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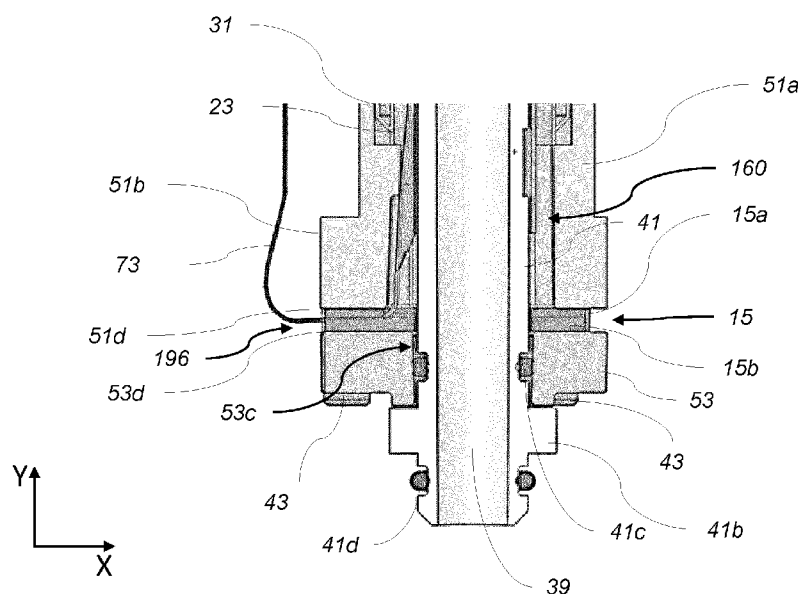


FIG. 8

(57) Abstract: An apparatus for an aerosol generating device comprises a first housing member for at least partly defining a chamber for containing a heater arrangement for heating an aerosol generating material; and a second housing member attached to the first housing member via an attachment. The first housing member and the second housing member define therebetween a passageway into the chamber. The passageway is configured to allow an electrical connecting member for connecting to the heater arrangement to extend through the passageway. The apparatus also comprises a sealing arrangement arranged to seal the passageway. The attachment between the first housing member and the second housing member is configured to hold the first housing member and the second housing member in a configuration which causes the sealing arrangement to seal the passageway.

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APPARATUS FOR AEROSOL GENERATING DEVICE

TECHNICAL FIELD

The present invention relates to apparatus for use with an aerosol generating
5 device, wherein the aerosol generating device is for heating aerosolisable material to
volatilise at least one component of the aerosolisable material.

BACKGROUND

Smoking articles, such as cigarettes, cigars and the like, burn tobacco during use
10 to create tobacco smoke. Attempts have been made to provide alternatives to these
articles by creating products that release compounds without combusting. Examples of
such products are so-called “heat not burn” products or tobacco heating devices or
products, which release compounds by heating, but not burning, material. The material
may be, for example, tobacco or other non-tobacco products, which may or may not
15 contain nicotine.

SUMMARY

According to a first aspect of the present disclosure there is provided apparatus
for an aerosol generating device, the apparatus comprising: a first housing member for
20 at least partly defining a chamber for containing a heater arrangement for heating an
aerosol generating material; a second housing member attached to the first housing
member via an attachment, wherein the first housing member and the second housing
member define therebetween a passageway into the chamber, and wherein the
passageway is configured to allow an electrical connecting member for connecting to
25 the heater arrangement to extend through the passageway; and a sealing arrangement
arranged to seal the passageway; wherein the attachment between the first housing
member and the second housing member is configured to hold the first housing member
and the second housing member in a configuration which causes the sealing
arrangement to seal the passageway.

30

The passageway may be located between a first end of the first housing member
and a second end of the second housing member located adjacent the first end of the

first housing member, and the attachment may attach the first end of the first housing member to the second end of the second housing member.

5 The attachment between the second housing member and the first housing member may be a releasable attachment and/or an attachment which is configurable to allow movement of the second housing member relative to the first housing member to unseal the passageway.

10 The attachment may comprise one or more threaded attachment members, such as one or more screws, or one or more nut and bolt pairs.

15 The one or more threaded attachment members may be tightened to a predetermined torque such that the sealing arrangement provides hermetic sealing of the passageway.

20 The sealing arrangement may comprise a first sealing member and a second sealing member; wherein the attachment between the first housing member and the second housing member is configured to hold the first and second sealing members in abutment with one another to hermetically seal the passageway between the first housing member and the second housing member and wherein the sealing arrangement is arranged in use to allow the electrical connecting member to extend through the passageway between the first sealing member and the second sealing member.

25 The attachment may be configured to provide a compressing force on the electrical connecting member located between the two sealing members to seal the passageway.

30 The sealing members may each comprise a surface which is configured to contact the electrical connecting member and which is configured to match a profile of a surface of the electrical connecting member. The surfaces of the sealing members may be substantially flat surfaces each configured to abut a substantially flat surface of the electrical connecting member.

One of the sealing members may comprise an aperture which is configured to allow the electrical connecting member to extend therethrough while the passageway is sealed to connect to the heater arrangement in the chamber.

- 5 The first housing member may define an elongate chamber for containing the heating arrangement, and the passageway may extend substantially perpendicularly to a longitudinal axis of the chamber.

10 The sealing arrangement may comprise at least one resilient sealing member.

 The sealing arrangement may comprise at least one resilient member comprising silicone.

- 15 The sealing arrangement may comprise two resilient sealing members comprising silicone, for example the sealing arrangement may comprise two silicone gaskets.

20 The sealing arrangement may be configured to seal the passageway when a portion of the electrical connecting member shaped substantially as a sheet extends through the passageway.

25 According to a second aspect of the present disclosure there is provided apparatus for an aerosol generating device comprising: apparatus according to the first aspect of the present disclosure; a heater arrangement for being received in the chamber defined by first housing member; and an electrical connecting member for extending through the passageway into the chamber to connect to the heating arrangement.

30 According to a third aspect of the present disclosure there is provided an aerosol generating device comprising apparatus according to the first aspect of the present disclosure or apparatus according to the second aspect of the present disclosure.

 According to a fourth aspect of the present disclosure there is provided a housing module for being received in an aerosol generating device, wherein the housing module

is for containing a heater arrangement for heating aerosol generating material in the aerosol generating device, the housing module comprising: a housing at least partly defining a chamber for containing a heater arrangement for heating aerosol generating material to thereby generate an aerosol, wherein the housing comprises a proximal end and a distal end; and a passageway through the housing into the chamber, wherein the passageway is configured to allow an electrical connecting member for connecting to the heater arrangement to exit the chamber through the passageway; and wherein the passageway is located away from both the proximal end and the distal end of the housing.

10

The passageway may be oriented laterally to a longitudinal axis of the housing module extending between the proximal and the distal ends of the housing module.

The passageway may be oriented substantially perpendicularly to the longitudinal axis of the housing module.

The housing module may comprise a sealing arrangement arranged to seal the passageway while allowing the electrical connecting member through the passageway.

The housing module may comprise apparatus according to the first aspect of the present disclosure.

According to a fifth aspect of the present disclosure there is provided an aerosol generating device comprising: a housing module according to the fourth aspect of the present disclosure and a heating arrangement arranged in the chamber defined by the housing module; and an electrical connecting member extending through the passageway into the chamber such that a first portion of the electrical connecting member may connect to the heating arrangement; wherein a second portion of the electrical connecting member is exterior to the housing module and is arranged to connect to an electrical component of the device.

30

The electrical connecting member may exit the passageway in a direction lateral to a longitudinal axis of the housing module extending between the proximal and distal

ends, and the second portion of the electrical connecting member may be aligned substantially parallel to the longitudinal axis of the housing module.

5 The second portion of the electrical connecting member may be configured to connect to an electrical component of the device, such as a printed circuit board, which is arranged adjacent to the housing module and substantially parallel with a longitudinal axis of the housing module.

10 The electrical connecting member may comprise only one bend between a portion of the electrical connecting member which exits the passageway in a direction lateral to the longitudinal axis of the housing module, and the second portion of the electrical connecting member which is aligned substantially parallel to the longitudinal axis of the housing module.

15 According to a sixth aspect of the present disclosure there is provided an aerosol generating system comprising: a device according to the third aspect of the present disclosure or a device according to a fifth aspect of the present disclosure; and an article containing an aerosol generating material arranged to be heated by the device.

20 The aerosol generating material may comprise tobacco and the device may be a tobacco heating product, also known as a heat not burn device.

Further features and advantages of the invention will become apparent from the following description of preferred embodiments of the invention, given by way of
25 example only, which is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a schematic perspective view of an example of an apparatus for heating aerosolisable material to volatilise at least one component of the aerosolisable
30 material, also referred to herein as an aerosol generating device, wherein the apparatus is shown with an article comprising aerosolisable material inserted;

Figure 2 shows a schematic front view of the example apparatus of Figure 1 with the article inserted;

Figure 3 shows a schematic right-side view of the example apparatus of Figure 1 with the article inserted;

Figure 4 shows a schematic left-side view of the example apparatus of Figure 1 with the article inserted;

5 Figure 5 shows a schematic front cross-sectional view of the example apparatus of Figure 1 with the article inserted through line A-A shown in Figure 4;

Figure 6 shows a schematic front cross-sectional view of the example apparatus of Figure 1 without an article inserted;

10 Figure 7 shows a schematic rear view of a portion of an example housing module for the example apparatus of Figure 1;

Figure 8 shows a schematic rear cross-sectional view of the portion of the example housing module shown in Figure 7;

Figure 9 shows a schematic perspective rear view of the portion of the example housing module shown in Figure 7;

15 Figure 10 shows a schematic cross-sectional perspective rear view of the portion of the example housing module shown in Figure 7;

Figure 11 shows a schematic perspective view of first housing member of the example housing module;

20 Figure 12 shows a schematic perspective view of the second housing member of the example housing module;

Figure 13 shows a top down perspective view first example sealing member; and

Figure 14 shows a top down perspective view of a second example sealing member.

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DETAILED DESCRIPTION

As used herein, the term “aerosolisable material” includes materials that provide volatilised components upon heating, typically in the form of vapour or an aerosol. “Aerosolisable material” may be a non-tobacco-containing material or a tobacco-containing material. “Aerosolisable material” may, for example, include one or more
30 of tobacco per se, tobacco derivatives, expanded tobacco, reconstituted tobacco, tobacco extract, homogenised tobacco or tobacco substitutes. The aerosolisable material can be in the form of ground tobacco, cut rag tobacco, extruded tobacco,

reconstituted tobacco, reconstituted aerosolisable material, liquid, gel, amorphous solid, gelled sheet, powder, or agglomerates, or the like. "Aerosolisable material" also may include other, non-tobacco products, which, depending on the product, may or may not contain nicotine. "Aerosolisable material" may comprise one or more humectants, such as glycerol or propylene glycol. The term "aerosol generating material" may also be used herein interchangeably with the term "aerosolisable material".

As noted above, the aerosolisable material may comprise an "amorphous solid", which may alternatively be referred to as a "monolithic solid" (i.e. non-fibrous), or as a "dried gel". The amorphous solid is a solid material that may retain some fluid, such as liquid, within it. In some cases, the aerosolisable material comprises from about 50wt%, 60wt% or 70wt% of amorphous solid, to about 90wt%, 95wt% or 100wt% of amorphous solid. In some cases, the aerosolisable material consists of amorphous solid.

As used herein, the term "sheet" denotes an element having a width and length substantially greater than a thickness thereof. The sheet may be a strip, for example.

Certain examples of an aerosol generating devices described herein heat aerosol generating material by resistive heating. Resistive heating involves using electrically resistive heating elements that heat up when an electric current is applied to the electrically resistive heating element/s to heat the aerosol generating material.

Referring to Figure 1, there is shown a schematic perspective view of an apparatus 1, also referred to herein as an aerosol generating device 1, according to an example of the invention. The apparatus 1 is for heating aerosolisable material to volatilise at least one component of the aerosolisable material. In this example, the aerosolisable material 72 comprises tobacco, and the apparatus 1 is a tobacco heating product (also known in the art as a tobacco heating device or a heat-not-burn device). The example apparatus 1 is a hand-held device.

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The apparatus 1 comprises a first end 3 and a second end 5, opposite the first end 3. The first end 3 is sometimes referred to herein as the mouth end or proximal end of the apparatus 1. The second end 5 is sometimes referred to herein as the distal end

of the apparatus 1. The apparatus 1 has an on/off button 7 to allow the apparatus 1, as a whole, to be switched on and off as desired by a user of the apparatus 1.

In broad outline, the apparatus 1 is configured to generate an aerosol to be inhaled by a user by heating an aerosol generating material. In use, a user inserts an article 21 into the apparatus 1 and activates the apparatus 1, e.g. using the button 7, to cause the apparatus 1 to begin heating the aerosol generating material. The user subsequently draws on the article 21 near the first end 3 of the apparatus 1 to inhale an aerosol generated by the apparatus 1. As a user draws on the article 21, generated aerosol flows through the apparatus 1 along a flow path towards the proximal end 3 of the apparatus 1.

