2015**

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

(30) Priority: **28.04.2014 CN 201420210143 U**
28.04.2014 CN 201420209253 U

(71) Applicant: **Shenzhen First Union Technology Co., Ltd.**
Shenzhen, Guangdong 518104 (CN)

(72) Inventors:
• **Li, Yonghai**
518104 Shenzhen Guangdong (CN)
• **Xu, Zhongli**
518104 Shenzhen Guangdong (CN)
• **Song, Laizhi**
518104 Shenzhen Guangdong (CN)
• **Zou, Xingbing**
518104 Shenzhen Guangdong (CN)
• **Deng, Yindeng**
518104 Shenzhen Guangdong (CN)

(74) Representative: **Prol European Patent Attorneys**
Postfach 2123
90711 Fürth (DE)

(54) **ATOMIZER AND ELECTRONIC CIGARETTE HAVING SAME**

(57) An exemplary atomizer (10) includes a liquid supply component (13), an atomizing assembly (16), and a piercing means (15). The liquid supply component (13) is configured for storing tobacco liquid. The liquid supply component (13) has a sealing means (132) for sealing the tobacco liquid therein. The piercing means (15) is adapted for piercing the sealing structure so that the tobacco liquid flows to the atomizing assembly (16). The atomizing assembly (16) is configured for heating the tobacco liquid to form aerosol.

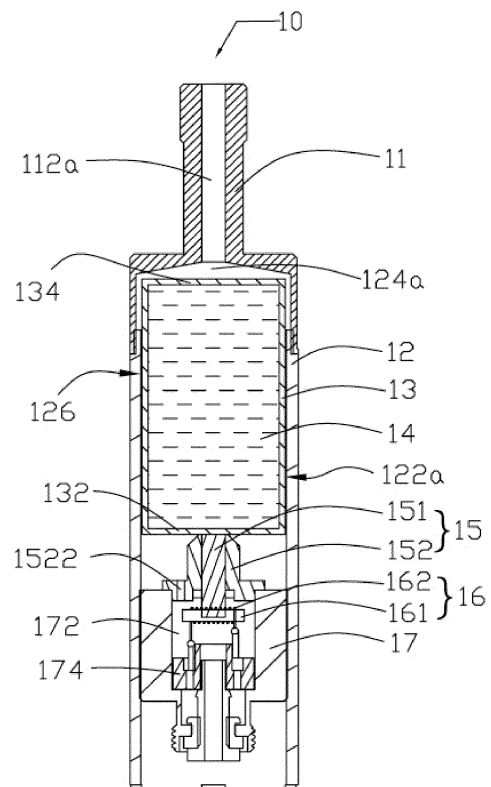


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to electronic cigarettes, and particularly to an atomizer and an electronic cigarette using same.

BACKGROUND ART

[0002] Nowadays, electronic cigarettes mainly include disposable electronic cigarettes and refillable electronic cigarette. The disposable electronic cigarettes are not environmental-friendly because they are discarded after used. The refillable electronic cigarettes can be used repeatedly. After tobacco liquid in the refillable electronic cigarettes is used up, the user of the electronic cigarettes can refill the tobacco liquid by themselves. Accordingly, the refillable electronic cigarettes are more environmental-friendly. However, it is inconvenient to refill the tobacco liquid, and the tobacco liquid may pollute clothes of the users during this process.

[0003] What is needed, therefore, is an atomizer and an electronic cigarette using same, which can overcome the above shortcomings.

SUMMARY

[0004] An exemplary atomizer includes a liquid supply component, an atomizing assembly, and a piercing means. The liquid supply component is configured for storing tobacco liquid. The liquid supply component has a sealing means for sealing the tobacco liquid therein. The piercing means for piercing the sealing structure so that the tobacco liquid flows to the atomizing assembly. The atomizing assembly is configured for heating the tobacco liquid to form aerosol.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. 1 is a cross-sectional view of an atomizer in a first state according to a first embodiment.

FIG. 2 is a cross-sectional view of the atomizer of FIG. 1 in a second state.

FIG. 3 is a cross-sectional view of an electronic cigarette according to a second embodiment.

FIG. 4 is a cross-sectional view of an atomizing device according to a first embodiment.

FIG. 5 is a cross-sectional view of an atomizing head assembly of the atomizing device of FIG. 4.

FIG. 6 is an exploded perspective view of the atomizing head assembly of FIG. 5.

FIG. 7 is a cross-sectional view of a liquid supply component of the atomizing device of FIG. 4.

FIG. 8 is an exploded perspective view of the liquid supply component of FIG. 7.

FIG. 9 is a cross-sectional view of a liquid supply component according to a second embodiment.

FIG. 10 is a perspective view of an electronic cigarette according to a third embodiment.

DETAILED DESCRIPTION

[0006] It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures and components have not been described in detail so as not to obscure the related relevant feature being described. Also, the description is not to be considered as limiting the scope of the embodiments described herein. The drawings are not necessarily to scale and the proportions of certain parts have been exaggerated to better illustrate details and features of the present disclosure.

[0007] The disclosure is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references mean at least one.

[0008] Several definitions that apply throughout this disclosure will now be presented.

[0009] The term "outside" refers to a region that is beyond the outermost confines of a physical object. The term "inside" indicates that at least a portion of a region is partially contained within a boundary formed by the object. The term "substantially" is defined to be essentially conforming to the particular dimension, shape or other word that substantially modifies, such that the component need not be exact. For example, substantially cylindrical means that the object resembles a cylinder, but can have one or more deviations from a true cylinder. The term "comprising," when utilized, means "including, but not necessarily limited to"; it specifically indicates open-ended inclusion or membership in the so-described combination, group, series and the like.

[0010] Referring to FIG. 1, an atomizer 10 includes a mouthpiece 11, an atomizing sleeve 12, a liquid tank 13, a piercing means 15, an atomizing assembly 16, and a connector 17.

[0011] The mouthpiece 11 and the atomizing sleeve

12 are detachably connected. In the present embodiment, the mouthpiece 11 and the atomizing sleeve 12 are engaged by screw threads. The mouthpiece 11 defines an air outlet 112.

[0012] The atomizing sleeve 12 defines a space 122 for receiving the liquid tank 13. The liquid tank 13 is configured (i.e., structured and arranged) for storing tobacco liquid 14. The liquid tank 13 includes a bottom wall 132 made of material, which can be pierced easily, for example, aluminum foil.

