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(71) Applicant: **JT International SA**
1202 Geneva (CH)

(72) Inventor: **ZOMINY, Claude**
74350 Copponex (FR)

(74) Representative: **Weihs, Bruno Konrad**
ANDRE ROLAND SA
P.O. Box 5107
1002 Lausanne (CH)

(54) **AEROSOL GENERATING SYSTEM**

(57) An aerosol generating system comprises a conically shaped heating element (101) configured to generate the aerosol by evaporating a vaporizable material on a slanted surface (104) of said conically shaped heating element, and a vaporizable material consumable (102) configured to contain a vaporizable material (103), whereby the vaporizable material consumable comprises a conically shaped contacting element having a slanted surface (106) configured to mate with the conically shaped heating element. The system further comprises a movable element (108) that is located in the conically shaped contacting element and is configured to be actuated at a time of mating with the conically shaped heating element to form a fluidic passage (105) such that vaporizable material may flow out of the vaporizable material consumable toward the conically shaped heating element.

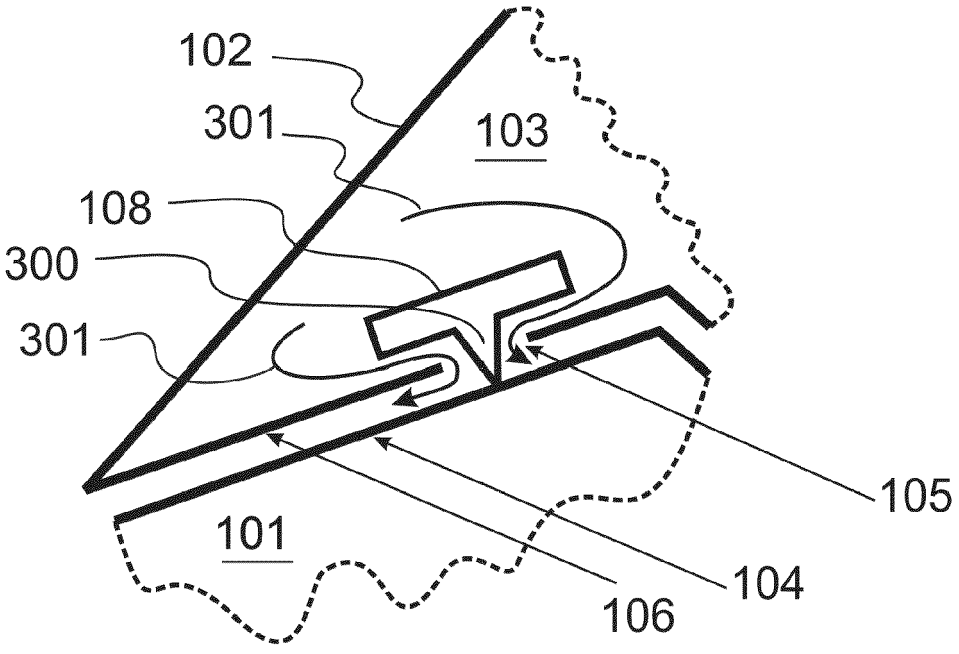

FIGURE 3

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Description

FIELD OF THE INVENTION

[0001] The present disclosure relates to elements for an aerosol generating system and for producing an aerosol or vapor for inhalation by a user. The present disclosure relates more particularly to an aerosol generating system with a conically-shaped heating element and a corresponding vaporizable material cartridge / consumable for holding a vaporizable material substance for producing an aerosol or vapor.

BACKGROUND

[0002] The use of aerosol generating systems, also known as e-cigarettes, e-cigs (EC), electronic nicotine delivery systems (ENDS), electronic non-nicotine delivery systems (ENNDS), electronic smoking devices (ESDs), personal vaporizers (PV), inhalation devices, vapes, which can be used as an alternative to conventional smoking articles such as lit-end cigarettes, cigars, and pipes, is becoming increasingly popular and widespread. The most commonly used e-cigarettes are usually battery powered and use a resistance heating element to heat and atomize a liquid containing nicotine and/or flavorants (also known as e-cigarette liquid, e-cig liquids, e-liquid, juice, vapor juice, smoke juice, e-juice, e-fluid, vape oil), to produce an aerosol (often called vapor) which can be inhaled by a user.

