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

(57) A smoking substitute device is configured to record and store user data that is generated during operation of the device. Analysing the user data can provide the user with useful information regarding their use of the smoking substitute device as well as useful information regarding the operational performance of the device. Typically, the analysis of the data would be conducted by a remote device and the smoking substitute device therefore includes a communication interface to connect

and communicate with the remote device.

The smoking substitute device and method of managing the smoking substitute device allows user data to be deleted from the device upon identification of a reset operation wherein the reset operation is able to be triggered from the connected remote device and / or the smoking substitute device. Providing a function to delete user data upon identification of a reset operation provides the user with some control over their information.

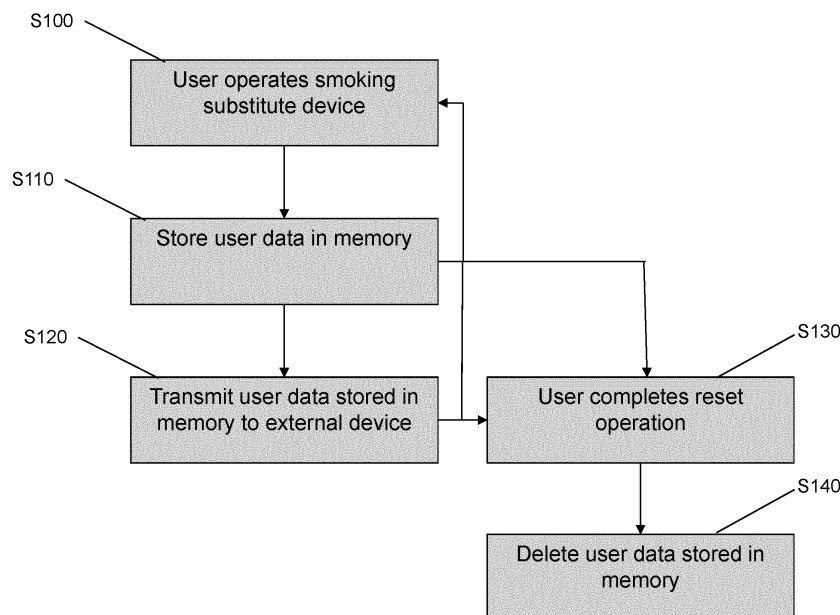


Fig. 5

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a smoking substitute device and particularly, although not exclusively, to the management of user generated data when the smoking substitute device is 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 tradi-

tional 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. Conse-

quently, 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 control over user generated data whilst maintaining the advantageous features associated with recording and logging the user generated data.

**[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 record and store user

data that is generated during operation of the device. Advantageously, analysing the user data can provide the user with useful information regarding their use of the smoking substitute device as well as useful information regarding the operational performance of the device. Typically, the analysis of the data would be conducted by a remote device and the smoking substitute device therefore includes a communication interface to connect and communicate with the remote device.

**[0027]** At their most general, the exemplary aspects provide a smoking substitute device and method of managing the smoking substitute device wherein user data can be deleted from the device upon identification of a reset operation wherein the reset operation is able to be triggered from the connected remote device and / or the smoking substitute device. Advantageously, providing a function to delete user data upon identification of a reset operation allows a user to delete information from the device and provides the user with some control over their information.

**[0028]** There is therefore provided, according to a first exemplary aspect, a smoking substitute device having; a memory, a communication interface, a control unit, and at least one additional component. In the exemplary aspects, the memory, control unit, and additional component are suitably housed in a body.

**[0029]** The memory stores firmware data. Firmware data is stored in the memory and used by the control unit to operate the smoking substitute device. Typically, the firmware data is permanently stored in the memory or semi permanently stored in the memory to allow firmware updates. However, upon identification of the reset operation, the control unit may not be caused to delete all the firmware data. Thus the smoking substitute device is reset to an operating condition.

**[0030]** The memory may also store user data. The user data is generated during operation of the smoking substitute device. For instance, the user data may log and or record details of the battery voltage, inhale count, inhale duration, coil resistance, pressure, temperature, charging source and status, error count number of charges or any other information useful to the operation or performance of the smoking substitute device. Here the body may house a battery and the additional component may include circuitry for controlling and managing the battery and battery recharging. Further, the body may include a coupling portion arranged to receive a consumable. Here the consumable may include a heating device such as a coil and may include machine readable information regarding the type or other details of the consumable. Further, the body may house an airflow sensor for detecting airflow through the body, wherein the airflow sensor can be monitored to determine an inhale or puff occurrence as well as data concerning the inhale duration and inhale pressure and additional or alternative inhale parameters.

**[0031]** The communication interface is configured to transmit user data stored in the memory to an external

device. Typically, the transmission is completed under the control of the control unit. 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 is able to receive user data from the smoking substitute device. In exemplary embodiments, data relating to the paired or verified external device is stored as user data that is deleted upon identification of a reset operation

**[0032]** The control unit controls the operation of the smoking substitute device using the firmware. The control unit also controls the storage of user data in the memory and the communication interface to communicate said data with the external device. Furthermore, the control unit is configured to delete user data from the memory upon identification of a reset operation. Deletion of the user data may be triggered by the control unit identifying a reset operation as a manipulation of the additional component. Additionally or alternatively, deletion of the user data may be triggered by the control unit identifying receipt by the communication interface of a reset command transmitted from the external device.

