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

(57) The present disclosure relates to an aerosol delivery device and system e.g. a smoking substitute device and system. In particular an aerosol delivery device comprising: a movement detection unit configured to detect a movement of the device; a power source having a

charge status; and a feedback element configured to provide feedback based on the charge status of the power source wherein the feedback element provides feedback in response to a movement of the device detected by the movement detection unit.

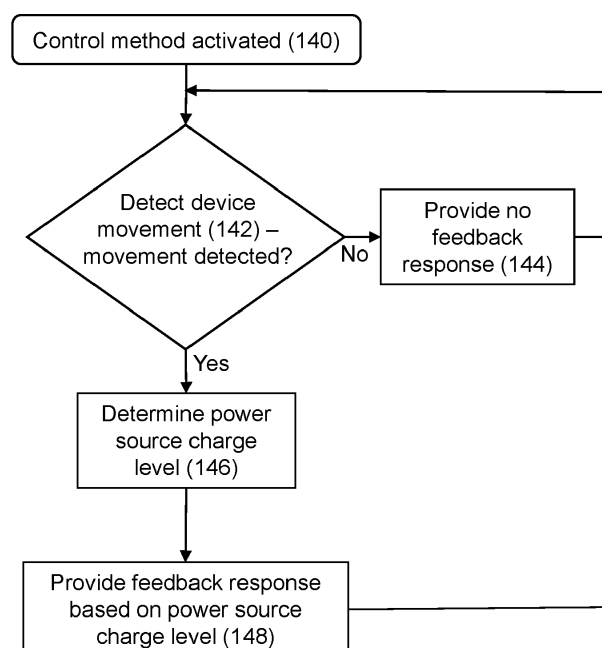


FIG 3

Description

Technical field

[0001] The present disclosure relates to an aerosol delivery device and an aerosol delivery system such as a smoking substitute device/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 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] It is known to provide smoking substitute systems with a means of indicating to the user the level of charge remaining within the power source within during use. This is typically provided by an LED which lights up during inhalation through the device. The user is not easily able to check the charge level when not inhaling on the device,

[0020] It is also known to provide a means of indicating to the user that the device is charging and this may also comprise an LED. For users who charge their devices overnight, the illuminated LED can provide an unwelcome light source.

[0021] Accordingly, there is a need for an improved aerosol delivery device/system which addresses at least some of the problems of the known devices and systems.

Summary

[0022] According to a first aspect, there is provided an aerosol delivery device (e.g. a smoking substitute device) comprising:

a movement detection unit configured to detect a movement of the device;
a power source having a level of charge; and
a feedback element configured to provide feedback based on the charge status of the power source wherein the feedback element provides feedback in response to a movement of the device detected by the movement detection unit.

[0023] Such a smoking substitute device can more easily indicate the charge status of the power source to the user, even when the device is not in use. In particular, the feedback element can provide useful information about the power source when the device is simply moved by the user. Thus, the feedback element ensures that status information, which is of key importance to the user, is easily and conveniently communicated without requiring activation of/inhalation upon the device.

[0024] Optional features will now be set out. These are applicable singly or in any combination with any aspect.

[0025] In some embodiments, the device may be configured to operate in a charging mode and the feedback element may be configured to provide feedback in response to the movement of the device when the device is in the charging mode e.g. only when the device is in the charging mode.

[0026] The feedback element may be configured to prohibit the provision of feedback when no movement is detected e.g. when the device is in the charging mode and no movement is detected. In this way, if the device is charged overnight, there is no light pollution unless the user chooses to move the device.

[0027] The feedback element is configured to provide feedback based on the charge status of the power source. The charge status may be indicative of the current level of charge of the power source, or a change (i.e. an increase or decrease) in the level of charge of the power source.

[0028] The movement detection unit may comprise an accelerometer. The movement detection unit may comprise one or more tilt switches and/or one or more g-sensors.

[0029] The movement detection unit may be configured to detect and/or measure a defined movement e.g. a defined movement having a movement parameter. The defined movement may be indicative of the device being picked up, tapped or moved by the user. The movement parameter may be indicative of an external force that is exerted upon the device. The feedback element may be configured to provide feedback when the movement parameter is above a predetermined movement threshold. The movement detection unit may be calibrated to avoid

unwanted activation of the feedback element, in order to ignore physical stimuli below the predetermined movement threshold. In this way, the movement detection unit may be configured to ignore extraneous and/or accidental device movements.

[0030] The feedback element may comprise a feedback controller configured to control the feedback element. Detection of a defined movement (e.g. a defined movement having a movement parameter above the predetermined movement threshold) may cause the movement detection unit to generate a signal which is detected by the controller which, in turn, is configured to send a signal to cause the feedback element to provide feedback relating to the current charge status of the power source.

[0031] The feedback element may comprise at least one visual feedback element configured to provide visual feedback to the user.

