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(54) **AEROSOL GENERATING DEVICE**

(57) An aerosol generating device for aerosolising an aerosol precursor, the aerosol generating device comprising a device body a heater assembly (100). The heater assembly (100) includes a base (102) configured to fix the heater assembly (100) within the device body and a heating element (104) protruding from the base (102), the heating element (104) operable to aerosolise the aerosol precursor. The heater assembly (100) further includes a coating (106) extending over the heating element (104) and at least a portion of the base (102), the coating (106) covering an interface between the heating element (104) and the base (102).

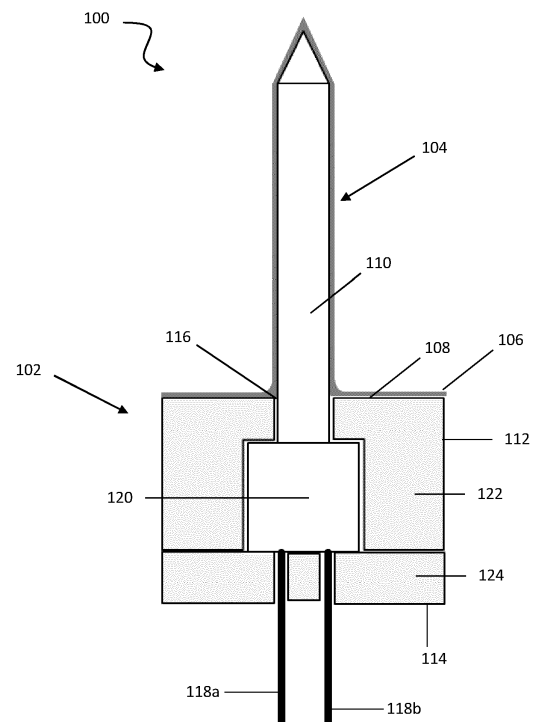


Fig. 6A

Description

FIELD

[0001] The present disclosure relates to an aerosol generating device.

BACKGROUND

[0002] A typical aerosol generating device / apparatus, or smoking substitute apparatus / device, includes a power supply, an aerosol generating unit that is driven by the power supply, an aerosol precursor, which in use is aerosolised by the aerosol generating unit to generate an aerosol, and a delivery system for delivery of the aerosol to a user. The aerosol is delivered to the user for inhalation by the user.

[0003] The aerosol generating unit is, in some cases, a heater, which heats the aerosol precursor to form the aerosol. In such examples, the heater and the aerosol precursor are in thermal contact with one another, to allow the heating of the aerosol precursor for aerosol formation.

[0004] In some examples, the aerosol precursor is provided as a consumable, or as part of a consumable. The consumable is a separate unit from the aerosol generating device. The aerosol generating device includes the heater. The aerosol generating device and consumable are mutually engaged with one another. Such engagement brings the heater into thermal contact with the aerosol precursor, for heating.

[0005] A drawback with known aerosol generating devices / apparatuses is that debris from the aerosol precursor may be retained within the aerosol generating device/ apparatus. Further, aerosol generating devices / apparatuses may be difficult to clean.

[0006] In spite of the effort already invested in the development of aerosol generating devices / apparatuses further improvements are desirable.

SUMMARY

[0007] The present disclosure provides an aerosol generating device having a heater assembly comprising a heating element, a base and a coating extending over the heating element and at least a portion of the base, wherein the coating covers an interface between the heating element and the base.

[0008] The coating covering the interface between the heating element and the base means that debris may be prevented from collecting at the interface. In this way, the device may be easier to clean. As such, the performance of the heating element may be improved and/or the lifetime of the heater assembly may be improved, because there may be less debris retained on or within the heater assembly and / or the debris that does collect is easier to remove.

[0009] Additionally, because of the coating, the heating

element and the base may be formed separately, and the above effect of preventing debris collecting at the interface may still be achieved. That is, to prevent debris collecting the interface does not require the heating element and the base to be integrally formed. For example, as is discussed in more detail below, the heating element and the base may be formed of different materials and the above effect of preventing debris collecting at the interface may still be achieved.

[0010] According to a first aspect the present disclosure provides an aerosol generating device for aerosolising an aerosol precursor, the aerosol generating device comprising a device body and a heater assembly, the heater assembly including a base configured to fix the heater assembly within the device body, and a heating element protruding from the base, the heating element operable to aerosolise the aerosol precursor, wherein the heater assembly comprises a coating extending over the heating element and at least a portion of the base, the coating covering an interface between the heating element and the base.

[0011] Optional features will now be set out. These may be applicable singly or in any combination of the optional features unless the combination is clearly impermissible.

[0012] The interface between the heating element and the base may include a point at which the heating element and the base meet. The interface between the heating element and the base may include a point at which the heating element and the base face one another. There may be a gap between the heating element and the base at the interface. The coating may cover the gap between the heating element and the base.

[0013] There may be a split line between the heating element and the base. The interface between the heating element and the base may be the split line. There may be a gap between the heating element and the base along the split line. The coating may cover the split line. Thus, the coating may prevent debris from collecting at the split line or reduce debris collecting at the split line.

[0014] The coating may be formed or applied by dipping the heating element and the portion of the base in a coating material to form the coating. The coating material may be a liquid when the heating element is dipped in the coating material.

[0015] The coating may be thermally conductive.

[0016] The coating may extend over an entire heating portion of the heating element. The heating portion of the heating element may be the portion of the heating element which protrudes from the base. The heating portion may be the portion of the heating element that is configured to heat the aerosol precursor. Advantageously, the coating extending over the entire heating portion of the heating element may allow the heating portion of the heating element to heat up uniformly. Further, the heater assembly may be easier to manufacture because the entire heating portion of the heating element may be dipped into the coating material.

[0017] The coating may extend over an outer surface of the heating element. The outer surface of the heating element may be a surface which faces towards the aerosol precursor in use. The outer surface of the heating element may face away from the volumetric centre of the heating element.

[0018] The portion of the base may include a portion of an upper surface of the base. That is, the coating may extend over a portion of an upper surface of the base. The upper surface of the base may be a surface which faces towards the aerosol precursor in use. The upper surface of the base may be a surface which faces towards the heating portion of the heating element. The upper surface of the base may be perpendicular to a longitudinal axis of the heating element. The upper surface of the base may be perpendicular to a longitudinal axis of the heating portion of the heating element. The upper surface of the base may be an outer surface of the base. In other words, the upper surface of the base may face away from a volumetric centre of the base. The upper surface of the base may be opposite to a lower surface of the base. The lower surface of the base may be a surface which faces towards a power source of the aerosol generating device. The lower surface of the base may be an outer surface of the base. In other words, the lower surface of the base may face away from a volumetric centre of the base.

[0019] The coating extending over the outer surface of the heating element and a portion of the upper surface of the base means that debris may be prevented from collecting at the interface and may instead be collected on the coating. In this way, the device may be easier to clean. As such, the performance of the heating element may be improved and/or the lifetime of the heater assembly may be improved, because there may be less debris retained on or within the heater assembly and / or the debris that does collect is easier to remove.

[0020] The coating may extend from the heating element over the portion of the upper surface of the base. The coating may extend at least 1 mm radially over the upper surface of the base. The upper surface of the base may have an upper surface radius. The coating may extend at least half of the upper surface radius radially over the upper surface of the base. In this way, a discontinuity created by an edge of the coating may be sufficiently far from the heating element that debris is prevented from collecting too close to the heating element, in particular at a position where the debris may affect the performance of the heating element. Thus, the performance of the heating element may be improved.

[0021] The coating may extend over the entire upper surface of the base. In this way, the heater assembly may be easier to manufacture because the entire upper surface of the base may be dipped in the coating material.

[0022] The portion of the base may include a portion of a side wall of the base. That is, the coating may extend over a portion of a side wall of the base. The side wall of the base may extend from a peripheral edge of the upper

surface of the base. The side wall of the base may be approximately perpendicular to the upper surface of the base. The coating may extend at least 1 mm down the side wall of the base from the upper surface of the base.

5 The coating may extend at least half-way down the side wall of the base from the upper surface of the base. The side wall of the base may be an outer surface of the base. In other words, the side wall of the base may face away from a volumetric centre of the base. Again, the heater assembly may be easier to manufacture because the entire upper surface of the base, and a portion of the side wall of the base may be dipped in the coating material.

10 **[0023]** The portion of the base may include a portion of a lower surface of the base. That is, the coating may extend over a portion of the lower surface of the base. The coating may extend from a peripheral edge of the lower surface of the base over the portion of the lower surface of the base.

15 **[0024]** The coating may extend at least 1 mm radially over the lower surface of the base. The lower surface of the base may have a lower surface radius. The coating may extend at least at least half of the lower surface radius radially over the lower surface of the base. The coating may extend over the whole lower surface of the base. Again, in this way the heater assembly may be easier to manufacture because the entire base may be dipped in the coating material. Further, the coating may strengthen the connection between the heating element and the base.

