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(71) Applicant: **NERUDIA LIMITED**
Liverpool Merseyside L24 9HP (GB)

(72) Inventor: **The designation of the inventor has not yet been filed**

(74) Representative: **Mewburn Ellis LLP**
Aurora Building
Counterslip
Bristol BS1 6BX (GB)

(54) **A SYSTEM AND METHOD FOR MANAGING A SMOKING SUBSTITUTE DEVICE**

(57) A smoking substitute device is configured to automatically reactivate a wireless communication mode upon sensing a puff operation. Typically, a wireless communication interface of the smoking substitute device is deactivated upon a deactivation command. After deactivation of the wireless communication interface, the wireless communication interface is configured to remain deactivated until a reactivation command. Here, the communication is reactivated by a puff sensor being arranged to detect a user operation to produce and inhale an aerosol. A control unit monitors the puff sensor and automatically reactivates the wireless communication interface to an active mode when the puff sensor detects a puff operation. Advantageously, the user is provided with a more user convenient operation as the functionality of the smoking substitute device when connected to an external device is automatically reactivated when the user initiates a puff operation without the user first having to recognise the smoking substitute device is in a deactivated mode and without the user having to undertake a separate input command to enter the active mode. Furthermore, by arranging a puff sensor to detect the puff operation of a user, the automatic reactivation command is a command that is unlikely to occur accidentally.

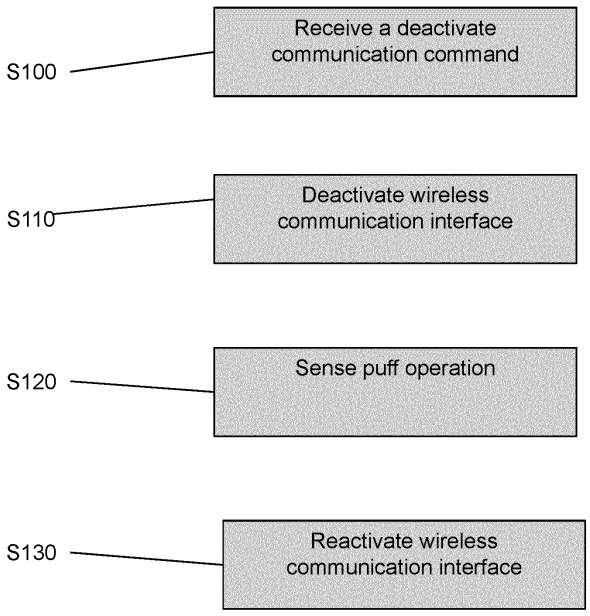

Fig. 5

EP 3 838 030 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a smoking substitute device and particularly, although not exclusively, to the management of the smoking substitute device when wirelessly connected to an external device.

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] Conventional combustible smoking articles, such as cigarettes, typically comprise a cylindrical rod of tobacco comprising shreds of tobacco which is surrounded by a wrapper, and usually also a cylindrical filter axially aligned in an abutting relationship with the wrapped tobacco rod. The filter typically comprises a filtration material which is circumscribed by a plug wrap. The wrapped tobacco rod and the filter are joined together by a wrapped band of tipping paper that circumscribes the entire length of the filter and an adjacent portion of the wrapped tobacco rod. A conventional cigarette of this type is used by lighting the end opposite to the filter, and burning the tobacco rod. The smoker receives mainstream smoke into their mouth by drawing on the mouth end or filter end of the cigarette.

[0004] Combustion of organic material such as tobacco is known to produce tar and other potentially harmful byproducts. There have been proposed various smoking substitute devices in order to avoid the smoking of tobacco.

[0005] Such smoking substitute devices can form part of nicotine replacement therapies aimed at people who wish to stop smoking and overcome a dependence on nicotine.

[0006] Smoking substitute devices may comprise electronic systems that permit a user to simulate the act of smoking by producing an aerosol (also referred to as a "vapour") that 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.

[0007] In general, smoking substitute devices are intended to provide a substitute for the rituals of smoking, whilst providing the user with a similar experience and satisfaction to those experienced with traditional smoking and tobacco products. Some smoking substitute systems use smoking substitute articles (also referred to as a "consumables") that are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end.

[0008] The popularity and use of smoking substitute devices has grown rapidly in the past few years. Although originally marketed as an aid to assist habitual smokers wishing to quit tobacco smoking, consumers are increasingly viewing smoking substitute devices as desirable lifestyle accessories. Some smoking substitute devices are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end. Other smoking substitute devices do not generally resemble a cigarette (for example, the smoking substitute device may have a generally box-like form).

[0009] There are a number of different categories of smoking substitute devices, each utilising a different smoking substitute approach. A smoking substitute approach corresponds to the manner in which the substitute system operates for a user.

[0010] One approach for a smoking substitute device is the so-called "vaping" approach, in which a vapourisable liquid, typically referred to (and referred to herein) as "e-liquid", is heated by a heating device to produce an aerosol vapour which is inhaled by a user. An e-liquid typically includes a base liquid as well as nicotine and/or flavourings. The resulting vapour therefore typically contains nicotine and/or flavourings. The base liquid may include propylene glycol and/or vegetable glycerin.

[0011] A typical vaping smoking substitute device includes a mouthpiece, a power source (typically a battery), a tank for containing e-liquid, as well as a heating device. In use, electrical energy is supplied from the power source to the heating device, which heats the e-liquid to produce an aerosol (or "vapour") which is inhaled by a user through the mouthpiece.

[0012] Vaping smoking substitute devices can be configured in a variety of ways. For example, there are "closed system" vaping smoking substitute devices which typically have a sealed tank and heating element which is pre-filled with e-liquid and is not intended to be refilled by an end user. One subset of closed system vaping smoking substitute devices include a main body which includes the power source, wherein the main body is configured to be physically and electrically coupled to a consumable including the tank and the heating element. In this way, when the tank of a consumable has been emptied, the main body can be reused by connecting it to a new consumable. Another subset of closed system vaping smoking substitute devices are completely disposable, and intended for one-use only.

[0013] There are also "open system" vaping smoking substitute devices which typically have a tank that is configured to be refilled by a user, so the device can be used multiple times.

[0014] An example vaping smoking substitute device is the myblu™ e-cigarette. The myblu™ e-cigarette is a closed system device which includes a main body and a consumable. The main body and consumable are physically and electrically coupled together by pushing the consumable into the main body. The main body includes

a rechargeable battery. The consumable includes a mouthpiece, a sealed tank which contains e-liquid, as well as a heating device, which for this device is a heating filament coiled around a portion of a wick which is partially immersed in the e-liquid. The device is activated when a microprocessor on board the main body detects a user inhaling through the mouthpiece. When the device is activated, electrical energy is supplied from the power source to the heating device, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0015] Another example vaping smoking substitute device is the blu PRO™ e-cigarette. The blu PRO™ e-cigarette is an open system device which includes a main body, a (refillable) tank, and a mouthpiece. The main body and tank are physically and electrically coupled together by screwing one to the other. The mouthpiece and refillable tank are physically coupled together by screwing one of the other, and detaching the mouthpiece from the refillable tank allows the tank to be refilled with e-liquid. The device is activated by a button on the main body. When the device is activated, electrical energy is supplied from the power source to a heating device, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0016] Another approach for a smoking substitute system 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. The vapour may contain nicotine and/or flavourings. In the HT approach the intention is that the tobacco is heated but not burned, i.e. the tobacco does not undergo combustion.

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

[0018] As the vapour passes through the consumable (entrained in the airflow) from the location of vaporisation to an outlet of the consumable (e.g. a mouthpiece), the vapour cools and condenses to form an aerosol for inhalation by the user. The aerosol will normally contain the volatile compounds.

