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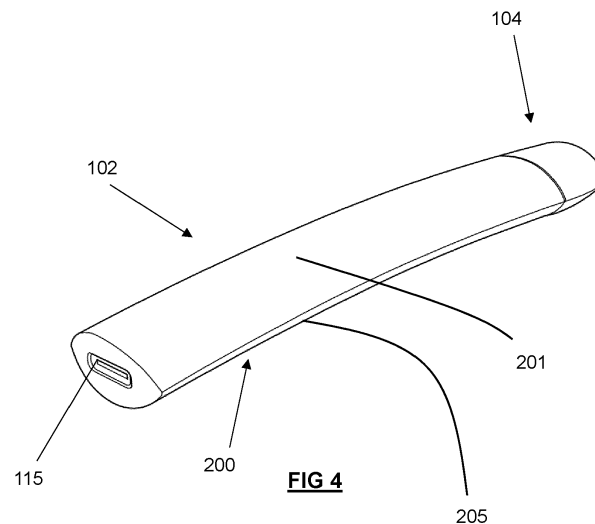
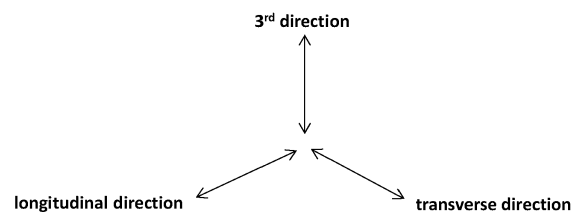
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(54) **AEROSOL DELIVERY DEVICE/SYSTEM**

(57) An aerosol delivery device (102) includes: a movement detection unit; a controller (120); and a feedback means (116). The movement detection unit is configured to detect rotary motion of the device about an

axis, and to transmit a movement detection signal to the controller; and in response to receiving the movement detection signal, the controller is configured to cause the feedback means to output feedback.



Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present disclosure relates to an aerosol delivery device and an aerosol delivery system such as a smoking substitute device/system.

BACKGROUND TO THE INVENTION

[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 component including the tank and the heater. In this way, when the tank of a component has been emptied, the device can be reused by connecting it to a new component. 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 component. The device and consumable component are physically and electrically coupled together by pushing the consumable component into the device. The device includes a rechargeable battery. The consumable component 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 component. The consumable component may include the tobacco material. The device and consumable component 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 component (entrained in the airflow) from the location of vaporization to an outlet of the component (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.

[0019] The primary purpose of aerosol delivery devices (e.g. smoking substitute devices) outlined above is to reduce the amount which a user smokes, by providing an alternative to smoking. In order to aid a user in ceasing smoking completely, it is beneficial to provide other activities which a user can perform in order to reduce the amount of time spent using a smoking substitute device. The present invention was conceived with this in mind.

SUMMARY OF THE INVENTION

[0020] Broadly speaking, a first aspect of the present invention provides an aerosol delivery system, e.g. a smoking substitute device, which is configured to produce illuminations in response to the detection of rotary motion of the device. Specifically, a first aspect of the present invention provides an aerosol delivery device in-

cluding: a movement detection unit; a controller; and a feedback means, wherein: the movement detection unit is configured to detect rotary motion of the device about an axis, and to transmit a movement detection signal to the controller; and in response to receiving the movement detection signal, the controller is configured to cause the feedback means to output feedback.

[0021] Aerosol delivery devices according to the present invention are effectively equipped with an additional functionality: the ability to output feedback in response to the detection that the device is being rotated by a user. Such a device provides a user with an additional distraction which may be useful in reducing the amount of time which a user spends using the device for vaping or other smoking substitute activity. In this way, the provision of an alternative functionality for the device is useful in aiding the user to give up smoking permanently. In addition to this, by encouraging a user to spin the device, it is possible to ensure that, in embodiments in which the wick is located at the bottom of the consumable component, liquid is moved away from the wick, allowing air to enter the consumable component through the wick, to provide pressure relief to the tank of the consumable component - preventing leakage. Alternatively, when the wick of the consumable component is located at the top of the wick, the spinning will cause liquid to the coat the wick which can reduce the likelihood of burning of the wick. In both cases, spinning of the device causes liquid to better reach the heater through a liquid transfer element, and the provision of a visual output informs the user that they are spinning the device fast enough to give rise to the desired effect.

[0022] The movement detection unit may be in the form of an accelerometer.

[0023] It is preferred that the feedback means is a visual feedback means, and the output is in the form of a visual output, in the form of visible light. In some embodiments of the invention, the front or rear surface of a device body of the device may include the visual feedback means, which preferably includes a light source, for example one or more light-emitting diodes (LEDs) configured to emit visible light in response to the detection of rotary motion. The device may include a plurality of light sources, preferably a plurality of LEDs. The light sources may be configured to illuminate an illumination region of the device. Alternatively, the lights may be configured to project an image, pattern, or spot of light onto a surface upon which the device is rotating.

[0024] The device may comprise a source of power which may be a battery. The source of power may be a capacitor.

[0025] The device body may be an elongate body i.e. with a greater length than depth/width. It may have a greater width than depth. The device body may have a length of between 5 and 30 cm e.g. between 10 and 20 cm such as between 10 and 13 cm. The maximum depth of the device body may be between 5 and 30 mm e.g. between 10 and 20 mm.

[0026] The device may include a device body. In order to describe the geometry of the device, it is useful first to define a front surface, a rear surface, two end surfaces, a transverse axis (and a corresponding transverse direction), and a longitudinal axis (and a corresponding longitudinal direction). The two end surfaces are joined at least by the front surface and the rear surface, and are spaced along the longitudinal axis (so that one must move in the longitudinal direction to go from one end surface to the other). The transverse axis is perpendicular to (or substantially perpendicular to) the longitudinal axis, and extends in a left-right direction, when the front surface is located above the rear surface. A third axis and a third direction may also be defined, which is substantially perpendicular to both the transverse and longitudinal axes (and directions).

[0027] The front surface may be curved in the transverse direction, and the rear surface may also be curved in the transverse direction. Here, curved in a given direction means that a given surface is curved away from the associated axis. Preferably, the points along a line which is said to be curved vary in distance from a straight line or straight axis in a direction which is perpendicular to both the transverse and longitudinal directions, i.e. the points vary in distance from a straight line in the third direction.