20 **[0025]** The thickness of the coating may be at least 1 micron. The thickness of the coating may be at least 10 microns. The thickness of the coating may be at least 100 microns. These lower limits on the coating thickness may mean that the coating can be formed by dipping the heating element and the portion of the base in the coating material.

25 **[0026]** The thickness of the coating may be less than 10 microns. The thickness of the coating may be less than 100 microns. The thickness of the coating may be less than 1 mm. The thickness of the coating may be less than 10% of the widest thickness of the heating element. The thickness of the coating may be less than 1% of the widest thickness of the heating element. The thickness of the coating may be less than 0.5% of the widest thickness of the heating element. The thickness of the heating element may be the diameter of the heating element. These upper limits on the coating thickness may mean that the heating properties of the heating element are affected only negligibly by the presence of the coating.

30 **[0027]** The maximum thickness of the coating adjacent the interface may be at least 1 micron. The maximum thickness of the coating adjacent the interface may be at least 10 microns. The maximum thickness of the coating adjacent the interface may be at least 100 microns. The maximum thickness of the coating adjacent the interface may be less than 10 microns. The maximum thickness of the coating adjacent the interface may be less than 100 microns. The maximum thickness of the coating ad-

jacent the interface may be less than 1 mm.

[0028] The thickness of the coating may be uniform. That is, the thickness of the coating may be approximately constant. In this way, the coating may provide a surface over the heating element and the portion of the base which conforms to the surface beneath the coating. For example, the portion of the coating which extends over the heating element may conform to the outer surface of the heating element. As another example, the portion of the coating which extends over the portion of the base may conform to the portion of the upper surface of the base.

[0029] The thickness of the coating over the heating element may be uniform. That is, the thickness of the coating over the heating element may be approximately constant. In this way, the coating may allow the heating element to heat up uniformly.

[0030] In some examples, an external surface of the coating adjacent the interface may be arcuate or curved. The external surface may be a surface facing away from the heating element or the base. Advantageously then, the coating may smooth off a sharp interface / join between the heating element and the base. The joining surface extending from the outer surface of the heater element to the upper surface of the base and passing through the interface may have a radius of curvature adjacent the interface which is less than the radius of curvature of an external surface of the coating adjacent the interface. In this way, the device may be easier to clean, because debris may be more easily cleaned from the rounded external surface of the coating, relative to the otherwise sharp join of the base and the heater. As such, the performance of the heating element may be improved and/or the lifetime of the heater assembly may be improved, because there may be less debris retained on or within the heater assembly and / or the debris that does collect is easier to remove.

[0031] The external surface of the coating adjacent the interface may be concavely arcuate. In this way, debris may be collected within a concave arc portion of the coating. Again, this may make the device easier to clean, and as such, the performance of the heating element may be improved and/or the lifetime of the heater assembly may be improved, because there may be less debris retained on or within the heater assembly and / or the debris that does collect is easier to remove.

[0032] The coating may be continuous. In this way, debris may be easier to remove from the coating as there may not be discontinuities in the coating. Advantageously then, the device may be easier to clean.

[0033] In some examples, the heating element may be located through a heating element-receiving aperture in the base. In this case, the interface between the heating element and the base may include a meeting point between a peripheral edge of the aperture and an outer surface of the heating element. Thus, the coating may prevent debris from collecting at the meeting point between the peripheral edge of the aperture and the outer

surface of the heating element.

[0034] The heating element being located through the heating element-receiving aperture may allow the heating element and the base to be fixed together mechanically. For example, the heater assembly may further comprise a flange fixed to the heating element, the flange being configured to engage with the base. The base may comprise a cavity configured to receive the flange. The flange and the cavity may have complementary shapes to one another. Thus, the heating portion of the heating element may be located through the heating element-receiving aperture while the flange fixed to the heating element engages with the cavity in the base.

[0035] The base may comprise an upper shroud and a lower shroud.

[0036] The upper shroud may comprise the upper surface of the base. That is, the upper surface of the base may be an upper surface of the upper shroud. The upper surface of the upper shroud may be a surface which faces away from the lower shroud. The upper shroud may comprise a portion of the side wall of the base. That is, the side wall of the upper shroud may form a portion of the side wall of the base. The lower shroud may comprise a portion of the side wall of the base. That is, the side wall of the lower shroud may form a portion of the side wall of the base. The lower shroud may comprise the lower surface of the base. That is, the lower surface of the base may be a lower surface of the lower shroud. The lower surface of the lower shroud may be a surface which faces away from the upper shroud.

[0037] The upper shroud may comprise the heating element-receiving aperture. The upper shroud may comprise the cavity complementary in shape to the shape of the flange.

[0038] The lower shroud may comprise one or more wire-receiving apertures. The heating element may be in electrical contact with a first heating element wire and a second heating element wire, the first and second heating element wires configured to electrically connect the heating element to a power supply of the aerosol generating device. The first and second heating element wires may extend through the one or more wire-receiving apertures in the lower shroud. For example, the lower shroud may comprise a first wire aperture and a second wire aperture. The first wire aperture and the second wire aperture may be respectively configured to receive the first wire and the second wire therethrough.

[0039] The lower shroud and the upper shroud may be configured to engage with one another to retain the heater flange between the upper shroud and the lower shroud. In this way, the heating element may be fixed relative to the base.

[0040] In some examples, the upper shroud may comprise one or more upper shroud projections. The lower shroud may comprise one or more lower shroud apertures. Each of the one or more upper shroud projections may be complementary in shape to a respective one of the one or more lower shroud apertures. In this way, the

upper shroud and the lower shroud may be configured to engage with one another.

[0041] The upper shroud may be configured to fix the heater assembly within the device body.

[0042] The base, or the upper shroud of the base, may be configured to engage with the device body. In some examples, the device body may comprise one or more alignment grooves. The base, or the upper shroud, may comprise one or more alignment protrusions. Each of the one or more alignment protrusions may be complementary in shape to a respective one of the one or more alignment grooves. The device body may comprise one or more alignment protrusions. The base, or the upper shroud, may comprise one or more alignment grooves. Each of the one or more alignment grooves may be complementary in shape to a respective one of the one or more alignment protrusions. Advantageously then, the base may be configured to securely engaged with the housing.

[0043] When the heater flange is retained between the upper shroud and the lower shroud, such that the heating element is fixed relative to the base, the coating may cover the heating portion of the heating element and a portion of the upper surface of the upper shroud. The coating may cover a meeting point between the peripheral edge of the heating element-receiving aperture in the upper shroud and the outer surface of the heating element. The coating may cover the heating portion of the heating element and the whole upper surface of the upper shroud. The coating may cover the heating portion of the heating element, the upper surface of the upper shroud and a portion of the side wall of the upper shroud and/or a portion of the side wall of the lower shroud. The coating may cover the heating portion of the heating element, the upper surface of the upper shroud, the side wall of the upper shroud, the side wall of the lower shroud, and a portion of the lower surface of the lower shroud.

[0044] The coating may be applied after the heating element has been fixed relative to the base. In this way, the manufacture of the heater assembly may be simplified. Further, the coating may cover the interface between the heating element and the base.

[0045] The base may be formed of a thermally insulating material. For example, the base may be formed of polyetheretherketone (PEEK). The upper shroud and/or the lower shroud may be formed of a thermally insulating material which may be PEEK. Thus, the base may thermally insulate the device body from heat emitted by the heating element. In this way, the device body may be prevented from heating up and the device body may be safe for a user to touch in use.

[0046] The heating element may be formed of a ceramic. For example, the heating element may be formed of zirconium oxide, which may be referred to as zirconia. The heating element may comprise a substrate and a heater track. The substrate may be formed of a ceramic.

[0047] Thus, as discussed above, the heating element and the base may be formed of different materials which

are suited to their respective purposes, and, because of the coating, debris may be prevented from collecting at the interface between the heating element and the base.

[0048] The coating may be formed of a ceramic material. For example, the coating may be formed of silicon dioxide, which may be referred to as silica. The coating may be formed of glass, which may be silicon glass. The coating being formed of a ceramic material may mean that the heating properties of the heating element are affected only negligibly by the presence of the coating. Silicon dioxide or glass may advantageously have a non-stick effect at high temperatures (which may be temperatures high enough to aerosolise the aerosol precursor). Silicon dioxide or glass may advantageously be able to withstand the chemical effects of nicotine. Silicon dioxide or glass may advantageously not cause off-gassing.

[0049] The aerosol generating device may be configured to aerosolise a solid aerosol precursor. Thus, the coating may prevent solid debris from the solid aerosol precursor from collecting at the interface. The aerosol generating device may be configured to receive the aerosol precursor in a receiving cavity of the aerosol generating device, the aerosol precursor being contained within a consumable. The heating element may be disposed within the receiving cavity. The aerosol generating device may be a heat-not-burn aerosol generating device.