[0013] The connector 17 is fixed at one end of the atomizing sleeve 12 away from the mouthpiece 11, and is configured for connecting with an external power supply. The piercing means 15 is arranged between the connector 17 and the liquid tank 13. The piercing means 15 is fixedly connected with the connector 17. The piercing means 15 includes a supporting element 152 and a first liquid absorbing element 151 extending through the supporting element 152. The supporting element 152 is made of hard material, such as, metal. The first liquid absorbing element 151 may be made of porous material. In the present embodiment, the first liquid absorbing element 151 is made of glass fiber core. The connector 17 is annular, and the supporting element 152 is fixed on the connector 17. The connector 17 includes a silicone holder 174 inside. The silicone holder 174 and the supporting element 152 cooperatively define an atomizing cavity 172.

[0014] The atomizing assembly 16 is received in the atomizing cavity 172, and includes a second liquid absorbing element 161 and a heating wire 162 spirally wound around the second liquid absorbing element 161. The second liquid absorbing element 161 is made of porous material. In the present embodiment, the second liquid absorbing element 161 is made of glass fiber core. An end of the first liquid absorbing element 151 is connected to the second liquid absorbing element 161. Quite usefully, a length direction of the first liquid absorbing element 151 is substantially perpendicular to a length direction of the second liquid absorbing element 161, and the end of the first liquid absorbing element 151 is connected to a middle portion of the second liquid absorbing element 161 in the length direction. The first liquid absorbing element 151 is configured for absorbing tobacco liquid and conveying the tobacco liquid to the second liquid absorbing element 161 after the piercing means 15 pierces the liquid tank 13. The second liquid absorbing element 161 absorbs tobacco liquid from the first liquid absorbing element 151, so that the heating wire 162 heats the tobacco liquid. The tobacco liquid is conveyed to the second liquid absorbing element 161 by the first liquid absorbing element 151 from the liquid tank 13 via capillary action. Two opposite ends of the heating wire 162 are connected to the power supply.

[0015] The liquid tank 13 and an inner wall of the atomizing sleeve 12 cooperatively define an air passage 126. The air passage 126 communicates with the air outlet 112. The supporting element 152 defines a through

hole 1522 communicating with the air passage 126. The aerosol can reach the air outlet 112 through the air passage 126.

[0016] Further, a top wall 134 of the liquid tank 13 and an inner wall of the mouthpiece cooperatively define a funnel-shaped space 124 for collecting air in the air passage 126 to the mouthpiece 11.

[0017] In use, the mouthpiece 11 is rotated relative to the atomizing sleeve 12, the mouthpiece 11 forces the liquid tank 13 to move downwards such that the piercing means 15 pierces through the bottom wall 132 of the liquid tank. The tobacco liquid 14 in the liquid tank 13 is conveyed to the second liquid absorbing element 161 via the first liquid absorbing element 151. After the heating wire 162 is powered on, the tobacco liquid absorbed in the second liquid absorbing element 161 is heated to form aerosol. After the tobacco liquid 14 in the liquid tank 13 is used up, the mouthpiece 11 is crewed off, and then the liquid tank 13 is replaced by a new liquid tank.

[0018] In the present embodiment, the tobacco liquid is conveyed to the second liquid absorbing element 161 by the first liquid absorbing element 151 from the liquid tank 13 via capillary action. Therefore, it is prevented that a lot of the tobacco liquid suddenly rushes to the atomizing assembly 16 when the bottom wall 132 is pierced, thus reducing risk of liquid leakage.

[0019] Referring to FIG. 3, an electronic cigarette 30 includes an atomizer 10 and a power supply 20. The power supply 20 is configured for providing the atomizer 10 working power.

[0020] Referring to FIGS. 4-8, an atomizing device 100 is shown. The atomizing device 100 is configured (i.e., structured and arranged) for heating tobacco liquid to form aerosol. The atomizing device 100 includes a liquid supply component 110 and an atomizing head assembly 120. The atomizing head assembly 120 is detachably coupled with the liquid supply component 110. The atomizing head assembly 120 includes an atomizing sleeve 121, a connector 122, a piercing means 123, and an atomizing assembly 124. The connector 122 is arranged at an end of the atomizing sleeve 121. The piercing means 123 is provided in the atomizing sleeve 121. The atomizing assembly 124 is arranged between the connector 122 and the piercing means 123. The liquid supply component 110 includes a liquid tank 111 and a mouthpiece 112. The mouthpiece 112 includes an engaging part 1121 configured for engaging with the atomizing sleeve 121 by interference fit, thus fixedly connecting with the liquid supply component 110 and the atomizing head assembly 120. The piercing means 123 is adapted for piercing the liquid tank 111 so that the tobacco liquid flows to the atomizing assembly 124. The atomizing assembly 124 is adapted to heat the tobacco liquid. The connector 122 is configured for connecting the atomizing device 100 and an external power supply.

[0021] The liquid tank 111 defines an opening at one end, and a silica gel stopper 113 is provided at the opening. The silica gel stopper 113 includes a thin film 1131

for sealing the opening. The thin film 1131 and the silica gel stopper 113 are integrally formed. The piercing means 123 pierces the thin film 1131, inserts into the liquid tank 111, and then guides the tobacco liquid in the liquid tank 111 to flow to the atomizing assembly 124.

[0022] When the thin film 1131 is pierced, the tobacco liquid in the liquid tank 111 flows along the piercing means 123. After the piercing means 123 is pulled out, an opening in the thin film 1131 formed by the piercing means 123, will shut off automatically due to the resilience of the thin film 1131. In this way, the tobacco liquid in the liquid tank 111 is prevented from leaking when replacing the liquid supply component 110.

[0023] In the present embodiment, the liquid tank 111 and the mouthpiece 112 are engaged by interference fit. When replacing the liquid tank 111, the mouthpiece 112 is pulled out. In this way, the liquid tank 111 and the mouthpiece 112 are pulled out together. Accordingly, it is very convenient to replace the liquid tank 111.

[0024] The piercing means 123 includes a main body 1231 and a pricking part 1232. When the pricking part 1232 pierces the thin film 1131 and inserts into the liquid tank 111, the main body 1231 abuts tightly against the silica gel stopper 113, thus preventing the tobacco liquid from leaking. To prevent the silica gel stopper 113 from being squeezed to deform by the main body 1231, a supporting ring 114 is provided in the silica gel stopper 113, and the supporting ring 114 is engaged with the silica gel stopper 113 by interference fit.

[0025] An outer diameter of the liquid tank 111 is slightly smaller than an inner diameter of the atomizing sleeve 121. An annular gap 130 is defined between the liquid tank 111 and the atomizing sleeve 121. The liquid tank 111 includes a cut-off surface 115 extending along an axial direction on an outer wall. When the liquid tank 111 is coupled with the mouthpiece 112, a first air passage 140 is defined between the liquid tank 111 and the mouthpiece 112. The aerosol generated by the atomizing assembly 124 flows along the annular gap 130, the first air passage 140 and an air outlet 1122 defined at one end of the mouthpiece 112, and then reaches a mouth of a user.