[0019] In HT smoking substitute systems, heating as opposed to burning the tobacco material is believed to cause fewer, or smaller quantities, of the more harmful compounds ordinarily produced during smoking. Consequently, the HT approach may reduce the odour and/or health risks that can arise through the burning, combustion and pyrolytic degradation of tobacco.

[0020] There may be a need for improved design of smoking substitute systems, in particular HT smoking substitute systems, to enhance the user experience and improve the function of the HT smoking substitute system.

[0021] An example of the HT approach is the IQOS™ smoking substitute device from Philip Morris Ltd. The IQOS™ smoking substitute device uses a consumable, including reconstituted tobacco located in a wrapper. The consumable includes a holder incorporating a mouthpiece. The consumable may be inserted into a main body that includes a heating device. The heating device has a thermally conductive heating knife which penetrates the reconstituted tobacco of the consumable, when the consumable is inserted into the heating device. Activation of the heating device heats the heating element (in this case a heating knife), which, in turn, heats the tobacco in the consumable. The heating of the tobacco causes it to release nicotine vapour and flavourings which may be drawn through the mouthpiece by the user through inhalation.

[0022] A second example of the HT approach is the device known as "Glo"™ from British American Tobacco p.l.c. Glo™ comprises a relatively thin consumable. The consumable includes leaf tobacco which is heated by a heating device located in a main body. When the consumable is placed in the main body, the tobacco is surrounded by a heating element of the heating device. Activation of the heating device heats the heating element, which, in turn, heats the tobacco in the consumable. The heating of the tobacco causes it to release nicotine vapour and flavourings which may be drawn through the consumable by the user through inhalation. The tobacco, when heated by the heating device, is configured to produce vapour when heated rather than when burned (as in a smoking apparatus, e.g. a cigarette). The tobacco may contain high levels of aerosol formers (carrier), such as vegetable glycerine ("VG") or propylene glycol ("PG").

[0023] The present inventor(s) have observed that most smoking substitute devices currently on the market are configured to operate in isolation of other devices, which limits the functions the smoking substitute devices can perform.

[0024] If the smoking substitute device does not operate in isolation to other devices, it would be advantageous to provide the user with the ability to manage the smoking substitute device's wireless connection with effective user convenience.

[0025] The present invention has been devised in light of the above considerations.

Summary of the Invention

[0026] According to exemplary aspects, a smoking substitute device is configured to automatically reactivate a wireless communication mode upon sensing a puff op-

eration. Advantageously, by automatically reactivating the wireless communication mode, the user is provided with a more effective user convenience as the user does not have to initiate a separate manipulation or command input to reactivate the wireless communication mode and corresponding device functionality. Furthermore, by arranging a puff sensor to detect the puff operation of a user, the automatic reactivation command is a command that is unlikely to occur accidentally.

[0027] At their most general, the exemplary aspects provide a smoking substitute device and a method of managing the smoking substitute device wherein a wireless communication interface of the smoking substitute device is deactivated upon a deactivate communication action. The smoking substitute device may be deactivated via a connected external device and / or directly by a user input to the device. For instance, the external device may transmit a deactivate communication command. Here, the deactivate communication action is the smoking substitute device receiving the deactivate communication command. Additionally or alternatively, the smoking substitute device may include a motion sensor or an input actuator and the user may input commands directly to the smoking substitute device by replicating a specific motion or by actuating the actuator. Thus here the deactivate communication action is recognising the user input at the device as a predetermined user input to deactivate wireless transmission.

[0028] After deactivation of the wireless communication interface, the wireless communication interface is configured to remain deactivated until a reactivation command. In the exemplary aspects, the reactivation command is a user puff operation. Here a puff sensor is arranged to detect a puff operation, that is, the puff sensor detects a user manipulation of the smoking substitute device replicating a user operation to produce and inhale an aerosol. A control unit monitors the puff sensor and automatically reactivates the wireless communication interface to an active mode when the puff sensor detects a puff operation. Advantageously, the user is provided with a more user-convenient operation as the functionality of the smoking substitute device when connected to an external device is automatically reactivated when the user initiates a puff operation without the user first having to recognise the smoking substitute device is in a deactivated mode and without the user having to undertake a separate input command to enter the active mode.

[0029] Once deactivated, the wireless communication interface is configured to be in a deactivated mode wherein the wireless communication interface is prevented from sending data to an external device. Here, typically the smoking substitute device is configured to send data over a wireless communication link established between the wireless communication interface and an external device. Thus, in an active mode, the wireless communication interface is configured and controlled by the control unit to send data over the wireless communication link. Here, the data sending maybe a push operation, wherein the control unit pushes data to the external device. Additionally or alternatively, the data sending may be polled from the remote device. In either event, in the deactivated mode, the wireless communication interface is configured to be deactivated such that the smoking substitute device does not transmit wireless signals, for instance it does not transmit any signals over a wireless frequency. In contrast, in the active mode, the control unit is configured to transmit data over the wireless communication link to an external device to provide connected functionality to the smoking substitute device. Advantageously, the deactivated mode may be entered when it is not desired or allowed to have devices transmitting wireless signals, for instance in 'flight mode' when on an aeroplane.

[0030] In the active mode, the wireless communication interface is configured to send and receive data and commands to and from an external device. Suitably, the external device may be a smartphone, tablet, smartwatch or other suitable device. The control unit may complete a pairing operation to pair the smoking substitute device and external device or to otherwise verify the external device as a trusted external device that the smoking substitute device is authorised to receive and send transmissions from / to the external device. In exemplary embodiments, the external device sends a deactivate communication command to the smoking substitute device. Upon receiving the deactivate communication command at the wireless communication interface, the control unit controls the smoking substitute device to enter the deactivated mode. Typically, the external device suitably operates an application to control the communication with the smoking substitute device and to display the information to the user. The application suitably provides an input means through the application's graphic user interface to initiate the sending of a deactivate communication command.

[0031] It will be appreciated that in the exemplary embodiments, the wireless communication interface is configured to wirelessly communicate with an external device. Specifically, the wireless communication interface is arranged to establish a wireless communication link with the external device. Here, the wireless communication interface is configured to receive the deactivate command. That is, the wireless communication interface is configured to receive the deactivate communication command from the external device. Here, the wireless communication interface receives the deactivate communication command over the established wireless communication link. Typically, receiving the deactivate communication command is completed under the control of the control unit.

[0032] Suitably, the control unit executes firmware stored in the memory to control the wireless communication interface. For instance, the control unit controls storage of data in a memory and the receipt by the wireless communication interface of transmissions from the external device. The control unit suitably also controls

the sending of data to the external device, for instance the sending of data stored in the memory. Upon receiving a deactivate communication command via the wireless communication interface, the control unit is configured to deactivate operation of the wireless communication interface such that the smoking substitute device does not transmit a wireless signal even if requested to do so by a user operation or a poll request from an external device. That is, the control unit switches the wireless communication interface from the active mode to the deactivated mode. In other embodiments, the control unit may be configured to send poll requests periodically to the external device. Here, as will be appreciated, in the deactivated mode, the wireless communication link is blocked from or controlled not to poll the external device.

[0033] In some exemplary embodiments, as will be appreciated, the smoking substitute device comprises a power source to power the wireless communication interface and / or the control unit and / or the puff sensor arrangement. The power source, for instance a battery, and the other components of the smoking substitute device are suitably housed in a body of the smoking substitute device.

[0034] In an exemplary aspect there is therefore provided a smoking substitute device comprising the wireless communication interface and a control unit for switching the operation of the wireless communication interface between an active mode and a deactivated mode, wherein the smoking substitute device further includes a puff sensor.

