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(54) **SMOKING SUBSTITUTE DEVICE**

(57) A smoking substitute device. The smoking substitute device comprising: a source of power, for providing power to a heater; a first charging connection, for charging the source of power, located at one end of the smoking substitute device; and a second charging connection, for charging the source of power, located on one or more lateral sides of the smoking substitute device.

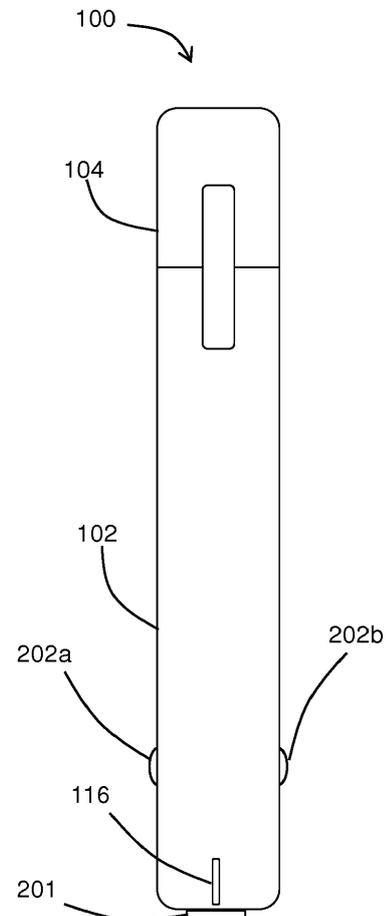


FIG 1A

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Description

Technical field

[0001] The present disclosure relates to a smoking substitute device and smoking substitute system.

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 systems in order to avoid the smoking of tobacco.

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

[0005] Smoking substitute systems, 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 systems 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 systems 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 systems as desirable lifestyle accessories. Some smoking substitute systems are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end. Other smoking substitute systems 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 systems, 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 system 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. 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 system includes a mouthpiece, a power source (typically a battery), 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.

[0011] Vaping smoking substitute systems can be configured in a variety of ways. For example, there are "closed system" vaping smoking substitute systems 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 smoking substitute systems include a device which includes the power source, wherein the device 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 device can be reused by connecting it to a new consumable. Another subset of closed system vaping smoking substitute systems are completely disposable, and intended for one-use only.

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

[0013] An example vaping smoking substitute system is the myblu™ e-cigarette. The myblu™ e cigarette is a closed system which includes a device and a consumable. The device and consumable are physically and electrically coupled together by pushing the consumable into the device. The device includes a rechargeable battery. The consumable includes a mouthpiece, a sealed tank which contains e-liquid, as well as a vaporiser, which for this system is a heating filament coiled around a portion of a wick which is partially immersed in the e-liquid. The system is activated when a microprocessor on board the device detects a user inhaling through the mouthpiece. When the system 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 through the mouthpiece.

[0014] Another example vaping smoking substitute system is the blu PRO™ e-cigarette. The blu PRO™ e cigarette is an open system which includes a device, a (refillable) tank, and a mouthpiece. The device 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 system is activated by a button on the device. When the system

is activated, electrical energy is supplied from the power source to a vaporiser, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0015] An alternative to the "vaping" approach is the so-called Heated Tobacco ("HT") approach in which tobacco (rather than an e-liquid) is heated or warmed to release vapour. HT is also known as "heat not burn" ("HNB"). The tobacco may be leaf tobacco or reconstituted tobacco. In the HT approach the intention is that the tobacco is heated but not burned, i.e. the tobacco does not undergo combustion.

[0016] The heating, as opposed to burning, of the tobacco material is believed to cause fewer, or smaller quantities, of the more harmful compounds ordinarily produced during smoking. Consequently, the HT approach may reduce the odour and/or health risks that can arise through the burning, combustion and pyrolytic degradation of tobacco.

[0017] A typical HT smoking substitute system may include a device and a consumable. The consumable may include the tobacco material. The device and consumable may be configured to be physically coupled together. In use, heat may be imparted to the tobacco material by a heating element of the device, wherein airflow through the tobacco material causes components in the tobacco material to be released as vapour. A vapour may also be formed from a carrier in the tobacco material (this carrier may for example include propylene glycol and/or vegetable glycerine) and additionally volatile compounds released from the tobacco. The released vapour may be entrained in the airflow drawn through the tobacco.

[0018] As the vapour passes through the consumable (entrained in the airflow) from the location of vaporization to an outlet of the consumable (e.g. a mouthpiece), the vapour cools and condenses to form an aerosol for inhalation by the user. The aerosol may contain nicotine and/or flavour compounds.

Summary

[0019] According to a first aspect, there is provided a smoking substitute device comprising:

- a source of power, for providing power to a heater;
- a first charging connection, for charging the source of power, located at one end of the smoking substitute device; and
- a second charging connection, for charging the source of power, located on one or more lateral sides of the smoking substitute device.

[0020] Such a smoking substitute device is more easily charged, for example by coupling with a dock or carrying case.

[0021] Optional features will now be set out. These are applicable singly or in any combination with any aspect.

[0022] The first charging connection may be a USB

connector.

[0023] The second charging connection may comprise a first electrical contact and a second electrical contact. The first electrical contact and the second electrical contact may be resiliently biased in a direction away from the smoking substitute device.

[0024] The first electrical contact may be located on a first lateral side of the smoking substitute device, and the second electrical contact may be located on a second lateral side of the smoking substitute device. The second lateral side may be opposite to the first lateral side.

[0025] The first electrical contact and the second electrical contact may be on the same lateral side of the smoking substitute device. The first electrical contact and the second electrical contact may be located in a row extending along a length of the smoking substitute device away from the first charging connection. The first electrical contact and the second electrical contact may be located in a row extending along a width of the smoking substitute device.

[0026] The second charging connection may be nearer the end of the smoking substitute device containing the first charging connection than an opposite end of the smoking substitute device.

[0027] The source of power may be a battery. The source of power may be a capacitor.

[0028] The smoking substitute device may include the heater. The heater may be used in a vaporiser to vaporise an aerosol precursor.

[0029] A main body of the smoking substitute device may have a mandorla-shaped cross-section. The mandorla-shaped cross-section may also be referred to as an eye-shaped cross-section. Advantageously, electrical components supporting the secondary charging connection (e.g. wires) can be located within a thinner section of the main body, which increases the packing efficiency of the device.

[0030] The device may include a controller.

[0031] 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. The device 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.

[0032] 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 a heating element in response to airflow detection by the sensor. The control may be in the form of activation of the heating element in response to a detected airflow. The airflow sensor may form part of the device.

[0033] The device may be configured to receive a consumable as described below. For example the device 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 device, such that there is snap engagement between the device and the consumable. Alternatively, the device and the consumable may be physically coupled together by screwing one onto the other, or through a bayonet fitting.

[0034] Thus, the consumable may comprise one or more engagement portions for engaging with the device. In this way, one end of the consumable (i.e. the inlet end) may be coupled with the device, while an opposing end (i.e. the outlet end) of the consumable may define a mouthpiece.

[0035] The consumable may comprise an electrical interface for interfacing with a corresponding electrical interface of the device. One or both of the electrical interfaces may include one or more electrical contacts. Thus, when the device is engaged with the consumable, the electrical interface may be configured to transfer electrical power from the power source to a heating element 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 device.

[0036] The device 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.

[0037] In a second aspect, there is provided a smoking substitute system comprising a device according to the first aspect and a tank (reservoir) for containing an aerosol precursor.

[0038] The smoking substitute system may comprise a passage for fluid flow therethrough. The passage may extend through (at least a portion of) the smoking substitute system, between openings that may define an inlet and an outlet of the passage. The outlet may be at a mouthpiece of the smoking substitute system. In this respect, a user may draw fluid (e.g. air) into and through the passage by inhaling at the outlet (i.e. using the mouthpiece).

