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(71) Applicant: **JT International S.A.**
1202 Geneva (CH)

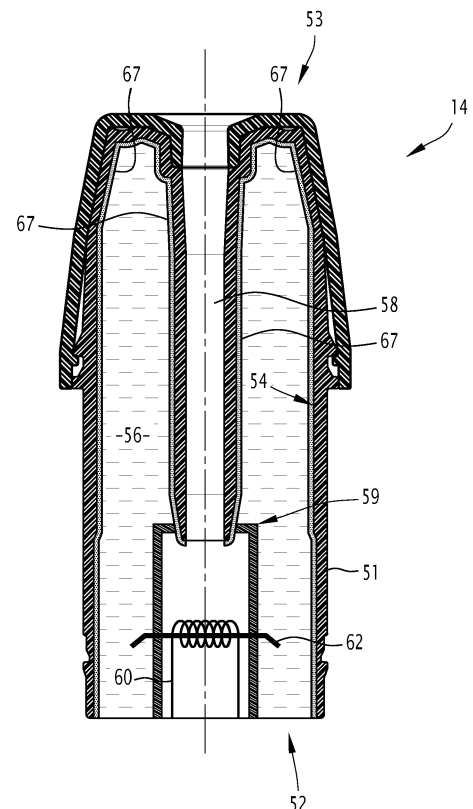
(72) Inventor: **JABER, Sami**
1160 WIEN (AT)

(74) Representative: **Lavoix**
2, place d'Estienne d'Orves
75441 Paris Cedex 09 (FR)

(54) A CARTRIDGE FOR STORING A VAPORIZABLE MATERIAL COMPRISING A COATING

(57) The present invention concerns a cartridge (14) for storing a vaporizable material for an aerosol generating device. The cartridge (14) comprises a cartridge body (51) defining an internal surface (54).

The cartridge (14) further comprises a coating (67) covering the internal surface (54) of the cartridge body (51) and being extractable from the cartridge body (51) before recycling the cartridge body (51).

**FIG.2****EP 4 140 333 A1**

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a cartridge for storing a vaporizable material for an aerosol generating device.

BACKGROUND OF THE INVENTION

[0002] Different types of aerosol generating devices are already known in the art. Generally, such devices comprise a storage portion for storing a vaporizable material, also known as aerosol forming precursor, which can comprise for example a liquid or a solid. A heating system is formed of one or more electrically activated resistive elements arranged to heat said precursor to generate the aerosol. The aerosol is released into a flow path extending between an inlet and outlet of the device. The outlet may be arranged in a mouthpiece, through which a user inhales for delivery of the aerosol.

[0003] The aerosol generating devices comprise generally a battery able to power the heating system. The powering may be controlled by a control module connecting the heating system to the battery via an electric circuit.

[0004] In some aerosol generating devices, the precursor is stored in a removable cartridge. Thus, when the precursor is consumed, the cartridge can be easily removed and replaced.

[0005] However, when the cartridge is empty, i.e. all the vaporizable material has been consumed, the cartridge is generally not recycled but rather put in a trash by a user. In addition, as for any manufactured product, cartridge manufacturing produces carbon dioxide and other polluting elements. Thus, reusing or recycling cartridges, at least partially, would considerably reduce the pollution related to said manufacturing.

[0006] Nevertheless, recycling the cartridge requires complex technologies and techniques since its internal surface has been in contact with the vaporizable material.

[0007] There is thus a need to make cartridge's recycling possible in a simple way. This can for example lead to reducing carbon dioxide production due to cartridge manufacturing.

SUMMARY OF THE INVENTION

[0008] One of the aims of the present invention is to propose a cartridge making it possible to be recycled after being used. This can notably reduce the carbon dioxide production due to cartridge manufacturing.

[0009] For this purpose, the invention relates to a cartridge for storing a vaporizable material for an aerosol generating device, the cartridge comprises a cartridge body defining an internal surface; the cartridge further comprising a coating covering the internal surface of the cartridge body and being extractable from the cartridge body before recycling the car-

tridge body.

[0010] Particularly, provided with these features, the internal surface of the cartridge is not directly in contact with the vaporizable material. Hence, after using the cartridge, and extracting the coating covering the internal surface of the cartridge body, said cartridge body can be recycled in a simple manner.