[0035] Suitably, the puff sensor is arranged to sense a puff operation of the smoking substitute device. That is, the puff sensor is configured to detect a user manipulation of the smoking substitute device predetermined to trigger the production and subsequent inhalation of an aerosol. In some embodiments, the puff sensor comprises an airflow sensor. Here, the airflow sensor is arranged to detect air flow through the smoking substitute device. In use, the user inhales on the smoking substitute device and the airflow sensor detects the increase in airflow and determines a puff operation has been initiated. As will be appreciated, as well as activating a heating device as part of the puff operation, the control unit determines the increase in airflow as a puff operation and, if the wireless communication is in a deactivated mode, automatically switches the wireless communication interface to the active mode. Additionally or alternatively, the puff sensor may comprise an actuator. For instance the smoking substitute device may be configured to require the actuator to be activated to initiate a heating device to create the aerosol. Here, in addition to activating the heating coil as part of the puff operation, the actuator may be configured to signal the control unit. The signal to the control unit suitably initiates the control unit to switch the wireless communication interface to the active mode. It will be appreciated that the puff sensor may be triggered by other events of the puff operation, for instance when it is detected that the heating unit is activated, or where applicable a consumable is inserted or the like.

[0036] In one exemplary embodiment, the control unit may additionally be configured to switch the wireless communication interface from a deactivated mode to an active mode by receipt of a reactivate command. For instance the external device may provide a reactivate communication command input through the application and, in addition to the wireless communication interface being automatically woken up on a user puff operation, the smoking substitute device can have the wireless communication interface reactivated via the external device.

[0037] According to further exemplary aspects there is provided a system including a smoking substitute device according to previous aspects and an external device connectable to the smoking substitute device.

[0038] According to a further exemplary embodiment, there is provided a method of managing a smoking substitute device. The method comprises the steps of receiving at a wireless communication interface a command to switch the wireless communication interface to a deactivated mode. In the deactivated mode, the wireless communication interface is configure not to transmit a wireless transmission. The method further comprises automatically reactivating the wireless communication interface upon a puff sensor sensing a puff operation. For instance, the puff sensor senses a user manipulation to inhale through the smoking substitute device or to activate a heating unit.

[0039] As will be appreciated, in the exemplary embodiments, the method may initially or subsequently comprise using the smoking substitute device with the wireless communication module in an active mode wherein the wireless communication interface transmits a wireless signal. For instance the wireless communication interface transmits data over an established wireless link with an external device.

[0040] According to a further exemplary aspect, there is provided a method of managing a system comprising the method steps of managing the smoking substitute device and including the step of a user inputting a deactivate communication command into an external device and subsequently transmitting a deactivated command to the smoking substitute device, wherein on receiving the deactivate communication command the wireless communication interface enters a deactivated mode.

[0041] According to another exemplary aspect, there is provided a computer implemented method for managing a smoking substitute device to execute the previous method aspect or a computer-readable medium containing computer-readable instructions which, when executed by a processor, cause the processor to perform the precious method aspect.

[0042] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

[0043] The skilled person will appreciate that except where mutually exclusive, a feature or parameter de-

scribed in relation to any one of the above aspects may be applied to any other aspect. Furthermore, except where mutually exclusive, any feature or parameter described herein may be applied to any aspect and/or combined with any other feature or parameter described herein.

Summary of the Figures

[0044] Embodiments and experiments illustrating the principles of the invention will now be discussed with reference to the accompanying figures in which:

Figure 1 shows an example system for managing a smoking substitute device;

Figure 2(a) shows an example smoking substitute device for use as the smoking substitute device in the system of Fig. 1;

Figure 2(b) shows the main body of the smoking substitute device of Fig. 2(a) without the consumable;

Figure 2(c) shows the consumable of the smoking substitute device of Fig. 2(a) without the main body;

Figure 3(a) is a schematic view of the main body of the smoking substitute device of Fig. 2(a);

Figure 3(b) is a schematic view of the consumable of the smoking substitute device of Fig. 2(a);

Figure 4 is an example schematic view of a system for automatically reactivating a wireless communication interface upon a puff operation; and

Figure 5 is a flow chart of a method of automatically reactivating a wireless communication module on sensing a puff operation.

Detailed Description of the Invention

[0045] Aspects and embodiments of the present invention will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art. All documents mentioned in this text are incorporated herein by reference.

[0046] Fig. 1 shows an example system 1 for managing a smoking substitute device 10.

[0047] The system 1 as shown in Fig. 1 includes a mobile device 2, an application server 4, an optional charging station 6, as well as the smoking substitute device 10.

[0048] The smoking substitute device 10 is configured to communicate wirelessly, e.g. via Bluetooth™, with an application (or "app") installed on the mobile device 2, e. g. via a suitable wireless interface (not shown) on the mobile device 2. The mobile device 2 may be a mobile phone, for example. The application on the mobile phone is configured to communicate with the application server 4, via a network 8. The application server 4 may utilise cloud storage, for example.

[0049] The network 8 may include a cellular network and/or the internet.

[0050] In other examples, the smoking substitute device 10 may be configured to communicate with the application server 4 via a connection that does not involve the mobile device 2, e.g. via a narrowband internet of things ("NB-IoT") connection. In some examples, the mobile device 2 may be omitted from the system.

[0051] A skilled person would readily appreciate that the mobile device 2 may be configured to communicate via the network 8 according to various communication channels, preferably a wireless communication channel such as via a cellular network (e.g. according to a standard protocol, such as 3G or 4G) or via a WiFi network.

[0052] The app installed on the mobile device and the application server 4 may be configured to assist a user with their smoking substitute device 10, based on information communicated between the smoking substitute device 10 and the app and/or information communicated between the app and the application server 4. The app may run in the background to handle communication with the smoking substitute device.

[0053] The charging station 6 (if present) may be configured to charge (and optionally communicate with) the smoking substitute device 10, via a charging port on the smoking substitute device 10. The charging port on the smoking substitute device 10 may be a USB port, for example, which may allow the smoking substitute device to be charged by any USB-compatible device capable of delivering power to the smoking substitute device 10 via a suitable USB cable (in this case the USB-compatible device would be acting as the charging station 6). Alternatively, the charging station could be a docking station specifically configured to dock with the smoking substitute device 10 and charge the smoking substitute device 10 via the charging port on the smoking substitute device 10.

[0054] Fig. 2(a) shows an example smoking substitute device 110 for use as the smoking substitute device 10 in the system 1 of Fig. 1.

[0055] In this example, the smoking substitute device 110 includes a main body 120 and a consumable 150. The consumable 150 may alternatively be referred to as a "pod".

[0056] In this example, the smoking substitute device 110 is a closed system vaping device, wherein the consumable 150 includes a sealed tank 156 and is intended for one-use only.

[0057] Fig. 2(a) shows the smoking substitute device 110 with the main body 120 physically coupled to the consumable 150.

[0058] Fig. 2(b) shows the main body 120 of the smoking substitute device 110 without the consumable 150.

[0059] Fig. 2(c) shows the consumable 150 of the smoking substitute device 110 without the main body 120.

[0060] The main body 120 and the consumable 150 are configured to be physically coupled together, in this example by pushing the consumable 150 into an aperture in a top end 122 of the main body 120, e.g. with the consumable 150 being retained in the aperture via an interference fit. In other examples, the main body 120 and the consumable could be physically coupled together by screwing one onto the other, through a bayonet fitting, or through a snap engagement mechanism, for example. An optional light 126, e.g. an LED located behind a small translucent cover, is located a bottom end 124 of the main body 120. The light 126 may be configured to illuminate when the smoking substitute device 110 is activated.

[0061] The consumable 150 includes a mouthpiece (not shown) at a top end 152 of the consumable 150, as well as one or more air inlets (not shown in Fig. 2) so that air can be drawn into the smoking substitute device 110 when a user inhales through the mouthpiece. At a bottom end 154 of the consumable 150, there is located a tank 156 that contains e-liquid. The tank 156 may be a translucent body, for example.