[0039] In some embodiments, the system is a vaping smoking substitute system. The aerosol precursor may comprise an e-liquid, for example, comprising 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. 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. The passage may extend longitudinally within the tank and a passage wall 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 may comprise longitudinal ribs extending along it. These ribs may provide support to the passage wall. The ribs may extend for the full length of the passage wall. The ribs may project (e.g. radially outwardly) into the tank.

[0041] The vaping smoking substitute system may comprise a vaporiser. The vaporiser may comprise a wick. The vaporiser may further comprise a heating element. The wick may comprise a porous material. A portion of the wick may be exposed to fluid flow in the passage. The wick may also comprise one or more portions in contact with e-liquid stored in the reservoir. For example, opposing ends of the wick may protrude into the reservoir and a central portion (between the ends) may extend across the passage so as to be exposed to fluid flow in the passage. Thus, fluid may be drawn (e.g. by capillary action) along the wick, from the reservoir to the exposed portion of the wick.

[0042] The heating element 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 is 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 fluid flowing through the passage. This vapour may subsequently cool to form an aerosol in the passage.

[0043] As discussed above, the device may be configured for engagement with a consumable. The consumable may comprise components of the system that are disposable, and the device 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 aerosol former (e.g. e-liquid or tobacco substrate) may be replenished by replacing a used consumable with an unused consumable. The vaporiser/heating element may form part of the device, or part of a consumable.

[0044] In an alternative embodiment the system may be a non-consumable system, in which an aerosol former (e.g. e-liquid) may be replenished by re-filling a tank that is provided within the device (rather than replacing the consumable). In this embodiment, the consumable described above may instead be a non-disposable component that is integral with the device. In this embodiment, the only consumable portion may be e-liquid contained

in the tank within the device. Access to the tank (for refilling 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).

[0045] In a third aspect, embodiments of the present invention provide a charging case for charging a smoking substitute device, the charging case comprising: a battery, for providing power to a source of power in the smoking substitute device; and a cavity, for receiving the smoking substitute device, wherein the cavity includes a charging connection on at least one lateral internal side thereof, arranged to electrically connect to a corresponding charging connection on one or more lateral sides of the smoking substitute device.

[0046] The charging connection of the charging case may comprise a pair of electrical contacts. The electrical contacts may be located on opposite lateral sides of the cavity. The electrical contacts may be located on a same lateral side of the cavity. The electrical contacts may be resiliently biased in a direction into the cavity from the walls thereof.

[0047] In a fourth aspect, embodiments of the present invention provide a system comprising: a smoking substitute device, the smoking substitute device comprising: a source of power, for providing power to a heater; a first charging connection, for charging the source of power, located at one end of the smoking substitute device; and a second charging connection, for charging the source of power, located on one or more lateral sides of the smoking substitute device; and a charging case, for charging the smoking substitute device, the charging case comprising: a battery, for providing power to the source of power in the smoking substitute device; and a cavity, within which the smoking substitute device is located, wherein the cavity includes a charging connection on at least one lateral side thereof, the charging connection being electrically connected to the second charging connection of the smoking substitute device.

[0048] Advantageously, a user can insert the smoking substitute device into the charging case in a single motion, which both: (i) mechanically links the smoking substitute device to the charging case; and (ii) establishes the electrical connection and so allows the smoking substitute device to charge.

[0049] Embodiments of the fourth aspect may have any one, or any combination insofar as they are compatible, of the optional features of the first and third aspects.

[0050] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] So that further aspects and features thereof may be appreciated, embodiments will now be discussed in further detail with reference to the accompanying figures, in which:

- Fig. 1A is a front schematic view of a smoking substitute system;
- Fig. 1B is a front schematic view of a device of the system;
- Fig. 1C is a front schematic view of a consumable of the system;
- Fig. 2A is a rear schematic view of a variant smoking substitute device;
- Fig. 2B is a rear schematic view of a variant smoking substitute device;
- Fig. 3A is a schematic of the components of the device;
- Fig. 3B is a schematic of the components of the consumable;
- Fig. 4 is a section view of the consumable;
- Fig. 5A is a schematic view of a charging case;
- Fig. 5B is a schematic view of a variant charging case;
- Fig. 6 is a side view of a smoking substitute device;
- Fig. 7 is a schematic cross-section of a smoking substitute device;
- Fig. 8 is a perspective view of the device of Figure 6; and
- Fig. 9 is a schematic cross-section view of a smoking substitute device.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0052] Aspects and embodiments will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art.

[0053] Fig. 1A shows a first embodiment of a smoking substitute system 100. In this example, the smoking substitute system 100 includes a device 102 and an aerosol delivery 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 device may be integral with the consumable. In such systems, a tank of the aerosol delivery system may be accessible for refilling the device.

[0054] 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 device 102 (i.e. for removal and replacement). Fig. 1A shows the smoking substitute system 100 with the device 102 physically coupled to the consumable 104, Fig. 1B shows the device 102 of the smoking substitute system 100 without the consumable 104, and Fig. 1C shows the consumable 104 of the smoking substitute system 100 without the device 102.

[0055] The device 102 and the consumable 104 are configured to be physically coupled together by pushing the consumable 104 into a cavity at an upper end 108 of the device 102, such that there is an interference fit between the device 102 and the consumable 104. In other examples, the device 102 and the consumable may be

coupled by screwing one onto the other, or through a bayonet fitting.

[0056] The consumable 104 includes a mouthpiece (not shown in Fig. 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.

[0057] The tank 106 includes a window 112, which allows the amount of e-liquid in the tank 106 to be visually assessed. The device 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 device 102.

[0058] The lower end 110 of the device 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 device 102, via an electrical interface, RFID chip, or barcode.

[0059] The lower end 110 of the device 102 also includes a USB socket 201, which is usable to charge a battery within the device 102. The USB socket can also be used to transfer data to and from the device, for example to update firmware thereon. In addition to the USB socket 201, a second charging connection, formed of contacts 202a and 202b, is provided on opposing lateral sides of the device 102. Contacts 202a and 202b electrically connect to a source of power, for example in a carry case suitable for the smoking substitute device 102. Contacts 202a and 202b may be spring-loaded, and biased to an outwards position. Alternatively, the contacts may be flat plate contacts so as to conform to the outer shape of the device.

[0060] Fig. 2A and 2B show variant smoking substitute devices 102, where like features are indicated by like reference numerals. In Fig. 2A, the electrical contacts 302a and 302b of the second charging connection are provided on a same lateral side of the device 102. In this instance, the contacts are horizontally spaced, so as to be provided in a row extending across a width of the device (left-right in Figure 2A).

[0061] In Fig. 2B, the electrical contacts 402a and 402b of the second charging connection are again provided on a same lateral side of the device 102. However, in this instance, the contacts are vertically spaced, so as to be provided in a row extending along a length of the device away from the first charging connection 201 (up-down in Figure 2B).

[0062] Figs. 3A and 3B are schematic drawings of the device (main body) 102 and consumable 104. As is apparent from Fig. 3A, the device 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.

[0063] 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.

[0064] 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.

[0065] The electrical interface 126 of the device 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 device 102. When the device 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).

[0066] 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 device 102 when the consumable 104 is connected to the device 102. Additionally, or alternatively, there may be a separate communication interface provided in the device 102 and a corresponding communication interface in the consumable 104 such that, when connected, the consumable 104 can identify itself to the device 102.

[0067] The additional components 128 of the device 102 may comprise the light 116 discussed above.

[0068] The additional components 128 of the device 102 also comprises the first charging connection and the second charging connection (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 device 102.

[0069] The additional components 128 of the device 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).

[0070] The additional components 128 of the device 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.

[0071] The additional components 128 of the device 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.

[0072] As shown in Fig. 3B, the consumable 104 includes the tank 106, an electrical interface 130, a vaporiser 132, one or more air inlets 134, a mouthpiece 136, and one or more additional components 138.

[0073] The electrical interface 130 of the consumable 104 may include one or more electrical contacts. The electrical interface 126 of the device 102 and an electrical interface 130 of the consumable 104 are configured to contact each other and thereby electrically couple the device 102 to the consumable 104 when the lower end 111 of the consumable 104 is inserted into the upper end 108 of the device 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 device 102 to the vaporiser 132 in the consumable 104.

