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(54) **AEROSOL PROVISION SYSTEM**

(57) An aerosol provision system comprises control circuitry for determining an operational parameter of the aerosol provision system, an aerosol generator configured to aerosolize an aerosol-generating material and a sensor configured to detect an inhalation on the aerosol provision system by a user of the aerosol provision system, and output corresponding inhalation detection signals to the control circuitry. The control circuitry is configured to determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of the operational parameter during the inhalation.

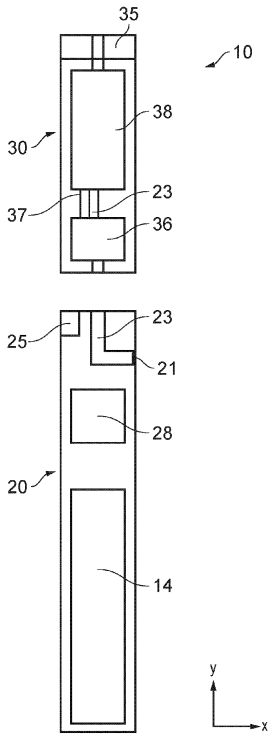

FIG. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to an aerosol provision system.

BACKGROUND

[0002] Electronic aerosol provision systems such as electronic cigarettes (e-cigarettes) generally contain an aerosol-generating material, such as a reservoir of a source liquid containing a formulation, typically including nicotine, or a solid material such as a tobacco-based product, from which an aerosol is generated for inhalation by a user, for example through heat vaporisation. Thus, an aerosol provision system will typically comprise an aerosol generator, e.g. a heating element, arranged to aerosolise a portion of aerosol-generating material to generate an aerosol in an aerosol generation region of an air channel through the aerosol provision system. As a user inhales on the device and electrical power is supplied to the aerosol generator, air is drawn into the device through one or more inlet holes and along the air channel to the aerosol generation region, where the air mixes with the vaporised aerosol generator and forms a condensation aerosol. The air drawn through the aerosol generation region continues along the air channel to a mouthpiece, carrying some of the aerosol with it, and out through the mouthpiece for inhalation by the user.

[0003] It is common for aerosol provision systems to comprise a modular assembly, often having two main functional parts, namely an aerosol provision device and disposable / replaceable consumable part. Typically the consumable will comprise the consumable aerosol-generating material and the aerosol generator (heating element), while the aerosol provision device part will comprise longer-life items, such as a rechargeable battery, device control circuitry and user interface features. The aerosol provision device may also be referred to as a reusable part or battery section and the consumable may also be referred to as a disposable part, cartridge or cartomiser.

[0004] The aerosol provision device and consumable are mechanically coupled together at an interface for use, for example using a screw thread, bayonet, latched or friction fit fixing. When the aerosol-generating material in a consumable has been exhausted, or the user wishes to switch to a different consumable having a different aerosol-generating material, the consumable may be removed from the aerosol provision device and a replacement consumable may be attached to the device in its place.

[0005] A potential drawback for aerosol provision systems is that there is no means to monitor the usage of the aerosol provision system by the user. This may lead to excessive use of the system by the user. Equally, the factory settings of the system may not resemble the desired operation of the system by the user, thereby reducing the user satisfaction.

[0006] Various approaches are described herein which seek to help address or mitigate some of the issues discussed above.

SUMMARY

[0007] The disclosure is defined in the appended claims.

[0008] In accordance with some embodiments described herein, there is provided an aerosol provision system comprising control circuitry for determining an operational parameter of the aerosol provision system, an aerosol generator configured to aerosolize an aerosol-generating material and a sensor configured to detect an inhalation on the aerosol provision system by a user of the aerosol provision system, and output corresponding inhalation detection signals to the control circuitry. The control circuitry is configured to determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of the operational parameter during the inhalation.

[0009] The control circuitry may be configured to determine a duration of a session based on the duration a plurality of inhalations, where a time between each of the plurality of inhalations is less than a predetermined time. The control circuitry can then be configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during the session based on the duration of the session and an indication of the operational parameter during the session.

[0010] The control circuitry may be configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during a rolling predetermined period based on the duration of each inhalation during the rolling predetermined period and an indication of the operational parameter during each inhalation during the rolling predetermined period. The control circuitry can then be configured to determine a time between each inhalation based on the inhalation detection signals, and wherein the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period is also based on the time between each inhalation during the rolling predetermined period.

[0011] The determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user may further be based on a concentration of the ingredient in the aerosol-generating material. In some embodiments the ingredient is nicotine, caffeine, taurine, theine, a vitamin, melatonin, or a cannabinoid.

[0012] In some embodiments the aerosol provision system also comprises a power source configured to supply electrical power to the aerosol generator, and the operational parameter of the system is an amount of electrical power supplied to the aerosol generator by the power source.

[0013] The control circuitry may be configured to determine default user behaviour based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user for a plurality of inhalations. For example, the control circuitry may be configured to determine a time between each of the plurality of inhalations based on the inhalation detection signals, and wherein determining default user behaviour is also based on the time between each of the plurality of inhalations.

[0014] The control circuitry may be configured to alter a mode of operation of the aerosol provision system based on the default user behaviour.

[0015] The control circuitry may be configured to provide a notification to the user based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the inhalation and the default user behaviour.

[0016] The control circuitry may be configured to provide a notification to the user when the indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation exceeds a puff threshold.

[0017] The control circuitry may be configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the session exceeds a session threshold.

[0018] The control circuitry may be configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period exceeds a period threshold.

[0019] The notification may be provided on the aerosol provision system and/or an application on a remote device. The notification may be a haptic notification. A parameter of the haptic notification may be adjustable by the user.

[0020] In accordance with some embodiments described herein, there is provided a system comprising an aerosol provision system configured to generate aerosol from an aerosol-generating material and a computer. The computer is configured to receive inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system, determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation.

[0021] In accordance with some embodiments described herein, there is provided a method of determining an amount of an ingredient delivered to a user of an aerosol provision system. The method comprises receiving inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system, determining a duration of the inhalation based on the inhalation detection signals received from the sensor, and determining an indication of an amount of an ingredient delivered from an aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation, wherein an aerosol generator is configured to aerosolize the aerosol-generating material. There is also provided a computer readable storage medium comprising instructions which, when executed by a processor, performs the above method.

[0022] These aspects and other aspects will be apparent from the following detailed description. In this regard, particular sections of the description are not to be read in isolation from other sections.

BRIEF DESCRIPTION OF DRAWINGS

[0023] Embodiments of the invention will now be described, by way of example only, with reference to accompanying drawings, in which:

Figures 1 and 2 are schematic diagrams of an aerosol provision system;

Figures 3A to 3C illustrate graphs of inhalation detection signal output by the sensor against time;

Figure 4 illustrates a system comprising an aerosol provision system and a computer;

Figure 5 is a flow chart of a method of determining an amount of an ingredient delivered to a user of an aerosol provision system.

DETAILED DESCRIPTION

[0024] Aspects and features of certain examples and embodiments are discussed / described herein. Some aspects and features of certain examples and embodiments may be implemented conventionally and these are not discussed / described in detail in the interests of brevity. It will thus be appreciated that aspects and features of articles and systems discussed herein which are not described in detail may be implemented in accordance with any conventional techniques for implementing such aspects and features.

[0025] The present disclosure relates to aerosol provision systems, which may also be referred to as aerosol provision systems, such as e-cigarettes. Throughout the following description the term "e-cigarette" or "electronic cigarette" may sometimes be used, but it will be appreciated this term may be used interchangeably with aer-

osol provision system and electronic aerosol provision system.

[0026] As noted above, aerosol provision systems (e-cigarettes) often comprise a modular assembly including both a reusable part (aerosol provision device) and a replaceable (disposable) cartridge part, referred to as a consumable. Systems conforming to this type of two-part modular configuration may generally be referred to as two-part systems or devices. It is also common for electronic cigarettes to have a generally elongate shape. For the sake of providing a concrete example, certain embodiments of the disclosure described herein comprise this kind of generally elongate two-part system employing disposable cartridges. However, it will be appreciated the underlying principles described herein may equally be adopted for other electronic cigarette configurations, for example modular systems comprising more than two parts, as devices conforming to other overall shapes, for example based on so-called box-mod high performance devices that typically have a more boxy shape.

[0027] As described above, the present disclosure relates to (but it not limited to) aerosol provision devices and corresponding aerosol provision systems, such as e-cigarettes and electronic cigarettes.

[0028] Figure 1 is a highly schematic diagram (not to scale) of an example aerosol provision system 10, such as an e-cigarette, to which embodiments are applicable. The aerosol provision system has a generally cylindrical shape, extending along a longitudinal or y axis as indicated by the axes (although aspects of the invention are applicable to e-cigarettes configured in other shapes and arrangements), and comprises two main components, namely an aerosol provision device 20 and a consumable 30.