[0026] The connector 122 is configured for connecting the atomizing device 100 to an external power supply. In the present embodiment, the connector 122 includes a connecting sleeve 1221, a tubular electrode 1222, and an insulated ring provided between the tubular electrode 1222 and the connecting sleeve 1221. The connecting sleeve 1221 is fixedly connected to the atomizing sleeve 121. The tubular electrode 1222 is arranged in the connecting sleeve 1221 and inserts into the atomizing assembly 124. The atomizing assembly 124 includes a heating element 1241. Two opposite ends of the heating element 1241 are respectively connected to the connecting sleeve 1221 and the tubular electrode 1222. The connecting sleeve 1221 and the tubular electrode 1222 are connected to the external power supply.

[0027] The atomizing assembly 124 includes a holder

1243. The holder 1243 and the piercing means 123 cooperatively define an atomizing cavity. The atomizing assembly 124 further includes a liquid conducting element 1242 arranged in the atomizing cavity, a heating element 1241 in the atomizing cavity wound around the liquid conducting element 1242, and a porous liquid absorbing body 1244. The heating element 1241 is wound around the liquid conducting element 1242. The porous liquid absorbing body 1244 is arranged between the piercing means 123 and the liquid conducting element 1242, and is in tight contact with the liquid conducting element 1242. The holder 1243 is configured for supporting the heating element 1241 and the liquid conducting element 1242. The porous liquid absorbing body 1244 is adapted for storing tobacco liquid, which is guided by the piercing means 123 from the liquid tank 111. The liquid conducting element 1242 is adapted for absorbing tobacco liquid from the porous liquid absorbing body 1244. The porous liquid absorbing body 1244 may be a cotton cloth, or other porous material. The heating element 1241 is configured for heating tobacco liquid absorbed in the liquid conducting element 1242.

[0028] The tubular electrode 1222 defines a central hole 1224 communicating with the atomizing cavity. The piercing means 123 and the atomizing sleeve 121 cooperatively define an air gap (not shown). The central hole 1224, the atomizing cavity, the air gap and the annular gap 130 cooperatively form a second air passage. The second air passage communicates with the first air passage 140. Air enters the second air passage via the central hole 1224, and brings the aerosol generated in the atomizing cavity out from the mouthpiece 112.

[0029] In the present embodiment, the atomizing sleeve 121 and the liquid tank 111 are made of transparent material, so that quantity of tobacco liquid left in the liquid tank 111 can be seen easily. When the tobacco liquid in the liquid tank 111 is used up, the liquid tank 111 or the liquid supply component 110 is replaced, and the atomizing head assembly 120 can be used repeatedly. Accordingly, the atomizing device 100 is environmental-friendly.

[0030] Referring to FIG. 9, another liquid supply component 210 is shown. The liquid supply component 210 includes a mouthpiece 212, a liquid tank 211. The mouthpiece 212 defines an air outlet 2122. The liquid supply component 210 further includes an air guide 213 arranged between the air outlet 2122 and the liquid tank 211. The air guide 213 defines a spiral air groove 2131, which communicates with a first air passage 240 and the air outlet 2122. After passing the air groove 2131, temperature of the aerosol is effectively decreased, thus improving user experience of the atomizing device.

[0031] Referring to FIG. 10, an electronic cigarette 1 includes an atomizer 2 and a power supply 3. The atomizer 1 may be any atomizer of the previous embodiment. The power supply 3 provides the atomizer 1 working power.

[0032] It is understood that the above-described em-

bodiments are intended to illustrate rather than limit the disclosure. Variations may be made to the embodiments and methods without departing from the spirit of the disclosure. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the disclosure.

Claims

1. An atomizer, comprising:

a liquid supply component, the liquid supply component being configured for storing tobacco liquid, the liquid supply component having a sealing means for sealing the tobacco liquid therein;
an atomizing assembly; and
a piercing means for piercing the sealing structure so that the tobacco liquid flows to the atomizing assembly, the atomizing assembly configured for heating the tobacco liquid to form aerosol.

2. The atomizer according to claim 1, further comprising:

an atomizing sleeve;
a mouthpiece connected to one end of the atomizing sleeve;
wherein the piercing means and the atomizing assembly are received in the atomizing sleeve, the piercing means comprises a first liquid absorbing element, the atomizing assembly comprises a second liquid absorbing element and a heating wire wound around the second liquid absorbing element, the first liquid absorbing element is connected to the second liquid absorbing element, and the first liquid absorbing element is configured for conveying the tobacco liquid to the second liquid absorbing element.

3. The atomizer according to claim 2, wherein the piercing means further comprises a supporting element surrounding the first liquid absorbing element, and the first liquid absorbing element extends through the supporting element.

4. The atomizer according to claim 2, wherein a length direction of the first liquid absorbing element is substantially perpendicular to a length direction of the second liquid absorbing element, and the end of the first liquid absorbing element is connected to a middle portion of the second liquid absorbing element in the length direction.

5. The atomizer according to claim 3, wherein the atomizing assembly further comprises a connector ar-

ranged at an end of the atomizing sleeve away from the mouthpiece, and the connector being configured for connecting to a power supply.

6. The atomizer according to claim 5, wherein the connector is annular, the supporting element is fixed on the connector, the connector comprises a silicone holder received in the connector, the silicone holder and the supporting element cooperatively define an atomizing cavity, and the atomizing assembly is accommodated in the atomizing cavity.

7. The atomizer according to claim 1, further comprising:

an atomizing sleeve, the piercing means being received in the atomizing sleeve; and
a connector arranged at an end of the atomizing sleeve, the connector being configured for connecting to a power supply;
wherein the atomizing assembly is positioned between the piercing means and the connector; the liquid supply component comprises a liquid tank and an engaging part, the engaging part is configured for connecting to an opposite end of the atomizing sleeve; the liquid tank defines an opening at one end, the sealing means is arranged at one end of the liquid tank, the sealing means comprises a silica gel stopper, the silica gel stopper has a thin film integrally formed, and the thin film is configured for sealing the opening.

8. The atomizer according to claim 7, wherein the liquid supply component further comprises a mouthpiece, the liquid tank and mouthpiece are engaged by interference fit, and the engaging part is provided at an end of the mouthpiece.

9. The atomizer according to claim 7, wherein the silica gel stopper further comprises a supporting ring provided in the silica gel stopper, and the supporting ring is configured for preventing the silica gel stopper from deforming.