[0074] 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.

[0075] 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 device 102, the air inlets 134 receive air, which flows to the air inlets 134 along a gap between the device 102 and the lower end 111 of the consumable 104.

[0076] In operation, a user activates the smoking substitute system 100, e.g. through interaction with a user input forming part of the device 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.

[0077] 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 anyone 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 device 102.

[0078] 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).

[0079] Fig. 4 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 passage 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.

[0080] 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 device 102 (i.e. by contact with an upper edge of the device 102).

[0081] The tank 106, the passage 140 and the mouthpiece 136 are integrally formed with each other so as to form a single unitary component and may e.g. be formed by way of an injection moulding process. Such a component may be formed of a thermoplastic material such as polypropylene.

[0082] The mouthpiece 136 comprises a mouthpiece aperture 148 defining an outlet of the passage 140. The vaporiser 132 is fluidly connected to the mouthpiece aperture 148 and 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.

[0083] The vaporiser 132 comprises a porous wick 150 and a heater filament 152 coiled around the porous wick 150. The wick 150 extends transversely across the chamber vaporising 156 between sidewalls of the chamber 156 which form part of an inner sleeve 154 of an insert 158 that defines the lower end 111 of the consumable 104 that connects with the device 102. The insert 158 is inserted into an open lower end of the tank 106 so as to seal against the tank housing 142.

[0084] In this way, the inner sleeve 154 projects into the tank 106 and seals with the passage 140 (around the

passage wall 144) so as to separate the vaporising chamber 156 from the e-liquid in the tank 106. Ends of the wick 150 project through apertures in the inner sleeve 154 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 150 (e.g. by capillary action) to a central portion of the wick 150 that is exposed to airflow through the vaporising chamber 156. The transported e-liquid is heated by the heater filament 152 (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 150. This vaporised liquid may cool to form an aerosol in the passage 140, which may then be inhaled by a user.

[0085] Fig. 5A shows a charging case 500 for use with the smoking substitute device discussed above. The charging case has a cavity 501, with an aperture located in one surface of the charging case through which the smoking substitute device can be introduced. Within the cavity, on two lateral sides of the internal surface thereof, are electrical connectors 502a and 502b. These electrically connect with connectors 202a and 202b on device 103. Wires 503a and 503b are connected to the connectors 502a and 502b, and electrically interconnect them to battery 504 (which may contain charging electronics, for example voltage regulators and/or processors for controlling the charging process).

[0086] Electrical connectors 502a and 502b may be pogo pin connectors, in that they may be biased towards the interior of the cavity 501 so as to ensure a reliable connection between themselves and the corresponding connectors on device 103.

[0087] Fig. 5B shows a variant charging case 600. Where case 600 shares features with case 500, like features are indicated by like reference numerals. In contrast to the case 500 shown in Figure 5A, electrical connectors 602a and 602b are located on a same lateral side of the interior of the cavity 501.

[0088] Fig. 6 illustrates an embodiment of the present invention. The smoking substitute device 102 is shown engaged with a consumable 104 at the upper end 108 of the device 200. The consumable 104 includes the mouthpiece 136. The device 200 includes a charging port (e.g. USB port) at the lower end 110 of the device 200. The device 200 further includes the secondary charging connections discussed previously, on a same lateral side of the device (and so not visible in this view).

[0089] The device 102 is generally defined, in terms of device shape, by a main body housing 200. The main body housing 200 houses a number of the device components. The particular, the main body housing 200 houses the battery for powering operations of the device 102 and supplying electrical power to the consumable 104. The main body housing 200 receives a portion of the consumable 104 to thereby engage with the consumable 104.

[0090] The main body housing 200 is generally elongate - "long and thin". The longitudinal dimension is orientated along the longest axis of the main body housing

200. The main body housing 200 has a total length in the longitudinal dimension. The total length may be between 5 and 20 centimetres, more preferably between 10 centimetres and 20 centimetres.

[0091] Perpendicular to the longitudinal dimension is the transverse dimension ("into the page" in Fig 6). In a plane in transverse dimension, the main body device 200 has a depth 204 and a width (which is into / out of the page in respect of Fig. 7). In some embodiments, the width of the main body housing 200 is larger than the depth 204. In other words, in some embodiments, the transverse cross sectional shape of the main body housing 200 is not a circle or square. In some embodiments the depth 204 of the main body housing 200 varies along the longitudinal dimension.

[0092] In some embodiments, as in that of Fig. 6, the transverse cross-sectional shape is generally constant along at least a portion of the length of the main body housing 200.

[0093] The main body housing 200 is generally curved along its length. That is, a hypothetical line 203 (see Fig. 7) passing through the centroid of the main body housing 200, aligned with the longitudinal axis of the main body housing 200, is curved. In the embodiment the main body housing 200 is curved along the full length. However in some embodiments, the main body housing 200 is only curved in a curved section or portion of the longitudinal length of the main body housing 200 between the upper 108 and lower end 110. In such embodiments, longitudinally outside of the curved portion, the main body housing 200 may be substantially straight.

[0094] The radius of curvature of the main body housing 200 of the embodiment of Fig. 6 is 550 millimetres. However in some embodiments the radius of curvature of the main body housing 200 is different. In some embodiments, the radius of curvature of the main body housing is between 3000 millimetres and 100 millimetres, preferably between 2000 millimetres, more preferably between 1000 and 200 millimetres, more preferably between 800 and 300 millimetres.

[0095] In some embodiments the radius of curvature of the main body housing 200 is substantially constant along the length of the main body housing 200. In some embodiments the radius of curvature of the main body housing 200 varies along the length of the main body housing 200.

[0096] When placed on a flat surface, e.g. a table top, the curved main body housing 200 therefore bows upward away from the table surface. This permits the user to easily grasp the device 102, relative to a device 102 having a straight main body housing. The device 102 is also ergonomically beneficial, the curvature of the device allowing for more comfortable compliance with the curvature of a user's body, for example the upper leg when placed in a pocket.

[0097] Fig. 7 shows a schematic illustration of a longitudinal cross-section of a device 102 according to any embodiment. The device 102 is shown engaged with a

consumable 104. The main body housing 200 is illustrated with the hypothetical line 203 passing along the longitudinal dimension. This line 203 illustrates the curvature of the main body housing 200.

[0098] The main body housing 200 has an upper surface 901 and oppositely directed lower surface 902. The lower surface 202 has a lower surface radius of curvature in the longitudinal dimension which is larger than the radius of curvature in the longitudinal dimension of the upper surface 201. In other words, the curvature of the lower surface 202 is less severe than the upper surface 201. This forms a main body housing 200 that terminally tapers at each longitudinal end, noting that at one end of the housing 200, the consumable 104 is engaged, so it is consumable 104 that includes the terminal taper of the combined consumable 104 and device 102. In some embodiments, the upper surface and / or lower surface taper together separately from their longitudinal curvature as defined above, and the terminal taper is not resultant from the curvature of the upper and lower surface as defined above.

[0099] In some embodiments, the longitudinal distance along the upper surface is longer than the longitudinal distance along the lower surface. This may permit a user to engage with a terminal transverse edge of the upper surface more easily, making the device 102 easier to pick up.

[0100] In some embodiments, the device 102 includes a visual user output indicator, which may be located on the upper surface 201. The user output indicator may include one or more lights.

[0101] Fig. 8 shows a perspective view of the device 102 shown engaged with the consumable 104 at the upper end 108. The device 102 includes a charging port at the lower end 110.

[0102] The upper surface 201 of the main body housing 200 is curved in the transverse dimension. The lower surface 202 of the main body housing 200 is curved in the transverse dimension. The curvatures of the upper surface 201 and lower surface 202 are of the opposite sense to one another. Both upper and lower surfaces 201, 202 are therefore convex in the transverse dimension. This leads to a mandorla or lemon-shaped cross sectional shape of the main body housing. In some embodiments the upper surface 201 and the lower surface 202 are curved in the same sense, which leads to one surface being convex and the other being concave.