[0050] The heating element may be a rod-shaped heating element.

[0051] According to a second aspect, the present disclosure provides a method of manufacturing a heater assembly for an aerosol generating device, the method comprising fixing a heating element to a base such that the heating element protrudes from the base, wherein the base is for fixing the heater assembly within a device body of the aerosol generating device and wherein the heating element is for aerosolising an aerosol precursor, and applying a coating material to the heating element and at least a portion of the base to form a coating extending over the heating element and the at least a portion of the base, the coating covering an interface between the heating element and the base.

[0052] As will be apparent, the optional features discussed above with reference to the first aspect are equally applicable to the second aspect.

[0053] The preceding summary is provided for purposes of summarizing some examples to provide a basic understanding of aspects of the subject matter described herein. Accordingly, the above-described features should not be construed to narrow the scope or spirit of the subject matter described herein in any way. Moreover, the above and/or proceeding examples may be combined in any suitable combination to provide further examples, except where such a combination is clearly impermissible or expressly avoided. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following text and the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

[0054] Aspects, features and advantages of the present disclosure will become apparent from the following description of examples in reference to the appended drawings in which like numerals denote like elements.

Fig. 1 is a block system diagram showing an example aerosol generating apparatus.

Fig. 2 is a block system diagram showing an example implementation of the apparatus of Fig. 1, where the aerosol generating apparatus is configured to generate aerosol from a liquid precursor.

Figs. 3a and 3b are schematic diagrams showing an example implementation of the apparatus of Fig. 2.

Fig. 4 is a block system diagram showing an example implementation of the apparatus of Fig. 1, where the aerosol generating apparatus is configured to generate aerosol from a solid precursor.

Fig. 5 is a schematic diagram showing an example implementation of the apparatus of Fig. 4.

Fig. 6A is a cross-sectional view of a heater assembly.

Fig. 6B is a cross sectional view of an alternative embodiment of a heater assembly.

Fig. 6C is a cross-sectional view of an alternative embodiment of a heater assembly.

Fig. 7 is a cut-away view of an aerosol generating device.

Fig. 8 is a perspective pre-assembly view of a heater assembly.

DETAILED DESCRIPTION OF EMBODIMENTS

[0055] Before describing several examples implementing the present disclosure, it is to be understood that the present disclosure is not limited by specific construction details or process steps set forth in the following description and accompanying drawings. Rather, it will be apparent to those skilled in the art having the benefit of the present disclosure that the systems, apparatuses and/or methods described herein could be embodied differently and/or be practiced or carried out in various alternative ways.

[0056] Unless otherwise defined herein, scientific and technical terms used in connection with the presently disclosed inventive concept(s) shall have the meanings that are commonly understood by those of ordinary skill in

the art, and known techniques and procedures may be performed according to conventional methods well known in the art and as described in various general and more specific references that may be cited and discussed in the present specification.

[0057] Any patents, published patent applications, and non-patent publications mentioned in the specification are hereby incorporated by reference in their entirety.

[0058] All examples implementing the present disclosure can be made and executed without undue experimentation in light of the present disclosure. While particular examples have been described, it will be apparent to those of skill in the art that variations may be applied to the systems, apparatus, and/or methods and in the steps or in the sequence of steps of the methods described herein without departing from the concept, spirit, and scope of the inventive concept(s). All such similar substitutions and modifications apparent to those skilled in the art are deemed to be within the spirit, scope, and concept of the inventive concept(s) as defined by the appended claims.

[0059] The use of the term "a" or "an" in the claims and/or the specification may mean "one," as well as "one or more," "at least one," and "one or more than one." As such, the terms "a," "an," and "the," as well as all singular terms, include plural referents unless the context clearly indicates otherwise. Likewise, plural terms shall include the singular unless otherwise required by context.

[0060] The use of the term "or" in the present disclosure (including the claims) is used to mean an inclusive "and/or" unless explicitly indicated to refer to alternatives only or unless the alternatives are mutually exclusive. For example, a condition "A or B" is satisfied by any of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0061] As used in this specification and claim(s), the words

"comprising," "having," "including," or "containing" (and any forms thereof, such as "comprise" and "comprises," "have" and "has," "includes" and "include," or "contains" and "contain," respectively) are inclusive or open-ended and do not exclude additional, unrecited elements or method steps.

[0062] Unless otherwise explicitly stated as incompatible, or the physics or otherwise of the embodiments, examples, or claims prevent such a combination, the features of examples disclosed herein, and of the claims, may be integrated together in any suitable arrangement, especially ones where there is a beneficial effect in doing so. This is not limited to only any specified benefit, and instead may arise from an "ex post facto" benefit. This is to say that the combination of features is not limited by the described forms, particularly the form (e.g. numbering) of example(s), embodiment(s), or dependency of claim(s). Moreover, this also applies to the phrase "in one embodiment," "according to an embodiment," and the like, which are merely a stylistic form of wording and

are not to be construed as limiting the following features to a separate embodiment to all other instances of the same or similar wording. This is to say, a reference to 'an,' 'one,' or 'some' embodiment(s) may be a reference to any one or more, and/or all embodiments, or combination(s) thereof, disclosed. Also, similarly, the reference to "the" embodiment may not be limited to the immediately preceding embodiment. Further, all references to one or more embodiments or examples are to be construed as non-limiting to the claims.

[0063] The present disclosure may be better understood in view of the following explanations, wherein the terms used that are separated by "or" may be used interchangeably:

As used herein, an **"aerosol generating apparatus"** (or **"electronic-cigarette"**) may be an apparatus configured to deliver an aerosol to a user for inhalation by the user. The apparatus may additionally/alternatively be referred to as a "smoking substitute apparatus", if it is intended to be used instead of a conventional combustible smoking article. As used herein a combustible "smoking article" may refer to a cigarette, cigar, pipe or other article, that produces smoke (an aerosol comprising solid particulates and gas) via heating above the thermal decomposition temperature (typically by combustion and/or pyrolysis). An aerosol generated by the apparatus may comprise an aerosol with particle sizes of 0.2 - 7 microns, or less than 10 microns, or less than 7 microns. This particle size may be achieved by control of one or more of: heater temperature; cooling rate as the vapour condenses to an aerosol; flow properties including turbulence and velocity. The generation of aerosol by the aerosol generating apparatus may be controlled by an input device. The input device may be configured to be user-activated, and may for example include or take the form of an actuator (e.g. actuation button) and/or an airflow sensor.

[0064] Each occurrence of the aerosol generating apparatus being caused to generate aerosol for a period of time (which may be variable) may be referred to as an **"activation"** of the aerosol generating apparatus. The aerosol generating apparatus may be arranged to allow an amount of aerosol delivered to a user to be varied per activation (as opposed to delivering a fixed dose of aerosol), e.g. by activating an aerosol generating unit of the apparatus for a variable amount of time, e.g. based on the strength/duration of a draw of a user through a flow path of the apparatus (to replicate an effect of smoking a conventional combustible smoking article).

[0065] The aerosol generating apparatus may be portable. As used herein, the term **"portable"** may refer to the apparatus being for use when held by a user.

[0066] As used herein, an **"aerosol generating system"** may be a system that includes an aerosol generating apparatus and optionally other circuitry/components associated with the function of the apparatus, e.g. one or more external devices and/or one or more external components (here "external" is intended to mean exter-

nal to the aerosol generating apparatus). As used herein, an "external device" and "external component" may include one or more of a: a charging device, a mobile device (which may be connected to the aerosol generating apparatus, e.g. via a wireless or wired connection); a networked-based computer (e.g. a remote server); a cloud-based computer; any other server system.

[0067] An example aerosol generating system may be a system for managing an aerosol generating apparatus. Such a system may include, for example, a mobile device, a network server, as well as the aerosol generating apparatus.

[0068] As used herein, an **"aerosol"** may include a suspension of precursor, including as one or more of: solid particles; liquid droplets; gas. Said suspension may be in a gas including air. An aerosol herein may generally refer to/include a vapour. An aerosol may include one or more components of the precursor. As used herein, a **"precursor"** may include one or more of a: liquid; solid; gel; loose leaf material; other substance. The precursor may be processed by an aerosol generating unit of an aerosol generating apparatus to generate an aerosol. The precursor may include one or more of: an active component; a carrier; a flavouring. The active component may include one or more of nicotine; caffeine; a cannabinoid oil; a non-pharmaceutical formulation, e.g. a formulation which is not for treatment of a disease or physiological malfunction of the human body. The active component may be carried by the carrier, which may be a liquid, including propylene glycol and/or glycerine. The term "flavouring" may refer to a component that provides a taste and/or a smell to the user. The flavouring may include one or more of: Ethylvanillin (vanilla); menthol, Isoamyl acetate (banana oil); or other. The precursor may include a substrate, e.g. reconstituted tobacco to carry one or more of the active component; a carrier; a flavouring.

