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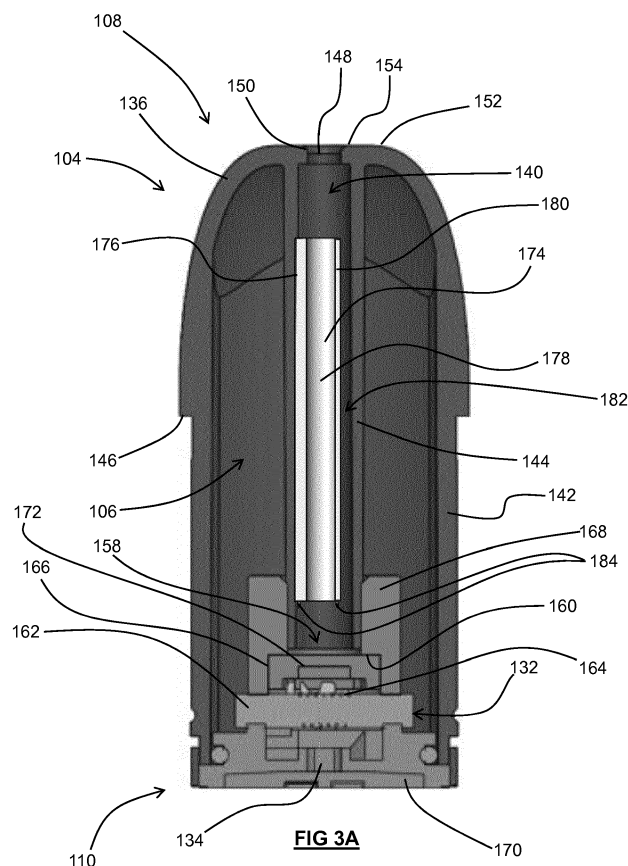
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(54) AEROSOL DELIVERY DEVICE

(57) Disclosed is an aerosol delivery device comprising one or more passage walls defining an elongate passage (140) downstream of a vaporiser and extending along a longitudinal axis to an outlet. The device further comprises an elongate filter (174) extending longitudi-

nally within the passage (140). An outer surface of the filter (174) is spaced from an internal surface of the one or more passage walls so as to define an elongate airflow path between the filter and the passage wall.



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Description

Field of the Invention

[0001] The present invention relates to an aerosol delivery device, and, more particularly but not exclusively, to an aerosol delivery device having a filter.

Background

[0002] The smoking of tobacco is generally considered to expose a smoker to potentially harmful substances. It is generally thought that a significant amount of the potentially harmful substances are generated through the heat caused by the burning and/or combustion of the tobacco and the constituents of the burnt tobacco in the tobacco smoke itself.

[0003] Combustion of organic material such as tobacco is known to produce tar and other potentially harmful by-products. There have been proposed various smoking substitute devices in order to avoid the smoking of tobacco.

[0004] Such smoking substitute devices can form part of nicotine replacement therapies aimed at people who wish to stop smoking and overcome a dependence on nicotine.

[0005] Smoking substitute devices, which may also be known as electronic nicotine delivery systems, may comprise electronic systems that permit a user to simulate the act of smoking by producing an aerosol, also referred to as a "vapour", which is drawn into the lungs through the mouth (inhaled) and then exhaled. The inhaled aerosol typically bears nicotine and/or flavourings without, or with fewer of, the odour and health risks associated with traditional smoking.

[0006] In general, smoking substitute devices are intended to provide a substitute for the rituals of smoking, whilst providing the user with a similar experience and satisfaction to those experienced with traditional smoking and tobacco products.

[0007] The popularity and use of smoking substitute devices has grown rapidly in the past few years. Although originally marketed as an aid to assist habitual smokers wishing to quit tobacco smoking, consumers are increasingly viewing smoking substitute devices as desirable lifestyle accessories. Some smoking substitute devices are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end. Other smoking substitute devices do not generally resemble a cigarette (for example, the smoking substitute device may have a generally box-like form).

[0008] There are a number of different categories of smoking substitute devices, each utilising a different smoking substitute approach. A smoking substitute approach corresponds to the manner in which the substitute system operates for a user.

[0009] One approach for a smoking substitute device is the so-called "vaping" approach, in which a vaporisable

liquid, typically referred to (and referred to herein) as "e-liquid", is heated by a heater to produce an aerosol vapour which is inhaled by a user. An e-liquid typically includes a base liquid as well as nicotine and/or flavourings.

5 The resulting vapour therefore typically contains nicotine and/or flavourings. The base liquid may include propylene glycol and/or vegetable glycerine.

[0010] A typical vaping smoking substitute device includes a mouthpiece, a power source (typically a battery),
10 a tank or liquid reservoir for containing e-liquid, as well as a heater. In use, electrical energy is supplied from the power source to the heater, which heats the e-liquid to produce an aerosol (or "vapour") which is inhaled by a user through the mouthpiece.

15 [0011] Vaping smoking substitute devices can be configured in a variety of ways. For example, there are "closed system" vaping smoking substitute devices which typically have a heater and a sealed tank which is pre-filled with e-liquid and is not intended to be refilled by an end user. One subset of closed system vaping
20 smoking substitute devices include a main body which includes the power source, wherein the main body is configured to be physically and electrically coupled to a consumable including the tank and the heater. In this way, when the tank of a consumable has been emptied, the
25 main body can be reused by connecting it to a new consumable. Another subset of closed system vaping smoking substitute devices are completely disposable, and intended for one-use only.

30 [0012] There are also "open system" vaping smoking substitute devices which typically have a tank that is configured to be refilled by a user, so the device can be used multiple times.

[0013] An example vaping smoking substitute device
35 is the myblu™ e-cigarette. The myblu™ e cigarette is a closed system device which includes a main body and a consumable. The main body and consumable are physically and electrically coupled together by pushing the consumable into the main body. The main body includes
40 a rechargeable battery. The consumable includes a mouthpiece, a sealed tank which contains e-liquid, as well as a vaporiser, which for this device is a heating filament coiled around a portion of a wick which is partially immersed in the e-liquid. The device is activated when a
45 microprocessor on board the main body detects a user inhaling through the mouthpiece. When the device is activated, electrical energy is supplied from the power source to the vaporiser, which heats e-liquid from the tank to produce a vapour which is inhaled by a user
50 through the mouthpiece.

[0014] Another example vaping smoking substitute device is the blu PRO™ e-cigarette. The blu PRO™ e cigarette is an open system device which includes a main
55 body, a (refillable) tank, and a mouthpiece. The main body and tank are physically and electrically coupled together by screwing one to the other. The mouthpiece and refillable tank are physically coupled together by screwing one into the other, and detaching the mouthpiece

from the refillable tank allows the tank to be refilled with e-liquid. The device is activated by a button on the main body. When the device is activated, electrical energy is supplied from the power source to a vapouriser, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0015] In prior art smoking substitute devices, some of the unvaporised e-liquid passes through the wick and to the mouthpiece. This may result in unvaporised e-liquid passing into the user's mouth, which may be unpleasant for the user. Further leakage occurs due to leakage paths present between the components of the consumable.

[0016] The present invention has been devised in light of the above considerations. Additionally, it is desirable to provide consumables which are easier and cheaper to manufacture

Summary of the Invention

[0017] At its most general, the present invention relates to an aerosol delivery device having a filter within a passage and an air gap between the filter and a wall of the passage (e.g. for an airflow path between the passage wall and the filter).

[0018] In a first aspect there is provided an aerosol delivery device comprising:

one or more passage walls defining an elongate passage downstream of a vapouriser and extending along a longitudinal axis to an outlet; and

an elongate filter extending longitudinally within the passage, an outer surface of the filter spaced from an internal surface of the one or more passage walls so as to define an elongate airflow path between the filter and the passage wall.

[0019] The inclusion of a filter within the passage, downstream of the vaporiser, may help to reduce (or prevent) un-vaporised liquid from the vaporiser being discharged from the outlet of the passage (i.e. into a user's mouth). That is, the filter may absorb un-vaporised liquid that is carried by the airflow through the passage.