[0062] The tank 156 preferably includes a window 158, so that the amount of e-liquid in the tank 156 can be visually assessed. The main body 120 includes a slot 128 so that the window 158 of the consumable 150 can be seen whilst the rest of the tank 156 is obscured from view when the consumable 150 is inserted into the aperture in the top end 122 of the main body 120.

[0063] In this present embodiment, the consumable 302 is a "single-use" consumable. That is, upon exhausting the e-liquid in the tank 156, the intention is that the user disposes of the whole consumable 150. In other embodiments, the e-liquid (i.e. aerosol former) may be the only part of the system that is truly "single-use". In such embodiments, the tank 156 may be refillable with e-liquid or the e-liquid may be stored in a non-consumable component of the system. For example, the e-liquid may be stored in a tank located in the device or stored in another component that is itself not single-use (e.g. a refillable tank).

[0064] The tank 156 may be referred to as a "clearomizer" if it includes a window 158, or a "cartomizer" if it does not.

[0065] Fig. 3(a) is a schematic view of the main body 120 of the smoking substitute device 110.

[0066] Fig. 3(b) is a schematic view of the consumable 150 of the smoking substitute device 110.

[0067] As shown in Fig. 3(a), the main body 120 includes a power source 128, a control unit 130, a memory 132, a wireless interface 134, an electrical interface 136, and, optionally, one or more additional components 138.

[0068] The power source 128 is preferably a battery, more preferably a rechargeable battery.

[0069] The control unit 130 may include a microprocessor, for example.

[0070] The memory 132 is preferably includes non-volatile memory.

[0071] The wireless interface establishes communication over a wireless communication channel between the smoking substitute device and communication terminal of the external device. The wireless interface may utilities any suitable wireless protocol. Suitably, the wireless interface may operate over a short range network. For example, it may comprise a wireless personal area network (WPAN), e.g. using Bluetooth™, ZigBee, a WiFi personal hotspot or the like. The smoking substitute device may pair with the portable communication terminal over the wireless communication channel. The portable communication terminal may be a master device and the smoking substitute device may be a slave device. As such, in exemplary embodiments, the wireless interface 134 is preferably configured to communicate wirelessly with the mobile device 2, e.g. via Bluetooth. To this end, the wireless interface 134 could include a Bluetooth™ antenna. Other wireless communication interfaces, e.g. WiFi, are also possible.

[0072] The electrical interface 136 of the main body 120 may include one or more electrical supply contacts. The electrical interface 136 may be located in, and preferably at the bottom of, the aperture in the top end 122 of the main body 120. When the main body 120 is physically coupled to the consumable 150, the electrical interface 136 may be configured to pass electrical power from the power source 128 to (e.g. a heating device of) the consumable 150 when the smoking substitute device 110 is activated, e.g. via the electrical interface 160 of the consumable 150 (discussed below). When the main body 120 is not physically coupled to the consumable 150, the electrical interface may be configured to receive power from the charging station 6.

[0073] The additional components 138 of the main body 120 may include the optional light 126 discussed above.

[0074] The additional components 138 of the main body 120 may, if the power source 128 is a rechargeable battery, include a charging port configured to receive power from the charging station 6. This may be located at the bottom end 124 of the main body 120. Alternatively, the electrical interface 136 discussed above is configured to act as a charging port configured to receive power from the charging station 6 such that a separate charging port is not required.

[0075] The additional components 138 of the main body 120 may, if the power source 128 is a rechargeable battery, include a battery charging control circuit, for controlling the charging of the rechargeable battery. However, a battery charging control circuit could equally be located in the charging station 6 (if present).

[0076] The additional components 138 of the main body 120 may include an airflow sensor for detecting airflow in the smoking substitute device 110, e.g. caused by a user inhaling through a mouthpiece 166 (discussed

below) of the smoking substitute device 110. The smoking substitute device 110 may be configured to be activated when airflow is detected by the airflow sensor. This optional sensor could alternatively be included in the consumable 150 (though this is less preferred where the consumable 150 is intended to be disposed of after use, as in this example).

[0077] The additional components 138 of the main body 120 may include an actuator, e.g. a button. The smoking substitute device 110 may be configured to be activated when the actuator is actuated. This provides an alternative to the airflow sensor noted, as a mechanism for activating the smoking substitute device 110.

[0078] The additional components 138 of the main body 120 may include a reading device configured to read information associated with the consumable from a machine readable data source included in (e.g. contained in the body of, or attached to) the consumable 150.

[0079] In some examples, the reading device (if present) may be configured to read information from the machine readable data source non-wirelessly, e.g. using an electrical connection between the main body 120 and consumable 150.

[0080] For example, the reading device (if present) may include a set of one or more electrical communication contacts configured to read information from the machine readable data source via an electrical connection established between the set of one or more electrical communication contacts and the machine readable data source. Conveniently, the set of one or more electrical communication contacts of the reading device may be configured to provide the electrical connection by engaging with a set of one or more electrical communication contacts of the consumable 150, when the main body 120 and the consumable 150 are physically coupled together.

[0081] In some examples, the reading device (if present) may be configured to read information from the machine readable data source wirelessly, e.g. via electromagnetic waves or optically. Thus, for example, the machine readable data source included in the consumable 150 could be an RFID tag (in which case the reading device included in the main body 120 may be an RFID reader) or a visual data source such as a barcode (in which case the reading device included in the main body may be an optical reader, e.g. a barcode scanner). Various wireless technologies and protocols may be employed to allow the reading device to wirelessly read information from a machine readable data source included in or attached to the consumable 150, e.g. NFC, Bluetooth, Wi-Fi, as would be appreciated by a skilled person.

[0082] The reading device (if present) may be configured to write information associated with the consumable to the machine readable data source (e.g. wirelessly or non-wirelessly, via one of the mechanisms discussed above) in addition to being configured to read information associated with the consumable from the machine readable data source. In this case, the reading device may be referred to as a reading/writing device.

[0083] As shown in Fig. 3(b), the consumable 150 includes the tank 156, an electrical interface 160, a heating device 162, one or more air inlets 164, a mouthpiece 166, and, optionally, one or more additional components 168.

[0084] The electrical interface 160 of the consumable 150 may include one or more electrical supply contacts. The electrical interface 136 of the main body 120 and an electrical interface 160 of the consumable 150 are preferably configured to contact each other and therefore electrically couple the main body 120 to the consumable 150 when the main body 120 is physically coupled to the consumable 150. In this way, electrical energy (e.g. in the form of an electrical current) is able to be supplied from the power source 128 in the main body 120 to the heating device 162 in the consumable 150.

[0085] The heating device 162 is preferably configured to heat e-liquid contained in the tank 156, e.g. using electrical energy supplied from the power source 128. In one example, the heating device 162 may include a heating filament and a wick, wherein a first portion of the wick extends into the tank 156 in order to draw e-liquid out from the tank 156, and wherein the heating filament coils around a second portion of the wick located outside the tank 156. In this example, the heating filament is configured to heat up e-liquid drawn out of the tank 156 by the wick to produce an aerosol vapour.

[0086] The one or more air inlets 164 are preferably configured to allow air to be drawn into the smoking substitute device 110, when a user inhales through the mouthpiece 166.

[0087] The additional components 168 of the consumable 150 may include a machine readable data source, which may e.g. be contained in the body of, or attached to the consumable 150. The machine readable data source may store information associated with the consumable. The information associated with the consumable may include information concerning the content of the consumable (e.g. e-liquid type, batch number) and/or a unique identifier, for example.

[0088] The machine readable data source may be rewritable, e.g. a rewritable RFID chip, or read only, e.g. a visual data source such as a barcode. As indicated above, the additional components 138 of the main body 120 may include a reading device configured to read information associated with the consumable from the machine readable data source.