10. The atomizer according to claim 8, wherein an outer diameter of the liquid tank is smaller than an inner diameter of the atomizing sleeve, the liquid tank has a cut-off surface extending along an axial direction on an outer wall, and the cut-off surface and the mouthpiece cooperatively define a first air passage.

11. The atomizer according to claim 7, wherein the connector comprises a connecting sleeve fixedly connected to the atomizing sleeve, and a tubular electrode, the tubular electrode is received in the connecting sleeve, and is insulated from the tubular electrode, the atomizing assembly comprises a heating element, and two opposite ends of the heating ele-

ment are respectively connected to the connecting sleeve and the tubular electrode.

12. The atomizer according to claim 11, wherein the atomizing assembly further comprises a holder, a liquid conducting element, and a porous liquid absorbing body; the holder and the piercing means cooperatively define an atomizing cavity, the liquid conducting element is arranged in the atomizing cavity; the porous liquid absorbing body is arranged between the piercing means and the liquid conducting element, the porous liquid absorbing body is in contact with the liquid conducting element, and the heating element is wound around the liquid conducting element.
13. The atomizer according to claim 12, wherein the tubular electrode defines a central hole communicating with the atomizing cavity, the piercing means and the atomizing sleeve cooperatively define an air gap, the atomizing sleeve and the liquid tank cooperatively define a gap, the central hole, the atomizing cavity, the air gap and the annular gap cooperatively form a second air passage.
14. The atomizer according to claim 7, wherein the piercing means comprises a pricking part configured for piercing the sealing structure.
15. An electronic cigarette, comprising:
an atomizer according to any of claims 1-14; and
a power supply configured for supplying the atomizer power.