[0011] According to some embodiments, the coating is extractable from the cartridge body with at least one internal element of the cartridge body having been in contact with the vaporizable material.

[0012] Provided with these features, a higher amount of elements in contact with the vaporizable material is extractable simultaneously, simplifying the recycling process of the cartridge.

[0013] According to some embodiments, the coating covers at least one internal element of the cartridge body different from the internal surface.

[0014] According to some embodiments, said internal element is chosen in the group comprising:

- a liquid transport element;
- a heater;
- a susceptor;
- an airflow channel.

[0015] Thanks to said feature, it is possible to isolate said internal element from contacting with the vaporizable material, so as it can be recycled after the coating extraction.

[0016] According to some embodiments, the coating is extractable using a removal process comprising at least one operation chosen in the group comprising:

- applying pressure inside the cartridge body;
- applying heat, preferably by increasing surrounding temperature;
- applying a mechanical action;
- applying electromagnetic radiations, such as UV rays.

[0017] Provided with these features, the coating is extractable using a simple removal process. Actually, the mentioned techniques are easy to implement in a manufacturing context.

[0018] According to some embodiments, the coating comprises a foil or film.

[0019] Thanks to these features, the coating can be particularly thin since the foil, or film, ensures a relatively small thickness. Thus, the coating does not substantially reduce the storing volume of the cartridge.

[0020] According to some embodiments, the coating is impermeable or water repellent.

[0021] Provided with this feature, no vaporizable material particles could transit through the coating ensuring that the internal surface of the cartridge not being in contact with the vaporizable material.

[0022] According to some embodiments, the coating

comprises a peelable tie or seal layer.

[0023] According to some embodiments:

- the coating is applied by spraying or painting on the corresponding surface;
- the coating is applied on the corresponding surface using heat to harden it; and/or
- the coating is applied on the internal surface of the cartridge body before assembling the cartridge.

[0024] Each of these features makes it possible to apply the coating in the cartridge body in a simple manner.

[0025] According to some embodiments, the vaporizable material is liquid.

[0026] According to some embodiments, the internal surface delimits a storage portion of the cartridge adapted to store the vaporizable material.

[0027] Thanks to these features, the most important surface area intended to be normally in contact with the vaporizable material is isolated by the coating from it.

[0028] According to some embodiments, the cartridge body is made of polypropylene or PET.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The invention and its advantages will be better understood upon reading the following description, which is given solely by way of non-limiting example and which is made with reference to the appended drawings, in which:

- Figure 1 is a schematic diagram showing an aerosol generating set comprising a cartridge according to the invention; and
- Figure 2 is a cross-sectional view of the cartridge of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

[0030] Before describing the invention, it is to be understood that it is not limited to the details of construction set forth in the following description. It will be apparent to those skilled in the art having the benefit of the present disclosure that the invention is capable of other embodiments and of being practiced or being carried out in various ways.

[0031] As used herein, the term "**aerosol generating device**" or "**device**" may include a vaping device to deliver an aerosol to a user, including an aerosol for vaping, by means of aerosol generating unit (e.g. an aerosol generating element which generates vapor which condenses into an aerosol before delivery to an outlet of the device at, for example, a mouthpiece, for inhalation by a user). The device may be portable. "Portable" may refer to the device being for use when held by a user. The device may be adapted to generate a variable amount of aerosol, e.g. by activating a heating system for a variable amount

of time (as opposed to a metered dose of aerosol), which can be controlled by a trigger. The trigger may be user activated, such as a vaping button and/or inhalation sensor. The inhalation sensor may be sensitive to the strength of inhalation as well as the duration of inhalation to enable a variable amount of vapor to be provided (so as to mimic the effect of smoking a conventional combustible smoking article such as a cigarette, cigar or pipe, etc.). The device may include a temperature regulation control to drive the temperature of the heater and/or the heated aerosol generating substance (aerosol precursor) to a specified target temperature and thereafter to maintain the temperature at the target temperature that enables efficient generation of aerosol.

[0032] As used herein, the term "**aerosol**" may include a suspension of precursor as one or more of: solid particles; liquid droplets; gas. Said suspension may be in a gas including air. Aerosol herein may generally refer to/include a vapor. Aerosol may include one or more components of the precursor.

