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(54) SMOKING SUBSTITUTE DEVICE/SYSTEM

(57) A substitute smoking device. The smoking substitute device including: a processor; a main body, including an illumination region; and a source of light contained within the main body, the illumination region being configured such that light provided by source of light passes through the illumination region of the main body. The processor is configured to: (i) identify an operation of the smoking substitute device; and (ii) control the source of light contained within the main body, to illuminate an area of the illumination region based on the operation of the smoking substitute device identified.

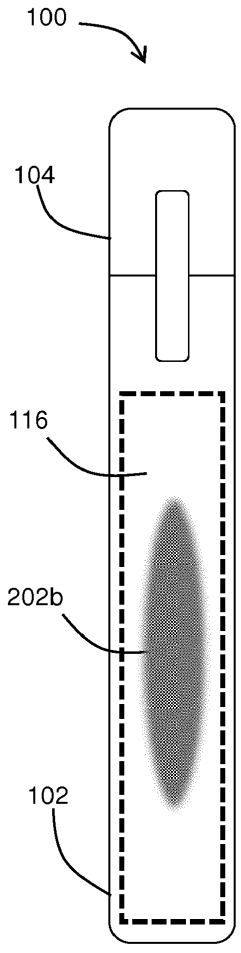

FIG 2B

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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 including:

a processor;
a main body, including an illumination region; and
a source of light contained within the main body, the illumination region being configured such that light provided by the source of light passes through the illumination region of the main body;
wherein the processor is configured to:

(i) identify an operation of the smoking substitute device; and
(ii) control the source of light contained within the main body, to illuminate an area of the illumination region based on the operation of the smoking substitute device identified.

[0020] Such a smoking substitute device can more easily indicate identified operations to the user.

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

[0022] The illumination region may be a surface area of the main body. The source of light may be one of a plurality of sources of light, and the processor may be configured to control the plurality of sources of light contained within the main body, to illuminate an area of the illumination region based on the operation of the smoking substitute device identified.

[0023] An intensity of the source of light may be controlled so as to vary the area of illumination. There may be plural sources of light contained within the main body, and a number of sources of light emitting light may be controlled so as to vary the area of illumination.

[0024] The source(s) of light may be an array of light emitting diodes.

[0025] The processor may be configured to identify a battery status query operation of the smoking substitute device, and to illuminate an area of the illumination region proportional to a level of charge stored in the battery.

[0026] The processor may be configured to identify a battery charging operation of the smoking substitute device, and to illuminate an area of the illumination region proportional to a current level of charge stored in the battery, and to change the area of the illumination region as the battery charges.

[0027] The processor may be configured to identify an inhalation operation of the smoking substitute device, and to increase an area of the illumination region which is illuminated in proportion to a length of the inhalation operation.

[0028] The processor may be configured to identify that a predetermined number of inhalation operations have occurred within a predetermined time period, and to decrease an area of the illumination region which is illuminated. For example, the processor may be configured to register the beginning of a usage session of the smoking substitute device, to illuminate a first area of the illumination region at the beginning of the usage session, and to decrease the illuminated area as the number of inhalations increases.

[0029] The source(s) of light may include a liquid crystal display.

[0030] The illumination region of the main body may be made from a diffusing material, such that light passing through the illumination region from source(s) of light is diffused.

[0031] The main body may be a one-piece shell. The one-piece shell may be attached or attachable at one end to a mouthpiece or consumable.

[0032] The main body may have a mandorla-shaped cross-section, or an eye-shaped cross-section. Advantageously, the illumination region may be located on the front portion and supporting components (wires etc.) may be provided in the void, thereby utilising the internal volume of the main body in an efficient manner.

[0033] The illumination region may be formed of polycarbonate. The illumination region may be formed of acrylic.

[0034] The illumination region may extend along at least half of a length of the main body. The illumination region may be contained on one side of the main body, the main body have plural sides.

[0035] The main body may include a shell having a first area with a first thickness and a second area with a second thickness, the first area including the illumination region and the first thickness being thinner than the second thickness.

[0036] The illumination region may include a plurality of discrete sub-illumination regions. Each sub-illumination may be separated from an adjacent sub-illumination region by an optically opaque divider.

[0037] The smoking substitute device may include a mouthpiece, and the illumination region may be located towards an end of the smoking substitute device opposite to the mouthpiece.

[0038] The smoking substitute device may include an adaptor for receiving a consumable, and the illumination region may be located towards an end of the smoking substitute device opposite to the adaptor.

[0039] In another aspect of the present disclosure, there is provided a smoking substitute device including: a processor; a main body, including an illumination region; and a source of light, contained within the main body, the illumination region being configured such that light provided by the source of light passes through the illumination region of the main body. The illumination region is preferably made of a diffusing material, such that the light passing through the illumination region from the source of light is diffused. The smoking substitute device of this aspect may have any one, or any combination insofar as they are compatible, of the optional features of the first aspect.

[0040] The device may include a power source.

[0041] A memory may be provided and may be operatively connected to the processor. The memory may include non-volatile memory. The memory may include instructions which, when implemented, cause the processor 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.

[0042] 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 processor so as to be able to provide a signal to the processor 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 processor 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.

[0043] 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.

[0044] 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.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] 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).

[0049] 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.

[0050] 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.

[0051] 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.

[0052] 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.

[0053] 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, processor, 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.

[0054] 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 re-filling of the e-liquid) may be provided via e.g. an opening to the tank that is sealable with a closure (e.g. a cap).