[0028] The curvatures of the front surface and rear surface may be of the opposite sense to one another. Both front and rear surfaces may be convex in the transverse direction. They may have an equal radius of curvature. The radius of curvature of the front surface may be between 10 and 50 mm, preferably between 10 and 40 mm, preferably between 10 and 30 mm, preferably between 10 and 20 mm, more preferably between 10 and 15 mm, more preferably substantially 13.5 mm. The front and rear surfaces may meet at opposing transverse edges of the device body. This leads to a mandorla-/lemon-/eye-shaped cross sectional shape of the device body, or an elliptical- or substantially elliptical-shaped. The transverse edges may have a radius of curvature that is significantly smaller than the radius of curvature of either the front or rear surface. 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 mm, preferably less than 5 mm, preferably less than 2 mm, preferably less than 1 mm. The transverse edges are spaced from each other in the transverse direction.

[0029] The transverse edges may extend substantially the full longitudinal length of the device body. However, in some embodiments, the transverse edges may only extend along a longitudinal portion of the device body.

[0030] The device body may be curved in the longitudinal direction, i.e. have a curved longitudinal axis i.e. curved in a direction between the front and rear faces.

[0031] It should be noted that throughout this description, the term "front surface" is used to refer to the surface which is convex in the longitudinal direction, and the term

"rear surface" is used to refer to the term which is concave in the longitudinal direction. By having a convex front surface, when the device is placed on a surface, its area of contact with the surface is reduced, enhancing its ability to spin on that surface, due to a reduction in friction.

[0032] In embodiments in which the cross-section of the device is as described above, with two sides which are convex in the transverse direction e.g. having a mandorla-/lemon-/eye-shaped cross-section, or an elliptical or substantially elliptical cross section, and with a longitudinally-convex rear surface, the area of contact between the rear surface of the device and an external surface may be even further reduced, even further enhancing the ability of the device to spin on that surface. In other words, it is preferable that the front surface is convex in both the longitudinal direction and the transverse direction.

[0033] In some embodiments, the device may include a projection or protrusion, preferably on the front surface, on which the device is able to spin, much like the point of a spinning top. Preferably the protrusion is located in a position which is below the centre of mass of the device or the device body, in order to ensure that the device is able to balance when spun on a surface.

[0034] The rotary motion is preferably rotary motion about an axis which is parallel to the third axis, i.e. the axis which is perpendicular (or substantially perpendicular) to the longitudinal axis and the transverse axis. Specifically, the rotary motion is rotary motion about an axis which is parallel to the third axis, and which is located approximately halfway along the device in both the transverse and longitudinal directions. Such an axis may be referred to as a central axis, and preferably passes through the device's centre of mass. In embodiments including the projection or protrusion as discussed in the previous paragraph, it is preferred that the protrusion is located at a point on the front surface of the device body, where the central axis intersects the rear surface, in order to ensure the best balance when the device is rotating on that surface.

[0035] In some embodiments, the movement detection unit may be configured to detect rotary motion about more than one axis, and the controller may be configured to cause the visual feedback means to display a different visual output depending on about which axis the rotary motion is detected. Specifically, if the movement detection unit detects rotation about a first axis (preferably the central axis as defined above), the controller may be configured to cause the visual feedback means to display a first visual output, and if the movement detection unit detects rotation about a second axis (for example, an axis which is parallel to the central axis but longitudinally displaced therefore, e.g. located at or close to one of the longitudinal ends of the device body or device), the controller may be configured to cause the visual feedback means to display a second visual output, wherein the second visual output is different from the first visual output.

[0036] In some embodiments, in addition to detecting that rotary motion is taking place, the movement detection unit may be further configured to measure, detect or determine one or more properties of the rotary motion, for example the angular velocity, angular acceleration and direction of the motion. The movement detection signal may include movement data which indicates a property of the rotary motion. In some cases, the device may be configured only to output feedback when a value representing a property of the rotary motion exceeds a predetermined threshold. For example, the controller may be configured to compare a value representing a property of the rotary motion with a predetermined threshold value, and only if it is determined that the value representing a property of the rotary motion exceeds the predetermined threshold, the controller may then cause the feedback means to output feedback. When it is detected that the value representing the property of the rotary motion has fallen below the threshold, the controller may be configured to cause the feedback means to stop outputting feedback. The preferred threshold value preferably corresponds to the angular velocity or rate of rotation which gives rise to the desirable technical effect associated with the spinning of the device, which was discussed earlier (i.e. prevention of leakage or prevention of wick burning). The preferred threshold may be determined based on an angular velocity or rate of rotation required to cause movement of liquid in a consumable component engageable with the aerosol delivery device, by centrifugal or centripetal force.

[0037] In some cases, the feedback may vary depending on the value representing the property of the rotary motion. For example if the property of the rotary motion is represented by any of a first range of values, a first type of feedback may be output, and if the property of the rotary motion is represented by any of a second range of values, a second type of feedback may be output, wherein the first range of values and the second range of values are nonoverlapping. It will be appreciated that this can straightforwardly be extended to more than two ranges of values and corresponding visual outputs. In embodiments in which the visual outputs are in the form of illuminations generated by a light source such as an LED, the first visual output may be a first colour, and the second visual output may be a second colour. The visual outputs may include flashing lights or moving lights. In those cases the frequency with which the lights flash, or speed with which the lights move may vary depending on the value representing the property of the rotary motion.

[0038] A visual output may be in the form of a sequence of LEDs illuminating at different times, and may be referred to as an illumination sequence. In some embodiments, the rate at which the illumination sequence is displayed may vary depending on a value representing a property of the rotary motion, preferably the angular velocity. An illumination sequence may be selected so that, depending on the locations of each LED at a given time

as the device or device body is rotating, an image or animation is viewable, in the same manner as an image is created by a dot-matrix display. By adjusting the illumination sequence in response to the angular velocity, the correct proportions of the image or animation can be maintained.

[0039] In order to prevent leakage, it is preferred that the controller is configured to prevent the action of the heater when rotary motion is detected by the movement detection unit. Also, in some embodiments, the controller may only be configured to cause the visual feedback means to display a visual output when the heater is off.