In examples, a vapour is produced that then at least partly condenses to form an aerosol before exiting the apparatus 1 to be inhaled by the user.

In this respect, first it may be noted that, in general, a vapour is a substance in the gas phase at a temperature lower than its critical temperature, which means that for example the vapour can be condensed to a liquid by increasing its pressure without reducing the temperature. On the other hand, in general, an aerosol is a colloid of fine solid particles or liquid droplets, in air or another gas. A “colloid” is a substance in which microscopically dispersed insoluble particles are suspended throughout another substance.

For reasons of convenience, as used herein the term aerosol should be taken as meaning an aerosol, a vapour or a combination of an aerosol and vapour.

The apparatus 1 comprises a casing 9 for locating and protecting various internal components of the apparatus 1. The casing 9 is therefore an external housing for housing the internal components. In the example shown, the casing 9 comprises a sleeve 11 that encompass a perimeter of the apparatus 1, capped with a top panel 17, at the first end 3, which defines generally the ‘top’ of the apparatus 1 and a bottom panel 19, at the second end 5 (see Figures 2 to 5), which defines generally the ‘bottom’ of the apparatus 1.

The sleeve 11 comprises a first sleeve 11a and a second sleeve 11b. The first sleeve 11a is provided at a top portion of the apparatus 1 and extends away from the first end 3. The second sleeve 11b is provided at the bottom of the apparatus 1 and extends away from the second end 5. The first sleeve 11a and second sleeve 11b each encompass a perimeter of the apparatus 1. That is, the apparatus 1 comprises a longitudinal axis along a Y-direction, and the first sleeve 11a and the second sleeve 11b each surround the internal components in a direction radial to the longitudinal axis.

10 In this example, the first sleeve 11a and a second sleeve 11b are removably engaged with each other. In this example, the first sleeve 11a is engaged with the second sleeve 11b in a snap-fit arrangement comprising grooves and recesses.

15 In some examples, the top panel 17 and/or the bottom panel 19 may be removably fixed to the corresponding first and second sleeves 11a, 11b, respectively, to permit easy access to the interior of the apparatus 1. In some examples, the sleeve 11 may be “permanently” fixed to the top panel 17 and/or the bottom panel 19, for example to deter a user from accessing the interior of the apparatus 1. In one example, the panels 17 and 19 are made of a plastics material, including for example glass-filled nylon
20 formed by injection moulding, and the sleeve 11 is made of aluminium, though other materials and other manufacturing processes may be used.

The top panel 17 of the apparatus 1 has an opening 20 at the mouth end 3 of the apparatus 1 through which, in use, the article 21 containing aerosolisable material is inserted into the apparatus 1 and removed from the apparatus 1 by a user. The opening
25 20 in this example is opened and closed by a door 4. In the example shown, the door is movable between a closed position and an open position to allow for insertion of the article 21 into the apparatus 1. The door 4 is configured to move bi-directionally parallel to an X-direction.

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A connection port 6 is shown at the second end 5 of the apparatus 1. The connection port 6 is for connection to a cable and a power source for charging a power source of the apparatus 1. The connection port 6 extends in a Z-direction from a front

side of the apparatus 1 to a rear side of the apparatus 1. As shown in Figure 3, the connection port 6 is accessible on a right-side of the apparatus 1 at the second end 5 of the apparatus 1. Advantageously, the apparatus 1 may stand on the second end 5 whilst charging or data connection through the connection port 6. In the embodiment shown,
5 the connection port 6 is a USB socket.

Referring to Figure 2, the first sleeve 11a comprises a surface at the first end 3 of the apparatus 1 that is tapered. The tapered surface comprises a first angle α with respect to a surface of the second sleeve 11b at the second end 5. In this example, the
10 surface of the second sleeve 11b at the second end 5 is substantially parallel to the X-direction. Therefore, as shown the article 21 is insertable through the opening 20 at a proximal portion of the first end 3. Where the first sleeve 11a and second sleeve 11b meet at a join 11c, a second angle β with respect to the X-direction is formed. The second angle β is shown to be greater than the first angle α .

15

Figure 3 and Figure 4 respectively show a right-side and left-side of the apparatus 1. Here, the article 21 is shown in a laterally central location. This is because the opening 20 through which the article 21 is inserted is positioned at a mid-way point along the X-direction and Z-direction.

20

Figure 5 and Figure 6 show schematic front cross-sectional views of the apparatus 1 with the article inserted and withdrawn, respectively, through a line 44 of the apparatus 1, as shown in Figure 4 and Figure 6.

25

As shown in Figure 6, the casing 9 has located or fixed therein a heater arrangement 23, control circuitry 25 and a power source 27. The heater arrangement 23 in this example is contained in a housing module 50, as will be described in more detail below. In this example, the control circuitry 25 is part of an electronics compartment and comprises two printed circuit boards (PCBs) 25a, 25b. In this example, the control
30 circuitry 25 and the power source 27 are laterally adjacent to the heater arrangement 23 (that is, adjacent when viewed from an end), with the control circuitry 25 being located below the power source 27. Advantageously, this allows the apparatus 1 to be compact in a lateral direction, corresponding to the X-direction.

The control circuitry 25 in this example includes a controller, such as a microprocessor arrangement, configured and arranged to control the heating of the aerosolisable material in the article 21, as discussed further below.

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The power source 27 in this example is a rechargeable battery. In other examples, a non-rechargeable battery, a capacitor, a battery-capacitor hybrid, or a connection to a mains electricity supply may be used. Examples of suitable batteries include for example a lithium-ion battery, a nickel battery (such as a nickel-cadmium battery), an alkaline battery and/ or the like. The battery 27 is electrically coupled to the heater arrangement 23 to supply electrical power when required and under control of the control circuitry 25 to heat the aerosolisable material in the consumable (as discussed, to volatilise the aerosolisable material without causing the aerosolisable material to burn).

15

An advantage of locating the power source 27 laterally adjacent to the heater arrangement 23 is that a physically large power source 27 may be used without causing the apparatus 1, as a whole, to be unduly lengthy. As will be understood, in general, a physically large power source 27 has a higher capacity (that is, the total electrical energy that can be supplied, often measured in Amp-hours or the like) and thus the battery life for the apparatus 1 can be longer.

In one example, the heater arrangement 23 is generally in the form of a hollow cylindrical tube, having a hollow interior heating chamber 29 into which the article 21 comprising the aerosolisable material is inserted for heating, in use. Broadly speaking, the heating chamber 29 is a heating zone for receiving the article 21. Different arrangements for the heater arrangement 23 are possible. In some examples, the heater arrangement 23 may comprise a single heating element or may be formed of plural heating elements aligned along the longitudinal axis of the heater arrangement 23. The or each heating element may be annular or tubular, or at least part-annular or part-tubular around its circumference. In an example, the or each heating element may be a thin-film heater. In another example, the or each heating element may be made of a ceramics material. Examples of suitable ceramics materials include alumina and

aluminium nitride and silicon nitride ceramics, which may be laminated and sintered. Other heater arrangements are possible, including for example inductive heating, infrared heater elements, which heat by emitting infrared radiation, or resistive heating elements formed by for example a resistive electrical winding.

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In this example, the heater arrangement 23 is supported by a stainless steel support tube 75 and comprises a heater 71. In one example the heater 71 may comprise a substrate in which at least one electrically conductive element is formed. The substrate may be in the form of a sheet and may comprise for example a plastics layer.

10 In a specific example the layer is a polyimide layer. The electrically conductive element/s may be printed or otherwise deposited in the substrate layer. The electrically conductive element/s may be encapsulated within or coated with the substrate.

The support tube 75 is a heating element that transfers heat generated by the
15 heater 71 to the article 21. The heater arrangement 23 is dimensioned so that substantially the whole of the aerosolisable material when the article 21 is inserted in the apparatus 1 so that substantially the whole of the aerosolisable material is heated in use. In other examples, other thermally conductive materials may be used for the support tube 75. For example, the support tube 75 may comprise a metal or a metal
20 alloy. In some examples the support tube 75 may comprise graphite or another conductive carbon material.

In some examples, the or each heating element may be arranged so that selected zones of the aerosolisable material can be independently heated, for example in turn
25 (over time) or together (simultaneously) as desired.

The heater arrangement 23 in this example is surrounded along at least part of its length by a vacuum region 31. The vacuum region 31 helps to reduce heat passing from the heater arrangement 23 to the exterior of the apparatus 1. This helps to keep
30 down the power requirements for the heater arrangement 23 as it reduces heat losses generally. The vacuum region 31 also helps to keep the exterior of the apparatus 1 cool during operation of the heater arrangement 23. In some examples, the vacuum region 31 may be surrounded by a double-walled sleeve wherein the region between the two

walls of the sleeve has been evacuated to provide a low-pressure region so as to minimise heat transfer by conduction and/or convection. In other examples, another insulating arrangement may be used, for example using heat insulating materials, including for example a suitable foam-type material, in addition to or instead of a vacuum region.

The housing 9 may further comprise various internal support structures 37 (best seen in Figure 6) for supporting internal components of the apparatus 1.

As mentioned above, in this example, the heater arrangement 23 and vacuum region 31 are contained within the housing module 50, which may also be referred to as cassette 51. The housing module 50 defines a chamber 160 in which the heater arrangement 23 and the vacuum region 31 are located. The heating chamber 29 is accordingly also within the chamber 160. In this example, the housing module 50 comprises a first housing member 51 and a second housing member 53. The first housing member 51 is an elongate member which defines the chamber 160 and houses the heater arrangement 23. The second housing member 53 is located at a distal end of the first housing member 51 and closes the chamber 160, as will be explained in more detail below. The first and second housing members 51, 53 may in examples be formed by a suitable material, such as a plastics material, as will be discussed below in more detail.

In examples, the housing module 50 provides for containment of the heater arrangement 23. The housing module 50 may act to isolate the heater arrangement 23 and associated components for receiving the article 21 from other components of the apparatus 1, such as the control circuitry 25. This may provide, for example, that vapour or aerosol generated by the heater arrangement 23 or air heated by the heater arrangement 23 does not come into contact with other components of the device 1, such as the control circuitry 25, or at least that airflow or vapour flow between the chamber 160 and the remainder of the apparatus 1 exterior to the housing module 50 is minimised. Furthermore, the vacuum region 31 is arranged in the housing module 50 to insulate the chamber 160 and the heater arrangement 23 contained therein from parts of the apparatus 1 outside of the housing module 50.

The apparatus 1 further comprises a collar 33 which extends around and projects from the opening 20 into the interior of the housing 9 and an expansion element 35 which is located between the collar 33 and one end of the vacuum region 31. The expansion element 35 is a funnel that forms an expansion chamber 40 at the mouth end 3 of the apparatus 1. The collar 33 is a retainer for retaining the article 21 (as is best shown in Figure 5). In this example, the retainer is reversibly removable from the apparatus 1.

One end of the expansion element 35 connects to and is supported by the first sleeve 11a and the other end of the expansion element 35 connects to and is supported by one end of the housing module 50, in this example by a proximal end of the first housing member 51. A first sealing element 55, shown as an o-ring, is interposed between the expansion element 35 and the first sleeve 11a, and a second sealing element 57, also shown as an o-ring, is interposed between the expansion element 35 and an interior surface of the first housing member 51. Each o-ring is made of silicone, however, other elastomeric materials may be used to provide the seal. The first and second sealing elements 55, 57 prevent the transmission of gas into surrounding components of the apparatus 1.

As best seen in Figure 6, the collar 33, the expansion element 35 and the vacuum region 31/heater arrangement 23 are arranged co-axially, so that, as best seen in Figure 5, when the article 21 is inserted in the apparatus 1, it extends through the collar 33 and the expansion element 35 into the heating chamber 29.

As mentioned above, in this example, the heater arrangement 23 is generally in the form of a hollow cylindrical tube. The heating chamber 29 formed by this tube is in fluid communication with the opening 20 at the mouth end 3 of the apparatus 1 via the expansion chamber 40.

In this example, the expansion element 35 comprises a tubular body that has a first open end adjacent the opening 20 and a second open end adjacent the heating chamber 29. The tubular body comprises a first section that extends from the first open

end to approximately half way along the tubular body and a second section that extends from approximately half away along the tubular body to the second open end. The first section comprises a flared portion that widens away from the second section. The first section therefore has an internal diameter that tapers outwardly towards the opening
5 first open end. The second section has a substantially constant internal diameter.

As best seen in Figure 6, in this example, the expansion element 35 is located in the housing 9 between the collar 33 and the vacuum region 31/heater arrangement 23. More specifically, at the second open end, the expansion element 35 is interposed
10 between an end portion of a support tube 75 of the heater arrangement 23 an inside of the vacuum region 31 so that the second open end of the expansion element 35 engages with the support tube 75 and the inside of the vacuum region 31. At the first open end, the expansion element 35 receives the collar 33 so that legs 59 of the collar 33 project into the expansion chamber 40. Therefore, an inner diameter of the first section of the
15 expansion element 35 is greater than an external diameter of the legs when the article 21 is received in the apparatus 1 (see Figure 5) and when no article 21 is present.

