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(54) Title: AEROSOL GENERATION SYSTEM WITH REPLACEABLE ATOMIZER

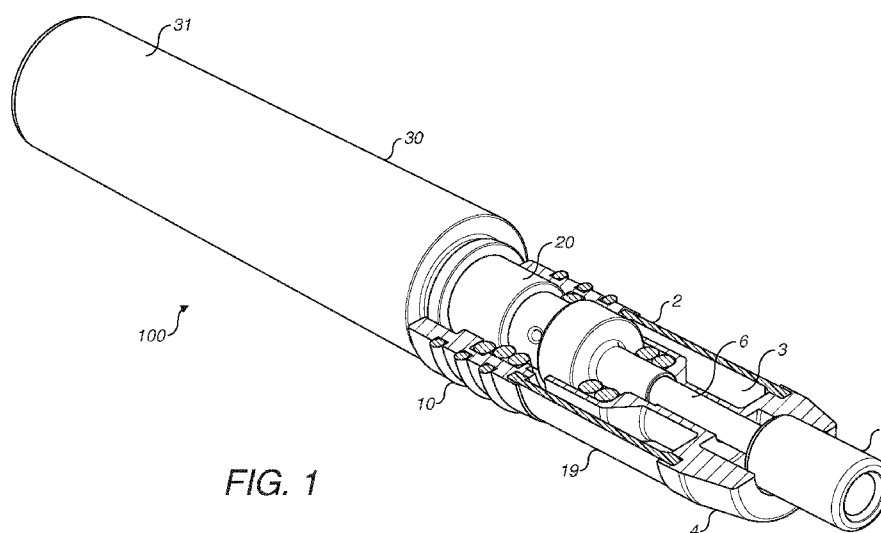


FIG. 1

(57) Abstract: An electrically operated aerosol generation system (100) is disclosed having a replaceable atomizer (20). The system (100) includes a housing (2) and an atomizer (20) that can be received within a bore (12) in a grasp ring (10) of the housing (2). A power supply unit (30) can be connected to the housing (2). A reservoir (3) contains vaporizable liquid which can be supplied to the atomizer (20). A mouthpiece assembly (5) is provided and can be actuated relative to the housing in order to separate and eject the atomizer from the housing when the power supply unit (30) is removed.

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## Aerosol Generation System with Replaceable Atomizer

The present invention relates to an electrically operated aerosol generation system such as an electronic cigarette.

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Electronic cigarettes and other aerosol inhalers are becoming increasingly popular consumer products. In these products an aerosol forming substance is stored in a tank in liquid form and is supplied to an atomizer which can generate an aerosol. The atomizer includes an absorbent material and a heating coil that vaporises the liquid aerosol forming substance. A battery is connected to the atomizer, which is typically operated by a button or an air pressure sensor. Air inlets are provided so that the user can draw air into the device through or past the atomizer. In use, a user activates the atomizer and inhales the aerosol that is generated, using a mouthpiece.

15

Sometimes it becomes necessary to replace an atomizer. This may be necessary if the atomizer heating coil becomes degraded. In conventional designs it can be difficult to access the atomizer in order to fit a replacement. Additionally, the atomizer can become hot in use, which means that a user may need to wait for the components to cool before trying to fit a replacement. A further difficulty is that the atomizer may have liquid from the tank on or in it. Thus, with conventional designs a user may be brought into direct contact with the liquid aerosol forming substance when attempting to remove a used atomizer, which is undesirable.

20

According to an aspect of the invention there is provided an electrically operated aerosol generation system, comprising: a housing; an atomizer that can be received by the housing; a reservoir configured to supply vaporisable liquid to the atomizer; a mouthpiece assembly which is actuatable relative to the housing in order to eject the atomizer; and a power supply unit configured for connection with the housing.

30

In this way, the mouthpiece assembly can be used as a mechanical ejector for the atomizer, which can be slid out of the housing. The atomizer can therefore be

replaced easily. A user does not need to physically touch the spent atomizer, which is advantageous because it may be hot and/or have vaporisable liquid residue on it.

5 Preferably the atomizer is slidably received in the housing, and is held in place by frictional engagement, a press fit or an interference fit. In one arrangement the atomizer may be held in the housing by one or more o-rings. The grip of the o-rings on the atomizer may be reduced when the atomizer is pushed out of the housing by the mouthpiece assembly.

10 The mouthpiece assembly may be arranged to actuate the atomizer between an operative position in which vaporisable liquid can be supplied to the atomizer from the reservoir, and an inoperative position in which vaporisable liquid cannot be supplied to the atomizer from the reservoir. In the operative position vapour  
15 generated by the atomizer may be transmitted to the mouthpiece assembly along an airflow path. The atomizer may be ejected from the housing in the inoperative position. Advantageously this can allow removal of the atomizer while minimising any leakage of vaporisable liquid from the reservoir.