[0040] The device may comprise a haptic feedback generation unit (e.g. an electric motor and a weight mounted eccentrically on a shaft of the electric motor).

[0041] The controller may be configured to wherein the processor is configured to identify an operation of the smoking substitute device; and control the visual feedback means, to illuminate the illumination region based on the operation of the smoking substitute device identified. It should be noted here, that "operation of the aerosol delivery device" refers not to the rotary motion referred to elsewhere, but actual use of the device as a smoking substitute device.

[0042] The controller may be configured to control the haptic feedback generation unit to generate the haptic feedback in response to the detection of movement of the system.

[0043] 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.

[0044] 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. The heating element may be used in a vaporiser to vaporise an aerosol precursor. The vaporiser may be housed in a vaporising chamber.

[0045] In a second aspect, there is provided an aerosol delivery system comprising an aerosol delivery device

according to the first aspect and a component for containing an aerosol precursor.

[0046] The component may be an aerosol-delivery (e.g. a smoking substitute) consumable i.e. in some embodiments the component may be a consumable component for engagement with the aerosol-delivery (e.g. a smoking substitute) device to form the aerosol-delivery (e.g. s smoking substitute) system.

[0047] The device may be configured to receive the consumable component. The device and the consumable component may be configured to be physically coupled together. For example, the consumable component may be at least partially received in a recess of the device, such that there is snap engagement between the device and the consumable component. Alternatively, the device and the consumable component may be physically coupled together by screwing one onto the other, or through a bayonet fitting.

[0048] Thus, the consumable component may comprise one or more engagement portions for engaging with the device.

[0049] The consumable component 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 (which may extend through the transverse plate of the lower portion of the insert). Thus, when the device is engaged with the consumable component, the electrical interface may be configured to transfer electrical power from the power source to a heating element of the consumable component. The electrical interface may also be used to identify the consumable component from a list of known types. The electrical interface may additionally or alternatively be used to identify when the consumable component is connected to the device.

[0050] The device may alternatively or additionally be able to detect information about the consumable component 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 component may include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the interface.

[0051] In other embodiments, the component may be integrally formed with the aerosol-delivery (e.g. a smoking substitute) device to form the aerosol-delivery (e.g. s smoking substitute) system.

[0052] In such embodiments, the aerosol former (e.g. e-liquid) may be replenished by re-filling a tank that is integral with the device (rather than replacing the consumable). 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).

[0053] The smoking substitute system may comprise an airflow path therethrough, the airflow path extending from an air inlet to an outlet. The outlet may be at a mouthpiece portion of the component. In this respect, a user

may draw fluid (e.g. air) into and along the airflow path by inhaling at the outlet (i.e. using the mouthpiece).

[0054] The airflow path passes the vaporiser between the air inlet to the air outlet.

5 **[0055]** The airflow path may comprise a first portion extending from the air inlet towards the vaporiser. The second portion of the airflow path passes through the vaporising chamber to a conduit that extends to the air outlet. The conduit may extend along the axial centre of the component.

10 **[0056]** References to "downstream" in relation to the airflow path are intended to refer to the direction towards the air outlet/outlet portion. Thus the second and third portions of the airflow path are downstream of the first portion of the airflow path. Conversely, references to "upstream" are intended to refer to the direction towards the air inlet. Thus the first portion of the airflow path (and the air inlet) is upstream of the second/third portions of the airflow path (and the air outlet/outlet portion).

15 **[0057]** References to "upper", "lower", "above" or "below" are intended to refer to the component when in an upright/vertical orientation i.e. with elongate (longitudinal/length) axis of the component vertically aligned and with the mouthpiece vertically uppermost.

20 **[0058]** The component may comprise a tank for housing the aerosol precursor (e.g. a liquid aerosol precursor). 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.

25 **[0059]** At least a portion of one of the walls defining the tank may be translucent or transparent.

30 **[0060]** The conduit may extend through the tank with the conduit walls defining an inner region of the tank. In this respect, the tank may surround the conduit e.g. the tank may be annular.

35 **[0061]** As discussed above, the air flow path passes the vaporiser between the air inlet to the air outlet. The vaporiser may comprise a wick e.g. an elongate wick which may have a cylindrical shape.

40 **[0062]** The wick may be oriented so as to extend in the direction of the width dimension of the component (perpendicular to the longitudinal axis of the component). Thus the wick may extend in a direction perpendicular to the direction of airflow in the airflow path.

45 **[0063]** The vaporiser may be disposed in the vaporising chamber. The vaporising chamber may form part of the airflow path.

50 **[0064]** The wick may comprise a porous material. A portion of the wick may be exposed to airflow in the airflow path. The wick may also comprise one or more portions in contact with liquid aerosol precursor stored in the tank. For example, opposing ends of the wick may protrude into the tank and a central portion (between the ends) may extend across the airflow path so as to be exposed to airflow. Thus, fluid may be drawn (e.g. by capillary action) along the wick, from the tank to the exposed portion of the wick.

[0065] 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 the 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 airflow along the airflow path. This vapour may subsequently cool to form an aerosol e.g. in the conduit.

[0066] In a third aspect there is provided a method of using the aerosol-delivery (e.g. smoking substitute) system according to the second aspect, the method comprising engaging the consumable component with an aerosol-delivery (e.g. smoking substitute) device (as described above) having a power source so as to electrically connect the power source to the consumable component (i.e. to the vaporiser of the consumable component). A fourth aspect of the invention provides a method of causing liquid to move around a consumable component of an aerosol-delivery system, the method including spinning the aerosol-delivery system on a surface to cause movement of the fluid by centripetal or centrifugal force. Optionally, the aerosol delivery system is the aerosol delivery system of the second aspect of the system.

[0067] 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

[0068] 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 component of the system;

Fig. 2A is a schematic of the components of the device;

Fig. 2B is a schematic of the components of the component;

Fig. 3 is a section view of the component;

Fig. 4 is a perspective view of the device, with the axes identified.

Fig. 5 is a cross-section of the device in a plane perpendicular to the longitudinal axis.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0069] 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.

[0070] 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 a component 104. The component 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 component. In such systems, a tank of the aerosol delivery system may be accessible for refilling the device.