5

10

15

20

25

30

35

40

45

50

55

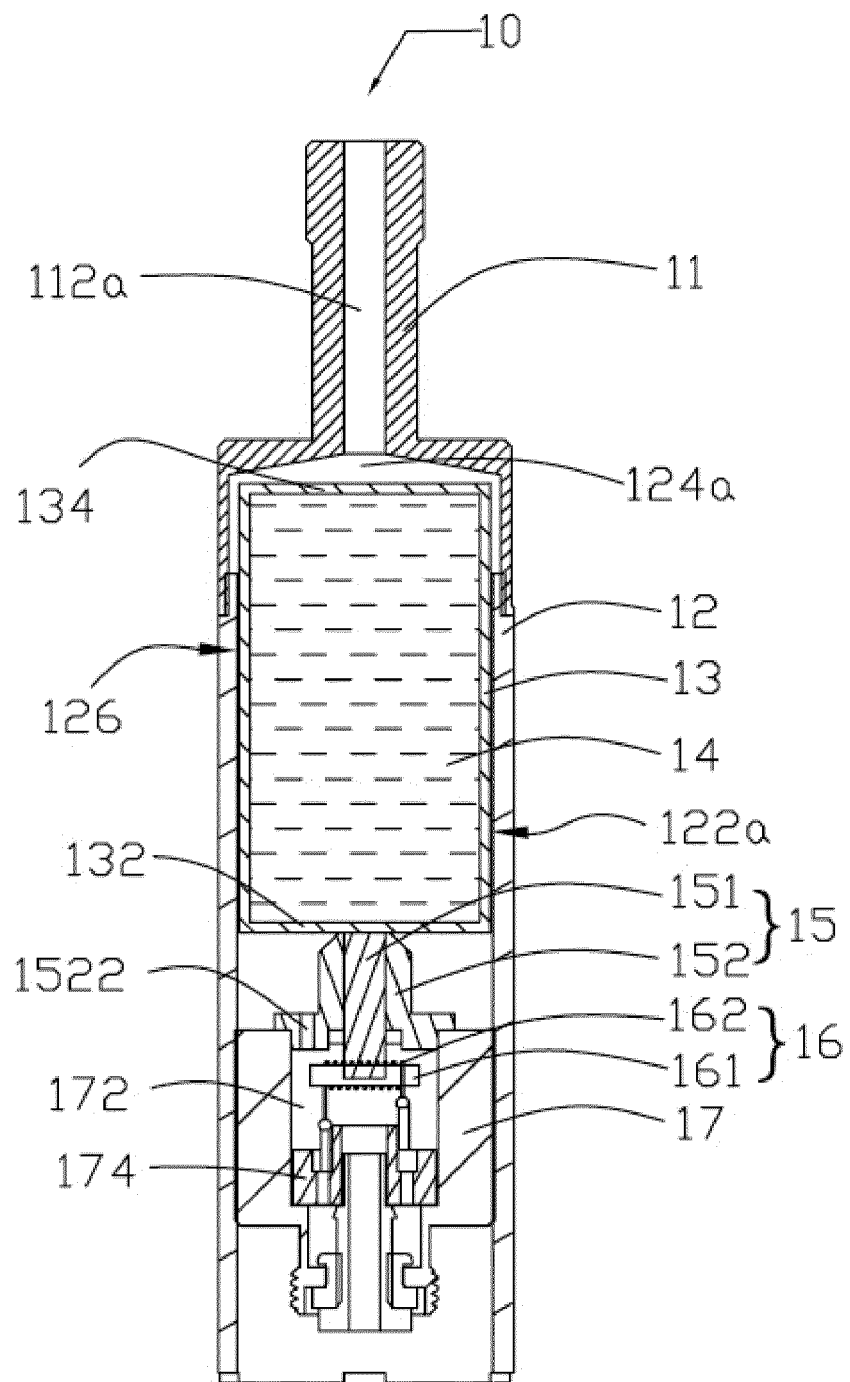


FIG. 1

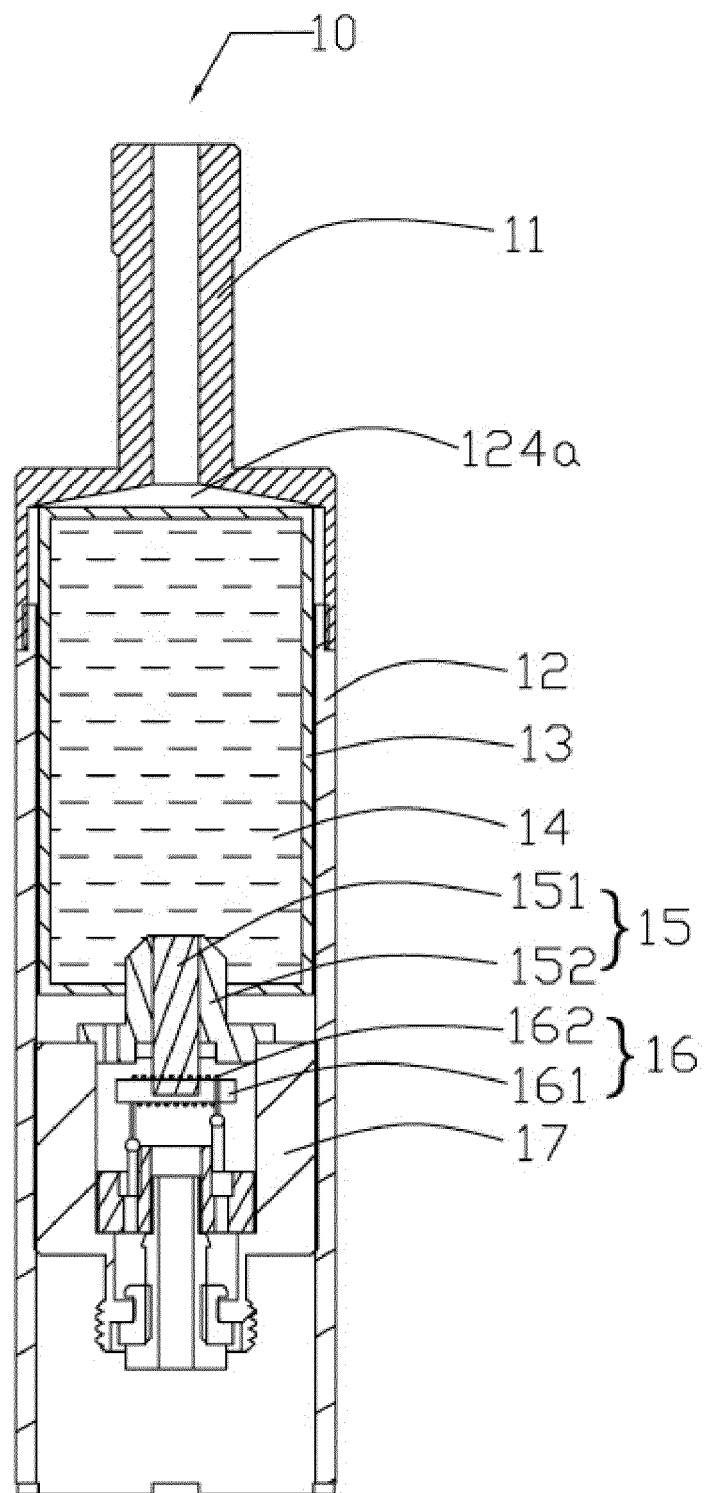


FIG. 2

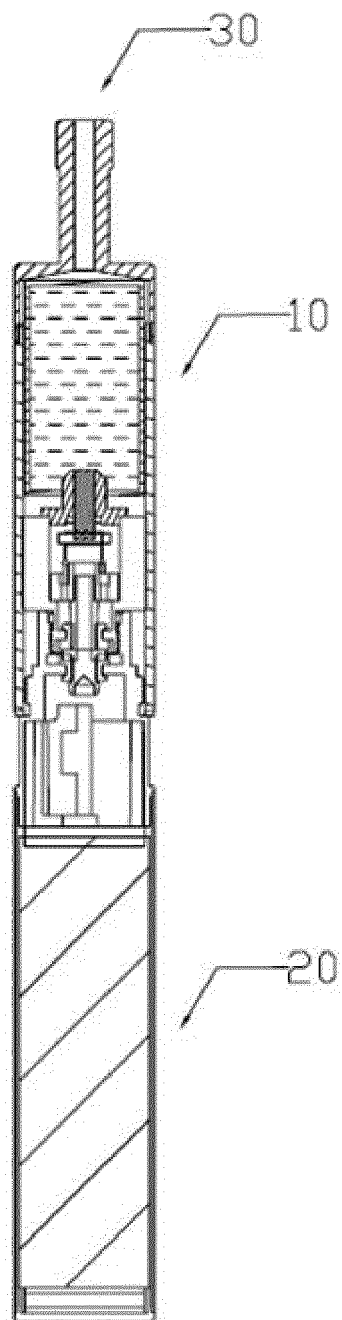


FIG. 3

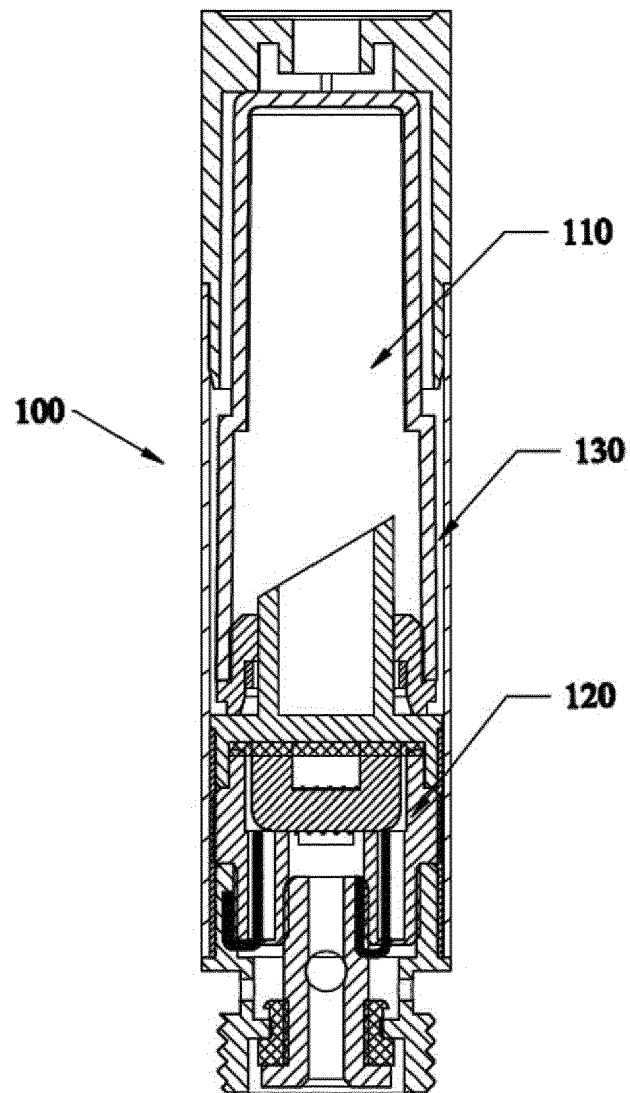


FIG. 4

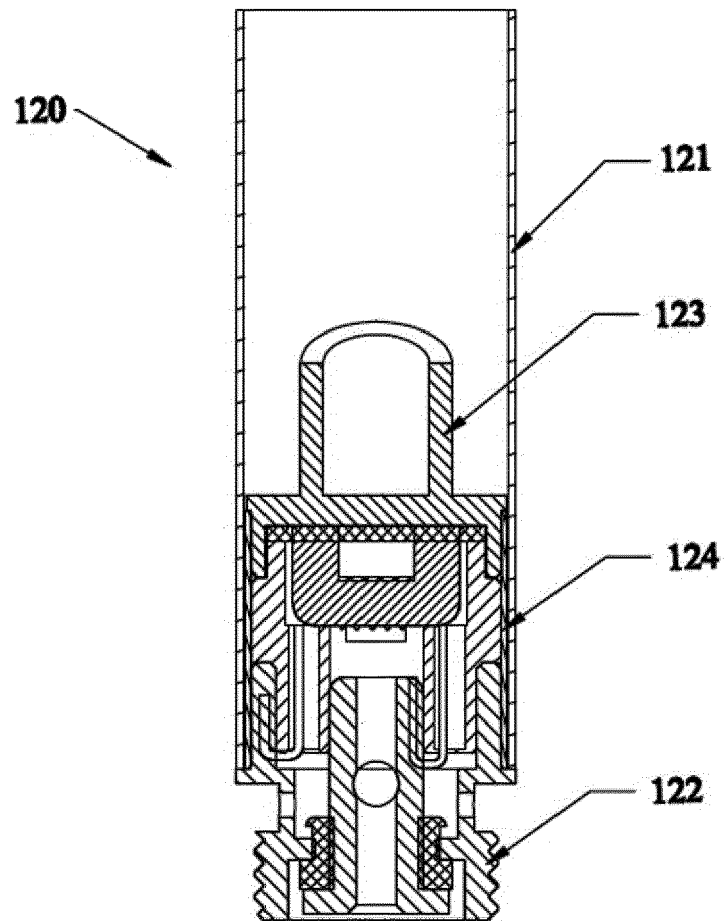


FIG. 5

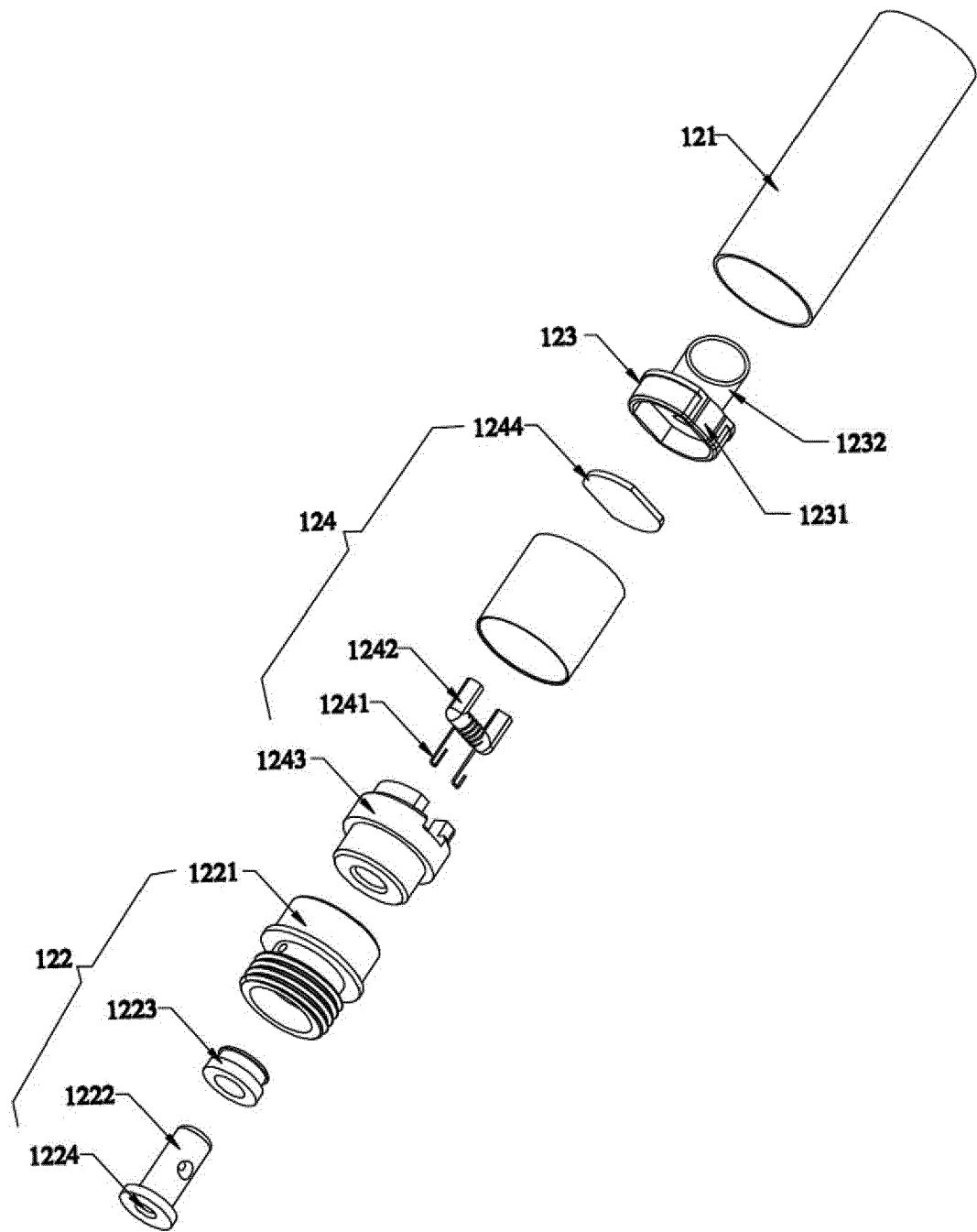


FIG. 6

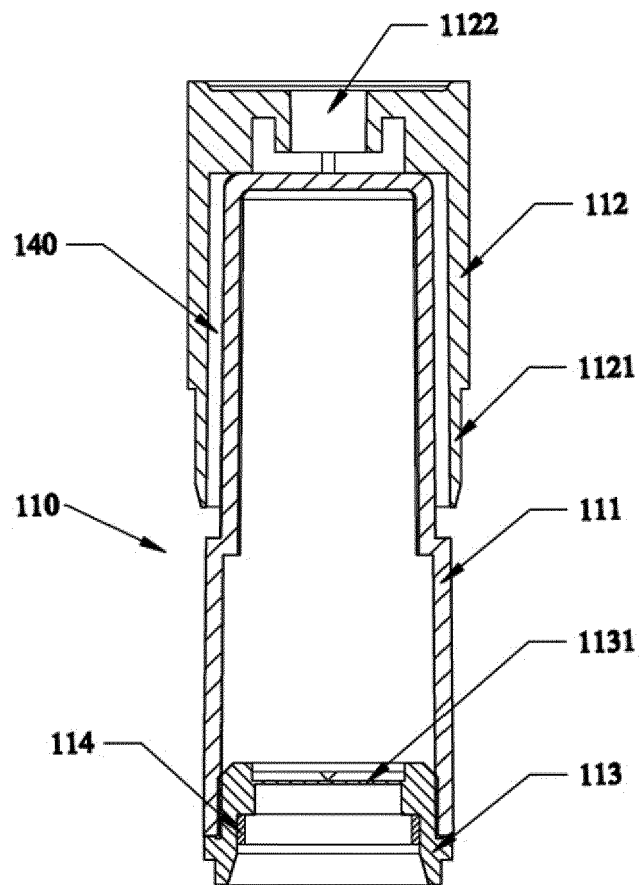


FIG. 7

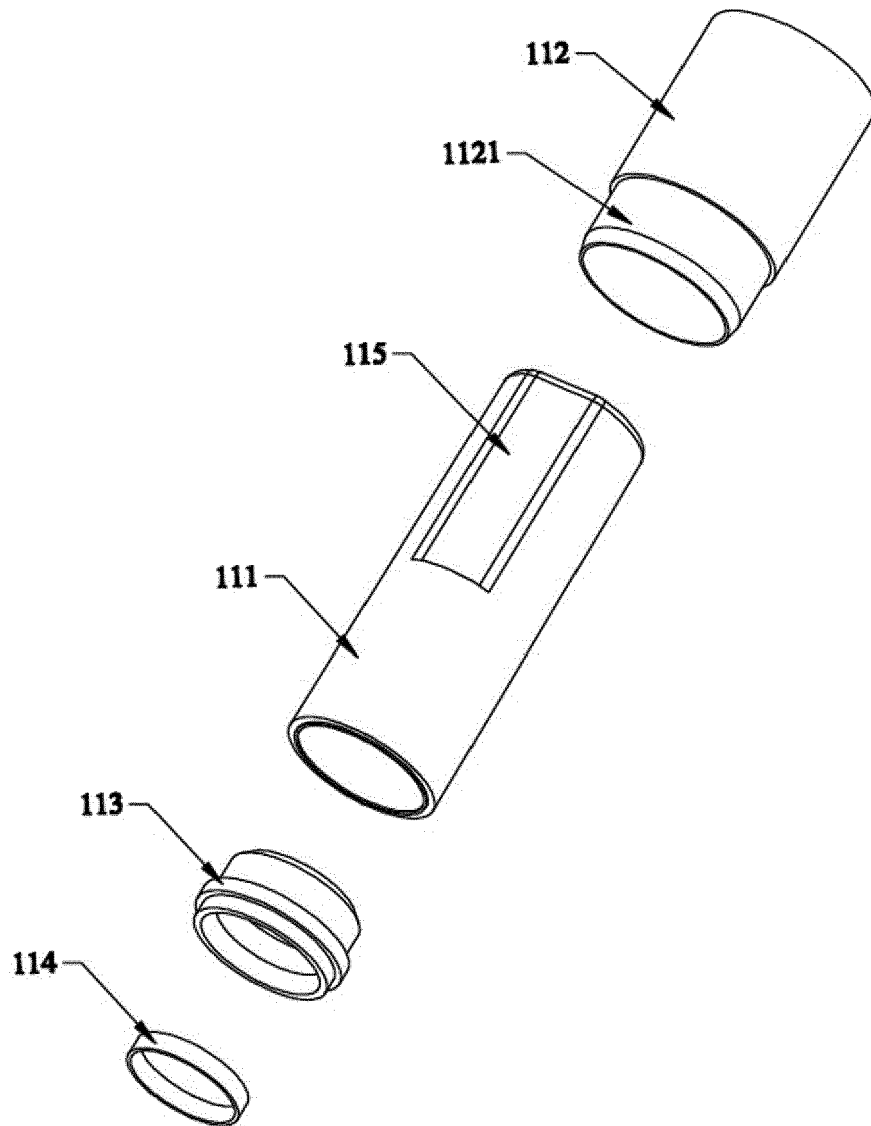


FIG. 8

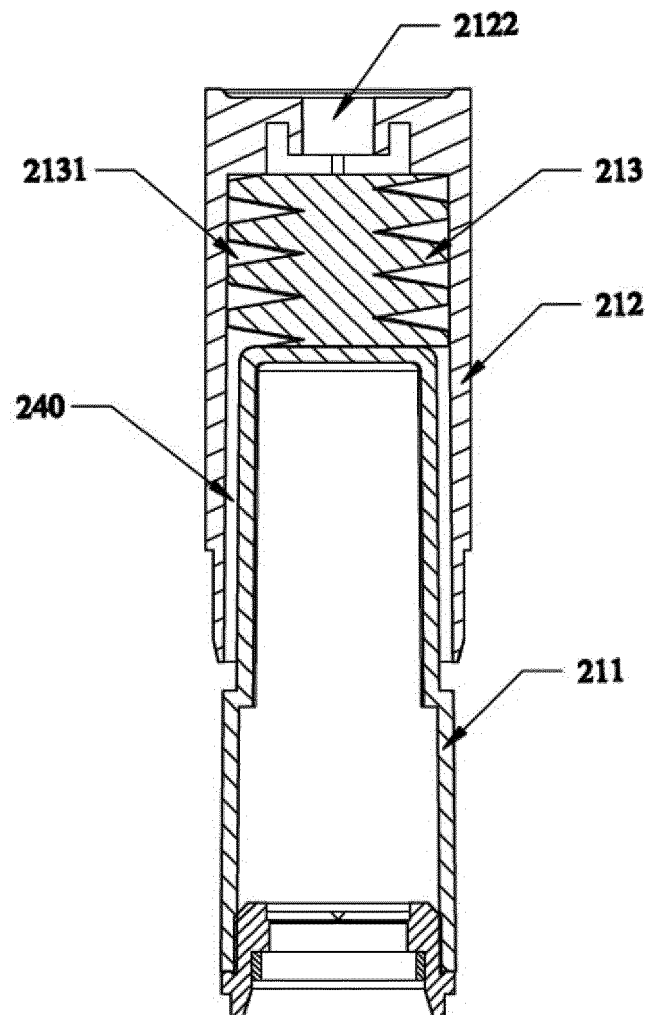


FIG. 9

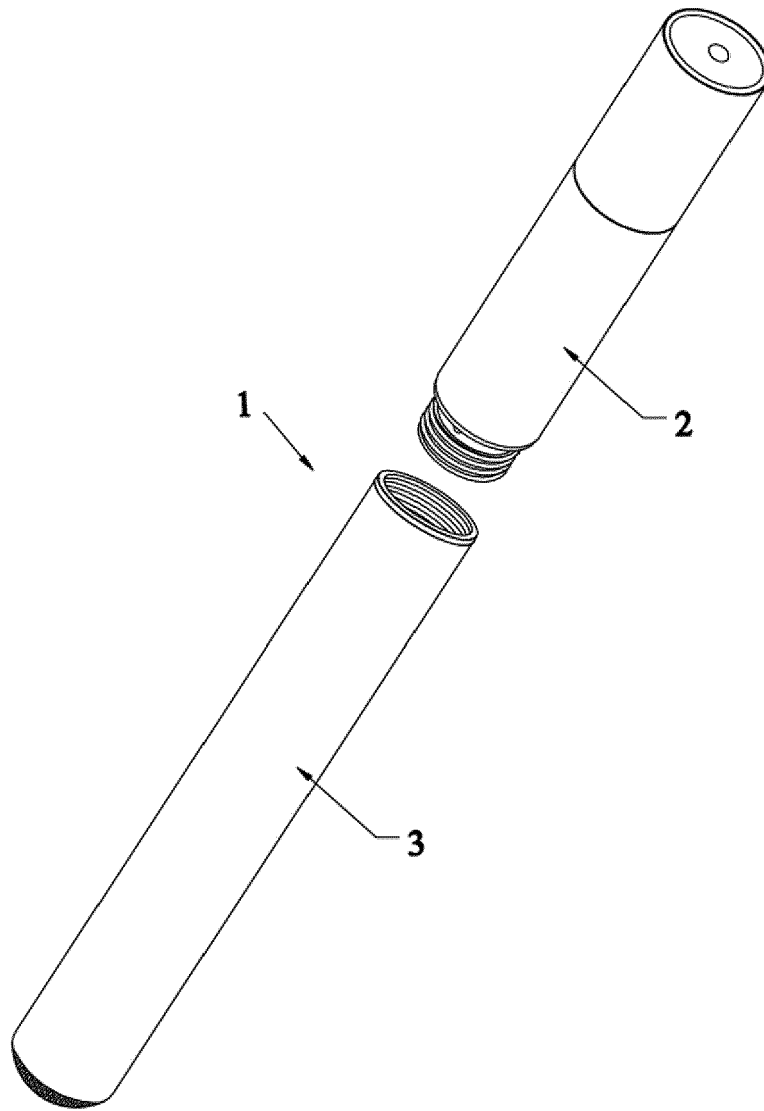


FIG. 10



EUROPEAN SEARCH REPORT

 Application Number
EP 15 16 4152

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	WO 2013/159245 A1 (RUYAN INVEST HOLDINGS LTD [GB]; HON LIK [CN]) 31 October 2013 (2013-10-31) * abstract; claims 1-4; figures 1-4 * * paragraph [0001] - paragraph [0004] * * paragraph [0014] - paragraph [0016] * -----	1-5,15	INV. A24F47/00