20 The mouthpiece assembly may be in an extended position when the atomizer is received in the housing and the mouthpiece assembly may be in a retracted position when the atomizer is ejected from the housing. Once an old atomizer has been removed, a replacement atomizer may be introduced to the housing. This may cause the mouthpiece assembly to return to its extended position, ready for use.

25 The mouthpiece assembly may be configured to close or to block a flow path between the atomizer and the reservoir in the inoperative position. In one arrangement the mouthpiece may comprise a sealing portion which closes or blocks the flow path.

30 Preferably the connection between the power supply unit and the housing inhibits actuation of the mouthpiece assembly. Therefore, the power supply unit may need to be detached from the housing before the mouthpiece assembly can be actuated and the atomizer can be ejected. A threaded or bayonet connection may be provided between the power supply unit and the housing.

A viewing window may be provided in the housing for a user to inspect the volume of vaporisable liquid in the reservoir. The housing may form part of the reservoir. In particular, the housing may form an outer wall of the reservoir. A transparent portion of the housing may be provided to allow a user to see whether the reservoir needs to be re-filled.

The mouthpiece assembly may comprise an elongate member having an airflow channel extending longitudinally thereof. In addition, the mouthpiece assembly may be configured for translational or sliding movement relative to the housing, when actuated.

In another arrangement the mouthpiece assembly may be configured for rotational movement, when actuated. In this configuration the user may twist the mouthpiece assembly. The twisting movement of the mouthpiece assembly may drive the atomizer longitudinally relative to the housing so that it becomes disattached.

According to another aspect of the invention there is provided a method of removing an atomizer in an electrically operated aerosol generation system, comprising a housing; an atomizer that can be received by the housing; a reservoir configured to supply vaporisable liquid to the atomizer; a mouthpiece assembly which is actuatable relative to the housing; and a power supply unit configured for connection with the housing, the method comprising the step of actuating the mouthpiece assembly relative to the housing in order to eject the atomizer from the housing. The method may involve disconnecting the power supply unit before actuating the mouthpiece assembly.

The method may involve replacing the atomizer, which includes a further step of introducing a further atomizer to the housing. The step of introducing the further atomizer to the housing preferably involves actuating the mouthpiece assembly and moving it from its retracted position to its extended position. The method may then involve re-attaching the power supply unit to the housing so that actuation of the mouthpiece assembly is inhibited.

Embodiments of the invention are now described, by way of example, with reference to the drawings, in which:

Figure 1 is a perspective view of an inhaler device, part of which is shown as a cross-section in an embodiment of the invention;

- 5     Figure 2 is a perspective view of the mouthpiece assembly and reservoir of the inhaler device shown in Figure 1;

Figure 3 is an exploded view of the mouthpiece assembly and reservoir shown in Figure 2;

10

Figure 4 is a perspective view of an atomizer in the inhaler device shown in Figure 1;

Figure 5 is an exploded view of the atomizer shown in Figure 4;

15

Figure 6 is a cross-sectional side view of an electrically operated aerosol generation system in an operative configuration, in an embodiment of the invention; and

- 20     Figure 7 is another cross-sectional side view of the electrically operated aerosol generation system shown in Figure 6, but in an inoperative configuration.

With reference to the Figures, an inhaler device 100 in the form of a personal vaporizer device (also known as an electronic smoking article or an "e-cigarette")

- 25     according to a preferred embodiment is illustrated.

The personal vaporizer device or e-cigarette 100 is generally elongate and has a substantially circular cylindrical shape. The e-cigarette 100 comprises a housing 2 which encloses a reservoir 3 for storing a liquid to be vaporized. The reservoir 3 has  
30     a generally annular form and surrounds a central core 4 of the housing 2. The mouthpiece includes a longitudinal member 6 which fits within the central core 4. The longitudinal member 6 is slideable within the central core 4 and is for conveying vapour formed from the liquid to a mouth of a user. The housing 2 includes a

transparent window 19 in an outer wall of the reservoir 3 so that a user can see how much liquid is present.

5 The housing 2 is connected to a power supply unit 30 which stores electrical potential or energy, e.g. in one or more batteries, enclosed within a cylindrical casing 31 of that unit 30. The power supply unit 30 is provided for delivering electrical power to an atomizer 20.