[0029] The consumable 30 is an article comprising or consisting of aerosol-generating material 38, part or all of which is intended to be consumed during use by a user. A consumable 30 may comprise one or more other components, such as an aerosol-generating material storage area, an aerosol-generating material transfer component 37, an aerosol generation area, a housing, a wrapper, a mouthpiece 35, a filter and/or an aerosol-modifying agent.

[0030] A consumable 30 may also comprise an aerosol generator 36, such as a heating element, that emits heat to cause the aerosol-generating material 38 to generate aerosol in use. The aerosol generator 36 may, for example, comprise combustible material, a material heatable by electrical conduction, or a susceptor. It should be noted that it is possible for the aerosol generator 36 to be part of the aerosol provision device 20 and the consumable 30 then may comprise the aerosol-generating material storage area for the aerosol-generating material 38 such that, when the consumable 30 is coupled with the aerosol provision device 20, the aerosol-generating material 38 can be transferred to the aerosol generator 36.

[0031] The aerosol-generating material 38 is a material that is capable of generating aerosol, for example when heated, irradiated or energized in any other way. The aerosol-generating material 38 may, for example, be in the form of a solid, liquid or gel which may or may not contain an active substance and/or flavourants. In some embodiments, the aerosol-generating material 38 may comprise an "amorphous solid", which may alternatively be referred to as a "monolithic solid" (i.e. non-fibrous). In some embodiments, the amorphous solid may be a dried gel. The amorphous solid is a solid material that may retain some fluid, such as liquid, within it. In some embodiments, the aerosol-generating material may for example comprise from about 50wt%, 60wt% or 70wt% of amorphous solid, to about 90wt%, 95wt% or 100wt% of amorphous solid.

[0032] The aerosol-generating material 38 comprises one or more ingredients, such as one or more active substances and/or flavourants, one or more aerosol-former materials, and optionally one or more other functional materials such as pH regulators, colouring agents, preservatives, binders, fillers, stabilizers, and/or antioxidants.

[0033] The active substance as used herein may be a physiologically active material, which is a material intended to achieve or enhance a physiological response. The active substance may for example be selected from nutraceuticals, nootropics, psychoactives. The active substance may be naturally occurring or synthetically obtained. The active substance may comprise for example nicotine, caffeine, taurine, theine, vitamins such as B6 or B12 or C, melatonin, cannabinoids, or constituents, derivatives, or combinations thereof. The active substance may comprise one or more constituents, derivatives or extracts of tobacco, cannabis or another botanical.

[0034] In some embodiments, the active substance comprises nicotine. In some embodiments, the active substance comprises caffeine, melatonin or vitamin B12.

[0035] The aerosol provision device 20 includes a power source 14, such as a battery, configured to supply electrical power to the aerosol generator 36. The power source 14 in this example is rechargeable and may be of a conventional type, for example of the kind normally used in electronic cigarettes and other applications requiring provision of relatively high currents over relatively short periods. The battery 14 may be recharged through the charging port (not illustrated), which may, for example, comprise a USB connector.

[0036] The aerosol provision device 20 includes control circuitry 28 configured to determine one or more operational parameters of the aerosol provision system 10. The control circuitry also controls the operation of the aerosol provision system 10 based on the determining and provides conventional operating functions in line with the established techniques for controlling aerosol provision systems such as electronic cigarettes. The control circuitry (processor circuitry) 28 may be considered to logically comprise various sub-units / circuitry elements associated with different aspects of the electronic cigarette's operation. For example, depending on the func-

tionality provided in different implementations, the control circuitry 28 may comprises power source control circuitry for controlling the supply of electrical power from the power source 14 to the aerosol generator 36, user programming circuitry for establishing configuration settings (e.g. user-defined power settings) in response to user input, as well as other functional units / circuitry associated functionality in accordance with the principles described herein and conventional operating aspects of electronic cigarettes. It will be appreciated the functionality of the control circuitry 28 can be provided in various different ways, for example using one or more suitably programmed programmable computer(s) and / or one or more suitably configured application-specific integrated circuit(s) / circuitry / chip(s) / chipset(s) configured to provide the desired functionality.

[0037] The aerosol provision device 20 illustrated in Figure 1 includes one or more air inlets 21. In use, as a user inhales on the mouthpiece 35, air is drawn into the aerosol provision device 20 through the air inlets 21 and along an air channel 23 to the aerosol generator 36, where the air mixes with the vaporised aerosol-generating material 38 and forms a condensation aerosol. The air drawn through the aerosol generator 36 continues along the air channel 23 to a mouthpiece 35, carrying some of the aerosol with it, and out through the mouthpiece 35 for inhalation by the user. It will be appreciated that the one or more air inlets may be provided on the consumable 30 such that the air channel 23 is entirely contained within the consumable 30, or the aerosol provision device 20 and the consumable 30 may each comprise at least one air inlet 21 and a portion of the air channel 23.

[0038] By way of a concrete example, the consumable 30 comprises a housing (formed, e.g., from a plastics material), a reservoir formed within the housing for containing the aerosol-generating material 38 (which in this example may be a liquid which may or may not contain nicotine), an aerosol-generating material transfer component 37 (which in this example is a wick formed of e.g., glass or cotton fibres, or a ceramic material configured to transport the liquid from the reservoir using capillary action), an aerosol generating area, and a mouthpiece 35. Although not shown, a filter and/or aerosol modifying agent (such as a flavour imparting material) may be located in, or in proximity to, the mouthpiece 35. The consumable of this example comprises a heater element formed from an electrically resistive material (such as NiCr8020) spirally wrapped around the aerosol-generating material transfer component 37, and located in the air channel 23. The area around the heating element and wick combination is the aerosol generating area of the consumable 30. The consumable comprises suitable electrical contacts for coupling to electrical contacts provided on the aerosol provision device 20, such that electrical power may be supplied directly to the heater element.

[0039] Figure 2 is a schematic diagram of a further example of an aerosol provision system 10, where the same reference signs have been used for like elements between the aerosol provision system 10 illustrated in Figure 1 and the aerosol provision system 10 illustrated in Figure 2.

[0040] The aerosol provision system 10 in Figure 2 comprises a sensor 25 configured to detect an inhalation on the aerosol provision system 10 by a user of the aerosol provision system 10. For example, the sensor 25 may be a flow sensor, a microphone, a pressure sensor, light sensor, touch sensor, accelerometer, gyroscope, or any other type of sensor suitable for directly or indirectly detecting or inferring an inhalation on the aerosol provision system 10 by a user of the aerosol provision system 10. Although the sensor 25 illustrated in Figure 2 is part of the aerosol provision device 20, this is not essential. In other embodiments the sensor 25 may be part of the consumable 30.

[0041] The sensor 25 may be configured to detect an inhalation based on the flow of air into one or more of the air inlets 21, or in the air channel 23 through the aerosol provision system 10. Alternative, the sensor may include a pressure sensor or light sensor on the mouthpiece 35 configured to detect when the user's lips are placed around the mouthpiece 35, or a pressure sensor or light sensor located on the aerosol provision device 20 to detect when the user places their hand around the aerosol provision device 20.

[0042] In some embodiments there is more than one sensor 25. For example, there may be a sensor 25 located proximate to an air inlet and a sensor 25 proximate to a portion of the air channel 23, the aerosol generator 36 and/or the mouthpiece 35 as described above. Accordingly, each sensor is configured to detect an inhalation on the aerosol provision system 10. Where there is more than one sensor 25, this can comprise more than one type of sensor, and/or multiple sensors of the same type.

[0043] In response to detecting an inhalation on the aerosol provision system 10 by a user of the system, the sensor 25 is configured to output corresponding inhalation detection signals to the control circuitry 28. In some embodiments, the sensor 25 is configured to continuously output inhalation detection signals, or to output inhalation detection signals periodically, such as every 0.01 seconds, every 0.1 seconds, or every 1 second. If the sensor 25 outputs inhalation detection signals periodically, then in some implementations the period between the output of subsequent inhalation detection signals may be set equal to or less than the average, or a typical length of an user inhalation (e.g. between 2 to 5 seconds) so as to ensure that an inhalation is not missed. In each case, the inhalation detection signals change when an inhalation on the system is detected by the sensor 25. For example, the inhalation detection signals could be a binary indication of whether an inhalation on the system is detected or not, for example a "1" to indicate an inhalation has been detected and a "0" to indicate that an

inhalation has not been detected. Alternatively, the inhalation detection signals could correspond to an inhalation level or strength detected by the sensor 25. In other words, the inhalation detection signals could provide an indication of the draw strength detected by the sensor 25. For example, if the sensor 25 is a microphone or a flow sensor, the inhalation detection signals could provide an indication of the air speed or mass flow through the aerosol provision system 10, thereby providing an indication of the magnitude or strength of the inhalation taken by the user. In some embodiments, the inhalation detection signals correspond to the signals detected by the sensor 25. In other words, the inhalation detection signals represent the raw output from the sensor 25 without any filtering or processing applied by the sensor 25.