[0055] The 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

[0056] 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 front schematic view of the smoking substitute device in a first illumination state;
- Fig. 2B is a front schematic view of the smoking substitute device in a second illumination state;
- Fig. 2C is a front schematic view of the smoking substitute device in a third illumination state;
- Fig. 3A is a front schematic view of the smoking substitute device in a variant first illumination state;
- Fig. 3B is a front schematic view of the smoking substitute device in a variant second illumination state;
- Fig. 3C is a front schematic view of the smoking substitute device in a variant third illumination state;
- Fig. 4A is a schematic of the components of the device;
- Fig. 4B is a schematic of the components of the consumable;
- Fig. 5 is a section view of the consumable;
- 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

[0057] 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.

[0058] 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.

[0059] 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.

[0060] 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.

[0061] 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.

[0062] 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.

[0063] The device 102 also includes a processor (not shown in Figs. 1A - 1C), and an illumination region 116, indicated by the dashed line. Below the illumination region, within the main body of the device 102 is at least one source of light (and in some examples, a plurality of sources of light) located behind a single translucent cover. The source(s) of light may be, in this example, one or more light emitting diodes. The source(s) of light 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. Each source of light may be, for example, a group of LEDs operable in a combination of colours. The illumination region may be formed of a diffusing material, for example polycarbonate, such that light emitted from the LEDs is diffused as it is transmitted through the illumination region. Additionally, or alternatively, the illumination region may have a thickness which is thinner than the remaining main body of the device. Further additionally, or alternatively, a liquid crystal display (LCD) may be provided in the illumination region and may be behind the diffusion material (or alternatively, may be present as an outermost surface of the main body). In some examples, the device 102 has a mandorla-shaped cross-section, also referred to as an eye-shaped cross-section. The cross-section may have the shape resulting from the partial overlap of two circles having the substantially the same radii. In these examples, the illumination region 116 is present on the larger surface of the main body, and components supporting the illumination region (wires etc. for the LEDs) may be positioned within the thinner void region of the interior surface (i.e. towards the lateral sides thereof).

[0064] Fig. 2A shows the device 102 in a first illuminate state. Here, the processor has identified that the device is undergoing a charging operation (e.g. the power source is receiving and storing power). The processor causes a varying area of the illumination region 116 to be illuminated. In Fig. 2A a small area 202a of the illumination region is illuminated. Next, so as to convey the idea of the power source being filled with power, a larger area 202b of the illumination region is illuminated. Finally, when the power source is filled with power, the largest area 202c of the illumination region is illuminated.

[0065] The processor is configured to achieve this variation in the illuminated area by control of one or both of: (i) an intensity of the LEDs; and (ii) a number of LEDs illuminated.

[0066] The sequence shown in Fig.2A-2C is an example of a possible sequence using the illumination region. For example, in alternative sequence performed using the same device, a bar decreases in height in a manner commensurate with the depletion of the battery or consumable 104. In a further alternative sequence, the connection of a valid consumable 104 to the main body 102 may cause the illumination region to undergo a sequence of illumination states to indicate that the connection has been made successfully. Further alternatively, the processor may be configured to detect an inhalation event (e.g. through a pressure sensor) and to cause the illumination region to mimic a breath sequence by pulsating the illumination region. For example, the area of the illumination region illuminated may increase in proportion with an inhalation time, and decrease in proportion to an exhalation time.

[0067] In the sequences shown above, the illuminated area 202a-c is contiguous. However, the processor may be configured to increase and/or decrease the illuminated area by illuminating discrete portions of the illumination region, referred to as sub-illumination regions. An example of the same sequence of Figs. 2A - 2C, but with discrete illumination areas, is shown in Figs. 3A - 3C. In the example shown in Figs. 3A - 3C, each sub-illumination region is separated from the adjacent sub-illumination regions by an optically opaque divider.

[0068] Figs. 4A and 4B are schematic drawings of the device (main body) 102 and consumable 104. As is apparent from Fig. 4A, the device 102 includes a power source 118, a processor 120, a memory 122, a wireless

interface 124, an electrical interface 126, and, optionally, one or more additional components 128.

[0069] The power source 118 is preferably a battery, more preferably a rechargeable battery. The processor 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 processor 120 to perform certain tasks or steps of a method.

[0070] 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.

[0071] 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).

[0072] The electrical interface 126 may be configured to receive power from a charging station when the device 102 is not physically coupled to the consumable 104 and is instead coupled to the charging station. The electrical interface 126 may also be used to identify the consumable 104 from a list of known consumables. For example, the consumable 104 may be a particular flavour and/or have a certain concentration of nicotine (which may be identified by the electrical interface 126). This can be indicated to the processor 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.

[0073] The additional components 128 of the device 102 comprises the source(s) of light discussed above.

[0074] The additional components 128 of the device 102 may also comprise a charging port (e.g. USB or micro-USB port) configured to receive power from the charging station (i.e. when the power source 118 is a rechargeable battery). This may be located at the lower end 110 of the device 102. Alternatively, the electrical interface 126 discussed above may be configured to act as a charging port configured to receive power from the charging station such that a separate charging port is not required.

[0075] 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).

[0076] 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.

[0077] 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.

[0078] As shown in Fig. 4B, 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.

[0079] 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.

[0080] 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.

[0081] 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.

[0082] 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 processor 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.

[0083] 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.

[0084] It should be appreciated that the smoking substitute system 100 shown in figures 1A to 3B 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).

[0085] Fig. 5 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.

[0086] 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).

[0087] 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.

[0088] 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.

[0089] 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.

[0090] 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.

[0091] 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).

[0092] 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.

[0093] 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.

[0094] Perpendicular to the longitudinal dimension is the transverse dimension ("into the page" in Fig 7). 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. 8). 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.

[0095] 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.

[0096] 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.

[0097] The radius of curvature of the main body housing 200 of the embodiment of Fig. 5 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.

[0098] In some embodiments the radius of curvature is 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.

[0099] 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.

[0100] 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.

[0101] 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 203. 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.

[0102] 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.

[0103] 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.

[0104] 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.

[0105] 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.