10 The mouthpiece 5 is configured for movement between an extended position (as shown in Figure 6) and a retracted position (as shown in Figure 7). A flow path P is provided for the liquid from the reservoir 3 to travel to the atomizer 20 where it can be vaporized. The flow path P includes one or more outlet ports 7 formed in a wall 11 of the reservoir 3, through which the liquid may flow under gravity and/or via capillary action (e.g. in the event of a narrow channel being provided) along the path  
15 P in the direction of the arrows towards the atomizer 20. The mouthpiece 5 includes a valve part or sealing part 8 which can block the outlet port 7 when the mouthpiece 5 is retracted. It is to be appreciated that a wall 11 of the central core 4 also constitutes the wall 11 of the reservoir 3 in which the outlet ports 7 are formed.

20 In one arrangement a spring (not shown) may be provided to bias the mouthpiece 5 in its retracted configuration. However, in the embodiment shown the mouthpiece 5 is not biased, and must be actuated manually.

25 A grasp ring 10 is provided adjacent the transparent window 19. The grasp ring 10 can be used to hold the e-cigarette 100 in normal use. Also, a user can hold the grasp ring 10 while actuating the mouthpiece 5.

30 The base of the grasp ring 10 is internally threaded (not shown). The power supply unit 30 includes an external thread, which can be connected to the internal thread of the grasp ring 10. In this way, the power supply unit 30 can be connected to the housing 2. In other arrangements a bayonet connection or a clip can be provided to create a secure connection. With the power supply unit 30 connected to the housing 2 (as shown in Figure 1) an upper wall of the power supply unit 30 abuts a lower surface of the atomizer 20. This arrangement effectively locks the mouthpiece

5 in its extended configuration. The mouthpiece 5 cannot therefore be actuated when the power supply unit 30 is connected to the housing 2.

The atomizer 20 includes a number of component parts. The aerosol generator 26  
5 is provided within a lower atomizer sleeve 22. The lower atomizer sleeve 22 is connected to an upper atomizer sleeve 24, which has a slightly larger radius. An electrical connector 28 is provided at one end of the atomizer 20, adjacent the upper atomizer sleeve 24, for connection to the power supply unit 30. In Figures 6 and 7 the upper atomizer sleeve 24 is depicted below the lower atomizer sleeve 22.

10

In use, the atomizer 20 is received within an internal bore 12 of the grasp ring 10. The internal bore 12 contains a number of o-rings 14 which have an internal radii that are slightly smaller than the respective external radii of the lower atomizer sleeve 22 and the upper atomizer sleeve 24. The frictional engagement between  
15 the o-rings 14 and the sleeves 22, 24 is enough to hold the atomizer 20 securely in place when the mouthpiece is in its extended position and the atomizer 20 is fully received in the bore 12.

With the atomizer 20 installed in the grasp ring 10, the lower end of the longitudinal  
20 member 6 abuts the atomizer 20, adjacent the lower sleeve 22. As illustrated in Figures 6 and 7, actuation of the mouthpiece 5 from the extended position to the retracted position causes the atomizer 20 to move downwards within the grasp ring 10. With the mouthpiece 5 in its fully retracted position, as shown in Figure 7, the o-rings 14 that were previously in contact with the upper atomizer sleeve 24 are now  
25 positioned adjacent the lower atomizer sleeve 22. The lower atomizer sleeve 22 has a smaller radius than the upper atomizer sleeve 24, and therefore the o-rings 14 have a much looser grip on the atomizer 20 in this configuration. In preferred embodiments the gripping force between the o-rings 14 and the lower atomizer sleeve 22 is less than the force of gravity that acts on the atomizer 20. Thus, the  
30 atomizer 20 can simply drop out of the grasp ring 10 when the mouthpiece 5 is depressed. This can allow a user to eject the atomizer 20 without touching it directly. This is advantageous because the atomizer 20 may be hot immediately after use. In addition, the atomizer 20 may have liquid residue on it from the reservoir 3, which it is preferable for the user to avoid.

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In order to remove the atomizer 20 the user must first unscrew and remove the power supply unit 30 from the housing 2. The user can then actuate the mouthpiece 5 by moving it from the extended position to the retracted position. This slides the atomizer 20 relative to the grasp ring 10 so that it can drop out of the open end. A fresh atomizer 20 can then be introduced into the internal bore 12 of the grasp ring 10. An upper surface of the fresh atomizer 20 introduced to the grasp ring 10 acts on a lower surface of the longitudinal member 6. Thus, sliding a fresh atomizer 20 into the grasp ring 10 can cause the mouthpiece 5 to move from its retracted position into its extended position. The power supply unit 30 can then be re-attached so that the e-cigarette 100 is ready for use.

Advantageously the valve 8 isolates the liquid in the reservoir 3 from the atomizer 20 when the mouthpiece 5 is in its retracted position. Therefore, a used atomizer 20 can be ejected and replaced without any liquid leaking from the reservoir 3.