**[0033]** Suitably, the additional component may be an actuator that the user may activate from the exterior of the housing. Here, the reset operation is a manipulation of the actuator, for instance, in one exemplary embodiment, the actuator is a button and the manipulation is a press of the button. Additionally or alternatively, the additional component maybe a motion sensor such as an accelerometer and the reset operation is a manipulation of the smoking substitute device to replicate a predetermined signal pattern from the accelerometer. For instance, the reset operation may be a set number and frequency of taps of the smoking substitute device. Advantageously, the additional component may be a component with a further operational purpose to the smoking substitute device and the reset operation therefore utilises a specific manipulation of the additional component in order to differentiate the reset command from the other operational command. For instance a short push of the button may be used to identify one operational command and a long push of the button may be predetermined as the manipulation required to trigger the control unit to identify the reset operation.

**[0034]** 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 reset command to the connected smoking substitute device.

**[0035]** In one exemplary embodiment, the control unit identifies and stores user data as either user specific data or global device data and upon identification of the reset operation, the control unit deletes user specific data only. Thus some user data remains permanently stored in the

memory. Here, the retained global device data is suitably data on the operation of the smoking substitute device restricted to the lifetime operation of the smoking substitute device. In contrast, the user specific data is limited to data on the operation of the device since the last rest operation or alternative event.

**[0036]** There is therefore provided, according to a further exemplary aspect, a method of managing a smoking substitute device wherein the method comprises the step of storing user data generated during operation of the smoking substitute device in a memory that also stores firmware. The method includes a step, subsequent to storing the user data, of causing a communication interface to transmit user data stored in the memory to an external device. The method step includes a step, subsequent to storing the user data, of deleting user data from the memory upon identification by a control unit of a reset operation. Here, the method comprises a user manipulating an additional component housed in a body of the smoking substitute device to trigger the reset operation. Additionally or alternatively, the method comprises a user inputting a reset command into the external device and causing the communication interface to receive the reset command from the external device to trigger the reset operation.

**[0037]** In one exemplary embodiment, the method comprises identifying user data as either user specific data or global device data and upon identification of the reset operation the control unit deletes user specific data only. Thus some user data remains permanently stored in the memory. Here the retained global device data is data on the operation of the smoking substitute device restricted to the lifetime operation of the smoking substitute device. In contrast, the user specific data is limited to data on the operation of the device since the last rest operation or alternative event.

**[0038]** 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. Yet further, according to another exemplary aspect, there is provided a computer implement 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 previous method aspect.

**[0039]** The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

**[0040]** The skilled person will appreciate that except where mutually exclusive, a feature or parameter described 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

**[0041]** 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 managing the reset of a smoking substitute device according to an exemplary embodiment;

**Figure 5.** is a flow chart of a reset method to automatically delete user generated data from a smoking substitute device according to an exemplary embodiment; and

**Figure 6.** is a flow chart of a reset method to automatically delete user generated data from a smoking substitute device according to another exemplary embodiment.

### Detailed Description of the Invention

**[0042]** 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.

**[0043]** Fig. 1 shows an example system 1 for managing a smoking substitute device 10.

**[0044]** 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.

**[0045]** 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.

**[0046]** The network 8 may include a cellular network and/or the internet.

**[0047]** 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.

**[0048]** 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.

**[0049]** 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.

**[0050]** 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.

**[0051]** 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.

**[0052]** 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".

**[0053]** 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.

**[0054]** Fig. 2(a) shows the smoking substitute device 110 with the main body 120 physically coupled to the consumable 150.

**[0055]** Fig. 2(b) shows the main body 120 of the smok-

ing substitute device 110 without the consumable 150.

**[0056]** Fig. 2(c) shows the consumable 150 of the smoking substitute device 110 without the main body 120.

**[0057]** 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 at 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.

**[0058]** 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.

**[0059]** 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.

**[0060]** 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).

**[0061]** The tank 156 may be referred to as a "clear-omizer" if it includes a window 158, or a "cartomizer" if it does not.

**[0062]** Fig. 3(a) is a schematic view of the main body 120 of the smoking substitute device 110.

**[0063]** Fig. 3(b) is a schematic view of the consumable 150 of the smoking substitute device 110.

**[0064]** 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.

**[0065]** The power source 128 is preferably a battery, more preferably a rechargeable battery.

**[0066]** The control unit 130 may include a microprocessor, for example.

**[0067]** The memory 132 is preferably includes non-volatile memory.

**[0068]** 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 utilize 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.

**[0069]** 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.

**[0070]** The additional components 138 of the main body 120 may include the optional light 126 discussed above.

**[0071]** 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.

**[0072]** 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). 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).

**[0073]** 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.

**[0074]** The additional components 138 of the main body 120 may include a motion sensor such as an accelerometer. The accelerometer may function as a motion sensor to receive inputs for controlling the device. An accelerometer is, as the skilled reader will know, an electromechanical device that measures acceleration forces, and provides a measure of "proper acceleration", which is the acceleration of a body or object, relative to free fall. The accelerometer comprised within the smoking substitute device, is configured to measure dynamic acceleration forces, and so can sense movement or vibrations. The accelerometer is configured to measure acceleration and its outputs may be used to determine position factors and/or orientation factors such as tilt, tilt angle, and incline, as well as being used to determine actions or events such as rotation, vibration and collision.

**[0075]** The accelerometer may be a piezoelectric accelerometer. However other types of accelerometer may be used in a smoking substitute device, such as a capacitance accelerometer. The accelerometer may comprise a three-axis model, to enable it to sense rotational tilt, as well as movement in a two-dimensional plane.