[0089] For example, the electrical interface 160 of the consumable 150 may include a set of one or more electrical communication contacts, which may allow a reading device of the main body to read information from a machine readable data source of the consumable, e.g. as discussed previously.

[0090] In use, a user activates the smoking substitute device 110, e.g. through actuating an actuator included in the main body 120 or by inhaling through the mouthpiece 166 as described above. Upon activation, the control unit 130 may supply electrical energy from the power

source 128 to the heating device 162 (via electrical interfaces 136, 166), which may cause the heating device 162 to heat e-liquid drawn from the tank 156 to produce a vapour which is inhaled by a user through the mouthpiece 166.

[0091] Of course, a skilled reader would readily appreciate that the smoking substitute device 110 shown in Figs. 2 and 3 shows just one example implementation of a smoking substitute device, and that other forms of smoking substitute device could be used as the smoking substitute device 10 of Fig. 1.

[0092] By way of example, a HNB smoking substitute device including a main body and a consumable could be used as the smoking substitute device 10 of Fig. 1, instead of the smoking substitute device 110. One such HNB smoking substitute device is the IQOS™ smoking substitute device discussed above.

[0093] As another example, an open system vaping device which includes a main body, a refillable tank, and a mouthpiece could be used as the smoking substitute device 10 of Fig. 1, instead of the smoking substitute device 110. One such open system vaping device is the blu PRO™ e-cigarette discussed above.

[0094] As another example, an entirely disposable (one use) smoking substitute device could be used as the smoking substitute device 10 of Fig. 1, instead of the smoking substitute device 110.

[0095] Referring to Figure 4, an exemplary embodiment is shown wherein the system comprises an external device 2 and a smoking substitute device 10. The devices 2, 10 can be as explained above, but specific features relating to the automatic reactivation of a wireless communication are herein further described.

[0096] The external device 10 is shown as suitably being a smart telephone operating an application. However, it will be appreciated that other devices such as tablet computers, smart watches or the like may be equally applicable. The external device 2 runs the application that can be used as a user interface between the user and the smoking substitute device. In order to establish communication between the external device and smoking substitute device, the smoking substitute device includes a wireless communications interface 134 and the external device is able to be connected thereto. Therefore, upon initial set up of the system, it will be appreciated that the application may be used to pair the external device with the smoking substitute device. For instance, the application may complete a Bluetooth pairing operation or another operation to establish the external device as a trusted device. With communication between the devices established, the external device can communicate with the smoking substitute device via the application, and the smoking substitute device can communicate with the application by being controlled to transmit data via the communication interface. Thus the user can manipulate the external device to send a deactivate communication command wirelessly to the smoking substitute device. As shown in Figure 4 an input button 202 is suitably provided as part of the application's graphic user interface to enable a user to initiate the command. Thus the smoking substitute device receives a deactivate communication command and the control unit recognises the receipt of the deactivate communication command and switches the wireless communication interface to deactivated mode in response thereto. When deactivated and in a deactivated mode, the wireless communication interface is configured to not transmit data over a communication link. That is, the wireless communication link is deactivated so that the smoking substitute device is blocked or controlled to not transmit wireless signals as may be required or desired, for instance to operate in a flight-safe mode when transported on an aeroplane.

[0097] Typically, the smoking substitute device's body 120 houses the wireless interface 134, the control unit 130 and a puff sensor 210. Here, the puff sensor senses a puff operation and automatically reactivates the wireless communication interface by switching the wireless communication interface to an active mode such that wireless transmissions are re-established / transmissions are able to be sent.

[0098] In one exemplary embodiment, the puff sensor is an airflow sensor as described above. Here, the airflow sensor detects a change in airflow and determines the user has manipulated the smoking substitute device to initiate a puff operation by inhaling through the smoking substitute device. As an alternative or addition, the puff sensor 210 may also include an actuator for initiating a heating device. Here the actuation of the actuator, for instance the pressing of a switch by a user, is determined to be the user input initiating a puff operation. As will be appreciated, as well as initiating the smoking substitute device to produce an aerosol, the action of initiating the puff operation also triggers the control unit to switch the disabled wireless communication interface to the active mode.

[0099] The user is able to manage the smoking device by inputting a command into the external device, for instance by entering a deactivate communication command through the application operating on the connected external device. Additionally or alternatively, the user may input the deactivate communication command directly into the smoking substitute device, for instance by manipulating the smoking substitute device in a predetermined action. As shown if Figure 5, at step S100 the smoking substitute device receives a deactivate communication command. As described, the deactivate communication command may be a command received at the wireless communication interface or may be a user manipulation of the smoking substitute device. At step S110, the control unit identifies the deactivate communication command and deactivates the wireless communication interface so that the wireless communication interface operates in a deactivated mode such that it is controlled to not emit wireless transmissions. At step S120, the puff sensor senses a user input initiating a puff operation. For instance, by sensing a user has inhaled through the

smoking substitute device and / or that a user has activated a heating unit. At step S130, the wireless communication interface is automatically reactivated upon identifying the puff operation.

[0100] In the exemplary embodiments, the smoking substitute device may include additional components such as a light, and / or a speaker, and / or a haptic generator for generating vibrations, wherein the smoking substitute device is configured to initiate an alert through the one or more additional components when entering the active mode and / or when entering the deactivated mode.

[0101] The features disclosed in the foregoing description, or in the following claims, or in the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for obtaining the disclosed results, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

[0102] While the invention has been described in conjunction with the exemplary embodiments described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments of the invention set forth above are considered to be illustrative and not limiting. Various changes to the described embodiments may be made without departing from the spirit and scope of the invention.

[0103] For the avoidance of any doubt, any theoretical explanations provided herein are provided for the purposes of improving the understanding of a reader. The inventors do not wish to be bound by any of these theoretical explanations.

[0104] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0105] Throughout this specification, including the claims which follow, unless the context requires otherwise, the word "comprise" and "include", and variations such as "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.

[0106] 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%.

Claims

1. A smoking substitute device comprising a wireless communication interface, a control unit, and a puff sensor arrangement; wherein
the wireless communication interface is configured to form a wireless connection with an external device for transmitting and receiving data between the devices;
the control unit is configured to switch the wireless communication interface between an active mode and a deactivated mode;
the puff sensor is arranged to sense a puff operation of the smoking substitute device; and
the control unit switches the wireless communication interface to the deactivated mode on detecting a deactivate communication action and automatically switches the wireless communication interface to the active mode when the puff sensor senses a puff operation.

2. The smoking substitute device of Claim 1, wherein the wireless communication interface is configured to receive a deactivate communication command and the control unit is configured to detect the receipt of the deactivate communication command as the deactivate communication action to switch the wireless communication interface to the deactivated mode.

3. The smoking substitute device of Claim 1, wherein the smoking substitute device is configured to sense a user manipulation and the control unit is configured to detect the user manipulation as a predetermined manipulation corresponding to the deactivate communication action as an input to switch the wireless communication interface to the deactivated mode.

4. The smoking substitute device of Claim 1, wherein the puff sensor comprises an airflow sensor and the control unit is configured to determine a change in airflow as a puff operation.

5. The smoking substitute device of Claim 1, wherein the puff sensor comprises an actuator for activating a heating unit and the control unit is configured to determine activation of the actuator as a puff operation.

6. The smoking substitute device according to Claim 1, wherein the control unit is configured to also switch the wireless communication interface to the active mode upon receiving a reactivate command at the wireless communication interface.

7. The smoking substitute device according to Claim 1, wherein the smoking substitute device includes an additional component for generating a visual or

audible or haptic signal to the user and the control unit is configured to control the additional component to generate said signal when switching the wireless communication interface to the active mode.