[0003] In the conventional e-cigarettes described above, the liquid is put into contact with a resistance heating element after flowing through small channels, where it is heated and vaporized. The flowing is realized for example via a wick, a mesh or another type of porous element, which has a plurality of small channels that transport the liquid from a reservoir to the heating element. This heating element together with the porous element, a reservoir that contains the e-liquid, and a mouthpiece may be arranged within a disposable capsule, cartridge or pod, that is discarded or refilled once the e-liquid has been consumed by the user, and usually removably connects to a main body that includes a rechargeable battery.

[0004] A specific type of aerosol generating systems makes use of a conically-shaped heating element, and a correspondingly designed capsule of smoking substance that fits on the conically shaped heating element.

[0005] Chinese publication CN204120237 discloses an example of an aerosol generating system with a conically-shaped heating element, i.e., an integrally casted truncated cone-shaped heating surface made of porous ceramic wherein an electric heating wire is wound on the outer surface of it, which is arranged to be received in a tobacco capsule cavity shaped accordingly. However, the capsule does not contain any e-liquid.

[0006] In case an e-liquid capsule is used in an aerosol generating system with a conically-shaped heating element, and the e-liquid capsule needs to be removed from the heating device, some e-liquid may remain inside of it. Remaining e-liquid may leak out from the capsule into a user's pocket, a user's bag or directly onto the user.

[0007] One aim of the invention is to address the issue of preventing e-liquid from possibly flowing out of the capsule onto the user when the capsule is removed from the conically-shaped heating element of the aerosol generating system.

[0008] Consequently, the background art presents a number of deficiencies and problems and the present disclosure seeks to address these difficulties.

SUMMARY

[0009] It is therefore one aspect of the present disclosure to provide an aerosol generating system comprising a conically shaped heating element configured to generate the aerosol by evaporating a vaporizable material on a slanted surface of said conically shaped heating element, and a vaporizable material consumable configured to contain a vaporizable material, whereby the vaporizable material consumable comprises a conically shaped contacting element having a slanted surface configured to mate with the conically shaped heating element. The system further comprises a movable element that is located in the conically shaped contacting element and is configured to be actuated at a time of mating with the conically shaped heating element to form a fluidic passage such that vaporizable material may flow out of the vaporizable material consumable toward the conically shaped heating element.

[0010] In a preferred embodiment, the movable element is provided in a wall of the contacting element slanted surface.

[0011] In a further preferred embodiment, the movable element comprises a plurality of lids that are distributed in a symmetrical manner in the conically shaped contacting element.

[0012] In a further preferred embodiment of the aerosol generating system, when actuated, the movable element is configured to open at least a valve, which is configured to release the vaporizable material in the fluidic passage toward an area to be heated.

[0013] In a further preferred embodiment, the movable element is configured to close the fluidic passage and stop vaporizable material flowing out of the vaporizable material consumable when the conically shaped heating element is un-mated from the contacting element.

[0014] In a further preferred embodiment, the system further comprises at least one fixed pushing element formed on the conically shaped heating element, configured to correspond to the movable element, such that the at least one fixed pushing element interacts with the movable element at the time of mating to actuate the movable element.

[0015] In a further preferred embodiment, the at least one fixed pushing element protuberates from the slanted

surface of the heating element.

[0016] In a further aspect, the invention provides a vaporizable material consumable for an aerosol generating system, comprising a conically shaped contacting element with a slanted surface, and a movable element that is located inside the conically shaped contacting element and is actuatable to form a fluidic passage such that vaporizable material flows out of the vaporizable material consumable.

[0017] In a further preferred embodiment, the movable element is provided in a wall of the slanted surface.

[0018] In a further preferred embodiment, the movable element comprises a plurality of lids that are distributed in a symmetrical manner in the conically shaped contacting element.

[0019] In a further preferred embodiment, when actuated, the movable element opens at least a valve, which is configured to release the vaporizable material in the fluidic passage.

[0020] The above and other objects, features and advantages of the present invention and the manner of realizing them will become more apparent, and the invention itself will best be understood from a study of the following description with reference to the attached drawings showing some preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The accompanying drawings, which are incorporated herein and constitute part of this specification, illustrate the presently preferred embodiments of the invention, and together with the general description given above and the detailed description given below, serve to explain features of the invention.

Figure 1 illustrates and exemplary embodiment of an aerosol generating system;
figure 2 contains a magnified illustration of a part of a vaporizable material consumable of the aerosol generating system;
figure 3 contains a further magnified illustration of the same part of the vaporizable material consumable as in figure 2;
figure 4 contains a schematic illustration of a preferred embodiment of the aerosol generating system according to the invention;
figure 5 shows a lid holder as illustrated in figure 4;
figures 6A and 6B contain schematic illustrations of a further preferred embodiment of the aerosol generating system according to the invention; and
figure 7 illustrates a further example embodiment of the aerosol generating system according to the invention.