**[0076]** The accelerometer may be configured to detect movement and collisions, and to provide one or more voltage outputs to the control unit 130, as a result of what it has detected. The accelerometer can, for example, detect the action of the smoking substitute device being tapped against (i.e. relatively gently colliding with) a surface. When the user taps the device, the accelerometer transmits a corresponding voltage signal to the control unit 130. The control unit 130 can then control the memory 132 to store (at least temporarily) a measure of the voltage signal, along with an indicator of the time at which it was received. If the smoking substitute device is currently paired with, or bonded to, a mobile device, it may also submit a signal to the mobile device, via the wireless communication link that has been established between them, regarding the detection that the accelerometer has made. This can be very useful as the smoking substitute device may be preconfigured for a tap (or a plurality of taps) to form part of a sequence for the user to convey instructions to the device and/or to the connected mobile device or application.

**[0077]** 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.

**[0078]** 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.

**[0079]** 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.

**[0080]** 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.

**[0081]** 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.

**[0082]** 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.

**[0083]** 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.

**[0084]** 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.

**[0085]** 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.

**[0086]** 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.

**[0087]** 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.

**[0088]** 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.

**[0089]** 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.

**[0090]** 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.

**[0091]** 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.

**[0092]** 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.

**[0093]** 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.

**[0094]** 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 deletion of user data are herein further described. The external device 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 communications interface and the external device is connected thereto. Whilst a wired connection would provide a suitable connection, it is envisaged that a more preferable connection would be a wireless connection as discussed above. 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. The substitute smoking device may store details of the trusted device or Bluetooth pairing or other details of the external device as user data in a memory 132 as described above.

**[0095]** The smoking substitute device's body 120 houses an additional component that in one embodiment is as an actuator. Suitably, the actuator is shown as a button 138. Here, the button 138 is arranged to be activated from an exterior of the smoking substitute device. Typically, the button is activated by pressing as is known in the art. The button 138 may have another operational purpose in which case the firmware is configured to differentiate between an input to trigger said other operational purpose and a reset operation input by a variance in the press condition, frequency, press pattern or the like. For instance, a short press where the button 138 is pressed for less than a second may determine an input

operation, whereas a long press may determine a reset operation. The long press may be determined as a press and hold of the button for more than two seconds or more than 3 seconds.

**[0096]** Where the smoking substitute device does not require a button 138, or as an alternative or additional rest operation input, an alternative additional component may be utilised. For instance, the additional component may be an accelerometer arranged to monitor taps of the smoking substitute device's body. Again, where the accelerometer is arranged to determine other operational commands the firmware is configured to differentiate between commands by identifying specific tap or tap pattern characteristics. To avoid the reset operation being inadvertently activated, the specific push or tap or other input characteristic or pattern is selected to be complex to reduce the pattern being replicated from manipulations during general use or whilst stowed. Moreover, the actuator may be arranged to be concealed or protected or difficult to access in order to reduce any unintended activations.

**[0097]** Although not depicted in Figure 4, the body 120 also houses memory 132. The memory as described above is arranged to store firmware data that is used by a control unit 130 to perform the operational functions of the smoking substitute device as is known in the art. For instance, the control unit uses the firmware to control the communication unit to complete communication steps and to monitor the additional component for user inputs and to store user data in the memory. User data is typically stored as non-volatile memory and is generated during operation of the smoking substitute device. For instance, the user data may be logs of operational details such as the time at which an inhale began, the duration or pressure or flow rate of an inhale, battery characteristics such as charge status or connection status, temperature details, error events, or the like. Where a consumable is inserted, the user data may include details such as time and number of consumables inserted, coil temperature and resistance details, and where supported, details of the type or other data of the consumable. It will be appreciated that to record the one or more desired user data, further hardware of the smoking substitute device may be required and / or further additional components as described above or otherwise known in the art.

**[0098]** Figure 5 shows a method of managing a smoking substitute device 2. At step S100 a user operates the smoking substitute device. At step S110, the control unit stores user data in the memory of the smoking substitute device. Subsequent to step S110, at step S120, the control unit controls the communication interface to transmit user data stored in the memory to an external device. It will be appreciated that Steps S100, S110 and S120 may be repeated multiple times, periodically and/or at varying intervals as required by the use of the smoking substitute device.

**[0099]** Subsequent to step S110, at step S130, a user completes a reset operation. At Step S140, the control

unit identifies the reset operation and deletes user data stored in the memory. Here, the control unit can recognise the reset operation as either a predetermined manipulation of the additional component or receipt by the communication interface of a reset command from the external device. That is, either through a hardware triggered reset or a software triggered reset.

**[0100]** It will be appreciated that the hardware triggered reset requires a specific manipulation of the smoking substitute device by the user. For instance, in the example wherein the additional component is a button 136, the management method includes the step of the user pressing the button to replicate the push time or push pattern predetermined as a reset operation input.

**[0101]** Further, it will be appreciated that the software triggered reset requires the user to complete a step of triggering the reset command to be transmitted to and received by the communication interface of the smoking substitute device. For instance, the user activates the reset command through the application operating on the external device. It will be appreciated that when using a wireless communication connection, prior to step S120, the user may complete a pairing or authorisation step so that the external device is trusted by the smoking substitute device.

**[0102]** Figure 6 shows a further exemplary method embodiment, wherein the step S110 of storing user data in the memory further includes the step S112 of first identifying the user data as either user specific data or global device data. After identifying and categorising the user data, the controller stores both categories of user data in the memory. The controller may be configured to store the user specific data in a separate area to the global device data. The memory may be organised so that the user specific data is overwritten when the memory becomes full on a first-in-first-out basis. In step S112 of identifying the category of user data, the controller may determine global device data as user data that is logged apportioned over the lifetime of operational use of the smoking substitute device. This global device data is not overwritten or deleted as part of a reset operation. The controller may identify user specific data as user data that is logged over apportioned over a period of time since the last reset operation or, if no previous reset operation has occurred, since the start of operation of the smoking substitute device.