[0020] However, one issue with the inclusion of such a filter is that it restricts airflow through the passage, which can increase the suction required in order to draw air (i.e. vapour/aerosol) through the passage. By forming the filter so as to define an airflow path that extends past the filter (i.e. between the passage wall and the filter), this issue can be at least partly alleviated.

[0021] The term "outer surface" is used here to describe an outer boundary of the filter. It is recognised that some filters are formed of e.g. a foam or mesh of fibres (or similar) formed into a particular shape. In such cases, the outer surface is not a surface of e.g. an individual fibre but is rather a boundary (or a portion of the boundary) of the overall shape formed by the fibres as a collective whole.

[0022] The term "upstream" is used to define a direction away from the outlet of the device. The term "downstream" is used to define a direction towards the outlet of the device.

[0023] Optional features of the present disclosure will now be set out. These are applicable singly or in any combination with any aspect of the present disclosure.

[0024] The airflow path between the filter and the passage wall may extend for (e.g. substantially) the length of the filter (i.e. in the longitudinal direction). That is, the outer surface of the filter may be spaced from the internal surface for the length of the filter. The airflow path may be substantially linear and may extend longitudinally between the filter and the one or more passage walls.

[0025] The transverse cross-sectional shape of the portion of the passage containing the filter may be consistent over the length of the portion of the passage. The transverse cross-sectional shape of the passage may be consistent for the entire length of the passage. The transverse cross-sectional shape of the passage may be circular. Alternatively, the cross-sectional shape of the passage may be e.g. elliptical, rectangular, triangular, etc.

[0026] The terms "transversely" and "transverse" are used herein to describe a direction that is substantially perpendicular to the axial (longitudinal) direction of the device.

[0027] The transverse cross-sectional shape of the airflow path may be consistent over the length of the airflow path. The transverse cross-sectional shape of the filter may be consistent over the length of the filter. The filter may, for example, have a cross-sectional shape that is a circle sector. The central angle of the circle sector may be approximately equal to or greater than 180 degrees. The cross-sectional shape of the filter may be semi-circular. Thus, the filter may comprise a circumferential outer surface that contacts (lies against) an inner circumferential surface of the passage wall (i.e. when the passage has a circular cross-section). A planar (diametrical) outer surface of the filter may extend between the ends of the circumferential surface, which may be spaced from an internal surface of the one or more passage walls to define the airflow path (having a semi-circular cross-section).

[0028] The cross-sectional shape of the filter may alternatively be triangular (i.e. such that the filter may have a triangular prism shape). The points of the triangle (i.e. longitudinal edges of the filter) may each contact an inner surface of the one or more passage walls. In this respect, the filter may be retained in the passage, at least partly, by the contact between the longitudinal edges of the filter and the internal surface(s). The triangular filter may comprise three planar outer surfaces (i.e. extending between the three longitudinal edges) that are each spaced from a respective internal surface so as to define three airflow paths extending between the filter and the one or more passage walls.

[0029] The filter may alternatively have a cross-sectional shape that is C-shaped. The C-shaped cross-section

tional shape may be in the form of an annulus sector. The annulus sector may have a central angle that is greater than or equal to 180 degrees, and may be less than or equal to 270 degrees. The outer radius of the annulus sector may be approximately twice as large as the inner radius of the annulus sector. When the filter has a C-shaped cross-section, the filter may comprise a circumferential outer surface that (when the passage has a circular cross section) contacts, e.g. lies against, an inner circumferential surface of the passage wall. This contact may help to retain the filter in the passage.

[0030] The cross-sectional area of the filter may be approximately equal to or greater than 15%, or greater than 30% of the cross-sectional area of the passage. The cross-sectional area of the filter may be approximately equal to or greater than 40% of the cross-sectional area of the passage. The cross-sectional area of the filter may be approximately equal to or greater than 50% of the cross-sectional area of the passage.

[0031] The filter may be formed of a fabric, which may be cotton or another fibre. The filter may be formed of a mesh. The filter may be configured to permit the flow of vaporised e-liquid therethrough, but prevent the flow of un-vaporised e-liquid.

[0032] The filter may be formed of a compressible (e.g. elastic) material or structure. The filter may be in a (e.g. partially) compressed or deformed state in the passage. For example, when the passage has a circular cross-section, the filter may be formed such that a circle circumscribing the cross-sectional shape of the filter is larger than the circle defining the cross-section of the passage. Thus, when the filter is received in the passage it must be compressed in order to fit within the passage. Once received therein, the expansion of the filter against the one or more passage walls (i.e. to return to its natural shape) may help to retain the filter in the passage.

[0033] The length of the filter (i.e. in the longitudinal direction) may be less than the length of the passage. Thus, the passage may comprise a void (i.e. a portion of the passage that does not contain the filter) downstream and/or upstream of the filter.

[0034] The passage comprises a retainer for retaining the filter in position in the passage. The retainer may be configured to restrict axial movement of the filter along the passage. In particular, the retainer may be configured to restrict axial movement of the filter in an upstream direction. For example, the retainer may comprise a rib or protrusion(s) extending inwardly from an inner surface of the one or more passage walls. An upstream end of the filter may abut/contact the retainer to prevent upstream movement. The retainer may comprise a retaining surface that extends transversely inwardly from an inner surface of the passage wall(s), and a sloped surface that extends obliquely (in an upstream direction) from an inner edge of the retaining surface to an inner surface of the passage wall(s). The sloped surface may allow the filter to be moved past the retainer in the downstream direction, whilst movement in the upstream direction is restrict-

ed by the retaining surface.

[0035] The device may comprise a vaporising chamber in which the vaporiser is mounted. The passage may extend from the vaporising chamber to the outlet. The device may comprise at least one inlet in fluid communication with the vaporising chamber, such that airflow is directed from the inlet(s) through the vaporising chamber to the passage.

[0036] A baffle may be interposed between the vaporiser and the passage. The baffle may extend generally transversely in the vaporising chamber and may be arranged such that un-vaporised liquid collects on an upstream (e.g. planar) surface of the baffle. The baffle may be aligned along the longitudinal axis so as to be transversely aligned with an opening to the passage (from the vaporising chamber).

[0037] The outlet may form part of a mouthpiece of the device. The mouthpiece may be integrally formed with the passage (i.e. the one or more walls of the passage). The mouthpiece may define an outer surface of the device that is received in a user's mouth in use.

[0038] The vaporising chamber may comprise opposing parallel side walls that are substantially parallel to the longitudinal axis, and a downstream (e.g. end) wall extending transversely between the side walls. The passage opening may be formed in the downstream wall of the chamber.

[0039] The device may comprise a tank (reservoir) for containing the vaporisable liquid (e.g. an e-liquid) with the vaporiser being in fluid communication with the tank. The e-liquid may, for example, comprise a base liquid and e.g. nicotine. The base liquid may include propylene glycol and/or vegetable glycerine.

[0040] The tank may be defined by a tank housing. The tank housing may be integrally formed with the mouthpiece and/or the passage. At least a portion of the tank housing may be translucent. For example, the tank housing may comprise a window to allow a user to visually assess the quantity of e-liquid in the tank. The tank may be referred to as a "clearomizer" if it includes a window, or a "cartomizer" if it does not.

[0041] The passage may extend longitudinally within the tank and the one or more passage walls may define the inner wall of the tank. In this respect, the tank may surround the passage e.g. the tank may be annular. The passage wall(s) may comprise longitudinal ribs extending therealong. These ribs may provide support to the passage wall(s). The ribs may extend for the full length of the passage wall(s). The ribs may project (e.g. radially outwardly) into the tank.

[0042] The device may comprise an insert defining the device inlet(s). The insert may be inserted into an open end of the tank so as to seal against the tank housing. The insert may comprise an inner, longitudinally-extending sleeve that defines wall(s) of the vaporising chamber and seals against the passage (e.g. seals against outer surfaces of the passage wall(s)). The insert may be configured to support the vaporiser within the vaporising

chamber. The insert may be formed of silicone. The baffle may be formed of silicone. The insert and the baffle may be integrally formed.