8. The smoking substitute device according to Claim 1, wherein the smoking substitute device includes an additional component for generating a visual or audible or haptic signal to the user and the control unit is configured to control the additional component to generate said signal when switching the wireless communication interface to the deactivated mode.

9. A system including the smoking substitute device of Claim 1 and an external device,
wherein the external device provides a user input to allow a user to input a command to control the smoking substitute device to enter a wireless communication deactivated mode.

10. The system of Claim 9, wherein the external device provides a second user input to allow a user to input an additional command to control the smoking substitute device to enter a wireless communication active mode

11. A method of managing a smoking substitute device comprising the steps of:

detecting a deactivate communication action and controlling the smoking substitute device to enter a deactivated mode wherein a wireless communication interface of the smoking substitute device is prevented from transmitting wireless signals;
sensing a puff operation; and
automatically switching the wireless communication interface to an active mode.

12. The method of Claim 11, wherein the step of detecting the deactivate communication action comprises receiving a deactivate command at the wireless communication interface.

13. The method of Claim 11, wherein the step of r detecting the deactivate communication action comprises a user operation to manipulate the smoking substitute device in a predetermined action.

14. A method of managing a system comprising prior to completing the method of claim 11, causing an external device to transmit a deactivate communication command to the smoking substitute device.

15. A computer implemented method for controlling a smoking substitute device to execute the method of claim 13 or a computer-readable medium containing computer-readable instructions which, when executed by a processor, cause the processor to perform the method of claim 13

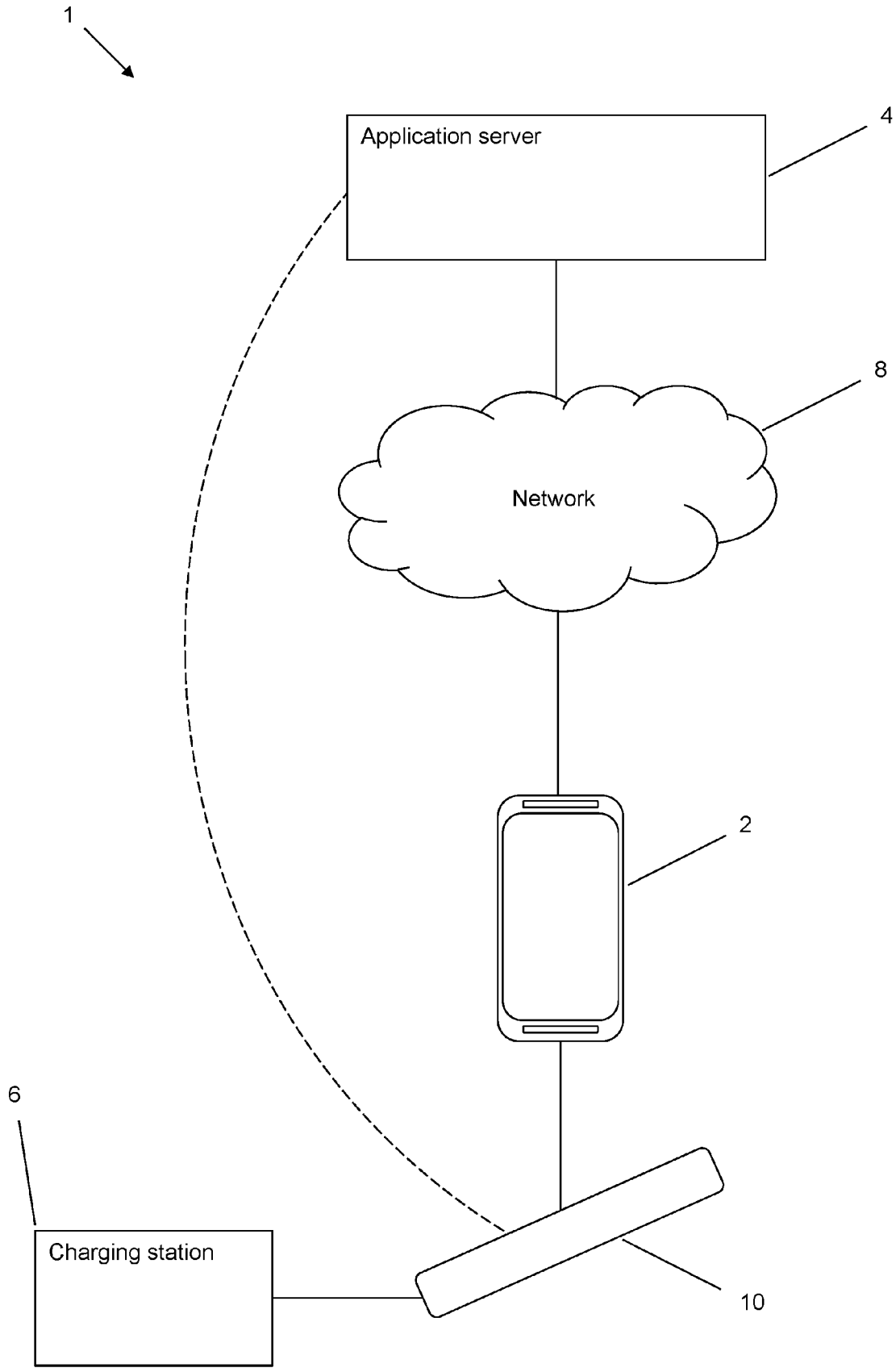

Fig. 1

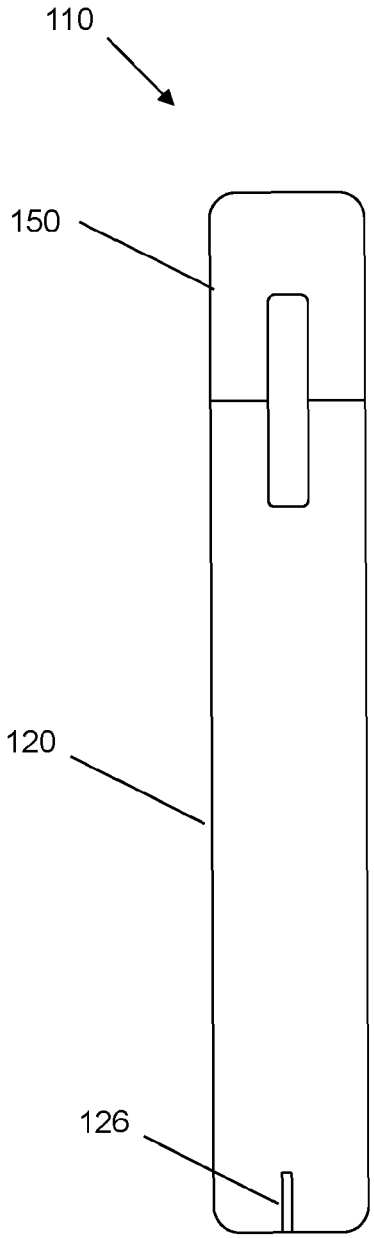

Fig. 2(a)

