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

(57) A smoking substitute device is provided, comprising a control unit and a memory. The control unit is configured to record in the memory usage information. The control unit is configured to, upon receiving an in-

struction to clear the memory, clear a first portion of the information from the memory, and retain a second portion of the information in the memory.

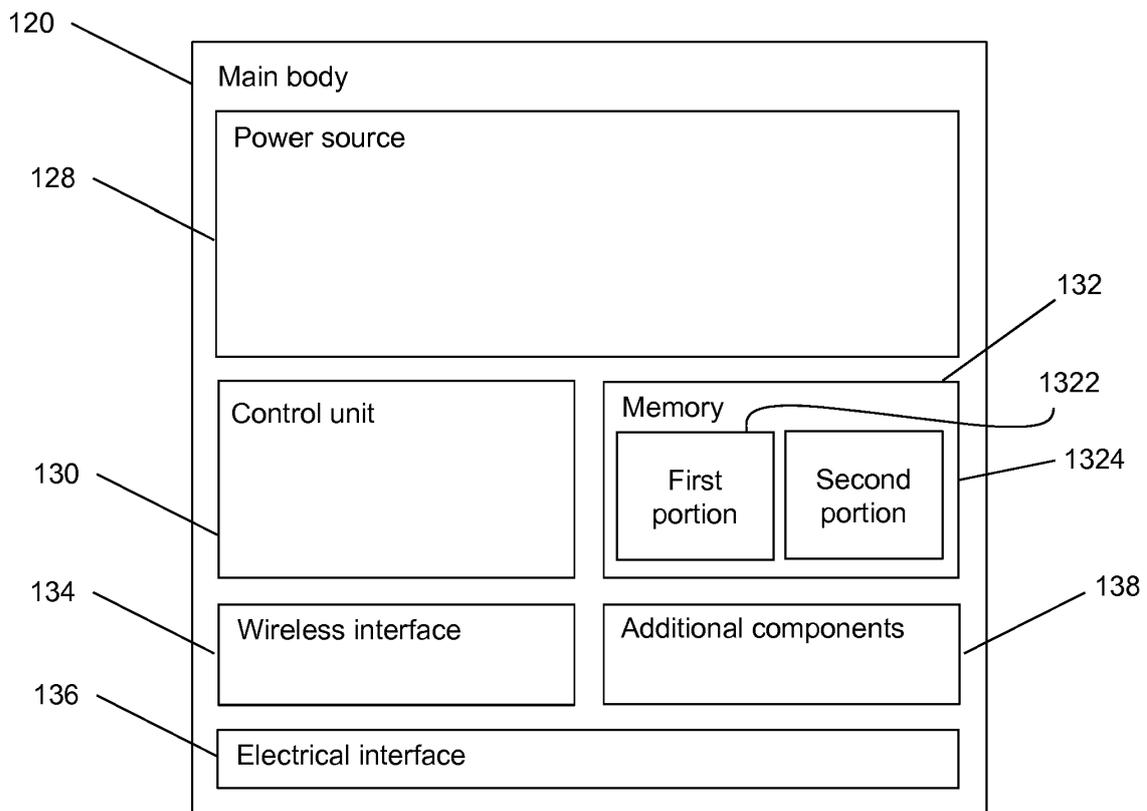


Fig. 3(a)

Description

TECHNICAL FIELD

[0001] The present invention relates to smoking substitute devices. In particular, although not exclusively, it relates to the management of data recording and storage for smoking substitute devices.

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 mouth-

piece 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] The present inventor(s) have observed that, in order to ensure safe and technically correct functioning of a smoking substitute device, it may be necessary for the user to carry out certain steps, for example towards the start of the lifetime of the device. Moreover, the present inventor(s) have observed that smoking substitute devices may unfortunately be at risk of misuse, for example by non-authorized users. It would be beneficial to limit the potential risk for such misuse.

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

Summary of the Invention

[0026] At its most general, the present invention provides a smoking substitute device configured to retain certain data in memory even after performing a factory reset or a clear memory or a memory overwrite operation in order to facilitate adherence to certain safety requirements or other regulations. The invention may help to prevent misuse of the smoking substitute device, for example by under-aged (and therefore non-permitted) users. It can also help to ensure that, for network-enabled smoking substitute devices, the relevant application, that is available for data transmission to and from the smoking substitute device, is accessed by the user. This enables the user to more completely and reliably utilise all the potential functions of the smoking substitute device and the application and to receive all the possible information that the application could provide. For example, it may enable the application to alert the user to any safety concerns in relation to the smoking substitute device.

[0027] The invention may thus operate to prevent a user from erasing or overwriting all the information that has been recorded by a control unit of the smoking substitute device. Therefore, it can prevent a user from regularly erasing or overwriting all such information, and thereby from circumventing safety requirements or other regulations for the device. For example, it is known for some network-enabled smoking substitute devices to have an inbuilt requirement for the user to connect to the relevant application on a mobile device, within a short time of the user beginning to use the device. For example, a smoking substitute device may be configured so that the user is only allowed to take a maximum of 15 inhales from the smoking substitute device, from the point of its first use, before connecting to the application. A key purpose of this requirement is for the application to perform age verification for the user, to try to prevent misuse of the smoking substitute device by underage users. By preventing the user from erasing or overwriting all the recorded information in the device's memory, and therefore removing the option to delete or obscure all usage data, the invention can therefore prevent the user from circumventing such important requirements.

[0028] According to one aspect of the invention, there is provided a smoking substitute device comprising a control unit and a memory. The control unit is configured to record, in the memory, usage information relating to operation of the smoking substitute device. The control unit is further configured to permit a first portion of the usage information to be overwritten or cleared from the memory while retaining a second portion of the usage information in the memory. For example, upon receiving an instruction to clear the memory, the control unit may be configured to clear a first portion of the usage information from the memory and retain a second portion of the usage information in the memory. In another example, the control unit may be configured to permit overwriting of an uploaded part of the first portion of the usage

information with newly recorded usage information, while retaining the second portion of the usage information intact.

[0029] According to another aspect of the invention, there is provided method of managing a smoking substitute device comprising a control unit and a memory. The method comprising storing, by the control unit, usage information in the memory. The usage information relates to operation of the smoking substitute device. The method further comprises clearing or overwriting a first portion of the usage information from the memory while retaining a second portion of the usage information in the memory. For example, the method may comprise receiving, by the control unit, an instruction to clear the memory; clearing the first portion of the usage information from the memory; and retaining the second portion of the usage information in the memory

[0030] By retaining the second portion of the recorded information relating to the smoking substitute device, the control unit ensures that the user cannot change all the recorded information or delete all the recorded information, either of which actions might otherwise lead to safety concerns, technical malfunction of the device, or misuse of the device. As a result, if the device is configured such that there are required actions that the user must carry out, for example within a predefined period of time after he or she begins using the device, or by the time he or she has taken a predetermined number of inhalations from the device, the user will not be able to avoid taking those required actions by merely deleting all data from the device and effectively returning it to its factory settings. Instead, because it has retained a second portion of its usage information in the memory, the smoking substitute device and any linked application or mobile device will have a record that the device has been in use, even if some of the usage information has been deleted, and it will therefore be operable to impose any relevant restrictions or regulations on the user. Because the smoking substitute device will know that it has been in use, even if some of its usage information has been deleted, it will also be able to provide the user with more accurate messages and/or warnings and therefore the overall user experience, and the efficiency and successful functioning of the smoking substitute device, will be improved.

[0031] The first and second portions of the usage information may be stored in separate locations in the memory. For example the first portion of usage information may be non-retainable data stored in a first portion of the memory. The second portion of usage information may be retainable data stored in a second portion of the memory. The first portion of the memory and the second portion of the memory may be independently addressable. For example, the first and second portions of the memory may be physically separate memory units, e.g. of differing memory types, or may be separate partitions or logically distinct portions of a single memory unit. The first portion of memory may be volatile or non-volatile memory. The second portion of memory may be non-

volatile memory or some type of permanent (e.g. non-erasable) memory.