[0033] As used herein, the term "**vaporizable material**" or "**aerosol-forming precursor**" may refer to one or more of a: liquid; solid; gel; mousse; foam or other substances. The vaporizable material may be processable by the heating system of the device to form an aerosol as defined herein. The vaporizable material may comprise one or more of: nicotine; caffeine or other active components. The active component may be carried with a carrier, which may be a liquid. The carrier may include propylene glycol or glycerin. A flavoring may also be present. The flavoring may include Ethylvanillin (vanilla), menthol, Isoamyl acetate (banana oil) or similar. A solid aerosol forming substance may be in the form of a rod, which contains processed tobacco material, a crimped sheet or oriented strips or shreds of reconstituted tobacco (RTB).

[0034] Figure 1 shows an aerosol generating set 10 comprising an aerosol generating device 12 and a cartridge 14 configured to operate with the aerosol generating device 12. The cartridge is preferentially a removable cartridge that can be plugged and unplugged on the aerosol generating device 12.

[0035] As shown on figure 1, the aerosol generating device 12 extends along a device axis X and comprises a housing 21 delimiting a cavity 23 configured to receive, at least partially, the cartridge 14. The cavity 23 extends for example according to the device axis X and is delimited by a bottom wall 25 perpendicular to the device axis X and at least one side wall 27 extending along the device axis X.

[0036] The housing 21 delimits an internal space of the device 12 receiving various elements designed to carry out different functionalities of the device 12. The internal space can for example receive a power block 31 for powering the device 12, a control module 32 for controlling the operation of the device 12 and at least a device part 39 of a heating system configured to heat a vaporizable material contained in the cartridge 14 as it will be ex-

plained in further details below. The internal space of the housing 21 may further comprise other internal components performing different functionalities of the device 12 known *per se*. These internal components will not be explained in detail below.

[0037] It should also be noted that Figure 1 presents only a schematic diagram of different components of the aerosol generating set 10 and does not necessarily show the real physical arrangement and dimension of said components. Particularly, such an arrangement can be chosen according to the design of the aerosol generating set and technical features of its components.

[0038] The power block 31 comprises a battery 35 and a battery charger 36. The battery 35 is for example a known battery designed to be charged using the power supply furnished by an external source and to provide a direct current of a predetermined voltage. The battery charger 36 is able to connect the battery 35 to the external source and comprises for this purpose a power connector (for example a mini-USB or USB-C connector) or wireless charging connector.

[0039] The control module 32 is configured to control the operation of the aerosol generating device 12 and notably, of the heating system to generate aerosol by controlling the power link of this heating system by the battery 35. For this purpose, the control module 32 is connected to the battery 35. The control performed by the control module 32 is known *per se* and will not be detailed hereinafter.

[0040] As it is shown on Figure 1, the cartridge 14 comprises a body 51, or cartridge body 51, having a shape at least partially complementary to the shape of the cavity 23. Thus, the cartridge 14 can be received at least partially inside the cavity 23 of the aerosol generating device 12. As it is shown on Figure 2, the cartridge body 51 extends between a proximal end 52 designed to be received entirely in the cavity 23 and a distal end 53 designed to be received in the cavity 23 or protrude from it. In this last case, the distal end 53 can form a mouthpiece designed to be in contact with the user's mouth and/or lips during a vaping session. The proximal end 52 forms a contact surface 55 extending perpendicularly to the device axis X when the cartridge 14 is received in the cavity 23 and designed to be in contact with the bottom wall 25 of the cavity 23.

[0041] The cartridge body 51 advantageously receives internal elements including notably a storage portion 56, an airflow channel 58 and a cartridge part 59 of the heating system. The cartridge body 51 further defines an internal surface 54 delimiting at least some of its internal components, as it will be explained in further detail below.

[0042] The storage portion 56 can store the vaporizable material in a liquid and/or a solid form and is delimited by at least a part of the internal surface 54.

[0043] When the vaporizable material is in a liquid form, according to the example of the invention shown on Figure 2, the cartridge part 59 of the heating system comprises a heater 60 and a liquid transport element 62

such as a capillary wick. More specifically, in this case, both cartridge part 59 and device part 39 of the heating system may for example comprise a pair of contacts protruding respectfully from the contact surface 55 of the cartridge 14 and from the bottom wall 25 of the cavity 23. Said contacts make it possible to power the heater 60 from the battery of the device 12, and thus vaporize the vaporizable material delivered by the liquid transport element 62.