[0106] 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.

[0107] 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.

[0108] 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.

[0109] 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.

[0110] 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.

[0111] 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.

[0112] 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 been 10 and 20 millimetres, more preferably between 10 millimetres and 15 millimetres, more preferably substantially 13.5 millimetres.

[0113] 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.

[0114] 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.

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

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

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

Claims

1. A substitute smoking device, including:

   a processor;
   a main body, including an illumination region; and
   a source of light contained within the main body, the illumination region being configured such that light provided by the source of light passes through the illumination region of the main body;
   wherein the processor is configured to:

   (i) identify an operation of the smoking substitute device; and
   (ii) control the source of light contained within the main body, to illuminate an area of the illumination region based on the operation of the smoking substitute device identified.

2. The smoking substitute device of claim 1, wherein the source of light is an array of light emitting diodes.

3. The smoking substitute device of claim 1 or 2, wherein an intensity of the source of light is controlled so as to vary the area of illumination.

4. The smoking substitute device of any preceding claim, wherein there are plural sources of light contained within the main body, and a number of sources of light emitting light is controlled so as to vary the area of illumination.

5. The smoking substitute device of any preceding

claim, wherein the processor is configured to identify a battery status query operation of the smoking substitute device, and to illuminate an area of the illumination region proportional to a level of charge stored in the battery.

6. The smoking substitute device of any preceding clam, wherein the processor is configured to identify a consumable status query operation of the smoking substitute device, and to illuminate an area of the illumination region proportional to a level of consumable remaining

7. The smoking substitute device of any preceding claim, wherein the processor is configured to identify an inhalation operation of the smoking substitute device, and to increase an area of the illumination region which is illuminated in proportion to a length of the inhalation operation.

8. The smoking substitute device of any preceding claim wherein the source of light includes a liquid crystal display

9. The smoking substitute device of any preceding claim, wherein the illumination region of the main body is made from a diffusing material, such that the light passing through the illumination region from the source of light is diffused.

10. The smoking substitute device of claim 6, wherein the illumination region is formed of polycarbonate.

11. The smoking substitute device of any preceding claim, wherein the illumination region extends along at least half of a length of the main body.

12. The smoking substitute device of any preceding claim, wherein the main body includes a shell having a first area with a first thickness and a second area with a second thickness, the first area including the illumination region and the first thickness being thinner than the second thickness.

13. The smoking substitute device of any preceding claim, wherein the illumination region includes a plurality of discrete sub-illumination regions.

14. The smoking substitute device of claim 13, wherein each sub-illumination region is separated from an adjacent sub-illumination region by an optically opaque divider.

15. The smoking substitute device of any preceding claim, further comprising a mouthpiece, and wherein the illumination region is located towards an end of the smoking substitute device opposite to the mouthpiece.