[0032] The control unit may be configured to extract, calculate or otherwise obtain the retainable data from the usage information. For example, the recorded usage information may be in a form that combines non-retainable data (e.g. time and duration of inhalation event) with retainable data (e.g. simple inhalation event count). The control unit may thus strip the non-retainable data from the usage information so that only the retainable data is stored in the second portion of the memory. The method disclosed herein may thus include determining, by the control unit from the usage information, the non-retainable data and retainable data, and storing the non-retainable data in a first portion of the memory and storing the retainable data in a second portion of the memory. The step of clearing a first portion of the usage information from the memory may comprise erasing the non-retainable data from the first portion of memory.

[0033] In one example, the non-retainable data may be uploaded (periodically or in an ad hoc manner) to a remote device, e.g. an application on a mobile device or a remote server. The control unit may be configured to flag uploaded non-retainable data as overwriteable, whereby, upon receipt of new usage data, the uploaded non-retainable data may be overwritten without affecting the retainable data. In this manner, the memory in the smoking substitute device can be managed efficiently whilst providing the security advantages mentioned above.

[0034] The usage information may relate to any aspect of operation of the smoking substitute device. For example, for a network enabled smoking substitute device that includes a wireless interface, the control unit may be configured to record a communication log in the memory. In another example, for a smoking substitute device that includes a consumable data reader, the control unit may also be configured to record consumable data, read from a consumable inserted into the main body of the smoking substitute device, in the memory. In yet other examples, the smoking substitute device may include additional operation components configured to output telemetry data indicative of operation of the device. The usage information may include telemetry data from these additional components.

[0035] The usage information may comprise information regarding inhalation events. For example, the usage information may comprise: a total number of inhalation events or a number of inhalation events performed within a predetermined time period.

[0036] The total number of inhalation events may be the number of inhalations performed using the device during the lifetime of the device. The so-called "lifetime" may be regarded as the period of time since the device was first used for an inhalation or other smoking substitute action.

[0037] In one example, the smoking substitute device may be configured to wirelessly transmit synchronisation

data to an application installed on a mobile device. The usage information may comprise a number of inhalations performed since the most recent wireless transmission of synchronisation data to the application. As mentioned above, following the wireless transmission of synchronisation data, the control unit may be configured to permit overwriting in the memory of the first portion of the usage information included in the uploaded usage information.

[0038] The device may comprise an airflow sensor, wherein the control unit is configured to detect an inhalation event using measurement data from the airflow sensor.

[0039] The usage information may comprise information regarding a time and/or a date of one more inhalations. Such information may be utilised by the control unit in conjunction with information regarding the time and or date or a pre-determined event. Therefore, the control unit may be configured to record the number of inhalations that have occurred since a pre-determined event.

[0040] The usage information may comprise information regarding an orientation of the device. For example, the device may comprise an accelerometer, wherein the usage information regarding an orientation of the device comprises measurement data obtained by the accelerometer.

[0041] The usage information may comprise information relating to the battery. For example, it may comprise information regarding battery charge status.

[0042] The second portion of information, which is retained in the memory, may include information regarding a number of inhalations performed using the device within a defined time period. For example, the defined time period may be the period of time since the first inhalation occurred for the device or, in other words, the lifetime of the device. For example, the defined time period may be the period of time since a predetermined event has occurred, for example since the most recent occurrence of a synchronisation data transfer from the smoking substitute device to an application running on a mobile device.

[0043] A so-called "synchronisation data transfer" may be regarded as the transfer of some or all of the data stored within a memory of the smoking substitute device to the application, to ensure that the information, for example usage information, stored on the application is synchronised with the data that has been stored within the memory of the device itself. According to an embodiment, some of the data that is transferred to the application from the smoking substitute device during a synchronisation data transfer will subsequently be deleted from or overwritten in the memory of the smoking substitute device, in order to reduce the load on its memory, increase efficiency and avoid redundancy with the application.

[0044] The control unit may be further configured to compare a usage parameter of the usage information to a predetermined threshold. For example, the recorded

information relate to the usage of the smoking substitute device may comprise a number of inhalations and the predetermined threshold may comprise a maximum permitted number of inhalations for a defined period of time. The control unit may cause the smoking substitute device to enter a locked state if the usage parameter exceeds the predetermined threshold. The second portion of the usage information may comprise the usage parameter so that the user cannot avoid entering the locked state by clearing the memory.

[0045] In one example, the usage parameter may be the total number of inhalation events, and the predetermined threshold may correspond to a maximum permitted number of inhalations, after the user first switches on the device, or first uses the device.

[0046] There may be a requirement for a user to take a particular action - such as accessing an application on a mobile device, in order to provide user identification and/or age verification - before (or by the time that) the maximum permitted number of inhalations has been exceeded or reached. The control unit may thus be configured to determine whether or not a predetermined action has been performed. The control unit may be configured to cause the smoking substitute device to enter the locked state if the usage parameter exceeds the predetermined threshold and the predetermined action has not been performed.

[0047] In the locked state, the control unit may disable a hardware component such as the heating device, so that the liquid and/or tobacco of the smoking substitute device cannot be heated. In an embodiment in which the air flow sensor is used for activation of the device, wherein an inhalation is sensed by the air flow sensor, the control unit may temporarily disable operation of the air flow sensor and/or may temporarily switch off an electrical path between the air flow sensor and the control unit, which would result in the device not being activatable for smoking substitute action. It will be understood that the control unit may take any suitable steps in order to temporarily disable the smoking substitute device. For example, it may use a switch, or it might otherwise reroute an electrical power supply between the hardware components of the device, so that normal operation of the device, for smoking substitute action, is not possible at that time.

[0048] The user may have to take a predetermined action or combination of actions in order to "unlock" the device and re-enable smoking substitute action. The required predetermined action or combination of actions in order to "unlock" the device may be referred to as a re-enablement procedure. The control unit may be configured to require the re-enablement procedure to be performed, before it will re-enable smoking substitute action using the device. Usually, the re-enablement procedure will comprise the action or combination of actions that the user should have performed, and the non-performance of which has led to the device being locked.

[0049] For example, a re-enablement procedure may

comprise an action or combination of actions that the manufacturer or other provider of the smoking substitute device has determined is required for safe use of the device.

5 **[0050]** The smoking substitute device may be configured to enter the locked state if, and only if, the re-enablement procedure has not been performed when the smoking substitute device determines that the actual usage of the smoking substitute device has exceeded the
10 predetermined threshold. According to an embodiment, a warning may be issued to the user that the control unit is going to transition the device to its locked state unless the re-enablement procedure is performed. Usually the warning will have an associated relatively short time period in which the re-enablement procedure has to be
15 performed in order to prevent subsequent locking of the device. The warning may be provided to the user directly by the smoking substitute device, for example via a flashing light or a message on an LED screen. Alternatively,
20 the warning may be provided via the application or via the mobile device with which the smoking substitute device is configured to wirelessly communicate.

[0051] The instruction to clear the memory of the smoking substitute device may comprise any suitable instruction. It should preferably be a user-initiated instruction
25 however there may be circumstances in which it is an automatically initiated instruction, for example if there has been a technical malfunction and the device needs to reset itself in order to resume normal functioning.