[0043] The vaporiser may comprise a heater and a wick (e.g. comprising a porous material). The wick may be elongate and extend transversely across the chamber between wall(s) (e.g. opposing side walls) of the chamber (which may be defined by the inner sleeve). So as to be in fluid communication with the tank, the wick extends into the tank, e.g. one or both of its opposing transverse ends may extend into the tank, e.g. through the wall(s) of the chamber/through the inner sleeve. In this way e-liquid may be drawn (e.g. by capillary action) along the wick, from the tank to the exposed (central) portion of the wick. The wick may be oriented so as to be perpendicular to the baffle. In this respect, air may pass around, through or proximate the wick and either side of the baffle.

[0044] The heater may comprise a heating element, which may be in the form of a filament wound about the wick (e.g. the filament may extend helically about the wick). The filament may be wound about the exposed portion of the wick. The heating element may be electrically connected (or connectable) to a power source. Thus, in operation, the power source may supply electricity to (i.e. apply a voltage across) the heating element so as to heat the heating element. This may cause liquid stored in the wick (i.e. drawn from the tank) to be heated so as to form a vapour and become entrained in the chamber portion of the airflow path. This vapour may subsequently cool to form an aerosol in the passage or vaporising chamber.

[0045] The device may be in the form of a consumable. The consumable may be configured for engagement with a main body (i.e. so as to form a smoking substitute system). For example, the consumable may comprise components of the system that are disposable, and the main body may comprise non-disposable or non-consumable components (e.g. power supply, controller, sensor, etc.) that facilitate the delivery of aerosol by the consumable. In such an embodiment, the vaporisable liquid (e.g. e-liquid) may be replenished by replacing a used consumable with an unused consumable.

[0046] The main body and the consumable may be configured to be physically coupled together. For example, the consumable may be at least partially received in a recess of the main body, such that there is snap engagement between the main body and the consumable. Alternatively, the main body and the consumable may be physically coupled together by screwing one onto the other, or through a bayonet fitting.

[0047] Thus, the consumable may comprise one or more engagement portions for engaging with a main body. In this way, one end of the device (i.e. the inlet end) may be coupled with the main body, whilst an opposing end (i.e. the outlet end) of the consumable may define the mouthpiece.

[0048] The main body or the consumable may comprise a power source or be connectable to a power

source. The power source may be electrically connected (or connectable) to the heater. The power source may be a battery (e.g. a rechargeable battery). An external electrical connector in the form of e.g. a USB port may be provided for recharging this battery.

[0049] The consumable may comprise an electrical interface for interfacing with a corresponding electrical interface of the main body. One or both of the electrical interfaces may include one or more electrical contacts. Thus, when the main body is engaged with the consumable, the electrical interface may be configured to transfer electrical power from the power source to a heater of the consumable. The electrical interface may also be used to identify the consumable from a list of known types. The electrical interface may additionally or alternatively be used to identify when the consumable is connected to the main body.

[0050] The main body may alternatively or additionally be able to detect information about the consumable via an RFID reader, a barcode or QR code reader. This interface may be able to identify a characteristic (e.g. a type) of the consumable. In this respect, the consumable may include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the interface.

[0051] The consumable or main body may comprise a controller, which may include a microprocessor. The controller may be configured to control the supply of power from the power source to the heater (e.g. via the electrical contacts). A memory may be provided and may be operatively connected to the controller. The memory may include non-volatile memory. The memory may include instructions which, when implemented, cause the controller to perform certain tasks or steps of a method.

[0052] The consumable or main body may comprise a wireless interface, which may be configured to communicate wirelessly with another device, for example a mobile device, e.g. via Bluetooth®. To this end, the wireless interface could include a Bluetooth® antenna. Other wireless communication interfaces, e.g. WiFi®, are also possible. The wireless interface may also be configured to communicate wirelessly with a remote server.

[0053] As is provided above, an airflow (i.e. puff) sensor may be provided that is configured to detect a puff (i.e. inhalation from a user). The airflow sensor may be operatively connected to the controller so as to be able to provide a signal to the controller that is indicative of a puff state (i.e. puffing or not puffing). The airflow sensor may, for example, be in the form of a pressure sensor or an acoustic sensor. The controller may control power supply to the heater in response to airflow detection by the sensor. The control may be in the form of activation of the heater in response to a detected airflow. The airflow sensor may form part of the consumable or the main body.

[0054] In an alternative embodiment the device may be a non-consumable device in which an aerosol former (e.g. e-liquid) of the system may be replenished by re-

filling the tank of the device (rather than replacing the consumable). In this embodiment, the consumable described above may instead be a non-consumable component that is integral with the main body. Thus the device may comprise the features of the main body described above. In this embodiment, the only consumable portion may be e-liquid contained in the tank of the device. Access to the tank (for re-filling of the e-liquid) may be provided via e.g. an opening to the tank that is sealable with a closure (e.g. a cap).

[0055] The device may be a smoking substitute device (e.g. an e-cigarette device) and, when in the form of a consumable, may be a smoking substitute consumable (e.g. an e-cigarette consumable).

[0056] In a second aspect there is disclosed a smoking substitute system comprising a main body having a power source, and a consumable as described above with respect to the first aspect, the consumable engageable with the main body such that vaporiser of the consumable is connected to the power source of the main body.

[0057] The consumable may be an e-cigarette consumable. The main body may be as described above with respect to the first aspect. The main body may, for example, be an e-cigarette device for supplying power to the consumable.

[0058] In a third aspect there is disclosed an elongate filter for an aerosol delivery device, the filter having a cross-sectional shape that is one of a semi-circle, a triangle, or an annulus sector.

[0059] The filter of the third aspect may be as otherwise described above with respect to the first aspect.

[0060] In a fourth aspect there is disclosed an elongate filter for an aerosol delivery device, the filter configured for receipt in an elongate passage of the aerosol delivery device such that an outer surface of the filter is spaced from an inner surface of a wall defining the passage so as to define an airflow between the filter and the wall of the passage.

[0061] The filter of the fourth aspect may be as otherwise described above with respect to the first or third aspects.

[0062] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

Summary of the Figures

[0063] So that the invention may be understood, and so that further aspects and features thereof may be appreciated, embodiments illustrating the principles of the invention will now be discussed in further detail with reference to the accompanying figures, in which:

Figure 1A is a front schematic view of a smoking substitute system;

Figure 1B is a front schematic view of a main body

of the system;

Figure 1C is a front schematic view of a consumable of the system;

Figure 2A is a schematic of the components of the main body;

Figure 2B is a schematic of the components of the consumable;

Figure 3A is a section view of the consumable;

Figure 3B is a bottom view of a tank and passage of the consumable;

Figure 4 is a variation of a filter for use in the consumable;

Figure 5 is a further variation of a filter for use in the consumable; and

Figure 6 is a section view of a manufacturing assembly for manufacturing the consumable.

Detailed Description of the Invention

[0064] Aspects and embodiments of the present invention will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art. All documents mentioned in this text are incorporated herein by reference.

[0065] Figure 1A shows a first embodiment of a smoking substitute system 100. In this example, the smoking substitute system 100 includes a main body 102 and an aerosol delivery device in the form of a consumable 104. The consumable 104 may alternatively be referred to as a "pod", "cartridge" or "cartomizer". It should be appreciated that in other examples (i.e. open systems), the main body may be integral with the consumable such that the aerosol delivery device incorporates the main body. In such systems, a tank of the aerosol delivery device may be accessible for refilling the device.

[0066] In this example, the smoking substitute system 100 is a closed system vaping system, wherein the consumable 104 includes a sealed tank 106 and is intended for single-use only. The consumable 104 is removably engageable with the main body 102 (i.e. for removal and replacement). Figure 1A shows the smoking substitute device 100 with the main body 102 physically coupled to the consumable 104, Figure 1B shows the main body 102 of the smoking substitute system 100 without the consumable 104, and Figure 1C shows the consumable 104 of the smoking substitute system 100 without the main body 102.

[0067] The main body 102 and the consumable 104 are configured to be physically coupled together by push-

ing the consumable 104 into a cavity at an upper end 108 of the main body 102, such that there is an interference fit between the main body 102 and the consumable 104. In other examples, the main body 102 and the consumable may be coupled by screwing one onto the other, or through a bayonet fitting.