[0032] The visual feedback element may comprises at least one light source, for example one or more lights e.g. one or more LEDs. The feedback controller may be configured to control the light source to produce illuminations having different colours and/or intensities and/or durations, in order to indicate a change in the charge level of the power source.

[0033] The visual feedback element (e.g. the light source) may be controlled (e.g. by the feedback controller) to produce a first illumination when the level of charge of the power source is above a first predetermined charge threshold (e.g. above 50% charge level), and produce a second illumination when the level of charge is below the charge threshold. By varying the illumination based on the determined charge level of the power source, the feedback element can provide an intuitive means of indicating the charge level to the user.

[0034] The light source may be controlled so that the first and second illuminations are different colours. The light source may be controlled so that the first and second illuminations are of different intensities. The light source may be controlled so that at least one of the first and second illuminations comprises a pulsed illumination. The light source may be controlled so that the first illumination is pulsed at a first frequency and the second illumination is pulsed at a second frequency, wherein the first pulse frequency is greater than the second pulse frequency.

[0035] The visual feedback element (e.g. the light source) may be controlled (e.g. by the feedback controller) to produce a third illumination when the power source charge level is substantially full i.e. at substantially 100%.

[0036] The visual feedback element (e.g. the light source) may be controlled (e.g. by the feedback controller) to produce a fourth illumination when the power source charge level is below a second predetermined charge threshold (e.g. around 20% charge level) which is less than the first predetermined charge threshold.

[0037] The third and/or fourth illumination(s) may be different colours and/or intensities and/or may pulse for different durations than each other and then the first and

second illuminations.

[0038] By way of example, the visual feedback element (e.g. light source) may be controlled (e.g. by the feedback controller), when the charge status of the power source is at substantially 100%, to provide the third illumination comprising a green illumination e.g. solid, or continuous, green illumination. When the charge status of the power source is substantially between 50% and 99%, then the light source may be controlled provide the first illumination comprising a pulsed green light. In situations where the charge status of the power source is substantially between 20% and 50%, the light source may be controlled to provide the second illumination comprising a pulsed yellow light. When the charge status of the power source is substantially between 0% and 19%, then the light source may be controlled to produce the fourth illumination comprising a pulsed red illumination.

[0039] The feedback element may be configured to provide feedback for a predetermined period of time (e.g. 10 seconds, or 5 seconds or 3 seconds) before turning off. The predetermined period of illumination may be calibrated so that the user, having identified that the device is charging, can return to sleep quickly without being disturbed by continued illumination from the device. By turning off the feedback response after a period of time, the feedback element may also increase the user's perception that the device is not using power on extraneous functionalities, which is important to a user of such devices.

[0040] The device further comprises the source of power which may be a battery. The source of power may be a capacitor. The power source may be a rechargeable power source. The device may comprise a charging connection for connection to an external power supply for recharging of the power source within the device.

[0041] The visual user feedback element may be arranged at the front and/or rear surface of the device body. In some embodiments, the device body may include an illumination region configured to allow light provided by the visual user feedback element (e.g. one or more lights/LEDs) within the device body to shine through.

[0042] The feedback element may comprise a haptic feedback generation unit (e.g. an electric motor and a weight mounted eccentrically on a shaft of the electric motor), configured to provide haptic feedback based on the charge status of the power source.

[0043] The device may include a controller. The controller may comprise, or be defined by, the feedback controller which is configured to control the operation of the feedback element.

[0044] The controller may be configured to identify an operation of the device; and control the one or more lights contained within the device body, (e.g. to illuminate the illumination region) based on the charge status of the power source.

[0045] 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 device by the movement detection unit.

[0046] 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. As discussed above, the visual feedback may be selected from a plurality of different visual feedback responses (i.e. illuminations) which may be stored in the memory.

[0047] 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.

[0048] The device may comprise an airflow (i.e. puff) sensor 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.

[0049] The controller may control power supply to a vaporiser in response to airflow detection by the sensor. The control may be in the form of activation of the vaporiser in response to a detected airflow.

[0050] The device may comprise an electrical connection (e.g. one or more contact pins) for connection of the power source to the vaporiser.

[0051] The device may comprise a chassis within the device body and one or more of the electrical components of the device (e.g. one or more of the power source, charging connection, visual feedback element, movement detection unit, haptic feedback generation unit, controller, memory, wireless interface, puff sensor and/or electrical connection) may be mounted on or affixed to the chassis.

[0052] The device may comprise a device body for housing the power source and/or other electrical components. 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.

[0053] 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.

[0054] The device body may have a front surface that is curved in the transverse dimension. The device body may have a rear surface that is curved in the transverse dimension. 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 dimension. They may have an equal radius of curvature.

[0055] 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.

[0056] 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.

[0057] 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.

[0058] 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.

[0059] The device body may have a curved longitudinal axis i.e. curved in a direction between the front and rear faces.