[0069] As used herein, a **"storage portion"** may be a portion of the apparatus adapted to store the precursor. It may be implemented as fluid-holding reservoir or carrier for solid material depending on the implementation of the precursor as defined above.

[0070] As used herein, a **"flow path"** may refer to a path or enclosed passageway through an aerosol generating apparatus, e.g. for delivery of an aerosol to a user. The flow path may be arranged to receive aerosol from an aerosol generating unit. When referring to the flow path, upstream and downstream may be defined in respect of a direction of flow in the flow path, e.g. with an outlet being downstream of an inlet.

[0071] As used herein, a **"delivery system"** may be a system operative to deliver an aerosol to a user. The delivery system may include a mouthpiece and a flow path.

[0072] As used herein, a **"flow"** may refer to a flow in a flow path. A flow may include aerosol generated from the precursor. The flow may include air, which may be induced into the flow path via a puff by a user.

[0073] As used herein, a **"puff"** (or **"inhale"** or **"draw"**) by a user may refer to expansion of lungs and/or oral cavity of a user to create a pressure reduction that induces flow through the flow path.

[0074] As used herein, an **"aerosol generating unit"** may refer to a device configured to generate an aerosol from a precursor. The aerosol generating unit may include a unit to generate a vapour directly from the precursor (e.g. a heating system or other system) or an aerosol directly from the precursor (e.g. an atomiser including an ultrasonic system, a flow expansion system operative to carry droplets of the precursor in the flow without using electrical energy or other system). A plurality of aerosol generating units to generate a plurality of aerosols (for example, from a plurality of different aerosol precursors) may be present in an aerosol generating apparatus.

[0075] As used herein, a **"heating system"** may refer to an arrangement of at least one heating element, which is operable to aerosolise a precursor once heated. The at least one heating element may be electrically resistive to produce heat from the flow of electrical current there-through. The at least one heating element may be arranged as a susceptor to produce heat when penetrated by an alternating magnetic field. The heating system may be configured to heat a precursor to below 300 or 350 degrees C, including without combustion.

[0076] As used herein, a **"consumable"** may refer to a unit that includes a precursor. The consumable may include an aerosol generating unit, e.g. it may be arranged as a cartomizer. The consumable may include a mouthpiece. The consumable may include an information carrying medium. With liquid or gel implementations of the precursor, e.g. an e-liquid, the consumable may be referred to as a **"capsule"** or a **"pod"** or an **"e-liquid consumable"**. The capsule/pod may include a storage portion, e.g. a reservoir or tank, for storage of the precursor. With solid material implementations of the precursor, e.g. tobacco or reconstituted tobacco formulation, the consumable may be referred to as a **"stick"** or **"package"** or **"heat-not-burn consumable"**. In a heat-not-burn consumable, the mouthpiece may be implemented as a filter and the consumable may be arranged to carry the precursor. The consumable may be implemented as a dosage or pre-portioned amount of material, including a loose-leaf product.

[0077] As used herein, an **"information carrying medium"** may include one or more arrangements for storage of information on any suitable medium. Examples include: a computer readable medium; a Radio Frequency Identification (RFID) transponder; codes encoding information, such as optical (e.g. a bar code or QR code) or mechanically read codes (e.g. a configuration of the absence or presents of cutouts to encode a bit, through which pins or a reader may be inserted).

[0078] As used herein **"heat-not-burn"** (or **"HNB"** or **"heated precursor"**) may refer to the heating of a precursor, typically tobacco, without combustion, or without

substantial combustion (i.e. localised combustion may be experienced of limited portions of the precursor, including of less than 5% of the total volume).

[0079] Referring to Fig. 1, an example aerosol generating apparatus 1 includes a power supply 2, for supply of electrical energy. The apparatus 1 includes an aerosol generating unit 4 that is driven by the power supply 2. The power supply 2 may include an electric power supply in the form of a battery and/or an electrical connection to an external power source. The apparatus 1 includes a precursor 6, which in use is aerosolised by the aerosol generating unit 4 to generate an aerosol. The apparatus 2 includes a delivery system 8 for delivery of the aerosol to a user.

[0080] Electrical circuitry (not shown in figure 1) may be implemented to control the interoperability of the power supply 4 and aerosol generating unit 6.

[0081] In variant examples, which are not illustrated, the power supply 2 may be omitted since, e.g. an aerosol generating unit implemented as an atomiser with flow expansion may not require a power supply.

[0082] Fig. 2 shows an implementation of the apparatus 1 of Fig. 1, where the aerosol generating apparatus 1 is configured to generate aerosol from a liquid precursor.

[0083] In this example, the apparatus 1 includes a device body 10 and a consumable 30.

[0084] In this example, the body 10 includes the power supply 4. The body may additionally include any one or more of electrical circuitry 12, a memory 14, a wireless interface 16, one or more other components 18.

[0085] The electrical circuitry 12 may include a processing resource for controlling one or more operations of the body 10 and consumable 30, e.g. based on instructions stored in the memory 14.

[0086] The wireless interface 16 may be configured to communicate wirelessly with an external (e.g. mobile) device, e.g. via Bluetooth.

[0087] The other component(s) 18 may include one or more user interface devices configured to convey information to a user and/or a charging port, for example (see e.g. Fig. 3).

[0088] The consumable 30 includes a storage portion implemented here as a tank 32 which stores the liquid precursor 6 (e.g. e-liquid). The consumable 30 also includes a heating system 34, one or more air inlets 36, and a mouthpiece 38. The consumable 30 may include one or more other components 40.

[0089] The body 10 and consumable 30 may each include a respective electrical interface (not shown) to provide an electrical connection between one or more components of the body 10 with one or more components of the consumable 30. In this way, electrical power can be supplied to components (e.g. the heating system 34) of the consumable 30, without the consumable 30 needing to have its own power supply.

[0090] In use, a user may activate the aerosol generating apparatus 1 when inhaling through the mouthpiece

38, i.e. when performing a puff. The puff, performed by the user, may initiate a flow through a flow path in the consumable 30 which extends from the air inlet(s) 34 to the mouthpiece 38 via a region in proximity to the heating system 34.

[0091] Activation of the aerosol generating apparatus 1 may be initiated, for example, by an airflow sensor in the body 10 which detects airflow in the aerosol generating apparatus 1 (e.g. caused by a user inhaling through the mouthpiece), or by actuation of an actuator included in the body 10. Upon activation, the electrical circuitry 12 (e.g. under control of the processing resource) may supply electrical energy from the power supply 2 to the heating system 34 which may cause the heating system 32 to heat liquid precursor 6 drawn from the tank to produce an aerosol which is carried by the flow out of the mouthpiece 38.

[0092] In some examples, the heating system 34 may include a heating filament / heating element and a wick, wherein a first portion of the wick extends into the tank 32 in order to draw liquid precursor 6 out from the tank 32, wherein the heating filament / heating element coils around a second portion of the wick located outside the tank 32. The heating filament/ heating element may be configured to heat up liquid precursor 6 drawn out of the tank 32 by the wick to produce the aerosol.

[0093] In this example, the aerosol generating unit 4 is provided by the above-described heating system 34 and the delivery system 8 is provided by the above-described flow path and mouthpiece 38.

[0094] In variant embodiments (not shown), any one or more of the precursor 6, heating system 34, air inlet(s) 36 and mouthpiece 38, may be included in the body 10. For example, the mouthpiece 36 may be included in the body 10 with the precursor 6 and heating system 32 arranged as a separable cartomizer.

[0095] Figs. 3a and 3b show an example implementation of the aerosol generating device 1 of Fig. 2. In this example, the consumable 30 is implemented as a capsule/pod, which is shown in Fig. 3a as being physically coupled to the body 10, and is shown in Fig. 3b as being decoupled from the body 10.

[0096] In this example, the body 10 and the consumable 30 are configured to be physically coupled together by pushing the consumable 30 into an aperture in a top end 11 the body 10, with the consumable 30 being retained in the aperture via an interference fit.

[0097] In other examples (not shown), the body 10 and the consumable 30 could be physically coupled together in other ways, e.g. by screwing one onto the other, through a bayonet fitting, or through a snap engagement mechanism, for example.

[0098] The body 10 also includes a charging port (not shown) at a bottom end 13 of the body 10.

[0099] The body 10 also includes a user interface device configured to convey information to a user. Here, the user interface device is implemented as a light 15, which may e.g. be configured to illuminate when the ap-

paratus 1 is activated. Other user interface devices are possible, e.g. to convey information haptically or audibly to a user.