As is best appreciated from Figure 5, the inner diameter of the first section of the expansion element 35 is larger than the external diameter of the article 21. There is
20 therefore an air gap 36 between the expansion element 35 and the article 21 when the article 21 is inserted in the apparatus 1 over at least part of the length of the expansion element 35. The air gap 36 is around the entire circumference of the article 21 in that region.

As best seen in Figure 6, the collar 33 comprises a plurality of legs 59. In this example there are four legs 59, where only three are visible in the view of Figure 6. However, in other examples there may be more or fewer than four legs 59. The legs 59 are arranged circumferentially equally spaced around an inner surface of the collar 33 and exist in the expansion chamber 40 when the apparatus 1 is assembled. In this
25 example, when installed in the apparatus 1, the legs 59 are circumferentially equally spaced around the periphery of the opening 20. Each of the legs 59 extend in the Y-direction and parallel to a longitudinal axis 44 (represented with a dotted line in Figure 6) of the expansion chamber 40 and project into the opening 20. The legs 59 also extend
30

radially at a tip 59a of the leg 59 in a direction towards the expansion element 35 such that the tips 59a are angled away from each other. The tip 59a of each leg 59 provides for improved passage of the article 21 so as to avoid damage to the article 21 when inserting and/or removing the article 21 from the apparatus 1. Together, the legs 59
5 provide a gripping section that grips the article 21 in order to correctly position and retain the portion of the article 21 that is within the expansion chamber 40 when the article 21 is within the apparatus 1. Between them, the legs 59 gently compress or pinch the article 21 in the region or regions of the article 21 that are contacted by the legs 59.

10 The legs 59 may be comprised of a resilient material (or be resilient in some other way) so that they deform slightly (for example compress) to better grip the article 21 when the article 21 is inserted in the apparatus 1 but then regain their original shape when the article 21 is removed from the apparatus 1 since the legs 59 are biased to a rest position shown in Figure 6. Therefore, the legs 59 are reversibly movable from a
15 first position, which is the rest position, to a second position, which is a deformed position shown in Figure 5, whereby the article 21 is gripped. In this embodiment, the legs 59 are formed integrally with a main body of the collar 33. However, in some embodiments, the legs 59 may be separate components that are attached to the body of the collar 33. The inner diameter of the space formed between the legs 59 in the first,
20 rest position, may be, for example, between 4.8mm and 5mm, and preferably 4.9mm. The legs 59 take up space within the opening 20 such that the open span of the opening 20 at the locations of the legs 59 is less than the open span of the opening 20 at the locations without the ridges 59.

25 The expansion element 35 may be formed of for example a plastics material, including for example polyether ether ketone (PEEK). PEEK has a relatively high melting point compared to most other thermoplastics, and is highly resistant to thermal degradation.

30 Referring to Figure 6, in this example, the heating chamber 29 communicates with a region 38 of reduced internal diameter towards the distal end 5. This region 38 defines a clean-out chamber 39 formed by a clean-out tube 41. The clean-out tube 41 is a hollow tube that provides an end stop for the article 21 passed through the opening

at the mouth end 3 (see Figure 5). In some examples, the clean-out tube 41 is arranged to support and locate the heater arrangement 23 in the chamber 160.

The apparatus 1 may further comprise a door 61 at the distal end 5 of the apparatus 1 that opens and closes an opening in the bottom panel 19 to provide access to the heating chamber 29 so that the heating chamber 29 can be cleaned. The door 61 pivots about a hinge 63. This access through the door 61 particularly enables the user to clean within the heater arrangement 23 and the heating chamber 29 at the distal end 5. When the door 61 is open, a straight through-bore is provided through the whole apparatus 1 between the opening 20 at the mouth end 3 and an opening at one end of the clean-out chamber at the distal end 5 of the apparatus 1. The user is therefore easily able to clean through substantially the whole of the interior of the hollow heating chamber 29. For this, the user can access the heating chamber 29 via either end of the apparatus 1 at choice. The user may use one or more various cleaning devices for this purpose, including for example a classic pipe cleaner or a brush or the like.

As shown in Figure 6, the top panel 17 generally forms the first end 3 of the housing 9 of the apparatus 1. The top panel 17 supports the collar 33 which defines an insertion point in the form of the opening 20 through which the article 21 is removably inserted into the apparatus 1 in use.

The collar 33 extends around and projects from the opening 20 into the interior of the housing 9. In this example, the collar 33 is a distinct element from the top panel 17, and is attached to the top panel 17 through an attachment, such as a bayonet locking mechanism. In other examples, an adhesive or screws may be used to couple the collar 33 to the top panel 17. In other examples, the collar 33 may be integral with the top panel 17 of the housing 9 so the collar 33 and the top panel 17 form a single piece.

As best appreciated from Figure 5, open spaces defined by adjacent pairs of legs 59 of the collar 33 and the article 21 form ventilation paths 61 around the exterior of the article 21. These ventilation paths 61, allow hot vapours that have escaped from the article 21 to exit the apparatus 1 and allow cooling air to flow into the apparatus 1 around the consumable 21. In this example, four ventilation paths are located around the

periphery of the article 21, which provide ventilation for the apparatus 1. In other examples, more or fewer such ventilation paths 61 may be provided.

Referring again particularly to Figure 5, in this example, the article 21 is in the form of a cylindrical rod which has or contains aerosolisable material 21a at a rear end in a section of the article 21 that is within the heater arrangement 23 when the article 21 is inserted in the apparatus 1. A front end of the article 21 extends from the apparatus 1 and acts as a mouthpiece assembly 21b which includes one or more of a filter for filtering aerosol and/or a cooling element 21c for cooling aerosol. The filter/cooling element 21c is spaced from the aerosolisable material 21a by a space 21d and is also spaced from a tip of mouthpiece assembly 21b by a further space 21e. The article 21 is circumferentially wrapped in an outer layer (not shown). In this example, the outer layer of the article 21 is permeable to allow some heated volatilised components from the aerosolisable material 21a to escape the article 21.

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In operation, the heater arrangement 23 will heat the article 21 to volatilise at least one component of the aerosolisable material 21a.

The primary flow path for the heated volatilised components from the aerosolisable material 21a is axially through the article 21, through the space 21d, the filter/cooling element 21c and the further space 21e before entering a user's mouth through the open end of the mouthpiece assembly 21b. However, some of the volatilised components may escape from the article 21 through its permeable outer wrapper and into the space 36 surrounding the article 21 in the expansion chamber 40.

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It would be undesirable for the volatilised components that flow from the article 21 into the expansion chamber 40 to be inhaled by the user, because these components would not pass through the filter/cooling element 21c and thus be unfiltered and not cooled.

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Advantageously, the volume of air surrounding the article 21 in the expansion chamber 40 causes at least some of the volatilised components that escape the article 21 through its outer layer to cool and condense on the interior wall of the expansion

chamber 40 preventing those volatilised components from being possibly inhaled by a user.

This cooling effect may be assisted by cool air that is able to enter from outside the apparatus 1 into the space 36 surrounding the article 21 in the expansion chamber 40 via the ventilation paths, which allows fluid to flow into and out of the apparatus. A first ventilation path is defined between a pair of the plurality of neighbouring legs 59 of the collar 33 to provide ventilation around the outside of the article 21 at the insertion point. A second ventilation path is provided between a second pair of neighbouring legs 59 for at least one heated volatilised component to flow from the article 21 at a second location. Therefore, ventilation is provided around the outside of the article 21 at the insertion point by the first and second ventilation paths. Furthermore, heated volatilised components that escape the article 21 through its outer wrapper do not condense on the internal wall of the expansion chamber 40 and are able to flow safely out of the apparatus 1 via the ventilation paths 61 without being inhaled by a user. The expansion chamber 40 and the ventilation both aid in reducing the temperature and the content of water vapour composition released in heated volatilised components from the aerosolisable material.

The apparatus 1 is fitted with a thermal liner 13 towards the first end 3 of the apparatus 1. As shown in Figure 6, the liner 13 is coupled with the first sleeve 11a. The thermal liner 13 helps to protect the first sleeve 11a from thermal stress by distributing internal heat generated by use of the apparatus 1 over a larger area. The thermal liner 13 is made from a metallic material such as aluminium in order to be lightweight and sufficiently spread heat around the proximal end 3. This helps to avoid localised hot spots and increases the longevity of the first sleeve 11a. The liner 13 distributes heat by conduction. The liner 13 is not configured to insulate heat or reflect heat by radiation.

As shown in Figure 6, the support tube 75 is externally wrapped by a heater 71. In an example, the heater 71 is a thin-film heater comprising polyimide and electrically conductive elements, for example as has been described above. The heater 71 may comprise a plurality of heating regions that are independently controlled and/or simultaneously controlled. In this example, the heater 71 is formed as a single heater.

However, in other examples, the heater 71 may be formed of a plurality of heaters aligned along the longitudinal axis of the heating chamber 29. In some examples, a plurality of temperature sensors (not shown) may be used to detect the temperature of the heater 71 and/or support tube 75. The support tube 75 in this example is made from stainless steel to conduct heat from the heater 71 towards the article 21 when the article 21 is inserted in a heating zone (the heating zone is defined by the thermal conduction region of the support tube 75). In other examples, the support tube 75 may be made from a different thermally conductive material. Other heating elements 75 may be used in other examples. For example the heating element may be a susceptor that is heatable by induction. In this example, the support tube 75 acts as an elongate support for supporting, in use, the article 21 comprising aerosolisable material.

In this example, the heater 71 is located externally of the support tube 75. However, in other examples, the heater 71 may be located internally of the support tube 75. The heater 71 in this example comprises a portion that passes outside of the support tube 75 and is referred to herein as a heater tail 73. The heater tail 73 extends out of the chamber 160 defined by the housing module 50 and containing the heater arrangement 23. The heater tail 73 is an electrical connecting member configured to provide electrical connection of the heater arrangement 23 to the control circuitry 25. In the example shown, the heater tail 73 physically connects the heater 71 to one PCB 25a. An electrical current may be provided by the power source 27 to the heater 71 via the control circuitry 25 and the heater tail 73. In examples, the heater tail 73 also connects to one or more temperature sensors (not shown) located in the chamber 160 containing the heater arrangement 23. In an example, the one or more temperature sensors comprises one or more resistance temperature detectors (RTD). In another example, the one or more temperature sensors may comprise one or more thermocouples. The one or more temperature sensors may be arranged to detect a temperature of the heater arrangement 23. The heater tail 73 in examples is configured to electrically connect the one or more temperature sensors via, for example via electrically conductive elements, to the control circuitry 25.

A passageway 196 is provided which allows the heater tail 73 to exit the chamber 160 defined by the housing module 50 to connect to the control circuitry 25.

The heater tail 73 in this example comprises a polyimide sheet, similar to that forming the heater 71. The heater tail 73 has a width (in the Z direction as shown in the figures when arranged in the housing module 50) significantly greater than its thickness (in the Y direction at the passageway 196). In the manner described above for the heater 71,
5 the heater tail 73 comprises electrically conductive elements formed in a polyimide substrate.

Figure 7 is a side view of a distal portion of the housing module 50 and components associated therewith. Figure 8 shows the same portion of the housing
10 module 50 as shown in Figure 7 but in a cross-sectional view.

The arrangement for allowing the heater tail 73 to exit the housing module 50 in the example apparatus 1 can be understood with reference to Figures 7 and 8. Figure 7 shows the passageway 196 provided between a distal end 51d of the first housing member 51 and a proximal end 53d of the second housing member 53. A sealing arrangement 15 is provided to seal the passageway 196 to substantially prevent airflow (or the flow of any other fluids) between the chamber 160, for example between the heating chamber 29, and the remainder of the interior of the apparatus 1. The sealing arrangement 15 comprises a first sealing member 15a and a second sealing member 15b.
15 The sealing members 15a, 15b may be resilient members. The sealing members 15a, 15b may be elastomeric members. The sealing members 15a, 15b may be made of, for example, one or more polymers such as silicone or rubber, which may be injection moulded, for example. In another example, one or more of the sealing members 15a, 15b may comprise overmoulded polyurethane.

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The first and second sealing members 15a, 15b, in this example, are silicone gaskets. The heater tail 73 exits between the silicon gaskets 15a, 15b and the sealing arrangement 15 is caused to seal the passageway 196 by compressing the silicon gaskets 15a, 15b together between a distal end 51d of the first housing member 51 and a
30 proximal end 53d of the second housing member 53.