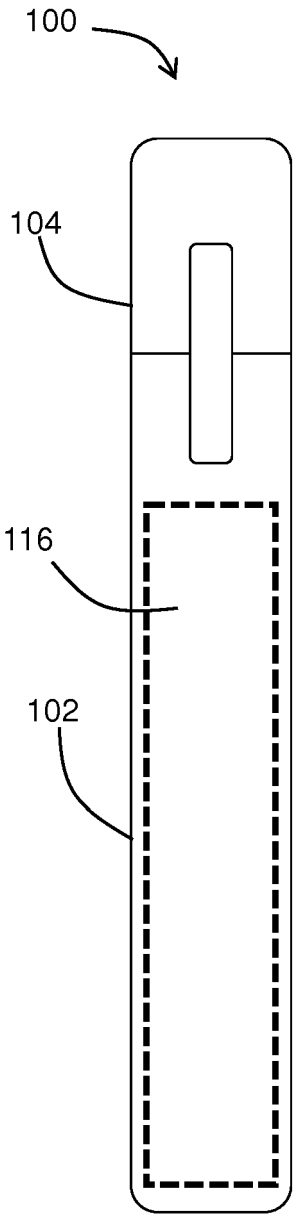

FIG 1A

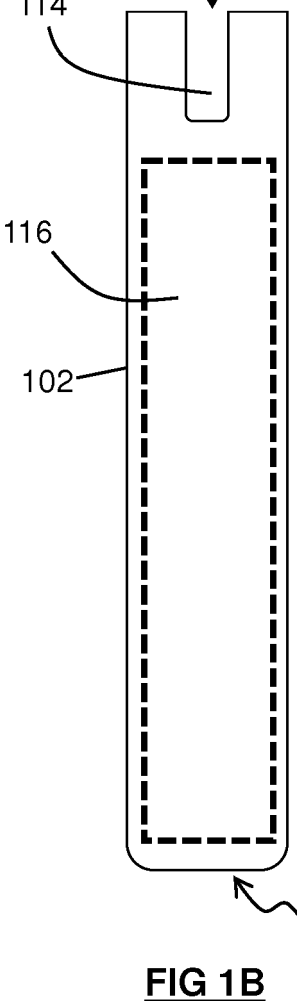

FIG 1B

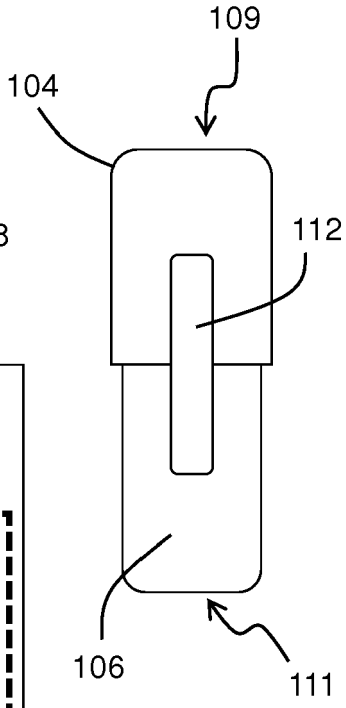

FIG 1C

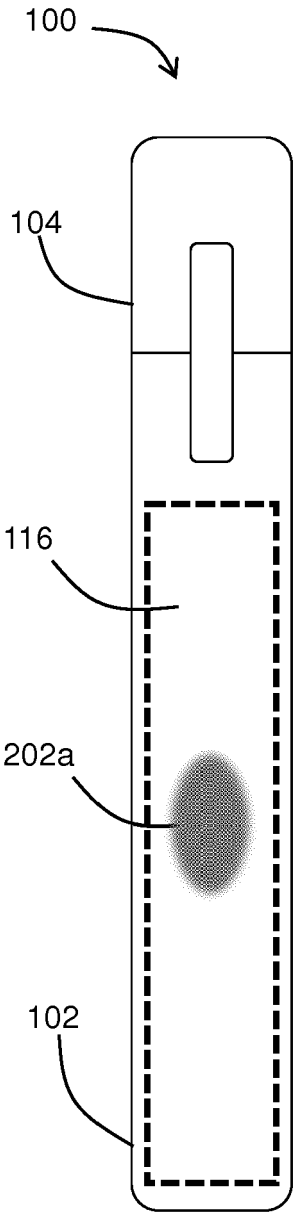

FIG 2A

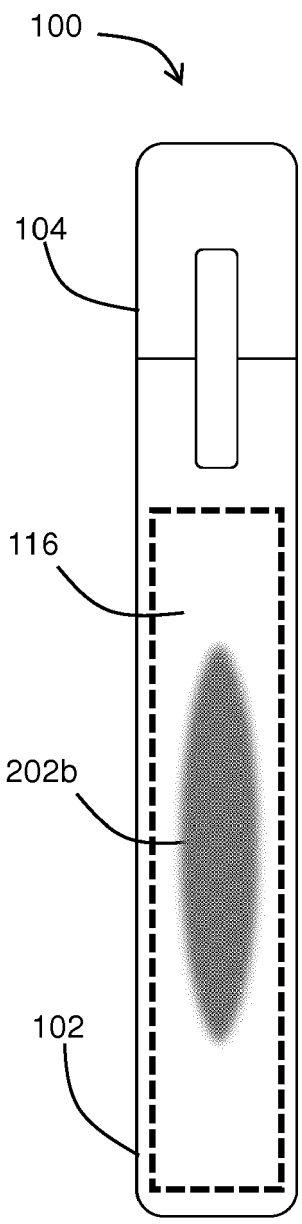

FIG 2B

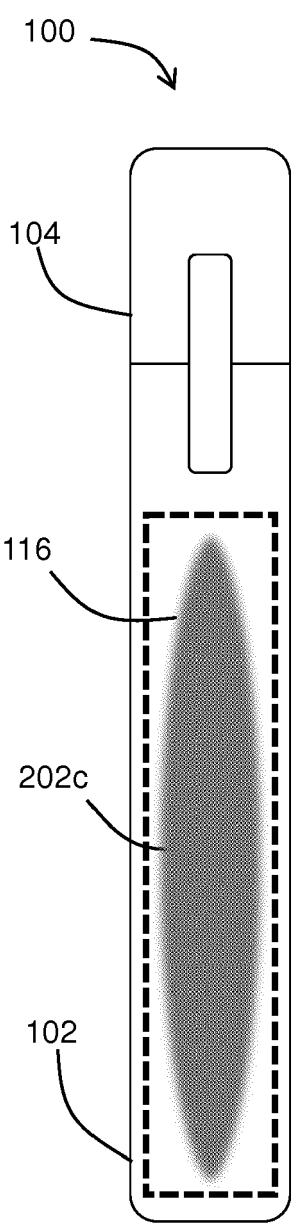

FIG 2C