**CLAIMS**

1. An electrically operated aerosol generation system, comprising:  
5 a housing;  
an atomizer that can be received by the housing;  
a reservoir configured to supply vaporisable liquid to the atomizer;  
a mouthpiece assembly which is actuatable relative to the housing in  
order to eject the atomizer from the housing; and  
10 a power supply unit configured for connection with the housing.
2. The electrically operated aerosol system of claim 1, wherein the atomizer  
is slidably received in the housing, and is held in place by frictional engagement.
- 15 3. The electrically operated aerosol system of claim 1 or claim 2, wherein  
the mouthpiece assembly is arranged to actuate the atomizer between an  
operative position in which vaporisable liquid can be supplied to the atomizer  
from the reservoir, and an inoperative position in which vaporisable liquid cannot  
be supplied to the atomizer from the reservoir.  
20
4. The electrically operated aerosol system of claim 3, wherein the  
mouthpiece assembly is in an extended position when the atomizer is received  
in the housing and the mouthpiece assembly is in a retracted position when the  
atomizer is ejected from the housing.  
25
5. The electrically operated aerosol system of claim 3 or claim 4, wherein  
the mouthpiece assembly is configured to close or to block a flow path between  
the atomizer and the reservoir in the inoperative position.
- 30 6. The electrically operated aerosol system of claim 5, wherein the  
mouthpiece comprises a sealing portion which closes or blocks the flow path.

7. The electrically operated aerosol system of any preceding claims, wherein the connection between the power supply unit and the housing inhibits actuation of the mouthpiece assembly.
- 5 8. The electrically operated aerosol system of any preceding claims, further comprising a viewing window in the housing for a user to inspect the volume of vaporisable liquid in the reservoir.
9. The electrically operated aerosol system of any preceding claims,  
10 wherein the mouthpiece assembly comprises an elongate member having an airflow channel extending longitudinally thereof.
10. The electrically operated aerosol system of any preceding claims, wherein the mouthpiece assembly is configured for translational or sliding  
15 movement relative to the housing, when actuated.
11. The electrically operated aerosol system of any of claims 1 to 9, wherein the mouthpiece assembly is configured for rotational movement, when actuated.
- 20 12. A method of removing an atomizer in an electrically operated aerosol generation system, comprising a housing; an atomizer that can be received by the housing; a reservoir configured to supply vaporisable liquid to the atomizer; a mouthpiece assembly which is actuatable relative to the housing; and a power supply unit configured for connection with the housing, the method comprising  
25 the step of actuating the mouthpiece assembly relative to the housing in order to eject the atomizer from the housing.
13. The method of claim 12, comprising the step of disconnecting the power supply unit before actuating the mouthpiece assembly.