[0060] In a second aspect, there is provided an aerosol delivery system comprising a device according to the first aspect and a component for containing an aerosol precursor.

[0061] 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. a smoking substitute) system.

[0062] 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.

[0063] Thus, the consumable component may comprise one or more engagement portions for engaging with the device.

[0064] The consumable component may comprise a vaporiser. The vaporiser may comprise a heating element. Alternatively, the vaporiser may comprise an ultrasonic or flow expansion unit, or an induction heating system.

[0065] 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 the vaporiser (e.g. 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.

[0066] 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.

[0067] 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.

[0068] 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).

[0069] The smoking substitute system may comprise an airflow path therethrough, the airflow path extending from an air inlet to an outlet. The air inlet may be provided in the device body. 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 portion).

[0070] The airflow path passes the vaporiser between the air inlet and the outlet. The vaporiser may be provided in the component.

[0071] The airflow path may comprise a first portion extending from the air inlet towards the vaporiser. A second portion of the airflow path passes through the vaporising chamber to a conduit that extends to the outlet. The conduit may extend along the axial centre of the component.

[0072] References to "downstream" in relation to the airflow path are intended to refer to the direction towards the outlet/mouthpiece portion. Thus the second portion of the airflow path is 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 portion of the airflow path (and the outlet/mouthpiece portion).

[0073] 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.

[0074] The component may comprise a tank for hous-

ing 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.

[0075] At least a portion of one of the walls defining the tank may be translucent or transparent.

[0076] 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.

[0077] As discussed above, the air flow path passes the vaporiser between the air inlet and the outlet. The vaporiser may comprise a wick e.g. an elongate wick which may have a cylindrical shape.

[0078] 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.

[0079] The vaporiser may be disposed in the vaporising chamber. The vaporising chamber may form part of the airflow path.

[0080] 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.

[0081] 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.

[0082] 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).

[0083] 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

[0084] 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 electrical components of the device;
- Fig. 2B is a schematic of the parts of the component; and
- Fig. 3 is a flow chart of a method of operating the device.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0085] 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.

[0086] 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.

[0087] 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.

[0088] 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.

[0089] The component 104 includes a mouthpiece portion at an upper end 109 of the component 104, and one or more air inlets (not shown) in fluid communication with the mouthpiece portion such that air can be drawn into

and through the component 104 when a user inhales through the mouthpiece portion. The tank 106 containing e-liquid is located at the lower end 111 of the component 104.

[0090] 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. Whilst not shown, the component 104 may identify itself to the device 102, via an electrical interface, RFID chip, or barcode.

[0091] The device 102 includes a feedback element configured to provide feedback to the user relating to the operating condition of the device 102. In particular, the feedback element is a visual feedback element, configured to provide visual feedback based on the charge status of a power source of the device 102, as will be described in more detail below.

[0092] The visual feedback element comprises a source of light 116 arranged at the lower end 110 of the device 102. The source of light 116 is located behind a small translucent cover which defines an illumination region of the device 102. The light 116 is, in this example, one or more light emitting diodes (LED) which are operable in a combination of colours. The light 116 is configured to illuminate when the smoking substitute system 100 is activated. Additionally, or alternatively, the visual feedback element 116 may comprise a liquid crystal display (LCD) which may be arranged behind the translucent cover (or alternatively, may be present as an outermost surface of the main body).

[0093] 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 light 116 is present on the larger surface of the main body, and components supporting the light 116 (wires etc. for the LEDs) may be positioned within the thinner void region of the interior surface (i.e. towards the lateral sides thereof).

[0094] The device 102 includes a movement detection unit configured to detect physical stimulus, in particular a movement of the device 102. The movement detection unit comprises one or more accelerometers which are configured to detect and measure the movement of the device 102. Alternatively, or in addition, the movement detection unit may comprise one or more tilt switches and/or one or more g-sensors. In this way, the movement detection unit is arranged to sense a purposeful movement of the device 102 by the user.

[0095] The movement detection unit is configured to detect device movements which are indicative of the device 102 being picked up, tapped or moved, by a user. Such physical stimuli may be detectable even without direct contact between the user and the device 102. In

some embodiments, the physical stimulus from the user may be a tap or shake of the device, a sequence of taps or shakes, or a movement of the device to a particular orientation or along a specified motion path.

[0096] 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.

[0097] 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.

[0098] The power source 118 is preferably a battery, more preferably a rechargeable battery. The power source 118 is arranged to hold a level of charge, which defines a capacity to store electrical power. The power source 118 is provided with a charge determination unit which is configured to determine the level of charge of the power source 118, i.e. the battery level.

[0099] 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.

[0100] 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.

[0101] 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).

[0102] 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.