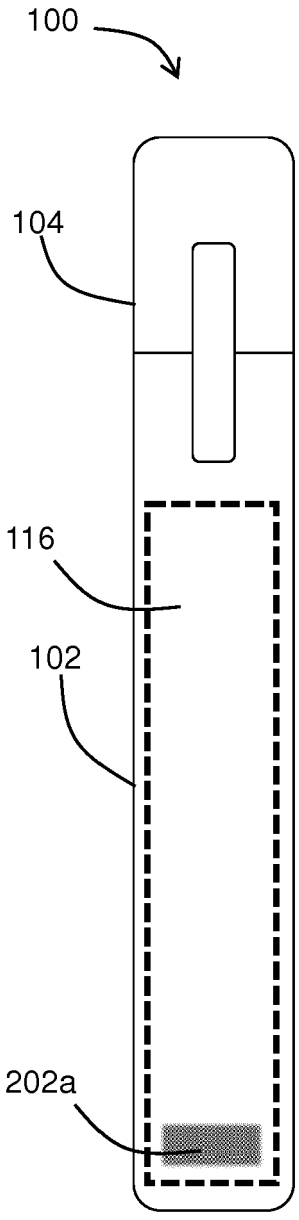

FIG 3A

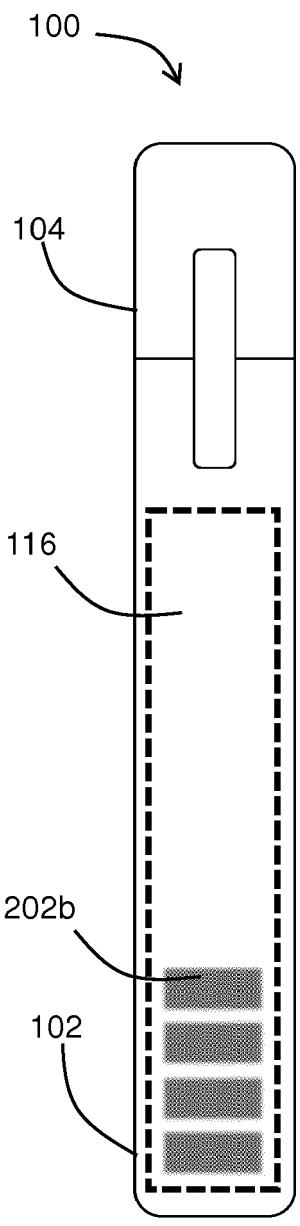

FIG 3B

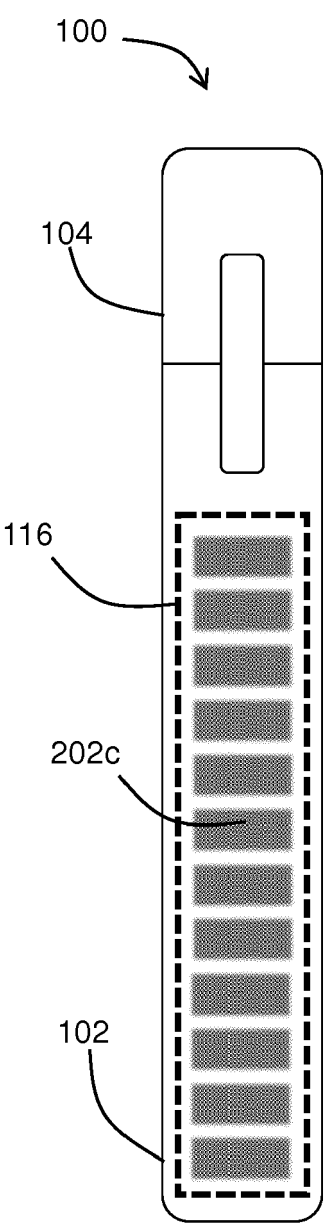

FIG 3C

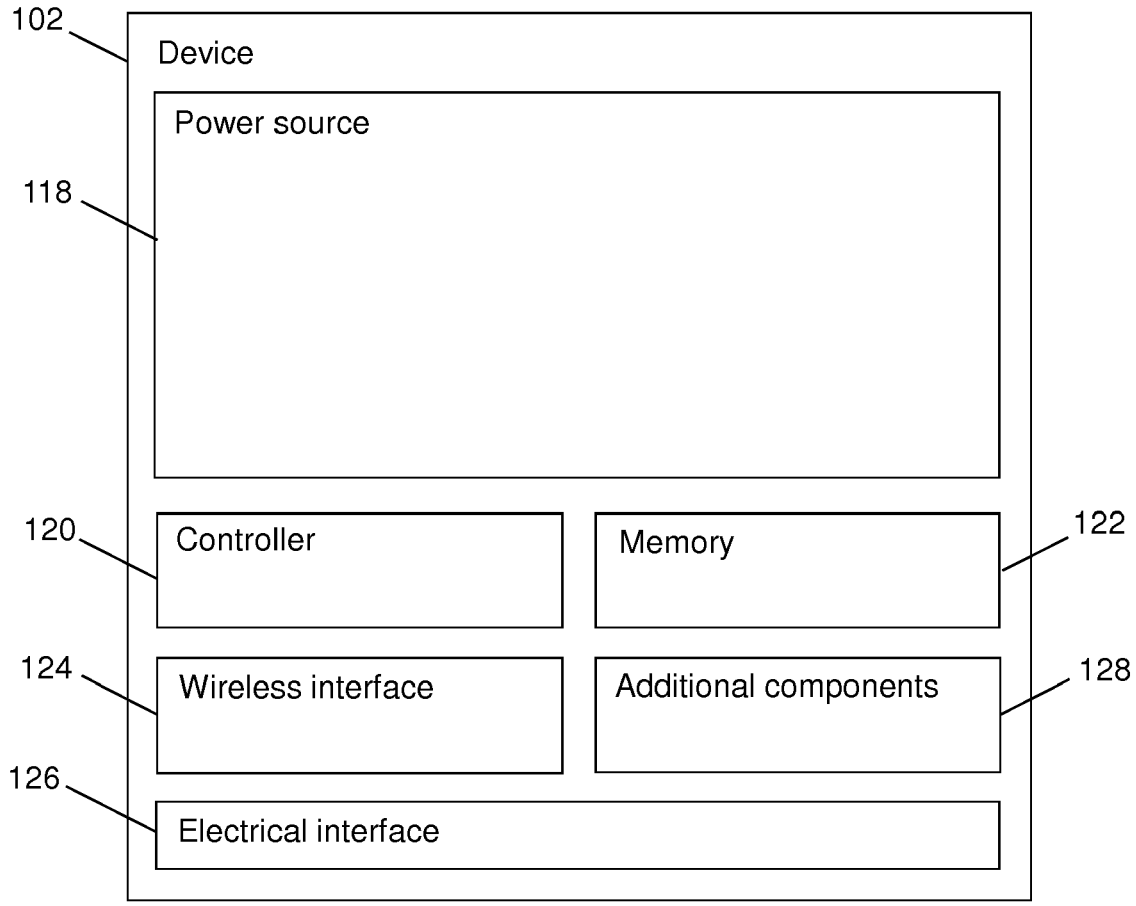
102
Device
Power source
118
120
Controller
Memory
122
124
Wireless interface
Additional components
128
126
Electrical interface