**[0103]** In the exemplary embodiment, Step S140 of deleting user data from the memory comprises deleting user specific data. Here, the user data identified as global device data is not deleted. Consequently, a subsequent connected device can still access lifetime data from the memory of the smoking substitute device in order to provide useful information or feedback or predictive analysis on the device's operational performance.

**[0104]** 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 meth-

od 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.

**[0105]** 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.

**[0106]** 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.

**[0107]** Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

**[0108]** 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.

**[0109]** It must be noted that, as used in the specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" one particular value, and/or to "about" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by the use of the antecedent "about," it will be understood that the particular value forms another embodiment. The term "about" in relation to a numerical value is optional and means for example +/- 10%.

## Claims

1. A smoking substitute device comprising a memory, a communication interface, a control unit and at least one additional component; wherein the memory is configured to store firmware data that is used by the control unit to operate the smoking substitute device; the memory is further configured to store user data that is generated during operation of the smoking substitute device; the control unit is operable to cause the communication interface to transmit user data stored in the memory to an external device; the control unit is configured to delete user data

- stored in the memory upon identification of a reset operation, wherein the reset operation is a predetermined manipulation of said additional component or receipt by the communication interface of a reset command from the external device.
2. The smoking substitute device of Claim 1, wherein the communication interface is a wireless interface and the control unit is configured to store details of the external device as a connected external device as user data in the memory.
  3. The smoking substitute device of any of Claim 1, wherein an additional component is an actuator that is manipulated by a user pressing the actuator.
  4. The smoking substitute device of Claim 1, wherein an additional component is a motion sensor that is activated by movement of the smoking substitute device.
  5. The smoking substitute device of Claim 1, wherein the body houses a further additional component and the further additional component is an airflow sensor for detecting airflow through the body, wherein the control unit monitors the airflow sensor to determine an inhale event, wherein each inhale event is logged as user data to count a number of inhale events.
  6. The smoking substitute device of Claim 1, wherein the smoking substitute device comprises a further additional component and the further additional component is an airflow sensor for detecting airflow through the body, wherein the control unit monitors the airflow sensor to determine an inhale event, wherein the duration of each inhale event is recorded as user data to record the inhale duration.
  7. The smoking substitute device of Claim 1, wherein the smoking substitute device comprises a power source and control circuitry for controlling charging of the power source, and the control unit monitors the control circuitry to log or record as user data charge duration and / or charge status and / or voltage of the power source.
  8. The smoking substitute device of Claim 1, wherein the control unit logs as user data an error count and / or a reset operation count.
  9. The smoking substitute device of Claim 1, wherein the smoking substitute device comprises body including a coupling portion arranged to receive a consumable and the control unit logs as user data a count of inserted consumables and / or records as user data details read from each inserted consumable.
  10. The smoking substitute device of Claim 1, wherein the control unit is configured to identify user data as either user specific data or global device data and to record both in the memory as user data and wherein the control unit is configured to delete the user specific data upon identification of a reset operation.
  11. The smoking substitute device of Claim 10, wherein global device data is a count of user data over a time period equal to the lifetime operation of the smoking substitute device.
  12. The smoking substitute device of claim 10 or 11, wherein user specific data is a count of user data over a time period of operation of the smoking substitute device since a first operation or, if a reset operation has been completed, since the reset operation.
  13. A method of managing a smoking substitute device, the method comprising the steps of; storing user data generated during operation of the smoking substitute device in a memory, causing a communication interface to transmit user data stored in the memory to an external device, deleting user data from the memory upon identification of a reset operation input, wherein the step of deleting user data includes at least one of identifying a user manipulation of an additional component as replicating a predetermined user manipulation of the additional component or receiving at the communication interface a reset command.
  14. The method of claim 15, wherein the method includes identifying user data as either user specific data or global device data before storing the data in the memory as user data and deleting the user specific data from the memory upon identifying the reset operation input.
  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.

