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(54) **CONSUMABLE**

(57) A consumable for a smoking substitute device comprises: a tank for storing an e-liquid; and a mouthpiece, the mouthpiece comprising a mouthpiece aperture, wherein the mouthpiece aperture is configured to be fluidly connected to the tank, so that the mouthpiece

aperture receives an aerosol vapour formed from the e-liquid in use, the external surface of the mouthpiece being adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour, wherein the tank and the mouthpiece are integrally formed.

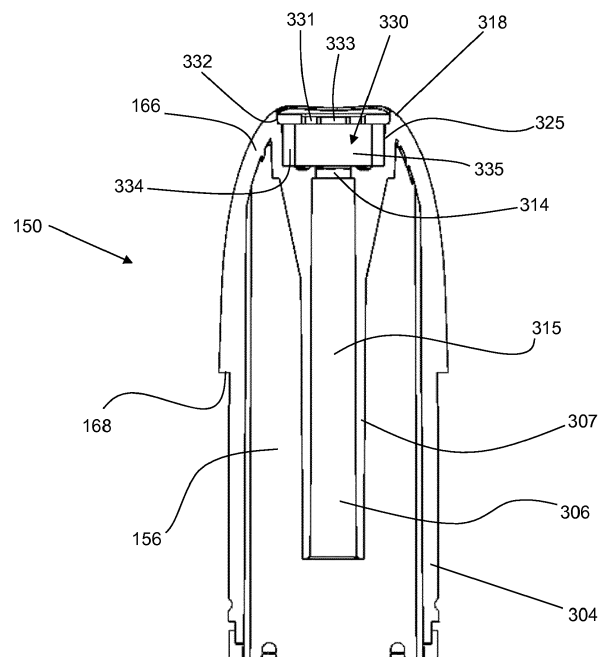


Fig. 3(a)

Description

Field of the Invention

[0001] The present invention relates to a consumable for a smoking substitute device, a smoking substitute device, a method of manufacturing a consumable for a smoking substitute device and a manufacturing assembly and particularly, although not exclusively, to a consumable including an external adaptation for receipt of 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 byproducts. 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 ap-

proach 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 heating device 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. The resulting vapour therefore typically contains nicotine and/or flavourings. The base liquid may include propylene glycol and/or vegetable glycerin.

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

[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 sealed tank and heating element which is pre-filled with e liquid and is not intended to be refilled by an end user. One subset of closed system vaping 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 heating element. In this way, when the tank of a consumable has been emptied, the 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.

[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 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 a rechargeable battery. The consumable includes a mouthpiece, a sealed tank which contains e-liquid, as well as a heating device, 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 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 heating device, which heats e-liquid from the tank to produce a vapour which is inhaled by a user 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 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 heating device, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0015] Another approach for a smoking substitute device is the so-called "heat not burn" ("HNB") approach in which tobacco (rather than e-liquid) is heated or warmed to release vapour. The tobacco may be leaf tobacco or reconstituted tobacco. The vapour may contain nicotine and/or flavourings. In the HNB approach the intention is that the tobacco is heated but not burned, i.e. does not undergo combustion.

[0016] A typical HNB smoking substitute device may include a main body and a consumable. The consumable may include the tobacco material. The main body and consumable may be configured to be physically coupled together. In use, heat may be imparted to the tobacco material by a heating device that is typically located in the main body, wherein airflow through the tobacco material causes moisture in the tobacco material to be released as vapour. A vapour may be formed from a carrier in the tobacco material (this carrier may for example include propylene glycol and/or vegetable glycerin) and additionally volatile compounds released from the tobacco. The released vapour may be entrained in the airflow drawn through the tobacco.

[0017] As the vapour passes through the smoking substitute device (entrained in the airflow) from an inlet to a mouthpiece (outlet), the vapour cools and condenses to form an aerosol (also referred to as a vapour) for inhalation by the user. The aerosol will normally contain the volatile compounds.

[0018] In HNB smoking substitute devices, heating as opposed to burning the tobacco material is believed to cause fewer, or smaller quantities, of the more harmful compounds ordinarily produced during smoking. Consequently, the HNB approach may reduce the odour and/or health risks that can arise through the burning, combustion and pyrolytic degradation of tobacco.

[0019] An example of the HNB approach is the IQOS® smoking substitute device from Philip Morris Ltd. The IQOS® smoking substitute device uses a consumable, including reconstituted tobacco located in a wrapper. The consumable includes a holder incorporating a mouthpiece. The consumable may be inserted into a main body that includes a heating device. The heating device has a thermally conductive heating knife which penetrates the reconstituted tobacco of the consumable, when the consumable is inserted into the heating device. Activation of the heating device heats the heating element (in this case a heating knife), which, in turn, heats the tobacco in the consumable. The heating of the tobacco causes it

to release nicotine vapour and flavourings which may be drawn through the mouthpiece by the user through inhalation.

[0020] A second example of the HNB approach is the device known as "Glo"® from British American Tobacco p.l.c. Glo® comprises a relatively thin consumable. The consumable includes leaf tobacco which is heated by a heating device located in a main body. When the consumable is placed in the main body, the tobacco is surrounded by a heating element of the heating device. Activation of the heating device heats the heating element, which, in turn, heats the tobacco in the consumable. The heating of the tobacco causes it to release nicotine vapour and flavourings which may be drawn through the consumable by the user through inhalation. The tobacco, when heated by the heating device, is configured to produce vapour when heated rather than when burned (as in a smoking apparatus, e.g. a cigarette). The tobacco may contain high levels of aerosol formers (carrier), such as vegetable glycerine ("VG") or propylene glycol ("PG").

[0021] 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. Additionally, it is desirable to provide consumables which are easier and cheaper to manufacture.

[0022] The present invention has been devised in the light of the above considerations.

Summary of the Invention

[0023] At its most general, the present invention relates to a consumable for a smoking substitute device in which a tank and a mouthpiece are integrally formed wherein the external surface of the consumable is adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour.

[0024] According to a first aspect of the present invention, there is provided a consumable for a smoking substitute device, the consumable comprising: a tank for storing an e-liquid; and a mouthpiece, the mouthpiece comprising a mouthpiece aperture, wherein the mouthpiece aperture is configured to be fluidly connected to the tank, so that the mouthpiece aperture receives an aerosol vapour formed from the e-liquid in use; the external surface of the mouthpiece being adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour; wherein the tank and the mouthpiece are integrally formed. The tank and the mouthpiece being integrally formed is advantageous, as it removes a possible fluid leakage path between the tank and the mouthpiece, reducing leakage of e-liquid. Additionally, it removes the need to assemble separate mouthpiece and tank components, simplifying the manufacture of the consumable.

[0025] The consumable comprises an external adap-

tation for receiving a filter. In particular, the external surface of the mouthpiece of the consumable is adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour. In this way, when a suitable filter is installed at the mouthpiece, any unvaporised liquid within the aerosol stream may be removed from the aerosol stream before entering the mouth of the user. This offers an improved user experience. Providing an external adaptation for receiving the filter means that the filter is easily installed or removed from the consumable without the need to dismantle any parts of the consumable.

[0026] Including the adaptation of the surface for receiving the filter is particularly advantageous for a consumable in which the tank is integrally formed with the mouthpiece, as integrally forming the tank and mouthpiece means that there is no location between the tank and mouthpiece for a filter.

[0027] In some embodiments the mouthpiece defines an external recess for receiving the filter or a portion of the filter. Thus the external surface of the mouthpiece may be adapted to receive the filter by providing a recess, or cavity, into which the filter or a portion of the filter is insertable.

[0028] The term "external recess" refers to a recessed portion of the outer wall of the mouthpiece which facilitates the receipt of a filter or a portion of a filter. Provision of a recess ensures that protrusion of the filter from the consumable is limited or avoided when the filter is installed and provides a means to secure the filter to prevent movement of the filter during use.