FIG 4A

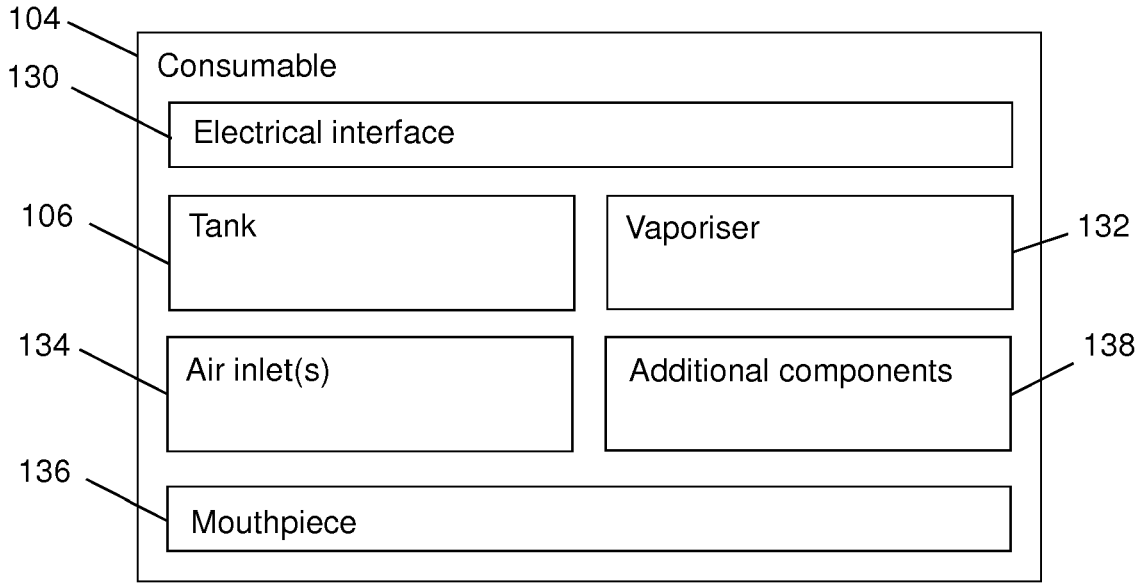
104
Consumable
130
Electrical interface
106
Tank
Vaporiser
132
134
Air inlet(s)
Additional components
138
136
Mouthpiece

FIG 4B

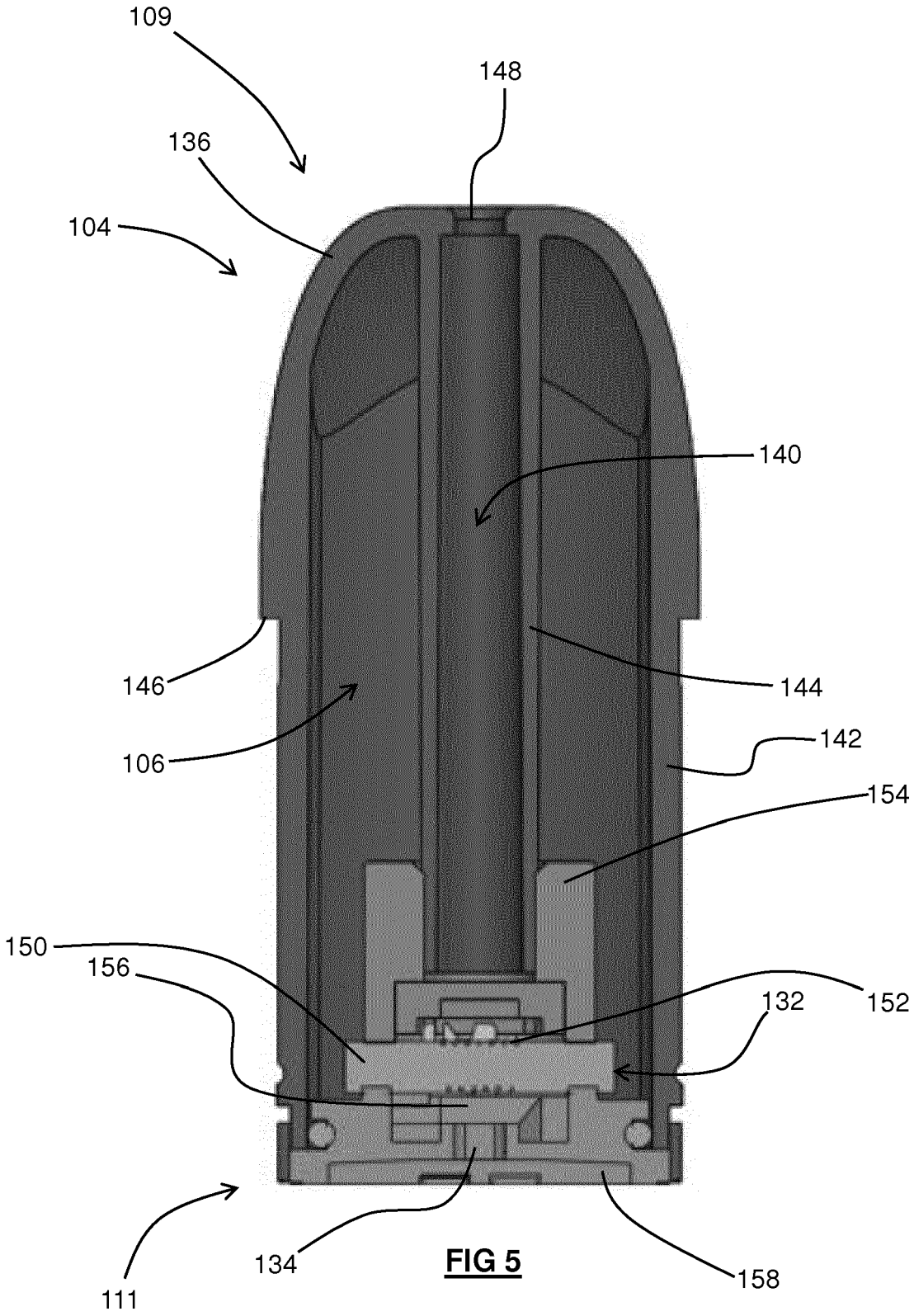
109
148
136
104
140
146
144
106
142
154
150
156
152
132
134
158
111