[0022] Herein, identical reference numerals are used, where possible, to designate identical elements that are common to the Figures. Also, the images are simplified for illustration purposes and may not be depicted to scale.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] In the present detailed description of preferred embodiment, the term vaporizable material *consumable* will be used to designate any one of a cartridge, or capsule that includes a chamber or reservoir containing or holding at least one vaporizable material or at least one vapor or aerosol generating substance. The term vaporizable material is used to designate any material that is vaporizable at a temperature up to 400°C, preferably up to 350°C, for example aerosol generating liquid, gel, wax and the like.

[0024] An exemplary embodiment of an aerosol generating system 100 according to the present disclosure is shown, for instance, in Figure 1. Figure 1 depicts an exemplary schematic view of the aerosol generating system 100 that comprises a conically-shaped heating element 101 and a vaporizable material consumable 102, both illustrated in a symbolic representation.

[0025] The aerosol generating system 100 is, for example, to be used in or included in an aerosol generating device, an inhalation device or an electronic cigarette.

[0026] The conically-shaped heating element 101 is configured to generate the aerosol (the aerosol is not represented in Figure 1) by evaporating vaporizable material 103 on a convex slanted surface 104. The process of evaporating vaporizable material to generate the aerosol is well known in the art and will not be described herein in more detail.

[0027] The vaporizable material consumable 102 contains the vaporizable material 103, which may flow out towards the convex slanted surface 104 through at least one hole 105 operated in a wall of the vaporizable material consumable, provided that the at least one hole 105 is not obstructed. The vaporizable material consumable comprises a conically-shaped cavity 107 delimited by a concave slanted surface 106 configured to mate with the conically-shaped heating element 101 along the convex slanted surface 104. The at least one hole 105 is located on the concave slanted surface 106 and may enable a fluidic passage for the vaporizable material 103 located inside the vaporizable material consumable 102 and a space delimited by the concave slanted surface 106 and the convex slanted surface 104.

[0028] A size and shape of the conically shaped cavity 107 are configured such that they substantially match the conically-shaped heating element 101 at a time of mating. It may optionally be possible to foresee a determined gap between the convex slanted surface 104 and the concave slanted surface 106, which may be useful to accommodate for example, a layer of mesh or other porous material. This is useful to receive the vaporizable material 103 inside the mesh or other porous material and evaporate it in a known manner. The layer of mesh or other porous material are not illustrated in Figure 1.

[0029] The aerosol generating system further comprises a movable element 108 that is located at least partly inside the conically shaped cavity 107. The movable element 108 is typically configured to close the at least one hole 105 at least before the vaporizable material consumable 102 is mated with the conically-shaped heating element 101 for a first time. The movable element 108 is further configured to be actuated at the time of mating between the vaporizable material consumable 102 and the conically-shaped heating element 101 to form the fluidic passage in such a manner that the vaporizable material 103 may flow out of the vaporizable material consumable 102 towards the conically-shaped heating element 101. This fluidic passage is formed by effectively opening the at least one hole 105, which happens when the movable element 108 is actuated.

[0030] Referring now to Figure 2, this contains a magnified illustration of a part of the vaporizable material consumable 102 of the aerosol generating system in a state before the vaporizable material consumable 102 mates with the conically-shaped heating element (the latter is not illustrated in Figure 2). The movable element 108 is positioned to close the hole 105. The movable element 108 may be spring loaded using a spring mechanism in a known manner (spring mechanism not illustrated in Figure 2) such that pressure necessary to close the hole 105 is exerted.

[0031] Referring now to Figure 3, this contains a magnified illustration of the same part of the vaporizable material consumable 102 as illustrated in Figure 2, except that the state here is after mating between the vaporizable material consumable 102 and the conically-shaped heating element 101, similar as the state shown in Figure 1. The movable element 108 is shown in an open position, which is reached after the movable element 108 has been actuated at the time of mating, this having caused a pin 300 of the movable element 108 that shows through the hole 105 to be pushed out of the conically shaped cavity, and thereby causing the movable element 108 to move inside the vaporizable material consumable 102. In this state the vaporizable material 103 may flow out of the hole 105 as represented by arrows 301. It can be understood from Figure 3, that the vaporizable material 103 comes into contact with the convex slanted surface 104 of the conically-shaped heating element 101.