[0103] The upper surface 201 and lower surface 202 meet at two transverse edges 205. The transverse edges 205 have a radius of curvature that is significantly smaller than the radius of curvature of either the upper 201 or lower surface 202. This leads to the transverse edges being substantially "pointed" or "sharp". The transverse edges may have a radius of curvature in the transverse dimension of less than 10 millimetres, preferably less than 5 millimetres, preferably less than 2 millimetres, preferably less than 1 millimetre.

[0104] As illustrated in Fig. 8, the transverse edges 205

extend substantially the full longitudinal length of the main body housing 200. However, in some embodiments, the transverse edges 205 may only extend along a longitudinal portion of the main body housing 200. The presence of the edges 205, relative to the upper surface 201 and the lower surface 202, permit the user to easily grasp the device. Such a main body housing 200 shape also ergonomically beneficial, and may lead to comfortable positioning the in hand, for example because the transverse edges locate at the joints of the fingers.

[0105] The main body housing 200 is formed from upper and lower housing sections 206, 207. The upper and lower housing sections 206, 207 are interconnected to one another (for examples, via a snap fit or by gluing) along the transverse edges 205. Such a configuration may improve the ease of manufacture of the device 102. In some embodiments the main body housing 200 is formed in an extrusion process.

[0106] The upper surface 201 of the main body housing 200 may include a user feedback means, for example one or more lights. The lower surface 202 of the main body housing 200 may include a window or notch through which a liquid level in the consumable 104 may be assessed by a user. The lower surface 202 may include a charging means. The charging means may include a pair of electrical contacts engagement with a corresponding pair of charging contacts. The charging contacts may, for example, be part of a charge case or dock.

[0107] A visual user feedback means may be provided along one or both of the transverse edges 205. In some embodiments the visual user feedback means is elongate along the longitudinal dimension. For example, a light may be provided that runs along at least a longitudinal portion of one of the edges 205. An elongate user feedback means may mean that it is less likely to be inadvertently obscured when the device 102 is grasped by a user.

[0108] Fig. 9 illustrates a schematic transverse cross section through the device 102 of Fig. 8, in accordance with an embodiment. The upper surface 201 and lower surface 202 are shown meeting at the transverse edges 205 on either side of the main body housing 200. The radius of curvature in the transverse dimension of the upper surface 201 is equal to the radius of curvature in the transverse dimension of the lower surface 202. As described above, in some embodiments, the radius of curvature of the upper surface 201 is different from the radius of curvature of the lower surface 202.

[0109] The radius of curvature of the upper surface 201 may be between 10 millimetres and 50 millimetres, preferably between 10 and 40 millimetres, preferably between 10 millimetres and 30 millimetres, preferably between 10 and 20 millimetres, more preferably between 10 millimetres and 15 millimetres, more preferably substantially 13.5 millimetres.

[0110] It is noted that the longitudinal curvature described in respect of Figs. 6 and 7 is independent of the curvature described in respect of Figs. 8 and 9.

[0111] While exemplary embodiments have been described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments set forth above are considered to be illustrative and not limiting.

[0112] 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.

[0113] 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%.

[0114] 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 smoking substitute device, comprising:

a source of power, for providing power to a heater;
 a first charging connection, for charging the source of power, located at one end of the smoking substitute device; and
 a second charging connection, for charging the source of power, located on one or more lateral sides of the smoking substitute device.

2. The smoking substitute device of claim 1, wherein the first charging connection is a USB connector.

3. The smoking substitute device of either claim 1 or claim 2, wherein the second charging connection comprises a first electrical contact and second elec-

trical contact.

4. The smoking substitute device of claim 3, wherein the first electrical contact and the second electrical contact are resiliently biased in a direction away from the smoking substitute device.

5. The smoking substitute device of claim 3 or 4, wherein the first electrical contact is located on a first lateral side of the smoking substitute device and the second electrical contact is located on a second lateral side of the smoking substitute device.

6. The smoking substitute device of claim 5, wherein the second lateral side is opposite the first lateral side.

7. The smoking substitute device of any of claims 1 - 4, wherein the first electrical contact and the second electrical contact are on a same lateral side of the smoking substitute device.

8. The smoking substitute device of claim 7, wherein the first electrical contact and the second electrical contact are located in a row extending along a length of the smoking substitute device away from the first charging connection.

9. The smoking substitute device of claim 7, wherein the first electrical contact and the second electrical contact are located in a row extending along a width of the smoking substitute device.

10. The smoking substitute device of any preceding claim, wherein the second charging connection is nearer the end of the smoking substitute device containing the first charging connection than an opposite end of the smoking substitute device.

11. The smoking substitute device of any preceding claim, wherein the source of power is a battery.

12. The smoking substitute device of any preceding claim, the smoking substitute device including the heater.

13. The smoking substitute device of claim 12, wherein the heater is used in a vaporiser to vaporise an aerosol precursor.

14. The smoking substitute device of any preceding claim, wherein a main body of the smoking substitute device has a mandorla-shaped cross-section.

15. A charging case for charging a smoking substitute device, the charging case comprising:

a battery, for providing power to a source of pow-

er in the smoking substitute device; and
a cavity, for receiving the smoking substitute de-
vice, wherein the cavity includes a charging con-
nection on at least one lateral internal side there-
of, arranged to electrically connect to a corre- 5
sponding charging connection on one or more
lateral sides of the smoking substitute device.