30 **[0052]** An instruction to clear the memory of the smoking substitute device may be conveyed, from the user to the smoking substitute device, using any suitable combination of hardware and or software implemented steps. For example, the user may use an application or a mobile
35 device that communicates wirelessly with the smoking substitute device, in order to convey the instruction. Alternatively, the user may deliver the instruction directly to the device itself. For example, there may be a predetermined action or combination of actions using hardware components of the smoking substitute device that
40 should be carried out in order to convey the instruction that the memory should be cleared. For example, if the smoking substitute device has an on/off button, the user may be able to depress the on/off button for a pre-determined period in order to instruct the device to clear its
45 memory. Alternatively, the instruction to clear the memory may be implemented using other hardware means, for example by tapping the device or otherwise moving it in a certain way, which could be detected by an accelerometer. The pre-determined combination of actions may involve a combination of different hardware components. For example, the user may have to plug a charging
50 cable into an electrical charging port of the device and at the same time move or tap the device in a predefined manner, in order to effect the memory clear instruction.

[0053] The instruction to clear the memory of the smoking substitute device may comprise a so called "factory reset" instruction. According to an embodiment, a factory

reset instruction may reset some or all of the operational parameters of the device to mirror the operational parameters that were in place when the device was manufactured, apart from of course the fact that a (second) portion of information relating to usage would be retained in the memory of the smoking substitute device. A factory reset instruction may therefore cause the smoking substitute to forget any user preferences or user-initiated instructions that it had previously learned, during usage of the device. Alternatively, the instruction to clear the memory of the smoking substitute device may simply comprise a "clear memory" instruction. A clear memory instruction may not cause changes to all the operational parameters of the device, and it may enable certain user preferences to be retained whilst at the same time still deleting a first portion of other usage data from the memory.

[0054] The smoking substitute device may operate to upload, by the control unit, the usage information to an application installed on a mobile device. The uploading step may be done using a wireless interface in any conventional manner. The control unit may include a memory management module configured to monitor the upload process and flag any part of the first portion of usage information that is uploaded as being overwriteable. Upon detecting, by the control unit after the usage information is uploaded, new usage information of the smoking substitute device, the smoking substitute device may operate to overwrite the first portion of the usage information included in the uploaded usage information with the new usage information.

[0055] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

[0056] 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

[0057] 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 consuma-

ble.

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 a flow diagram depict a method of managing a smoking substitute device that is an embodiment of the invention.

Detailed Description of the Invention

[0058] 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.

[0059] Fig. 1 shows an example system 1 for managing a smoking substitute device 10.

[0060] 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.

[0061] 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.

[0062] The network 8 may include a cellular network and/or the internet.

[0063] 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.

[0064] 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.

[0065] 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.

[0066] 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.

[0067] 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".

[0068] 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.

[0069] Fig. 2(a) shows the smoking substitute device 110 with the main body 120 physically coupled to the consumable 150.

[0070] Fig. 2(b) shows the main body 120 of the smoking substitute device 110 without the consumable 150.

[0071] Fig. 2(c) shows the consumable 150 of the smoking substitute device 110 without the main body 120.

[0072] 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.

[0073] 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.

[0074] 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.

[0075] In this present embodiment, the consumable 150 is a "single-use" consumable. That is, upon exhaust-

ing 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).

[0076] The tank 156 may be referred to as a "clear-omizer" if it includes a window 158, or a "cartomizer" if it does not.

[0077] Fig. 3(a) is a schematic view of the main body 120 of the smoking substitute device 110.

[0078] Fig. 3(b) is a schematic view of the consumable 150 of the smoking substitute device 110.

[0079] 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.

[0080] The power source 128 is preferably a battery, more preferably a rechargeable battery.

[0081] The control unit 130 may include a microprocessor, for example.

[0082] The memory 132 preferably includes non-volatile memory, and may be partitioned or otherwise physically or logically separated into a first portion 1322 and a second portion 1324, whose function is described below.

[0083] 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. The wireless interface 134 may be configured to receive instructions, commands or other data from a remote device, e.g. mobile phone or the like.

[0084] The electrical interface 136 of the main body 120 may include one or more electrical 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.

[0085] The additional components 138 of the main body 120 may include the optional light 126 discussed above.

[0086] 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.

[0087] 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).

[0088] 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).

[0089] 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.

[0090] The additional components 138 of the main body 120 may include a reader 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.

[0091] The reader 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 reader included in the main body 120 may be an RFID reader) or a visual data source such as a barcode (in which case the reader 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 reader 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.

[0092] For avoidance of any doubt, the reader (if present) may be configured to read information from the machine readable data source non-wirelessly, e.g. using a direct electrical connection between the main body 120 and consumable 150.

[0093] 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.

[0094] The electrical interface 160 of the consumable

150 may include one or more electrical 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.

[0095] 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.

[0096] 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.

[0097] 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.

[0098] 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 reader configured to read information associated with the consumable from the machine readable data source.

[0099] 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.

[0100] 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.

[0101] 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.

[0102] 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.

[0103] 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.

[0104] Embodiments of the present invention relate to data storage and data preservation for a smoking substitute device, for example a network-enabled smoking substitute device such as that discussed above in relation to Fig. 1. In particular, they relate to preserving at least a portion of recorded usage data even if instruction has been issued for the memory of the smoking substitute device to be cleared. As a result, the risk of misuse of the device is lowered and it is harder for a user to avoid or circumnavigate important regulatory and/or safety requirements for the device.

[0105] In an embodiment of the invention, the control unit 130 is configured to record or otherwise obtain, measure or calculate usage data relating to operation of the device. The usage data may comprise telemetry data relating to operation of any of the additional components 138 mentioned above. In one example, the additional components 138 of the main body 120 of the smoking substitute device 110 comprises an airflow sensor for detecting airflow in the smoking substitute device 110, e.g. caused by a user inhaling through a mouthpiece 166. This action is may be referred to herein as being "an inhalation". The smoking substitute device 110 is configured, according to this embodiment, to be activated when an inhalation is detected by the airflow sensor. This is a particularly useful feature as it allows the device 110 to be provided without an on/off switch, which saves on both physical space and processing capacity. In this case, the usage data obtained by the control unit 130 may include, but need not be limited to, information regarding inhalations. For example, the control unit may record the number of inhalations that occur per unit time. For example, it may record the number of inhalations per hour or per day. Optionally, the control unit 130 may be configured to record the time and or the date of each inhalation however it may be deemed to be unnecessary to record an exact time for every inhalation. It may instead be more efficient, and sufficient for any subsequent data analysis or computations, to allocate each inhalation event to a particular time range, for example a particular hour or a particular day.

[0106] The usage data may comprise information about the identity of one or more mobile devices with

which the smoking substitute device is configured to wirelessly communicate. For example, the usage data may comprise a routine or schedule for the transmission of synchronisation data between the smoking substitute device and an application running on a mobile device. The transmission of synchronisation data may be performed regularly in order to transfer usage data or other information from the smoking substitute device to the application, to ensure that the information stored on the application is synchronised with that which has been recorded by the smoking substitute device. This can be of particular importance if the application is configured to make calculations or other determinations, for example if the application is configured to monitor battery charge status and to issue a warning if the battery of the smoking substitute device is running low.

[0107] The usage data may comprise measurement data relating to certain of the components of the smoking substitute device. For example, it may record a battery output voltage level in order to monitor battery charge status. It may be configured to record and store other measurement data so that operation of certain components may be monitored, and any faults detected. For example, it may measure operational data for the heating device. The control unit 130 may also be configured to store data from an accelerometer in the memory. It will be understood that data from the accelerometer may be used to sense certain movements of the device, which in turn may prompt certain control instructions. For example, there may be a hardware reset process that involves repeated tapping of the device against a surface, which the accelerometer would be configured to sense.

[0108] The control unit 130 is configured to store the usage data in the memory 132. The usage data may be stored in any suitable form, e.g. as a log or the like. As discussed above, the memory 132 may comprise a plurality of separate portions, e.g. a first portion 1322 and a second portion 1324 as shown in Fig. 3(a). The portions may be either physically or logically separate so as to be independently addressable by the control unit 130. The portions may comprise different memory types and/or different partitions within the same logical volume.