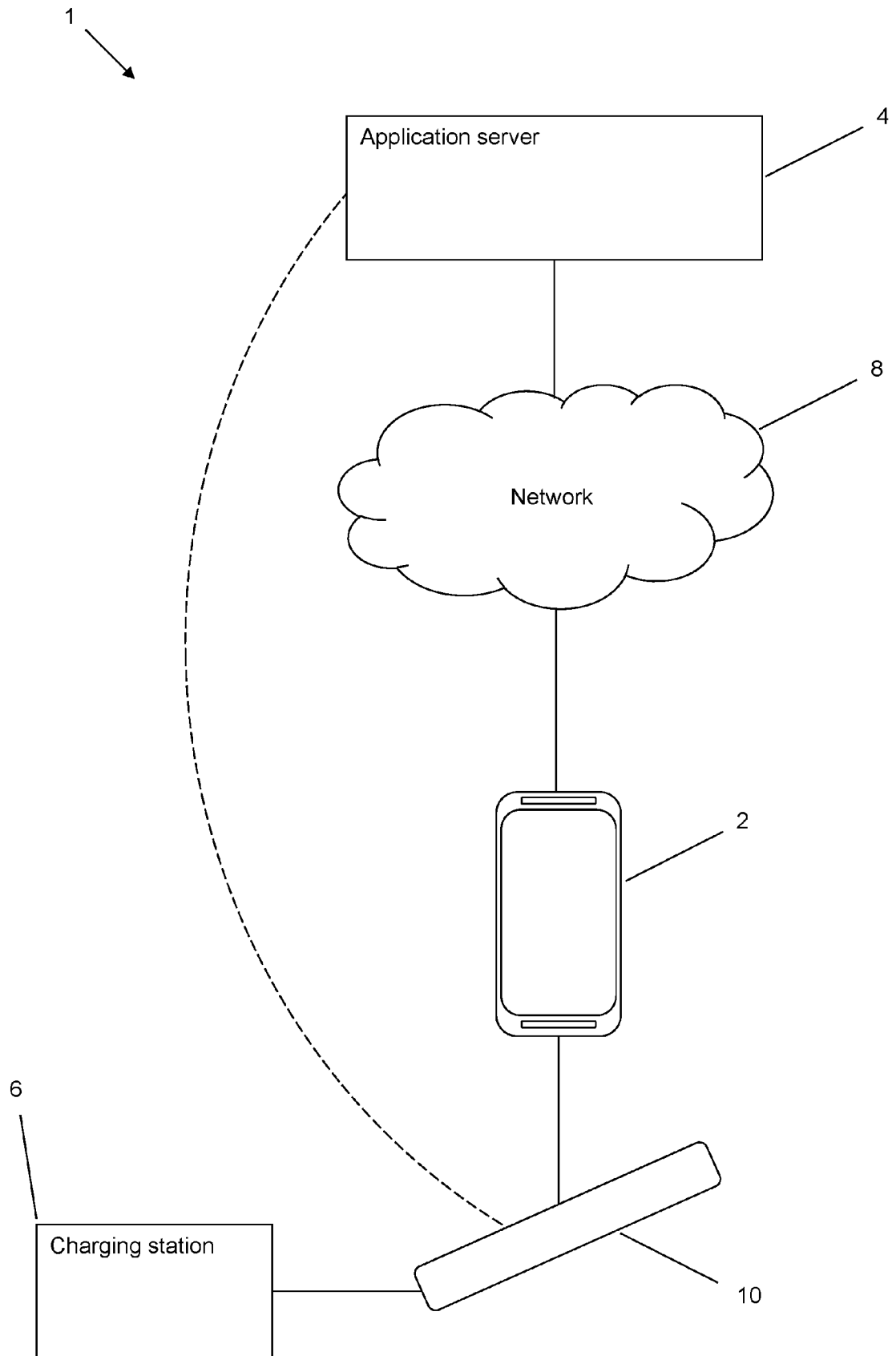


Fig. 1

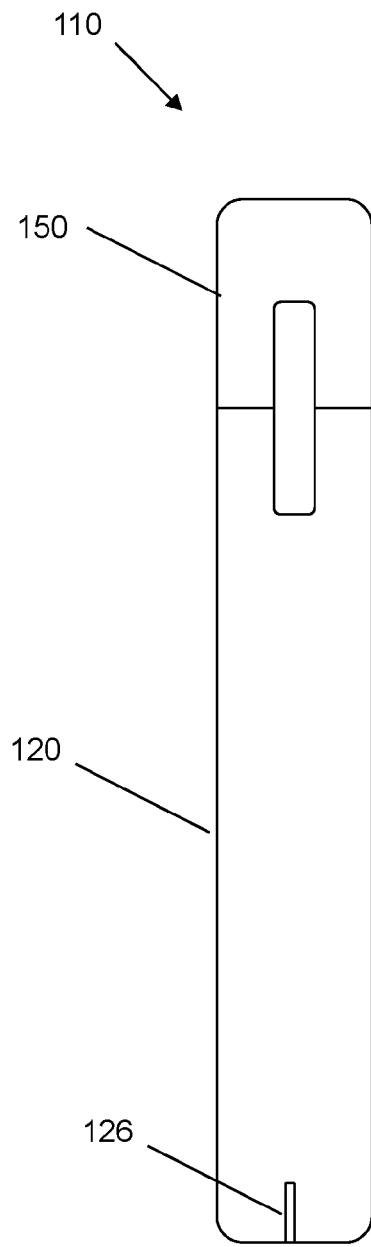


Fig. 2(a)

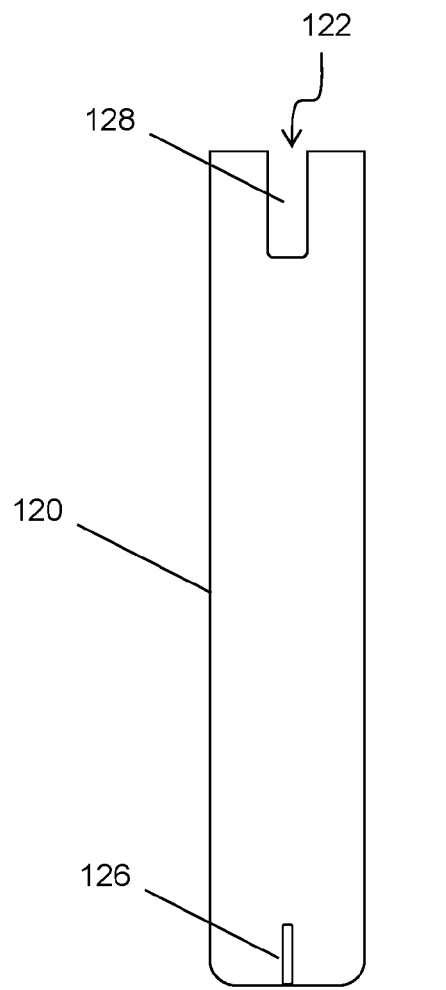


Fig. 2(b)