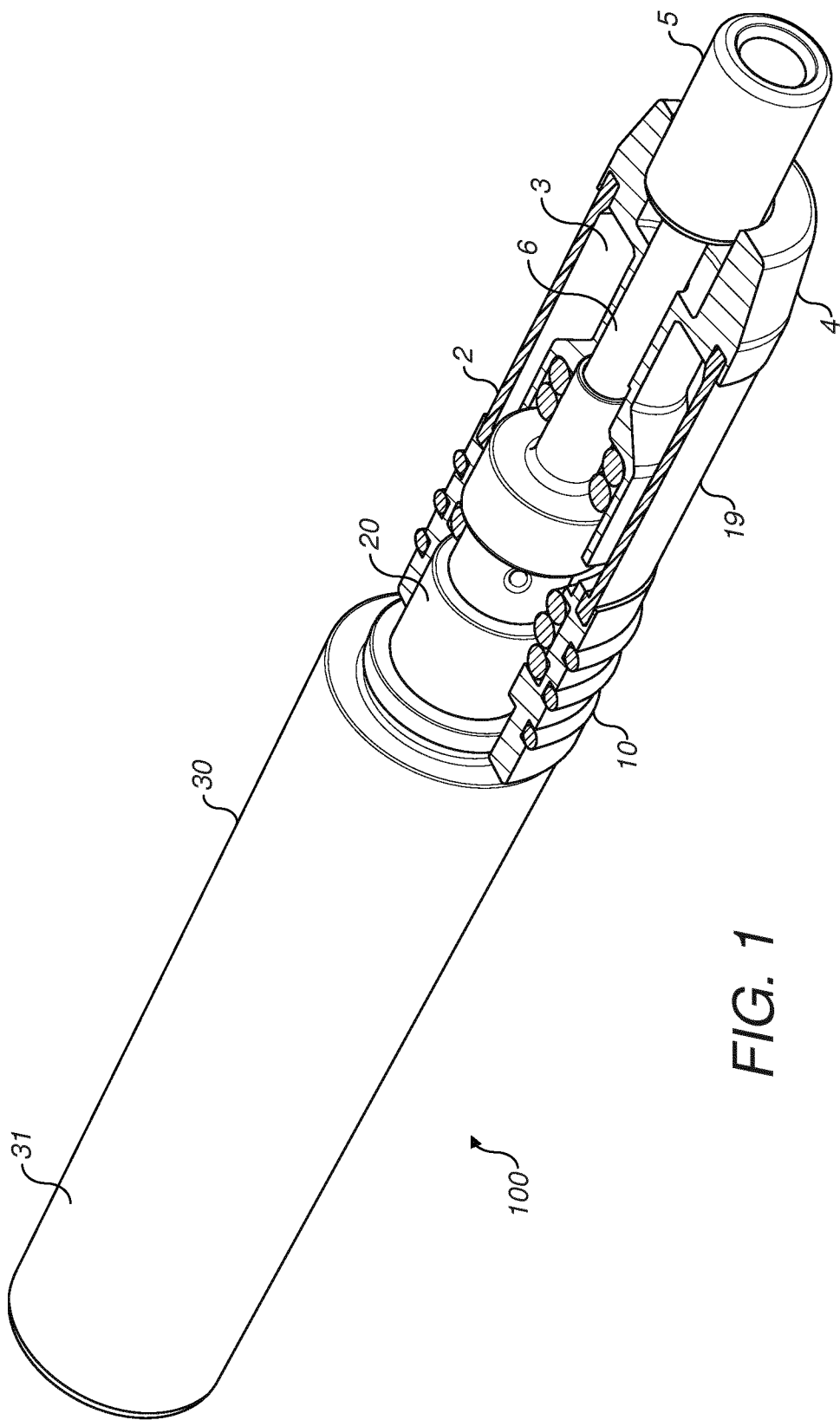


FIG. 1

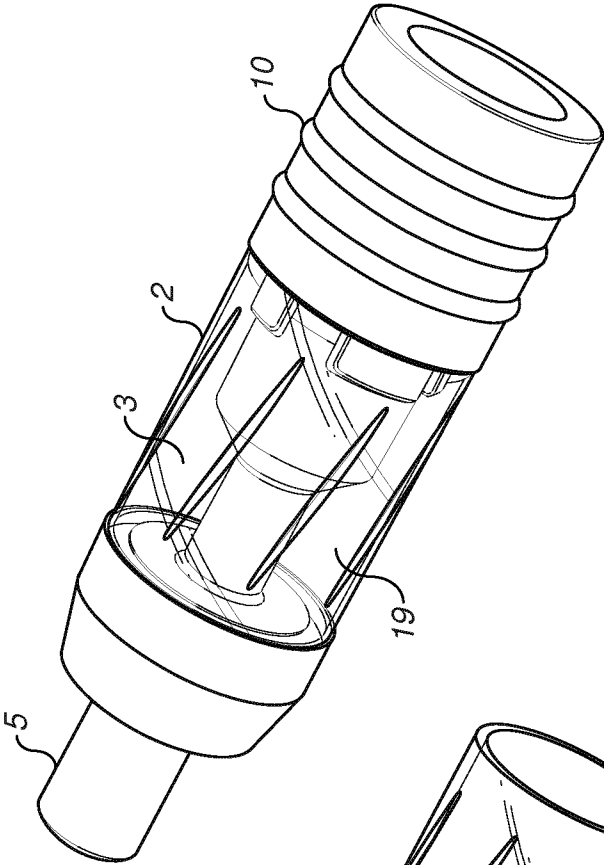


FIG. 2

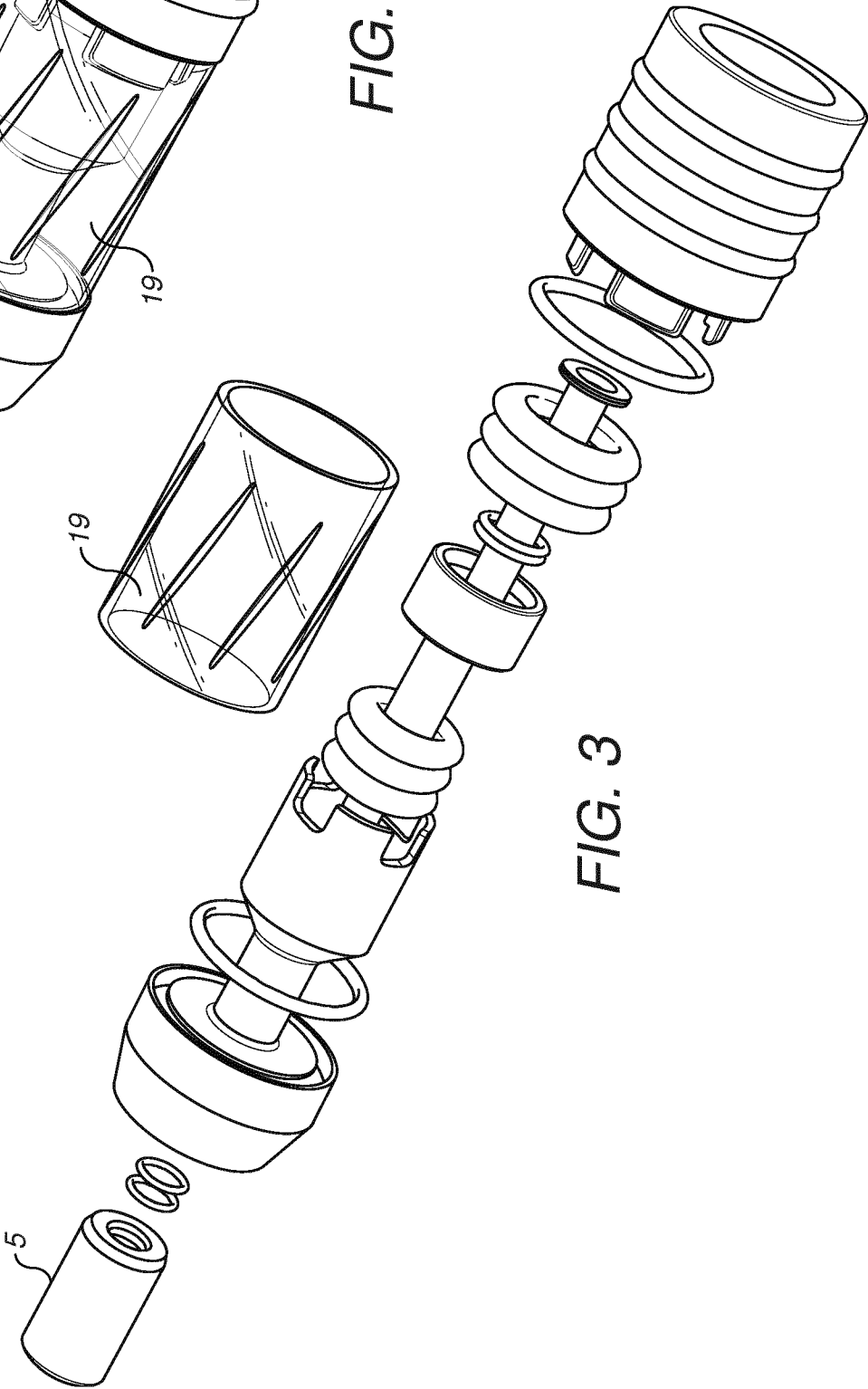


FIG. 3

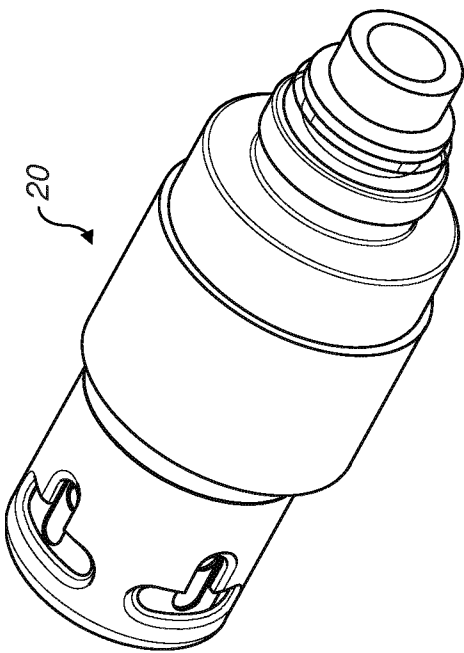


FIG. 4