[0100] In this example, the consumable 30 has an opaque cap 31, a translucent tank 32 and a translucent window 33. When the consumable 30 is physically coupled to the body 10 as shown in Fig. 3a, only the cap 31 and window 33 can be seen, with the tank 32 being obscured from view by the body 10. The body 10 includes a slot 15 to accommodate the window 33. The window 33 is configured to allow the amount of liquid precursor 6 in the tank 32 to be visually assessed, even when the consumable 30 is physically coupled to the body 10.

[0101] Fig. 4 shows an implementation of the apparatus 1 of Fig. 1, where the aerosol generating apparatus 1 is configured to generate aerosol by a heat not-burn process.

[0102] In this example, the apparatus 1 includes a device body 50 and a consumable 70.

[0103] In this example, the body 50 includes the power supply 4 and a heating system 52. The heating system 54 includes at least one heating element 54. The body may additionally include any one or more of electrical circuitry 56, a memory 58, a wireless interface 60, one or more other components 62.

[0104] The electrical circuitry 56 may include a processing resource for controlling one or more operations of the body 50, e.g. based on instructions stored in the memory 58.

[0105] The wireless interface 60 may be configured to communicate wirelessly with an external (e.g. mobile) device, e.g. via Bluetooth.

[0106] The other component(s) 62 may include an actuator, one or more user interface devices configured to convey information to a user and/or a charging port, for example (see e.g. Fig. 5).

[0107] The body 50 is configured to engage with the consumable 70 such that the at least one heating element 54 of the heating system 52 penetrates into the solid precursor 6 of the consumable. In use, a user may activate the aerosol generating apparatus 1 to cause the heating system 52 of the body 50 to cause the at least one heating element 54 to heat the solid precursor 6 of the consumable (without combusting it) by conductive heat transfer, to generate an aerosol which is inhaled by the user.

[0108] Fig. 5 shows an example implementation of the aerosol generating device 1 of Fig. 4.

[0109] As depicted in Fig. 5, the consumable 70 is implemented as a stick, which is engaged with the body 50 by inserting the stick into an aperture at a top end 53 of the body 50, which causes the at least one heating element 54 of the heating system 52 to penetrate into the solid precursor 6.

[0110] The consumable 70 includes the solid precursor 6 proximal to the body 50, and a filter distal to the body 50. The filter serves as the mouthpiece of the consumable 70 and thus the apparatus 1 as a whole. The solid precursor 6 may be a reconstituted tobacco formulation.

[0111] In this example, the at least one heating element 54 is a rod-shaped element with a circular transverse profile. Other heating element shapes are possible, e.g. the at least one heating element may be blade-shaped (with a rectangular transverse profile) or tube-shaped (e.g. with a hollow transverse profile).

[0112] In this example, the body 50 includes a cap 51. In use the cap 51 is engaged at a top end 53 of the body 50. Although not apparent from Fig. 5, the cap 51 is moveable relative to the body 50. In particular, the cap 51 is slidable and can slide along a longitudinal axis of the body 50.

[0113] The body 50 also includes an actuator 55 on an outer surface of the body 50. In this example, the actuator 55 has the form of a button.

[0114] The body 50 also includes a user interface device configured to convey information to a user. Here, the user interface device is implemented as a plurality of lights 57, which may e.g. be configured to illuminate when the apparatus 1 is activated and/or to indicate a charging state of the power supply 4. Other user interface devices are possible, e.g. to convey information haptically or audibly to a user. The body may also include an airflow sensor which detects airflow in the aerosol generating apparatus 1 (e.g. caused by a user inhaling through the consumable 70). This may be used to count puffs, for example.

[0115] In this example, the consumable 70 includes a flow path which transmits aerosol generated by the at least one heating element 54 to the mouthpiece of the consumable.

[0116] In this example, the aerosol generating unit 4 is provided by the above-described heating system 52 and the delivery system 8 is provided by the above-described flow path and mouthpiece of the consumable 70.

[0117] Fig. 6A shows an example of a heater assembly 100 for an aerosol generating device according to the present disclosure.

[0118] The heater assembly 100 includes a base 102, a heating element 104 protruding from the base 102, and a coating 106 extending over the heating element 104 and the base 102.

[0119] The coating 106 has been formed / applied by dipping the heating element 104 and the upper surface 108 of the base 102 in a liquid coating material. The coating 106 extends over the entire outer surface of the heating portion 110 of the heating element 104, which, as shown in Fig. 6A, is the portion of the heating element 104 protruding from the base 102 and configured to heat the aerosol precursor. The coating 106 further extends over the entire upper surface 108 of the base 102.

[0120] In other embodiments, the coating 106 does not extend over the whole of the upper surface 108 of the base 102. For example, as shown in Fig. 6B, the coating 106 may extend approximately half of the upper surface radius radially over the upper surface 108. In other embodiments, the coating extends over a portion of the side walls 112 of the base 102 and/or over a portion of the

lower surface 114 of the base 102. For example, as shown in Fig. 6C, the coating 106 may extend approximately half-way down the side wall of the base 102. Features shared in the heater assemblies of Figs. 6A, 6B and 6C are not labelled in Figs. 6B and 6C.

[0121] As shown in Fig. 6A, the coating 106 covers the interface 116 between the heating element 104 and the base 102. Although it cannot be seen in the cross-sectional view of Fig. 6A, the interface 116 is the entire split line between the heating element 104 and the base 102, and the coating 106 covers the entire split line between the heating element 104 and the base 102. The coating 106 thus prevents debris from getting trapped along the split line between the heating element 104 and the base 102.

[0122] As further shown in Fig. 6A, the external surface of the coating 106 adjacent the interface 116 is concavely arcuate. The coating 106 thus smooths off the sharp join between the heating element 104 and the base 102 at the interface 116.

[0123] As is described in more detail below, the heating element is in electrical contact with two heating element wires 118a/b. As is further described in more detail below, the heating element is fixed to a flange 120 which is retained between an upper shroud 122 and a lower shroud 124 of the base 102. The upper surface 108 of the base 102 is the upper surface 108 of the upper shroud 122. The lower surface 114 of the base 102 is the lower surface 114 of the lower shroud 124. The side walls 112 of the base 102 are formed by the side walls of the upper shroud 122 and the lower shroud 124.

[0124] Fig. 7 shows the heater assembly 100 of Fig. 6A/B/C fixed within the device body 126 of an aerosol generating device. The coating 106 is not visible in Fig. 7., however, according to the present disclosure the coating extends over the heating portion 110 of the heating element 104 and a portion of the base 102 as described above with reference to Figs. 6A, 6B and 6C.

[0125] The aerosol generating device of Fig. 7 is configured to aerosolise a solid aerosol precursor contained within a consumable. An example of an aerosol generating device configured to aerosolise a solid aerosol precursor is described above with reference to Figs. 4 and 5. The device body 126 and the heating element 104 may thus correspond respectively to the body 50 and the heating element 54 described above with reference to Figs. 4 and 5. As is described with reference to Fig. 4, in use, the rod-shaped heating element 104 penetrates into a solid precursor of a consumable.

[0126] In alternative embodiments, the aerosol generating device which the heater assembly is fixed within may be configured to aerosolise a liquid aerosol precursor. An example of an aerosol generating device configured to aerosolise a liquid aerosol precursor is described above with reference to Figs. 2 and 3.

[0127] As shown in Fig. 7, the base 102 of the heater assembly 100 fixes the heater assembly 100 within the device body 126. In particular, the upper shroud 122 of

the base 102 engages with the device body 126. To engage the upper shroud 122 with the device body 126, the upper shroud 122 comprises an alignment protrusion 128 complementary in shape to an alignment groove (not visible in Fig. 7) in the device body 126. The alignment protrusion 128 sits within the alignment groove. The structure of the base 102 will be described in more detail with reference to Fig. 8.

[0128] Fig. 8 shows the components of the heater assembly 100 before the components have been engaged with one another, and before the coating 106 has been applied. As shown, the base 102 comprises an upper shroud 122, a gasket 130, and a lower shroud 124.

[0129] The upper shroud 122 comprises a heating element-receiving aperture 132. During assembly, the heating portion 110 of the heating element 104 is inserted through the heating element-receiving aperture 132 in the upper shroud 122.

[0130] Due to the heating element 104 being received within the heating element-receiving aperture 132, the interface 116 between the heating element 104 and the base 102 includes a meeting point 116 between a peripheral edge of the aperture 132 and the outer surface of the heating element 104. Further, the interface 116 is the split line between the heating element 104 and the base 102. Thus, the coating 106, which is continuous over the split line / interface 116, is important as it prevents debris from collecting at the split line / interface.

[0131] To engage the upper shroud 122 with the heating element 104, the upper shroud 122 comprises a cavity 134 which is complementary in shape to the shape of a flange 120 fixed to the heating element 104. In particular, the upper shroud 122 comprises a D-shaped cavity 134 complementary in shape to the D-shape of the flange 120 fixed to the heating element 104.