[0109] In embodiments of the invention, the different portions of the memory 132 are used to store different types of usage data. In particular, the first portion 1322 may be configured to store non-retainable (i.e. erasable) data, whereas the second portion 1324 may be configured to store retainable (i.e. non-erasable) data. The control unit 130 may be configured to determine, from the recorded usage data, retainable data and non-retainable data, and store the retainable data and the non-retainable data in a corresponding portion of the memory, depending on the determined usage data type. The retainable data and the non-retainable data may be stored in different formats in the first portion 1322 and second portion 1324 of the memory 132. For example, the control unit 130 and memory 132 may be configured so that the non-retainable data is stored temporarily, for example only

until after it has been wirelessly transmitted to a mobile device in communication with the smoking substitute device or, for example, only for a limited period of time. For example, non-retainable data may be stored in a buffer wherein the oldest data therein is continually being replaced by newer, more up-to-date data.

[0110] It may be desirable to provide a user with control over the data stored on the smoking substitute device. For example, for security reasons a user may wish to limit the storage of any personal data on the device, or on the mobile device and/or the application with which the smoking substitute device is configured to wirelessly communicate. The user may deem it unnecessary to record or store particular types of data, or a user may deem it unnecessary to keep any data stored on the smoking substitute device itself, after that data has been transmitted to a mobile device or application for storage. For example, a user may deem it unnecessary to record any data which has been read from a consumable which is inserted into the main body of the smoking substitute device. He or she may therefore wish to opt, for simplicity and/or in order to reduce processing load on the device, not to record or not to store such data. According to an embodiment, it may be possible to implement user choice regarding data recordal or storage, either directly at the smoking substitute device or via a mobile device or an application with which it wirelessly communicates. Alternatively, when purchasing a smoking substitute device, a user may opt for a simpler model of device, which has limited data recording and/or storage capacity.

[0111] The present inventors have recognised that, although providing user choice and flexibility can be very important, this must be balanced against the fact that certain usage data is particularly useful as evidence of actual use of a smoking substitute device. Moreover, they have recognised that it is important for users to respect and adhere to safety rules and other regulations that are intended to govern the use of his or her smoking substitute device. As detailed further below, actual usage data can provide an accurate and highly useful resource, for ensuring that this happens. Therefore, to ensure that safety rules and other regulations are adhered to, the present inventors have recognised that certain usage data should be retained within the memory of a smoking substitute device in a manner and/or in a location that prevent the user from deleting it. Accordingly, the smoking substitute device may be configured to provide control over the ability of the control unit to record and/or store non-retainable data, whilst always recording retainable data. Similarly, the control unit may be configured to permit erasure of non-retainable data, but prohibit erasure of retainable data.

[0112] The smoking substitute device may be a network-enabled device, which is configured to communicate with an application running on a mobile device, such as a mobile phone, smart phone, laptop computer or tablet computer. The communication with the mobile device may be used for user identification, which may include

user age verification. It will be understood that it is important to reduce the potential risk of misuse of a smoking substitute device by underage users. The user identification may also be useful for registration of the device, for example for warranty or insurance purposes in case the device is lost, stolen or damaged or in case it does not function correctly. The user identification can also play an important role in the security of the smoking substitute device. For example, the user identification process may involve setting up a unique user ID and/or password, which the user may subsequently have to use when he or she wishes to submit control inputs, which may include submitting user preferences for operation of the device, via the application or mobile device.

[0113] The control unit may include a security function requires the smoking substitute device to communicate with an application on a mobile device before a number of detected inhalations exceeds a predetermined threshold. The predetermined threshold, i.e. the number of inhalations permitted before connection, may be 15 or fewer. It will be appreciated that numerical limits other than 15 inhalations may be imposed but, in principle, the limit should be relatively low so that the user is compelled to communicate with the application very soon after he or she begins to use the smoking substitute device. Therefore if, for example, the user is underage and would therefore be unable to provide the requisite age verification via the application, his or her use of the smoking substitute device would be for a very limited time and therefore the risk of potential harm would be reduced. If the number of inhalations is detected before communicate with an application on a mobile device, the control unit may be configured to disable or otherwise lock the smoked substitute device.

[0114] As mentioned above, it is possible that a user will wish to exert control over data recording and storage for his or her smoking substitute device. Furthermore, it is known for smoking substitute devices to provide the user with an option to clear the memory of their device. Clearing the memory can be comprised within a 'reset' option, via which the factory settings of the device would be restored. Alternatively, a 'clear memory' option may be provided, separate to a complete 'reset' option.

[0115] Instructions to clear the memory may be provided directly by the user to the device, for example by taking one or more pre-determined actions with respect to hardware components of the device. Alternatively, a "clear memory" instruction may be issued via a mobile device, or an application running on a mobile device, with which the smoking substitute device wirelessly communicates. When a smoking substitute device is network-enabled, and when it transfers data from its memory to an application running on a mobile device, the application may be configured to automatically send a "clear memory" instruction to the control unit of the device, when it has safely received a transfer of such data. The principle of such an instruction is to limit the load on the memory of the device, which will inherently be limited, and to avoid

redundancy, by ensuring that the device memory does not retain information that is also being stored by the application.

[0116] Clearing a device memory can be useful if, for example, the processor within a device seems to be running slowly, as a result of the memory being overloaded. It can also be useful if the user wishes to sell or loan his or her device and therefore wishes to remove certain personal data from the memory to prevent it being accessed by non authorised persons. However, the present inventor(s) have recognised that providing an unrestricted option to clear the memory of, or to reset, a smoking substitute device can also, in known devices, provide the potential for misuse, e.g. by enabling circumvention of the limited inhalation security feature mentioned above.

[0117] Therefore, according to the embodiments described herein, although the user will be provided with the option to clear the memory of their device, it is a restricted option in that the control unit 130 is configured not to entirely clear all data from the memory 132 of the device. Instead, in response to an instruction to clear the memory 132 of the smoking substitute device, the control unit 130 operates to clear only the non-retainable data, i.e. the data stored in the first portion 1322 of the memory. The retainable data in the second portion 1324 of the memory 1322 thus remains.

[0118] According to one particular example, the retainable data in the second portion 1324 of the memory 132 comprises a number of inhalations taken by the user, using the device, during the lifetime of the device (i.e. since the time at which the user first began using the device). Other information regarding inhalations may be included in the non-retainable data. For example, if precise times and dates of inhalations have been recorded, they may be in the non-retainable data and hence may be deleted when a clear memory instruction is received. If there is information recorded regarding usage patterns, and/or number of inhalations per day, such information may also be deleted. Therefore, even if the user "clears" the memory, the device will retain the information on number of inhalations and therefore the control unit will be able to detect when the total number of inhalations exceeds the predetermined threshold.

[0119] The present invention may also find use in preserving important data in memory in conjunction with efficient use of local (i.e. on-device) and remote storage (e.g. memory on a mobile device or a remote server). As discussed above, the smoking substitute device may include a wireless communication function that may be used to upload collected usage data (stored on the memory of the device) to a mobile device and/or remote application server. The uploading can occur periodically or on an ad hoc basis. Once usage data is uploaded, there may no longer be any need to store it on the device itself, so for efficient on-device memory management, it is desirable to be able to overwrite data that has already been uploaded.

[0120] The control unit 130 may include a memory

management module that is configured to flag data that can be overwritten. However, for reasons similar to those explained above, it may be desirable to retain some elements or the usage data, including some elements that may have been uploaded to the mobile device or application server, on the smoking substitute device itself. Thus, in some embodiments of the invention, the control unit 130 may be arranged to prohibit or otherwise prevent overwriting of data in the second portion of the memory. If new usage data is recorded, the control unit 130 may be configured to ensure that only uploaded data in the first portion of the memory can be overwritten with new usage data.