[0071] In this example, the smoking substitute system 100 is a closed system vaping system, wherein the component 104 includes a sealed tank 106 and is intended for single-use only. The component 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 component 104, Fig. 1B shows the device 102 of the smoking substitute system 100 without the component 104, and Fig. 1C shows the component 104 of the smoking substitute system 100 without the device 102.

[0072] The device 102 and the component 104 are configured to be physically coupled together by pushing the component 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 component 104. In other examples, the device 102 and the component may be coupled by screwing one onto the other, or through a bayonet fitting.

[0073] The component 104 includes a mouthpiece (not shown in Fig. 1A, 1B or 1C) at an upper end 109 of the component 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 component 104 when a user inhales through the mouthpiece. The tank 106 containing e-liquid is located at the lower end 111 of the component 104.

[0074] 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 component 104 can be seen whilst the rest of the tank 106 is obscured from view when the component 104 is inserted into the cavity at the upper end 108 of the device 102.

[0075] 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 component 104 may identify itself to the device 102, via an electrical interface,

RFID chip, or barcode.

[0076] The lower end 110 of the device 102 also includes a charging connection 115, which is usable to charge a battery within the device 102. The charging connection 115 can also be used to transfer data to and from the device, for example to update firmware thereon.

[0077] Figs. 2A and 2B are schematic drawings of the device 102 and component 104. As is apparent from Fig. 2A, 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.

[0078] 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.

[0079] 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.

[0080] 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 component 104, the electrical interface 126 is configured to transfer electrical power from the power source 118 to the component 104 (i.e. upon activation of the smoking substitute system 100).

[0081] The electrical interface 126 may also be used to identify the component 104 from a list of known components. For example, the component 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 component 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 component 104 such that, when connected, the component 104 can identify itself to the device 102.

[0082] The additional components 128 of the device 102 may comprise the light 116 discussed above.

[0083] The additional components 128 of the device 102 also comprises the charging connection 115 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.

[0084] 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 con-

trolling the charging of the rechargeable battery. However, a battery charging control circuit could equally be located in the charging station (if present).

[0085] 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 component 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 component 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.

[0086] 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.

[0087] As shown in Fig. 2B, the component 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.

[0088] The electrical interface 130 of the component 104 may include one or more electrical contacts. The electrical interface 126 of the device 102 and an electrical interface 130 of the component 104 are configured to contact each other and thereby electrically couple the device 102 to the component 104 when the lower end 111 of the component 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 component 104.

[0089] 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.

[0090] 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 component 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 component 104.

[0091] 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.

[0092] An example of one of the one or more additional components 138 of the component 104 is an interface for obtaining an identifier of the component 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 component. The component 104 may, therefore include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the electronic interface in the device 102.

[0093] 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).

[0094] Fig. 3 is a section view of the component 104 described above. The component 104 comprises a tank 106 for storing e-liquid, a mouthpiece 136 and a conduit 140 extending along a longitudinal axis of the component 104. In the illustrated embodiment the conduit 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 conduit 140, such that the conduit 140 extends centrally through the tank 106.

[0095] A tank housing 142 of the tank 106 defines an outer casing of the component 104, whilst a conduit wall 144 defines the conduit 140. The tank housing 142 extends from the lower end 111 of the component 104 to the mouthpiece 136 at the upper end 109 of the component 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 component 104 is inserted into the device 102 (i.e. by contact with an upper edge of the device 102).

[0096] The tank 106, the conduit 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.

[0097] The mouthpiece 136 comprises a mouthpiece aperture 148 defining an outlet of the conduit 140. The vaporiser 132 is fluidly connected to the mouthpiece aperture 148 and is located in a vaporising chamber 156 of the component 104. The vaporising chamber 156 is downstream of the inlet 134 of the component 104 and is fluidly connected to the mouthpiece aperture 148 (i.e. outlet) by the conduit 140.

[0098] 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 cham-

ber 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 component 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.

[0099] In this way, the inner sleeve 154 projects into the tank 106 and seals with the conduit 140 (around the conduit 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 conduit 140, which may then be inhaled by a user.

[0100] Fig. 4 shows a perspective view of an embodiment of the device 102 engaged with the component 104 at the upper end 108. The device 102 includes a charging connection 115 at the lower end 110. The longitudinal, transverse, and third directions are also annotated onto the drawing.

[0101] The front surface 201 of the device body 200 is curved in the transverse dimension. The rear surface 202 of the device body 200 is curved in the transverse dimension. The curvatures of the front surface 201 and rear surface 202 are of the opposite sense to one another. Both front and rear surfaces 201, 202 are convex in the transverse dimension. This leads to a mandorla-/lemon-/eye-shaped cross sectional shape of the device body 200.

[0102] The front surface 201 and rear 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 front 201 or rear 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 1 millimetre.

[0103] As illustrated in Fig. 4, the transverse edges 205 extend substantially the full longitudinal length of the device body 200.

[0104] The front surface 201 of the device body 200 may include visual user feedback means.

[0105] Fig. 5 illustrates a schematic transverse cross section through the device 102 of Fig. 4, in accordance with an embodiment. The longitudinal, transverse, and third directions are also annotated onto the drawing. The front surface 201 and rear surface 202 are shown meeting at the transverse edges 205 on either side of the device body 200. The radius of curvature in the transverse dimension of the front surface 201 is equal to the radius of curvature in the transverse dimension of the

rear surface 202.

[0106] The radius of curvature of the front surface 201 may be between 10 and 15 mm.

[0107] 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.

[0108] 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.

[0109] 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%.

[0110] The words "preferred" and "preferably" are used herein refer to embodiments of the invention that may provide certain benefits under some circumstances. It is to be appreciated, however, that other embodiments may also be preferred under the same or different circumstances. The recitation of one or more preferred embodiments therefore does not mean or imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, or from the scope of the claims.

Claims

1. An aerosol delivery device including: a movement detection unit; a controller; and a visual feedback means, wherein: the movement detection unit is configured to detect rotary motion of the device about an axis, and to transmit a movement detection signal to the controller; and in response to receiving the movement detection signal, the controller is configured to cause the visual feedback means to display a visual output.
2. An aerosol delivery device according to claim 1, wherein a device body of the device is curved in a longitudinal direction such that a front surface of the device is convex with respect to a longitudinal axis

of the device.