[0068] The consumable 104 includes a mouthpiece (not shown in Figure 1A, 1B or 1C) at an upper end 109 of the consumable 104, and one or more air inlets (not shown) in fluid communication with the mouthpiece such that air can be drawn into and through the consumable 104 when a user inhales through the mouthpiece. The tank 106 containing e-liquid is located at the lower end 111 of the consumable 104.

[0069] The tank 106 includes a window 112, which allows the amount of e-liquid in the tank 106 to be visually assessed. The main body 102 includes a slot 114 so that the window 112 of the consumable 104 can be seen whilst the rest of the tank 106 is obscured from view when the consumable 104 is inserted into the cavity at the upper end 108 of the main body 102.

[0070] The lower end 110 of the main body 102 also includes a light 116 (e.g. an LED) located behind a small translucent cover. The light 116 may be configured to illuminate when the smoking substitute system 100 is activated. Whilst not shown, the consumable 104 may identify itself to the main body 102, via an electrical interface, RFID chip, or barcode.

[0071] Figures 2A and 2B are schematic drawings of the main body 102 and consumable 104. As is apparent from Figure 2A, the main body 102 includes a power source 118, a controller 120, a memory 122, a wireless interface 124, an electrical interface 126, and, optionally, one or more additional components 128.

[0072] The power source 118 is preferably a battery, more preferably a rechargeable battery. The controller 120 may include a microprocessor, for example. The memory 122 preferably includes non-volatile memory. The memory may include instructions which, when implemented, cause the controller 120 to perform certain tasks or steps of a method.

[0073] The wireless interface 124 is preferably configured to communicate wirelessly with another device, for example a mobile device, e.g. via Bluetooth®. To this end, the wireless interface 124 could include a Bluetooth® antenna. Other wireless communication interfaces, e.g. WiFi®, are also possible. The wireless interface 124 may also be configured to communicate wirelessly with a remote server.

[0074] The electrical interface 126 of the main body 102 may include one or more electrical contacts. The electrical interface 126 may be located in a base of the aperture in the upper end 108 of the main body 102. When the main body 102 is physically coupled to the consumable 104, the electrical interface 126 is configured to transfer electrical power from the power source 118 to the consumable 104 (i.e. upon activation of the smoking substitute system 100).

[0075] The electrical interface 126 may be configured to receive power from a charging station when the main body 102 is not physically coupled to the consumable 104 and is instead coupled to the charging station. The electrical interface 126 may also be used to identify the consumable 104 from a list of known consumables. For example, the consumable 104 may be a particular flavour and/or have a certain concentration of nicotine (which may be identified by the electrical interface 126). This can be indicated to the controller 120 of the main body 102 when the consumable 104 is connected to the main body 102. Additionally, or alternatively, there may be a separate communication interface provided in the main body 102 and a corresponding communication interface in the consumable 104 such that, when connected, the consumable 104 can identify itself to the main body 102.

[0076] The additional components 128 of the main body 102 may comprise the light 116 discussed above.

[0077] The additional components 128 of the main body 102 may also comprise a charging port (e.g. USB or micro-USB port) configured to receive power from the charging station (i.e. when the power source 118 is a rechargeable battery). This may be located at the lower end 110 of the main body 102. Alternatively, the electrical interface 126 discussed above may be configured to act as a charging port configured to receive power from the charging station such that a separate charging port is not required.

[0078] The additional components 128 of the main body 102 may, if the power source 118 is a rechargeable battery, include a battery charging control circuit, for controlling the charging of the rechargeable battery. However, a battery charging control circuit could equally be located in the charging station (if present).

[0079] The additional components 128 of the main body 102 may include a sensor, such as an airflow (i.e. puff) sensor for detecting airflow in the smoking substitute system 100, e.g. caused by a user inhaling through a mouthpiece 136 of the consumable 104. The smoking substitute system 100 may be configured to be activated when airflow is detected by the airflow sensor. This sensor could alternatively be included in the consumable 104. The airflow sensor can be used to determine, for example, how heavily a user draws on the mouthpiece or how many times a user draws on the mouthpiece in a particular time period.

[0080] The additional components 128 of the main body 102 may include a user input, e.g. a button. The smoking substitute system 100 may be configured to be activated when a user interacts with the user input (e.g. presses the button). This provides an alternative to the airflow sensor as a mechanism for activating the smoking substitute system 100.

[0081] As shown in Figure 2B, the consumable 104 includes the tank 106, an electrical interface 130, a vapouriser 132, one or more air inlets 134, a mouthpiece 136, and one or more additional components 138.

[0082] The electrical interface 130 of the consumable

104 may include one or more electrical contacts. The electrical interface 126 of the main body 102 and an electrical interface 130 of the consumable 104 are configured to contact each other and thereby electrically couple the main body 102 to the consumable 104 when the lower end 111 of the consumable 104 is inserted into the upper end 108 of the main body 102 (as shown in Fig. 1A). In this way, electrical energy (e.g. in the form of an electrical current) is able to be supplied from the power source 118 in the main body 102 to the vaporiser 132 in the consumable 104.

[0083] The vaporiser 132 is configured to heat and vaporise e-liquid contained in the tank 106 using electrical energy supplied from the power source 118. As will be described further below, the vaporiser 132 includes a heating filament and a wick. The wick draws e-liquid from the tank 106 and the heating filament heats the e-liquid to vaporise the e-liquid.

[0084] The one or more air inlets 134 are preferably configured to allow air to be drawn into the smoking substitute system 100, when a user inhales through the mouthpiece 136. When the consumable 104 is physically coupled to the main body 102, the air inlets 134 receive air, which flows to the air inlets 134 along a gap between the main body 102 and the lower end 111 of the consumable 104.

[0085] In operation, a user activates the smoking substitute device 110, e.g. through interaction with a user input forming part of the main body 102 or by inhaling through the mouthpiece 136 as described above. Upon activation, the controller 120 may supply electrical energy from the power source 118 to the vaporiser 132 (via electrical interfaces 126, 130), which may cause the vaporiser 132 to heat e-liquid drawn from the tank 106 to produce a vapour which is inhaled by a user through the mouthpiece 136.

[0086] An example of one of the one or more additional components 138 of the consumable 104 is an interface for obtaining an identifier of the consumable 104. As discussed above, this interface may be, for example, an RFID reader, a barcode, a QR code reader, or an electronic interface which is able to identify the consumable. The consumable 104 may, therefore include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the electronic interface in the main body 102.

[0087] It should be appreciated that the smoking substitute system 100 shown in figures 1A to 2B is just one exemplary implementation of a smoking substitute system. For example, the system could otherwise be in the form of an entirely disposable (single-use) system or an open system in which the tank is refillable (rather than replaceable).

[0088] Figure 3A is a section view of the consumable 104 described above. The consumable 104 comprises a tank 106 for storing e-liquid, a mouthpiece 136 and a passage 140 extending along a longitudinal axis of the consumable 104. In the illustrated embodiment the pas-

sage 140 is in the form of a tube having a substantially circular transverse cross-section (i.e. transverse to the longitudinal axis). The tank 106 surrounds the passage 140, such that the passage 140 extends centrally through the tank 106.

[0089] A tank housing 142 of the tank 106 defines an outer casing of the consumable 104, whilst a passage wall 144 defines the passage 140. The tank housing 142 extends from the lower end 111 of the consumable 104 to the mouthpiece 136 at the upper end 109 of the consumable 104. At the junction between the mouthpiece 136 and the tank housing 142, the mouthpiece 136 is wider than the tank housing 142, so as to define a lip 146 that overhangs the tank housing 142. This lip 146 acts as a stop feature when the consumable 104 is inserted into the main body 102 (i.e. by contact with an upper edge of the main body 102).

[0090] The tank 106, the passage 140 and the mouthpiece 136 are integrally formed with each other so as to form a single unitary component. As will be described further below with respect to Figure 4, this component may be formed by way of an injection moulding process and, for example, may be formed of a thermoplastic material such as polypropylene.

[0091] Although not immediately apparent from the figures, the tank housing 142 tapers, such that the thickness of the tank housing 142 decreases in a first demoulding direction (as will be discussed further with respect to Figure 4). In Figure 3A the first demoulding direction is in a downward direction away from the mouthpiece 136. This means that, aside from a small number of indents (which provide physical connection between the consumable 104 and the main body 102), the thickness of the tank housing 142 decreases with increasing distance away from the mouthpiece 136. In particular, the tank housing 142 tapers in this way, because internal and external surfaces of the tank housing 142 are angled with respect to the first demoulding direction. This tapering assists in forming the tank housing 142 and passage wall 144 as a single (i.e. unitary) component.