[0121] The control unit 130 is configured so that, when it is detected that the number of inhalations has exceeded 15, a check will be performed to see whether the device has yet communicated with an application running on a mobile device. This check can be performed, for example, by obtaining information from the wireless interface of the device and/or by checking the telemetry data stored in the memory, to see if any communication links have been established. If it is determined that the device has not yet communicated with the application, the control unit can take steps to prevent further use of the device for smoking substitute action, until the requirement for communication with the application has been fulfilled.

[0122] The control unit may be configured to transition the smoking substitute device into a "locked state" upon detection that communication with the application has not been made, when the number of inhalations exceeds the predetermined threshold. When the device is in a locked state, the user will not be able to use it for a smoking substitute action. For example, the control unit may temporarily disable the operation of the air flow sensor, so that no inhalations can be detected and therefore smoking substitute action cannot be activated. For example, the control unit may reroute an electrical path away from the heating device, such that the heating device will not be operable to heat liquid or tobacco, when the device is in its locked state. For example, the control unit may use a switch to deactivate any relevant electrical path, so that smoking substitute action cannot be performed when the device is in its locked state.

[0123] Once the device has been locked, in order to unlock it the user will have to perform the required action, the non-performance of which has led to the control unit locking the device. This action can therefore be referred to as a "re-enablement procedure". In this embodiment, therefore, the user will have to access the relevant application, on a mobile device, and communicate with the device via the application, before the device can be unlocked. Once the user accesses the application and performs the requisite steps - such as user identification, age verification and so on - the application will provide instructions to the control unit, that the device may be unlocked. The control unit can then take any suitable steps to reverse the temporary disablement of smoking substitute action, for the device.

[0124] The device may provide the user with a final warning before it locks the smoking substitute device. That is, for the particular embodiment described herein, when the control unit detects that the number of inhalations is approaching the predetermined threshold, it may issue a warning to the user that the device will be locked unless the required steps (in this case communication with the application) are carried out. The warning may take the form of a flashing light, for example, or a message on an LED screen.

[0125] Optionally, the application may require the user to take additional steps, before it will issue an instruction to the control unit of the device, to unlock it. For example, the fact that communication with the application was not initiated by the user within the limited number of available inhalations may prompt suspicion, at the application, the user is under-age or is otherwise non-authorized. Therefore the application may request an additional, more thorough input from the user than would have been required, had the user communicated with the application before the predetermined threshold was exceeded. For example, it may ask the user for additional age-verification evidence.

[0126] Although the particular embodiment described herein uses certain inhalation data, specifically number of inhalations, as the retainable data, it will be appreciated that other types of data may be used instead. For example, the time and date of inhalations may be used, wherein the control unit is configured to lock the device if the required steps have not been carried out by the time the device has been used for smoking substitute action for a particular total number of days. Alternatively, or additionally, battery information may be used. For example, the control unit may trigger locking of the device if the required steps have not been carried out by the time the battery charge reaches (or falls below) a predetermined level. Alternatively, or additionally, information regarding the orientation of the device may be used. For example, the control unit may be configured to recognise the orientation that the smoking device will be in for a smoking substitute action. It may use that orientation information to track the number of substitute smoking actions and/or the time period over which smoking substitute action has been performed using the device, and it may trigger locking of the device if the required steps have not been carried out by the time the number of, or the time period of, smoking substitute actions reaches or exceeds a predetermined level.

[0127] Although the particular embodiment described herein has "communication with an application" as its required step, and therefore as its "re-enablement procedure", it will be appreciated that other requirements are possible, in addition to or instead of such communication. For example, the user may be required to register the device, online or otherwise, within a pre-determined time limit or before he or she reaches a pre-determined amount of usage of the device. For example, there may be a requirement for the user to provide user identification

and or age verification directly to the smoking substitute device, not via an application stop. This may be a requirement for simple devices that are not network enabled. The retention of important usage data and the related requirements that must be fulfilled before the usage reaches or exceeds pre-determined levels may be particularly important for simpler models of smoking substitute device, which are likely to be less expensive and therefore to be more attractive and accessible to under-age persons.

[0128] The locking of the smoking substitute device may happen at other times, and in relation to other requirements, apart from towards the beginning of the lifetime of the device. For example, locking and subsequent re-enablement may be employed in order to ensure that the user keeps his or her device up to date or, for network-enabled devices, that the device performs sufficiently regular data transfers to the application or mobile device with which it communicates wirelessly.

[0129] For example, the user may need to log into the application on a repeated or regular basis, in order for the application to retrieve the synchronisation data from the smoking substitute device. If the control unit determines that a synchronisation data transfer has not happened for a predetermined period of time, or for a predetermined amount of data that is accumulating on the memory of the device, it may lock the device and require a re-enablement procedure to be performed, in order to unlock it. In this case, the re-enablement procedure may include implementing a data synchronisation transfer from the smoking substitute device to an application on the mobile device.

[0130] Alternatively, or additionally, a re-enablement procedure may include connecting the smoking substitute device to an electrical power supply. Therefore, the control unit may lock the device when the battery is running low, to prompt the user to take action and recharge the device.

[0131] Alternatively or additionally, a re-enablement procedure may include updating the software on the smoking substitute device or running an application software update, to ensure that the smoking substitute device is being controlled using the most up to date software and to avoid potential errors which using older versions might otherwise cause. Therefore, the control unit may lock the device if it determines that a particular update has not been performed by a deadline, or for a predetermined length of time.

[0132] A re-enablement procedure may comprise taking a break from using the device for a predetermined period of time. Therefore, the control unit may be configured to lock the device when the usage exceeds a predetermined level within a defined period of time, and only to unlock it and allow continued use of the device for smoking substitute action after a predetermined time period has elapsed.

[0133] According to an embodiment, the user may determine bespoke conditions for his or her device, as re-

guards the locking and unlocking of the device. For example, the user may pre-set usage restrictions for his or her device. For example, he or she may wish to set a limit on the number of inhalations per day or per week etc. Therefore, the control unit may be configured to lock the device if those limits are exceeded. The re-enablement procedure may comprise the user re-setting, or re-confirming those limits, or confirming either via the device or via an application connected mobile device that it is permissible for those limits to be exceeded, on this occasion. Or the user may have to take a break from using the device. The user's bespoke conditions may include security measures, wherein the control unit is configured to lock the device if it is detected that a user, other than the authorised user, is using the device. The re-enablement procedure in this case would require user authentication, either directly at the device or at the mobile device or application with which it corresponds.

[0134] Although the focus of the particular embodiment described herein has been the preservation of important usage data in order to prevent potential misuse of the smoking substitute device, it will be appreciated that the preservation of a portion of the usage information, within a memory of the smoking substitute device, can have other important advantages as well.

[0135] For example, by preserving a portion of the information relating to usage of a smoking substitute device, and by using that information to determine if certain required steps have been performed within a usage limit or time limit, the invention can enable the device to be operated more safely and efficiently. For example, in embodiments in which the required steps include communicating with an application, the application will usually enable the device to perform better. For example, the application may take some of the data storage burden away from the smoking substitute device. It may also take away some processing burden, wherein calculations or other determinations may be made by the application, not by the control unit of the device itself. Moreover, communication of data to the application may enable the application to have a better picture of the operating parameters of the device's components and to alert the user to any safety concerns in relation to the smoking substitute device.

[0136] For example, as mentioned above, it is known for an application that communicates wirelessly with a smoking substitute device to store information that had previously been stored in the device's memory and to instruct the device to clear that information from its memory, once it has been safely received by the application. However, such an approach has a potential pitfall in that, if there is a malfunction of the application or if the user is left without access to the application, for example if he or she forgets the username and password required to access the application, or if the mobile device via which he or she accesses the application is lost, stolen or damaged, the user would be left potentially without any information regarding the usage history of the device. With

the present invention however, the user would always retain some information on usage within the device itself and therefore any reliance on a separate mobile device or application would not be absolute.