[0132] To fix the heating element 104 between the upper shroud 122 and the lower shroud 124, the upper shroud 122 and the lower shroud 124 are configured to engage with one another as follows. The lower shroud 124 comprises four lower shroud apertures 136 complementary in shape to four upper shroud projections 138. During assembly, each of the four upper shroud projections 138 are slotted into a respective one of the four lower shroud apertures 136.

[0133] The lower shroud 124 further comprises a first wire aperture 140a and a second wire aperture 140b. The first wire aperture 140a and the second wire aperture 140b are respectively configured to receive a first heating element wire 118a and a second heating element wire 118b therethrough. The first and second heating element wires 118a/b are configured to electrically connect the heating element 104 with a power source of the aerosol generating device (not present in the figures). During assembly, the first wire 118a is slotted into the first wire aperture 140a, and the second wire 118b is slotted into the second wire aperture 140b.

[0134] The base 102 further comprises a gasket 130 between the upper shroud 122 and the lower shroud 124.

[0135] Similarly to the lower shroud 124, the gasket 130 comprises four gasket apertures 142 (only two being visible in Fig. 8). Each of the gasket apertures 142 is complementary in shape to a respective one of the upper shroud projections 138. During assembly, each of the four upper shroud projections 138 are slotted into a respective one of the four gasket apertures 142.

[0136] The gasket 130 further comprises a D-shaped sealing aperture 144 which is complementary in shape to the D-shaped heater flange 120. The D-shaped sealing aperture 144 fits around the D-shaped flange 120 to create a seal around the D-shaped flange 120.

[0137] Once the flange is fixed between the upper shroud 122 and the lower shroud 124 such that the heating element is fixed with respect to the base, the coating 106 is applied. For example, to achieve a heater assembly 100 shown in Fig. 6A, the heating portion 110 of the heating element 104, and the whole of the upper surface 108 of the upper shroud 122 are dipped in the coating material. To achieve the heater assembly 100 shown in Fig. 6B, the heating portion 110 of the heating element 104 and only a portion of the upper surface 108 of the upper shroud 122 are dipped in the coating material. To achieve the heater assembly shown in Fig. 6C, the heating portion 110 of the heating element 104, the whole of the upper surface 108 of the upper shroud 122, and a portion of the side walls 112 of the upper shroud 122 are dipped in the coating material.

[0138] The upper shroud 122 and the lower shroud 124 are formed of PEEK. The heating element 104 is formed of zirconia. The ceramic coating 106 is formed of silicon glass.

Claims

1. An aerosol generating device for aerosolising an aerosol precursor, the aerosol generating device comprising:

a device body; and,
a heater assembly including:

a base configured to fix the heater assembly within the device body; and,
a heating element protruding from the base, the heating element operable to aerosolise the aerosol precursor,

wherein the heater assembly comprises a coating extending over the heating element and at least a portion of the base, the coating covering an interface between the heating element and the base.

2. The aerosol generating device of claim 1 wherein the coating extends over an outer surface of the heating element wherein the outer surface of the heating

element faces towards the aerosol precursor in use.

3. The aerosol generating device of any of the preceding claims wherein the portion of the base includes a portion of an upper surface of the base, wherein the upper surface of the base faces towards the heating element. 5
4. The aerosol generating device of claim 3 wherein the coating extends from the heating element at least 1 mm radially over the upper surface of the base. 10
5. The aerosol generating device of claim 4 wherein the coating extends over a portion of a side wall of the base. 15
6. The aerosol generating device of any of the preceding claims wherein a thickness of the coating is between 1 micron and 10 microns. 20
7. The aerosol generating device of any of the preceding claims wherein an external surface of the coating adjacent the interface is arcuate.
8. The aerosol generating device of claim 7 wherein the external surface of the coating adjacent the interface is concavely arcuate. 25
9. The aerosol generating device of any of the preceding claims, when dependent upon claim 3, wherein a joining surface extending from the outer surface of the heater element to the upper surface of the base and passing through the interface has a radius of curvature adjacent the interface which is less than a radius of curvature of an external surface of the coating adjacent the interface. 30 35
10. The aerosol generating device of any of the preceding claims wherein the interface is a split line between the heating element and the base. 40
11. The aerosol generating device of claim 10, wherein the heating element is located through a heating element-receiving aperture in the base, and wherein the interface includes a meeting point between a peripheral edge of the aperture and an outer surface of the heating element. 45
12. The aerosol generating device of any of the preceding claims wherein the base is formed of a thermally insulating material. 50
13. The aerosol generating device according to any of the preceding claims wherein the coating is formed of a ceramic material. 55
14. The aerosol generating device of claim 13 wherein the coating is formed of silica.

15. A method of manufacturing a heater assembly for an aerosol generating device, the method comprising:

fixing a heating element to a base such that the heating element protrudes from the base, wherein the base is for fixing the heater assembly within a device body of the aerosol generating device and wherein the heating element is for aerosolising an aerosol precursor; and, applying a coating material to the heating element and at least a portion of the base to form a coating extending over the heating element and the at least a portion of the base, the coating covering an interface between the heating element and the base.