[0044] The inhalation detection signals could be set to 0 when an inhalation has not been detected by the sensor 25 and correspond to the inhalation level or strength detected by the sensor 25 when an inhalation has been detected. In some embodiments, the sensor 25 is configured to only output inhalation detection signals when an inhalation has been detected. In other words, the sensor 25 is configured output inhalation detection in response to detecting an inhalation on the system and the sensor 25 is configured to stop outputting inhalation detection signals when the inhalation is no longer detected by the sensor 25.

[0045] Figures 3A to 3C illustrate graphs of inhalation detection signals output by the sensor 25 against time. In the example illustrated in Figure 3A, the sensor 25 outputs inhalation detection signals continuously, and an inhalation being detected by the sensor 25 corresponds to the period when the inhalation detection signals are greater than a detection threshold 301. In the example illustrated in Figure 3B, until time point 302, which corresponds to the time point at which the sensor 25 detects an inhalation by the user on the aerosol provision system 10, the inhalation detection signal 305A output by the sensor 25 is "0". This may either represent no inhalation detection signal being output, or an inhalation detection signal being output with a value equal to "0". Between time point 301 and 302, which corresponds to the times during which the sensor 25 detects an inhalation by the user on the aerosol provision system 10, the inhalation detection signal 305B output by the sensor 25 is "1". In other words, the sensor 25 outputs an inhalation detection signal to indicate that an inhalation is detected. After time point 303, the inhalation detection signal 305A output by the sensor 25 is "0", indicating that the sensor 25 no longer detects an inhalation. As set out above, this may either represent no inhalation detection signal being output, or an inhalation detection signal being output with a value equal to "0". In the example illustrated in Figure 3C the inhalation detection signals 305A are set to "0" when an inhalation is not detected by the sensor 25, and the inhalation detection signal 305C corresponds to the signal recorded by the sensor 25 when the sensor 25 detects an inhalation.

[0046] As described above, the sensor 25 is configured to output the inhalation detection signals to the control circuitry 28. In response to receiving the inhalation detection signals, the control circuitry 28 is configured to determine a duration of the inhalation based on the inhalation detection signals received from the sensor 25. In other words, the control circuitry 28 is configured to determine the elapsed time for an inhalation based on the inhalation detection signals received from the sensor 25. As set out above, the sensor 25 may be configured to continuously or periodically output inhalation detection signals to the control circuitry, and the control circuitry is configured to use the change in these signals described above to determine a duration of an inhalation, for example by starting an inhalation timer when the inhalation detection signals change a first time and stop the inhalation timer when the inhalation detection signals change a second time. The control circuitry 28 may be configured to start the inhalation timer when the first non-zero inhalation detection signal is received, or when the first inhalation detection signal indicative of an inhalation being detected by the sensor 25 is received, such as at time 302 in Figures 3B and 3C respectively. The control circuitry 28 may then be configured to stop the inhalation timer when the next zero value inhalation detection signal is received, or when the next inhalation detection signal indicative of the sensor 25 no longer detecting an inhalation is received, such as at time 303 in Figures 3A-3C. Using Figures 3A-3C as an example, the duration of inhalation determined by the control circuitry 28 is the elapsed time between the time points 302 and 303.

[0047] As set out above, the sensor 25 may be configured to only output inhalation detection signals when an inhalation has been detected. In this case, the control circuitry 28 can be configured to determine the duration of the inhalation by activating the inhalation timer when an inhalation detection signal is received, and stopping the inhalation timer when inhalation detection signals are no longer received.

[0048] Alternatively, the duration of an inhalation may be determined based on information contained within the inhalation detection signals, such as a time stamp associated with each inhalation detection signal. For example, in the case illustrated in Figure 3B or 3C, the control circuitry 28 is configured to use the timestamp of a first non-zero inhalation detection signal (at time 302) received and the timestamp of the next zero value inhalation detection signal received (at lime 303) to determine the duration of the inhalation. Alternatively, in the example illustrated in Figure 3A, the control circuitry 28 is configured to use the timestamp of the first inhalation detection signal exceeding the detection threshold 301 received from the sensor 25, corresponding to time point 302 in the Figure 3A, and the timestamp of the next inhalation detection signal indicative not exceeding the detection threshold received from the sensor, corresponding to time point 303 in Figure 3A, to determine the duration of the inhalation.

[0049] In the example where the inhalation detection signals are output periodically by the sensor 25, the control circuitry 28 may be configured to determine the duration of an inhalation by counting the number of consecutive, non-zero inhalation detection signals received, or the number of consecutive inhalation detection signals receive from the sensor 25 indicative of an inhalation being detected by the sensor 25. The period of output of the airflow detection signals can then be used to determine the duration of the inhalation.

[0050] In the example where there are two or more sensors 25, each sensor 25 is configured to output inhalation detection signals in accordance with the principles described above. The control circuitry 28 is then configured to determine the duration of an inhalation based on the inhalation detection signals received from one or more of the sensors 25. For example, the control circuitry 28 may be configured to determine the duration of an inhalation in response to receiving inhalation detection signals indicating an inhalation has been detected from any one of the sensors 25. Alternatively, the control circuitry 28 may be configured to determine the duration of an inhalation in response to receiving inhalation detection signals indicating an inhalation has been detected from more than a given percentage of the total number of sensors 25, such as 25%, 50%, 80% or 100%.

[0051] In some embodiments, the control circuitry 28 is configured to determine a time between inhalations based on the inhalation detection signals. In other words, the control circuitry 28 is configured to determine the elapsed time between an inhalation and the next inhalation. This can be achieved using the same techniques as described above with respect to determining the duration of an inhalation, such as using a timer, information contained within the inhalation detection signals or the period of output of the inhalation detection signals. For example, the control circuitry 28 may be configured to start an interval timer in response to receiving the first zero value inhalation detection signal after a non-zero inhalation detection signal. The control circuitry 28 is then configured to stop the interval timer in response to receiving the next non-zero value inhalation detection signal.

[0052] In the embodiment described above where the sensor 25 is configured to stop outputting inhalation detection signals when an inhalation has not been detected, the control circuitry 28 can be configured to determine a time between inhalations by activating the interval timer when the sensor 25 stops outputting the inhalation detection signals. In other words, the control circuitry 28 is configured to start the interval timer in response to the sensor 25 stopping the output of inhalation detection signals following an inhalation having been detected by the sensor 25. The control circuitry 28 can then be configured to stop the interval timer when the next inhalation detection signal is outputted by the sensor 25, thereby allowing the control circuitry 28 to determine the time between inhalations.

[0053] The duration of each inhalation can be used to determine the duration of multiple inhalations by the user during a given predetermined time period, such as a minute, an hour or a day. For example, the control circuitry 28 can be configured to determine the duration of each inhalation during a rolling 24 hour period, which can then be summed to determine the total duration of inhalations in the rolling 24 hour time period. As will be appreciated, a rolling 24 hour period is intended to mean the 24 hours immediately prior to any point in time, such that the rolling 24 hour period represents the most recent 24 hours in time from a given time point. Accordingly, the rolling predetermined period represents a period of time immediately prior to any point in time, and the period of time is predetermined. As set out above, the rolling predetermined period may be a rolling minute, a rolling hour, a rolling day (24 hours) or longer such as a rolling week or other period of time.

[0054] As will be appreciated, many users of aerosol provision systems 10 do not take single inhalations on the aerosol provision system 10, but rather perform a session on the aerosol provision system 10, where a session is a plurality of inhalations within a time period such as 1 to 2 minutes, sometimes longer such as 5 or 10 minutes. The control circuitry 28 can therefore be configured to determine the duration of a session based on the duration of a plurality of inhalations using the inhalation detection signals received from the sensor 25, where the time between each of the plurality of inhalations is less than a predetermined time. The predetermined time may be set and altered by the user or the control circuitry 28, or may be a fixed value, for example based on empirical data. The predetermined time could be less than 1 minute, 1, 2, 5, 10 minutes or longer. The predetermined time can be defined as a rolling time period as described above such that each inhalation within the most recent predetermined time period is considered by the control circuitry 28 to be part of the session. Alternatively, the predetermined time may set such that the time between each inhalation must be less than the predetermined time in order for the inhalation to be considered by the control circuitry 28 as part of the same session. In this case, a session timer could be implemented to determine the duration of the session, where the session timer is started when the inhalation detection signals indicate that an inhalation has been detected by the sensor, and the session timer is stopped when the duration between an inhalation exceeds the predetermined time. Alternatively, as described above, a time stamp associated with each inhalation detection signal could be used to determine the duration of the session based on the duration of each inhalation and the time between each inhalation.