[0137] The preservation of a portion of usage information within the memory of a smoking substitute device can also be very useful if there is a technical malfunction and if the device is subsequently sent to the manufacturer or other third party to be fixed. Understandably, many users would be uncomfortable with a manufacturer or other third party accessing all the information that may be available via an application. If, however, the memory of the device has retained certain information relating to its usage, the third party may have no need to access the application or to request additional information from the user. Therefore, efficiency, user security and user peace of mind are enhanced.

[0138] Fig. 4 is a flow diagram of a method 400 for managing a smoking substitute device that is an embodiment of the invention. The method 400 begins with a step 402 of recording, by a control unit in a smoking substitute device of the type discussed above, usage information relating to operation of the device. The usage information may be of any of the types discussed above.

[0139] The method continues with a step 404 of determining, by the control unit from the recorded usage information, non-retainable data and retainable data. The retainable data may be extracted, calculated or otherwise obtained from the usage information.

[0140] The method continues with a step 406 of storing, by the control unit, the non-retainable data in a first portion of memory and the retainable data in a second portion of memory. The first and second portions of memory may be of any of the types discussed above. For example, the non-retainable data may be stored by overwriting non-retainable data in the first portion that is flagged as having been uploaded to the mobile device or remote application server.

[0141] The method continues with a step 408 of receiving, by the control unit, an instruction or command to clear or overwrite the memory of the smoking substitute device. As discussed above, the instruction may be sent wirelessly from a mobile device, or may be provided by pressing a reset button on the device, or by manipulating the device in a certain manner. In one example, the device is configured automatically to permit overwriting of the memory after non-retainable usage data has been downloaded to a mobile device or remote server. The device may be configured to flag all or part of the non-retainable data as overwriteable, e.g. by setting an appropriate flag after an upload operation is complete.

[0142] The method continues with a step 410 of erasing or overwriting, in response to the instruction to clear memory, the non-retainable data from the first portion of memory. The retainable data in the second portion of memory is not erased and is configured to prohibit overwriting thereof.

[0143] The features disclosed in the foregoing descrip-

tion, 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.

[0144] 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.

[0145] 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.

[0146] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0147] 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.

[0148] 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 control unit; and
- a memory;

wherein the control unit is configured to:

- record, in the memory, usage information relating to operation of the smoking substitute device; and
- permit a first portion of the usage informa-

tion to be overwritten or cleared from the memory while retaining a second portion of the usage information in the memory.

2. The smoking substitute device of claim 1, wherein the first portion of the usage information is non-retainable data stored in a first portion of the memory, and wherein the second portion of the usage information is retainable data stored in a second portion of the memory, wherein the first portion of the memory and the second portion of the memory are independently addressable.

3. The smoking substitute device of claim 1, wherein the control unit is further configured to extract the retainable data from the recorded usage information.

4. The smoking substitute device of any preceding claim, wherein the second portion of the usage information comprises:

- a total number of inhalation events; or
- a number of inhalation events performed within a predetermined time period.

5. The smoking substitute device of any preceding claim, wherein the usage information comprises any one or more of:

- a number of inhalations performed using the device within a defined time period;
- a number of inhalations performed using the device since an occurrence of a predetermined event; or
- a number of inhalations performed using the device since the most recent occurrence of a predetermined event; or
- information regarding a time and/or a date of one more inhalations; or
- information regarding an orientation of the device; or
- information relating to the battery.

6. The smoking substitute device of any preceding claim, wherein the control unit is configured, upon receiving an instruction to clear the memory, to:

- clear the first portion of the usage information from the memory; and
- retain the second portion of the usage information in the memory.

7. The smoking substitute device of any preceding claim configured to wirelessly transmit synchronisation data to an application installed on a mobile device, wherein the usage information comprises a number of inhalations performed since the most recent wireless transmission of synchronisation data

to the application.

8. The smoking substitute device of claim 7, wherein the wireless transmission of synchronisation data includes uploading the usage information to the application installed on the mobile device, and wherein, following the wireless transmission of synchronisation data, the control unit is configured to permit overwriting in the memory of the first portion of the usage information included in the uploaded usage information.

9. The smoking substitute device of any preceding claim, wherein the control unit is further configured to:

compare a usage parameter of the usage information to a predetermined threshold; and cause the smoking substitute device to enter a locked state if the usage parameter exceeds the predetermined threshold, wherein the second portion of the usage information comprises the usage parameter.

10. The smoking substitute device of claim 9, wherein the control unit is configured to determine whether or not a predetermined action has been performed, and wherein the control unit is configured to cause the smoking substitute device to enter a locked state if the usage parameter exceeds the predetermined threshold and the predetermined action has not been performed.

11. The smoking substitute device of claim 9 or 10, wherein the usage parameter is a total number of inhalation events, or a number of inhalation events performed within a predetermined time period.

12. A method of managing a smoking substitute device comprising a control unit and a memory, the method comprising:

storing, by the control unit, usage information in the memory, wherein the usage information relates to operation of the smoking substitute device; and clearing or overwriting a first portion of the usage information from the memory while retaining a second portion of the usage information in the memory.

13. The method of claim 12 further comprising:

receiving, by the control unit, an instruction to clear the memory; clearing the first portion of the usage information from the memory; and retaining the second portion of the usage infor-

mation in the memory.

14. The method of claim 12 or 13 further comprising:

uploading, by the control unit, the usage information to an application installed on a mobile device; detecting, by the control unit after the usage information is uploaded, new usage information of the smoking substitute device; and overwriting the first portion of the usage information included in the uploaded usage information with the new usage information.

15. The method of any one of claims 12 to 14 further comprising:

determining, by the control unit from the usage information, non-retainable data and retainable data, wherein the step of storing the usage information in the memory comprises storing the non-retainable data in a first portion of the memory and storing the retainable data in a second portion of the memory, wherein the first portion of the memory and the second portion of the memory are independently addressable, and wherein the step of clearing or overwriting the first portion of the usage information from the memory comprises either (i) erasing the non-retainable data from the first portion of memory, or (ii) overwriting the non-retainable data in the first portion or memory.