[0044] According to another example of the invention, the cartridge part 59 of the heating system may comprise susceptors. These susceptors can be arranged and/or distributed in the storage portion 56 of the cartridge 14. In this case, the device part 39 of the heating system may comprise electromagnetic emitter(s) configured to produce an electromagnetic field when powered by the battery. Such an emitter can comprise for example a magnetic coil configured to be arranged around the cartridge 14. Thus, when an electromagnetic field is created by the coil, eddy currents appear in the susceptor that leads to their heating.

[0045] According to still another example of the invention, each of the cartridge part 59 and device part 39 of the heating system may comprise a heating plate which is intended to be engaged with the heating plate of the other part to transfer heat to the vaporizable material.

[0046] According to still another embodiment, no cartridge part 59 of the heating system can be provided. In this case, the device part 39 of the heating system, like for example a heating blade, may be configured to penetrate the storage portion 56 of the cartridge 14 to heat directly the vaporizable material.

[0047] Other examples of the heating system are still possible.

[0048] Referring again to the example of Figure 2, the airflow channel 58 may extend from the heater 60 to the distal end 53 and aims at guiding an airflow loaded with vaporized material, until the user's mouth, during a vaping session. In the embodiment of Figure 2, an external surface of the airflow channel 58 delimits partially the storage portion 56 and makes for example a part of the internal surface 54.

[0049] According to an example of the invention, the internal surface 54 of the cartridge body 51 is composed of any surface which is intended to be in contact with the vaporizable material. For example, in this case, the internal surface 54 can comprise the surface delimiting the storage portion 56 (including the external surface of the airflow channel 58) and an internal surface of the airflow channel 58 guiding the vaporized vaporizable material. In other cases, the internal surface 54 can for example comprise only the surface delimiting the storage portion 56 including the external surface of the airflow channel 58. Still in some other cases, the internal surface 54 can comprise only the surface delimiting the storage portion 56 (excluding the external surface of the airflow channel 58).

[0050] According to the invention, the cartridge 14 fur-

ther comprises a coating 67 covering the internal surface 54 as defined below. Thus, the vaporizable material is not directly in contact with the internal surface 54. In some embodiments, the coating 67 may further cover at least one other internal component of the cartridge body 51 as the heater 60 and/or the liquid transport element 62.

[0051] The coating 67 may for example comprise a foil or film. Preferably, the coating 67 is a thin foil or film, which fits the internal surface 54, in order not to avoid losing the internal volume of the cartridge body 51.

[0052] Optionally, the coating 67 is applied on the internal surface 54 by spraying or painting the corresponding internal surface 54. In other words, the coating 67 can for example initially be a sprayable element or a liquid, which is applied on the internal surface 54. Preferably, the coating 67 is hardened, for example to make it solid, by applying heat to the internal surface 54. Said heat might be applied from an exterior of the cartridge body 51. The coating 67 is preferably impermeable. Optionally, the coating 67 is made in a hydrophobic material. In this latter case, the coating 67 is also named hydrophobic coating 67.

[0053] Advantageously the coating 67 is applied on the internal surface 54 of the cartridge body 51 before assembling the cartridge 14. In other words, the coating 67 can be applied on the internal surface 54 prior to assembling the internal components of the cartridge as for example the heater 60 and the liquid transport element 62, and prior to filling the cartridge with the vaporizable material.

[0054] In the example of Figure 2, the coating 67 can for example be applied inside the cartridge body 51, after inserting the airflow channel 58 but before inserting the heater 60 and the liquid transport element 62, and before filling the storage portion with the vaporizable material.

[0055] Additionally, according to the invention, the coating 67 is extractable from the cartridge body 51. The coating 67 is preferably extractable from the cartridge body 51 using a removal process comprising at least one operation chosen in the following group:

- applying pressure inside the cartridge body 51;
- applying heat, preferably by increasing surrounding temperature of the cartridge body 51;
- applying a mechanical action,
or
- applying electromagnetic radiation on the coating 67.

[0056] Applying pressure inside the cartridge body can be understood as applying a pressure of a predetermined value, which can for example be determined empirically. The pressure can be applied by means of a fluid or solid particles.

[0057] Applying heat can be understood as increasing the temperature surrounding the cartridge body 51 or on the internal surface 54 by a predetermined value, which can for example be determined empirically.