[0055] The control circuitry 28 is configured to determine an indication of an amount of an ingredient delivered from the aerosol-generating material 38 to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter during the

inhalation. As it will be appreciated, the amount of aerosol, and by extension the amount of aerosol-generating material 38, delivered to the user during an inhalation will vary based on the duration of the inhalation, such that the longer the inhalation, the more aerosol-generating material 38 that will be delivered to the user during the inhalation.

[0056] As described above, the aerosol-generating material 38 comprises one or more ingredients. Accordingly, the amount of each of the one or more ingredients delivered from the aerosol-generating material 38 to the user during the inhalation will also vary based on the duration of the inhalation, and therefore the control circuitry 28 is configured to use the duration of the inhalation in the determination of the amount of an ingredient delivered from the aerosol-generating material 38 to the user during the inhalation.

[0057] As described above, the control circuitry 28 determines an operational parameter of the aerosol provision system 10. The amount of aerosol-generating material 38 delivered to the user during the inhalation will varying depending on operational parameters (settings) of the aerosol provision system 10. Accordingly, an indication of the operational parameter during the inhalation is used along with the duration of the inhalation to determine the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation. The indication of the operational parameter may be the actual value of the operational parameter itself, or a numerical number corresponding to a setting, such as "0" for "off" and "1" for "on", or "1" for low, "2" for medium and "3" for high. As such, the indication is any suitable means of conveying the nature or state of a component of the aerosol provision system 10 for use in determining an indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation.

[0058] The operational parameter may be an amount of electrical power supplied to the aerosol generator 36 by the power source 14. The control circuitry 28 is then configured to determine the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation based on an indication of the amount of electrical power supplied to the aerosol generator 36 by the power source 14 during the inhalation. For example, the indication of the amount of electrical power supplied could be the amount of power delivered or a voltage and/or current supplied to the aerosol generator 36 during the inhalation, or could be a power setting for the aerosol generator 36 during the inhalation, such as an integer between 1 and 10 or "1" for low, "2" for medium and "3" for high. The amount of aerosol generated by the aerosol generator 36 during an inhalation will vary depending on the amount of electrical power supplied to the aerosol generator 36, and therefore a more accurate determination of the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation can be achieved by considered the amount of electrical power in the calculation.

[0059] Alternatively or in addition, control circuitry 28 may determine one or more other operational parameters of the aerosol provision system, such as an amount of charge in the power source 14, a temperature of the aerosol generator 36 or a temperature proximate to the aerosol generator 36, an amount and/or speed of airflow through the aerosol provision system 10, indications of which are then used to determine the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation. The operational parameter may change or vary during an inhalation, for example a decrease in the amount of charge in the power source 14 or an increase in the temperature of the aerosol generator 36. The determination of the operational parameter by the control circuitry 28 may therefore correspond to a maximum value, a minimum value or an average, model or median value of the operational parameter during the inhalation. Equally, the indication of the operational parameter may represent one or more of a value for the operational parameter at the start of the inhalation, a value for the operational parameter at the end of the inhalation, a maximum value of the operation parameter during the inhalation, a minimum value of the operation parameter during the inhalation and an average, model and/or median value for the operational parameter during the inhalation.

[0060] As described above, the control circuitry 28 is configured to determine an indication of the amount of the ingredient delivered. The indication may represent the actual amount of the ingredient delivered, for example a mass or volume of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation. For example, control circuitry 28 may be configured to use an algorithm or look-up table to determine the amount of the ingredient delivered during the inhalation based on the duration of the inhalation and the operational parameter. The algorithm or look-up table may be based on empirical data related to the aerosol provision system 10, such as the maximum or average mass flow of air through the air channel 23, or an amount of the ingredient delivered for a standard inhalation profile, such as 55ml of air in a 3 second inhalation every thirty seconds (referred to as an 55/3/30 profile). If the amount of an ingredient delivered for a standard inhalation profile is known, then this can be scaled using a look-up table or an algorithm in order to determine the amount of the ingredient that is delivered for an inhalation with a different duration and/or volume of aerosol delivered, and hence an indication of this amount of ingredient can be determined.

[0061] Alternatively, the indication of the amount of the ingredient delivered during the inhalation may relate to the amount of the ingredient delivered compared to a capacity of the aerosol-generating material storage area, such that the indication of the amount of the ingredient delivered indicates the amount of the ingredient and/or

the aerosol-generating material remaining in the aerosol-generating material storage area. For example, the indication could be a percentage of the total amount of the aerosol-generating material present in the aerosol-generating material storage area when the aerosol-generating material storage area is full.

[0062] In some embodiments, the indication of the amount of the ingredient delivered during the inhalation is a rating on a fixed scale, for example an integer or real number between 0 and 10, where 0 is the lowest value and 10 is the highest value, although different forms and granulations of scales can also be used. In this case, an indication of 2 represents that a small amount of ingredient was delivered during the inhalation, whilst an indication of 10 represents that a maximum amount of the ingredient was delivered. This rating may be calculated by multiplying the duration of the inhalation by the indication of the operational parameter during the inhalation and applying one or more scaling factors, or by any other suitable calculation technique. Using such a rating on a scale allows for comparison between indications from different inhalations without requiring as exact or detailed a calculation as when the indication corresponds to the actual amount of the ingredient delivered.

[0063] The determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user may occur during the inhalation itself. In other words, the control circuitry 28 is configured to determine the indication of the amount of the ingredient that has been delivered as the inhalation takes place, such that the determination is ongoing during the inhalation. The determination of the indication of the amount of the ingredient delivered therefore occurs concurrently with the determination of the duration of the inhalation. For example, as described above, the control circuitry 28 may be configured to start a timer or otherwise begin the determination of the duration of the inhalation in response to receiving inhalation detection signals from the sensor 25, or in response to a change in the inhalation detection signals received from the sensor 25. The determination of the indication of the amount of the ingredient delivered would also begin at the same time. Both the determination of the duration of the inhalation and the determination of the indication of the amount of the ingredient delivered would therefore continue until the inhalation detection signals were no longer received from the sensor 25, or the inhalation detection signals received from the sensor 25 changed for a second time.

[0064] Alternatively, the determination of the duration of the inhalation may occur during the inhalation whilst the determination of the indication of the amount of the ingredient delivered occurs after the inhalation has concluded, or both determinations could be performed after the inhalation has concluded.

[0065] As described above, the control circuitry 28 may be configured to determine a duration of a session based on the duration a plurality of inhalations. In response the control circuitry 28 may be configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material 38 to the user during the session based on the duration of the session and an indication of the operational parameter during the session. The determining of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the session may also be based on the duration of each inhalation during the session and the time in between each inhalation during the session. As described above, this determination may be performed for each inhalation in the session, for example a separate determination performed during each inhalation or after each inhalation has concluded in the session. Alternatively, the determination may be performed once, either during the session or after the entire session has concluded. As described above, the indication of the operational parameter during the session may represent one or more of a value for the operational parameter at the start of the session, a value for the operational parameter at the end of the session, a maximum value of the operation parameter during the session, a minimum value of the operation parameter during the session and an average value for the operational parameter during the session. Alternatively, the indication of the operational parameter during the session may correspond to an indication of the operational parameter for each inhalation in session.

[0066] In the embodiment described above where the control circuitry 28 is configured to determine the duration of each inhalation during the rolling predetermined period, the control circuitry 28 can also be configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material 38 to the user during the rolling predetermined period based on the duration of each inhalation during the rolling predetermined period and an indication of the operational parameter during each inhalation during the rolling predetermined period. As described above, the control circuitry 28 determines an operational parameter of the aerosol provision system, and therefore the control circuitry 28 can be configured to determine the operational parameter during each inhalation during a rolling predetermined period in order to determine the an indication of an amount of the ingredient delivered from the aerosol-generating material 38 to the user during the rolling predetermined period.

[0067] Additionally, the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the rolling predetermined period may also be based on the time between each inhalation during the rolling predetermined period. For some ingredients, the amount of residual ingredient in the user's body system will decrease over time as the ingredient is absorbed, broken down, expelled or otherwise depleted from the user's body system. By considering the time between each inhalation and the duration of each inhalation in a predetermined period, the indication of an amount of the ingredient de-

livered from the aerosol-generating material 38 to the user during the rolling predetermined period can indicate the amount of residual ingredient in the user's body system rather than the amount of the ingredient delivered to the user in the predetermined period.