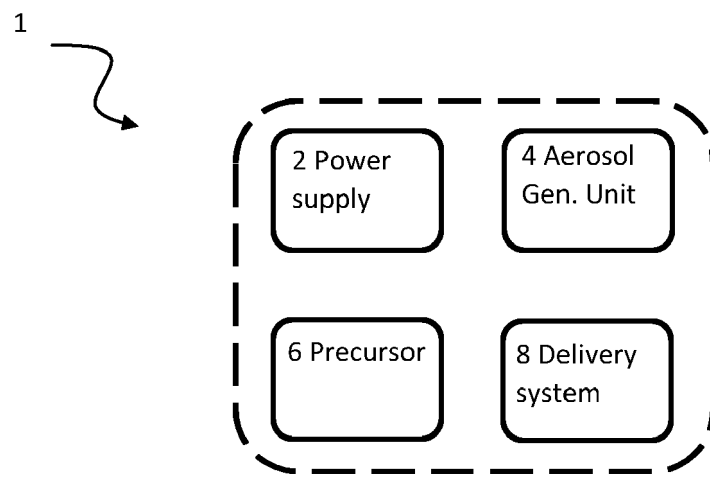


Fig. 1

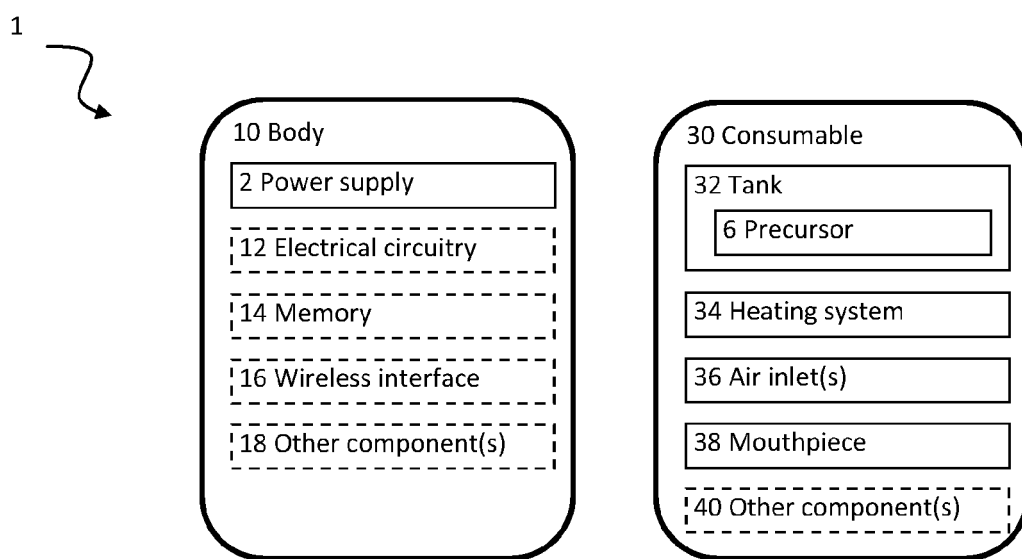


Fig. 2

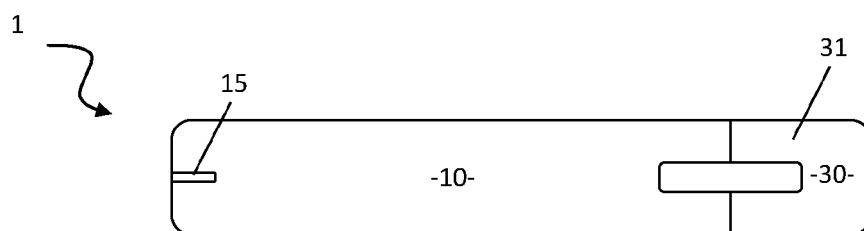


Fig. 3a

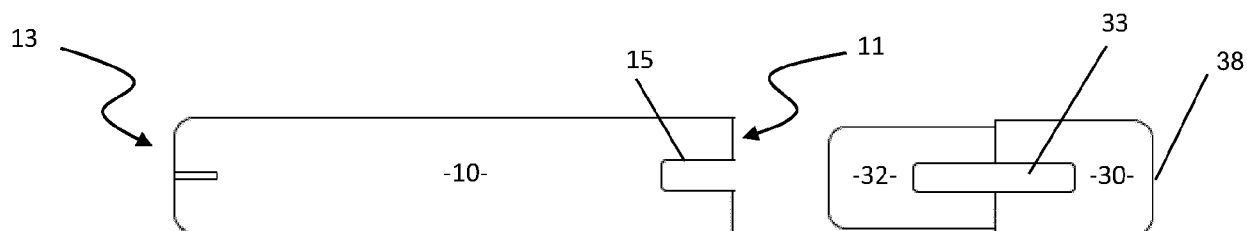


Fig. 3b

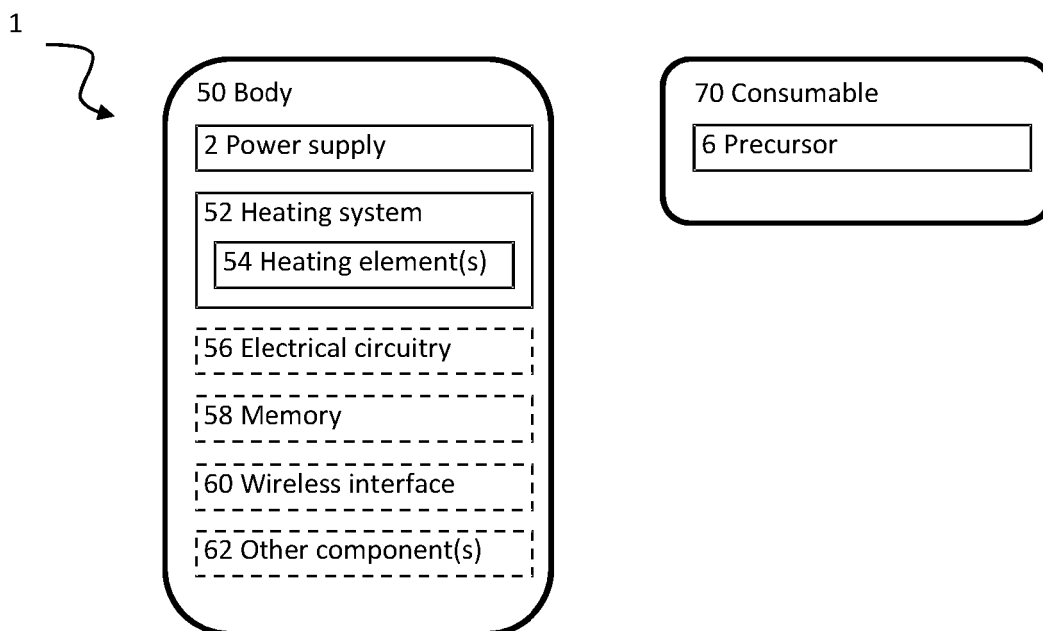


Fig. 4

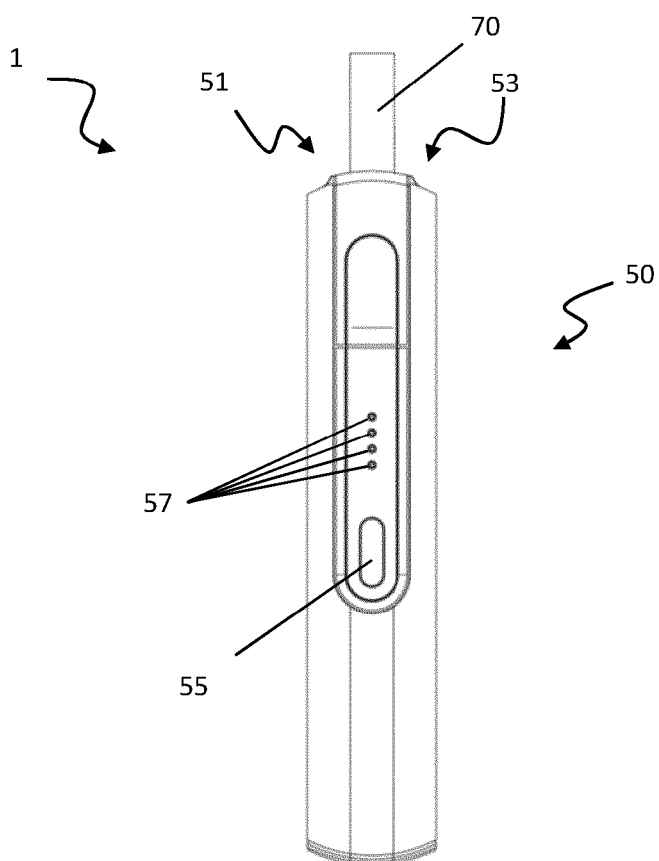


Fig. 5

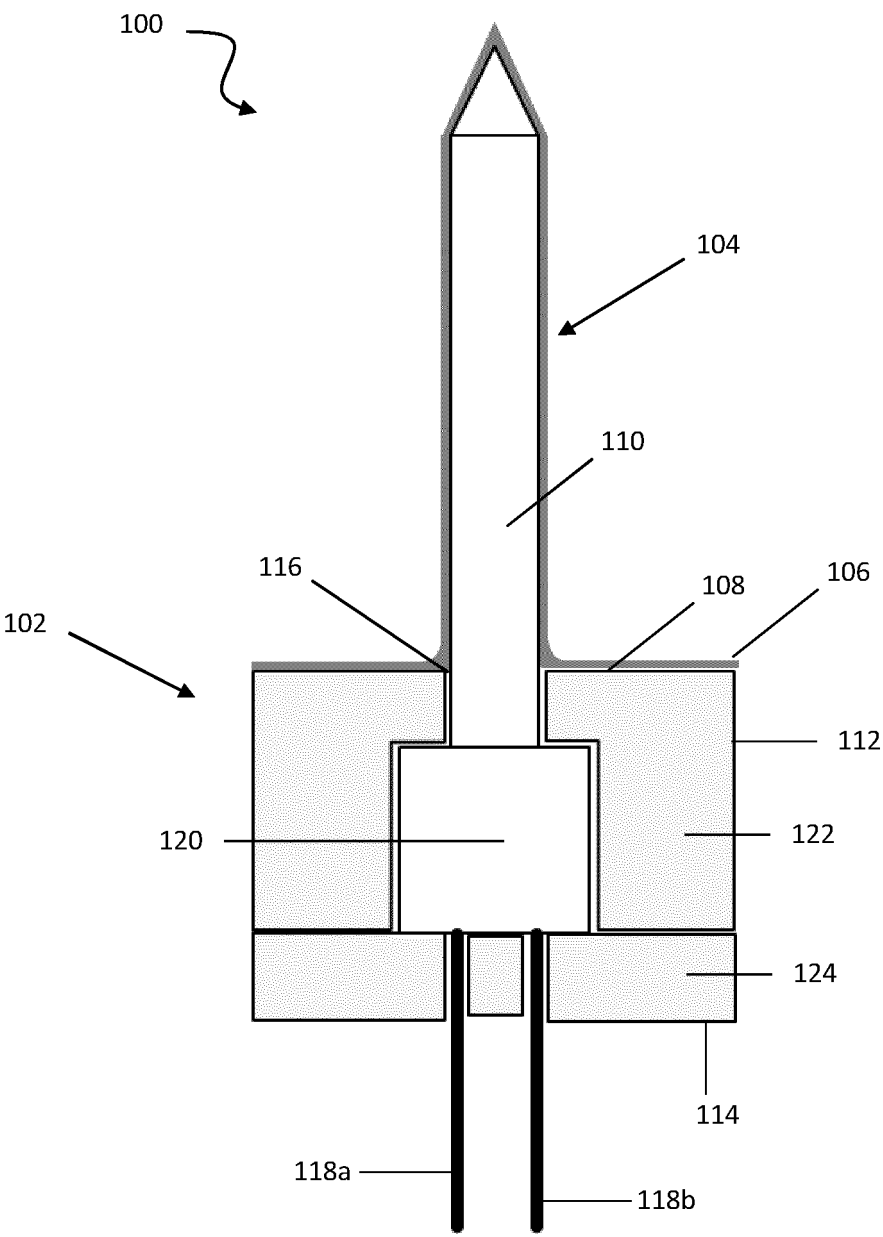


Fig. 6A

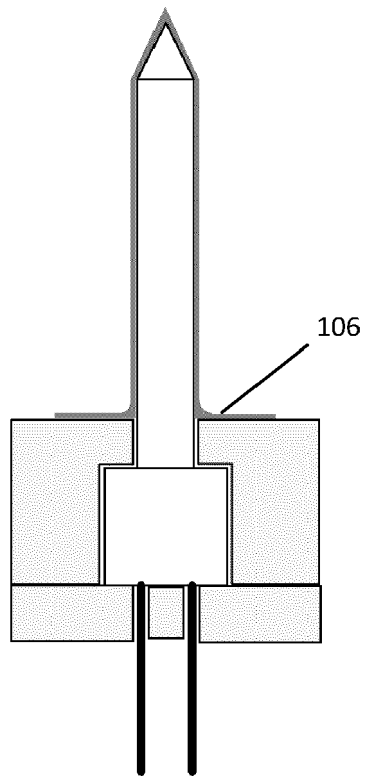


Fig. 6B