X	US 2011/277757 A1 (TERRY NATHAN ANDREW [US] ET AL) 17 November 2011 (2011-11-17) * paragraph [0086] - paragraph [0087]; figures 5-9 * * paragraph [0094] - paragraph [0101] * * paragraph [0127] - paragraph [0128]; figures 59,59a * -----	1-5,15	
X	EP 2 260 733 A1 (XIU YUNQIANG [CN]) 15 December 2010 (2010-12-15) * abstract; claim 1; figures 1,2 * * paragraph [0020] * -----	1,15	
X	US 2009/151717 A1 (BOWEN ADAM [US] ET AL) 18 June 2009 (2009-06-18) * paragraph [0044]; claims 1,2,17,36,41; figures 3,4,7 * * paragraph [0069] - paragraph [0076] * -----	1,15	TECHNICAL FIELDS SEARCHED (IPC) A24F
E	EP 2 929 903 A1 (SHENZHEN FIRST UNION TECH CO [CN]) 14 October 2015 (2015-10-14) * abstract; claims 1,12; figures 2,3,4,15-17 * * paragraph [0010] - paragraph [0015] * -----	1-15	
X	US 2010/006113 A1 (URTSEV VLADIMIR NIKOLAEVICH [RU] ET AL) 14 January 2010 (2010-01-14) * abstract; claims 1,2; figures 1,2,5,7 * -----	1	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 October 2015	Examiner Gaiser, Markus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 16 4152