3. An aerosol delivery device according to claim 2, wherein the front surface is also convex with respect to transverse axis of the device.
4. An aerosol delivery device according to any one of claims 1 to 3, wherein the movement detection unit is configured to detect rotary motion about a third axis which is perpendicular to a transverse axis and a longitudinal axis of the device.
5. An aerosol delivery device according to claim 4, wherein movement detection unit is configured to detect rotary motion about a central axis which is perpendicular to a transverse axis and a longitudinal axis of the device, and is located approximately halfway along the device in both the longitudinal and transverse directions.
6. An aerosol delivery device according to any one of claims 1 to 5, wherein the movement detection unit is configured to measure, detect, or determine a property of the rotary motion, and the movement detection signal includes movement data indicating the property of the rotary motion.
7. An aerosol delivery device according to claim 6, wherein the controller is configured to compare a value representing a property of the rotary motion with a predetermined threshold value, and only if it is determined that the value representing a property of the rotary motion exceeds the predetermined threshold, the controller may then cause the feedback means to output feedback.
8. An aerosol delivery device according to claim 7, wherein the predetermined threshold is determined based on an angular velocity or rate of rotation required to cause movement of liquid in a consumable component engageable with the aerosol delivery device, by centripetal or centrifugal force.
9. An aerosol delivery device according to any one of claims 1 to 8, wherein: if the property of the rotary motion is represented by any of a first range of values, the controller is configured to cause the feedback means to output a first type of feedback, and if the property of the rotary motion is represented by any of a second range of values, the controller is configured to cause the visual feedback means to output a second type of feedback.
10. An aerosol delivery device according to claim 9, wherein the feedback means is a visual feedback means configured to display a visual output, wherein the visual feedback means includes a light source, and wherein the visual output includes illumination

of the light source.

11. An aerosol delivery device according to claim 10, wherein the visual output includes flashing lights or moving lights, and wherein a frequency with which the lights flash, or a speed with which the lights move varies depending on a value representing a property of the rotary motion. 5
12. An aerosol-delivery system comprising a device according to any one of claims 1 to 11, and a component for containing an aerosol precursor. 10
13. A method of using the aerosol-delivery system of claim 12, the method comprising engaging the consumable component with an aerosol-delivery device having a power source so as to electrically connect the power source to the component. 15
14. A method of causing liquid to move around a consumable component of an aerosol-delivery system, the method including spinning the aerosol-delivery system on a surface to cause movement of the fluid by centripetal or centrifugal force. 20
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15. A method according to claim 14, wherein the aerosol delivery system is the aerosol-delivery system of claim 12, in which the component is engaged with the aerosol delivery device. 30

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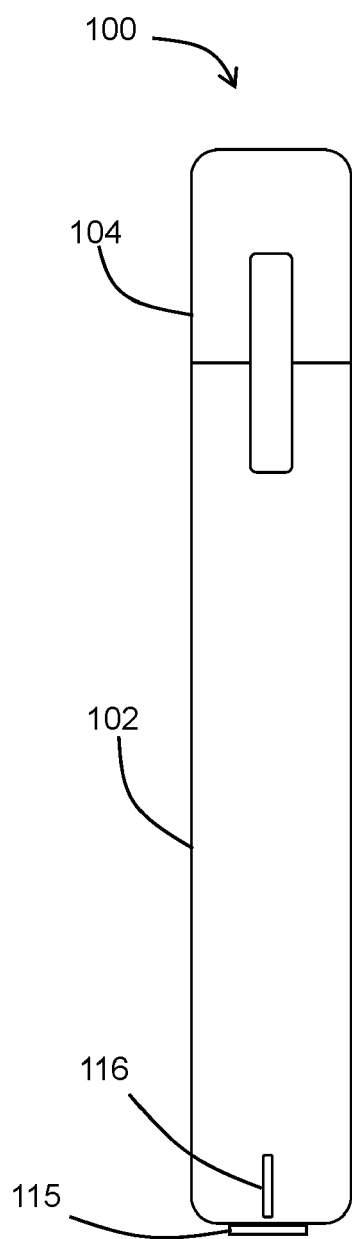