The second housing member 53 is attached to the first housing member 51 via an attachment arrangement 42, examples of which will be described below. When the

second housing member 53 is suitably attached to the first housing member 51 the first and second sealing members 15a, 15b are held in abutment with one another by the first housing member 51 and the second housing member 53, with the heater tail 73 between the first and second sealing members 15a, 15b, to seal the passageway 196. The attachment arrangement 42 holds the first and second housing members 51, 53 together to provide a compressive force on the sealing arrangement 15 to seal the passageway 196. The heater tail 73 in this example is held substantially flat between the sealing members 15a, 15b by the compressive force exerted by the first and second housing members 51, 53. This is advantageous in providing a good seal of the passageway 196. Furthermore, the sealing members 15a, 15b are shaped to abut the heater tail 73 to provide a good seal. That is, the heater tail 73 is a substantially flat sheet, as has been described elsewhere herein. A proximal surface of the heater tail 73 is contacted by a distal surface of the first sealing member 15a and a distal surface of the heater tail 73 is contacted by a proximal surface of the second sealing member 15b. Accordingly, by providing a compression force on the sealing elements 15a, 15b with the heater tail 73 arranged therebetween, a good surface is made by contact between the surfaces of the heater tail 73 and the sealing members 15a, 15b. For example, since the sealing members 15a, 15b are resilient, they may slightly deform around the heater tail 73. In other examples, the heater tail 73 may be a differently shaped electrical connecting member, for example cylindrical in profile with having a longitudinal axis extending through the passageway. In some examples, the sealing members may be differently shaped in order to conform to a differently profiled heater tail and to make a good seal therewith.

The first housing member 51 comprises a tubular portion 51a towards its proximal end and a flange 51b toward its distal end 51d. The flange 51b facilitates connection of the second housing member 53 to the first housing member 51. In this example, the attachment arrangement 42 comprises a plurality of screws 43. The plurality of screws 43 are arranged to provide, in this example, a releasable attachment arrangement between the first housing member 51 and the second housing member 53. In this example the attachment arrangement 42 comprises four screws 43, extending through four respective holes parallel to the longitudinal axis 44 through the second housing member 53, to be received by a plurality of corresponding threaded holes

located in the longitudinally extending corner portions 51e of the flange 51b. To attach the second housing member 53 to the first housing member 51, the screws 43 are inserted through the holes in the second housing member 53 to be received in threaded connection in the threaded holes in the corner portions 51e of the first housing member 51.

In this example, the screws 43, when sufficiently tightened, secure the second housing member 53 to the first housing member 51 and cause the sealing arrangement 15 to seal the passageway 196. The screws 43 may be tightened to a pre-determined torque to cause the sealing arrangement 15 to suitably seal the passageway 196.

In examples, the seal provided by this sealing arrangement 15 is a substantially hermetic seal. The sealing arrangement 15 may minimise or prevent air or vapour passing through the passageway 196 into or out of the chamber 160. The hermetic seal of the passageway 196 may be such that at most only a negligible amount of air flows through the passageway 196 into or out of the chamber 160.

In other examples, the attachment 42 between the first housing member 51 and the second housing member 53 may comprise a different number of fastening members, e.g. a different number of screws 43, or may comprise one or more of another type of connection. For example, the attachment 42 may comprise a different type of threaded connection, such as one or more bolts to be secured respectively with one or more corresponding nuts. In examples, the attachment 42 may be any suitable attachment 42 which provides for the first housing member 51 to be attached to the second housing member 53 to secure the sealing arrangement 15 between the first and second housing members 51, 53. As mentioned above, in examples such as that shown in the figures, the attachment 42 may be releasable. In some examples, the attachment 42 may provide for movement between the second housing member 53 and the first housing member 51, when the attachment 42 is in a particular configuration. For example, the attachment 42 may allow the second housing member 53 to move in the longitudinal direction away from the first housing member 51, while the second housing member 53 remains attached to the first housing member 51 by the attachment 42.

The attachment 42 in examples also allows movement of the second housing member 53 relative to the first housing member 51 when the screws 43 are not tightened, for example, when the screws 43 are loosened or when the screws 43 are removed from their corresponding holes. The arrangement allows the housing module 50 to be assembled with the heater tail 73 exiting therefrom and the attachment 42 configured to seal the passageway 196. This may provide for convenient assembly for the apparatus 1 wherein the assembled housing module 50 may be fitted therein.

Also shown in Figure 7 and Figure 8 is the end tube 41. The end tube 41 extends into the housing module 50 as described above with reference to earlier figures. The second housing member 53 comprises a lip 53j against which a ridge 41j of the end tube 41 is configured to abut. The ridge 41j may comprise a protruding feature 41k (shown in Figure 9) for interacting with a corresponding feature 53k on the lip 53j. This may provide for alignment between the end tube 41 and the second housing member 53. The end tube 41 is inserted along a longitudinal axis 44 of the housing module 50 through an aperture 53c through the second housing member 53. A first end tube o-ring 41c provides a seal between the end tube 41 and walls of the aperture 53c. A second end tube o-ring 41d provides a seal between the end tube 41 and the internal support structure 37 when the apparatus 1 is assembled to contain the housing module 50 and associated components.

Figure 9 shows a perspective view of the portion of the housing module 50 and associated components shown in Figures 7 and 8. Figure 10 shows the same portion of the housing module 50 as shown by Figure 9 but in a cross-sectional perspective view. The heater tail 73, as can be appreciated from Figure 9 and Figure 10, comprises a first portion 73a for connecting to the heater 71 and a second portion 73b for connecting to the PCB 25b, as is shown in Figure 6. In this example, the second portion 73b has a width (in the Z direction shown in the Figures) greater than that of the first portion 73a. The second portion 73b of the heater tail 73 comprises a plurality of connection features 73d, in this example apertures, for allowing the heater tail 73 to make an electrical connection to the PCB 25b, as is also shown in Figure 6.

A third portion 73e of the heater tail 73 extends through the passageway 196 and is held between the first sealing member 15a and the second sealing member 15b. In this example, the passageway 196 extends perpendicularly to a longitudinal axis 44 of the housing module 50, and the third portion 73e extends in a direction defined by the
5 passageway 196.

The second portion 73b of the heater tail 73 extends substantially parallel to the longitudinal axis 44. In this example the direction in which the second portion 73b extends is determined by the layout of the PCB 25b with respect to the housing module
10 50. That is, the PCB 25b is arranged substantially parallel with and adjacent to the housing module 50. This may provide a layout for the components within the apparatus 1 which makes efficient use of available space, as has been described above. To provide the change in direction in the heater tail 73 after exiting the passageway 196, a bent portion 73c in the heater tail 73 is provided. The bent portion 73c in this example
15 provides for the substantially 90° upward change of direction in the heater tail 73. The bent portion 73c also widens towards the second portion 73b of the heater tail 73. In this example, the bent portion 73c provides a single bend in the heater tail 73 after exiting the passageway 196. The upward change in direction of the heater tail 73 allows the second portion 73b for connecting to the PCB 25b which is laterally adjacent to the
20 housing module 50.

The passageway 196 is located away from a longitudinal end 50d of the housing module 50. The passageway 196 is also located away from a proximal end of the housing module 50, i.e. a proximal end of the first housing member 51. In this example,
25 as mentioned above, the location of the passageway 196 allows for the heater tail 73 to exit the chamber 160 in a direction perpendicular to the longitudinal axis 44 of the housing module 50. This may provide an advantage in that fewer bends are required to be made in the heater tail 73 outside of the housing module 50. For example, if the heater tail 73 exited the housing module 50 at the distal end 50d, two 90° bends or the
30 equivalent thereof may be required to provide for the second portion 73c of the heater tail 73 to extend parallel and adjacent to the PCB 25b in the arrangement of the example apparatus 1. Minimising the number of bends or the angle through which the heater tail 73 is bent after exiting the passageway 196 may reduce the likelihood of damage being

done to the heater tail 73, for example when fitting the housing module 50 into the apparatus 1. For example, a bend in the heater tail 73 may provide a relative weak point which is more susceptible to damage through mechanical stress than neighbouring unbent portions.

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It will be noted that the first portion 73a of the heater tail 73 comprises an upward bend inside the chamber 160 defined by housing module 50. This bend is secured within the housing module 50 and the first portion 73a of the heater tail 73 is held in place between the silicon gaskets 15a, 15b when the screws 43 are suitably tightened. The bend in the third portion 73e is accordingly contained within the chamber 160 and is supported by the sealing arrangement 15 and protected from damage by mechanical stress.

Furthermore, the arrangement in which the heater tail 73 is configured to exit the housing module 50 from a side, rather than a proximal or distal end, allows the heater tail 73 to exit at a point which is closer to the PCB 25b. This can allow the heater arrangement 23 to be located closer to the PCB 25b and can contribute to more efficient performance of the heater arrangement 23.

In this example, the passageway 196 extends perpendicularly to the longitudinal axis 44. However, it will be appreciated that in other examples the passageway 196 may be located away from the proximal and distal ends of the housing module 50 but may extend in a different direction other than perpendicularly to the longitudinal axis 44. For example, the passageway 196 may extend laterally but not perpendicularly to the longitudinal axis 44, for example at an angle not equal to 90° to the longitudinal axis 44. In examples, the passageway 196 may be located at any point along the housing module 50, but away from a distal and proximal end thereof.

Figure 11 shows a perspective view of the first housing member 51 in isolation.

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Figure 12 shows the second housing member 53 in isolation, viewed from a proximal end 53d.

As can be seen from Figure 11 and Figure 12, the flange 51b and the second housing member 53 have corresponding cross-sections parallel to the X and Z plane. First sides 51f, 53f of the flange 51b and the second housing member 53 are substantially straight, and it is between these first sides 51f, 53f that the passageway 196 is provided when the first and second housing members 51, 53 are attached to one another. Second sides 51g, 53g are substantially semi-circular and are shaped to allow the housing module 50 to be accommodated adjacent to an interior curved wall of the casing 9 of the apparatus 1. Between the first sides 51f, 53f and second sides 51g, 53g are straight sides 51h, 53h.

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Shown in Figure 12, the proximal end 53d of the second housing member 53 defines a substantially flat surface against which the second sealing member 15b is placed. The second housing member 53 has, on the surface at its proximal end 53d, indented corner portions 53e offset below the proximal end 53d of the second housing member 53. The indented portions 53e are for contacting the screw receiving portions 51e of the first housing member 51. Protruding portions 53i, in this example three protruding portions 53i, extend in a proximal direction and allow for alignment of the sealing members 15a, 15b between the first and second housing members 51, 53.

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With reference to Figure 11, the first housing member 51 in this example has a longitudinal axis 51e and a height, in a Y-direction parallel to the longitudinal axis 44, of around 69.85mm. This includes a length of the corner portions 51e of the flange 51b which extend around 1.6mm in the Y-direction. The flange 51b, including the corner portions 51e, has a height in the Y-direction of around 4.65mm; a depth in an X-direction between the first side 51f and the second side 51g of around 14.6mm; and a width in the Z-direction between the two opposing straight sides 51h of around 15.6mm. The first housing member 51 in this example is made from PEEK material, for example by injection moulding. In other examples, the first housing member 51 may be formed of polycarbonate, or polyethersulfone (PES), or another suitable polymer. In examples, the first housing member 51 may be formed of a heat resistant material, due to close proximity of the material of the first housing member 51 to the heater arrangement 23. The first housing member 51 may be formed of a material capable of resisting

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temperatures of at least around 100°C. In other examples, the first housing member 51 could be formed from a metal or ceramic material, for example by casting.

The tubular portion 51a of the first housing member 51 has an outer diameter
5 OD of around 11.6mm and an inner diameter ID of around 10.6mm. The tubular portion 51a has walls of thickness of around 0.5mm. The tubular portion 51a in this example comprises wall portions 51m slightly thicker than the remainder of the tube 51a, towards the distal end of the tube 51a and adjacent to the flange 51b. These thickened portions 51m provide for the cross-section of the chamber 160 to expand as described herein,
10 towards the distal end of the tube 51a.

With reference to Figure 12, in this example, the second housing member 53 has a height in the Y-direction of around 4.55mm. The second housing member 53 has a depth in the X-direction of around 14.6mm and a width in the Z-direction of around
15 15.6mm. The flange 51b has a depth and width in the X and Z directions respectively which is equal to that of the flange 51b. The second housing member 53 is configured to act as an end cap on the first housing member 51 having substantially the same cross-section as the flange 51b. The second housing member 53 is formed of polycarbonate in this example and may be formed, for example, by injection moulding. In other
20 examples, the second housing member 53 may be formed from a different polymer for example acrylonitrile butadiene styrene (ABS) or PEEK. In other examples, the second housing member 53 may be made of a metal or ceramics material, for example by casting. The second housing member 53 in examples is typically not in such close proximity with the heater arrangement 23 as is the first housing member 51. As such,
25 the second housing member 53 may in some examples be formed of a material which is not as resistant to heat as the material used to form the first housing member 51.

