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(54) **BATTERY LEVEL INDICATION FOR AN AEOROSOL GENERATING DEVICE**

BATTERIESTANDSANZEIGE FÜR EINE AEROSOLERZEUGUNGSVORRICHTUNG

INDICATION DE NIVEAU DE BATTERIE POUR UN DISPOSITIF DE GÉNÉRATION D'AÉROSOL

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of aerosol generating device and in particular relates to battery level indication for an aerosol generating device.

BACKGROUND

[0002] In the recent years devices which heat rather than burn or cause combustion of a substance to generate a vapour or aerosol for inhalation by a user have become increasingly popular.

[0003] Such commonly used device which heat rather than burn or cause a combustion of a substance may be tobacco-based device also known as heated tobacco products. These devices normally contain tobacco and/or other suitable substance that is heated but not burned to create an inhalable aerosol. The tobacco and/or the other suitable substance may in general also be called an aerosol generating substance and the device in general may be called an aerosol generating device. As an example; document WO 2020/225105 A1 discloses a device which is capable of indicating the battery level or the amount of consumable left.

[0004] Normally, the aerosol generating substance is placed in a container, also called a stick or a tobacco stick, that can be inserted in and removed from the aerosol generating device by the user. Therefore, the stick or the tobacco stick is a consumable article.

[0005] For heating the aerosol generating substance the aerosol generating device comprises a battery for providing power to the heating arrangement of the aerosol generating device that heats the aerosol generating substance. The amount of charge that is stored in the battery when the battery is fully charged normally allows that more than one consumable article is fully used. Fully used is to be understood in the sense that the aerosol generating substance for producing an aerosol has been burned. The battery is normally a rechargeable battery.

[0006] Usually, the user checks the amount of charge remaining in the battery (also called here below battery level) before starting an aerosol generating session with the aerosol generating device for ensuring whether a consumable article that is inserted or is to be inserted in the aerosol generating device can be fully used with the amount of charge remaining in the battery. This is particularly important for the user if the user intends to go to an environment in which it is not possible, or it is difficult to charge the battery.

[0007] In the conventional art, the battery level is indicated in percentage using any suitable output means placed on the aerosol generating device. The percentage indicates the battery level with respect to a fully charged battery or entirely emptied battery. However, based merely on indication of the percentage it is difficult for the user to comprehend how many consumable articles

can be fully used with the amount of charge remaining in the battery.

[0008] On the other hand, the number of consumable articles that can be fully used with the amount of charge remaining in the battery is an important information for the user which enables the user to better manage the charging of the battery. For example, the user may plan in advance the charging of the battery so that unnecessary charging and discharging, for example complete discharging of the battery that may negatively or disadvantageously influence the lifetime and performance of the battery may be effectively avoided. In addition, it is also preferred that the consumable articles are fully used which avoids a waste of resources for producing the consumable articles. Further, this information also enables the user to better manage its own consumption of consumable articles thus reducing its own anxiety regarding the amount of charge remaining in the battery. For example, the user may like to know whether there is enough amount of charge remaining in the battery for the user to fully empty the next, for example, three or other desired number of consumable articles.

[0009] Moreover, indicating the battery level is also dependent on the overall shape and design of the aerosol generating device. For example, since the aerosol generating device is a handheld device, normally a smooth surface that provides physical ergonomic advantage for the user is preferred. Such smooth surface should not be interrupted by means for indicating the battery level.

[0010] Therefore, there is a need for an indication of a battery level of a battery of an aerosol generating device that is easily understandable for the user and can enable better management of the charging of the battery by the user as well as the user's own consumption of consumable articles. Even further such indication of battery level should also be in accordance with the overall shape and design of the aerosol generating device.

SUMMARY

[0011] The mentioned problems and objects are met by the subject-matter of the independent claims. Advantageous embodiments are defined in the dependent claims.