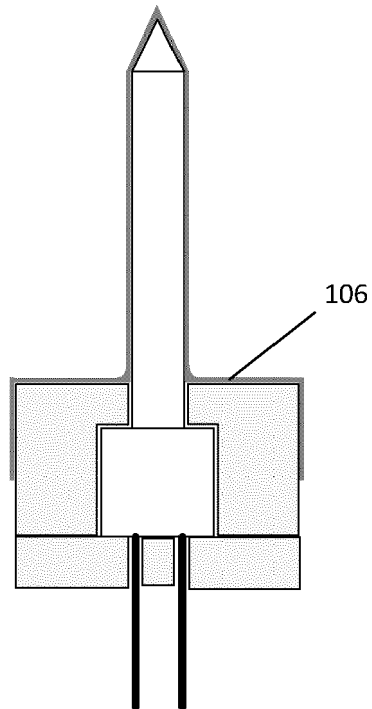


Fig. 6C

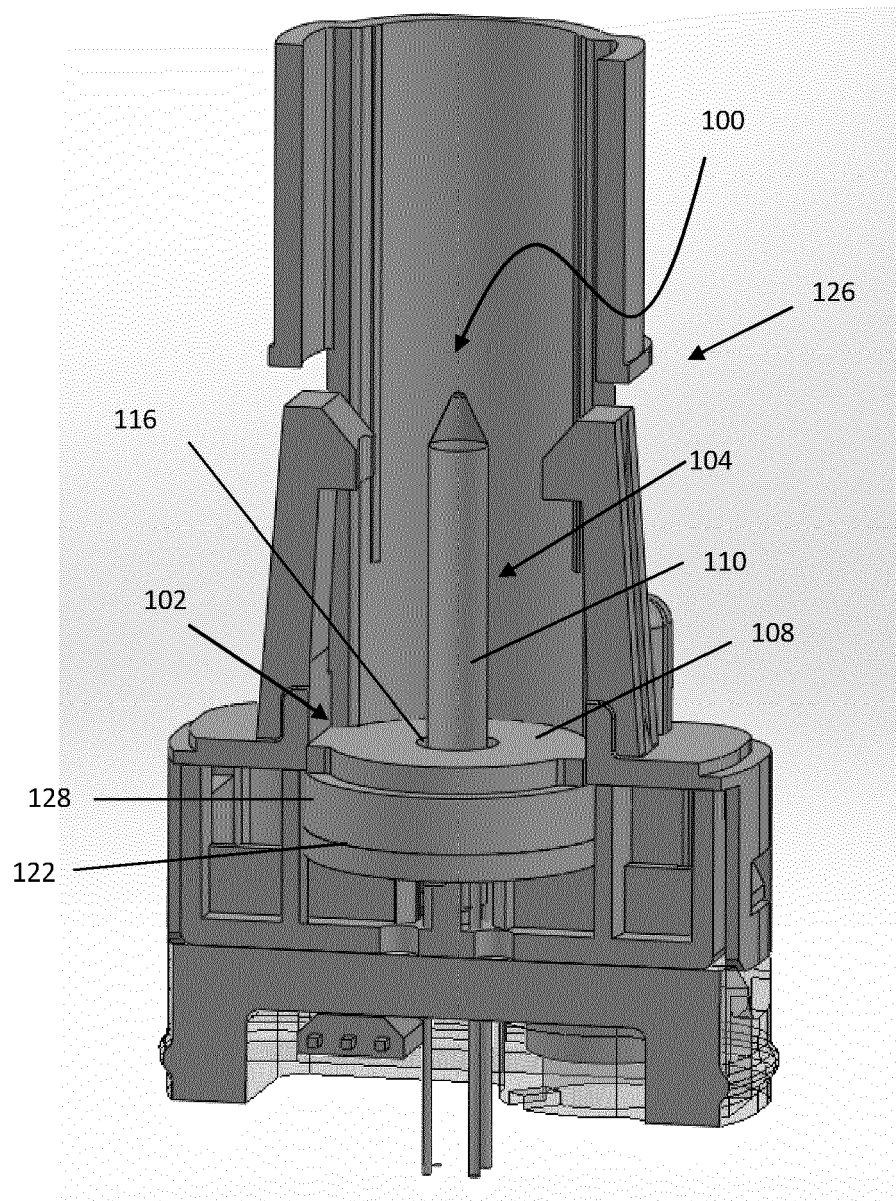


Fig. 7

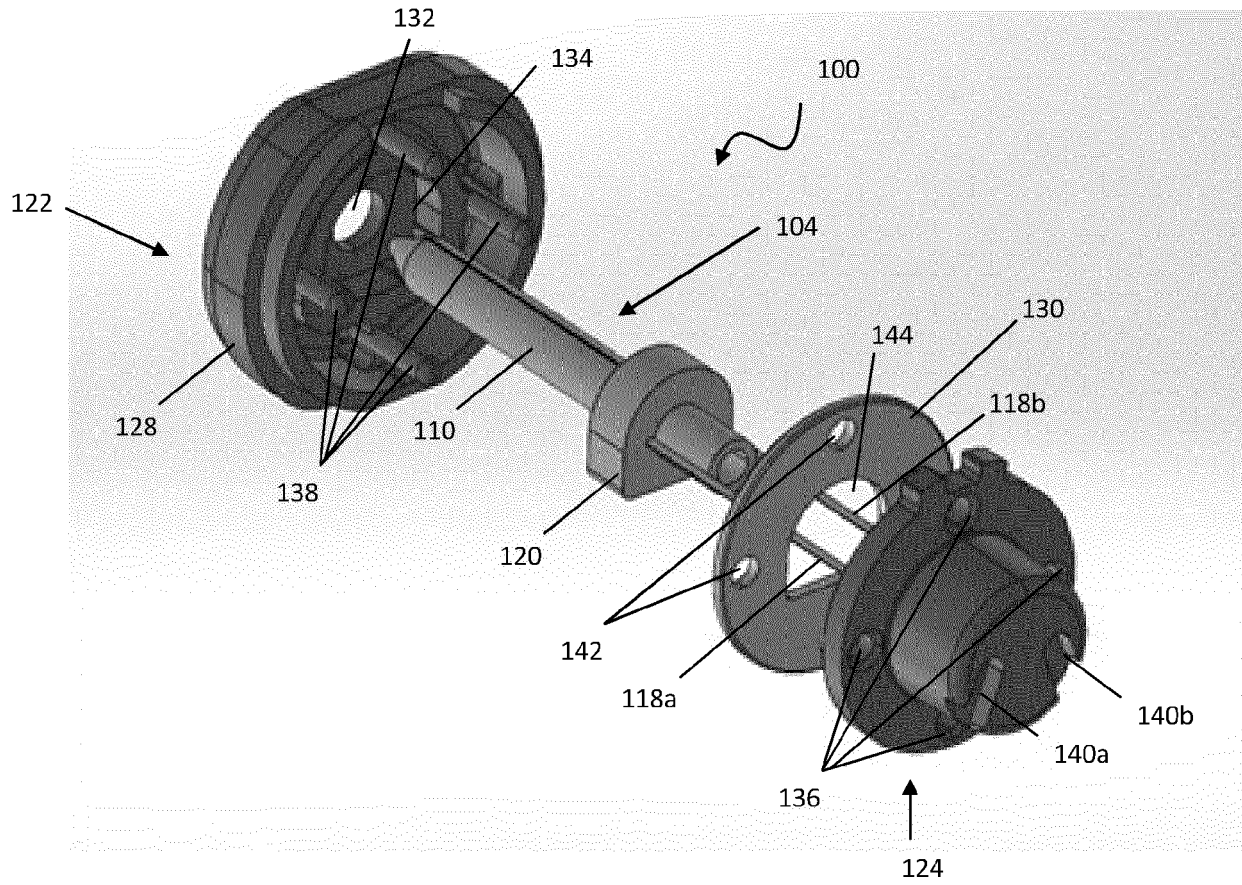


Fig. 8



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Place of search Munich		Date of completion of the search 14 June 2023	Examiner Marzano Monterosso
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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