[0029] In some embodiments the external recess surrounds the mouthpiece aperture. In other words, the recessed portion of the outer wall is a portion which lies immediately adjacent to the mouthpiece aperture. In this way, when a filter is installed within the recess the aperture is occluded by the filter ensuring optimum filtration of the aerosol vapour stream.

[0030] In some embodiments, the recess has a larger cross section than the mouthpiece aperture. In this way the filter, when installed, covers at least the entire mouthpiece aperture such that aerosol vapour passing out of the consumable through the aperture is forced to pass through the filter before entering the mouth of the user. This ensures maximum filtration efficiency and removal of any unvaporised liquid.

[0031] In some embodiments the consumable is adapted to retain the filter in the recess by interference fit or a retention mechanism. In some embodiments the consumable is adapted to retain the filter in the recess by interference fit (also known as friction fit). For example, the dimensions of the recess and the filter may be complementary to provide a snug fit which prevents the inadvertent removal of the filter.

[0032] In some embodiments the consumable is adapted to retain the filter in the recess by a retention mechanism. In some embodiments this mechanism comprises a clip, such as a detent mechanism which prevents the removal of the filter after it has been pushed into the

recess by a predetermined amount. In some embodiments, the mechanism comprises a movable cover, for example a cover which is movable away from the recess or removable from the consumable so that the filter can be installed, then movable to cover the filter when the filter is installed in the recess to prevent its inadvertent removal from the consumable. In some embodiments, the retention mechanism is releasable to provide for the straightforward removal of the filter from the mouthpiece. For example, the user may release a detent mechanism or remove a cover in order to remove the filter from the mouthpiece, or apply a modest level of force to overcome an interference fit. This allows the user to e.g. replace the filter with a different filter which offers a different level of filtration or remove the filter entirely and use the consumable without any filter if this is desired, thereby offering a versatile user experience.

[0033] In some embodiments, the recess comprises a floor which defines the mouthpiece aperture, and one or more side walls extending from the floor up to an annular rim where the side walls of the recess meet the outer surface of the mouthpiece. In some embodiments, the floor of the recess has a circular or elliptical shape. In some embodiments, a single continuous side wall provides a recess with a cylindrical (or elliptical cylindrical) shape. In some embodiments, a step change in the diameter of the recess is provided in the side wall. In some embodiments, the recess has a larger diameter for the portion of the recess adjacent the rim of the recess and a smaller diameter for the portion of the recess adjacent the floor of the recess, thereby providing a shoulder or shelf within the recess which faces outwards, towards the rim. In some embodiments, the step change in diameter of the side wall is located closer to the rim of the recess than the floor of the recess. In some embodiments, less than 50% of the depth of the recess is located between the step change in diameter and the rim of the recess, for example less than 40%, less than 30% or less than 25%, with the remainder of the depth being located between the step and the floor of the recess.

[0034] In some embodiments, the depth of the recess measured as the distance from the floor of the recess (or from the mouthpiece aperture) to the rim where the recess meets the outer surface of the mouthpiece, in a direction parallel with the outlet of the consumable, is at least 3.0 mm, for example at least 3.1 mm, at least 3.2 mm, at least 3.3 mm, at least 3.4 mm, at least 3.5 mm or at least 3.6 mm. In some embodiments, the depth of the recess is less than 5.0 mm, for example less than 4.9 mm, less than 4.8 mm or less than 4.7 mm.

[0035] In some embodiments, the width of the recess measured as the largest distance between opposing side walls of the recess, in a direction perpendicular with the outlet of the consumable, is at least 7.0 mm, for example at least 7.1 mm, at least 7.2 mm, at least 7.3 mm, at least 7.4 mm or at least 7.5 mm. In some embodiments, the width of the recess is less than 9.0 mm for example less than 8.9 mm, less than 8.8 mm, less than 8.7 mm, less

than 8.6 mm or less than 8.5 mm.

[0036] In some embodiments, the mouthpiece is further adapted for receiving a removable cover or cap for covering the filter when the filter is installed within the recess. The removable cover may be retained by the mouthpiece by an interference fit, for example by providing a snug fit between the outer edge of the cover and an inner wall of the recess. The removable cover may define an aperture permitting the passage of aerosol vapour. In some embodiments, the adaptation of the mouthpiece for receiving the cover comprises a shoulder or shelf within the recess upon which the cover rests when received by the mouthpiece. In some embodiments, the cover is formed of plastics material, preferably rigid plastics material. In some embodiments, the cover has a planar geometry, and may have the form of a plate or disc. The cover may have a circular or elliptical cross-section. In some embodiments, the cover is fully detachable from the mouthpiece.

[0037] In some embodiments the recess has an annular cross section. In this way the recess is adapted to receive a complementary annular filter. Providing an annular recess and filter allows the filter to be installed in any orientation, i.e. rotation of the filter to match the shape of the recess is not necessary.

[0038] In some embodiments, the diameter of the recess widens at the opening of the recess, i.e. at the most downstream part of the recess. The widening may be provided as a discrete step change in diameter as described above, thereby providing a shoulder feature within the recess. For example, the recess may include an upstream portion of a first internal diameter and a downstream portion of a second internal diameter, wherein the second internal diameter is greater than the first internal diameter. In this way, a filter of a length which matches the length of recess of the first internal diameter may be inserted into the recess. The downstream portion of the recess having a second internal diameter may then be covered, for example by the cap or closure described above, which will cover both the filter and the step in the inner surface of the recess which lies adjacent the outer edges of the filter. In this way, a more tortuous path around the outside of the filter (between the filter, the inner wall of the recess and the cap) is provided, ensuring that most if not all of the aerosol vapour passes through the filter itself, maximising filtration efficiency. Furthermore, the presence of the cap reduces the risk of inadvertent loss of the filter from the mouthpiece. The use of a vapour-impermeable cap defining a vapour-permeable aperture provides increased resistance-to-draw since the vapour must pass through the aperture to enter the mouth of the user, which may improve user experience or offer a means to tailor the user experience by varying the aperture size.

[0039] In some embodiments, when the filter is in place within the recess, no part of the filter protrudes beyond the furthest extension of the outer wall of the mouthpiece. In some embodiments, when the filter and closure are in

place within the recess, no part of the filter or closure protrudes beyond the furthest extension of the outer wall of the mouthpiece.

[0040] Optionally, the tank and mouthpiece are formed of the same material as each other.

[0041] In some embodiments, the tank and the mouthpiece are formed as a unitary component.

[0042] In some embodiments, the consumable further comprises an outlet, the outlet providing fluid connection between the tank and the mouthpiece aperture, wherein the outlet is integrally formed with the tank and the mouthpiece.

[0043] Optionally, the consumable may comprise an additional filter for filtering unvaporised liquid out of the aerosol vapour, wherein the additional filter is located within the outlet. Again, including the filter in the outlet is particularly advantageous for a consumable in which the tank is integrally formed with the mouthpiece, as integrally forming the tank and mouthpiece means that there is no location between the tank and mouthpiece for a filter.

[0044] Advantageously, the outlet comprises a void. The void provides a portion of the outlet for condensation settling, which means that unvaporised e-liquid can condense within the outlet. This reduces the amount of unvaporised e-liquid which reaches the mouthpiece and the user's mouth. In an example, the void occupies at least 5% of the total length of the outlet.

[0045] In some embodiments, the consumable is at least partially formed by an injection moulding process.

[0046] Optionally, the consumable further comprises a window, so that a liquid level in the tank can be visually assessed through the window.

[0047] In some embodiments, the consumable further comprises a heating device for vaporising the e-liquid to form the aerosol vapour, the heating device located in a fluid path between the tank and the mouthpiece.

[0048] According to a second aspect of the present invention, there is provided a smoking device comprising a consumable according to the first aspect.

[0049] A third aspect of the invention is a filter for filtering unvaporised liquid out of the aerosol vapour of a consumable, wherein the filter is adapted to be coupled with the consumable according to the first aspect.

[0050] In some embodiments, the filter comprises a filtering portion made of a suitable material for removing unvaporised liquid from an aerosol stream. In some embodiments, the filter comprises an outer wall which encloses at least part of the filtering portion.