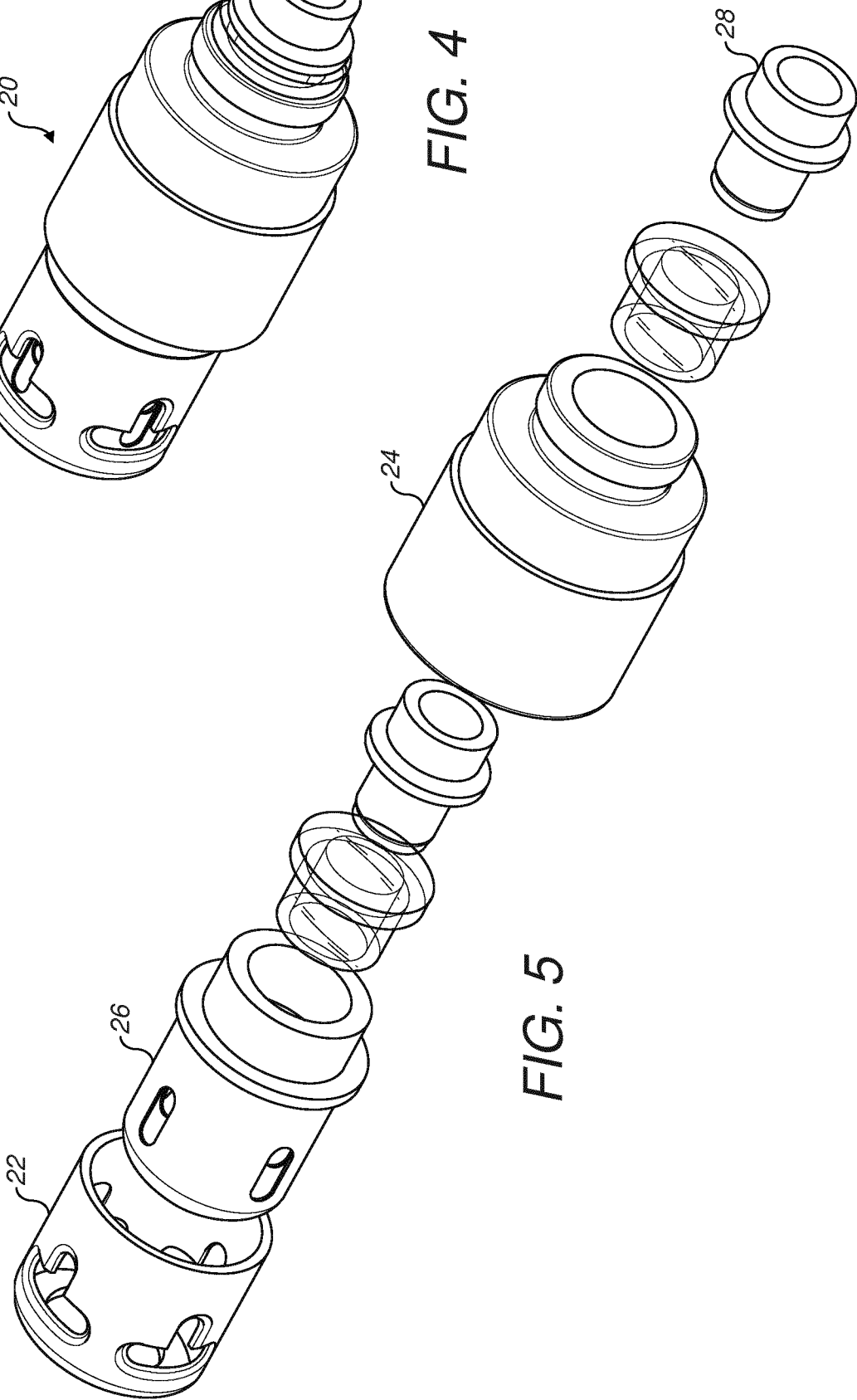


FIG. 5

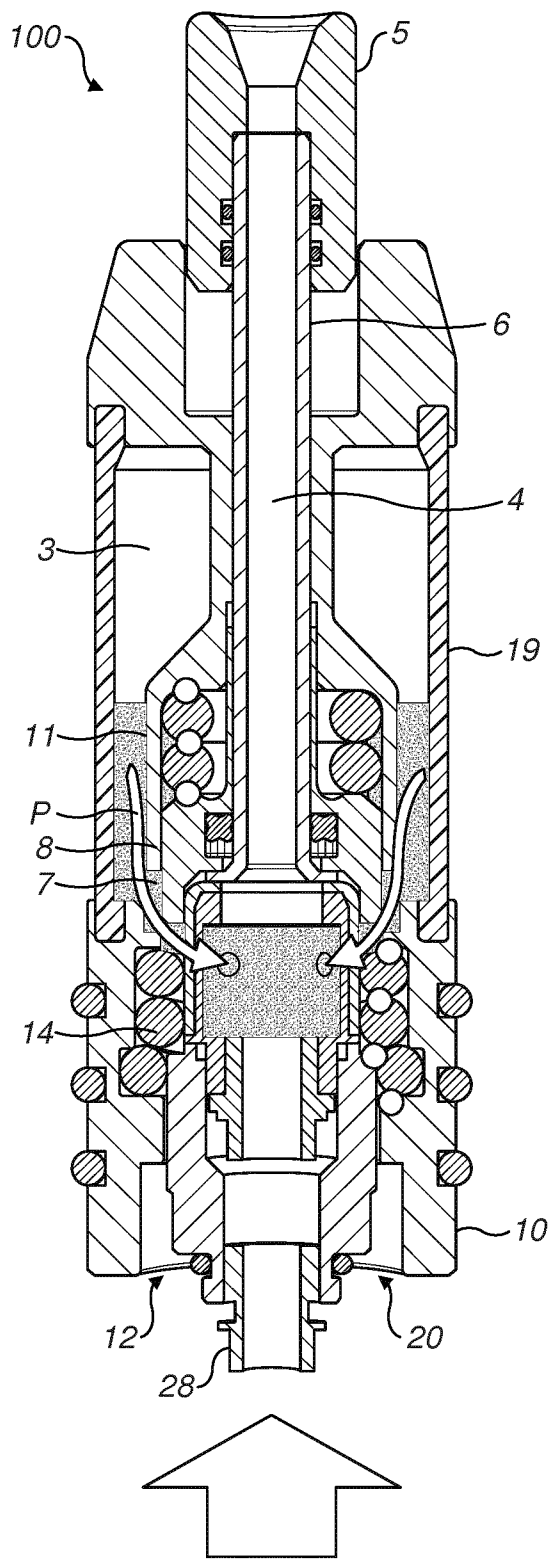


FIG. 6

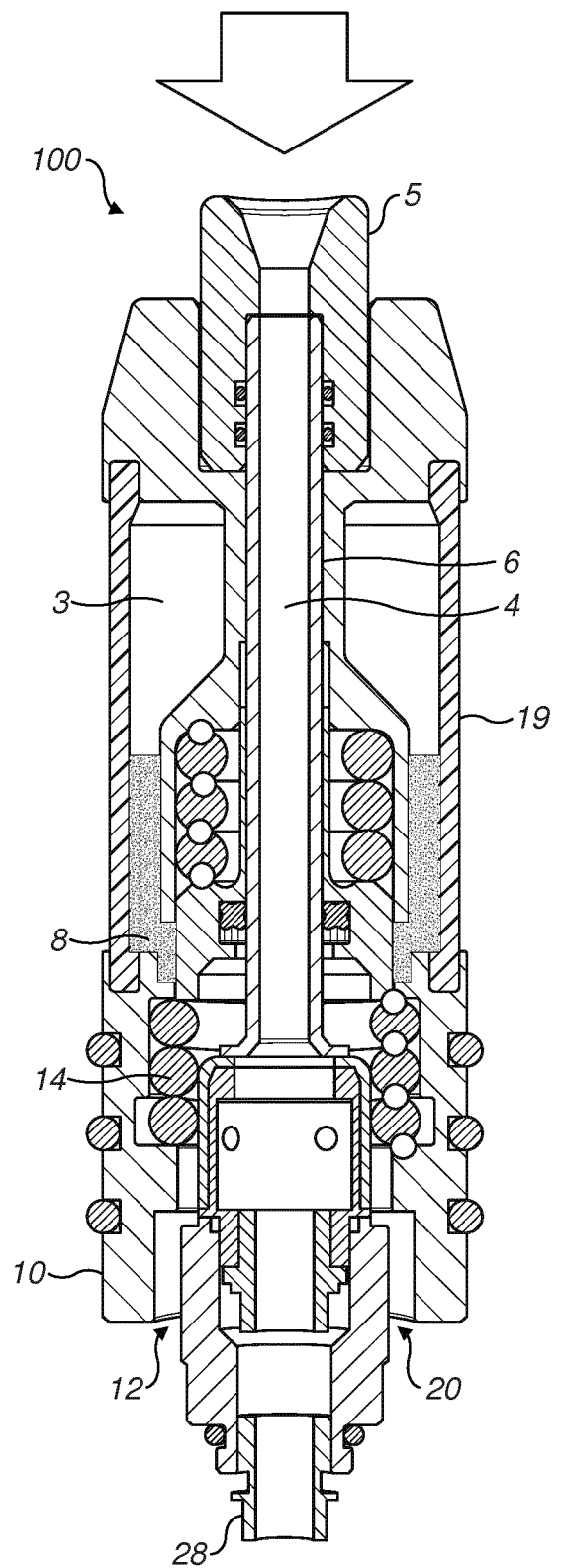


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/064068

A. CLASSIFICATION OF SUBJECT MATTER  
INV. A61M15/06 A24F47/00  
ADD.

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

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
A61M A24F

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2016/045076 A1 (SHENZHEN SMOORE TECHNOLOGY LTD [CN]) 31 March 2016 (2016-03-31) abstract; figures 1-12 -----	1-13
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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