FIG 1A

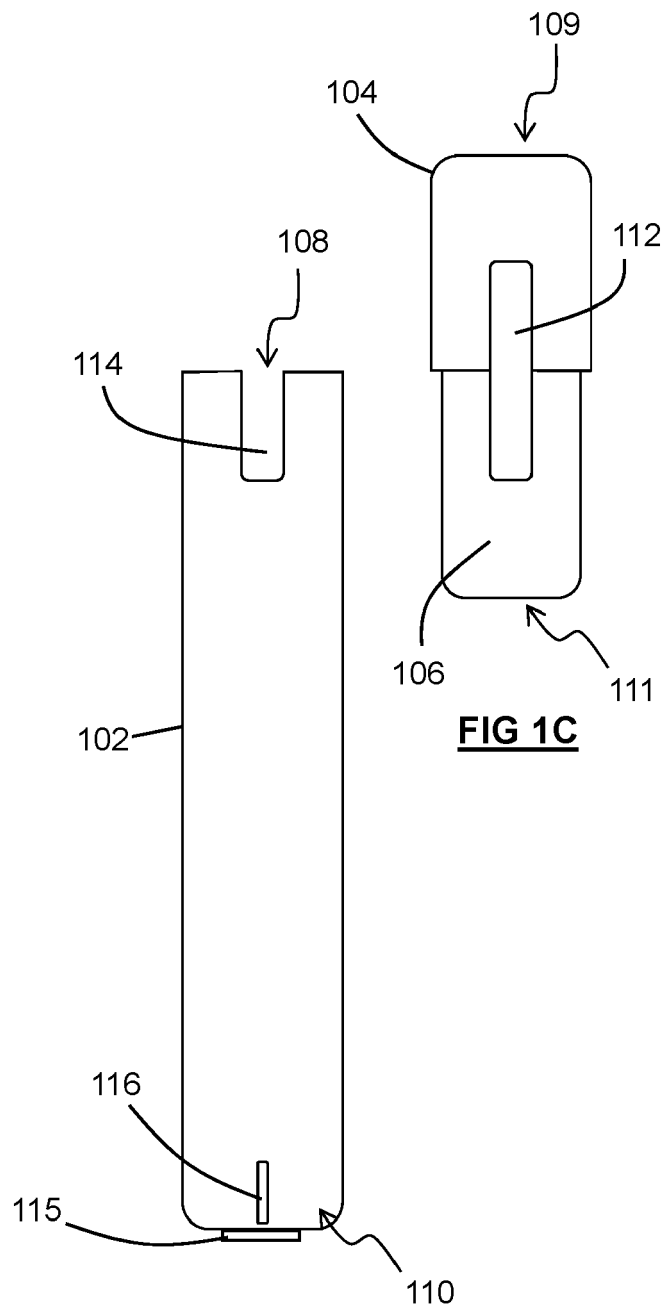


FIG 1C

FIG 1B

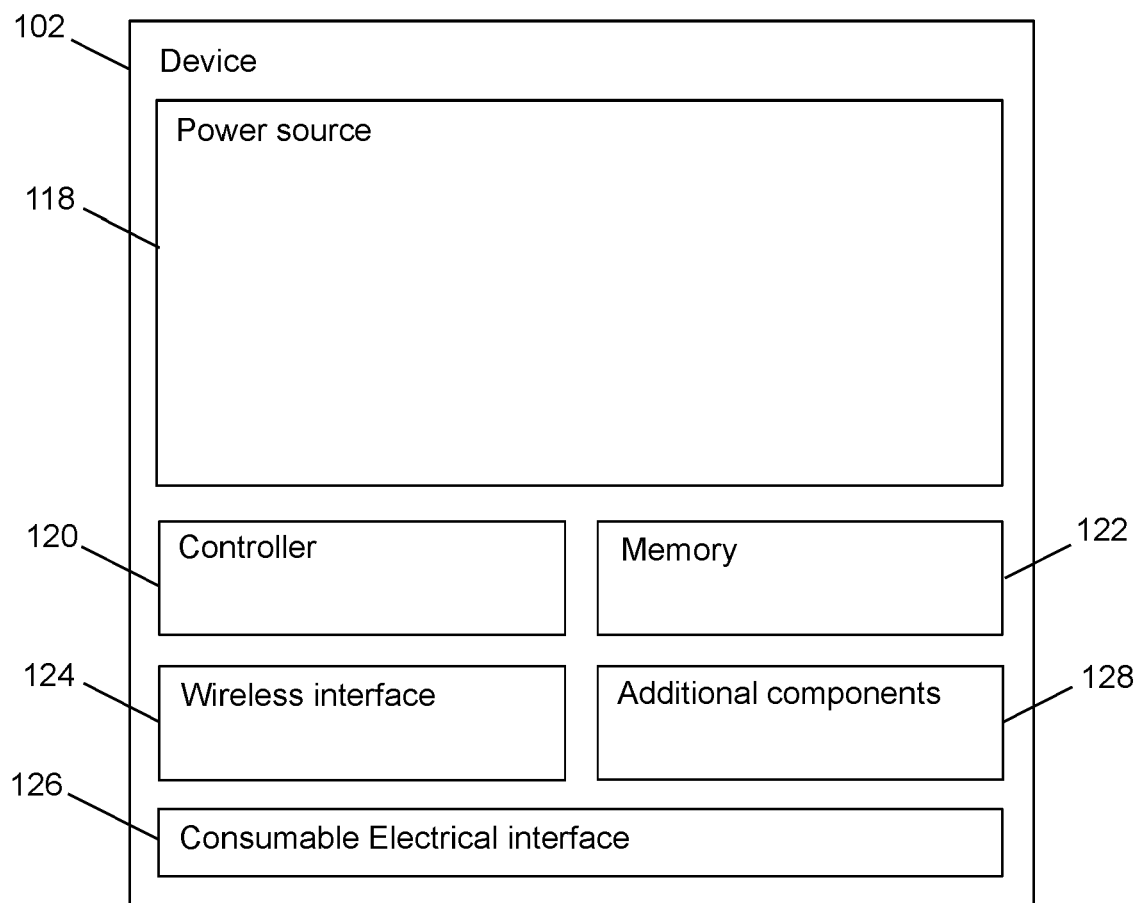


FIG 2A

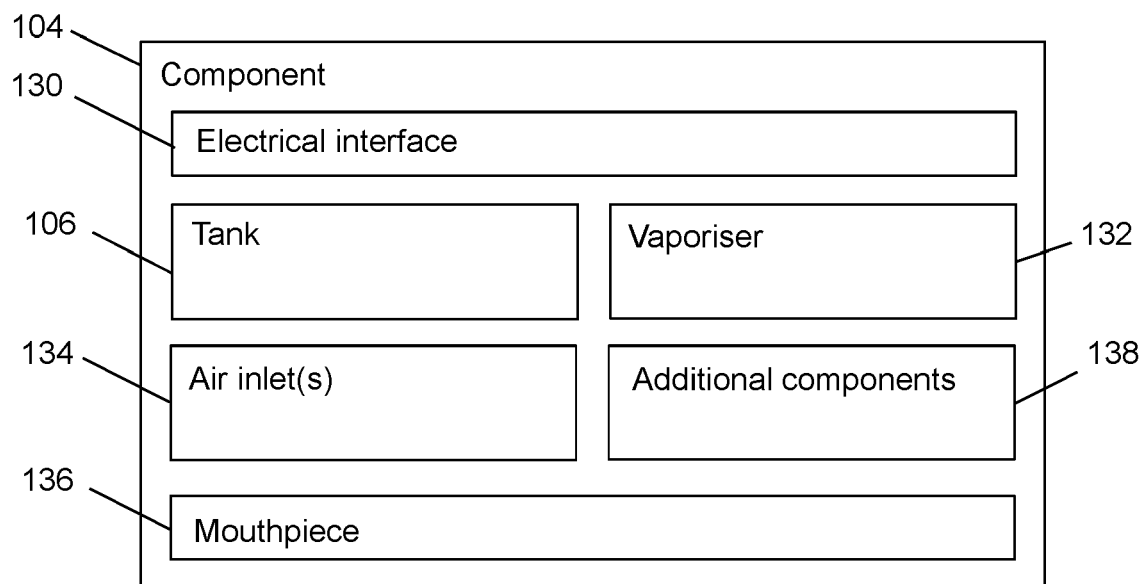