[0051] A fourth aspect of the invention is a kit comprising the consumable according to the first aspect and a filter adapted to be coupled with the consumable. In some embodiments the kit further comprises a closure adapted to be removably attachable to the mouthpiece to cover the filter and retain it within the mouthpiece.

[0052] According to a fifth aspect of the present invention, there is provided a method of manufacturing a consumable for a smoking substitute device, the method comprising integrally forming: a tank for storing an e-liq-

uid; and a mouthpiece, the mouthpiece comprising a mouthpiece aperture, wherein the mouthpiece aperture is configured to be fluidly connected to the tank and the external surface of the mouthpiece is adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour.

[0053] In some embodiments the method further comprises integrally forming an outlet with the tank and the mouthpiece, the outlet providing fluid connection between the tank and the mouthpiece aperture.

[0054] Optionally, the integrally forming is by an injection moulding process.

[0055] According to a sixth aspect of the present invention, there is provided a manufacturing assembly comprising a first mould and a second mould, the first mould and second mould configured to be brought together to form a cavity, wherein the cavity has a shape such that when material is injected into the cavity, the material forms a consumable according to the first aspect.

[0056] 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

[0057] 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 1(a) is a side view of a smoking substitute device;

Figure 1(b) is a side view of main body of the smoking substitute device;

Figure 1(c) is a side view of consumable of the smoking substitute device;

Figure 2(a) is a schematic drawing of the main body;

Figure 2(b) is a schematic drawing of the consumable;

Figure 3(a) is a cross-sectional view of the consumable;

Figure 3(b) is a cross-sectional view of the lower portion of the consumable showing the heating device; and

Figure 4 is a cross-sectional view of a manufacturing assembly.

Detailed Description of the Invention

[0058] 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.

[0059] Figure 1(a) shows a smoking substitute device 110. In this example, the smoking substitute device 110 includes a main body 120 and a consumable 150. The consumable 150 may alternatively be referred to as a "pod". The consumable may also be referred to as a cartridge or cartomizer.

[0060] In this example, the smoking substitute device 110 is a closed system vaping device, wherein the consumable 150 includes a sealed tank or liquid reservoir 156 and is intended for one-use only.

[0061] Figure 1(a) shows the smoking substitute device 110 with the main body 120 physically coupled to the consumable 150.

[0062] Figure 1(b) shows the main body 120 of the smoking substitute device 110 without the consumable 150.

[0063] Figure 1(c) shows the consumable 150 of the smoking substitute device 110 without the main body 120.

[0064] The main body 120 and the consumable 150 are configured to be physically coupled together, in this example by pushing the consumable 150 into an aperture in a top end 122 of the main body 120, such that there is an interference fit between the main body 120 and the consumable 150. In other examples, the main body 120 and the consumable could be physically coupled together by screwing one onto the other, or through a bayonet fitting, for example. An optional light 126, e.g. an LED, located behind a small translucent cover, is located a bottom end 124 of the main body 120. The light 126 may be configured to illuminate when the smoking substitute device 110 is activated.

[0065] The consumable 150 includes a mouthpiece (not shown in Fig. 1(a)-(c)) at a top end 152 of the consumable 150, as well as one or more air inlets (not shown) so that air can be drawn into the smoking substitute device 110 when a user inhales through the mouthpiece. At a bottom end 154 of the consumable 150, there is located a tank 156 that contains e-liquid. The tank 156 may be a translucent body, for example.

[0066] The tank 156 preferably includes a window 158, so that the amount of e-liquid in the tank 156 can be visually assessed. The main body 120 includes a slot 128 so that the window 158 of the consumable 150 can be seen whilst the rest of the tank 156 is obscured from view when the consumable 150 is inserted into the aperture in the top end 122 of the main body 120.

[0067] The tank 156 may be referred to as a "clear-omizer" if it includes a window 158, or a "cartomizer" if it does not.

[0068] The consumable 150 may identify itself to the main body 120, via an electrical interface, RFID chip, or barcode.

[0069] Figure 2(a) is a schematic drawing of the main body 120 of the smoking substitute device 110.

[0070] Figure 2(b) is a schematic drawing of the consumable 150 of the smoking substitute device 110.

[0071] As shown in Figure 2(a), the main body 120 includes a power source 128, a control unit 130, a memory 132, a wireless interface 134, an electrical interface 136, and, optionally, one or more additional components 138.

[0072] The power source 128 is preferably a battery, more preferably a rechargeable battery.

[0073] The control unit 130 may include a microprocessor, for example.

[0074] The memory 132 is preferably includes non-volatile memory. The memory may include instructions which, when implemented, cause the control unit 130 to perform certain tasks or steps of a method.

[0075] The wireless interface 134 is preferably configured to communicate wirelessly with another device, for example a mobile device, e.g. via Bluetooth®. To this end, the wireless interface 134 could include a Bluetooth® antenna. Other wireless communication interfaces, e.g. WiFi®, are also possible. The wireless interface 134 may also be configured to communicate wirelessly with a remote server.

[0076] The electrical interface 136 of the main body 120 may include one or more electrical contacts. The electrical interface 136 may be located in, and preferably at the bottom of, the aperture in the top end 122 of the main body 120. When the main body 120 is physically coupled to the consumable 150, the electrical interface 136 may be configured to pass electrical power from the power source 128 to (e.g. a heating device of) the consumable 150 when the smoking substitute device 110 is activated, e.g. via the electrical interface 160 of the consumable 150 (discussed below). The electrical interface may be configured to receive power from a charging station, when the main body 120 is not physically coupled to the consumable 150 and is instead coupled to the charging station. The electrical interface 136 may also be used to identify the consumable 150 from a list of known consumables. For example, the consumable may be a particular flavour and/or have a certain concentration of nicotine. This can be identified to the control unit 130 of the main body 120 when the consumable is connected to the main body. Additionally, or alternatively, there may be a separate communication interface provided in the main body 120 and a corresponding communication interface in the consumable 150 such that, when connected, the consumable can identify itself to the main body 120.

[0077] The additional components 138 of the main body 120 may comprise the optional light 126 discussed above.

[0078] The additional components 138 of the main

body 120 may, if the power source 128 is a rechargeable battery, comprise a charging port configured to receive power from the charging station. This may be located at the bottom end 124 of the main body 120. Alternatively, the electrical interface 136 discussed above is configured to act as a charging port configured to receive power from the charging station such that a separate charging port is not required.

[0079] The additional components 138 of the main body 120 may, if the power source 128 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). The additional components 138 of the main body 120 may include an airflow sensor for detecting airflow in the smoking substitute device 110, e.g. caused by a user inhaling through a mouthpiece 166 (discussed below) of the smoking substitute device 110. The smoking substitute device 110 may be configured to be activated when airflow is detected by the airflow sensor. This optional sensor could alternatively be included in the consumable 150 (though this is less preferred where the consumable 150 is intended to be disposed of after use, as in this example). 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 138 of the main body 120 may include an actuator, e.g. a button. The smoking substitute device 110 may be configured to be activated when the actuator is actuated. This provides an alternative to the airflow sensor noted, as a mechanism for activating the smoking substitute device 110.

[0081] As shown in Figure 2(b), the consumable 150 includes the tank 156, an electrical interface 160, a heating device 162, one or more air inlets 164, a mouthpiece 166, and, optionally, one or more additional components 168.

[0082] The electrical interface 160 of the consumable 150 may include one or more electrical contacts. The electrical interface 136 of the main body 120 and an electrical interface 160 of the consumable 150 are preferably configured to contact each other and thereby electrically couple the main body 120 to the consumable 150 when the bottom end 154 of the consumable 150 is inserted into the top end of the main body 122 (as shown in Fig. 1a) to physically couple the consumable 150 to the main body 120. In this way, electrical energy (e.g. in the form of an electrical current) is able to be supplied from the power source 128 in the main body 120 to the heating device 162 in the consumable 150.