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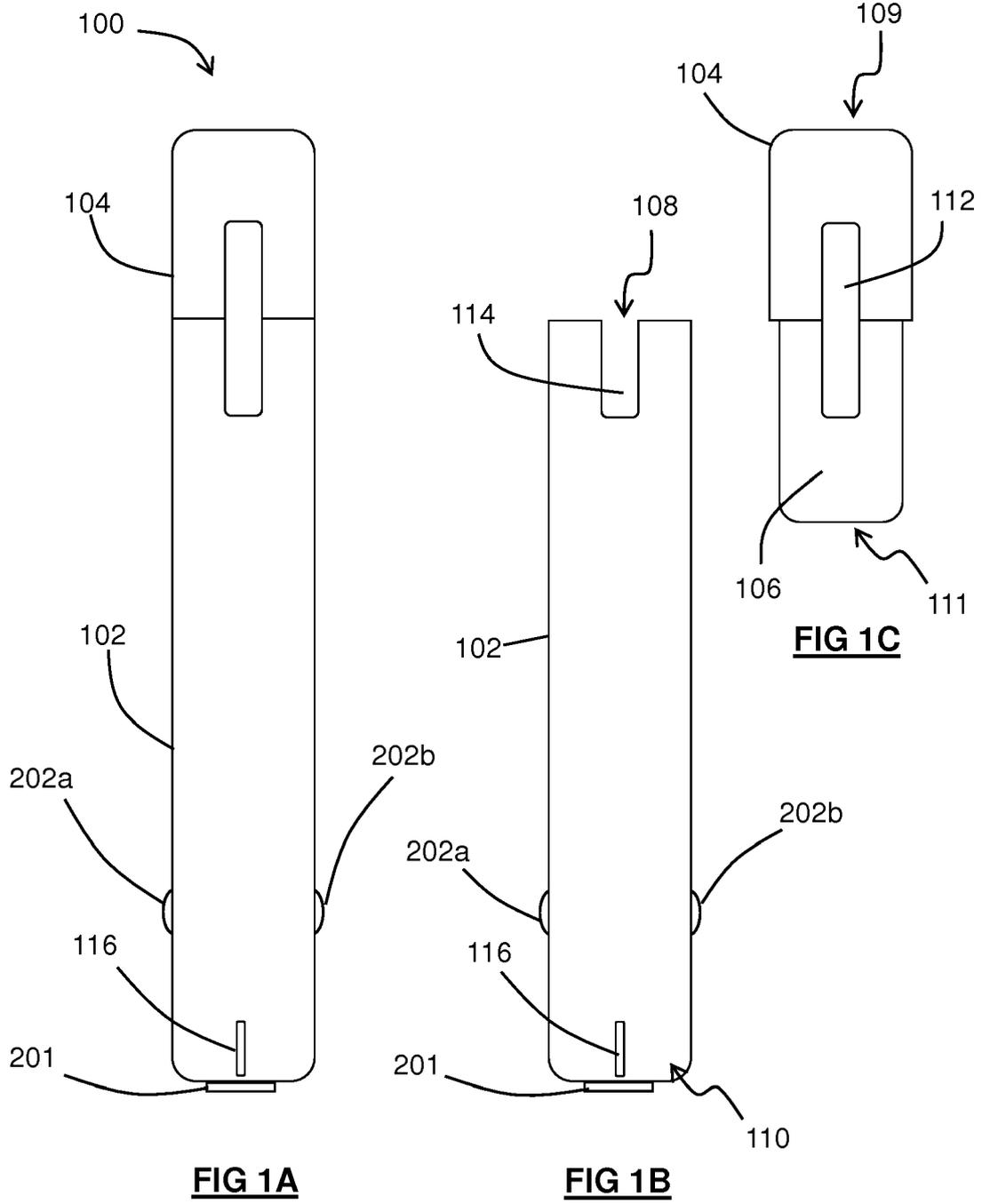
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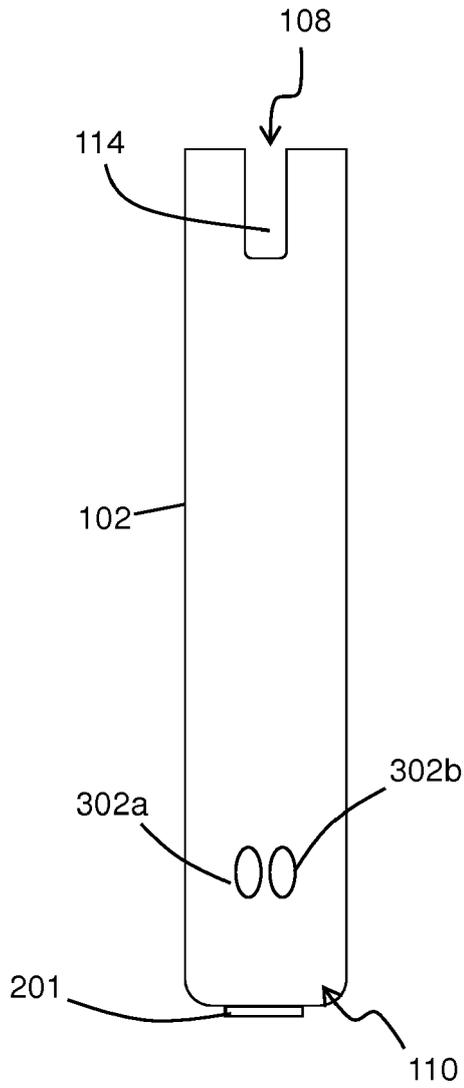