[0092] Like the tank housing 142, the passage wall 144 is also tapered such that the thickness of the passage wall 144 decreases along the first demoulding direction. Again, the thickness of the passage wall 144 decreases due to internal and external surfaces of the passage wall 144 being angled with respect to the first demoulding direction. As a result of the tapering of the passage wall 144, the passage 140 has an internal diameter that decreases in a downstream direction (i.e. an upward direction in Figure 3A). For example, the passage 140 has an internal width less than 4.0 mm and greater than 3.0 mm at an upstream end of the passage 140 (e.g. approximately 3.6 mm). On the other hand, the passage 140 has an internal width of less than 3.8 mm and greater than 2.8 mm at the downstream end of the passage 140 (e.g. approximately 3.4 mm).

[0093] The mouthpiece 136 comprises a mouthpiece aperture 148 defining an outlet of the passage 140. The

mouthpiece aperture 148 has a radially inwardly directed inner surface 150, which joins an outer surface 152 of the mouthpiece 136 (i.e. a surface which contacts a user's lips in use) at an outer edge 154 of the mouthpiece aperture 148. At this outer edge 154, the included angle between the inner surface 150 of the mouthpiece aperture 148 and the outer surface 152 of the mouthpiece 136 (i.e. the "mouthpiece angle") is greater than 90 degrees. In the illustrated embodiment, this is due to the outer edge 154 being rounded. This edge 154 may otherwise be chamfered or bevelled.

[0094] The vaporiser 132 is located in a vaporising chamber 156 of the consumable 104. The vaporising chamber 156 is downstream of the inlet 134 of the consumable 104 and is fluidly connected to the mouthpiece aperture 148 (i.e. outlet) by the passage 140. In particular, the passage 140 extends between the mouthpiece aperture 148 and an opening 158 from the chamber 156. This opening 158 is formed in a downstream (i.e. upper) wall 160 of the chamber 156.

[0095] The vaporiser 132 comprises a porous wick 162 and a heater filament 164 coiled around the porous wick 162. As is apparent from Figures 3A and 3B, the wick 162 extends transversely across the chamber 156 between sidewalls 166 of the chamber 156 which form part of an inner sleeve 168 of an insert 170 that defines the lower end 111 of the consumable 104 (i.e. that connects with the main body 102). The insert 170 is inserted into an open lower end of the tank 106 so as to seal against the tank housing 142.

[0096] In this way, the inner sleeve 168 projects into the tank 106 and seals with the passage 140 (around the passage wall 144) so as to separate the chamber 156 from the e-liquid in the tank 106. Ends of the wick 162 project through apertures in the inner sleeve 168 and into the tank 106 so as to be in contact with the e-liquid in the tank 106. In this way, e-liquid is transported along the wick 162 (e.g. by capillary action) to a central portion of the wick 162 that is exposed to airflow through the chamber 156. The transported e-liquid is heated by the heater filament 164 (when activated e.g. by detection of inhalation), which causes the e-liquid to be vaporised and to be entrained in air flowing past the wick 162. This vaporised liquid may cool to form an aerosol in the passage 140, which may then be inhaled by a user.

[0097] In some cases, un-vaporised liquid can be carried by air flowing through the chamber 156. This may be undesirable for a user. To reduce this, the consumable 104 comprises a baffle 172. The baffle 172 extends across the chamber 156 so as to be interposed between the vaporiser 132 and the passage opening 158. In this way, un-vaporised liquid from the wick 162 may collect on an upstream (i.e. lower) planar surface of the baffle 172 rather than entering the passage 158.

[0098] Whilst the baffle 172 may restrict the flow of some un-vaporised liquid into the passage 140, some liquid may still enter the passage 140. In order to prevent (or at least restrict) this un-vaporised liquid from being

inhaled by a user (through the mouthpiece aperture 148), the consumable 104 comprises an elongate filter 174 extending longitudinally within the passage 140.

[0099] As is particularly apparent from Figure 3B, the filter 174 has a cross-sectional shape that is an annulus sector (i.e. a portion of an annulus). In particular, the central angle of the annulus sector is approximately 240 degrees. This cross-sectional shape is consistent for the length of the filter 174. In this way, the filter 174 may be formed by way of e.g. an extrusion process. In particular, the filter 174 comprises an outer circumferential surface 176 that lies against an inner surface of the passage wall 144, an inner circumferential surface 178 that is spaced inwardly from the outer circumferential surface 176 and two end surfaces 180 that join the inner 178 and outer 176 circumferential surfaces. The inner circumferential surface 178 and the end surfaces 180 are each spaced from the inner surface of the passage wall 144. This space defines an elongate airflow path 182 that extends longitudinally between the filter 174 and the passage wall 144. This airflow path 182 helps to reduce pressure drop (caused by the presence of the filter) through the passage 140.

[0100] The filter 174 is partly retained in the passage 140 by its shape (including e.g. the contact between the passage wall 144 and the outer circumferential surface 176). The filter 174 is retained against upstream movement in the passage 140 by a retainer arrangement in the form of a plurality of projections 184 extending inwardly from the passage wall 144. Whilst not apparent from the Figure, these projections 184 each comprise a retaining surface extending transversely inwardly from the passage wall 144, and a sloped surface extending (upstream) from an inner edge of the retaining surface to the passage wall 144. The sloped surface allows the filter 174 to be inserted into the passage 140 via the opening 158 (e.g. during manufacture).

[0101] Whilst the illustrated filter 174 has a cross-sectional shape that is an annulus sector, other shapes may be used in order to provide an airflow path between the filter and the passage wall. Two variations of the filter 174 are illustrated in Figure 4 and Figure 5. Similar reference numerals have been used in these figures to denote similar features.

[0102] In Figure 4, the filter 274 has a cross-sectional shape that is a circle sector (in this case having a central angle of 180 degrees so as to be a semi-circle). In other embodiments the circle sector may have a different central angle (such as an angle greater than 180 degrees). The filter 274 comprises a circumferential surface 276 that contacts an inner surface of the passage wall 144, and a planar (diametrical) surface 278 that extends diametrically across the passage 140. The planar surface 278 is spaced from the inner surface of the passage wall 144 so as to define an airflow path 282 between the filter 274 and the passage wall 144.

[0103] In Figure 5, the filter 374 has a cross-sectional shape that is a triangle. The filter 374 comprises three

longitudinal edges 376 and three planar surfaces 378 extending between the longitudinal edges 376. Each longitudinal edge 376 contacts the passage wall 144 so as to help retain the filter 374 in the passage 140. Each of the planar surfaces 378 is spaced from the inner surface of the passage wall 144 so as to define a respective airflow path extending longitudinally between the filter 374 and the passage wall 144. Thus, in this embodiment, three airflow paths extend between the filter 374 and the passage wall 144.

[0104] Figure 6 shows a drawing of a manufacturing assembly 486 which is used to manufacture the consumable 104 described above. The manufacturing assembly 486 comprises a first mould 488 and a second mould 490.

[0105] The first mould 488 has a shape which complements that of a first end of the integrally formed tank housing 142 and mouthpiece 136. The first mould 488 therefore has a shape which matches the inner surfaces defining the tank 106.

[0106] The second mould 490 has a shape which complements that of a second end of the integrally formed tank housing 142 and mouthpiece 136. The second mould 490 has a shape which matches the outer surface of the mouthpiece 136 and the inner surface of the mouthpiece aperture 148.

[0107] When the first mould 488 and the second mould 490 are brought together, they define a closed cavity which has the shape of the tank housing 142, the mouthpiece 136 and the passage walls 144.

[0108] To manufacture these components, heated material is injected into the cavity between the first mould 488 and the second mould 490. At this point, the first mould 488 and the second mould 490 meet at a boundary between external surfaces of the mouthpiece 136 and the tank housing 142.