[0083] The heating device 162 is preferably configured to heat e-liquid contained in the tank 156, e.g. using electrical energy supplied from the power source 128, in order to vaporise the e-liquid. In one example, the heating device 162 includes a heating filament and a wick, wherein a first portion of the wick extends into the tank 156 in

order to draw e-liquid out from the tank 156, and wherein the heating filament coils around a second portion of the wick located outside the tank 156. In this example, the heating filament is configured to heat up e-liquid drawn out of the tank 156 by the wick to produce an aerosol vapour.

[0084] The one or more air inlets 164 are preferably configured to allow air to be drawn into the smoking substitute device 110, when a user inhales through the mouthpiece 166. When the consumable 150 is physically coupled to the main body 120, the air inlet 164 receives air which flows from the top end 122 of the main body 120, between the main body 120 and the bottom end 154 of the consumable 150.

[0085] In use, a user activates the smoking substitute device 110, e.g. through actuating an actuator included in the main body 120 or by inhaling through the mouthpiece 166 as described above. Upon activation, the control unit 130 may supply electrical energy from the power source 128 to the heating device 162 (via electrical interfaces 136, 166), which may cause the heating device 162 to heat e-liquid drawn from the tank 156 to produce a vapour which is inhaled by a user through the mouthpiece 166.

[0086] As an example of one of the one or more additional components 168, an interface for obtaining an identifier of the consumable may be provided. As discussed above, this interface may be, for example, an RFID reader, a barcode or QR code reader, or an electronic interface which is able to identify the consumable to the main body. The consumable 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.

[0087] Of course, a skilled reader would readily appreciate that the smoking substitute device 110 shown in Figs. 1 and 2 shows just one example implementation of a smoking substitute device, and that other forms of smoking substitute device could be used.

[0088] As another example, an entirely disposable (one use) smoking substitute device could be used as the smoking substitute device.

[0089] Fig. 3(a) shows a cross-sectional view of a consumable 150. The consumable comprises a tank 156 for storing e-liquid, a mouthpiece 166 and an outlet 306, which in this example is a chimney or tube. The tank 156 surrounds the outlet 306, with the outlet extending through a central portion of the tank 156. The outlet 306 has a substantially circular cross-section. The outlet 316 defines a central void 315 which extends along the entire length of the outlet.

[0090] The tank 156 is provided by an outer casing of the consumable 150, and for clarity details of the heating device are omitted. The outer casing of the consumable 150 comprises a tank wall 304. The tank wall 304 extends completely around the outlet 306 to define the tank 156 in the form of an annulus between the outlet 306 and the tank wall 304. The tank wall 304 extends from the bottom

of the consumable up to the mouthpiece 166. Where the tank wall 304 meets the mouthpiece 166, the mouthpiece 166 has a larger outer width than the tank 156, which means that there is a lip 168 around the bottom of the mouthpiece 166.

[0091] The tank wall 304 tapers, which means that it has a thickness which decreases. The thickness of the tank wall 304 decreases along a first demoulding direction, as defined below with respect to Fig. 4. The first demoulding direction is a downward direction in Fig. 3(a), which is a direction away from the mouthpiece 166. This means that, aside from a small number of indents (for example, to provide physical connection between the consumable 150 and the main body 120), the thickness of the tank wall 304 generally decreases with increasing distance along the first demoulding direction.

[0092] The thickness of the tank wall 304 decreases due to internal surfaces of the tank wall 304 being angled to the first demoulding direction at a first tank draft angle. Additionally, the thickness of the tank wall 304 decreases due to external surfaces of the tank wall 304 being angled to the first demoulding direction at a second tank draft angle.

[0093] The first tank draft angle is preferably at least 0.5 degrees. The second tank draft angle is preferably at least 0.5 degrees.

[0094] The first tank draft angle is preferably not more than 3.5 degrees. The second tank draft angle is preferably not more than 3.5 degrees.

[0095] It will be appreciated that the first tank draft angle and the second tank draft angle need not be the same as each other, and may be selected independently according to the above draft angles. In fact, one of the first tank draft angle and the second tank draft angle may be substantially 0 degrees, while the other may vary as described above.

[0096] Similarly, the outlet 306 comprises an outlet wall 307. The outlet wall 307 extends fully around the circular cross-section of the outlet 306 to provide the outlet 306. The outlet wall 307 tapers, which means that it has a thickness which decreases. The thickness of the outlet wall 307 decreases along the first demoulding direction, as defined below with respect to Fig. 4. As before, the first demoulding direction is a downward direction in Fig. 3, which is a direction away from the mouthpiece 166. This means that the thickness of the outlet wall 307 generally decreases along the first demoulding direction. The thickness of the outlet wall 307 decreases due to an inner surface of the outlet wall 307 being angled to the first demoulding direction at a first outlet draft angle. Additionally, the thickness of the outlet wall 307 decreases due to an external surface of the outlet wall 307 being angled to the first demoulding direction at a second outlet draft angle.

[0097] The first outlet draft angle is preferably at least 0.5 degrees. The second outlet draft angle is preferably at least 0.5 degrees.

[0098] The first outlet draft angle is preferably not more

than 3.5 degrees. The second outlet draft angle is preferably not more than 3.5 degrees.

[0099] It will be appreciated that the first outlet draft angle and the second outlet draft angle need not be the same as each other, and may be selected independently according to the above draft angles. In fact, one of the first outlet draft angle and the second outlet draft angle may be substantially 0 degrees, while the other may vary as described above.

[0100] Similarly, the outlet draft angles and tank draft angles may be selected independently from each other according to the above draft angles.

[0101] The outlet 306 has an internal width (i.e. a width/diameter of a passage through the outlet 306) which generally decreases in a downstream direction (i.e. downstream with respect to the fluid flow when a user inhales, which is an upward direction in Fig. 3(a)). The downstream direction is a direction towards the mouthpiece 166 and, in this example, is an opposite direction to the first demoulding direction. This decrease in width occurs due to the second outlet draft angle described above.

[0102] A difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is more than 0.10 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is more than 0.12 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is more than 0.14 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is more than 0.16 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is more than 0.18 mm.

[0103] The difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is not more than 0.30 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is not more than 0.28 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is not more than 0.26 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is not more than 0.24 mm. More specifically, the difference between the internal width at the downstream end of the outlet 306 and the internal width at the upstream end of the outlet 306 is not more than 0.22 mm.

[0104] More specifically, the difference between the internal width at the downstream end of the outlet 306 and

the internal width at the upstream end of the outlet 306 is substantially 0.20 mm. The outlet 306 is substantially 30 mm long. In other examples, the outlet 306 may have a length less than 30 mm.

[0105] The airway has an internal width less than 5.0 mm at an upstream end of the outlet 306. More specifically, the airway has an internal width less than 4.5 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width less than 4.2 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width less than 4.0 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width less than 3.8 mm at the upstream end of the outlet 306.

[0106] The airway has an internal width greater than 2.0 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width greater than 2.5 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width greater than 3.0 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width greater than 3.2 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width greater than 3.4 mm at the upstream end of the outlet 306.

[0107] More specifically, the airway has an internal width of substantially 3.6 mm at the upstream end of the outlet 306.

[0108] The airway has an internal width less than 4.8 mm at a downstream end of the outlet 306. More specifically, the airway has an internal width less than 4.3 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width less than 4.0 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width less than 3.8 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width less than 3.6 mm at the downstream end of the outlet 306.

[0109] The airway has an internal width greater than 1.8 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width greater than 2.3 mm at the upstream end of the outlet 306. More specifically, the airway has an internal width greater than 2.8 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width greater than 3.0 mm at the downstream end of the outlet 306. More specifically, the airway has an internal width greater than 3.2 mm at the downstream end of the outlet 306.

[0110] More specifically, the airway has an internal width of substantially 3.4 mm at a downstream end of the outlet 306.

[0111] The mouthpiece 166 comprises a mouthpiece aperture 314. The outlet 306 fluidly connects the heating device 162 to the mouthpiece 166, and, more specifically, the outlet 306 fluidly connects the heating device 162 to the mouthpiece aperture 314.