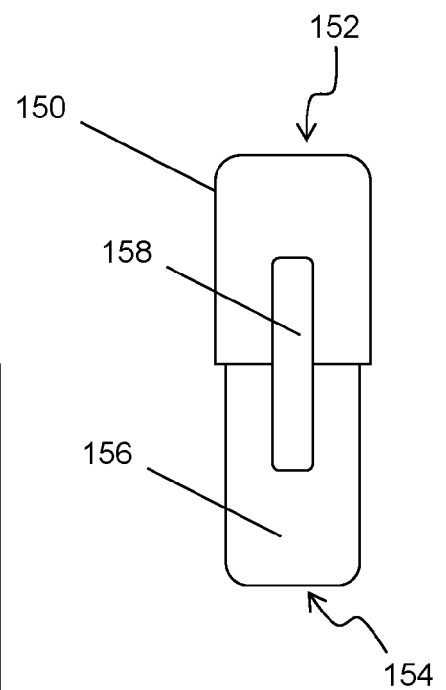


Fig. 2(c)

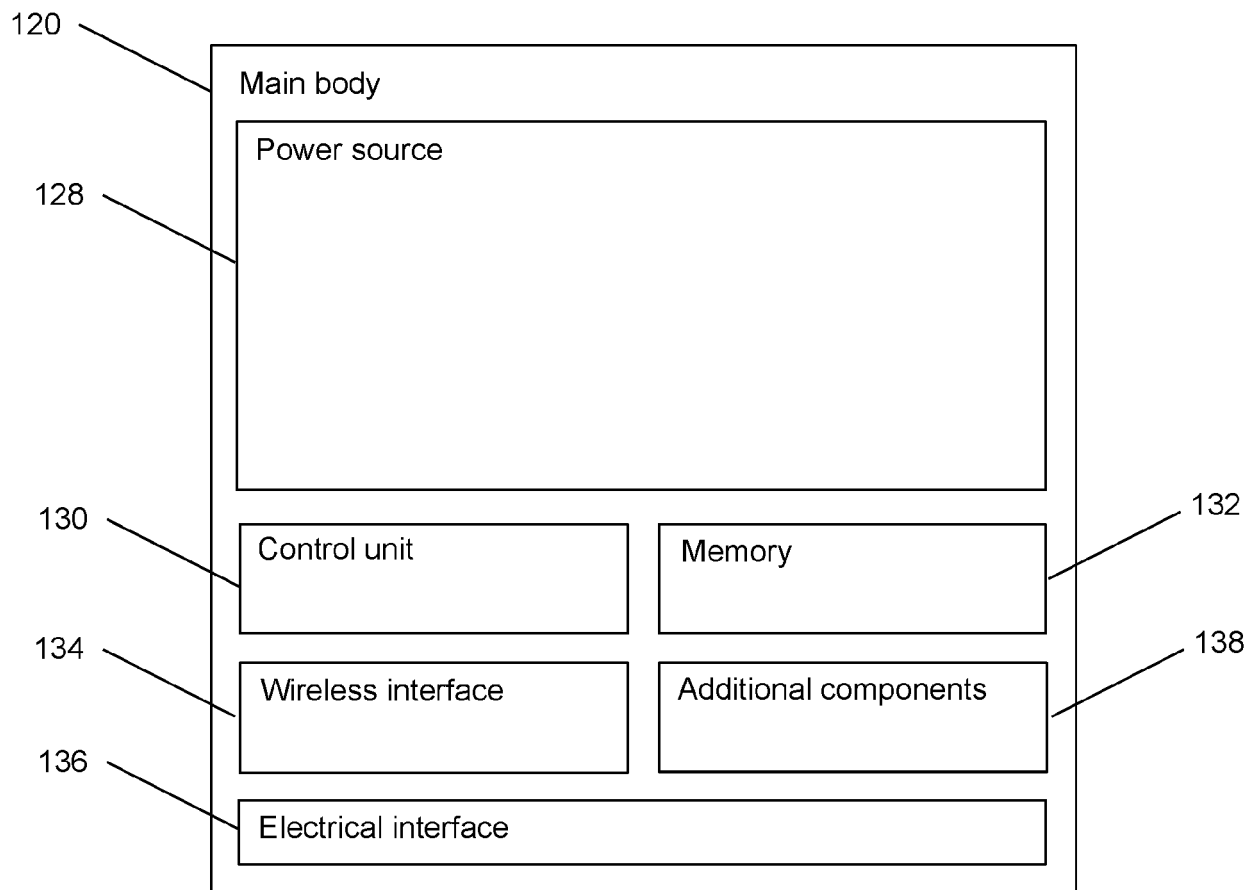


Fig. 3(a)