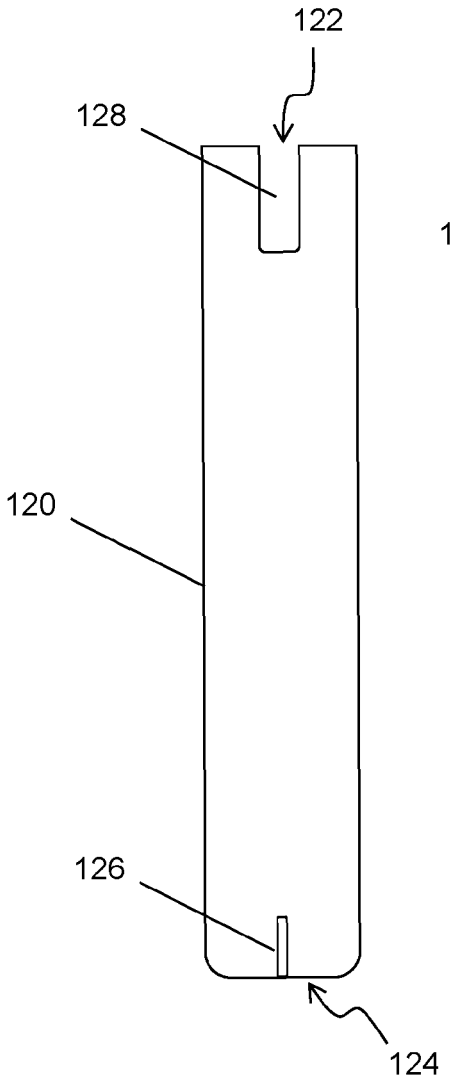

Fig. 2(b)

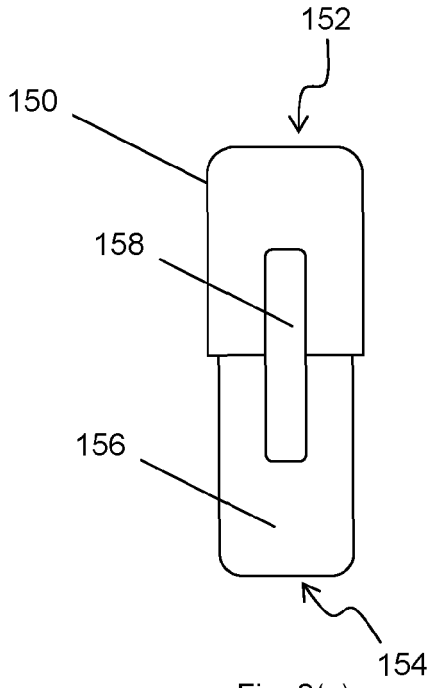

Fig. 2(c)

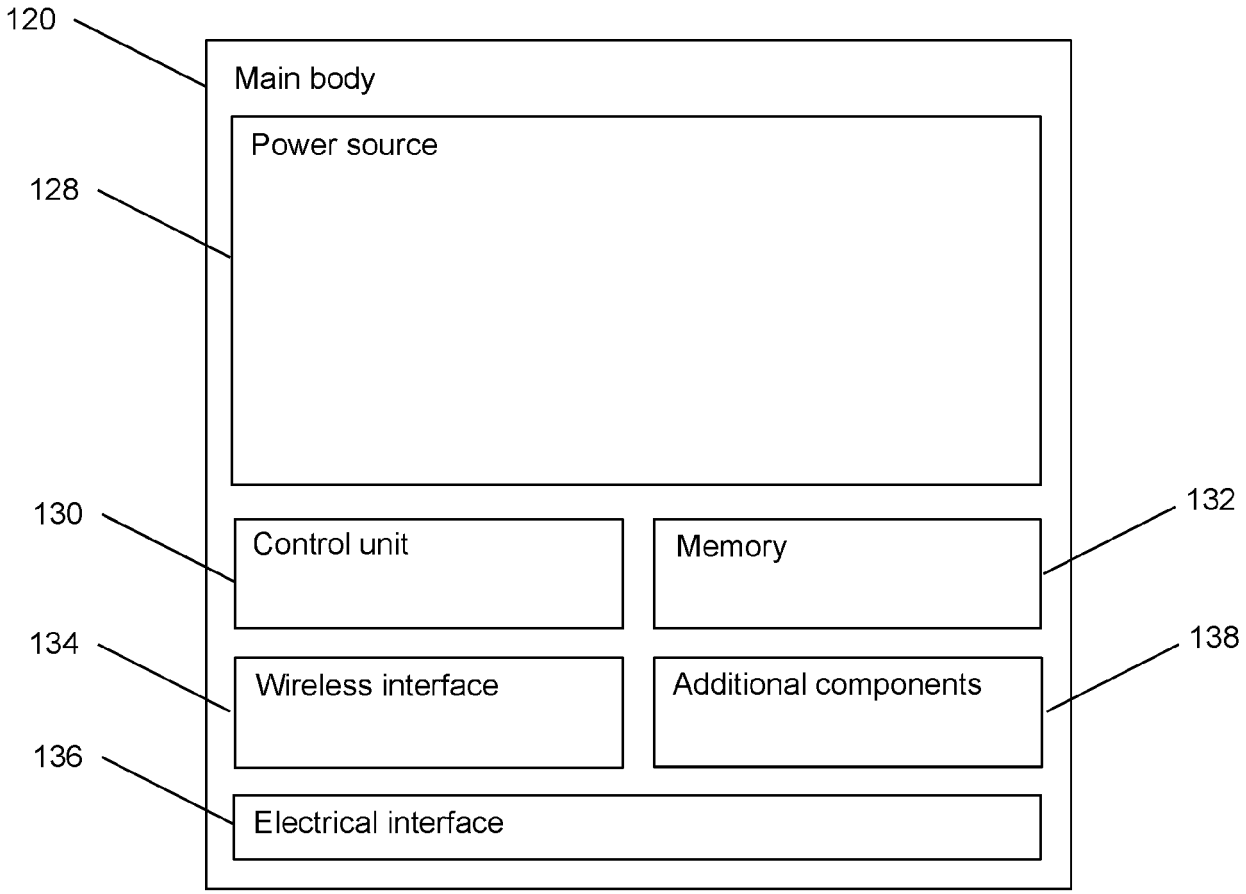
120
Main body
Power source
128
130
Control unit
Memory
132
134
Wireless interface
Additional components
138
136
Electrical interface

Fig. 3(a)

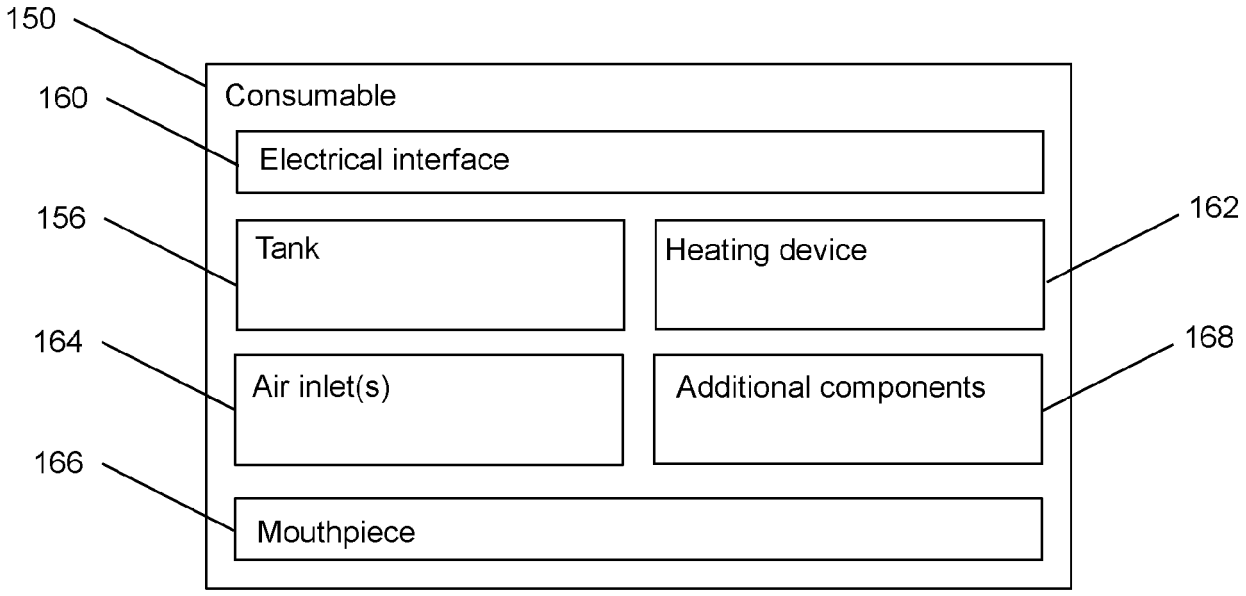
150
Consumable
160
Electrical interface
156
Tank
Heating device
162
164
Air inlet(s)
Additional components
168
166
Mouthpiece