FIG 2B

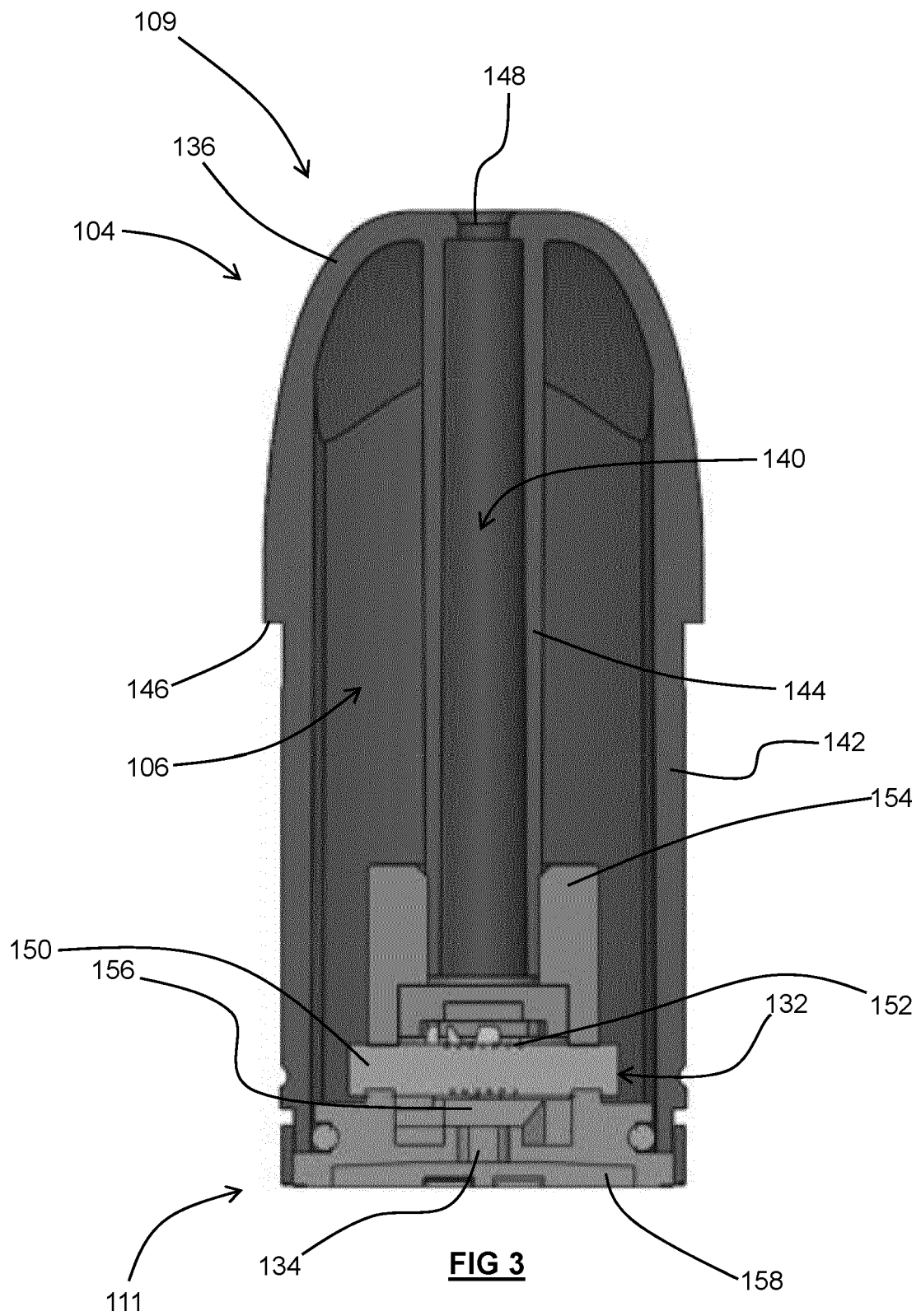
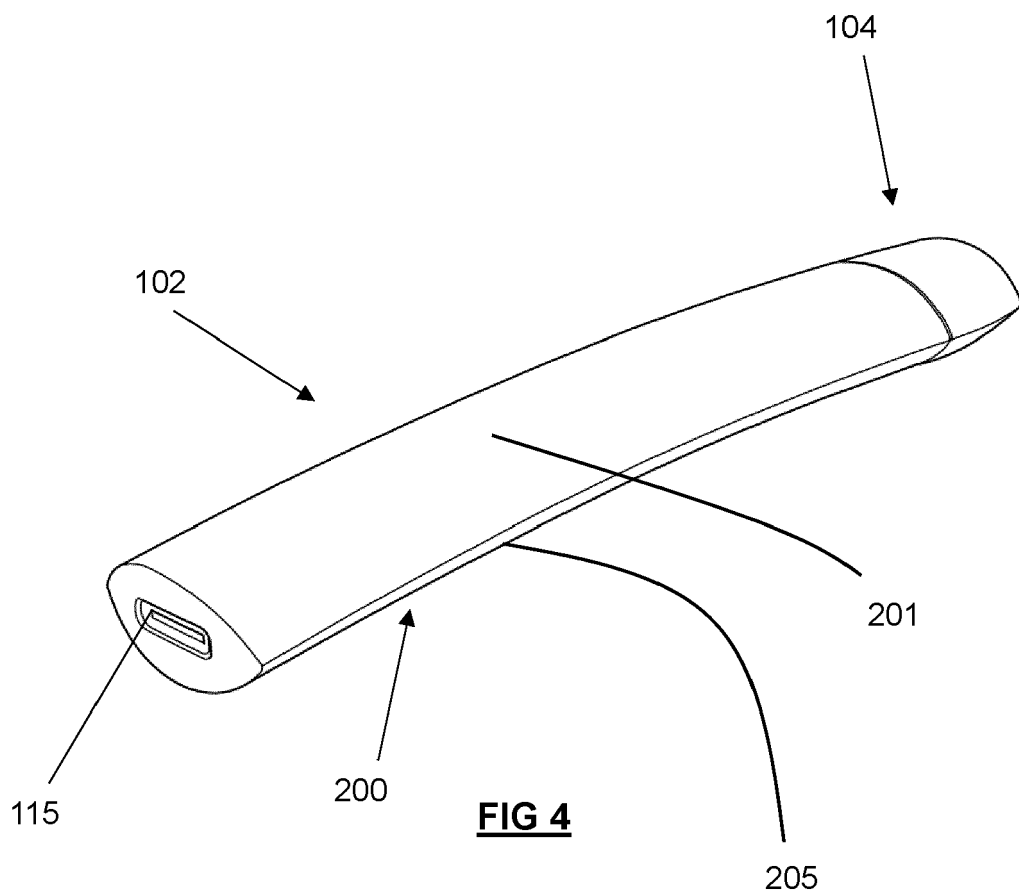
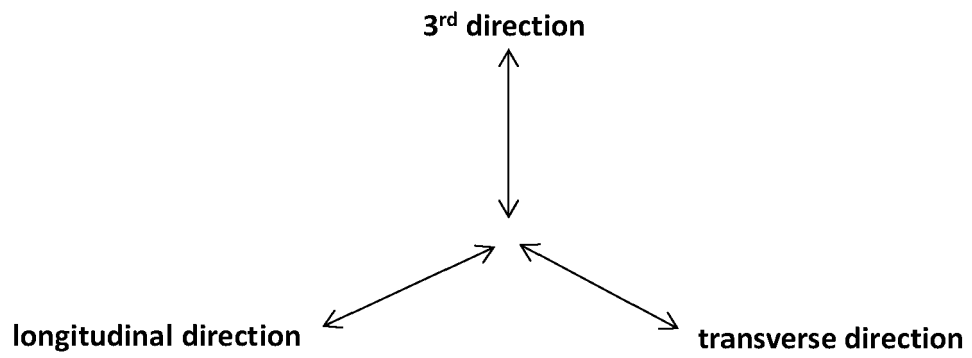