[0112] The outer surface 318 of the mouthpiece 166 of the consumable forms a recess adjacent the mouthpiece aperture 314. The recess is defined by an inner

cylindrical wall 325.

[0113] A removable filter 330 is shown positioned in the consumable 150. The mouthpiece 166 of the consumable includes a recessed portion of the outer surface 318 of the mouthpiece 166. The inner wall 325 of the recess is sized to accommodate the filter 330 in a snug fit, thereby securing the filter 330 in the recess by interference fit. The filter 330 is made from a fabric, which may be cotton or another fibre. The filter may be formed of a mesh. The filter permits flow of vaporised e-liquid through the filter 330, but prevents flow of unvaporised e-liquid through the filter 330. This reduces leakage of unvaporised e-liquid into the user's mouth. The filter 330 may be a gas-permeable and liquid-impermeable membrane.

[0114] The filter 330 is tubular, defined by a tubular outer wall 334 of an annular cross-section, and an outer surface of the tubular wall 334 of the filter 330 is in contact with an inner surface 325 of the recess in the outer wall of the mouthpiece. The outer wall 334 encloses a central filtering portion 335 made of a suitable filter material. The filtering portion 335 may be fabric, which may be cotton or another fibre. The filtering portion 335 may be formed of a mesh. The filtering portion 335 permits flow of vaporised e-liquid through the filter 330, but prevents flow of unvaporised e-liquid through the filter 330. This reduces leakage of unvaporised e-liquid into the user's mouth. The filtering portion 335 may be a gas-permeable and liquid-impermeable membrane.

[0115] An elliptical planar cap 331 is in place in the mouthpiece, covering the filter 330. The cap 331 is made of rigid plastics material and has an elliptical shape when viewed from above. The planar cap 331 defines a central aperture 333 through which filtered aerosol vapour may pass into the mouth of a user after passing through the filtering portion 335. The cap 331 is held in place by an interference fit between the outer annular edge of the cap 331 and the inner annular surface 332 of the recess. As seen in Figure 3(a) the diameter of the cap 331 is slightly larger than the diameter of the filter 330, such that the cap covers the filter and also extends to cover a shelf formed in the wall of the recess, adjacent the outer edge of the filter. This provides a seat for the cap 331 when it is pushed into place in the recess, preventing further insertion. The cap has a thickness of around 0.7 mm.

[0116] The positioning of the shelf in the recess and the thickness of the cap 331 are such that, when properly secured in place and resting on the shelf, the cap does not protrude beyond the furthest extension of the mouthpiece. This reduces the risk that the cap comes into contact with external objects thereby reducing the risk that the cap becomes accidentally dislodged from the mouthpiece.

[0117] In another embodiment (not shown) the consumable includes a retention mechanism which keeps the filter 330 and/or cap 331 in place once positioned within the recess. This may comprise a snap fit, for ex-

ample through co-operation of complementary protrusion(s) and recess(es) on the outer wall 334 of the filter and/or cap and inner wall 325 of the recess. Alternatively, a clip or releasable detent mechanism may be provided to secure the filter and/or cap.

[0118] As explained above, Figure 3(a) shows the consumable without any detail of the heating assembly, for clarity. Figure 3(b) shows the lower portion of the same consumable shown in Figure 3(a), but also shows the heating device 162, which in this example is a coil and wick assembly. The heating device 162 comprises an outer shell with one or more apertures. These apertures are filled with a wick material, so that e-liquid may only ingress the heating device 162 from the tank 156 via capillary action. The wick material passes through or proximal to a coil, which is connected to one or more electrical contacts.

[0119] The consumable 150 further comprises a tank seal 308, which seals a bottom portion of the tank 156 beneath the heating device 162. The tank seal 308 is connected to the heating device 162, and the tank seal 308 comprises an air inlet 164, such that airflow is permitted from outside the tank through the air inlet 164 to the heating device 162.

[0120] The tank 156, the outlet 306 and the mouthpiece 166 are integrally formed with each other. The tank 156, the outlet 306 and the mouthpiece 166 make up a single component formed from a continuous piece of material. The tank 156, the outlet 306 and the mouthpiece 166 are formed in an injection moulding process as described below with respect to Fig. 4. The tank 156, the outlet 306 and the mouthpiece 166 are made of a thermoplastic material. More specifically, the tank 156, the outlet 306 and the mouthpiece 166 are made of polypropylene.

[0121] In use, when the consumable 150 is connected to the main body 120, the user inserts the mouthpiece 166 into their mouth. The user inhales through the mouthpiece aperture 314, which draws air through the air inlet 164 and into the heating device 162.

[0122] At the same time, an electrical current is provided to the one or more contacts, which causes heating of the coil, and consequent vaporisation of the e-liquid within the wick material. The air flow passes through the coil and wick assembly, drawing with it vaporised e-liquid to form the aerosol vapour. The aerosol vapour flows up the outlet 306, before passing through the mouthpiece aperture 314, into the filter 330 and finally out of the filter 330, through the aperture 333 in the cap 331 and into the mouth of the user. The e-liquid only enters the coil and wick assembly via the one or more apertures and then, only via the wick.

[0123] The aerosol vapour flows through the void 315 of the outlet 306 and then passes through the mouthpiece aperture 314 and into the filtering portion 335 of the filter 330, which filters unvaporised e-liquid out of the aerosol vapour. Unvaporised e-liquid which remains in the aerosol vapour can condense and flow down the inner surface of the outlet 306. This further reduces leakage of

unvaporised e-liquid into the user's mouth. Filtered vapour passes out of the filtering portion 335 of the filter 330, through the aperture 333 in the cap 331 of the filter 330 and into the mouth of the user.

[0124] Fig. 4 shows a drawing of a manufacturing assembly 400 which is used to manufacture the consumable 150. The manufacturing assembly 400 comprises a first mould 402 and a second mould 404.

[0125] The first mould 402 has a shape which complements that of a first end (a lower end in Fig. 3A) of the integrally formed tank 156, mouthpiece 166 and outlet 306. The first mould 402 therefore has a shape which matches the inner surfaces of the tank 156, and the inner and outer surfaces of the outlet 306.

[0126] The second mould 404 has a shape which complements that of a second end (an upper end in Fig. 3A) of the integrally formed tank 156, mouthpiece 166 and outlet 306. The second mould 404 therefore has a shape which matches the outer surface 318 of the mouthpiece 166 and the inner surface 316 of the mouthpiece aperture 314.

[0127] When the first mould 402 and the second mould 404 are brought together, they define a closed cavity which has the shape of the tank 156, the mouthpiece 166 and the outlet 306.

[0128] To manufacture the tank 156, the mouthpiece 166 and the outlet 306, heated material is injected into the cavity between the first mould 402 and the second mould 404. At this point, the first mould 402 and the second mould 404 meet at a boundary between external surfaces of the mouthpiece 166 and the tank 156.

[0129] The material is subsequently cooled, and the first mould 402 and the second mould 404 are separated, with the first mould 402 travelling in the first demoulding direction 406 (i.e. away from the second mould 404) and the second mould 404 travelling in a second demoulding direction 408 (i.e. away from the first mould 402 and opposite to the first demoulding direction 406). 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.

[0130] The filter 330 can be inserted into the recess in the mouthpiece 166 either directly following manufacture and prior to shipping, or may be provided to the user separately who may then insert the filter 330 themselves before using the consumable.

[0131] 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.

[0132] 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.

[0133] 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.

[0134] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0135] 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.

[0136] 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%.