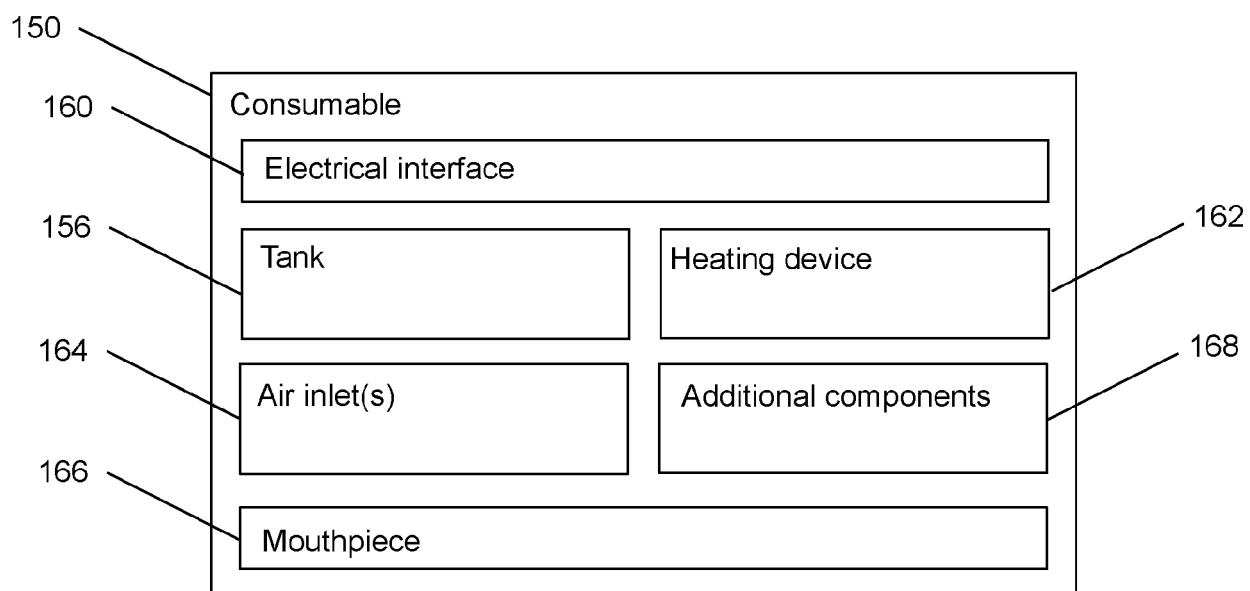


Fig. 3(b)