Figure 13 shows a perspective view of a proximal surface 16b of the first sealing member 15a. In this example the first sealing member 15a is a silicone gasket as
30 described above. The proximal surface 16b of the first sealing member 15a is configured to abut the distal end 51d of the first housing member 51 as has been previously described. The first sealing member 15a has cutaway portions 16i to interact with the protruding portions 53i of the second housing member 53 to provide correct alignment

of the first sealing member 15a. A first side 16f of the first sealing member 15a is configured for being arranged parallel with both first sides 51f, 53f of the first and second housing members 51, 53. A second side 16g of the first sealing member 15a is slightly curved and is configured for being aligned adjacent the second sides 51g, 53g
5 of the first and second housing members 51, 53. The second side 16g is configured to fit up against the protruding portion 53i toward the second side 53g of the second housing member 53.

The first sealing member 15a has a first aperture 16a. The central aperture 16a
10 allows the end pipe 41 to extend through in the Y-direction into the chamber 160 which, when the apparatus 1 is assembled, is located proximal of the first sealing member 15a. The first aperture 16a has a first edge 18f which is parallel to the first side 16f and is of similar width thereto. The first aperture 16a further has a second edge 18g which has the profile of an arc. The first aperture 16a comprises two straight edges 18h which
15 converge from the wider straight first edge 18f to the narrower arc profiled second edge 18g.

The first aperture 16a is shaped to correspond to the profile of a distal end of the chamber 160. As can be seen in Figure 8 and Figure 10, in this example the chamber
20 160 widens toward the distal end 51d of the first housing member 51. This allows the first portion 73a of the heater tail 73 to extend adjacent to the end tube 41 down to the passageway 196. The widened shape of the first aperture 16a toward the first side 18f allows the heater tail 73 to extend through the first aperture 16a and therefore to extend through the passageway 196 between the first and second sealing members 15a, 15b.

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The first sealing member 15a has dimensions in the X and Z dimensions respectively substantially equal to the corresponding dimensions of the flange 51b and the second housing member 53 between which the first sealing member 15a is configured to fit. Both the first sealing member 15a and the second sealing member 15b
30 have a thickness in the Y direction of around 0.75mm.

Figure 14 shows the second sealing member 15b. The second sealing member 15b is configured to be placed abutting the proximal end 53d of the second housing

member 53. As described previously, the first and second sealing members 15a, 15b are configured to be compressed together, with the third portion 73e of the heater tail 73 passing between them, to seal the passageway 196. The second sealing member 15b also comprises cutaway portions 17i, similar to the cutaway portions 16i of the first sealing member 15a, to provide alignment with the first and second housing members 51, 53. Similarly, the second sealing member 15b comprises a straight first side 17f and a curved second side 17g. The first and second sides 17f, 17g of the second sealing member 15b are configured to be arranged in use parallel respectively with the first and second sides 16f, 16g of the first sealing member 15a. The second sealing member 15b has a second aperture 17a of circular profile which is configured to receive the end tube 41 and which may be configured to contact a periphery of the end tube 41 to provide a seal around the end tube 41. The second aperture 17a has a diameter of around 6.05mm.

As described with reference to the Figures, in some examples, the heater tail 73 comprises a sheet. The third portion 73e when arranged to exit the passageway 196 in such examples, may be arranged as a sheet which is parallel with and located between planes defined substantially perpendicular to the Y axis by the sealing members 15a, 15b. This arrangement may be advantageous in providing a good seal between the first and second sealing members 15a, 15b, with the heater tail portion 73e arranged parallel between the two, and the elastomeric sealing members 15a, 15b being compressed around the heater tail portion 73e. However, in other examples, a differently shaped electrical connecting member may be arranged to extend through a sealed passageway into the chamber 160 to connect to a heater arrangement therein. For example, one or more electrical connecting members, such as one or more tubular connecting members, such as electrically conducting wires, may be used.

While in examples described with reference to the figures the sealing arrangement 15 comprises two sealing members 15a, 15b, in other examples, the sealing arrangement 15 may comprise a different number of sealing members, for example only one sealing member. In such examples, the sealing member may be an elastomeric sealing member, such as one comprising silicone. For example, where the sealing arrangement 15 only comprises one sealing member, the sealing member may be compressed between the distal end 51d of the first housing member 51 and the proximal

end 53d of the second housing member 53 to seal the passageway 196. The heater tail 73 in an example with only one sealing member may for example be located between the sealing member and one of the distal end 51d of the first housing member 51 and the proximal end 53d of the second housing member 53.

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Although the example apparatus 1 described with reference to the figures comprises a resistive heating arrangement in other examples the apparatus may comprise an induction heating arrangement. For example, a susceptor arrangement may be provided that is heatable by penetration with varying magnetic fields to generate eddy currents and/or heat by magnetic hysteresis to heat an interior volume of the susceptor. In use the respective varying magnetic fields may be generated by at least one coil having a varying current flowing therethrough to penetrate the susceptor. In some examples, respective portions of the susceptor may be heatable by penetration with respective varying magnetic fields. In some examples, control circuitry of the device may be configured to cause heating of respective portions of the susceptor, for example, at different respective times, for different respective durations, and/or at different respective rates.

Where the apparatus comprises an inductive heating arrangement a component arranged in the manner of the support tube 75 may be a susceptor comprising a heating material. In some examples, the heating material may be aluminium. However, in other examples, the heating material may be other than aluminium. In some examples, the heating material may comprise one or more materials selected from the group consisting of: an electrically-conductive material, a magnetic material, and a magnetic electrically-conductive material. In some examples, the heating material may comprise a metal or a metal alloy. In some examples, the heating material may comprise one or more materials selected from the group consisting of: aluminium, gold, iron, nickel, cobalt, conductive carbon, graphite, steel, plain-carbon steel, mild steel, stainless steel, ferritic stainless steel, molybdenum, silicon carbide, copper, and bronze. Other heating material(s) may be used in other examples.

In certain examples described above, the electrical connecting member extending through the passageway 196 is a heater tail 73. However, examples

arrangements described herein for sealing the passageway 196 and/or for providing an advantageous location and orientation for the passageway 196 may also be applied for other types of electrical connecting members. For example, where the apparatus 1 uses inductive heating, a heater tail 73 may supply power to one or more inductor coils and/or one or more temperature sensors arranged inside the housing module 50.

Similarly, certain examples herein have described an electrical connecting member exiting through the passageway 196 which is located away from a distal end and away from a proximal end of the housing module 50. In certain examples described herein, the passageway 196 is provided between first and second housing members 51, 53. However, in examples, the principle described herein of locating the passageway away from the proximal and distal ends of a housing module for allowing the electrical connecting arrangement to exit therefrom may be applied in other examples. For example, in some such examples, the housing module may comprise a single housing member and the passageway may comprise an aperture through the single housing member.

In some examples, the aerosolisable material comprises tobacco. However, in other examples, the aerosolisable material may consist of tobacco, may consist substantially entirely of tobacco, may comprise tobacco and aerosolisable material other than tobacco, may comprise aerosolisable material other than tobacco, or may be free from tobacco. In some examples, the aerosolisable material may comprise a vapour or aerosol forming agent or a humectant, such as glycerol, propylene glycol, triacetin, or diethylene glycol.

In some examples, the aerosolisable material is non-liquid aerosolisable material, and the apparatus is for heating non-liquid aerosolisable material to volatilise at least one component of the aerosolisable material.

In examples, once all, or substantially all, of the volatilisable component(s) of the aerosolisable material in the article 21 has/have been spent, the user may remove the article 21 from the apparatus 1 and dispose of the article 21. The user may subsequently re-use the apparatus 1 with another of the articles 21. However, in other

respective examples, the article may be non-consumable, and the apparatus and the article may be disposed of together once the volatilisable component(s) of the aerosolisable material has/have been spent.

5 In examples described herein the article 21 comprises a mouthpiece assembly 21b. However, it will be appreciated that in other examples an example apparatus as described herein may comprise a mouthpiece. For example, the apparatus 1 may comprise a mouthpiece which is integral with the apparatus 1, or in other examples the apparatus may comprise a mouthpiece which is detachably attached to the apparatus 1.

10 In an example, the apparatus 1 may be configured to receive aerosolisable material to be heated. The aerosolisable material may be contained in an article not comprising a mouthpiece portion. A user may draw on the mouthpiece of the apparatus to inhale aerosol generated by the apparatus by heating the aerosolisable material.

15 In some examples, the article 21 is sold, supplied or otherwise provided separately from the apparatus 1 with which the article 21 is usable. However, in some examples, the apparatus 1 and one or more of the articles 21 may be provided together as a system, such as a kit or an assembly, possibly with additional components, such as cleaning utensils.

20 In order to address various issues and advance the art, the entirety of this disclosure shows by way of illustration and example various examples in which the claimed invention may be practised and which provide for superior heating elements for use with apparatus for heating aerosolisable material, methods of forming a heating

25 element for use with apparatus for heating aerosolisable material to volatilise at least one component of the aerosolisable material, and systems comprising apparatus for heating aerosolisable material to volatilise at least one component of the aerosolisable material and a heating element heatable by such apparatus. The advantages and features of the disclosure are of a representative sample of examples only, and are not exhaustive

30 and/or exclusive. They are presented only to assist in understanding and teach the claimed and otherwise disclosed features. It is to be understood that advantages, examples, examples, functions, features, structures and/or other aspects of the disclosure are not to be considered limitations on the disclosure as defined by the claims

or limitations on equivalents to the claims, and that other examples may be utilised and modifications may be made without departing from the scope and/or spirit of the disclosure. Various examples may suitably comprise, consist of, or consist in essence of, various combinations of the disclosed elements, components, features, parts, steps, 5 means, etc. The disclosure may include other inventions not presently claimed, but which may be claimed in future.

CLAIMS

1. Apparatus for an aerosol generating device, the apparatus comprising:
 - a first housing member for at least partly defining a chamber for
 - 5 containing a heater arrangement for heating an aerosol generating material;
 - a second housing member attached to the first housing member via an attachment, wherein the first housing member and the second housing member define therebetween a passageway into the chamber, and wherein the passageway is configured to allow an electrical connecting member for
 - 10 connecting to the heater arrangement to extend through the passageway; and
 - a sealing arrangement arranged to seal the passageway;
 - wherein the attachment between the first housing member and the second housing member is configured to hold the first housing member and the second housing member in a configuration which causes the sealing arrangement to seal the
 - 15 passageway.
2. Apparatus according to claim 1 wherein the passageway is located between a first end of the first housing member and a second end of the second housing member located adjacent the first end of the first housing member, and the attachment attaches
- 20 the first end of the first housing member to the second end of the second housing member.
3. Apparatus according to claim 1 or claim 2 wherein the attachment between the second housing member and the first housing member is a releasable attachment and/or
- 25 an attachment which is configurable to allow movement of the second housing member relative to the first housing member to unseal the passageway.
4. Apparatus according to claim 3 wherein the attachment comprises one or more threaded attachment members, such as one or more screws, or one or more nut and bolt
- 30 pairs.

5. Apparatus according to claim 4 wherein the one or more threaded attachment members are tightened to a predetermined torque such that the sealing arrangement provides hermetic sealing of the passageway.
- 5 6. Apparatus according to any preceding claim wherein the sealing arrangement comprises a first sealing member and a second sealing member;
wherein the attachment between the first housing member and the second housing member is configured to hold the first and second sealing members in abutment with one another to hermetically seal the passageway between the first housing member and the second housing member and wherein the sealing arrangement is arranged in use to allow the electrical connecting member to extend through the passageway between the first sealing member and the second sealing member.
- 10 7. Apparatus according to claim 6 wherein the attachment is configured to provide a compressing force on the electrical connecting member located between the two sealing members to seal the passageway.
- 15 8. Apparatus according to claim 6 or claim 7 wherein the sealing members each comprise a surface which is configured to contact the electrical connecting member and which is configured to match a profile of a surface of the electrical connecting member, and optionally, wherein the surfaces of the sealing members are substantially flat surfaces each configured to abut a substantially flat surface of the electrical connecting member.
- 20 9. Apparatus according to any of claims 6 to 8 wherein one of the sealing members comprises an aperture which is configured to allow the electrical connecting member to extend therethrough while the passageway is sealed to connect to the heater arrangement in the chamber.
- 25 10. Apparatus according to any preceding claim wherein the first housing member defines an elongate chamber for containing the heating arrangement, and wherein the passageway extends substantially perpendicularly to a longitudinal axis of the chamber.
- 30

11. Apparatus according to any preceding claim wherein the sealing arrangement comprises at least one resilient sealing member.
12. Apparatus according to claim 11 wherein the sealing arrangement comprises at
5 least one resilient member comprising silicone.
13. Apparatus according to claim 12 wherein the sealing arrangement comprises two resilient sealing members comprising silicone, for example wherein the sealing arrangement comprises two silicone gaskets.
- 10 14. Apparatus according to any preceding claim wherein the sealing arrangement is configured to seal the passageway when a portion of the electrical connecting member shaped substantially as a sheet extends through the passageway.
- 15 15. Apparatus for an aerosol generating device comprising:
apparatus according to any preceding claim;
a heater arrangement for being received in the chamber defined by first housing member; and
an electrical connecting member for extending through the passageway into the
20 chamber to connect to the heating arrangement.
16. An aerosol generating device comprising apparatus according to any of claims 1 to 14 or apparatus according to claim 15.
- 25 17. A housing module for being received in an aerosol generating device, wherein the housing module is for containing a heater arrangement for heating aerosol generating material in the aerosol generating device, the housing module comprising:
a housing at least partly defining a chamber for containing a heater arrangement for heating aerosol generating material to thereby generate an aerosol, wherein the
30 housing comprises a proximal end and a distal end; and
a passageway through the housing into the chamber, wherein the passageway is configured to allow an electrical connecting member for connecting to the heater arrangement to exit the chamber through the passageway;

and wherein

the passageway is located away from both the proximal end and the distal end of the housing.