[0137] 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. A consumable for a smoking substitute device, the consumable comprising:

a tank for storing an e-liquid; and
a mouthpiece, the mouthpiece comprising a mouthpiece aperture, wherein the mouthpiece aperture is configured to be fluidly connected to the tank, so that the mouthpiece aperture receives an aerosol vapour formed from the e-liquid in use;

- the external surface of the mouthpiece being adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour; wherein the tank and the mouthpiece are integrally formed. 5
2. A consumable according to claim 1, wherein the mouthpiece defines an external recess for receiving the filter. 10
3. A consumable according to claim 2, wherein the external recess surrounds the mouthpiece aperture. 15
4. A consumable according to claim 2 or 3, wherein the recess has an annular cross section. 20
5. A consumable according to any one of claims 1 to 4, wherein the consumable is adapted to retain the filter by interference fit or a retention mechanism, wherein the retention mechanism optionally comprises a clip or a movable cover. 25
6. A consumable according to any one of claims 1 to 5, wherein the mouthpiece is further adapted for receiving a removable cap for covering the filter. 30
7. A consumable according to any one of claims 1 to 6, wherein the tank and mouthpiece are formed of the same material as each other. 35
8. A consumable according to any one of claims 1 to 7, wherein the tank and the mouthpiece are formed as a unitary component. 40
9. A consumable according to any one of claims 1 to 8, further comprising an outlet, the outlet providing fluid connection between the tank and the mouthpiece aperture, wherein the outlet is integrally formed with the tank and the mouthpiece. 45
10. A consumable according to any one of claims 1 to 9, wherein the consumable is formed by an injection moulding process. 50
11. A consumable according to any one of claims 1 to 10, further comprising a window permitting visual assessment of liquid level. 55
12. A consumable according to any one of claims 1 to 11, further comprising a heating device for vaporising the e-liquid to form the aerosol vapour, the heating device located in a fluid path between the tank and the mouthpiece.
13. A smoking substitute device comprising a consumable according to any one of claims 1 to 12.
14. A method of manufacturing a consumable for a

smoking substitute device, the method comprising integrally forming:

a tank for storing an e-liquid; and
a mouthpiece, the mouthpiece comprising a mouthpiece aperture, wherein the mouthpiece aperture is configured to be fluidly connected to the tank and the external surface of the mouthpiece is adapted for receiving a filter for filtering unvaporised liquid out of the aerosol vapour.

15. A manufacturing assembly comprising a first mould and a second mould, the first mould and second mould configured to be brought together to form a cavity, wherein the cavity has a shape such that when material is injected into the cavity, the material forms a consumable according to any one of claims 1 to 12.

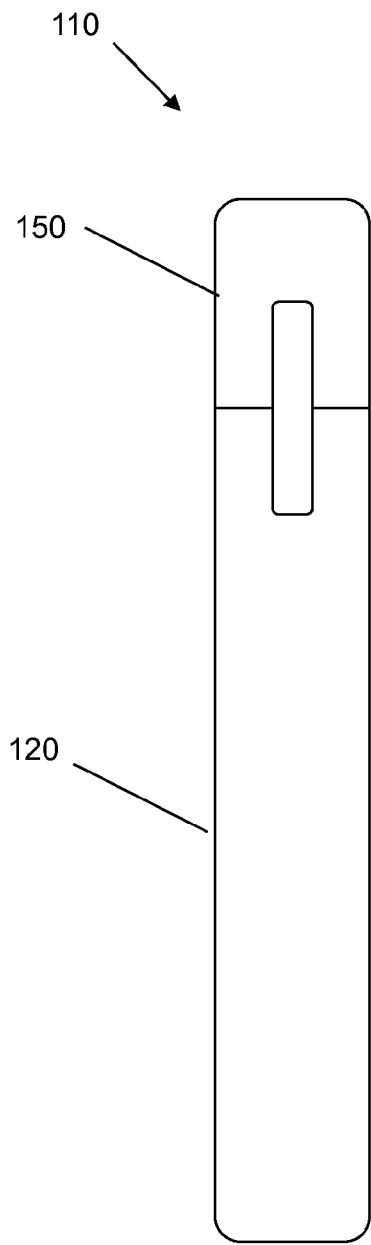


Fig. 1(a)

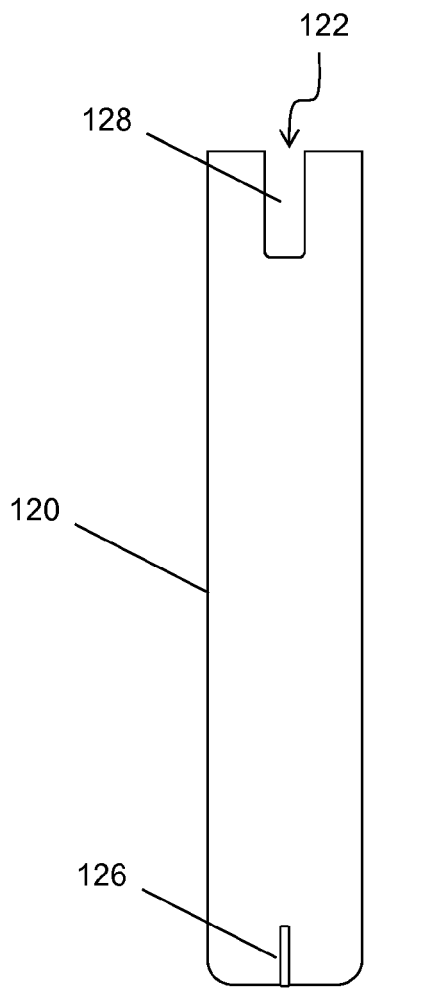


Fig. 1(b)

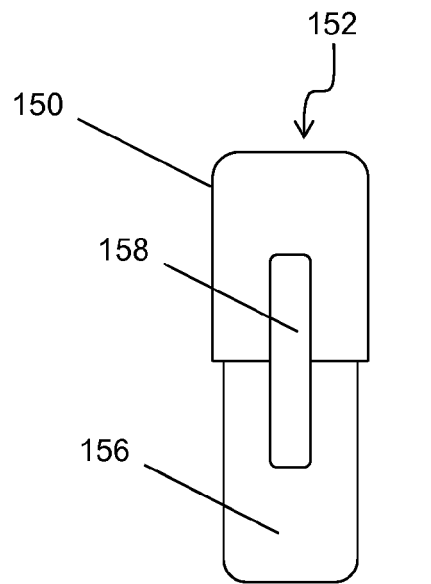


Fig. 1(c)