[0032] Referring now to Figure 4, this contains a schematic illustration of a preferred embodiment 400 of the aerosol generating system according to the invention. The object are represented in 3 dimensions, however the proportions and sizes have been selected to favor good readability. The vaporizable material consumable 402 is represented in transparency, near to mating state with the conically-shaped heating element 401 that can be seen inside the delimitations of the vaporizable material consumable 402. The movable element here comprises two lids 403 that at located at the extremities of a lid holder 404. A structure of the lid holder 404 and the material used to manufacture it enable a spring loading of both lids 403. Both lids may comprise a pin, not illustrated in Figure 4, similar to the pin 300 illustrated in Figure 3. These pins enable both lids 403 to be actuated at the time when the vaporizable material consumable 402 and the conically-shape heating element are mating, thereby bending and pushing both lids 403 inside the volume of the vaporizable material consumable 402, and forming the fluidic passage in a similar manner as explained in the discussion of Figures 1 to 3. The detailed illustration of the elements required to realize this is contained in those Figures 1 to 3 and has been left out of Figure 4 for a better readability. While Figure 4 illustrates a pair of lids 403 arranged in a symmetrical fashion, it is possible also to have more than 2 lids by adapting the lid holder 404 accordingly. Preferably the lids 403 are distributed to be located in a circumference of the conically shape cavity of the vaporizable material consumable 402 in a symmetrical manner. They may be diametrically opposed in pairs in case of having 2, 4 or 6 lids, or form a triangle in case of having 3 lids.

[0033] Figure 5 shows the lid holder 404 alone with both lids 403. Preferably the lid holder may be manufactured separately from a body of the vaporizable material consumable and then installed into place before the vaporizable material is filled into the vaporizable material consumable.

[0034] Figures 6A and 6B contain schematic illustrations of a further preferred embodiment of the aerosol generating system 600 according to the invention. In Figure 6A, the conically-shaped heating element 601 is inserted into the corresponding conically-shaped cavity of vaporizable material consumable 602. The movable element comprises at least one bendable section 603 of the wall of the conically-shaped cavity (2 bendable sections 603 are illustrated in Figure 6A), which under proper actuation by pressure of the conically-shaped heating element 601 at the time of mating, bend to the inside volume of the vaporizable material consumable 602. The actuation of the pressure is represented by arrows 604. When bent, the bendable section 603 forms the fluidic passage in a similar manner as explained in the discussion of Figures 1 to 3. The detailed illustration of the elements required to realize this is contained in those Figures 1 to 3 and has been left out of Figure 6A for a better readability. While Figure 6A illustrates a pair of bendable sections 603 arranged in a symmetrical fashion, it is possible also to have more than 2 bendable sections 603 by adapting the wall of the vaporizable material consumable 602 in its cavity accordingly. Preferably the bendable sections 603 are distributed to be located in a circumference of the conically shape cavity of the vaporizable material consumable in a symmetrical manner. They may be diametrically opposed in pairs in case of having 2, 4 or 6 bendable sections 603, or form a triangle in case of having 3 bendable sections.

[0035] Figure 6B shows the vaporizable material consumable 602 of the aerosol generating system 600 in a state when the conically-shape heating element is re-

moved (the latter is not illustrated in Figure 6B). In this state the bendable section 603 pushes back according to arrows 605 to close the fluidic passage and prevent vaporizable material from leaking out of the vaporizable material consumable 602.

[0036] Figure 7 illustrates a further example embodiment of the aerosol generating system 700 according to the invention. In this embodiment the conically-shaped heating element 701 comprises at least one fixed pushing element 703. In Figure 7, the conically-shaped heating element 701 is illustrated in the upper part of the Figure in the mating state with the vaporizable material consumable 702, and also in the lower part of the Figure where it is isolated from the aerosol generating system and shown in an upper view looking towards the tip of the conically-shape heating element. The vaporizable material consumable 702 comprises the movable part 704, which may open and close a valve to form the fluidic passage between the inside of the vaporizable material consumable 702 and the mated conically-shaped heating element 701. The valve is not illustrated in details, and is understood to be realized in intimate contact with the movable part 704. The at least one fixed pushing element 703 is configured to push on the movable part 704, thereby opening the valve. Preferably, the conically-shaped heating element may be covered by a layer of insulating material 705 that surrounds at least a part of the surface of the heating element 701 located adjacent to each of the fixed pushing elements 703, and is configured such to insulate the fixed pushing elements 703 from heat produced by heating surfaces 706, thereby keeping the pushing elements 703 comparatively cool and avoiding that any vaporizable material in contact with the pushing elements 703 be heated up.