FIG 2A

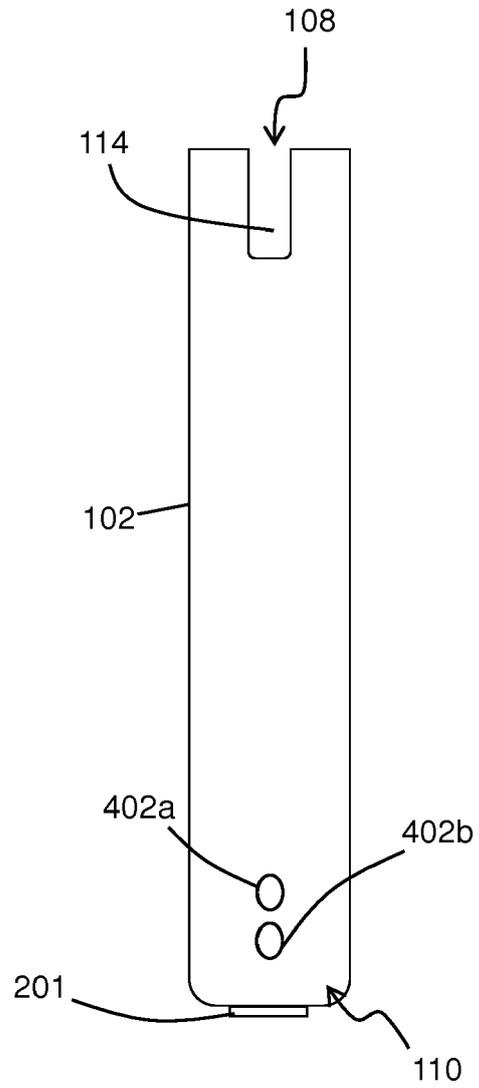


FIG 2B

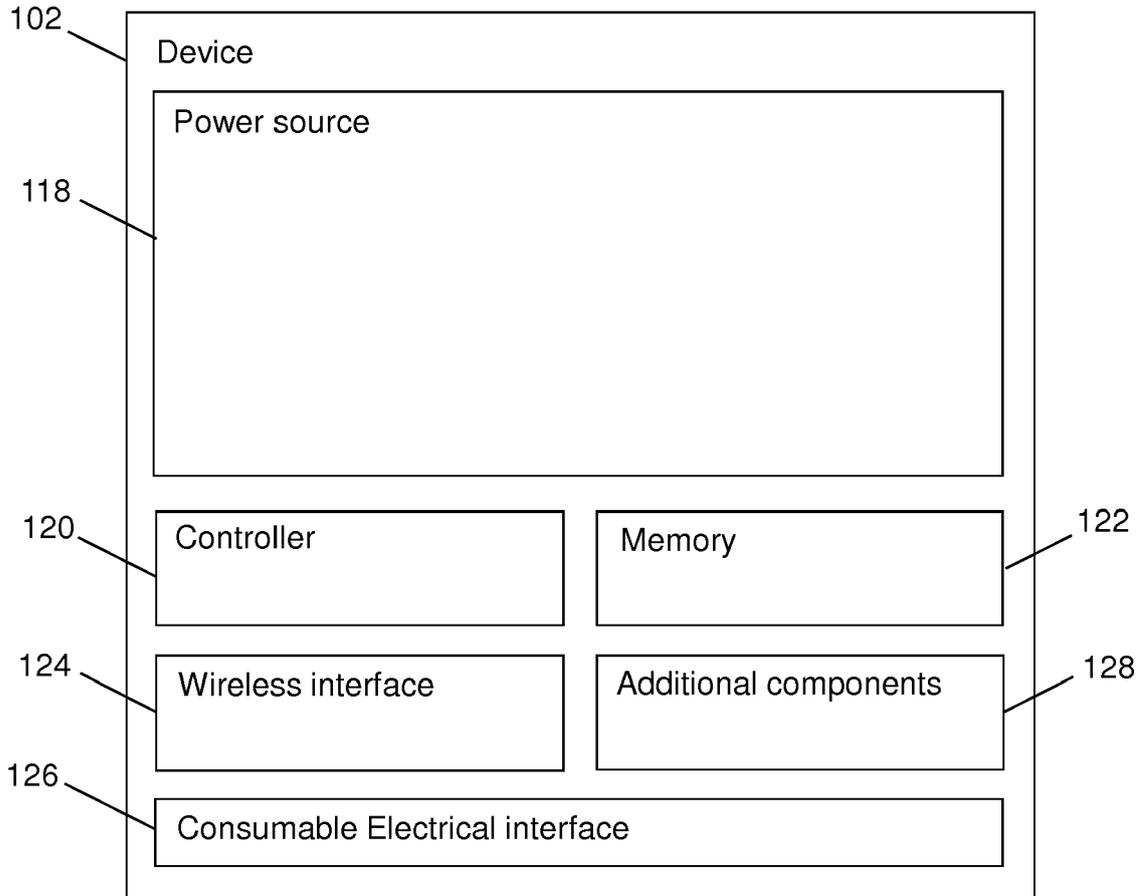


FIG 3A

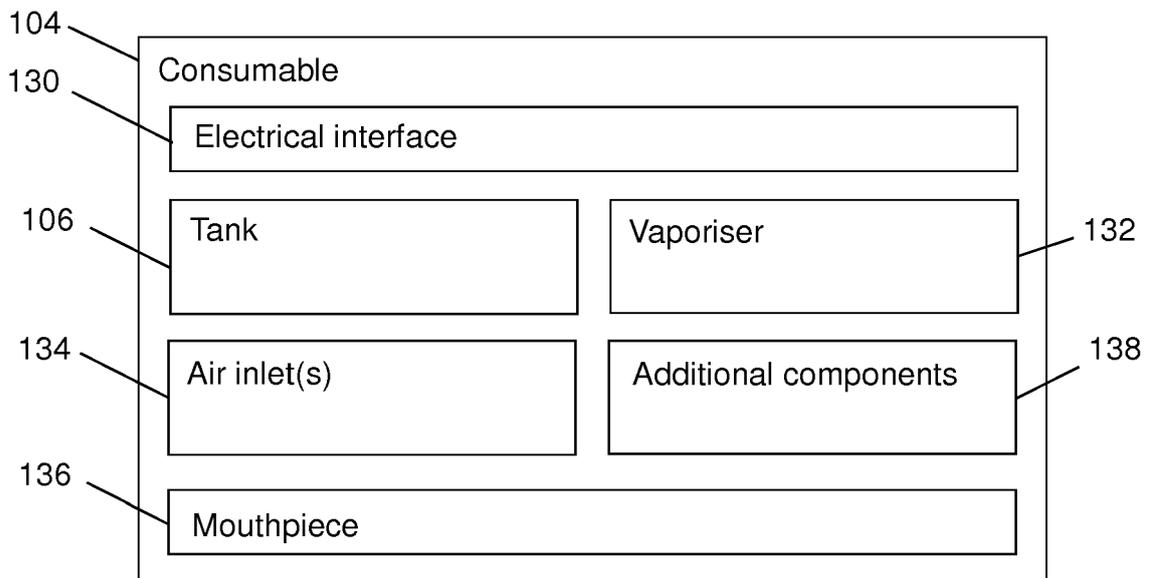
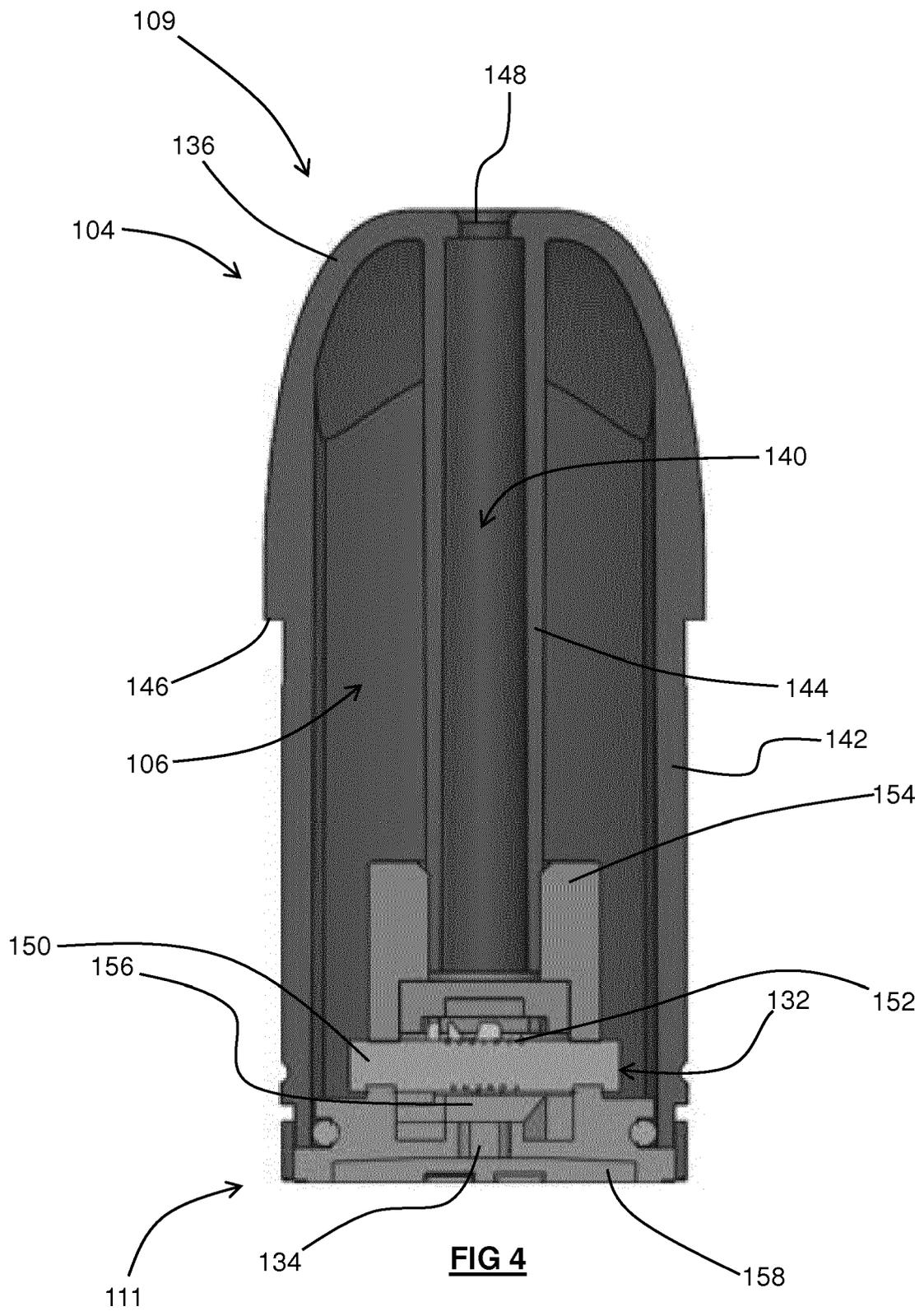