[0012] According to one aspect of the present invention, as defined in claim 1, there is provided a method of indicating a battery level of a battery of an aerosol generating device for generating an aerosol from an aerosol generating substance contained in a consumable article, the method comprising the steps of: determining the amount of charge remaining in the battery; calculating the number of consumable articles that can be fully used with the determined amount of charge remaining in the battery; and displaying an information, said information indicating the calculated number of consumable articles that can be fully used with the determined amount of charge remaining in the battery.

[0013] According to another aspect of the present in-

vention, as defined in claim 14, there is provided an aerosol generating device comprising a heating chamber configured so that a user can place a consumable article containing an aerosol generating substance into said heating chamber; a heater configured to supply heat to the heating chamber to thereby heat the aerosol generating substance in the consumable article; a battery configured to supply electrical power to the heater; an output unit for displaying an information to the user; and a control unit configured to carry out the method according to the above elaborated aspect.

[0014] According to another aspect of the present invention, as defined in claim 15, there is provided a system comprising the aerosol generating device according to the above-elaborated aspect and a charging case, said charging case comprising a display for displaying said calculated number.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Embodiments of the present invention which are presented for better understanding the inventive concept of the present invention, but which are not to be seen as limiting the present invention, will now be described with reference to the figures in which:

- Figs. 1A and 1B show a schematic view of the aerosol generating device according to the embodiment of the present invention;
- Fig. 1C shows a schematic view of the aerosol generating device in a communication environment with external devices;
- Fig. 1D shows a schematic view of the consumable article to be used with the aerosol generating device according to the embodiment of the present invention;
- Fig. 2 shows a schematic view of the functional components of the aerosol generating device of the embodiment of the present invention;
- Fig. 3 shows a flowchart diagram of the method of indicating a battery level of a battery of the aerosol generating device according to the embodiment of the present invention;
- Fig. 4A and 4B show numerical and graphical representation of the battery level of the aerosol generating device by the aerosol generating device according to the embodiment of the

present invention;

Fig. 5A and 5B show numerical and graphical representation of the battery level of the aerosol generating device by a smartphone according to the embodiment of the present invention;

Fig. 6 shows an arrangement of indicators on the aerosol generating device for indicating the battery level according to the embodiment of the present invention;

Fig. 7 shows further details of the graphical representation of the battery level of the aerosol generating device by the aerosol generating device according to the embodiment of the present invention.

DETAILED DESCRIPTION

[0016] Figure 1A shows a schematic view of the aerosol generating device 1 according to the embodiment of the present invention.

[0017] The aerosol generating device 1 according to the embodiment of the present invention is a handheld device with a pebble-like shape and comprises an access portion 11 and a housing portion 12. The access portion 11 is in the top part of the aerosol generating device 1 and comprises means for opening and closing an opening 13 to a heating chamber of the aerosol generating device 1. In the heating chamber, a user may place at least one consumable article 100 comprising an aerosol generating substance. The access portion 11 may comprise for example a lid that can at least partly be removed from the housing portion 12. In other embodiment the access portion 11 may comprise for example a slider. The slider may be moved between two positions such as opened position and closed position for opening and closing the opening 13 to the heating chamber.

[0018] Figure 1B shows a schematic view of the aerosol generating device 1 according to the embodiment of the present invention when the access portion 11 is closed. As further shown in figure 1B the aerosol generating device 1 may comprise on the outer side of the housing portion 12 one or more input means 14 (comprising for example one or more buttons) for controlling, for example turning on or off, the aerosol generating device 1.

[0019] The housing portion 12 of the aerosol generating device 1 may have a smooth outer surface which together with the pebble-like shape provides a physical ergonomic advantage for the user. The housing portion 12 houses at least the mentioned heating chamber and houses further components of the aerosol generating device 1 as elaborated below.

[0020] The user can place a consumable article 100 containing an aerosol generating substance into the heating chamber.