[0068] The determination of the indication of the amount of the ingredient delivered from the aerosol-generating material 38 may also be based on other factors, such as a concentration of the ingredient in the aerosol-generating material 38. It will be appreciated that, for a given amount of aerosol generated by the aerosol generator 36 from the aerosol-generating material 38, the amount of the ingredient in the resulting aerosol will vary depending on the concentration, in other words the amount, of the ingredient in the aerosol-generating material 38. As described above, the ingredient may be an active substance, such as nicotine, caffeine, taurine, theine, vitamins such as B6 or B12 or C, melatonin, cannabinoids, or constituents, derivatives, or combinations thereof. The ingredient may be a flavourant, an aerosol-former material or a functional material such as a pH regulator, colouring agent, preservative, binder, filler, stabilizer or antioxidant. Accordingly, the concentration of the ingredient in the aerosol-generating material 38 can be considered when determining the indication of the amount of the ingredient delivered from the aerosol-generating material 38 in order to improve the accuracy of the determination. The concentration of the ingredient in the aerosol-generating material 38 may be provided to the control circuitry 38 by the user, for example by inputting the concentration on a user input device associated with the aerosol provision system 10, or the control circuitry 28 may be configured to determine the concentration of the ingredient in the aerosol-generating material 38, for example in response to the consumable 30 being attached to the aerosol provision system 10. The consumable 30 may comprise an electronic chip or tag, such as an RFIG tag, which the control circuitry 28 as able to read in order to determine the concentration of the ingredient in the aerosol-generating material 38, as well as other properties of the consumable 30, such as the identify of the manufacturer or the consumable, one or more flavourants or other ingredients contained within the aerosol-generating material 38 and the volume or mass of the aerosol-generating material 38 in the consumable 30.

[0069] In some embodiments, the control circuitry 28 is configured to determine default user behaviour based on the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user for a plurality of inhalations. In other words, the control circuitry 28 is configured to detect patterns in the inhalations by the user based on data determined for the inhalations, such as the duration of an inhalation, the duration of a session, a time between inhalations, the amount of electrical power delivered to the aerosol generator 36 during the inhalation, a power level or setting for the aerosol generator 36 for the inhalation and the type and/or concentration of one or more of the ingredients in the aerosol-generating material 38. These patterns are then used to default user behaviour with respect to the amount of the ingredient delivered from the aerosol-generating material 38 to the user during an inhalation. The data determined for the inhalations can also be used to determine default user behaviour over another period, such as a session or rolling predetermined period as described above, a week, a month and/or a year. Additionally, the control circuitry 28 can continually update the determined default user behaviour based on changes in the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user for inhalations over time.

[0070] For example, where the control circuitry 28 is configured to determine a time between each of the plurality of inhalations based on the inhalation detection signals, the default user behaviour can also be determined based on the time between each of the plurality of inhalations. This allows patterns of behaviour to be detected for the user, such as if the user takes a series of puffs, such as a session described above, then has an extended period between sessions, such as 30 minutes, 1 hour or longer, or whether the user takes a small number of inhalations, such as 1 or 2, but spaced more regularly, such as every 10 of 20 minutes. Equally, the data collected may allows the control circuitry 28 to determine particular times of the day when the user takes more inhalations, such as in the mornings or the evenings, or if the number and duration of inhalations in a session change during a day. For example, the user may have a session comprising a plurality of long inhalations with a high power setting in the morning, but sessions in the evening comprise fewer, short inhalations with a lower power setting. The user may perform more inhalations on weekdays, whilst over the course of a month or a year the data may indicate that the user is performing fewer inhalations, for example due to the user trying to cut down their usage of the aerosol provision system 10. Such default behaviour can be determined based on the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user for a plurality of inhalations.

[0071] The control circuitry 28 may also be configured to alter a mode of operation of the aerosol generation system 10 based on the default user behaviour, such as an amount of electrical power supplied to the aerosol generator 36 by the power source 14, the temperature of the aerosol generator 36, a sensitivity or detection threshold on the sensor 25, the colour and/or number of light indicators illuminated and/or the volume, pitch and/or duration of a sound emitted on the aerosol provision device 20 for an inhalation.

[0072] For example, if it is determined that the user takes longs inhalations, such as greater than 10 seconds, the control circuitry 28 can be configured to alter the amount of electrical power supplied to the aerosol generator 36 by the power source 14 during the inhalation in order to prevent dry out or overheating of the aerosol generator 36. The power supplied to the aerosol gener-

ator 36 may be set to an initial value or power setting, and then reduced as the inhalation continues. Alternatively, if is determined that the user takes very small or gentle inhalations, for example with a low air speed or mass flow, the control circuitry 28 can be configured to change a sensitivity or detection threshold on the sensor 25 to ensure that an inhalation is properly detected for the user.

[0073] In some embodiments, the control circuitry 28 is configured to provide a notification to the user based on the indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation and the default user behaviour. For example, a notification may be provided on the aerosol provision system 10, such as by activating an indicator light, emitting a sound from a speaker or displaying a message on a display screen on the aerosol provision device 20 and/or the consumable 30. The notification may also be a haptic notification on the aerosol provision system 10, such as a vibration or force feedback. For example, a vibration may be generated by an eccentric rotating mass (ERM) or piezoelectric actuator within the aerosol provision device 20 and/or the consumable 30, or a force may be generated by a motor within the aerosol provision device 20 and/or the consumable 30. The notification could also be a change in a mode of operation of the aerosol provision system 10 which the user would detect, such switching off, disabling or otherwise preventing electrical power from being supplied to the aerosol generator 36. For example, the aerosol generator 36 could be disabled for a period of time, such as 5 seconds, 10 seconds, a minute or longer.

[0074] Alternatively, or in addition, the notification may be provided on an application on a remote device. For example, the user of the aerosol provision system 10 may have a device associated with, but separate from, the aerosol provision system 10, and the control circuitry 28 is configured to communicate with the remote device, for example by Bluetooth, Bluetooth Low Energy (BLE), ANT+, Wi-Fi or any other suitable wireless communication method. The control circuitry 28 can be configured to communicate with the remote device such that the notification is provided to the user on the remote device, such as on an application installed on the remote device. For example, a message may be displayed on a display screen on the remote device, an indicator light activated, a sound emitted from a speaker or a haptic notification means on the remote device as described above. The remote device may include any suitable electronic device that can be communicatively coupled to the aerosol provision system 10. For example, the remote device may include a mobile device (such as a smartphone), a PDA, a personal computer, laptop, tablet, smartwatch, etc.

[0075] Further, one or more parameters associated with the notification may be adjustable by the user. For example, the user may be able to adjust the number, brightness and/or colour of the indictor light that is activated, the volume, pitch and or duration of the sound emitted and/or the message that is displayed. The user may also be able to adjust one or more parameters of the haptic notification. For example the user may be able to adjust the duration, magnitude and/or pattern of the vibrations or forces provided by the actuator and motor respectively.

[0076] The user may be able to adjust the one or more parameters associated with the notification on the aerosol provision system 10 and/or the remote device regardless of whether the notification is provided on the aerosol provision system 10 or the remote device. For example, the user may be able to use the application on the remote device to adjust one or more of the parameters associated with the notification even though the notification itself is provided on the aerosol provision system 10. For example, the user may disable notifications during an inhalation such that notifications are only received when an inhalation is not detected by the sensor 25.

[0077] In some embodiments, the control circuitry 28 is configured to provide a notification to the user when the indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation exceeds a puff threshold. The puff threshold may correspond to a safe usage limit of the ingredient and/or aerosol-generating material 38, or a safe usage limit of the aerosol provision system 10 for an inhalation, for example to prevent overheating or drying out of one or more of the components of the aerosol provision system 10. The notification could be in any of the forms described above.

[0078] The indication of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation might represent a proportion or percentage of the amount of the ingredient delivered from the aerosol-generating material 38 to the user during the inhalation compared to the puff threshold. For example, the indication might be a percentage of the puff threshold, such as 10%, 20%, 50%, 80% or 110%, and the notification is provided to the user when the percentage is greater that 100%.

[0079] As described above, the determination of the indication of an amount of an ingredient delivered may occur during the inhalation. In this case, a comparison between the indication of an amount of an ingredient delivered and the puff threshold may be performed during the inhalation, either continuously or periodically (such as every second or every 5 seconds). In other words, the indication of an amount of an ingredient delivered is constantly determined during the inhalation, and the value for the indication of an amount of an ingredient delivered at the current moment in time is compared to the puff threshold, such a notification can be provided to the user during the inhalation as soon as the amount of the ingredient delivered from the aerosol-generating material to the user exceeds the puff threshold.

[0080] In some embodiments the control circuitry 28 is configured to provide a notification to the user when the indication of the amount of an ingredient delivered from

the aerosol-generating material 38 to the user during the session exceeds a session threshold. In addition or alternatively, the control circuitry 28 may be configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material 38 to the user during the rolling predetermined period exceeds a period threshold. In a similar fashion to the puff threshold, the session threshold and the period threshold may correspond to a safe usage limit of the ingredient and/or aerosol-generating material 38, or a safe usage limit of the aerosol provision system 10 for a session and a predetermined period respectively. The notification could be in any of the forms described above. As described above, the determination of the indication of an amount of an ingredient delivered may occur during the session and/or the rolling predetermined period.

[0081] The control circuitry 28 may be configured to alter one or more thresholds described above based on the default user behaviour, such as the puff threshold, session threshold or period threshold, thereby personalising or otherwise tailoring the operation of the aerosol provision system 10 to the user. Alternatively or in addition, the user may be able to alter one or more of the thresholds, for example by providing an input on an input device on the aerosol provision device 20 or consumable 30, or through an application on an associated remote device, thereby giving the user additional control over the operation of the aerosol provision system 10.