[0103] The additional components 128 of the device 102 comprise at least one feedback element configured

to provide feedback to the user based on the current operating state of the device 102. The feedback element comprises a visual feedback element, such as the source of light 116 discussed above. The additional components 128 of the device 102 further comprise a movement detection unit configured to detect movement of the device 102, and a charge determination unit configured to determine the level of charge of the power source, as described above.

[0104] In operation, the feedback element is configured to provide feedback based on the charge level of the power source. In particular, the feedback element is controlled to provide the feedback in response to a movement of the device 102 being detected by the movement detection unit.

[0105] In this way, when the device 102 is picked up by the user (ortapped, or moved in any way), the feedback element will indicate useful information about the battery. Thus, the feedback element ensures that the battery level information, which is of key importance to the user, is easily and conveniently communicated during normal use of the device 102. The user is, therefore, able to check the battery level status of the device 102 without having to provide a specific input (such as pressing a button). Furthermore, by implementing the battery level status indication as part of a standard action of the user (i.e. picking device up), the task of checking the battery status can be encompassed in a simple subconscious act of the user.

[0106] An exemplary method of operating the device 102 will now be described with reference to Fig. 3, which illustrates a flow chart of the corresponding method steps. The method steps are stored as a set of executable instructions on the memory 122 of the device 102. The controller 120 is configured to implement the method in order to control the illumination of the light 116 in accordance with the method steps. In this way, the controller 120 defines a feedback controller of the feedback element.

[0107] The method commences with a first method step 140 in which the charge mode of the device 102 is activated by the user by connecting the device 102 up to an external power source. In a second method step 142, the movement detection unit senses for a movement of the device 102. If no movement is detected, then the feedback element is configured not to provide feedback (i.e. the light 116 is not activated). If a movement is detected, then the method proceeds to a third method step 144 in which the charge level determining unit determines the charge level of the battery. In a final method step 146, the feedback element is configured, in response to the detected movement of the device 102, to provide a feedback response based on the determined charge level of the battery.

[0108] According to the above described method, the feedback element is configured to only provide feedback when the device 102 is operating in a charging mode, i.e. when the battery is undergoing a charging operation.

Alternative exemplary methods of operating the device 102 may be activated in dependence on additional and/or alternative stimuli, such as the device 102 being switched on by the user.

[0109] The movement detection unit can be calibrated to exclude unwanted vibrations which do not correspond to a deliberate movement of the device by the user. For example, the accelerometer may be configured to ignore vibrations which may be transmitted, for example, through a table on which the device 102 is resting. The calibration of the movement detection unit ensures that the feedback element is only activated at an appropriate time, thereby reducing unwanted distractions for the user. In this way, the calibration of the movement detection unit reduces extraneous illuminations of the light 116 which would otherwise drain power from the battery.

[0110] The movement detection unit is configured to measure a movement parameter, such as an external force that is exerted upon the device 102. The movement detection unit is configured to compare the measured movement parameter with a predetermined threshold value. The predetermined threshold value represents a movement parameter value which corresponds to a minimum level of device movement that would require activation of the feedback element. Thus, the movement detection unit is calibrated to avoid unwanted activation of the feedback element, in order to ignore physical stimuli below a predetermined level.

[0111] In an exemplary arrangement of the device 102, the device is operated in a charging mode. In particular, the feedback element is configured such that it doesn't provide feedback when the device 102 is charging and when no device movement is detected. To achieve this, the feedback element is configured to identify that the device 102 is undergoing a charging operation (e.g. the power source is receiving and storing power) and, in response to a detected device movement, provide feedback based on the charge status of the power source. The controller 120 receives a charge status signal from the charge determination unit indicating that the power source is being charged.

[0112] The charge status signal is indicative of an increase in the charge level of the battery. Upon determining that the battery is being charged, the controller 120 then waits to receive a movement signal indicative of device undergoing a movement event (e.g. through activation of the accelerometer). Upon determining that the device has been moved, the feedback element controls the light 116 to illuminate so as to indicate to the user that the device 102 is undergoing a charging operation. In this way, the light 116 is prohibited from illuminating when the battery is charging and when no device movement is detected.

[0113] In this way, the light 116 is set to an off configuration when the device 102 is being charged so as to prevent the light from emitting an unwanted illumination which could prove distracting to the user. It is common for a user to charge their device at night, whereupon the

device 102 may be placed near to the user (e.g. on a bedside table). By controlling the light 116 to only illuminate when a device movement is detected, the feedback element is configured to ensure that the light 116 does not disturb or distract the user when they are trying to sleep. If the user wishes to check whether the device is charging, they may pick-up the device 102. At which point, the detected movement of the device 102 will cause the feedback element to provide visual feedback to the user, informing them that the device 102 is being charged.

[0114] The feedback element is configured to provide feedback to the user for a predetermined period of time before turning off the illumination. In particular, the feedback controller controls the light 116 to turn off the illumination after three seconds. The predetermined period of illumination is calibrated so that the user, having identified that the device is charging, can return to sleep quickly without being disturbed by continued illumination from the device 102. Turning off the light 116 after a short illumination period also increases the user's perception that the device is not using battery power on extraneous functionalities, which is important to a user of such devices.