FIG 5

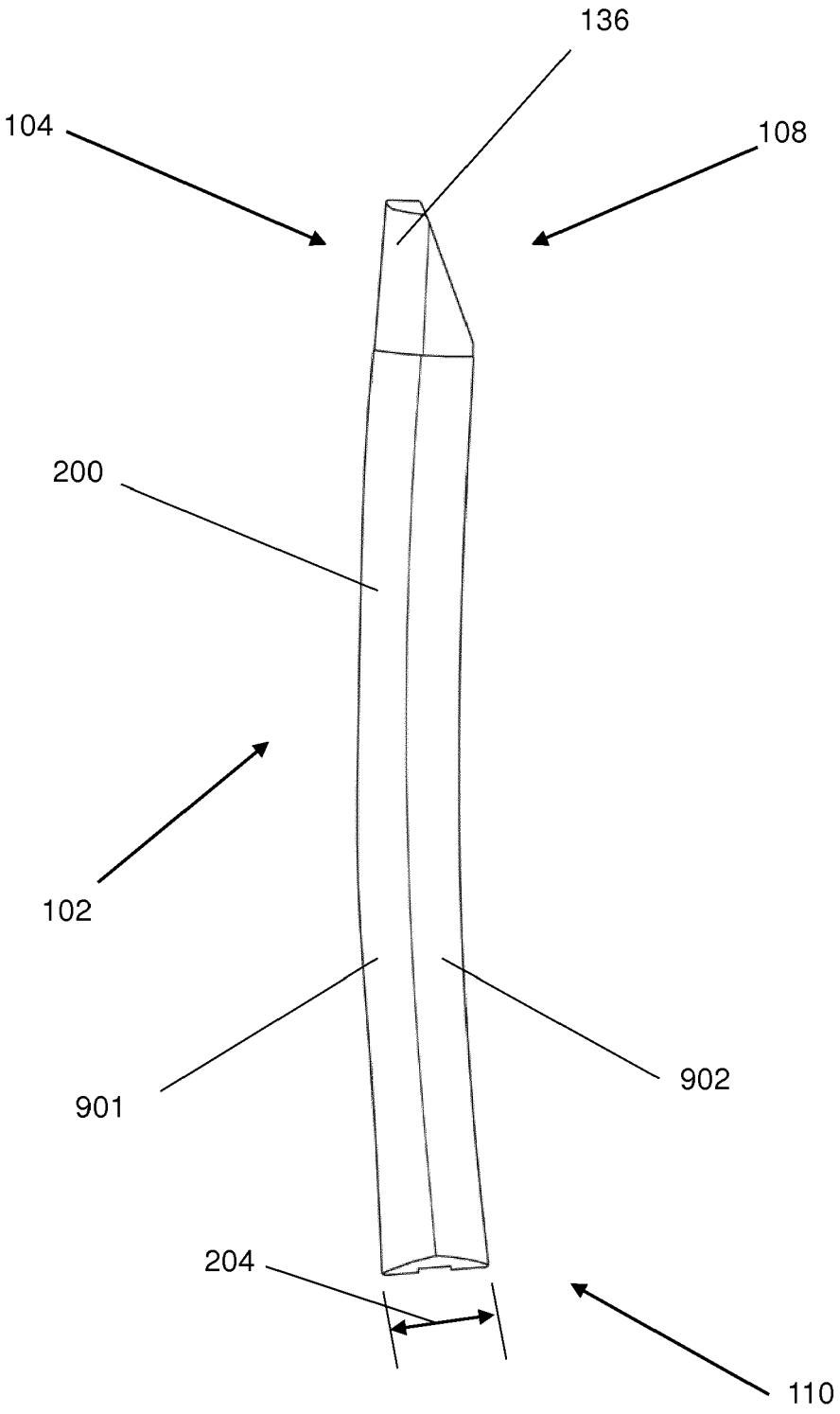

FIG 6

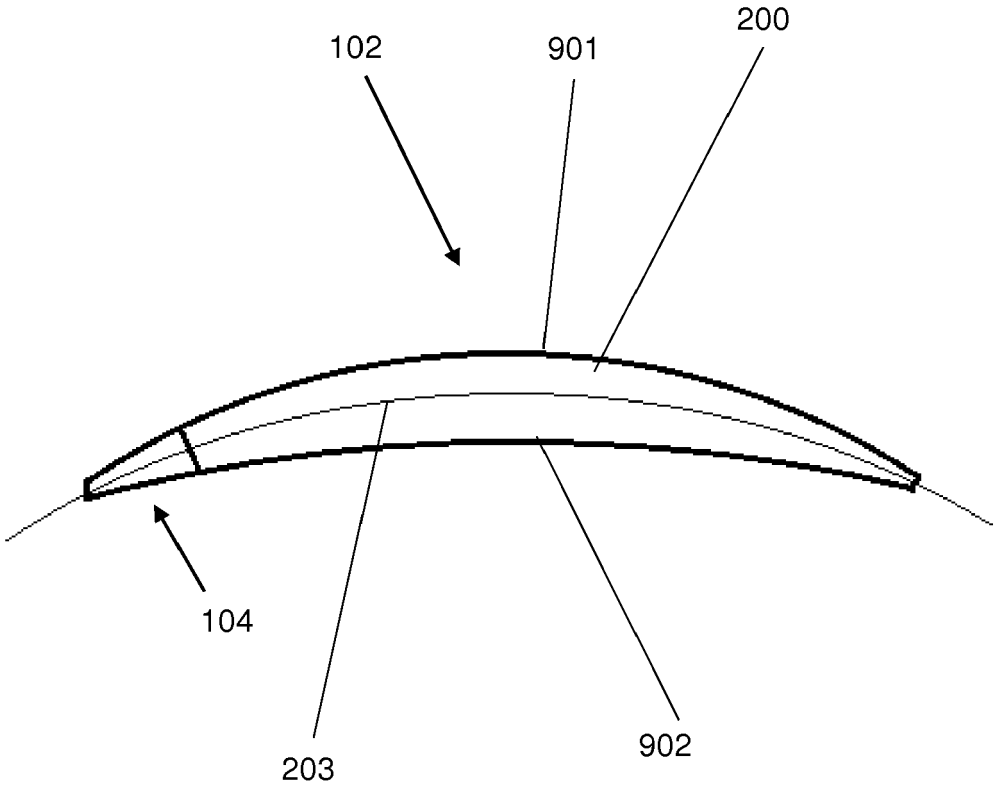

FIG 7

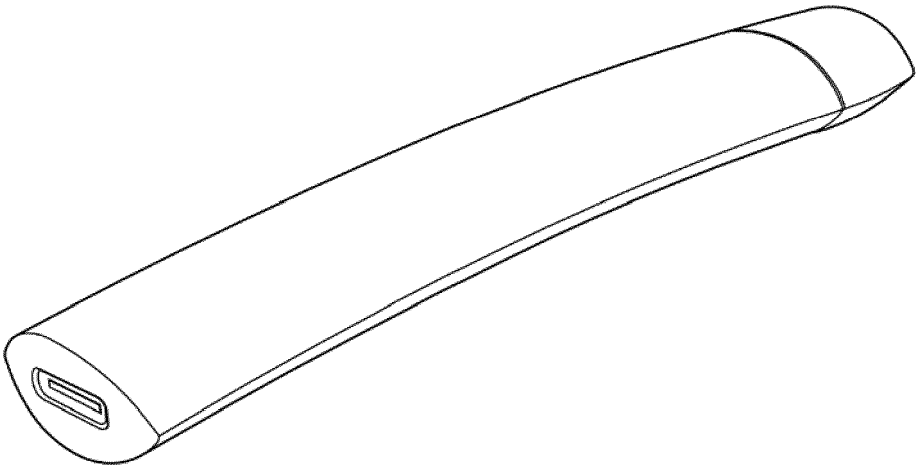

FIG 8

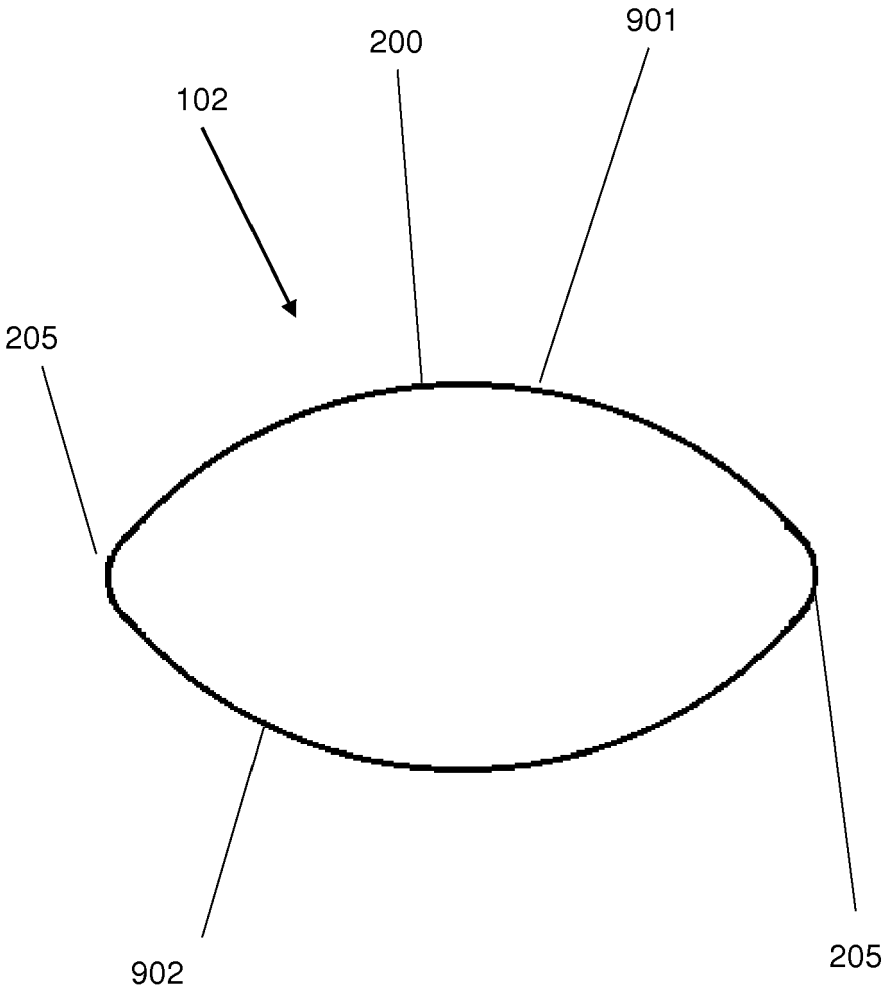

FIG 9

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 19 19 6546

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2019/162158 A1 (NERUDIA LTD [GB]) 29 August 2019 (2019-08-29) * page 4, line 24 - line 30 * * page 5, line 17 - line 21 * * page 6, line 17 - line 30; claims; figures *	1-15	INV. A24F40/53 A24F40/60
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X	US 2017/071259 A1 (YAMADA MANABU [JP] ET AL) 16 March 2017 (2017-03-16) * paragraph [0074]; claims; figures *	1-15	
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			A24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 March 2020	Acerbis, Giorgio

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 19 6546

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13-03-2020

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