FIG 3B



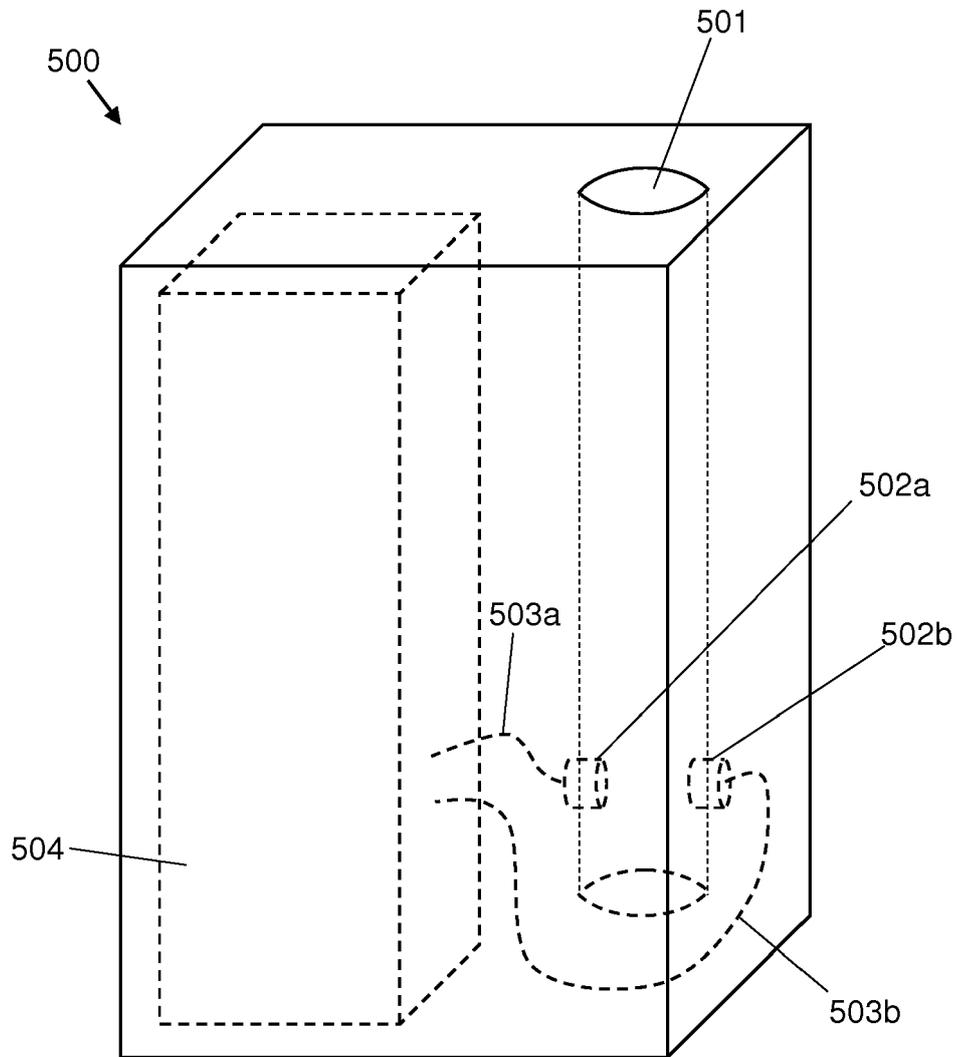


FIG 5A

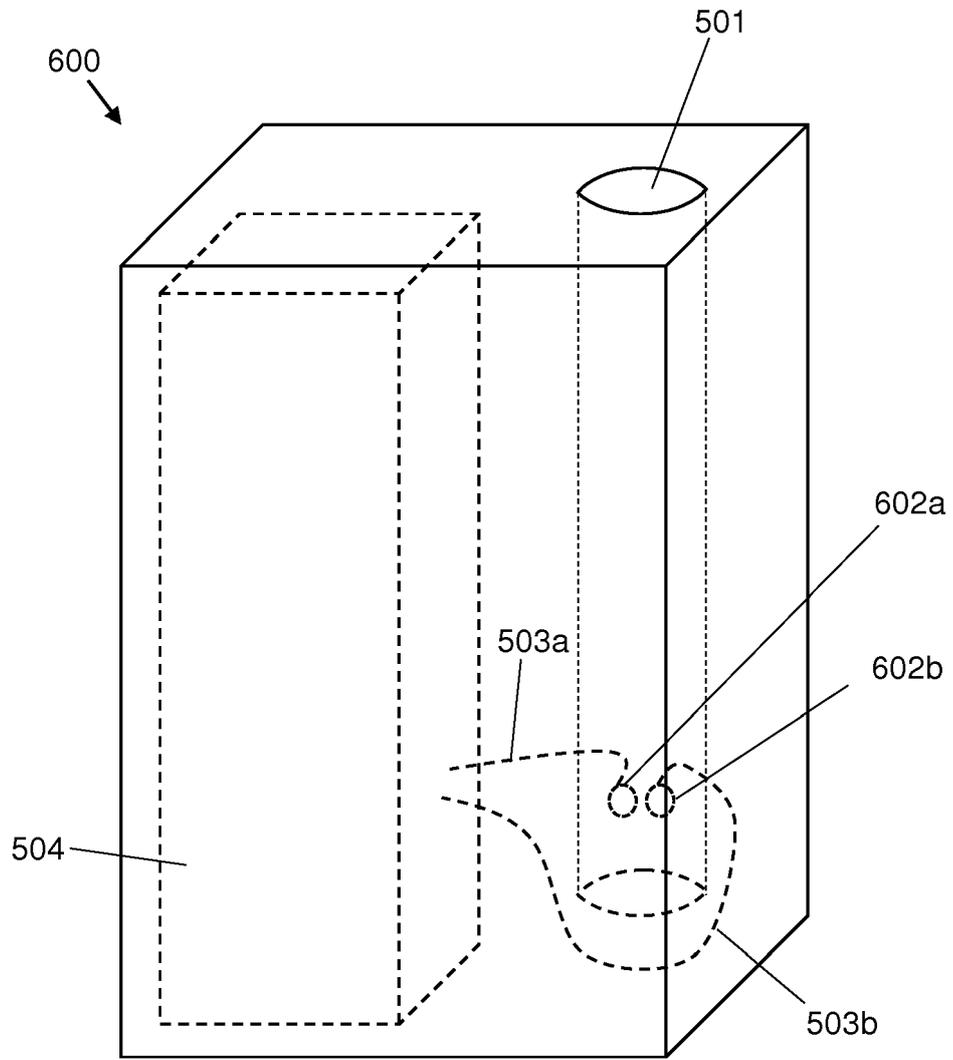


FIG 5B

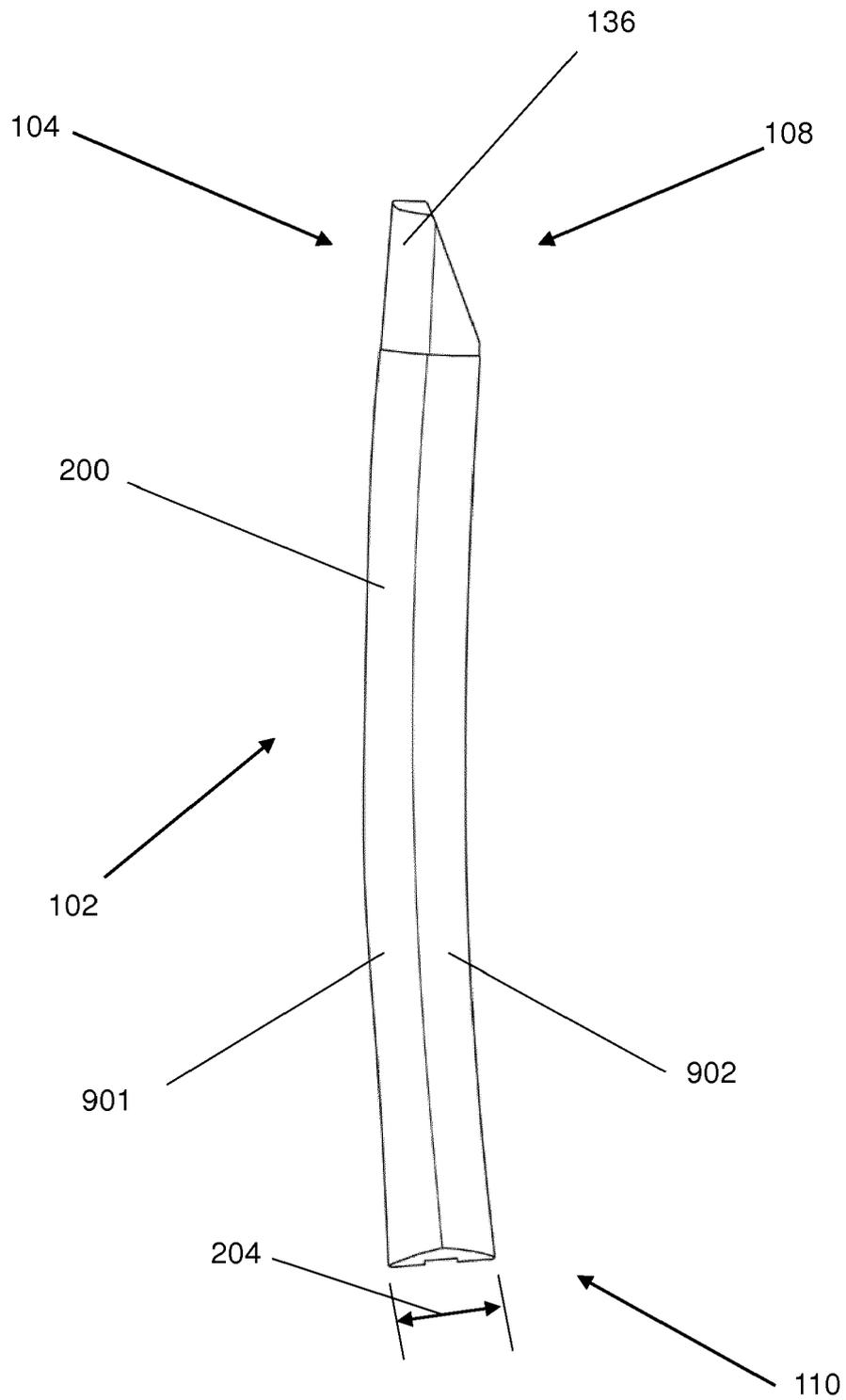


FIG 6

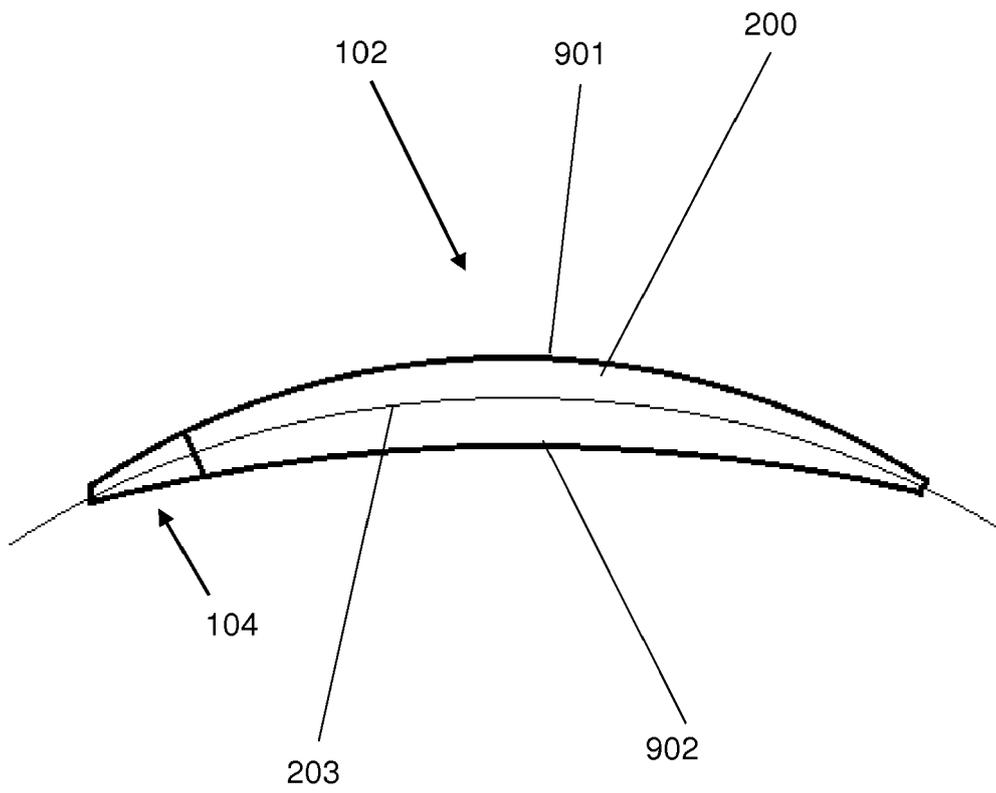


FIG 7

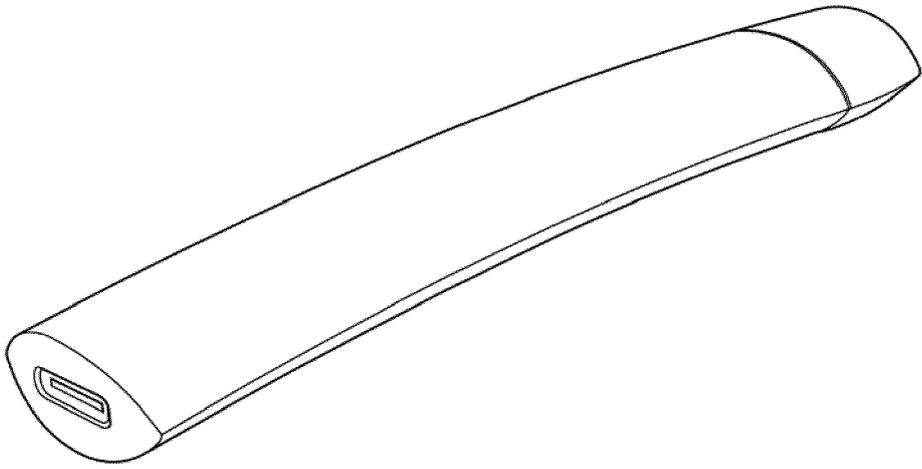


FIG 8