[0082] Figure 4 illustrates a system 400 comprising an aerosol provision system 10 configured to generate aerosol from an aerosol-generating material 38, such as described above. The system 400 also comprises a computer 40 configured to receive inhalation detection signals from a sensor 25 configured to detect the inhalation on the aerosol provision system 10 by a user of the aerosol provision system 10. The computer 40 is also configured to determine a duration of the inhalation based on the inhalation detection signals received from the sensor 25 and determine an indication of an amount of an ingredient delivered from the aerosol-generating material 38 to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system 10 during the inhalation.

[0083] As described above and illustrated in Figure 4, the computer 40 may be a remote device associated with the user and in communication with the aerosol provision system 10. Accordingly, it will be appreciated that the functions of the control circuitry described herein, such determining a duration of an inhalation, determining an indication of an amount of an ingredient delivered, determining default user behaviour and providing a notification to the user may be performed by a computer 40 separate from the aerosol provision system 10, such as a remote device.

[0084] Figure 5 is a flow chart of a method 500 of determining an amount of an ingredient delivered to a user of an aerosol provision system 10. The method begins at step 501, where inhalation detection signals are received from a sensor 25 configured to detect the inhalation on the aerosol provision system 10 by a user of the aerosol provision system 10. Next, at step 502, a duration of the inhalation is determined based on the inhalation detection signals received from the sensor 25. At step 503, an indication of an amount of an ingredient delivered from an aerosol-generating material 38 to the user during the inhalation is determined based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system 10 during the inhalation. As described above, an aerosol generator 36 is configured to aerosolize the aerosol-generating material 38.

[0085] The method 500 illustrated in Figure 5 may be stored as instructions on a computer readable storage medium, such that when the instructions are executed by a processor, the method 500 described above is performed. The computer readable storage medium may be non-transitory.

[0086] As described above, the present disclosure relates to (but it not limited to) aerosol provision system comprises control circuitry for determining an operational parameter of the aerosol provision system, an aerosol generator configured to aerosolize an aerosol-generating material and a sensor configured to detect an inhalation on the aerosol provision system by a user of the aerosol provision system, and output corresponding inhalation detection signals to the control circuitry. The control circuitry is configured to determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of the operational parameter during the inhalation.

[0087] Thus, there has been described an aerosol provision system, a system comprising an aerosol provision system and a computer, a method of determining an amount of an ingredient delivered to a user of an aerosol provision system, and computer readable storage medium.

[0088] The various embodiments described herein are presented only to assist in understanding and teaching the claimed features. These embodiments are provided as a representative sample of embodiments only, and are not exhaustive and/or exclusive. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects described herein are not to be considered limitations on the scope of the invention as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope of the claimed invention. Various embodiments of the invention may suitably comprise, consist of, or consist essentially of, appropriate combinations of the disclosed elements, components, features, parts, steps, means, etc., other than those specifically

described herein. In addition, this disclosure may include other inventions not presently claimed, but which may be claimed in future.

CLAUSES

[0089]

1. An aerosol provision system comprising:

control circuitry for determining an operational parameter of the aerosol provision system;

an aerosol generator configured to aerosolize an aerosol-generating material;

a sensor configured to detect an inhalation on the aerosol provision system by a user of the aerosol provision system, and output corresponding inhalation detection signals to the control circuitry; and

wherein the control circuitry is configured to:

determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and

determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of the operational parameter during the inhalation.

2. The aerosol provision system of clause 1, wherein the control circuitry is configured to determine a duration of a session based on the duration of a plurality of inhalations, wherein a time between each of the plurality of inhalations is less than a predetermined time.

3. The aerosol provision system of clause 2, wherein the control circuitry is configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during the session based on the duration of the session and an indication of the operational parameter during the session.

4. The aerosol provision system of any one of clauses 1 to 3, wherein the control circuitry is configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during a rolling predetermined period based on the duration of each inhalation during the rolling predetermined period and an indication of the operational parameter during each inhalation during the rolling predetermined period.

5. The aerosol provision system of clause 4, wherein the control circuitry is configured to determine a time between each inhalation based on the inhalation detection signals, and wherein the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period is also based on the time between each inhalation during the rolling predetermined period.

6. The aerosol provision system of any one of clauses 1 to 5, wherein the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user is further based on a concentration of the ingredient in the aerosol-generating material.

7. The aerosol provision system of any one of clauses 1 to 6, wherein the ingredient is nicotine, caffeine, taurine, theine, a vitamin, melatonin, or a cannabinoid.

8. The aerosol provision system of any one of clauses 1 to 7, further comprising a power source configured to supply electrical power to the aerosol generator, and wherein the operational parameter of the system is an amount of electrical power supplied to the aerosol generator by the power source.

9. The aerosol provision system of any one of clauses 1 to 8, wherein the control circuitry is configured to determine default user behaviour based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user for a plurality of inhalations.

10. The aerosol provision system of clause 9, wherein the control circuitry is configured to determine a time between each of the plurality of inhalations based on the inhalation detection signals, and wherein determining default user behaviour is also based on the time between each of the plurality of inhalations.

11. The aerosol provision system of clause 9 or clause 10, wherein the control circuitry is configured to alter a mode of operation of the aerosol provision system based on the default user behaviour.

12. The aerosol provision system of any one of clauses 9 to 11, wherein the control circuitry is configured to provide a notification to the user based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the inhalation and the default user behaviour.

13. The aerosol provision system of any one of clauses 1 to 12, wherein the control circuitry is configured to provide a notification to the user when the indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation exceeds a puff threshold.

14. The aerosol provision system of any one of clauses 2 to 13, wherein the control circuitry is configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the session exceeds a session threshold.

15. The aerosol provision system of any one of clauses 4 to 14, wherein the control circuitry is configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period exceeds a period threshold.

16. The aerosol provision system of any one of clauses 12 to 15, wherein the notification is provided on the aerosol provision system.

17. The aerosol provision system of any one of clauses 12 to 16, wherein the notification is provided on an application on a remote device.

18. The aerosol provision system of any one of clauses 12 to 17, wherein the notification is a haptic notification.

19. The aerosol provision system of clause 18, wherein a parameter of the haptic notification is adjustable by the user.

20. A system comprising:

an aerosol provision system configured to generate aerosol from an aerosol-generating material; and

a computer configured to:

receiving inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system;

determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and

determining an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation.

21. A method of determining an amount of an ingredient delivered to a user of an aerosol provision system, the method comprising:

receiving inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system;

determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and

determining an indication of an amount of an ingredient delivered from an aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation,

wherein an aerosol generator is configured to aerosolize the aerosol-generating material.

22. A computer readable storage medium comprising instructions which, when executed by a processor, performs a method comprising:

receiving inhalation detection signals from a sensor configured to detect the inhalation on an aerosol provision system by a user of the aerosol provision system;

determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and

determining an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation.

Claims

1. An aerosol provision system comprising:

control circuitry for determining an operational parameter of the aerosol provision system;
an aerosol generator configured to aerosolize an aerosol-generating material;
a sensor configured to detect an inhalation on

the aerosol provision system by a user of the aerosol provision system, and output corresponding inhalation detection signals to the control circuitry; and
wherein the control circuitry is configured to:

determine a duration of the inhalation based on the inhalation detection signals received from the sensor, and
determine an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of the operational parameter during the inhalation.

2. The aerosol provision system of claim 1, wherein the control circuitry is configured to determine a duration of a session based on the duration of a plurality of inhalations, wherein a time between each of the plurality of inhalations is less than a predetermined time, optionally wherein the control circuitry is configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during the session based on the duration of the session and an indication of the operational parameter during the session.

3. The aerosol provision system of claim 1 or 2, wherein the control circuitry is configured to determine an indication of an amount of the ingredient delivered from the aerosol-generating material to the user during a rolling predetermined period based on the duration of each inhalation during the rolling predetermined period and an indication of the operational parameter during each inhalation during the rolling predetermined period, optionally wherein the control circuitry is configured to determine a time between each inhalation based on the inhalation detection signals, and wherein the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period is also based on the time between each inhalation during the rolling predetermined period.

4. The aerosol provision system of any one of claims 1 to 3, wherein the determination of the indication of the amount of the ingredient delivered from the aerosol-generating material to the user is further based on a concentration of the ingredient in the aerosol-generating material.

5. The aerosol provision system of any one of claims 1 to 4, further comprising a power source configured to supply electrical power to the aerosol generator, and wherein the operational parameter of the system is an amount of electrical power supplied to the aerosol generator by the power source.

6. The aerosol provision system of any one of claims 1 to 5, wherein the control circuitry is configured to determine default user behaviour based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user for a plurality of inhalations.