[0115] As well as notifying the user that the device is being charged, the feedback element can also be controlled to provide information relating to the current charge status of the battery. A detected movement of the device 102 will cause the light 116 to produce one of a list of selectable feedback responses to the user (i.e. different illuminations) in order to indicate the different charge states of the battery. For example, the light 116 may be controlled to produce illuminations having different colours, and/or intensities and/or durations, in order to indicate a change in the battery level.

[0116] The different illuminations are achieved by varying the output from the illuminated area of the device 102. In particular, the controller 120 is configured to control the illumination intensity of each LED and/or the activation of a plurality of LEDs, based on the determined charge status of the battery. Each of the different illuminations are selectable from a plurality of illuminations which are stored in the memory 122 of the controller 120.

[0117] During use, the feedback controller receives a charge status signal from the charge determination unit, indicating the current charge status of the battery. If the charge level of the battery is above a first predetermined charge threshold value, then the light 116 is controlled to produce a first illumination. If the battery level is below the threshold value then a second illumination is provided. The light 116 is controlled so that each of the first and second illuminations comprise different colours and/or have different illumination intensities. Each of the first and second illuminations may also comprise pulsed illuminations having different frequencies.

[0118] According to an exemplary arrangement of the device 102, when the battery level is 100%, the light 116 is controlled to provide a third illumination comprising a

solid, or continuous, green illumination. If the battery level is between 50% and 99%, then the light 116 is configured to provide a first illumination comprising a pulsed green light. In situations where the battery level is between 20% and 50% the light 116 is configured to provide a second illumination comprising a pulsed yellow light. Finally, when the battery level is between 0% and 19%, then the light 116 is controlled to produce a fourth illumination comprising a pulsed red illumination. Each of the above described illuminations are cancelled after three seconds of being initiated. In all of the above described exemplary operations of the device 102, the light 116 is controlled to only provide feedback in response to a detected movement of the device.

[0119] The feedback element is conveniently configured to output pulsed illuminations which increases the number and variety of the feedback responses that can be displayed to the user. For example, a single LED can be configured to pulse at different frequencies in order to provide variety of different feedback responses to the user. Accordingly, the provision of pulsed illuminations reduces the requirement to house different coloured LEDs within the device 102, which thereby lowers the cost and complexity of its manufacturer.

[0120] 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.

[0121] 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 a charging station (if present).

[0122] 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 portion 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.

[0123] 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.

[0124] 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 portion 136, and one or more additional components 138.

[0125] 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.

[0126] 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.

[0127] 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 portion 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.

[0128] 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 portion 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 portion 136.

[0129] 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.

[0130] 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).

[0131] 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.

[0132] 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.

[0133] 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%.

[0134] The words "preferred" and "preferably" are used herein refer to embodiments of the invention that may provide certain benefits under some circumstances. It is to be appreciated, however, that other embodiments may also be preferred under the same or different circumstances. The recitation of one or more preferred embodiments therefore does not mean or imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, or from the scope of the claims.

Claims

1. An aerosol delivery device, comprising:

a movement detection unit configured to detect a movement of the device;
a power source having a level of charge; and
a feedback element configured to provide feedback based on the charge status of the power source, wherein the feedback element provides feedback in response to a movement of the device being detected by the movement detection unit.

2. A device according to claim 1, the device having a charging mode, wherein the feedback element is configured to only provide feedback when the device is in the charging mode.

3. A device according to claim 1 or claim 2, the device having a charging mode, wherein the feedback element is configured to prohibit the provision of feedback when the device is in the charging mode and when no movement is detected.

4. A device according to any one of claims 1 to 3, wherein the movement detection unit is configured to detect a defined movement of the device by a user.

5. A device according to claim 4, wherein the defined movement is indicative of the device being picked up, and/or tapped and/or moved by the user.

6. A device according to any one of the preceding claims, wherein the movement detection unit is configured to determine a movement parameter and the feedback element is configured to provide feedback when the movement parameter is determined to be above a predetermined movement threshold.

7. A device according to any one of the preceding claims, the feedback element comprising a light source for emitting an illumination, wherein the light source is configured to produce a first illumination, when the level of charge of the power source is above a predetermined charge threshold, and a second illumination when the level of charge is below the charge threshold.

8. A device according to claim 7, wherein the first and second illuminations comprise different colours.

9. A device according to claim 7 or claim 8, wherein the first and second illuminations comprise different intensities.

10. A device according to any one of claims 7 to 9, wherein at least one of the first and second illuminations comprises a pulsed illumination.

11. A device according to claim 10, wherein the first illumination comprises a pulsed illumination having a first frequency, and the second illumination comprises a pulsed illumination having a second frequency, wherein the first pulse frequency is greater than the second pulse frequency.