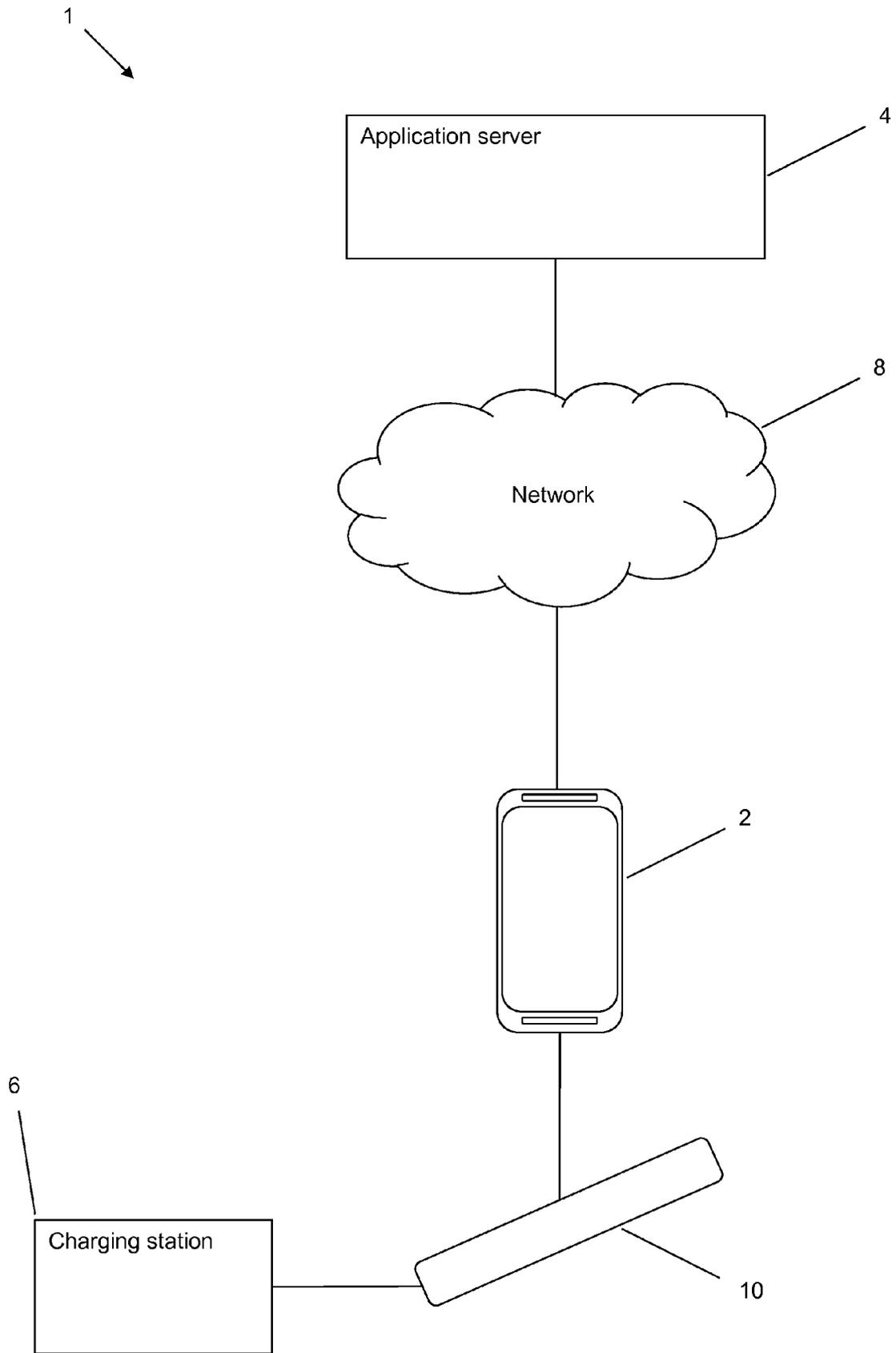


Fig. 1

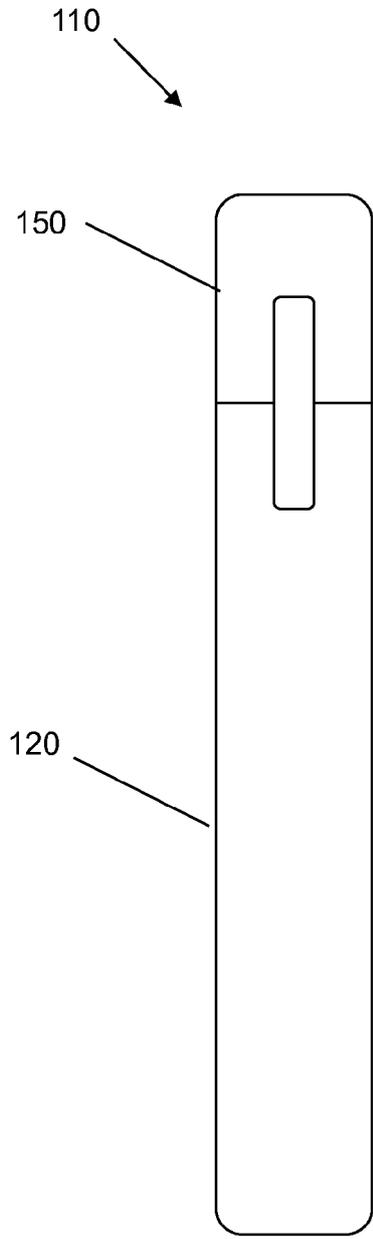


Fig. 2(a)

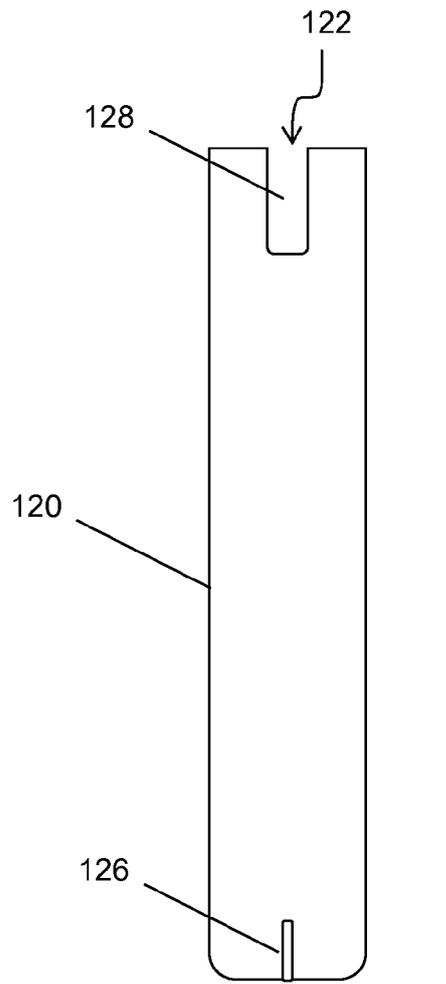


Fig. 2(b)

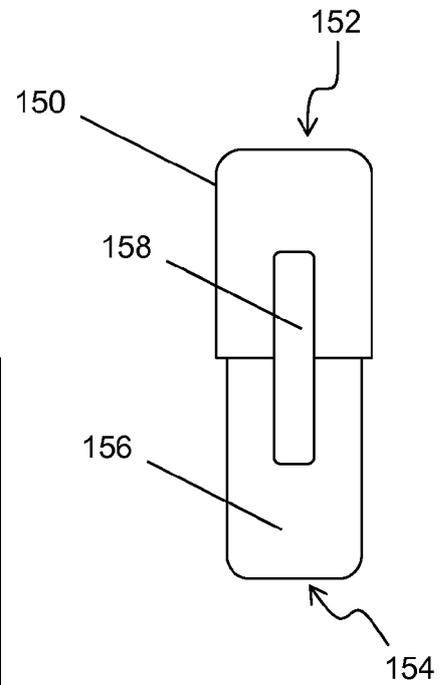


Fig. 2(c)