7. The aerosol provision system of claim 6, wherein the control circuitry is configured to determine a time between each of the plurality of inhalations based on the inhalation detection signals, and wherein determining default user behaviour is also based on the time between each of the plurality of inhalations, and/or wherein the control circuitry is configured to alter a mode of operation of the aerosol provision system based on the default user behaviour.

8. The aerosol provision system of claim 6 or 7, wherein the control circuitry is configured to provide a notification to the user based on the indication of the amount of the ingredient delivered from the aerosol-generating material to the user during the inhalation and the default user behaviour.

9. The aerosol provision system of any one of claims 1 to 8, wherein the control circuitry is configured to provide a notification to the user when the indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation exceeds a puff threshold.

10. The aerosol provision system of any one of claims 2 to 9, wherein the control circuitry is configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the session exceeds a session threshold.

11. The aerosol provision system of any one of claims 3 to 10, wherein the control circuitry is configured to provide a notification to the user when the indication of the amount of an ingredient delivered from the aerosol-generating material to the user during the rolling predetermined period exceeds a period threshold.

12. The aerosol provision system of any one of claims 8 to 11, wherein the notification is provided on the aerosol provision system, and/or wherein the notification is provided on an application on a remote device.

13. A system comprising:

an aerosol provision system configured to generate aerosol from an aerosol-generating mate-

rial; and
a computer configured to:

receiving inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system;
determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and
determining an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation.

14. A method of determining an amount of an ingredient delivered to a user of an aerosol provision system, the method comprising:

receiving inhalation detection signals from a sensor configured to detect the inhalation on the aerosol provision system by a user of the aerosol provision system;
determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and
determining an indication of an amount of an ingredient delivered from an aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation, wherein an aerosol generator is configured to aerosolize the aerosol-generating material.

15. A computer readable storage medium comprising instructions which, when executed by a processor, performs a method comprising:

receiving inhalation detection signals from a sensor configured to detect the inhalation on an aerosol provision system by a user of the aerosol provision system;
determining a duration of the inhalation based on the inhalation detection signals received from the sensor; and
determining an indication of an amount of an ingredient delivered from the aerosol-generating material to the user during the inhalation based on the duration of the inhalation and an indication of an operational parameter of the aerosol provision system during the inhalation.