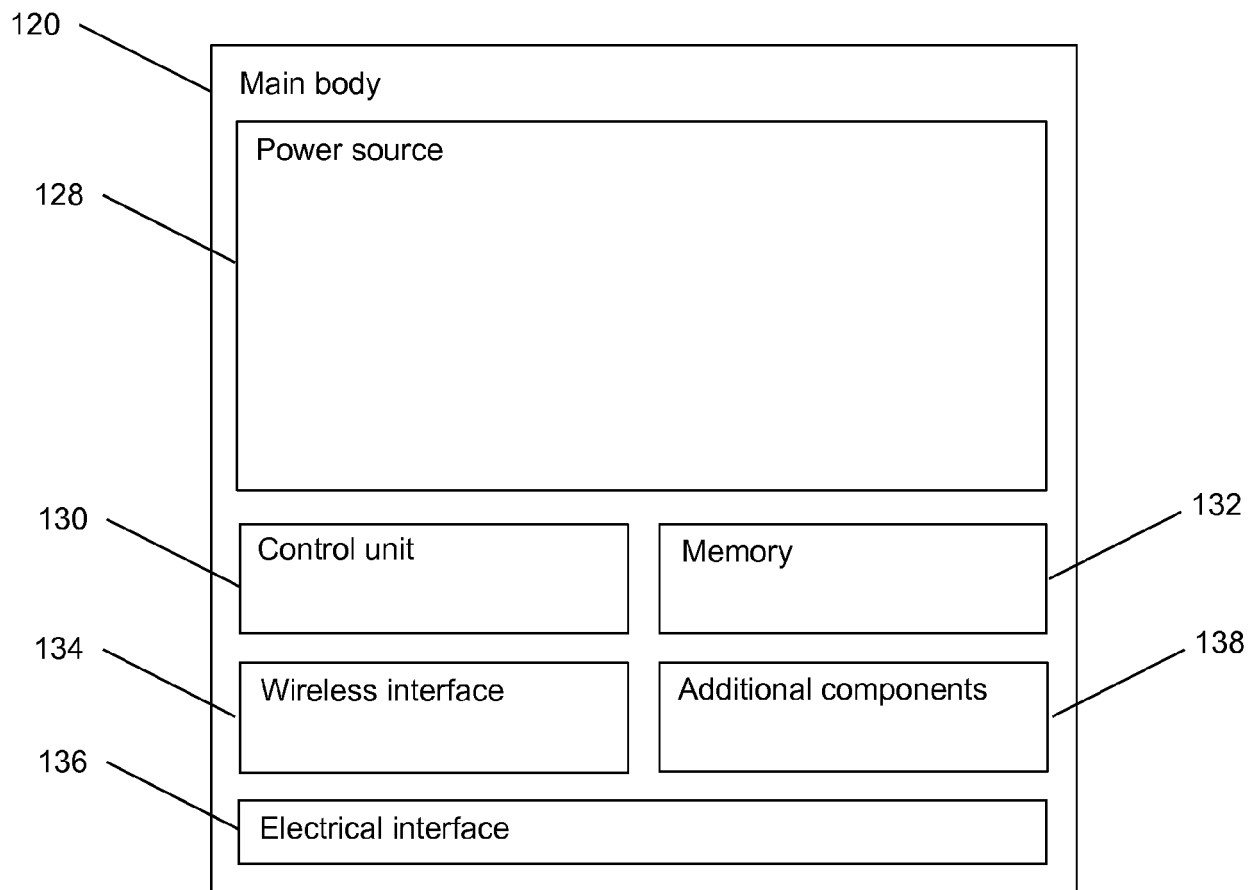


Fig. 2(a)

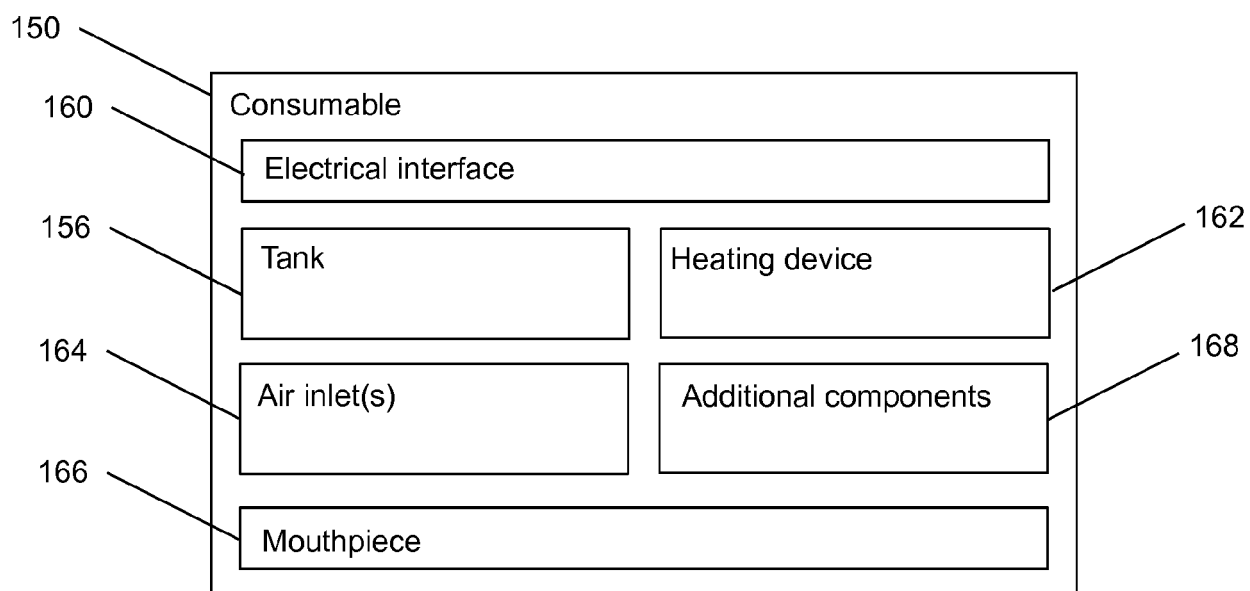


Fig. 2(b)

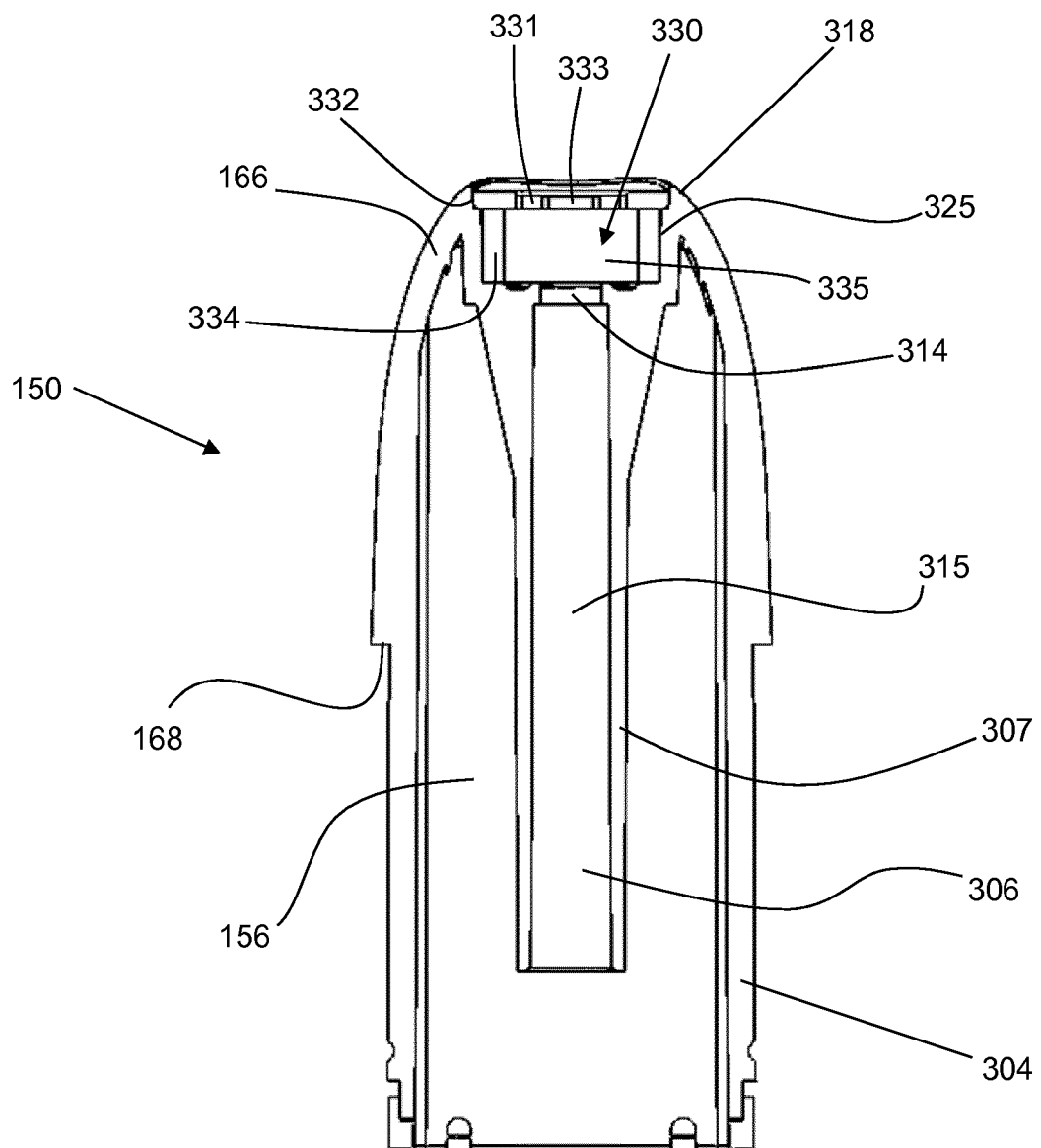


Fig. 3(a)