12. A device according to any one of claims 7 to 11, wherein the device comprises a controller configured to control the feedback element to provide at least one visual feedback response, the at least one visual feedback response being selectable from a plurality of visual feedback responses which are stored in a memory.

13. A device according to any one of the preceding claims, wherein the feedback element is configured to provide feedback for a predetermined period of time before turning off.

14. A device according to claim 13, wherein the feedback element is configured to turn off the feedback after substantially three seconds.

15. An aerosol delivery system, comprising: an aerosol delivery device as defined in any one of claims 1 to 14, and a consumable component for receipt in the aerosol delivery device.

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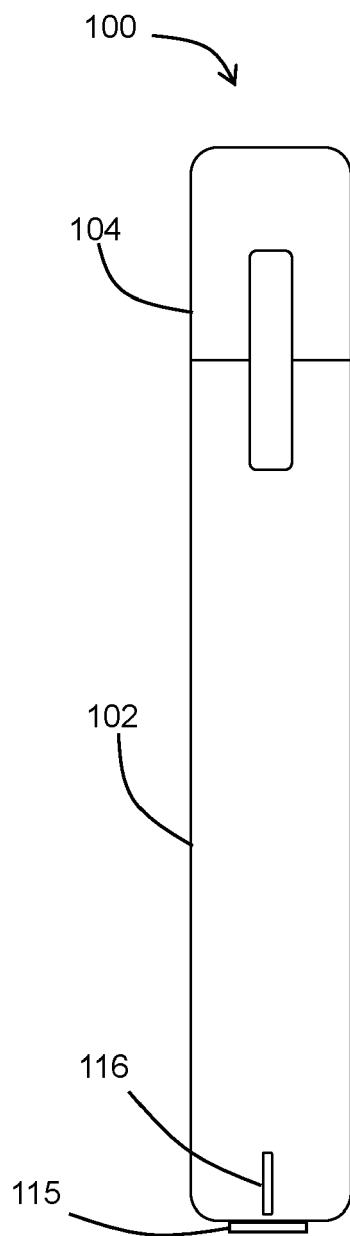