[0037] Implementations described herein are not intended to limit the scope of the present disclosure but are just provided to illustrate possible realizations.

[0038] In particular in an alternative embodiment of the invention not illustrated in the figures, the geometrical configuration of both the heating element 101 and cavity 102 may be inverted, meaning that the conically shaped heating element is configured as a cavity, and the vaporizable material consumable is configured to have a convex conically shaped part configured to mate with the frusto-conically shaped heating element. This provides similar technical effects and advantages of easily and precisely centering the vaporizable material consumable in the corresponding cavity of the heating element while allowing similarly to actuate the movable element arranged in the slanted wall of the convex slanted surface of the consumable.

[0039] While the invention has been disclosed with reference to certain preferred embodiments, numerous modifications, alterations, and changes to the described embodiments, and equivalents thereof, are possible without departing from the sphere and scope of the invention. Accordingly, it is intended that the invention not be limited to the described embodiments and be given the broadest reasonable interpretation in accordance with the language of the appended claims. The features of any one of the above described embodiments may be included in any other embodiment described herein.

Claims

1. An aerosol generating system comprising
a conically shaped heating element configured to generate the aerosol by evaporating a vaporizable material on a slanted surface of said conically shaped heating element, and
a vaporizable material consumable configured to contain a vaporizable material, whereby the vaporizable material consumable comprises a conically shaped contacting element having a slanted surface configured to mate with the conically shaped heating element,
a movable element that is located in the conically shaped contacting element and is configured to be actuated at a time of mating with the conically shaped heating element to form a fluidic passage such that vaporizable material may flow out of the vaporizable material consumable toward the conically shaped heating element.

2. The aerosol generating system of claim 1, wherein the movable element is provided in a wall of the contacting element slanted surface.

3. The aerosol generating system of any one of claims 1 to 2, wherein
the movable element comprises a plurality of lids that are distributed in a symmetrical manner in the conically shaped contacting element.

4. The aerosol generating system of any one of claims 1 to 3, wherein
when actuated, the movable element is configured to open at least a valve, which is configured to release the vaporizable material in the fluidic passage toward an area to be heated.

5. The aerosol generating system of any one of claims 1 to 4, wherein
the movable element is configured to close the fluidic passage and stop vaporizable material flowing out of the vaporizable material consumable when the conically shaped heating element is un-mated from the contacting element.

6. The aerosol generating system of any one of claims 1 to 5, further comprising
at least one fixed pushing element formed on the conically shaped heating element, configured to correspond to the movable element, such that the at least one fixed pushing element interacts with the

movable element at the time of mating to actuate the movable element.

7. The aerosol generating system of claim 6, wherein the at least one fixed pushing element protuberates from the slanted surface of the heating element.

8. A vaporizable material consumable for an aerosol generating system, comprising
a conically shaped contacting element with a slanted surface,
a movable element that is located inside the conically shaped contacting element and is actuatable to form a fluidic passage such that vaporizable material flows out of the vaporizable material consumable.

9. The vaporizable material consumable of claim 8, wherein
the movable element is provided in a wall of the slanted surface.

10. The vaporizable material consumable of claim any one of claim 8 to 9, wherein
the movable element comprises a plurality of lids that are distributed in a symmetrical manner in the conically shaped contacting element.

11. The vaporizable material consumable of any one of claims 8 to 10, wherein
when actuated, the movable element opens at least a valve, which is configured to release the vaporizable material in the fluidic passage.