5 18. A housing module according to claim 17 wherein the passageway is oriented laterally to a longitudinal axis of the housing module extending between the proximal and the distal ends of the housing module.

10 19. A housing module according to claim 18 wherein the passageway is oriented substantially perpendicularly to the longitudinal axis of the housing module.

20. A housing module according to any of claims 17 to 19 wherein the housing module comprises a sealing arrangement arranged to seal the passageway while allowing the electrical connecting member through the passageway.

15

21. A housing module according to claim 20 wherein the housing module comprises apparatus according to any of claims 1 to 14.

20 22. An aerosol generating device comprising:
a housing module according to any of claims 17 to 21; and
a heating arrangement arranged in the chamber defined by the housing module;
and

25 an electrical connecting member extending through the passageway into the chamber such that a first portion of the electrical connecting member may connect to the heating arrangement;

wherein a second portion of the electrical connecting member is exterior to the housing module and is arranged to connect to an electrical component of the device.

30 23. An aerosol generating device according to claim 22 wherein the electrical connecting member exits the passageway in a direction lateral to a longitudinal axis of the housing module extending between the proximal and distal ends, and the second portion of the electrical connecting member is aligned substantially parallel to the longitudinal axis of the housing module.

24. An aerosol generating device according to claim 23 wherein the second portion of the electrical connecting member is configured to connect to an electrical component of the device, such as a printed circuit board, which is arranged adjacent to the housing module and substantially parallel with a longitudinal axis of the housing module.

25. An aerosol generating device according to claim 23 or claim 24 wherein the electrical connecting member comprises only one bend between a portion of the electrical connecting member which exits the passageway in a direction lateral to the longitudinal axis of the housing module, and the second portion of the electrical connecting member which is aligned substantially parallel to the longitudinal axis of the housing module.

26. An aerosol generating system comprising:
a device according to claim 16 or a device according to any of claims 22 to 25;
and
an article containing an aerosol generating material arranged to be heated by the device.

27. An aerosol generating system according to claim 26 wherein the aerosol generating material comprises tobacco and the device is a tobacco heating product, also known as a heat not burn device.

1 / 8

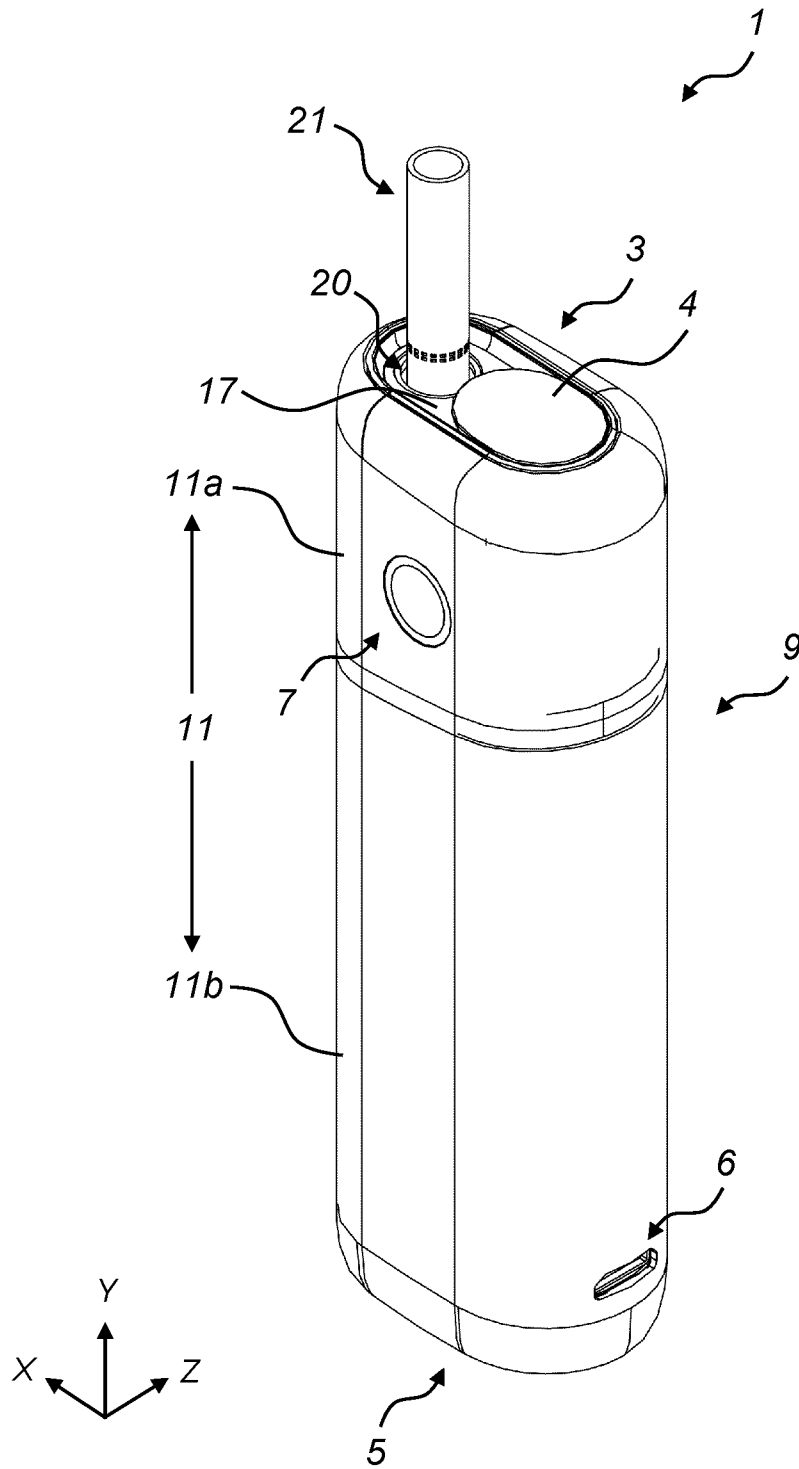


FIG. 1

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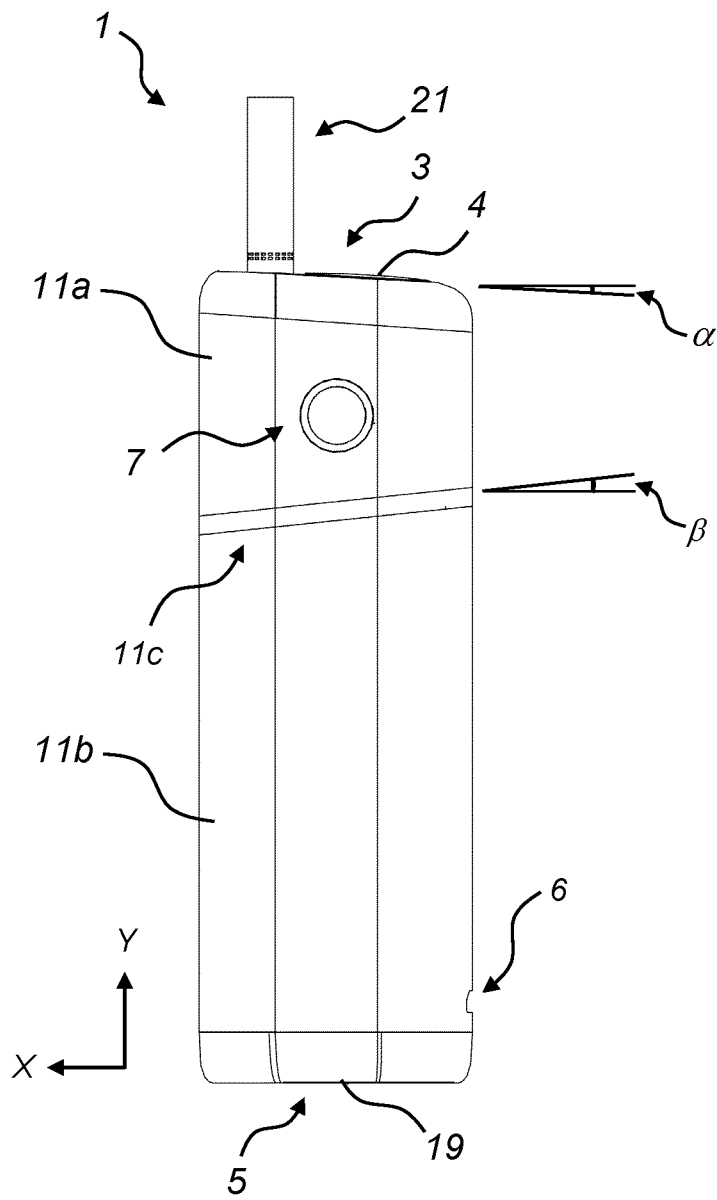


FIG. 2

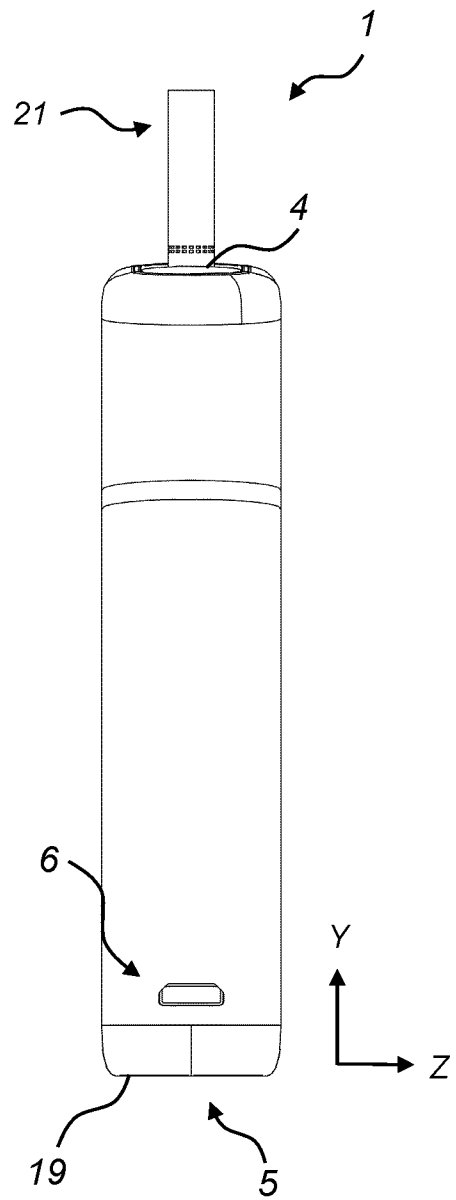


FIG. 3

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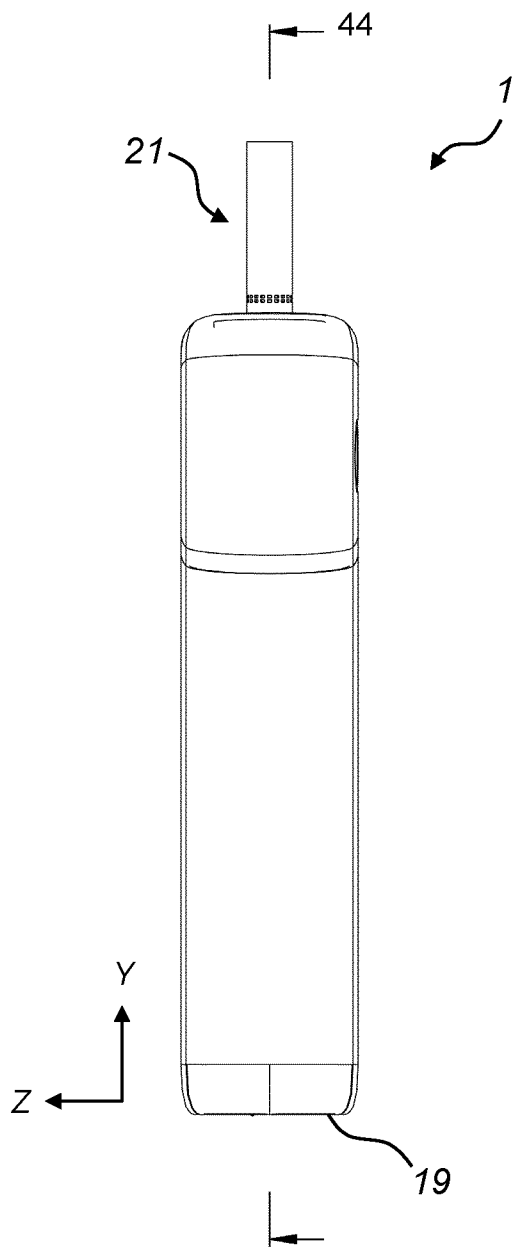