[0058] The mechanical action for example comprises scratching the coating 67 or tearing, peeling or pulling the coating 67 out of the cartridge body 51 from the proximal 52 or from the distal 53 end.

5 **[0059]** Applying electromagnetic radiation can comprises enlightening the cartridge with a light beam having a wavelength lower for example than 400 nanometers (nm), i.e. ultraviolet rays.

10 **[0060]** Advantageously, in some embodiments, when being extracted from the cartridge body 51, the coating 67 can form a bag, carrying with it, at least one among the airflow channel 58, the heater 60 and the liquid transport element 62.

15 **[0061]** An assembling method of the cartridge 14, according to a particular example of the invention, will now be explained.

[0062] Initially, the cartridge body 51 is empty. Advantageously, the airflow channel 58 is put in the cartridge body 51. The coating 67 is then applied on the internal surface 54 by spraying or painting on the corresponding surface 54 or dipping the surface in a liquid material bath or drop casting deposition. The coating may require hardening at ambient or polymerisation using heat or plasma. Preferably, the coating 67 is also applied on the airflow channel 58. The internal surface 54 is then heated to harden the coating 67. The heater 60 and the liquid transport element 62 are then installed in the cartridge body 51 and the vaporizable material is injected in the storage portion 56 of the cartridge body 51. The cartridge 14 can thus be operated by a user. In another possible embodiment, the coating 67 is applied to the internal surface of the body by blow moulding.

25 **[0063]** In general, the hydrophobic coating 67 may be made of water repellent material such as wax and/or tri-acyl glyceride or SiO₂ film. For example, the coating comprises: beeswax, carnauba wax, paraffin, soybean wax, soybean wax. The coating 67 can be prepared as a suspension of wax in water for spraying on the surface.

30 **[0064]** The coating 67 is for example formed of at least two distinct functional layers. Said layers are not represented on the figures. An inner seal or tie layer and an outer water repellent layer. The seal layer can be formulated to peel the coating 67 from the inner surface 54. For example, the tie or seal layer can be a peelable resin such as APPEELTM resin commercialized by Dow.

35 **[0065]** In a possible example, the coating 67 comprises a thin aluminium foil (e.g. 5 to 30 microns thick).

[0066] In general, the cartridge body 51 may be made of rigid and heat-resistant polyolefin such as PP or PET. The thickness of the cartridge body 51 may be between 0.5 and 1.5 mm.

40 **[0067]** A recycling method of the cartridge 14, according to a particular example of the invention, is now explained.

45 **[0068]** When the user finishes using the cartridge 14, i.e. when sensibly all the vaporizable material is consumed or when the cartridge part of the heating system 59 becomes dysfunctional, the cartridge 14 is to be re-

cycled.

[0069] The cartridge part 59 of the heating system is firstly extracted from the cartridge body 51. Then, the coating 67 is extracted according to at least one of the removal processes, as previously explained introduced. According to some embodiments, such a process is performed by a dedicated service. According to some other embodiments, such a process is performed by the user. As explained above, the coating 67 can be extracted together with at least some internal components like the airflow channel 58, the heater 60 and/or the liquid transport element 62.

Claims

1. A cartridge (14) for storing a vaporizable material for an aerosol generating device (12), the cartridge (14) comprises a cartridge body (51) defining an internal surface (54);
the cartridge (14) being **characterized in that** it further comprises a coating (67) covering the internal surface (54) of the cartridge body (51) and being extractable from the cartridge body (51) before recycling the cartridge body (51).
2. The cartridge (14) according to claim 1, wherein the coating (67) is extractable from the cartridge body (51) with at least one internal element (58, 60, 62) of the cartridge body (51) having been in contact with the vaporizable material.
3. The cartridge (14) according to claim 1 or 2, wherein the coating (67) covers at least one internal element (58, 60, 62) of the cartridge body (51) different from the internal surface (54).
4. The cartridge according to claim 2 or 3, wherein said internal element (58, 60, 62) is chosen in the group comprising:
 - a liquid transport element (62);
 - a heater (60);
 - a susceptor;
 - an airflow channel (58).
5. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) is extractable using a removal process comprising at least one operation chosen in the group comprising:
 - applying pressure inside the cartridge body (51);
 - applying heat, preferably by increasing surrounding temperature;
 - applying a mechanical action;
 - applying electromagnetic radiations, such as UV rays.
6. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) comprises a foil or film.
7. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) is impermeable or water repellent.
8. The cartridge (14) according to claim 7, wherein the coating (67) comprises a peelable tie or seal layer.
9. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) is applied by spraying or painting on the corresponding surface (54).
10. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) is applied on the corresponding surface (54) using heat to harden it.
11. The cartridge (14) according to any one of the preceding claims, wherein the coating (67) is applied on the internal surface (54) of the cartridge body before assembling the cartridge.
12. The cartridge (14) according to any one of the preceding claims, wherein the vaporizable material is liquid.
13. The cartridge (14) according to any one of the preceding claims, wherein the internal surface (54) delimits a storage portion (56) of the cartridge adapted to store the vaporizable material.
14. The cartridge (14) according to any one of the preceding claims, wherein the cartridge body (51) is made of polypropylene or PET.