FIG 3



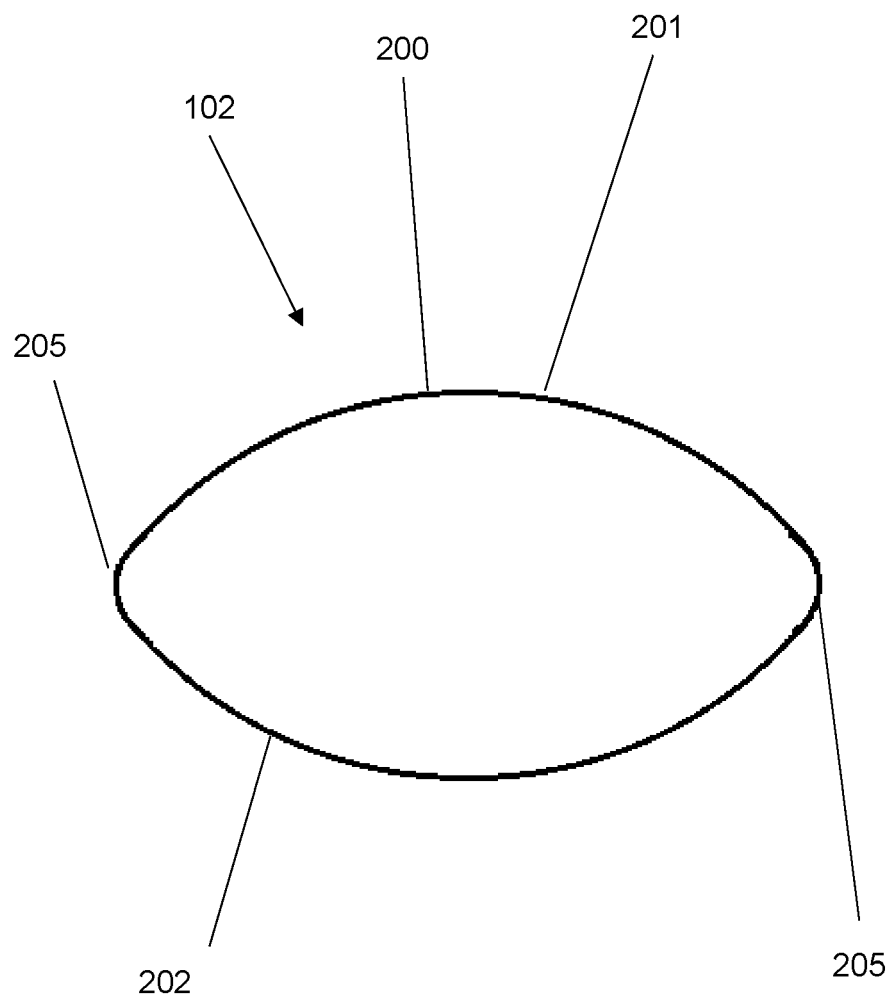
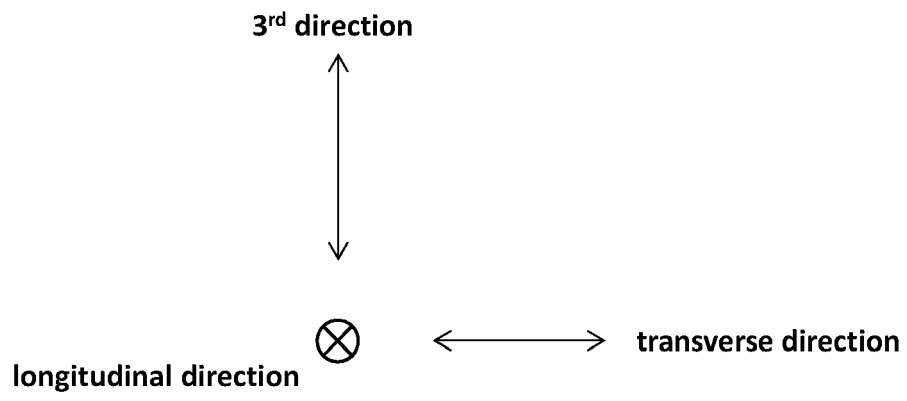


FIG 5



EUROPEAN SEARCH REPORT

Application Number
EP 19 21 8940

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