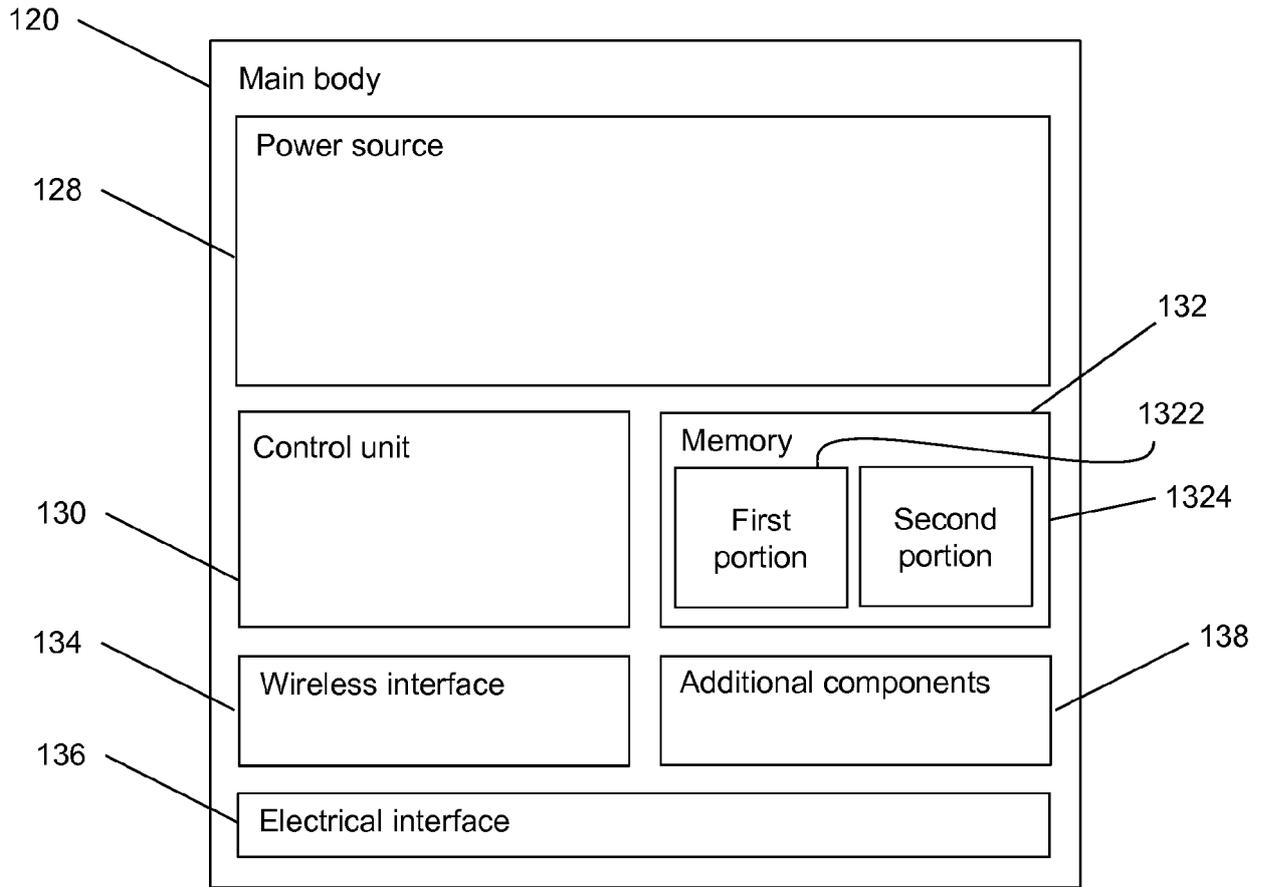


Fig. 3(a)

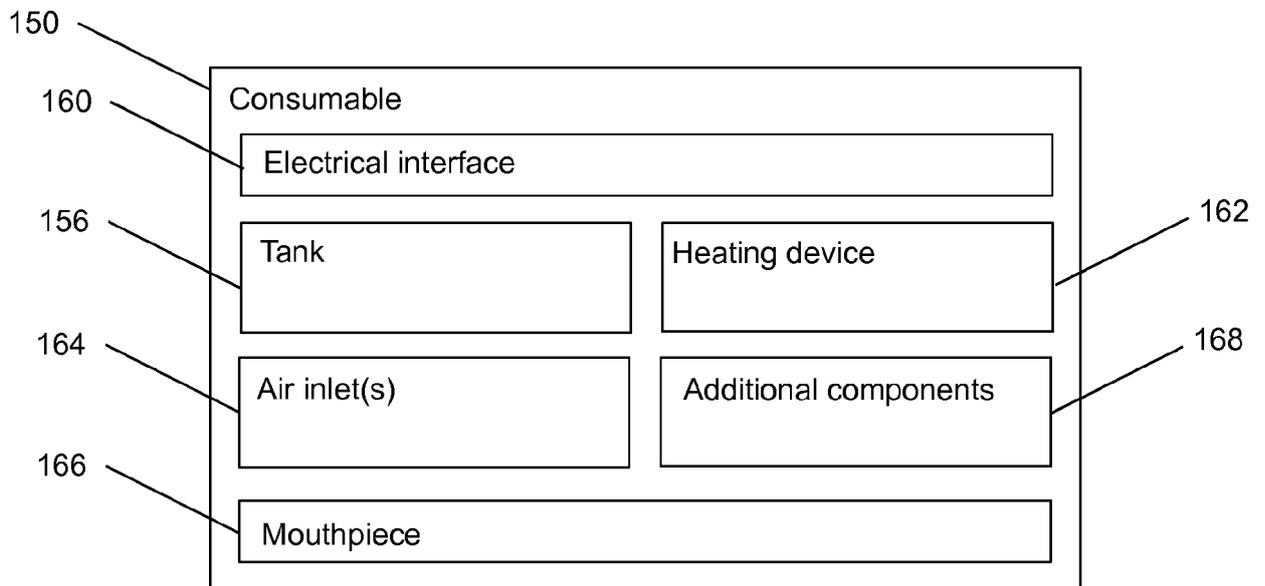


Fig. 3(b)

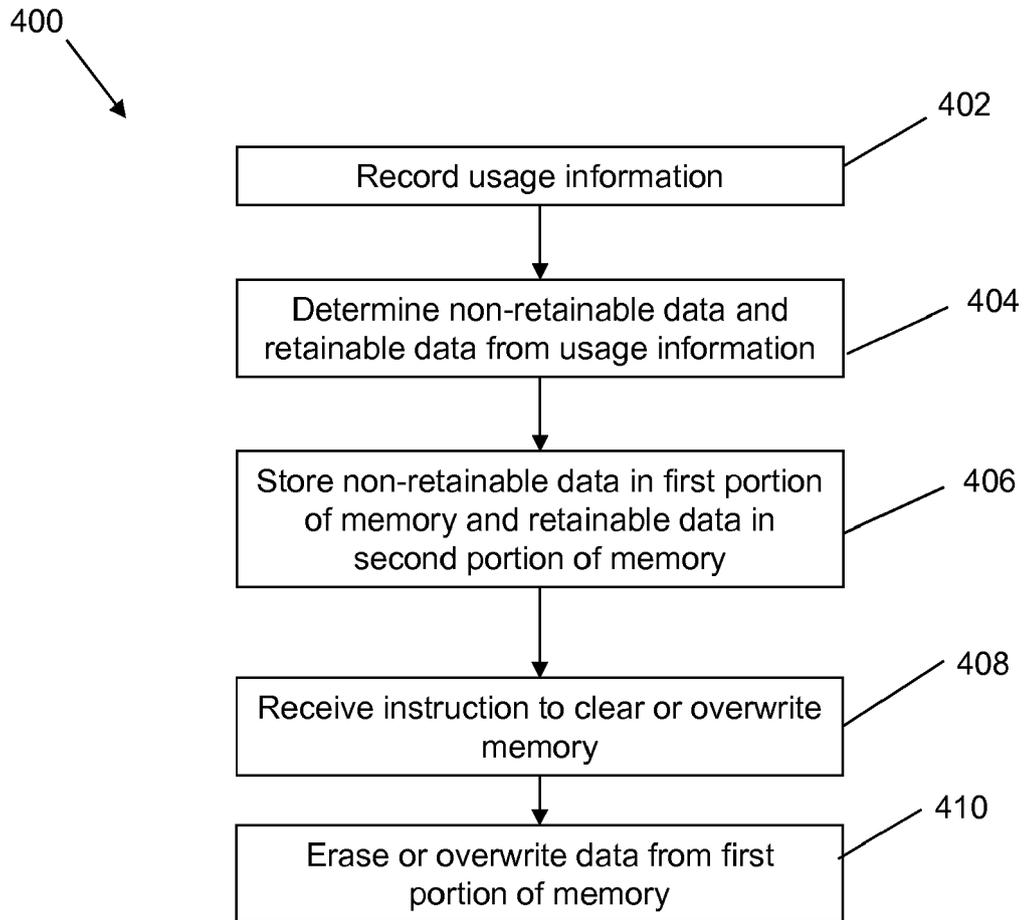


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 9902

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			A24F
Place of search		Date of completion of the search	Examiner
Munich		10 December 2019	Pavón Mayo, Manuel
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ON EUROPEAN PATENT APPLICATION NO.

EP 19 17 9902

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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