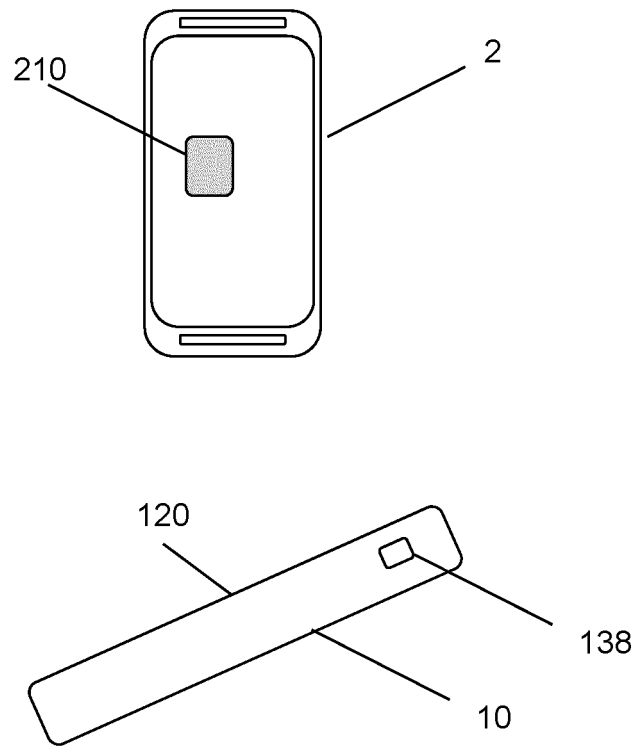


Fig. 4

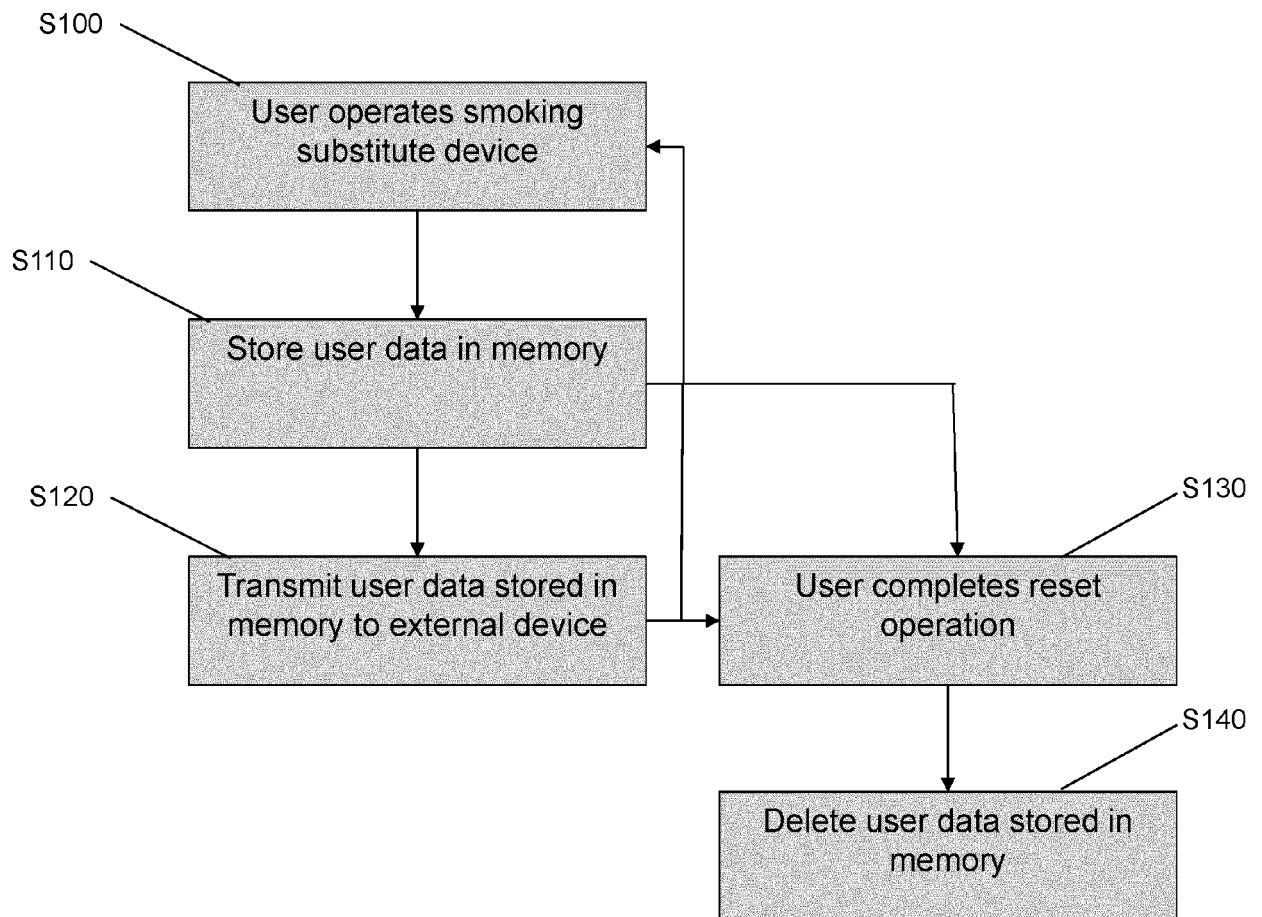


Fig. 5



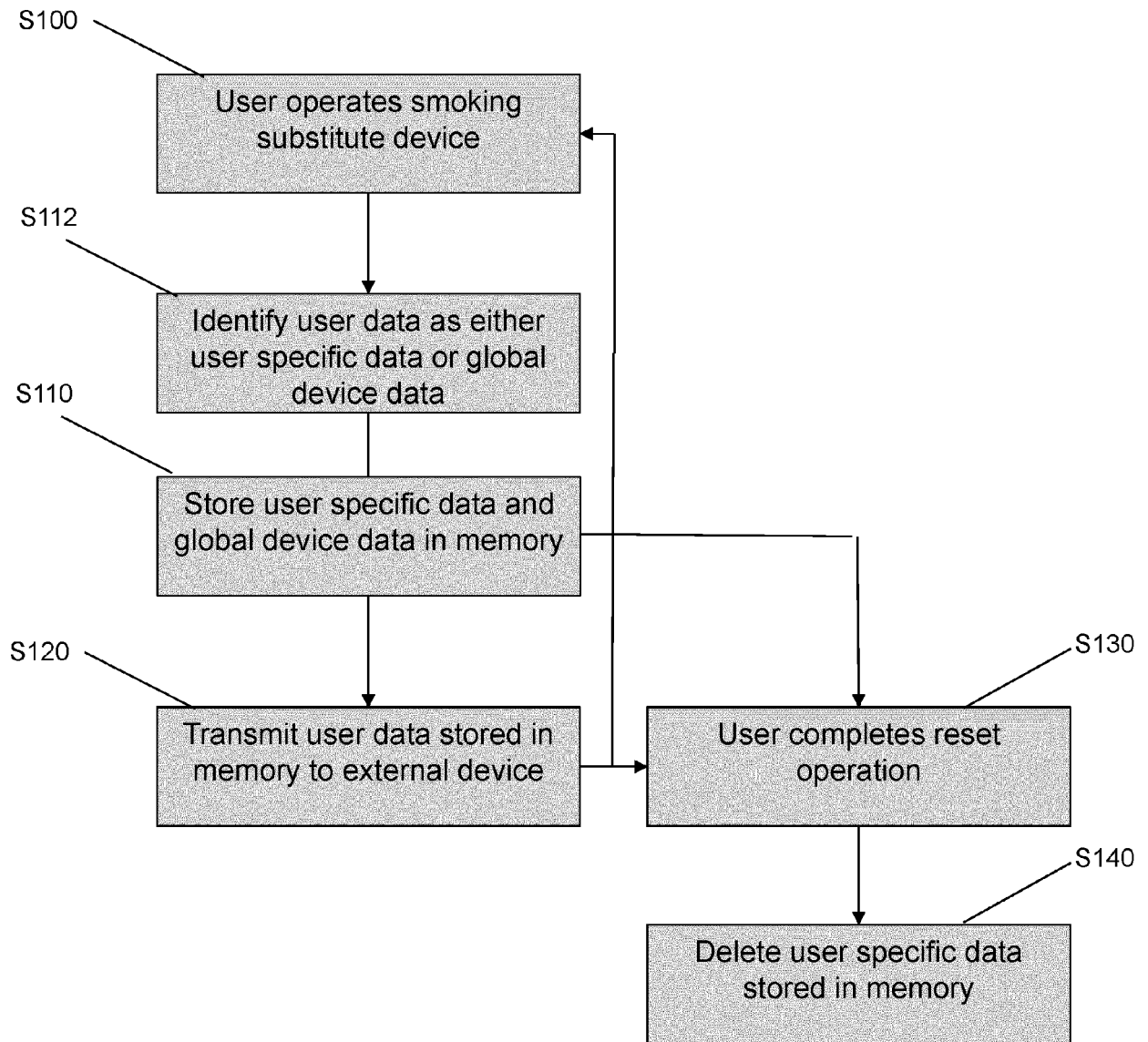


Fig. 6



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