Fig. 3(b)

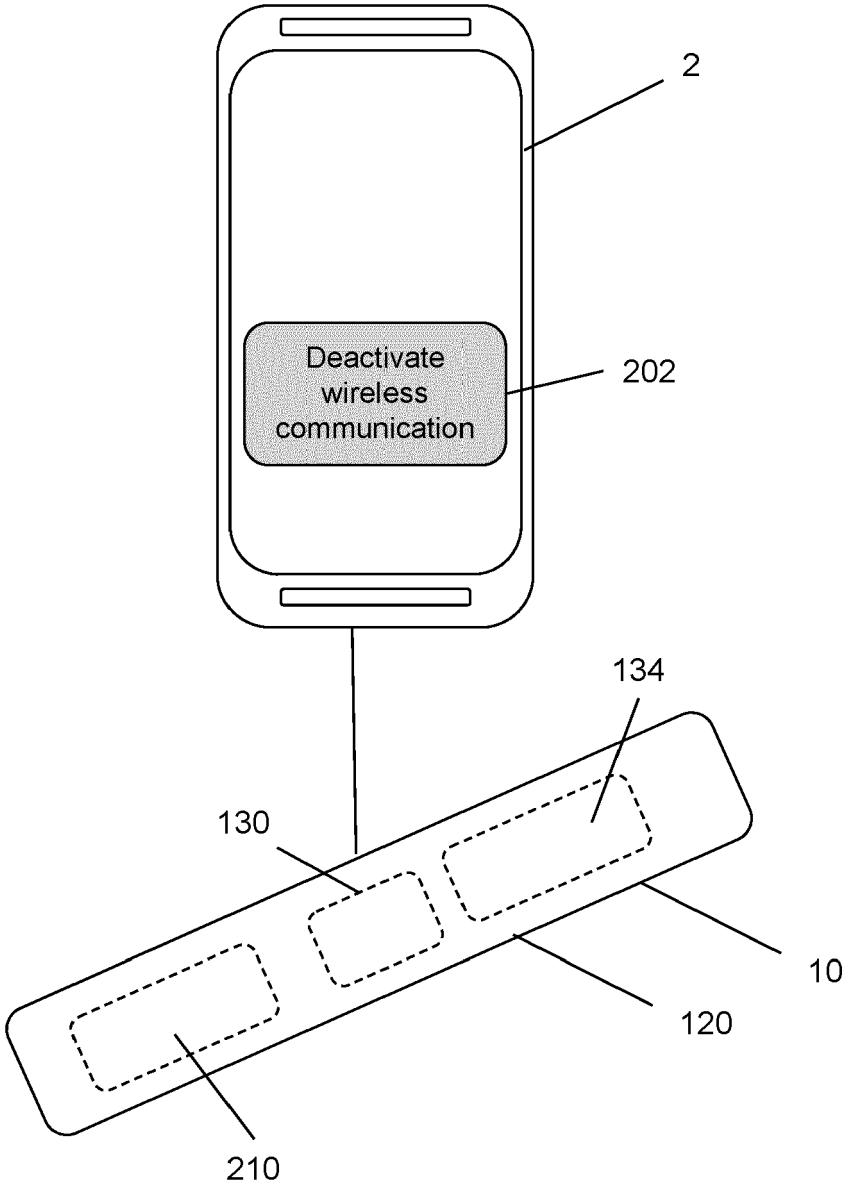

Fig. 4

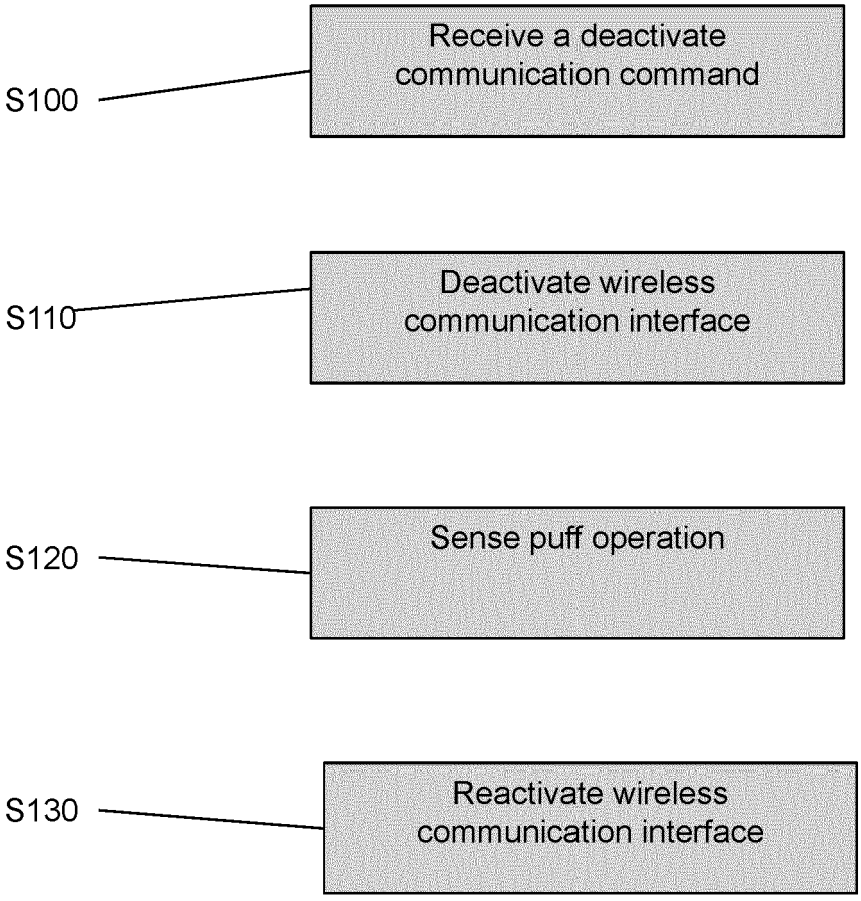
S100
Receive a deactivate communication command
S110
Deactivate wireless communication interface
S120
Sense puff operation
S130
Reactivate wireless communication interface

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 19 21 8512

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 Y	WO 2019/162157 A1 (NERUDIA LTD) 29 August 2019 (2019-08-29) * figures 1-15 * * paragraphs [0074], [00146], [00148], [00153] - [00154], [00160], [00167] - [00183] * * paragraphs [00187] - [00193], [00197] - [00203], [00205] - [00209], [00215] * -----	1-7,9-15 8	INV. A24F40/65 A24F40/50
X Y	US 2018/160733 A1 (LEADLEY ET AL) 14 June 2018 (2018-06-14) * figure 4 * * paragraphs [0033] - [0036], [0039], [0048] * -----	1,11 8	
X	US 2018/292846 A1 (HENRY ET AL) 11 October 2018 (2018-10-11) * figures 2-4 * * paragraphs [0076] - [0082] * -----	1,11	
A	WO 2019/020151 A1 (ODIN & THOR APS) 31 January 2019 (2019-01-31) * page 19, line 4 - line 30 * * page 20, line 22 - page 24, line 19 * * figures 3-6 * -----	1-15	TECHNICAL FIELDS SEARCHED (IPC) A24F H04W H04L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 June 2020	Mier Abascal, Ana

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 21 8512

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18-06-2020

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