[0109] The material is subsequently cooled, and the first mould 488 and the second mould 490 are separated, with the first mould 488 travelling in a first demoulding direction 492 (i.e. away from the second mould 490) and the second mould 490 travelling in a second demoulding direction 494 (i.e. away from the first mould 488 and opposite to the first demoulding direction 492). For a particular component, a demoulding direction is a direction along which a mould which contacts that component is removed during an injection moulding process.

[0110] The filter 174 is then inserted in the passage 140 via the opening 158 to the passage. Subsequently, the insert 170 (e.g. including the vaporiser) and any additional components are inserted into the tank 106 to form the consumable 104.

[0111] The features disclosed in the foregoing description, or in the following claims, or in the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for obtaining the disclosed results, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

[0112] While the invention has been described in conjunction with the exemplary embodiments described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments of the invention set forth above are considered to be illustrative and not limiting. Various changes to the described embodiments may be made without departing from the spirit and scope of the invention.

[0113] For the avoidance of any doubt, any theoretical explanations provided herein are provided for the purposes of improving the understanding of a reader. The inventors do not wish to be bound by any of these theoretical explanations.

[0114] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0115] Throughout this specification, including the claims which follow, unless the context requires otherwise, the words "have", "comprise", and "include", and variations such as "having", "comprises", "comprising", and "including" will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

[0116] It must be noted that, as used in the specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" one particular value, and/or to "about" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by the use of the antecedent "about," it will be understood that the particular value forms another embodiment. The term "about" in relation to a numerical value is optional and means, for example, +/- 10%.

[0117] The words "preferred" and "preferably" are used herein refer to embodiments of the invention that may provide certain benefits under some circumstances. It is to be appreciated, however, that other embodiments may also be preferred under the same or different circumstances. The recitation of one or more preferred embodiments therefore does not mean or imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, or from the scope of the claims.

Claims

1. An aerosol delivery device comprising:

one or more passage walls defining an elongate passage downstream of a vaporiser and extending along a longitudinal axis to an outlet; and an elongate filter extending longitudinally within

- the passage, an outer surface of the filter spaced from an internal surface of the one or more passage walls so as to define an elongate airflow path between the filter and the passage wall.
2. An aerosol delivery device according to claim 1 wherein the airflow path extends for the length of the filter. 5
 3. An aerosol delivery device according to claim 1 or 2 wherein the airflow path is linear and extends longitudinally. 10
 4. An aerosol delivery device according to any one of the preceding claims wherein a cross-sectional shape of the airflow path is consistent for the length of the airflow path. 15
 5. An aerosol delivery device according to any one of the preceding claims wherein a cross-sectional shape of the filter is consistent for the length of the filter. 20
 6. An aerosol delivery device according to any one of the preceding claims wherein the cross-sectional shape of the filter is a circle sector. 25
 7. An aerosol delivery device according to claim 6 wherein the cross-sectional shape of the filter is a semi-circle. 30
 8. An aerosol delivery device according to any one of claim 1 to 5 wherein the cross-sectional shape of the filter is an annulus sector or a triangle. 35
 9. An aerosol delivery device according to any one of the preceding claims wherein the longitudinal length of the filter is less than the length of the passage. 40
 10. An aerosol delivery device according to any one of the preceding claims wherein the cross-sectional area of the filter is greater than 30% of the cross-sectional area of the passage. 45
 11. An aerosol delivery device according to any one of the preceding claims wherein the passage has a circular cross-section. 50
 12. An aerosol delivery device according to any one of the preceding claims further comprising a retainer projecting inwardly from the one or more passage walls, the retainer configured to restrict upstream movement of the filter. 55
 13. An aerosol delivery device according to claim 12 wherein the retainer comprises a retaining surface extending transversely inwardly from the one or more passage walls, and a sloped surface extending upstream from an inner edge of the retaining surface to the one or more passage walls.
 14. An aerosol delivery device according to any one of the preceding claims, wherein the aerosol delivery device is a consumable for a smoking substitute device.
 15. A smoking substitute system comprising:
 - a main body comprising a power source; and
 - a consumable according to claim 14, the consumable engageable with the main body such that the vaporiser of the consumable is electrically connected to the power source of the main body.