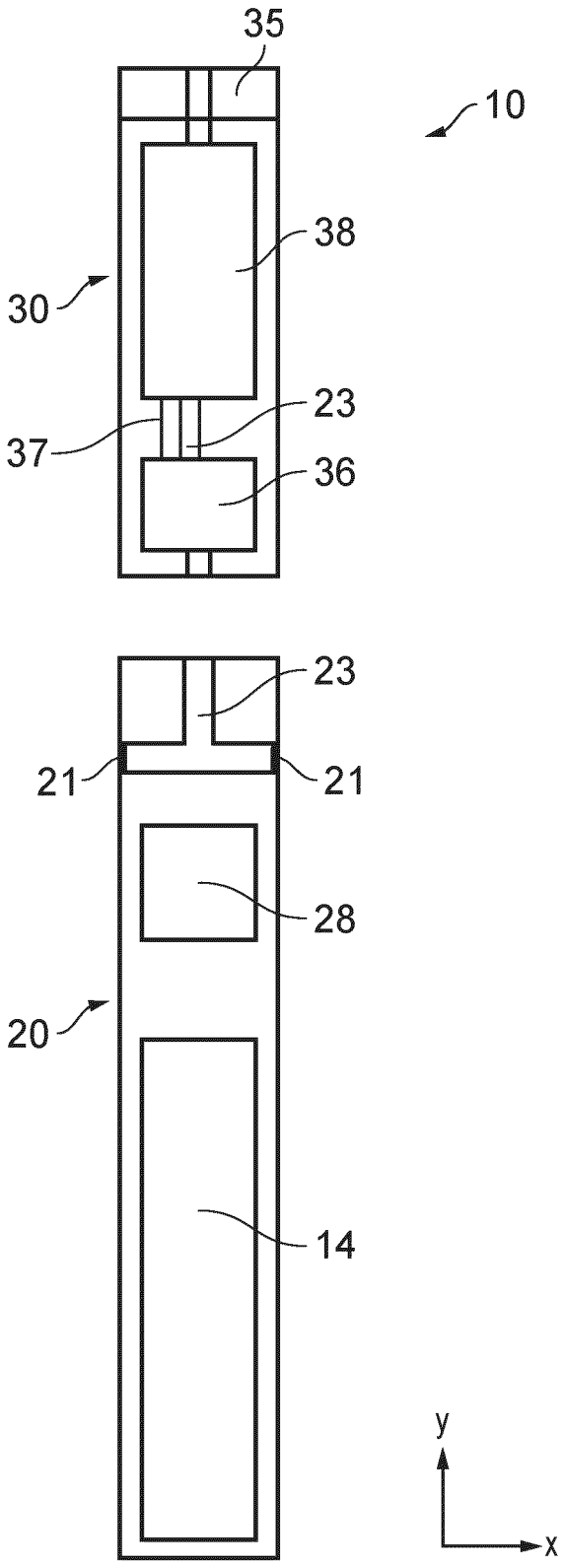

FIG. 1

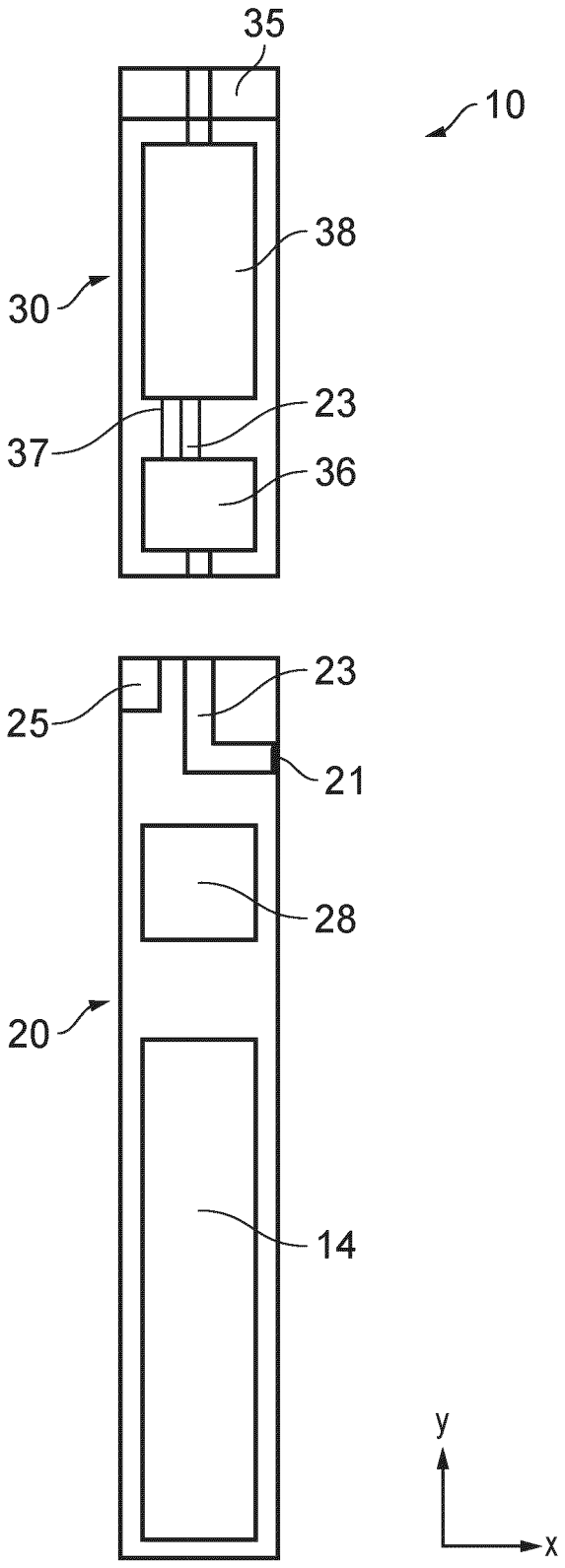

FIG. 2

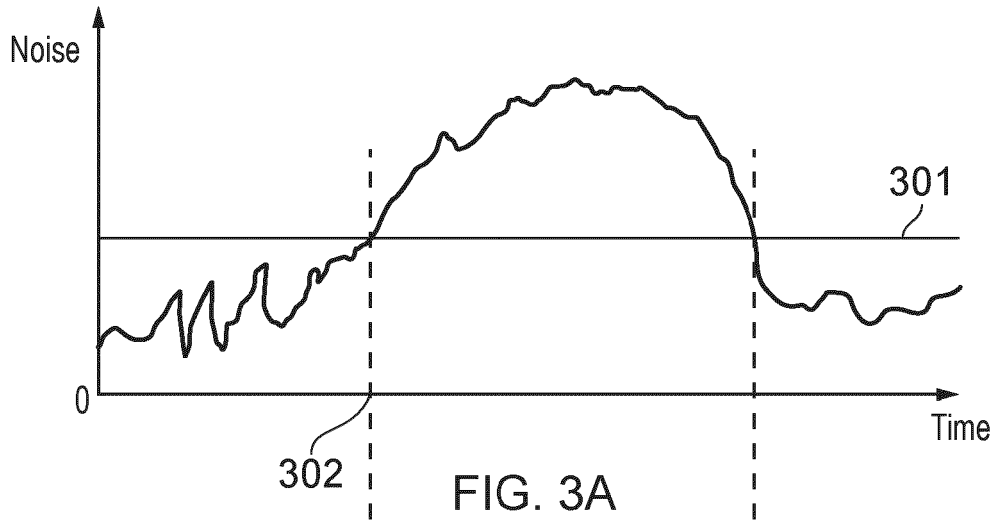

FIG. 3A

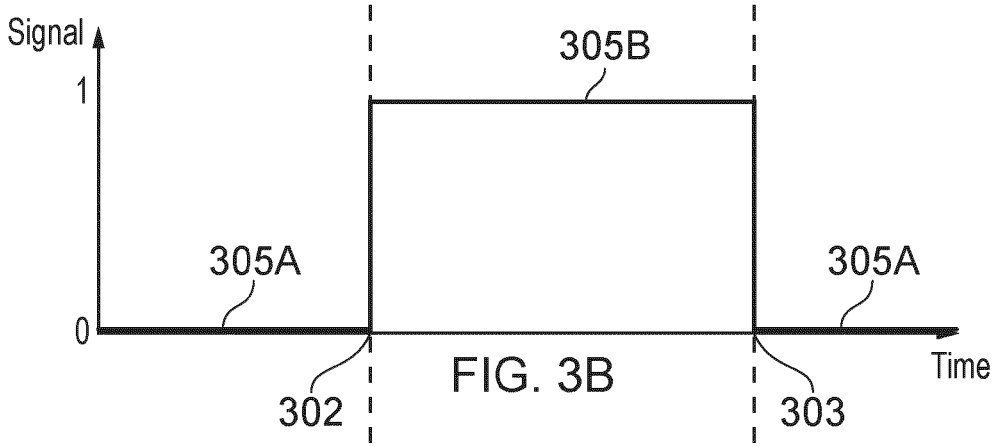

FIG. 3B

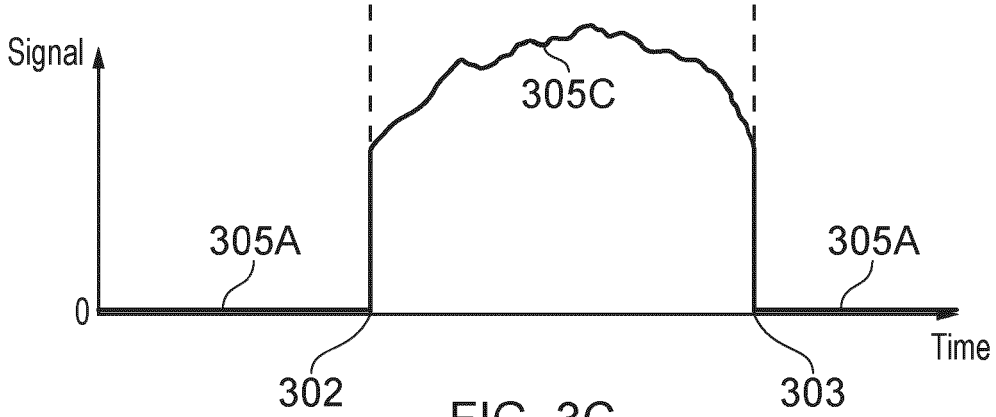

FIG. 3C

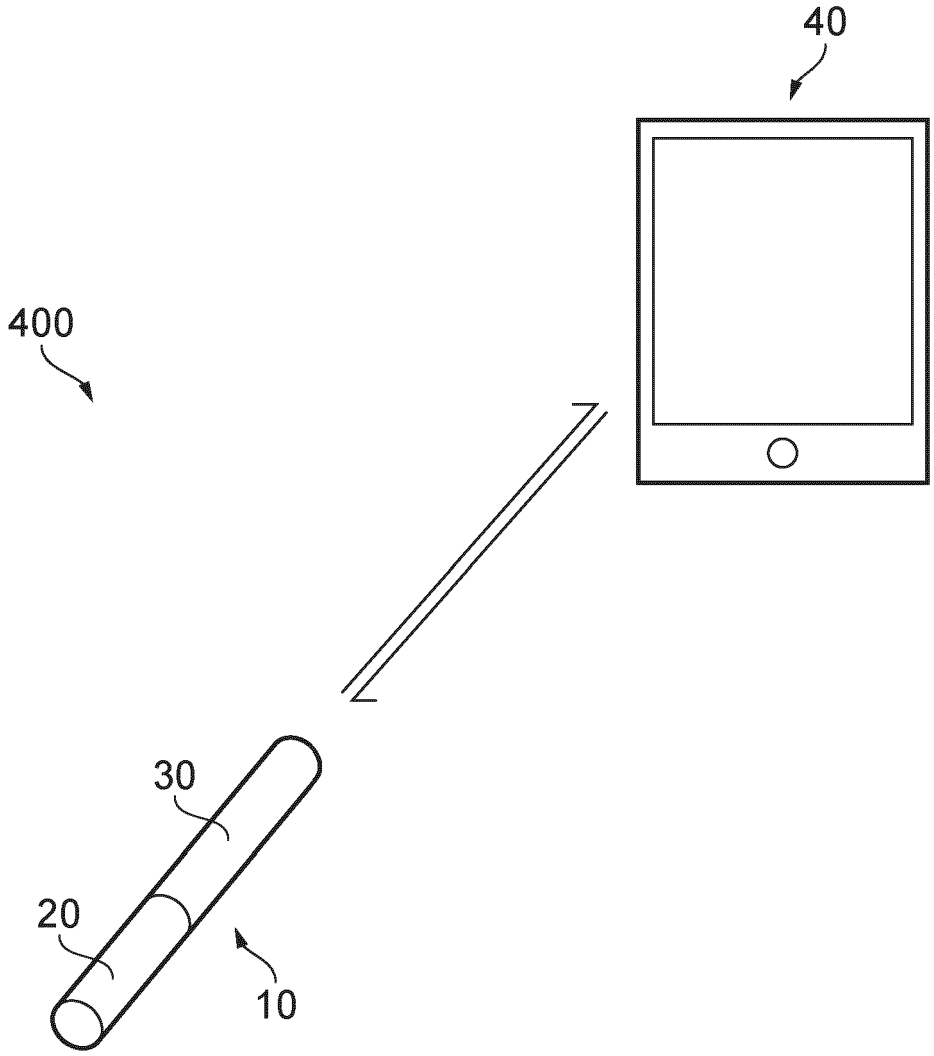

FIG. 4

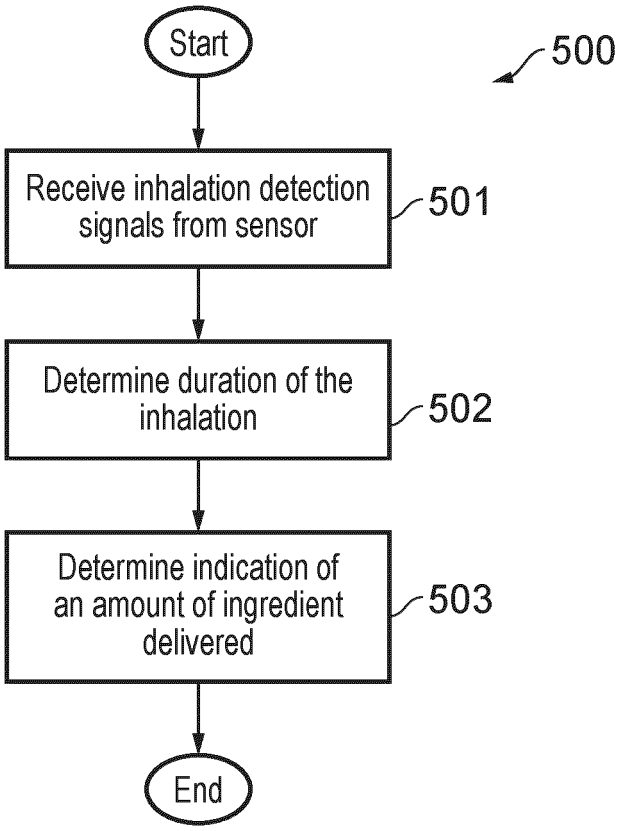
Start
500
Receive inhalation detection signals from sensor
501
Determine duration of the inhalation
502
Determine indication of an amount of ingredient delivered
503
End

FIG. 5