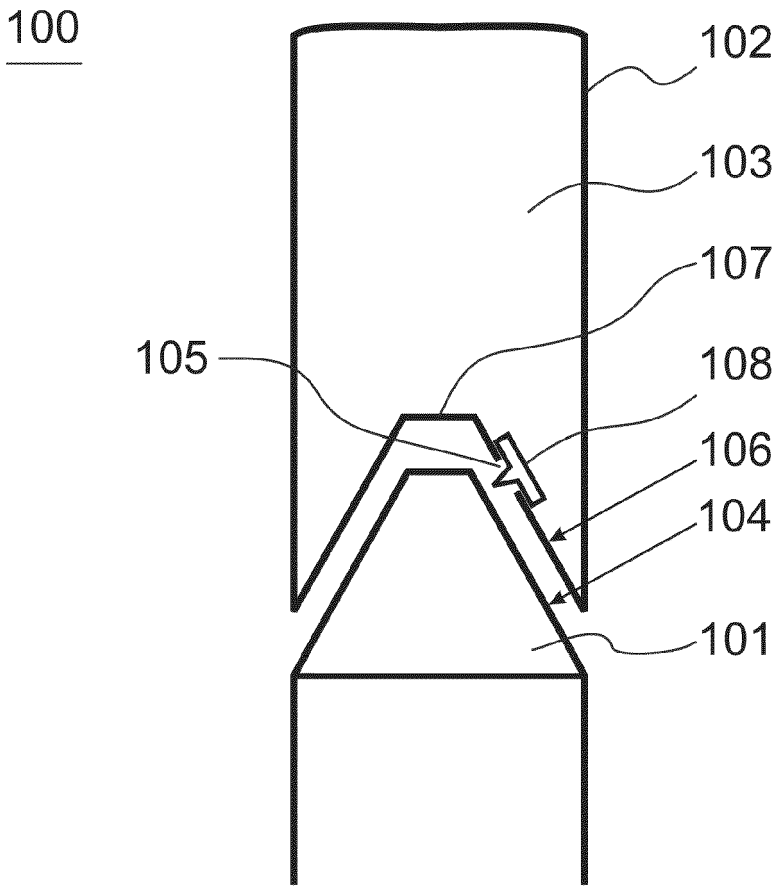

FIGURE 1

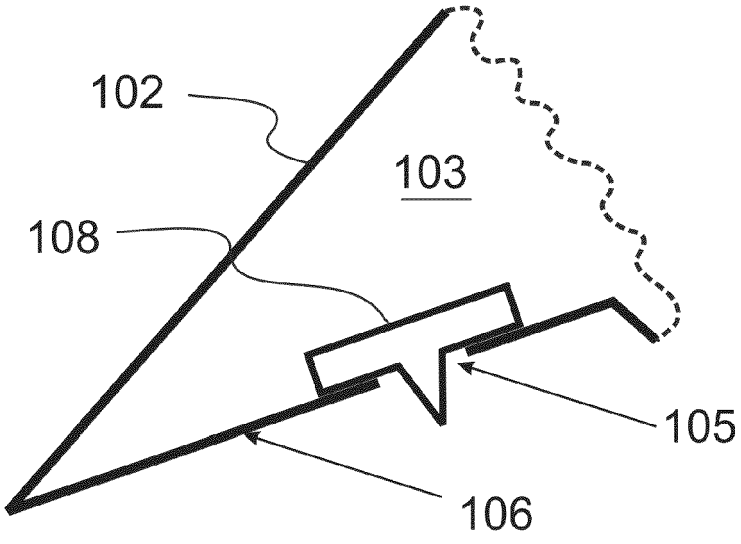

FIGURE 2

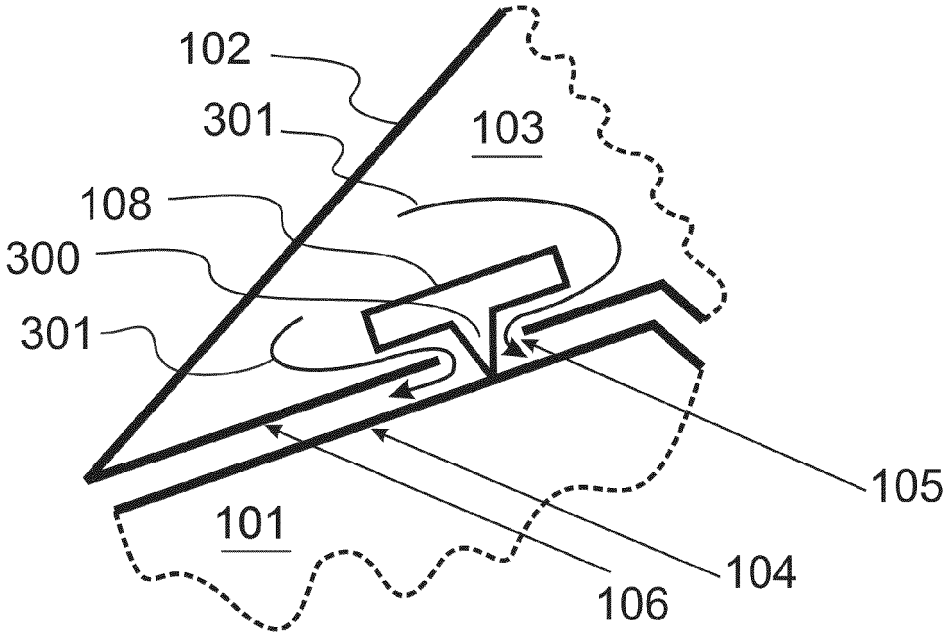

FIGURE 3

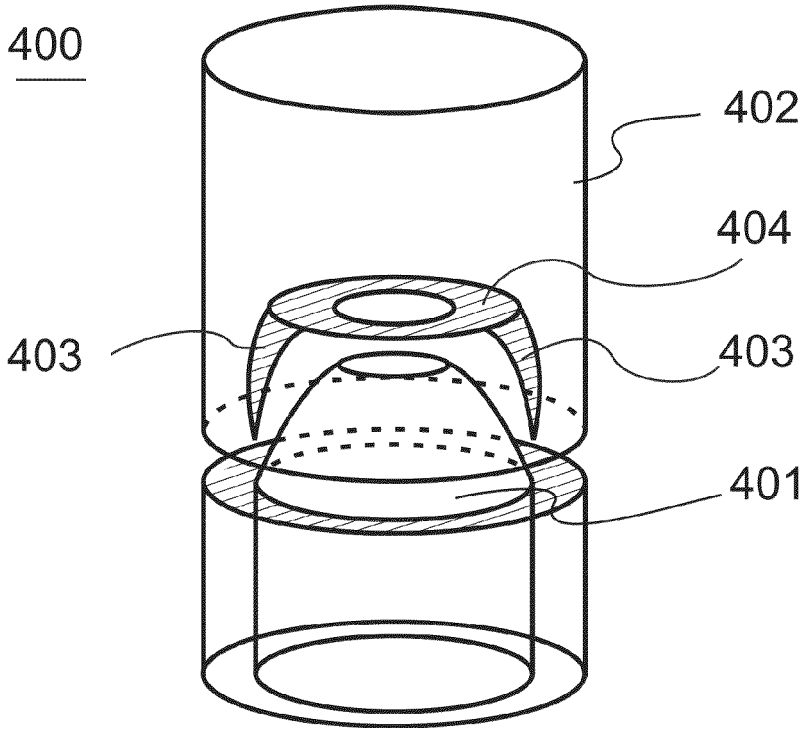

FIGURE 4

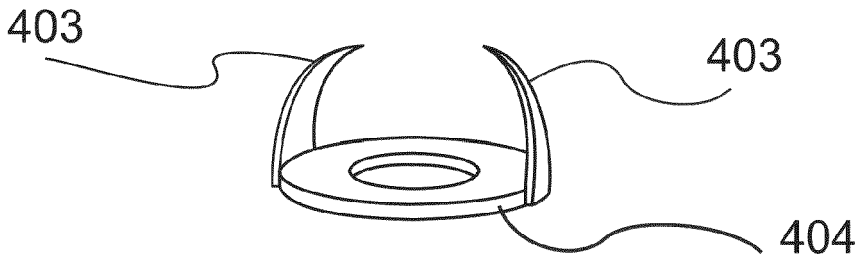