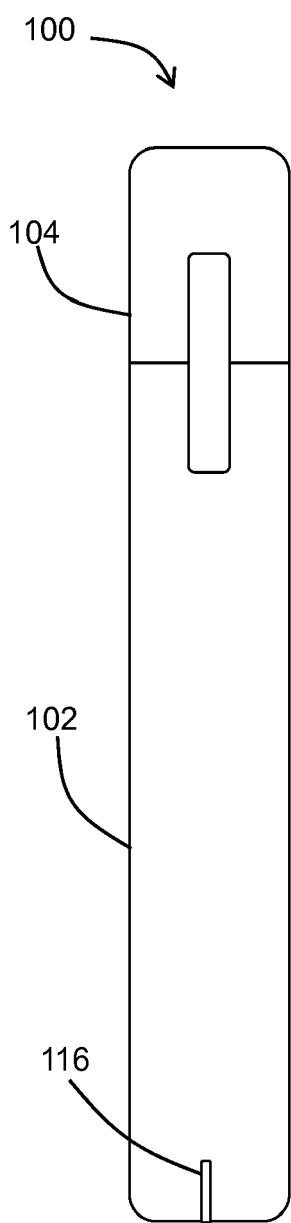


FIG 1A

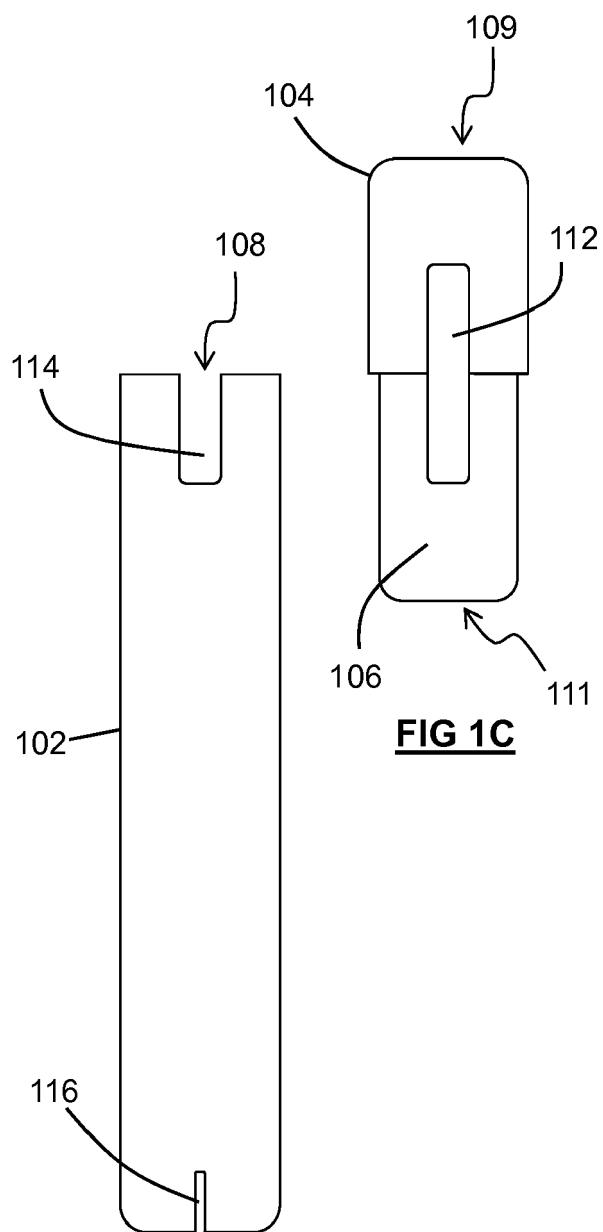


FIG 1C

FIG 1B

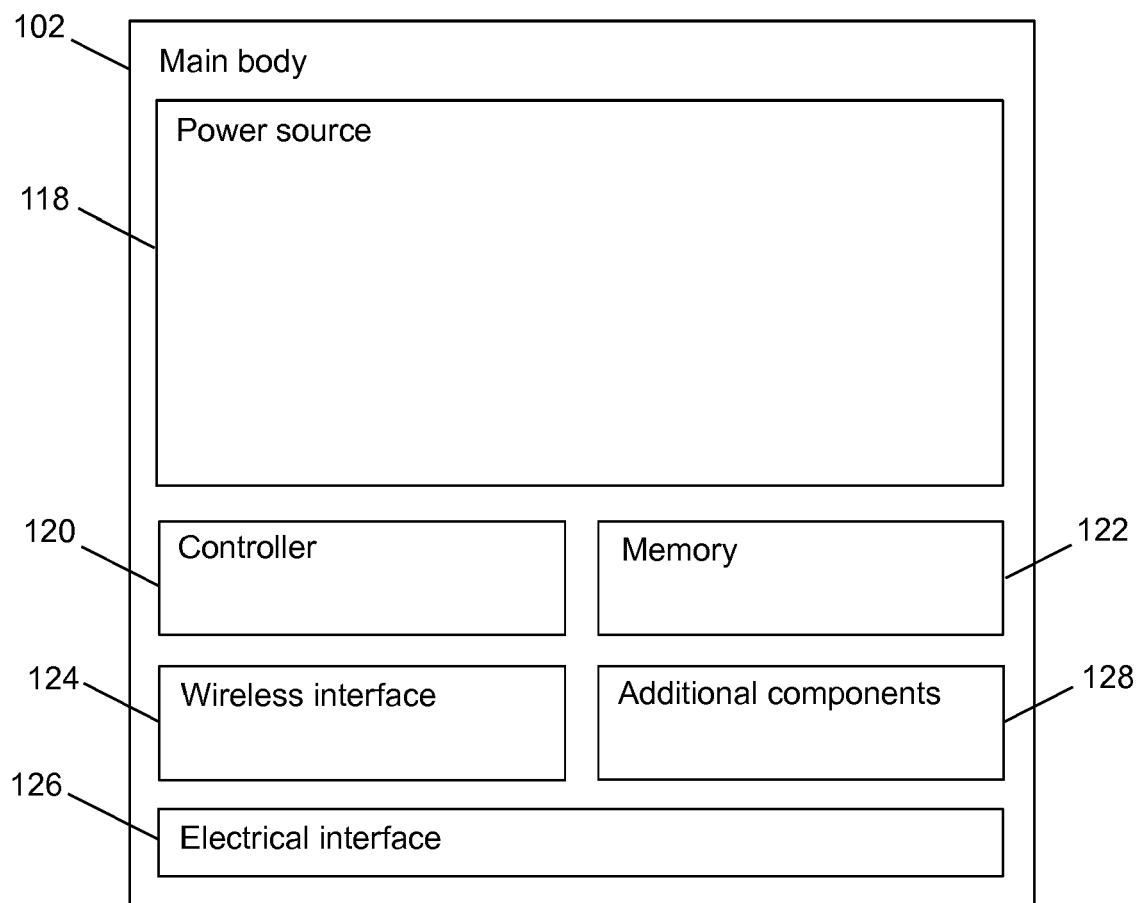


FIG 2A

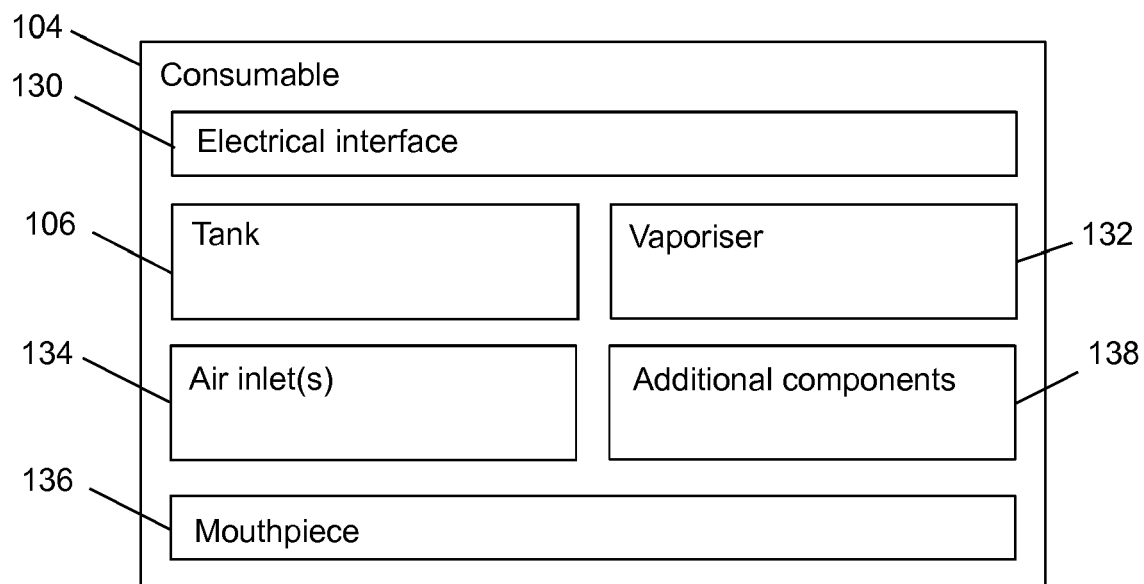
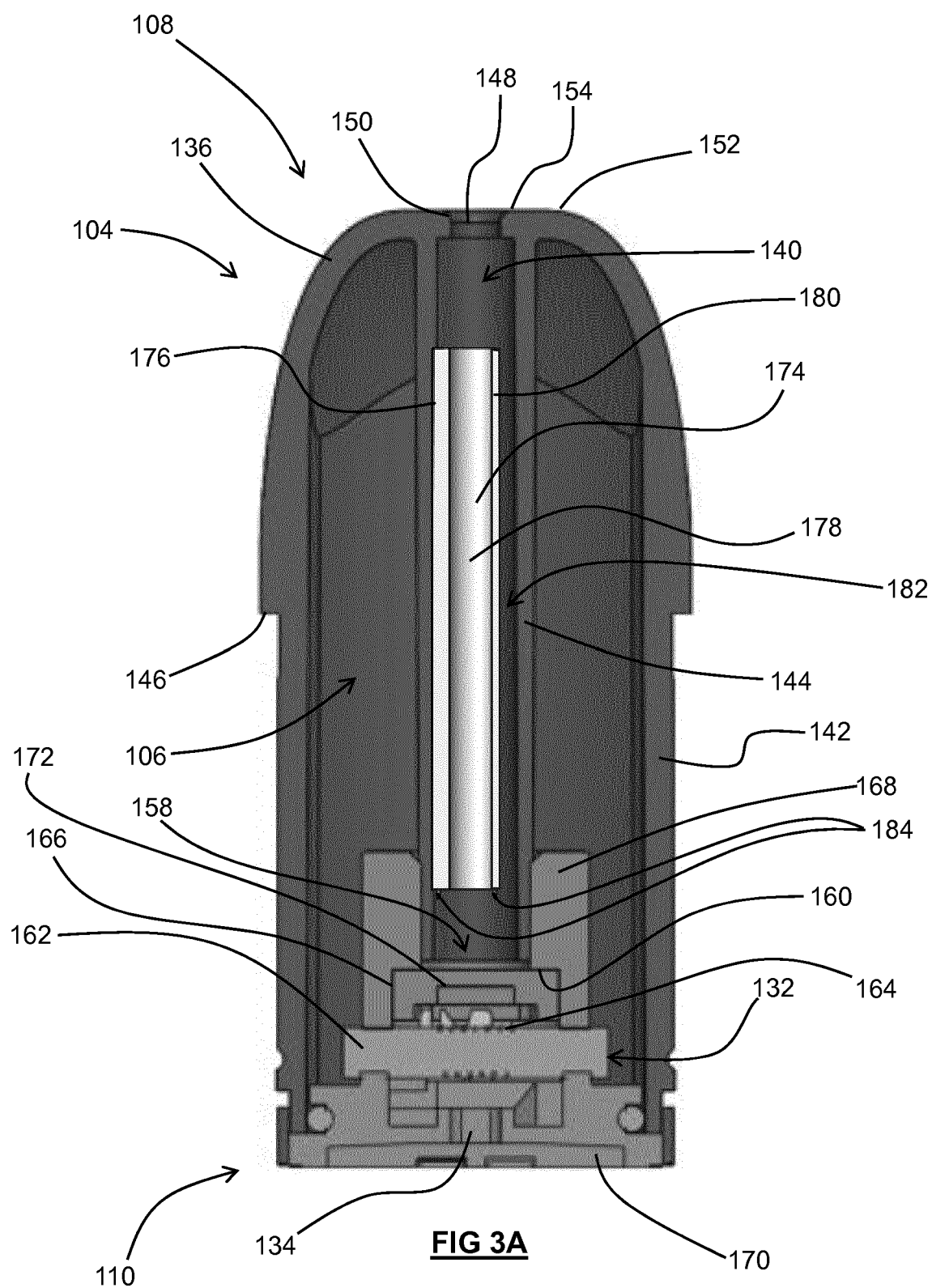
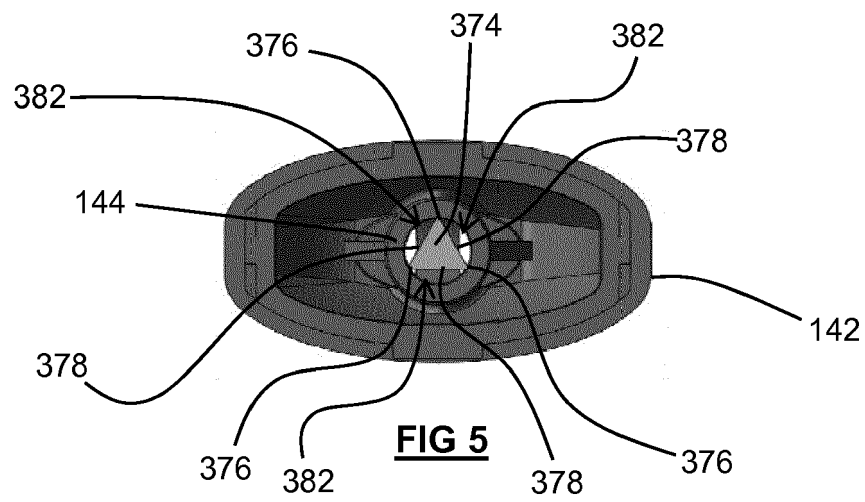
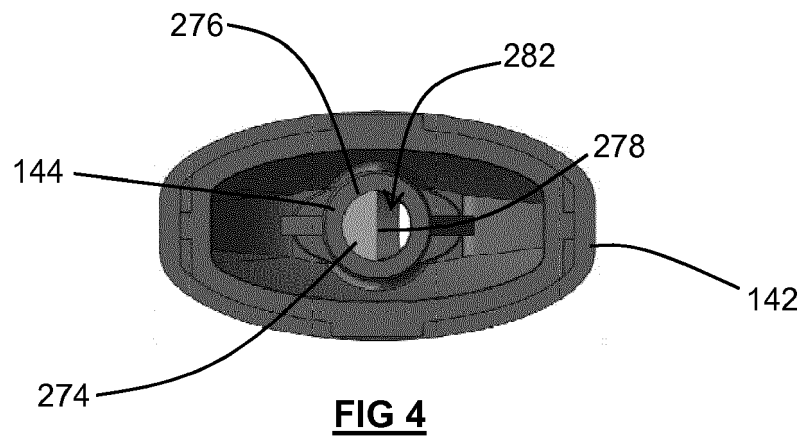
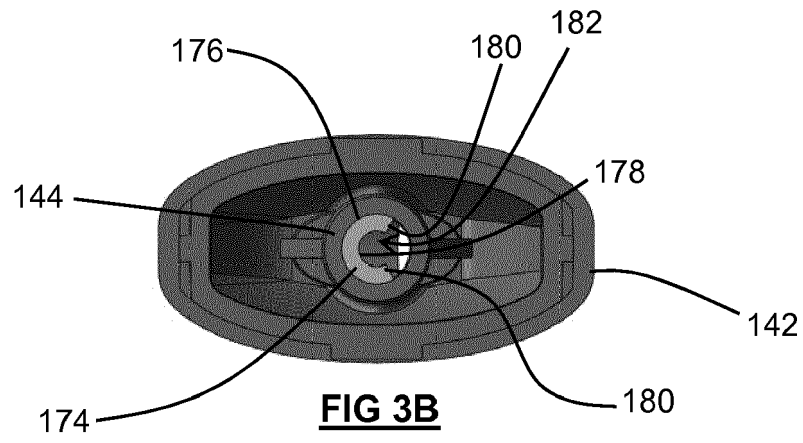