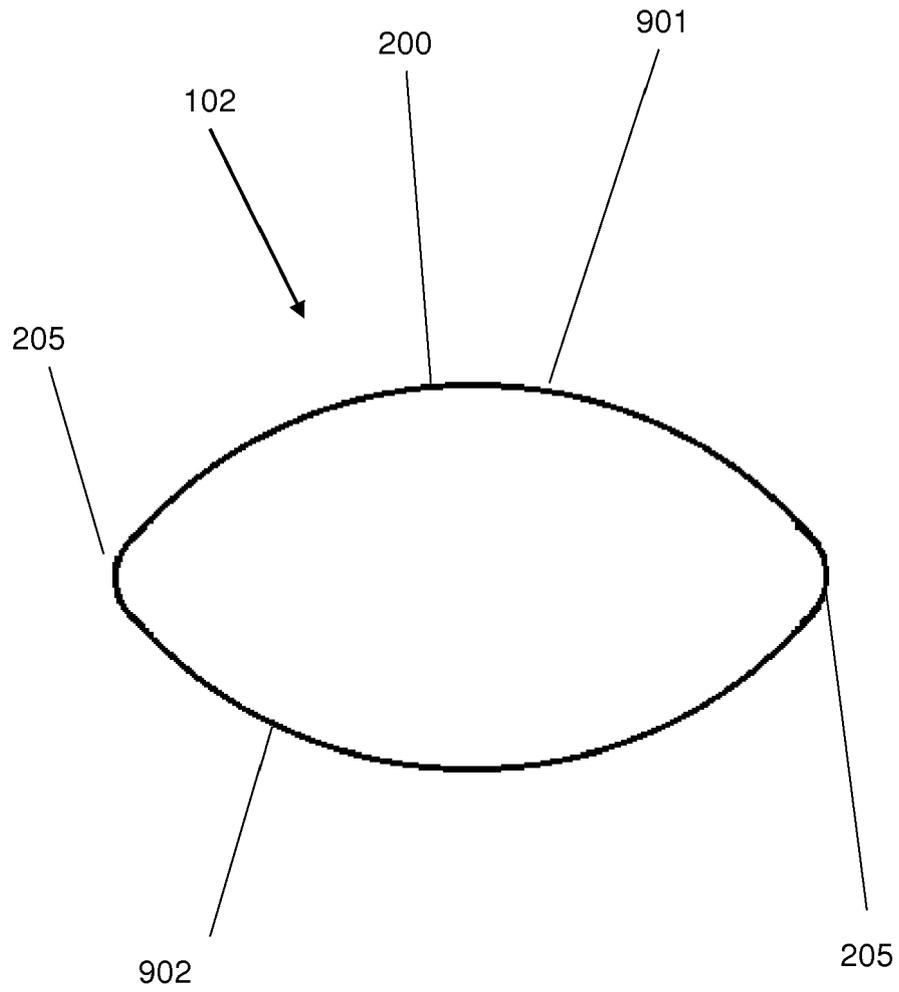


FIG 9



EUROPEAN SEARCH REPORT

Application Number
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Place of search Munich		Date of completion of the search 17 March 2020	Examiner Mier Abascal, Ana
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