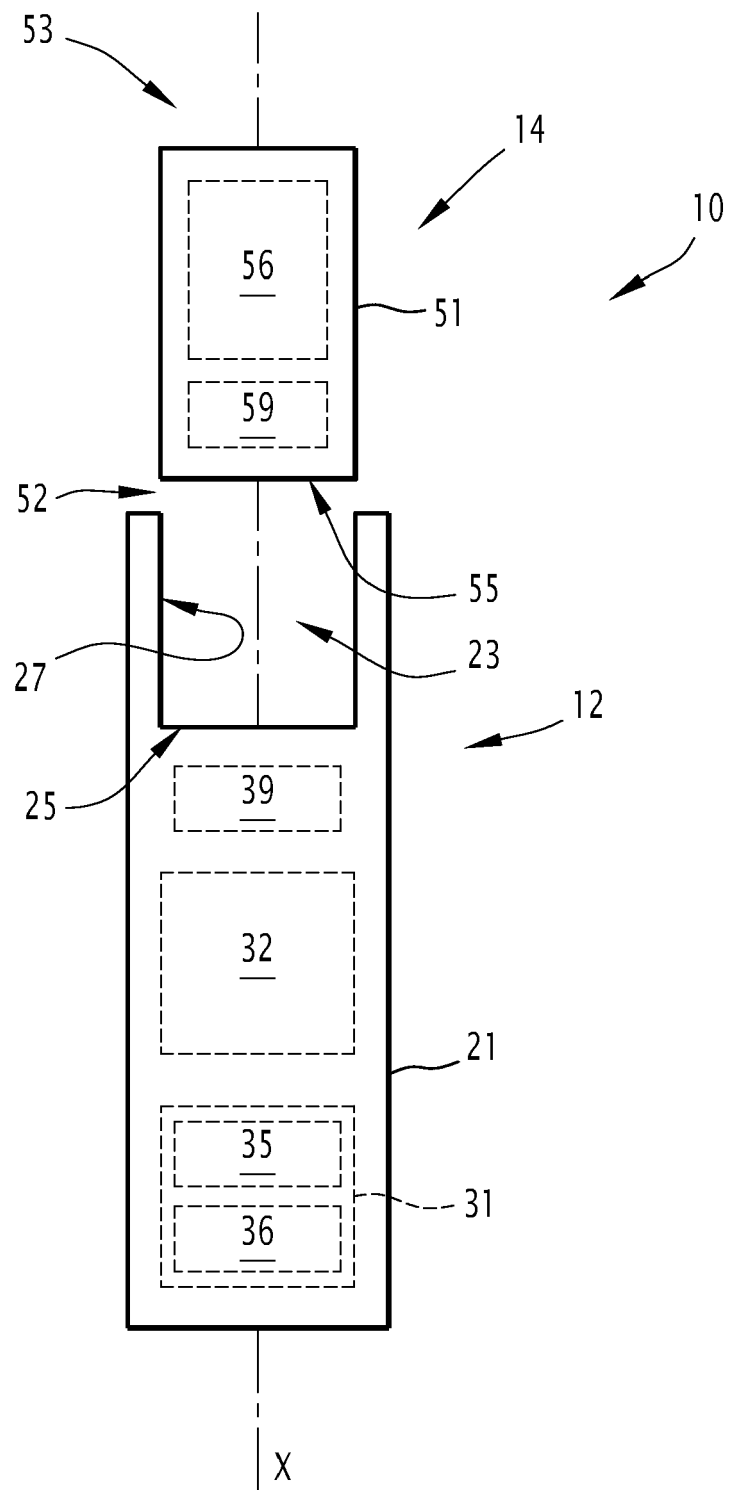


FIG.1

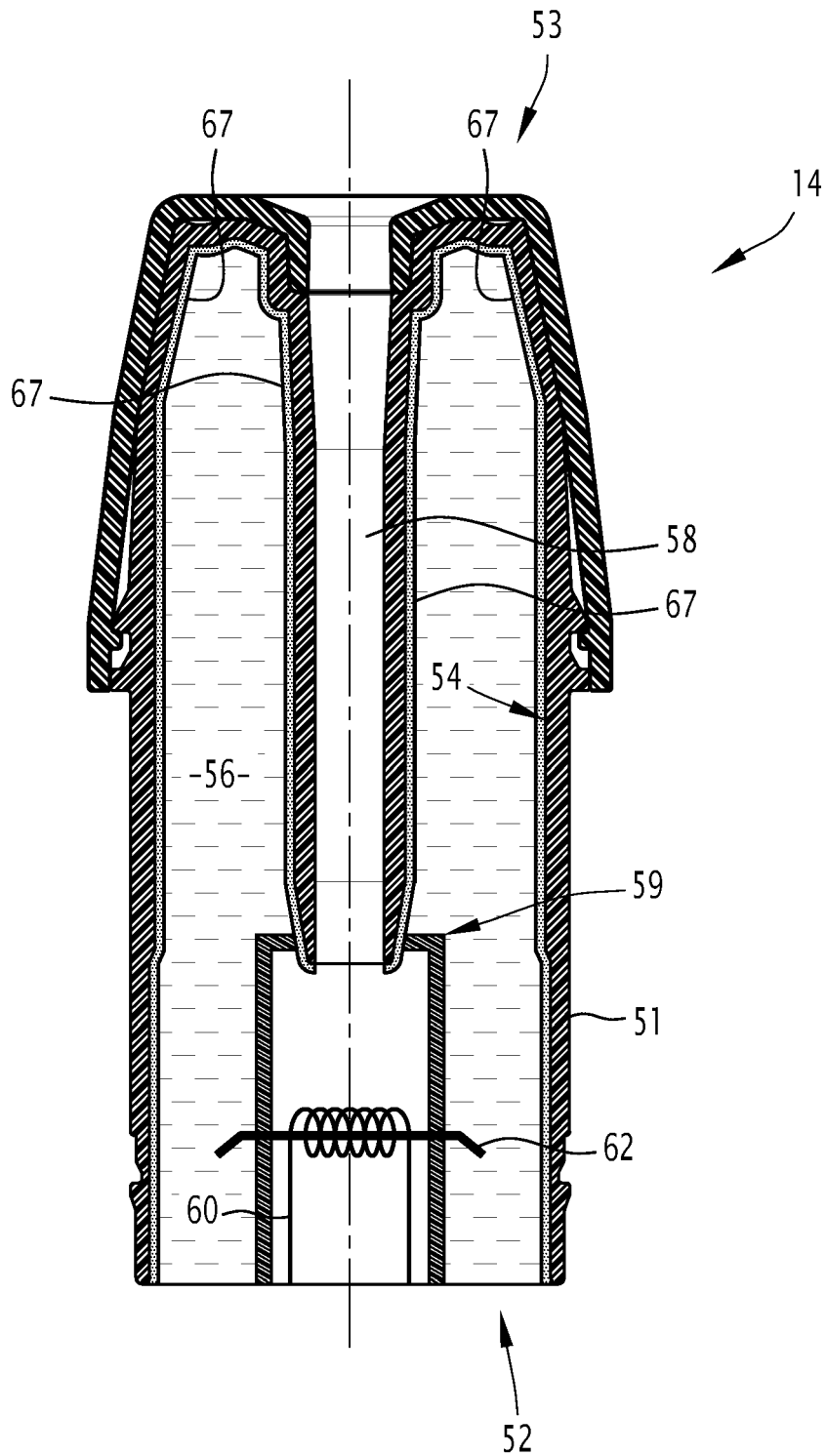


FIG.2



EUROPEAN SEARCH REPORT

Application Number

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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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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