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

16-10-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013159245 A1	31-10-2013	AR 090841 A1	10-12-2014
		AU 2012378108 A1	13-11-2014
		CA 2870469 A1	31-10-2013
		CN 104602552 A	06-05-2015
		EP 2840913 A1	04-03-2015
		JP 2015514429 A	21-05-2015
		KR 20150020182 A	25-02-2015
		US 2015040929 A1	12-02-2015
		WO 2013159245 A1	31-10-2013
US 2011277757 A1	17-11-2011	TW 201208720 A	01-03-2012
		US 2011277757 A1	17-11-2011
		WO 2011146318 A2	24-11-2011
EP 2260733 A1	15-12-2010	AU 2008351672 A1	03-09-2009
		CA 2729601 A1	03-09-2009
		DE 202008018338 U1	16-04-2013
		EP 2260733 A1	15-12-2010
		GB 2466758 A	07-07-2010
		US 2011005535 A1	13-01-2011
		WO 2009105919 A1	03-09-2009
US 2009151717 A1	18-06-2009	AU 2008338305 A1	25-06-2009
		CA 2712469 A1	25-06-2010
		CN 101951796 A	19-01-2011
		EP 2234508 A2	06-10-2010
		JP 2011505874 A	03-03-2011
		KR 20100108565 A	07-10-2010
		TW 200944142 A	01-11-2009
		US 2009151717 A1	18-06-2009
		US 2015157056 A1	11-06-2015
		WO 2009079641 A2	25-06-2009
EP 2929903 A1	14-10-2015	EP 2929903 A1	14-10-2015
		US 2015282529 A1	08-10-2015
US 2010006113 A1	14-01-2010	CA 2668047 A1	08-05-2008
		CN 101568269 A	28-10-2009
		EA 200701988 A1	30-06-2008
		EP 2084978 A1	05-08-2009
		IL 198382 A	31-07-2012
		JP 5131490 B2	30-01-2013
		JP 2010508034 A	18-03-2010
		NO 330556 B1	16-05-2011
		RU 2328192 C1	10-07-2008
		US 2010006113 A1	14-01-2010

EPO FORM P0459

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

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 16 4152

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

16-10-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		W0 2008052570 A1	08-05-2008

EPO FORM P0459

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