FIGURE 5

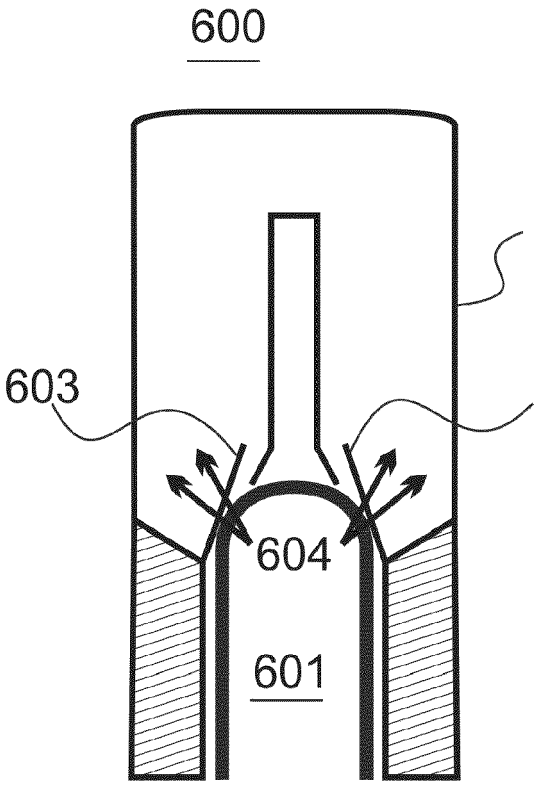

FIGURE 6A

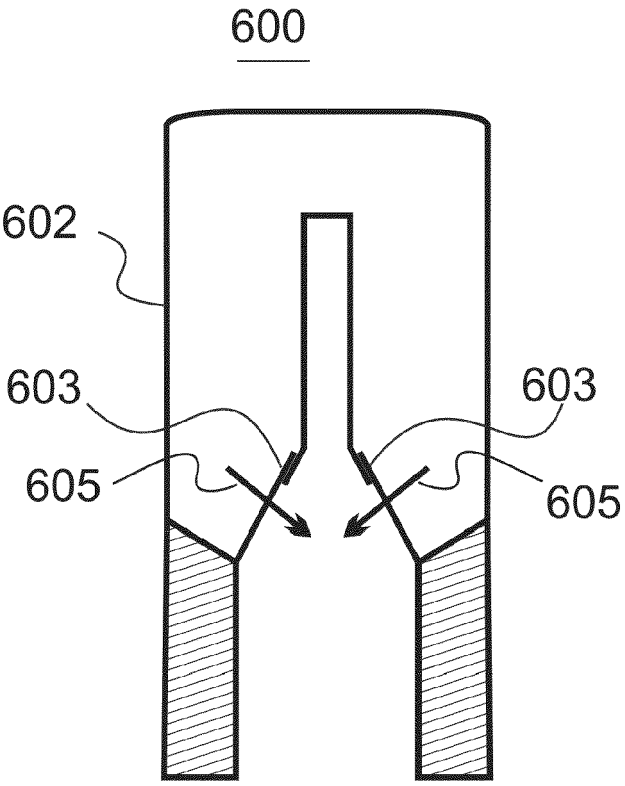

FIGURE 6B

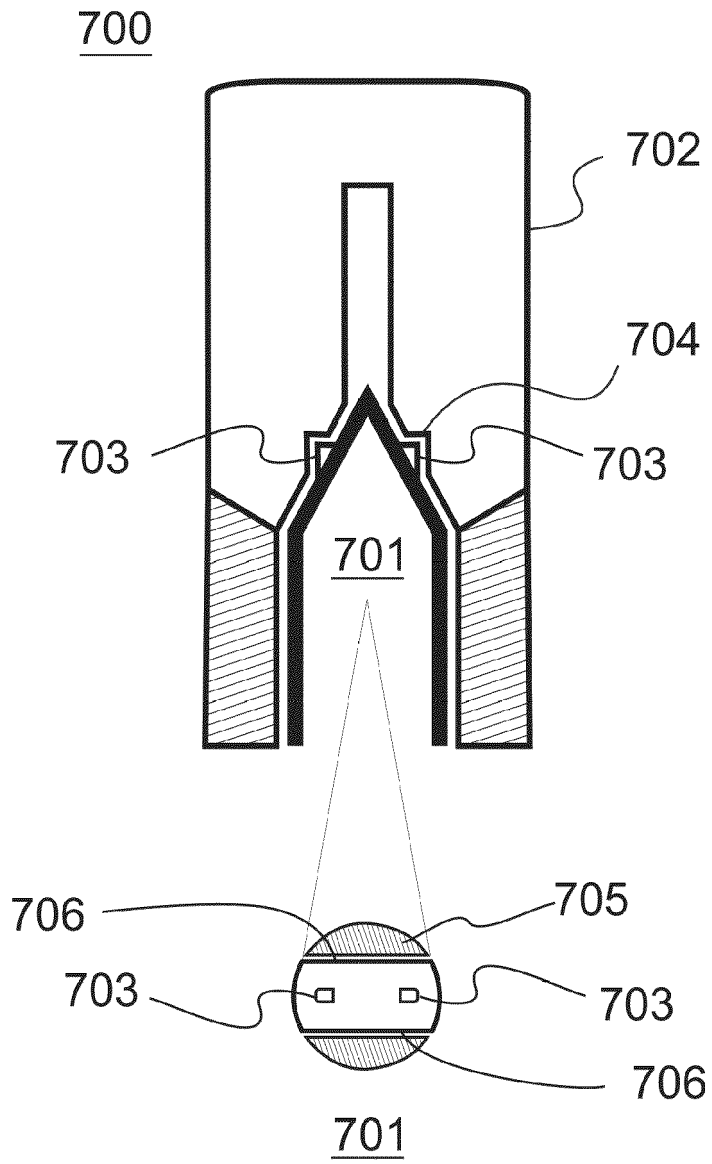

FIGURE 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 7062

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 October 2020	Espla, Alexandre

CATEGORY OF CITED DOCUMENTS

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

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