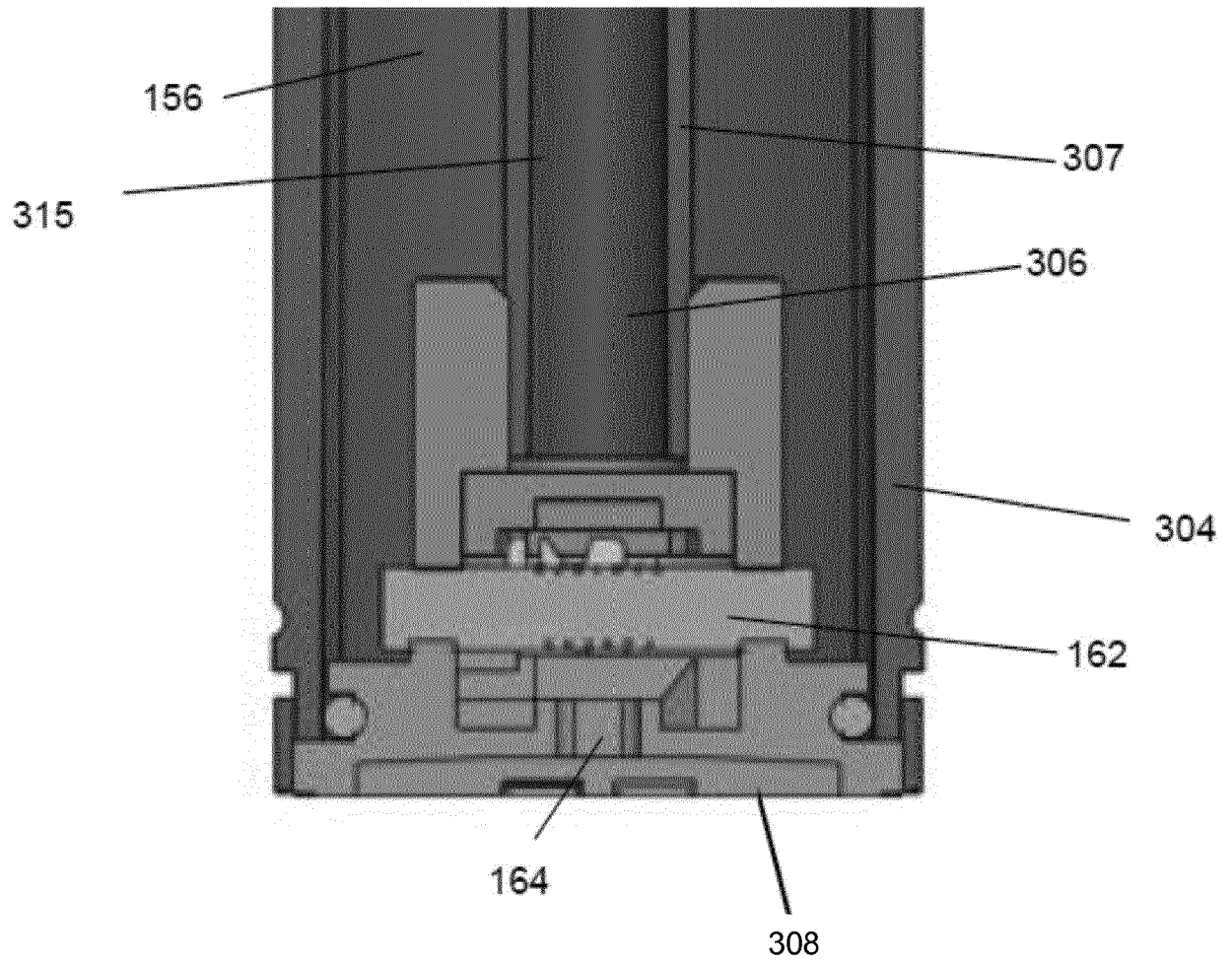


Fig. 3(b)

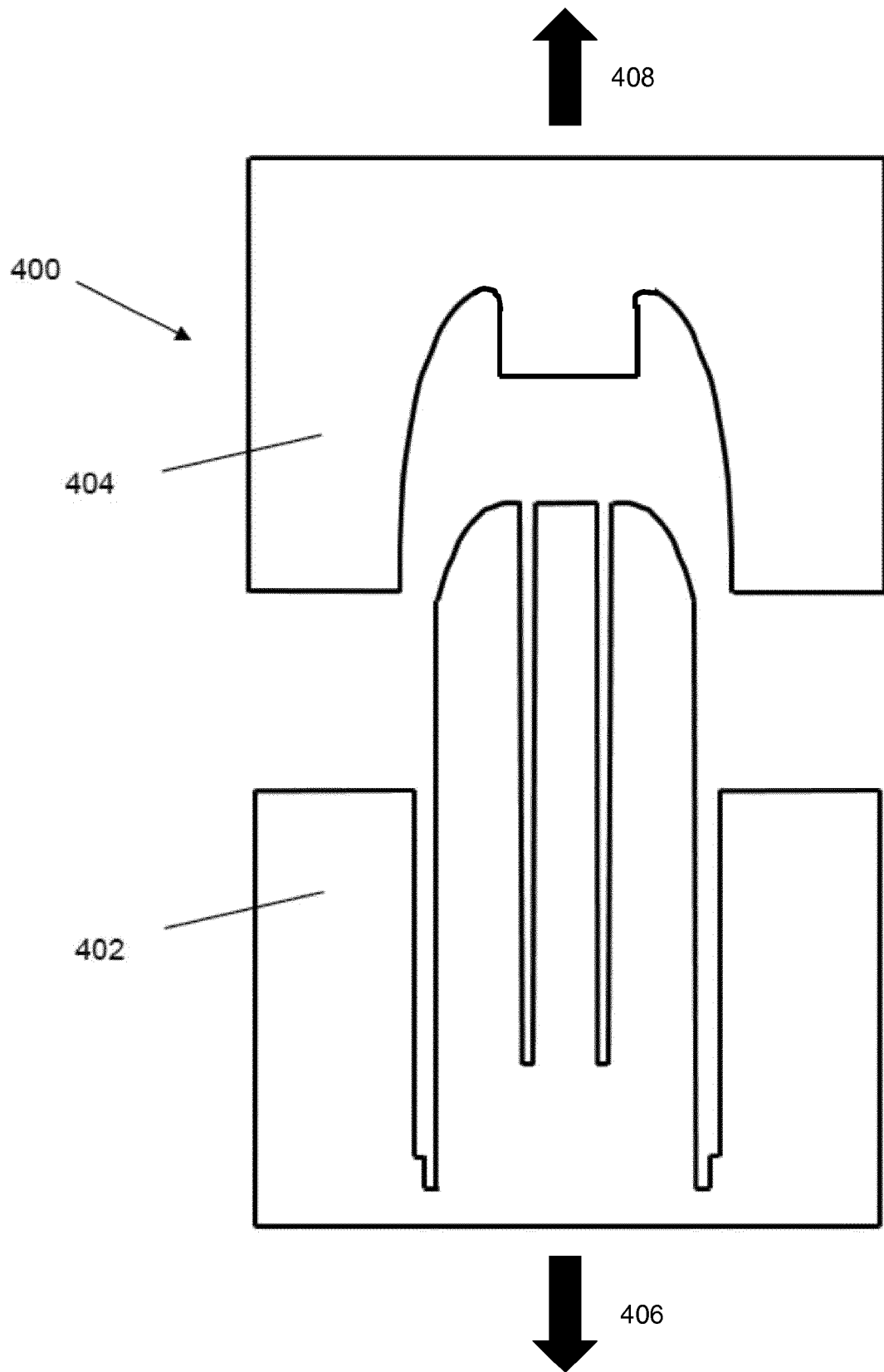


Fig. 4



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Application Number
EP 19 16 6299

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Place of search Munich		Date of completion of the search 10 October 2019	Examiner Escudero, Raquel
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