FIG 2B





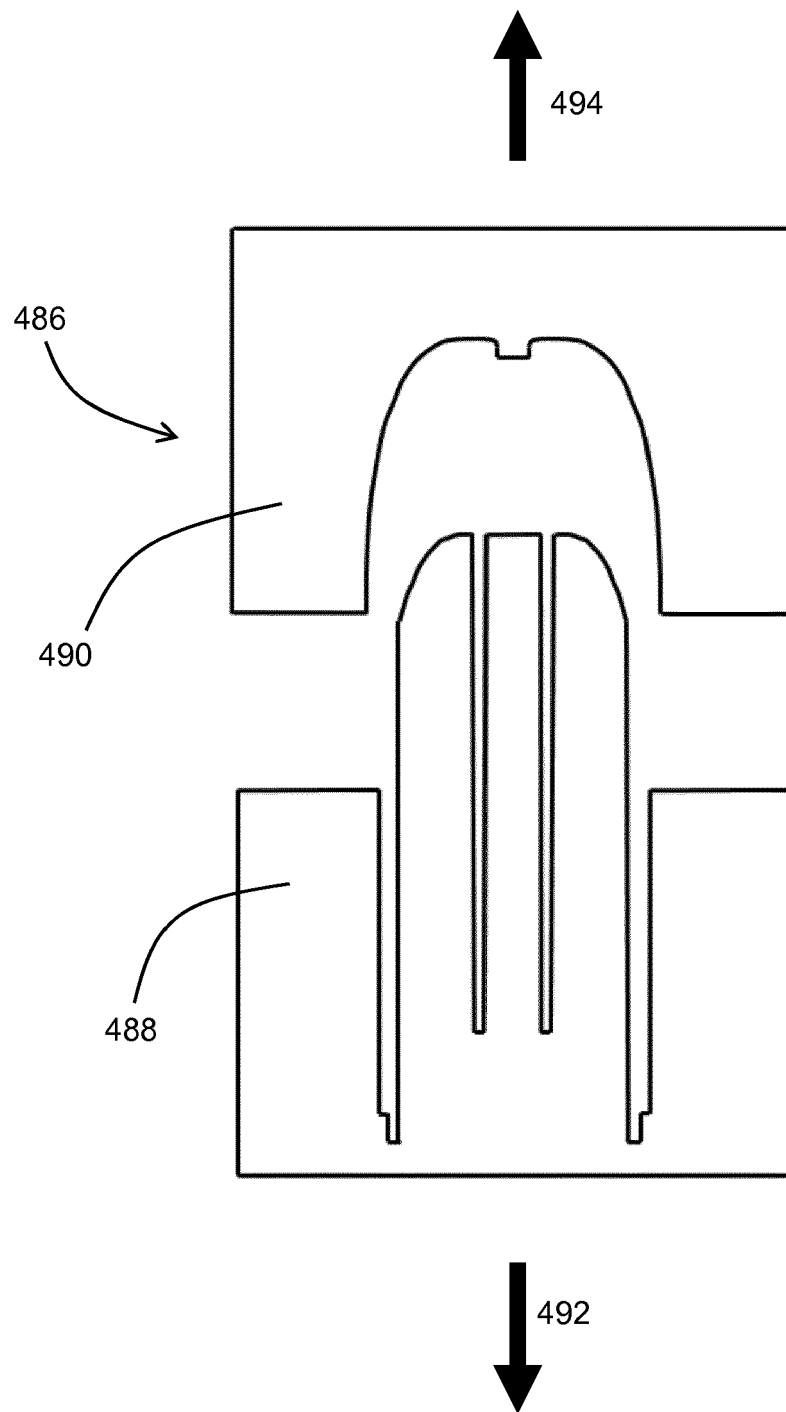


FIG 6



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 Application Number
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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