FIG. 4

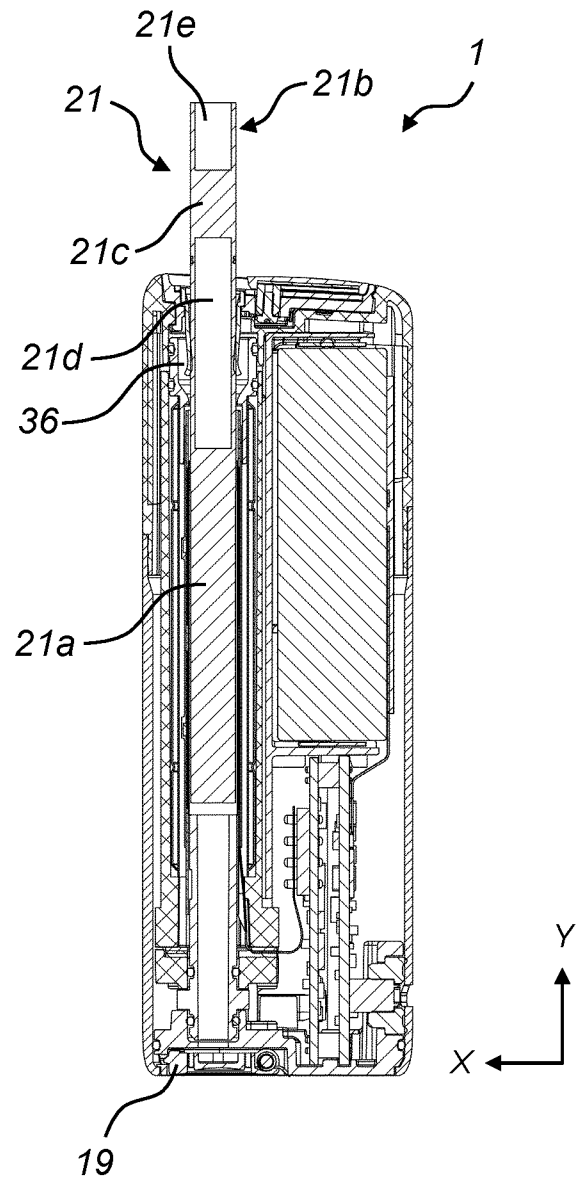


FIG. 5

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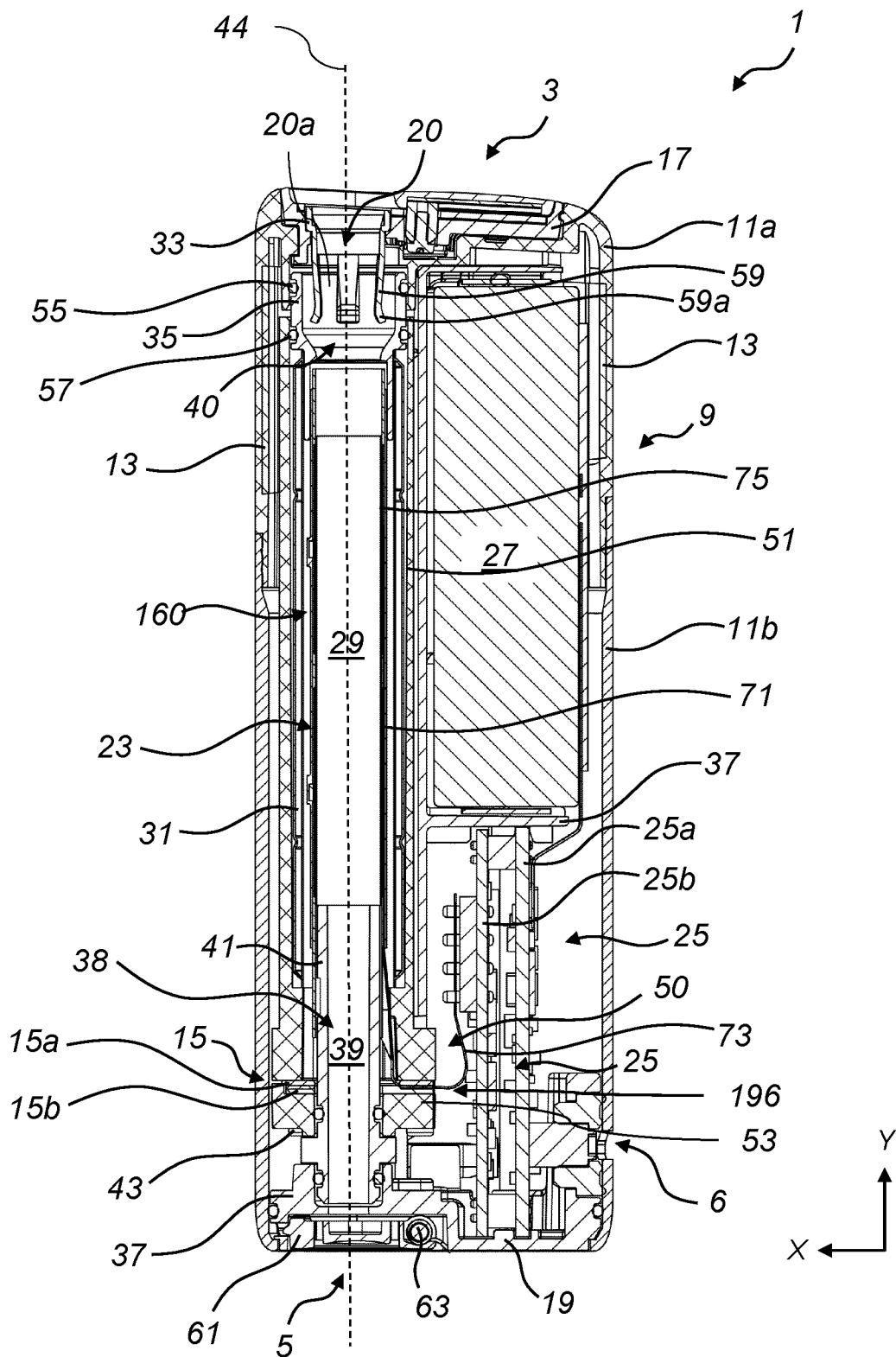


FIG. 6

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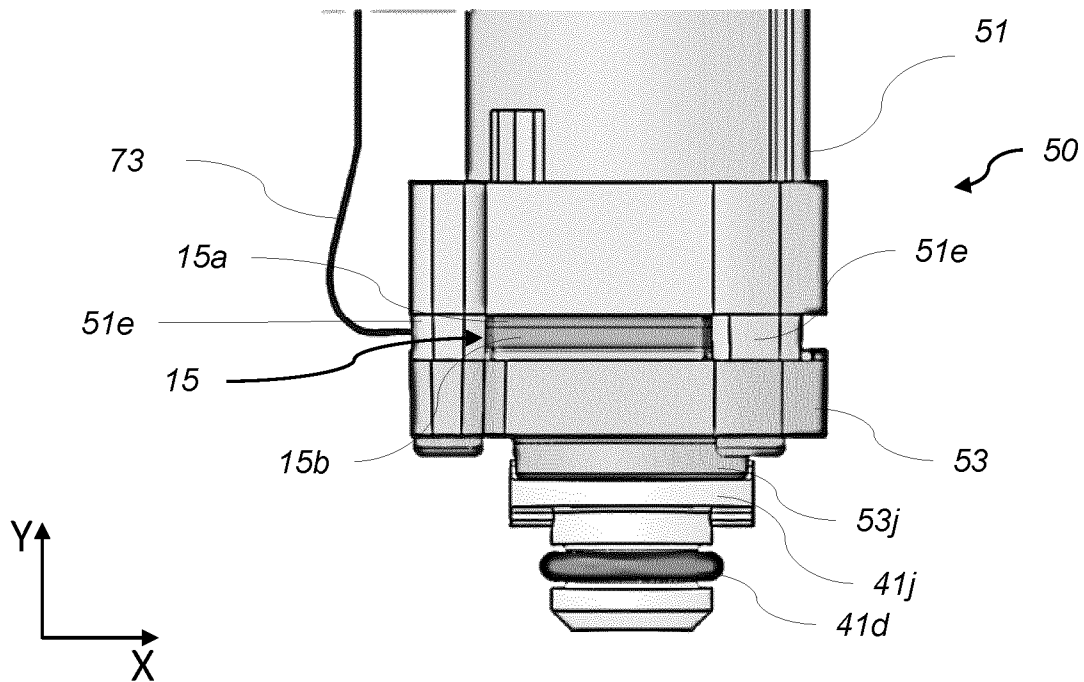


FIG. 7

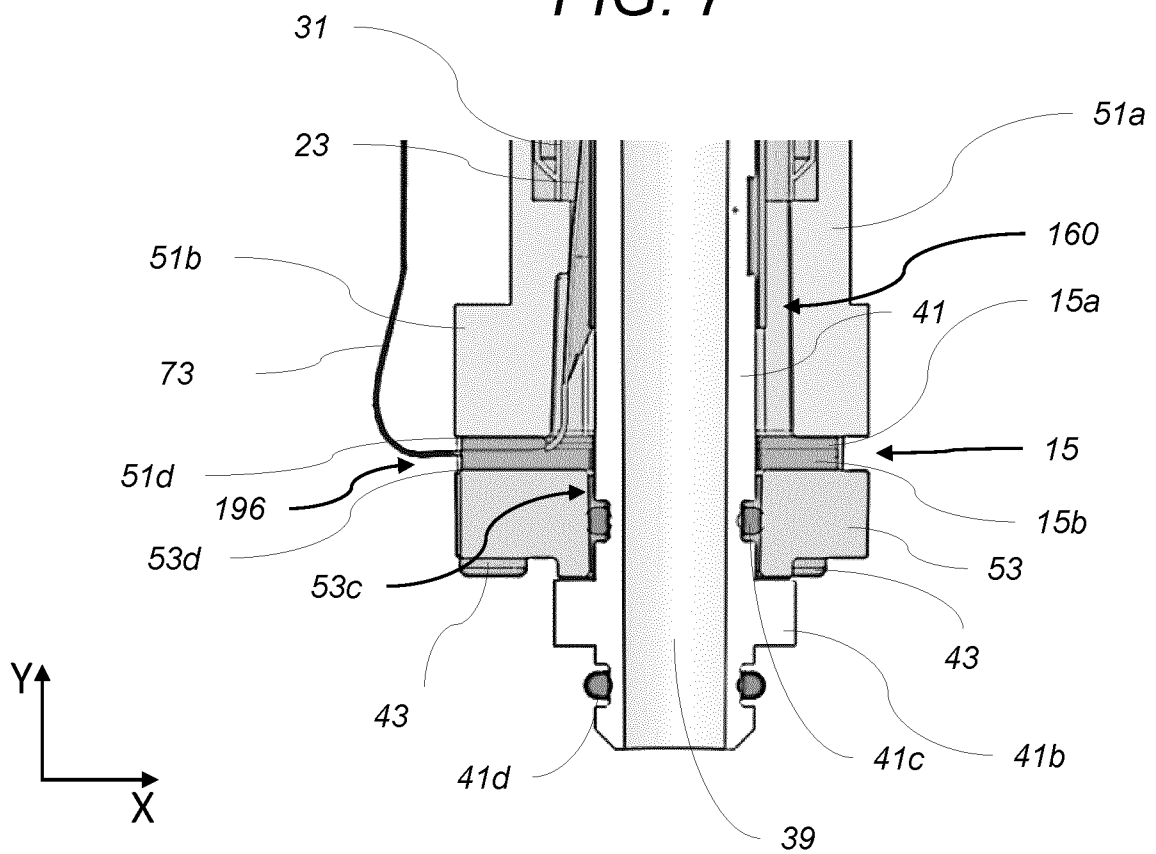


FIG. 8

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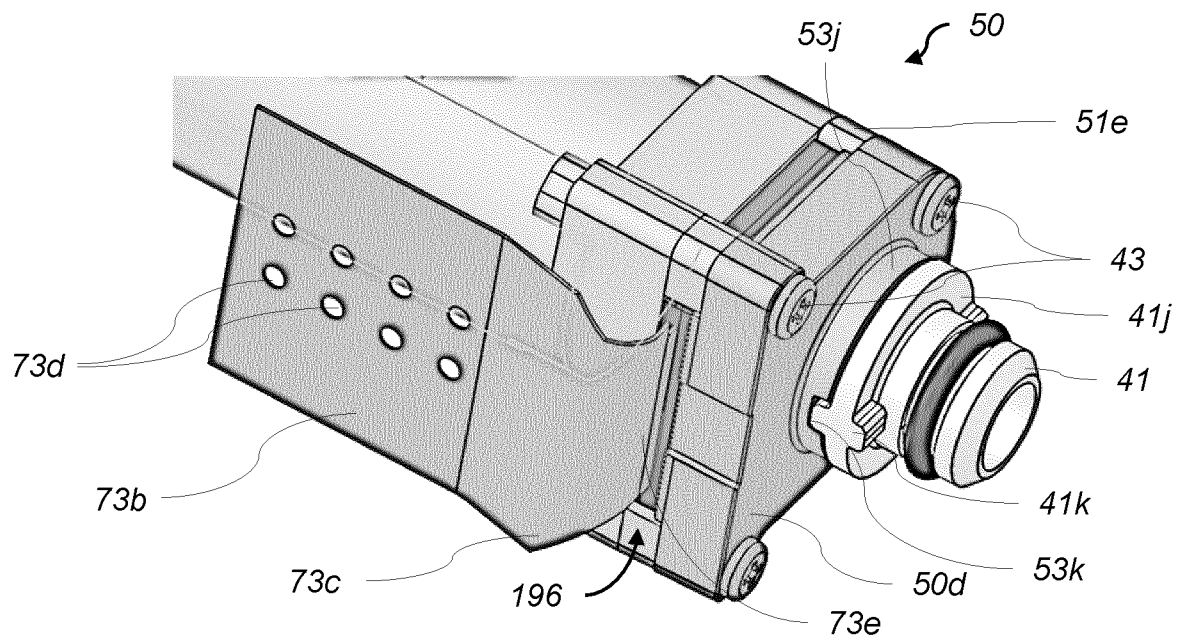