FIG 1A

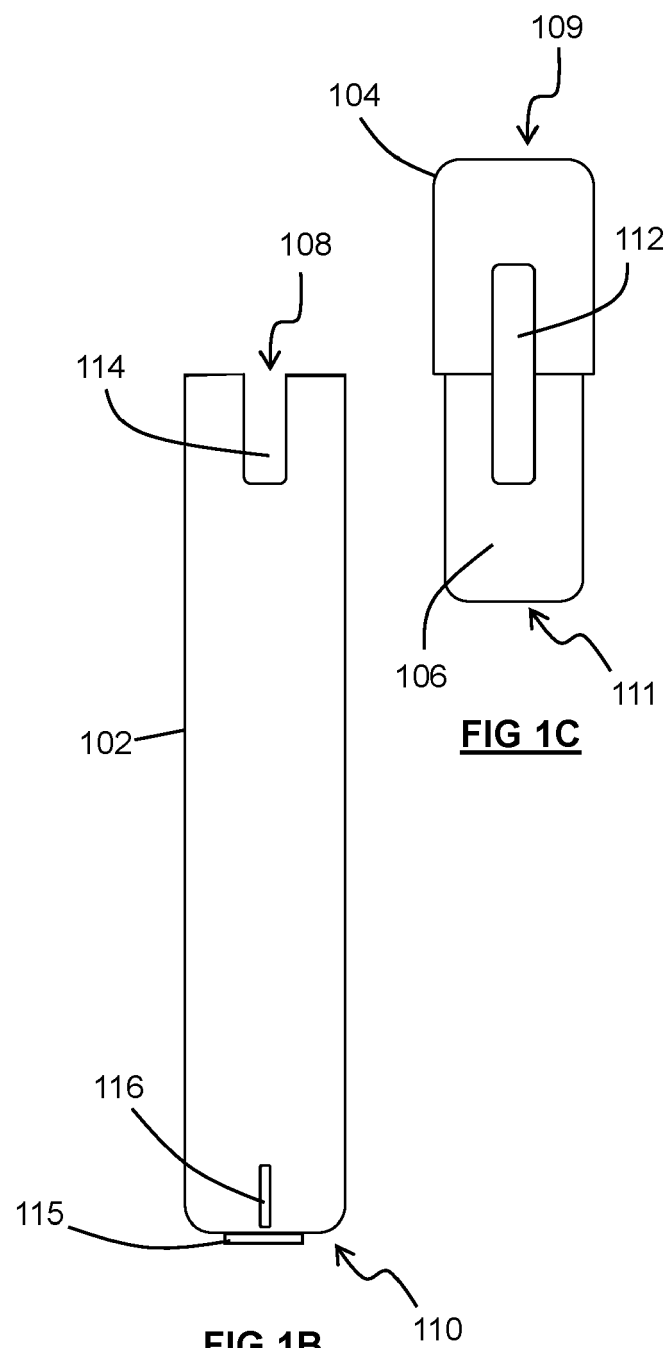


FIG 1C

FIG 1B

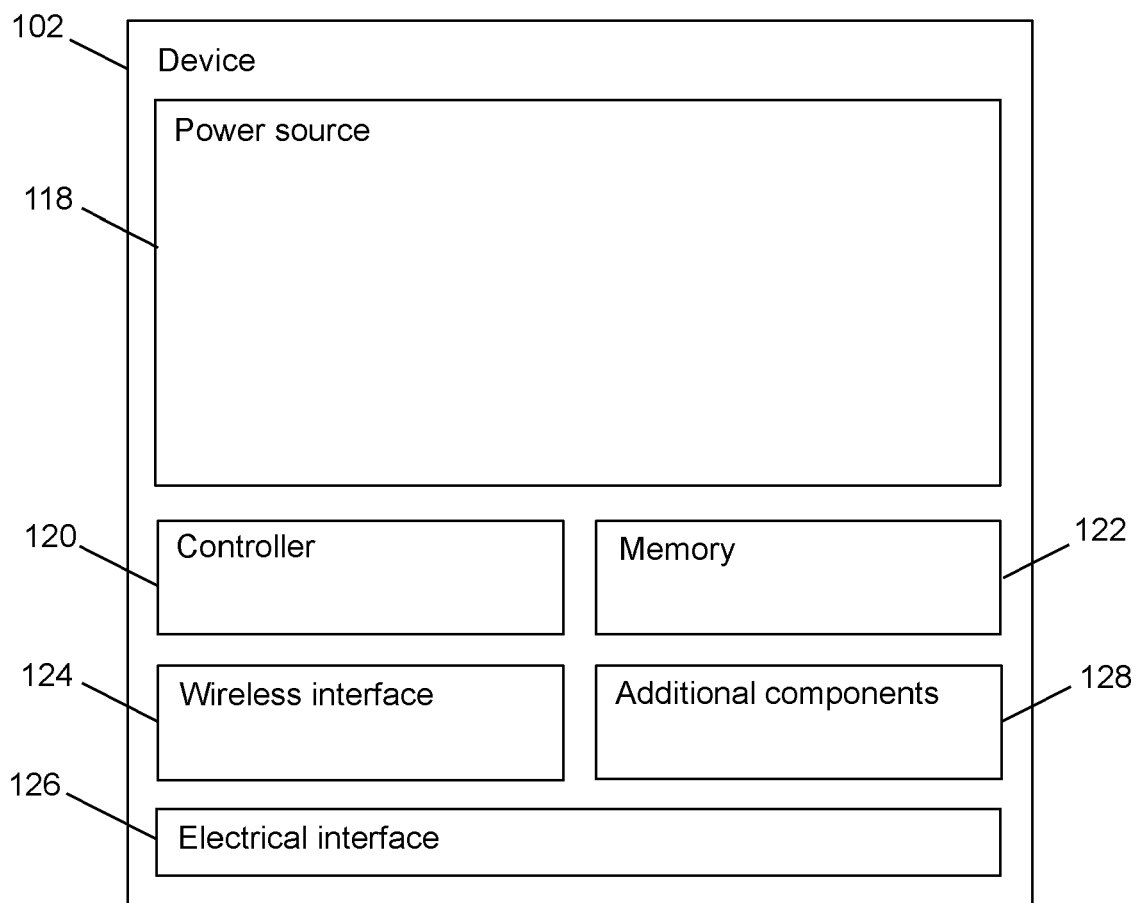


FIG 2A

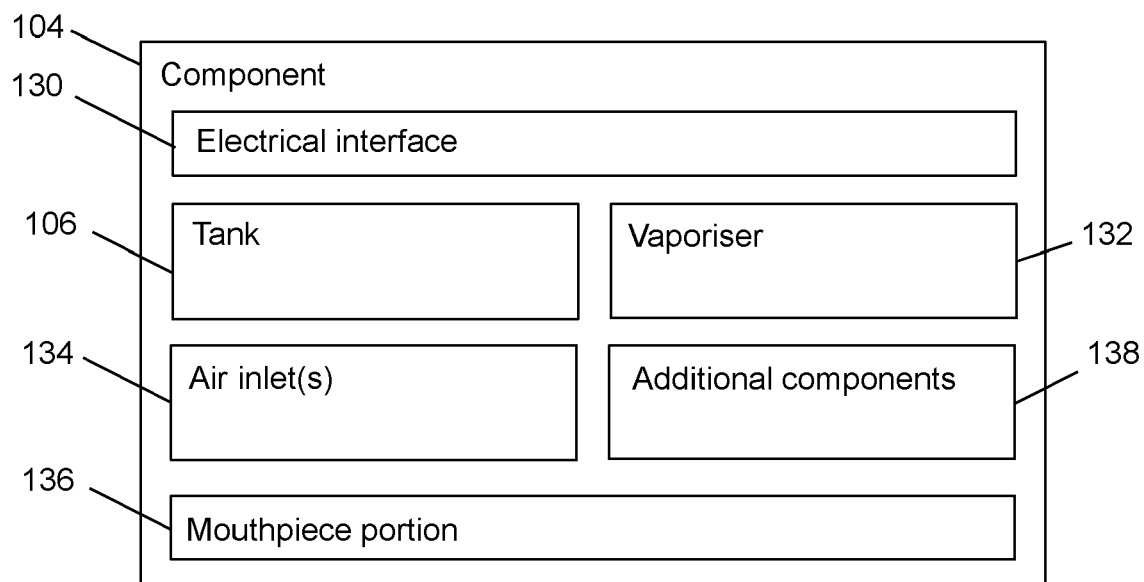
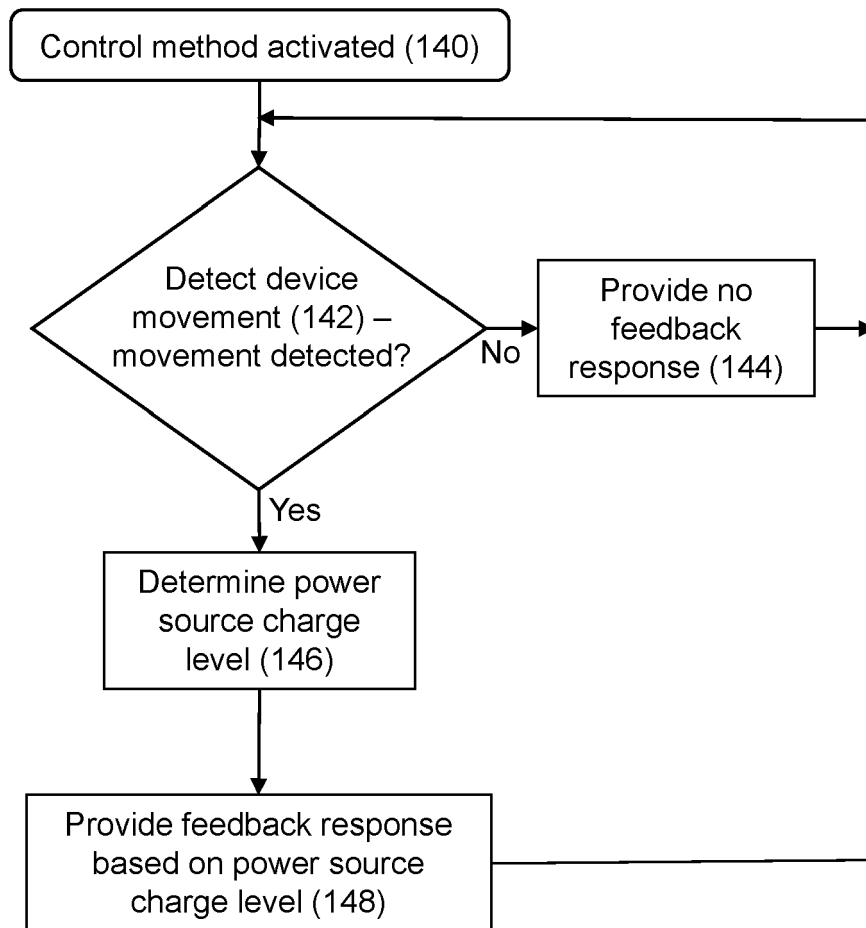


FIG 2B

**FIG 3**



EUROPEAN SEARCH REPORT

Application Number

EP 21 19 6938

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EPO FORM 1503 03.82 (P04C01)

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 2021/089855 A1 (NERUDIA LTD [GB]) 14 May 2021 (2021-05-14) * abstract * * figures 16-23 * * page 5 - page 28 * * page 53 - page 59 * -----	1-15	INV. A24F40/50 A24F40/60 H03K17/965
X	EP 3 838 025 A1 (NERUDIA LTD [GB]) 23 June 2021 (2021-06-23) * abstract * * figures 1-8 * * paragraphs [0018] - [0038], [0090] - [0098], [0119] - [0126] * -----	1-9, 12-15	
A	WO 2020/249789 A1 (NERUDIA LTD [GB]) 17 December 2020 (2020-12-17) * abstract * * figures A1-C5 * * page 12, line 15 - line 49 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A24F H03K
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 February 2022	Examiner Juvenelle, Cyril
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 19 6938

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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15-02-2022

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WO 2021089855 A1	14-05-2021	NONE	
EP 3838025 A1	23-06-2021	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82