Fig. 9

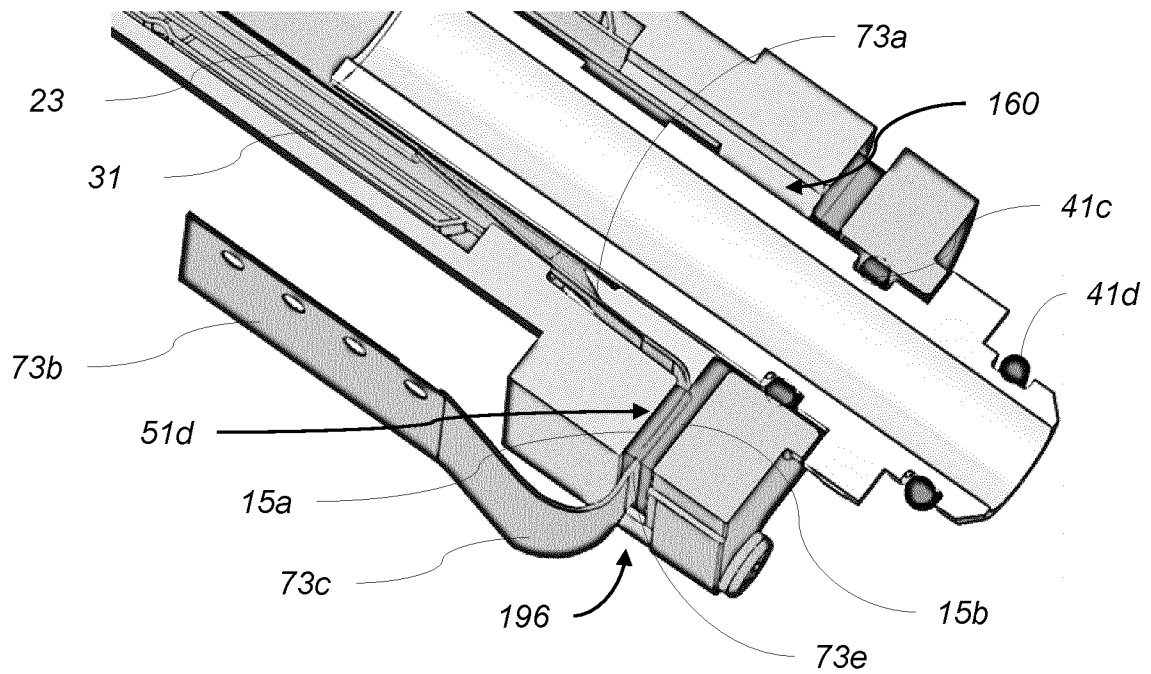


Fig. 10

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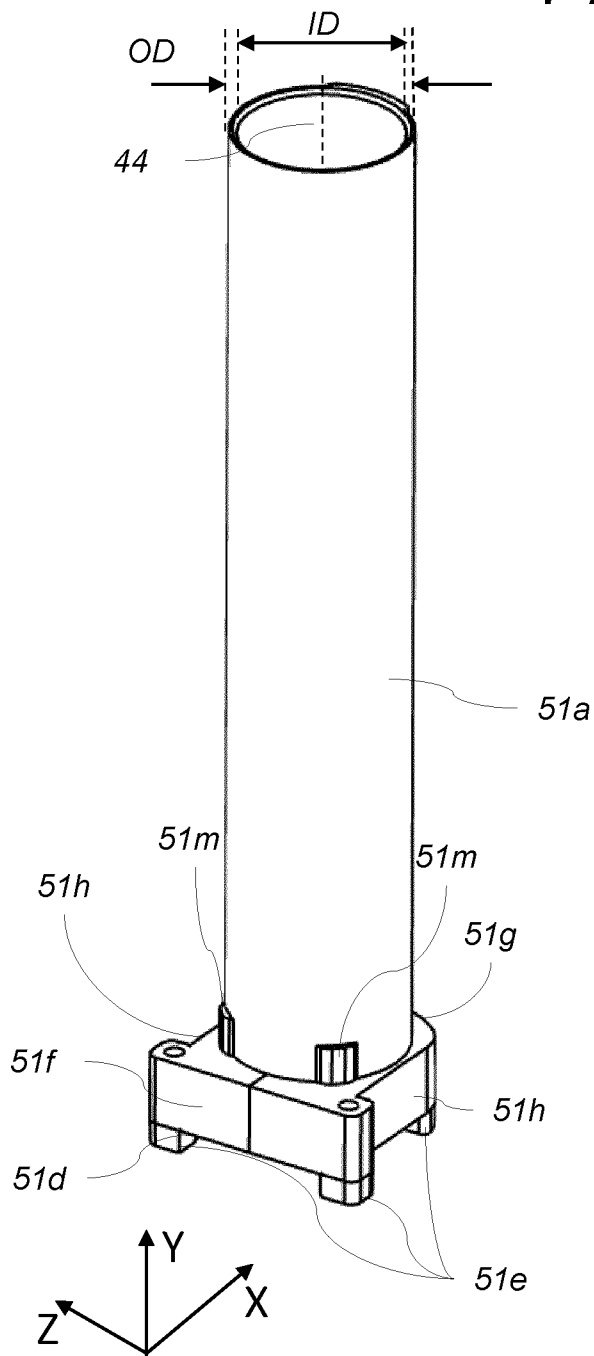


Fig. 11

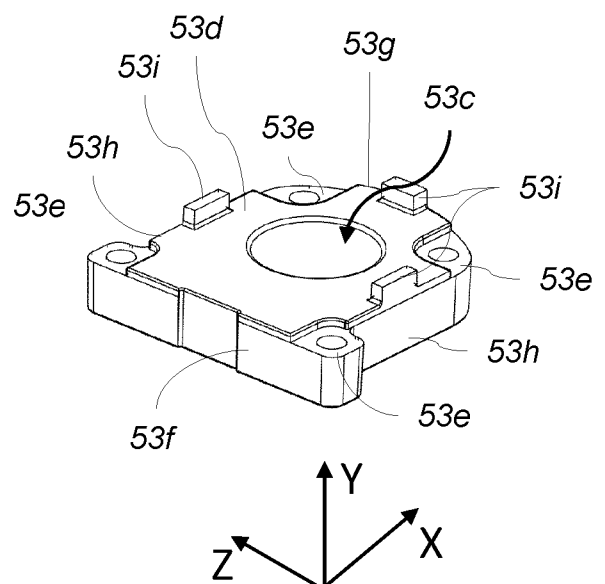


Fig. 12

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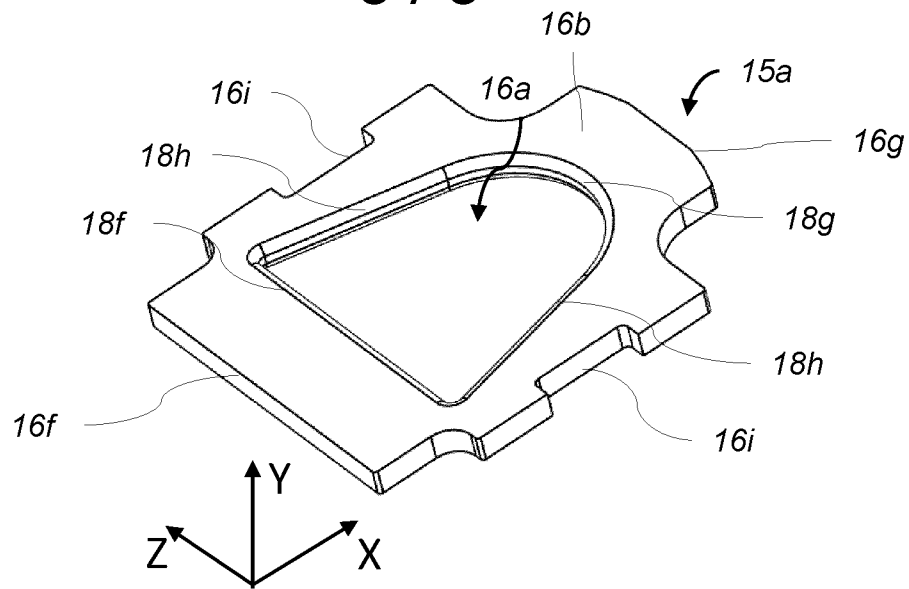


Fig. 13

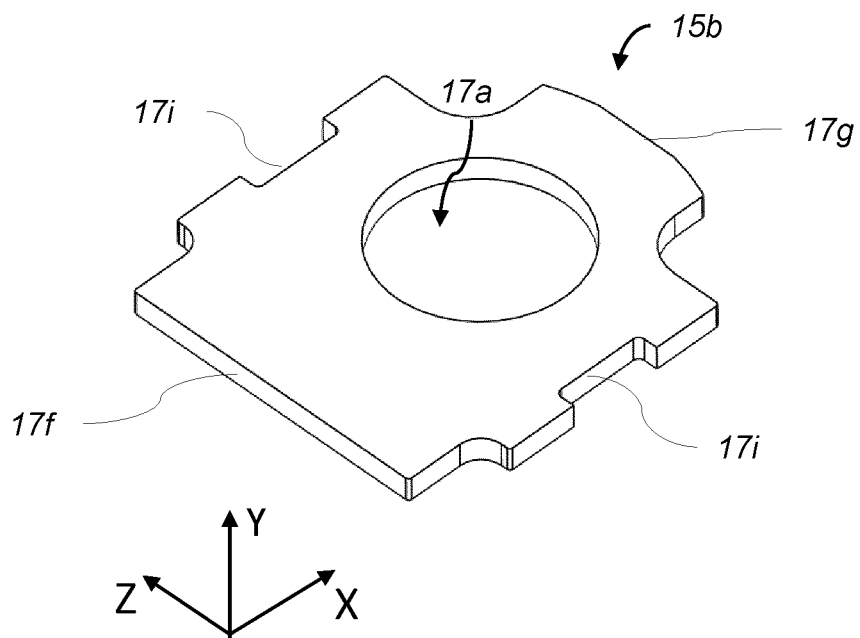


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2020/059537

A. CLASSIFICATION OF SUBJECT MATTER

INV. A24F40/20 A24F40/40
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F A61M

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2017/194766 A1 (BRITISH AMERICAN TOBACCO LTD [GB]) 16 November 2017 (2017-11-16)	1-8, 10-27
A	page 5, line 16 - page 15, line 9; figures 1-10	9
X	WO 2017/194762 A1 (BRITISH AMERICAN TOBACCO LTD [GB]) 16 November 2017 (2017-11-16)	1-8, 10-27
A	page 4, line 31 - page 14, line 21; figures 1-10	9
A	WO 2015/062983 A2 (BRITISH AMERICAN TOBACCO CO [GB]) 7 May 2015 (2015-05-07) page 8, line 29 - page 20, line 29; figures 1-12	1-27



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 July 2020

Date of mailing of the international search report

11/08/2020

Name and mailing address of the ISA/

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Authorized officer

Klintebäck, Daniel

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2020/059537

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-27

an apparatus for an aerosol generating device comprising a housing member defining a passageway for the electrical connecting member of the heater.

1.1. claims: 1-16

an apparatus for an aerosol generating device comprising a first and second housing member defining a passageway there between for the electrical connecting member of the heater; and a sealing member arranged in the passageway.

1.2. claims: 17-27

a housing module for an aerosol generating device comprising a housing and a passageway through the housing for the electrical connecting member of the heater; the passageway being oriented away (laterally to the longitudinal axis of the housing) from both ends of the housing.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2020/059537

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