[0021] Figure 1D shows schematic view of the consumable article 100 according to the embodiment of the present invention. The consumable article 100 may be a stick or a tobacco stick comprising tobacco and/or other suitable substance that is heated but not burned in the heating chamber to create an inhalable aerosol. The consumable article 100 may further comprise a flavour adding substance. The consumable article 100 may have an elongated form, for example a cylindrical form as shown in figure 1D. The consumable article 100 may be partitioned in two parts: in the first part 110 the aerosol generating substance is placed while the second part is a filter portion 120.

[0022] Figure 2 shows a schematic view of the functional components of the aerosol generating device 1 of the embodiment of the present invention.

[0023] The heating chamber 10 mentioned above may be such that the user can place one consumable article 100 at a time or the user may place more than one consumable articles 100 at a time. The heating chamber 10 may also have a cylindrical form as the consumable article 100. The form of the consumable article 100 and the heating chamber 10 are not to be seen as limiting to the concept of the present invention.

[0024] The aerosol generating device 1 comprises further a heater 20 (or a heating arrangement 20) for supplying heat to the heating chamber 10 to thereby heat the aerosol generating substance 110 in the consumable article 100. The heater 20 may be a heater 20 that supplies heat to the heating chamber 10 based on a resistive heating, but may also be a heater 20 that supplies heat to the heating chamber 10 based on inductive heating. The type of heating is not to be seen as limiting to the concept of the present invention.

[0025] Further, the heater 20 may be placed outside the heating chamber 10 so that it indirectly, for example through convective heat transfer, heats the aerosol generating substance 100 but may also be placed entirely or at least partially in the heating chamber 10 and directly or indirectly heat the aerosol generating substance 100. The position of the heater 20 with respect to the heating chamber 10 is not to be seen as limiting to the concept of the present invention.

[0026] The aerosol generating device 1 comprises further a battery 30 for supplying electrical power to the heater 20. The battery 30 is a rechargeable battery. When the battery 30 is fully charged the amount of charge stored in the battery enables that more than one consumable article 100 is fully used (or consumed). Fully used (or consumed) is to be understood in the sense that the aerosol generating substance 110 for producing an aerosol has burned out. In the following, the full use (or consumption) of one consumable article 100 may also be called a complete (or completed) aerosol generating session.

[0027] The aerosol generating device 1 comprises further an output unit 40 for displaying an information to the user. The information comprises an information for indicating an amount of charge remaining in the battery 30 (also called here below battery level). The output unit 40 may be any suitable output unit, for example a liquid crystal display (LCD display) or LED display, or one or more indicators, for example lamps or light emitting devices (LEDs). The lamps or light emitting devices (LEDs) may be single coloured or multi coloured, or in other words may emit single colour light or may be able to emit light in more than one colour or may emit white colour light. Details of the output unit 40 will be elaborated further below.

[0028] The aerosol generating device 1 comprises further a control unit 50 for carrying out various processing as will be elaborated further below. In particular, the control unit 50 carries out processing for performing the steps of the method for indicating the battery level of the battery 30 of the aerosol generating device 1 elaborated further below.

[0029] The control unit 50 is any suitable unit or comprises any suitable unit such as computer processing unit that can perform computer processing. The control unit 50 (also called controller) may be for example a micro processing unit (MCU). Further, the control unit 50 may comprise storage means, such as a memory. The memory may also be a separate unit from the control unit 50 also placed inside the housing portion 12. The memory may store different information needed for the processing by the control unit 50. Further, the memory may store computer program (code) comprising instructions which, when the program is executed by the control unit 50, cause the control unit 50 to carry out the processing (or method steps) of the embodiment of the present invention as will be elaborated further below.

[0030] The aerosol generating device 1 may also comprise transmitting and/or receiving means 60 for transmitting and/or receiving data to/from an external device. The external device may be an electronic device such as a smartphone 2 or other electronic device for personal use or may be a charging case 3. The charging case 3 may be used for charging the battery 30 of the aerosol generating device 1 when the aerosol generating device 1 is placed in the charging case 3. Figure 1C shows schematically the aerosol generating device 1 communicating with a smartphone 2 and a charging case 3.

[0031] Figure 3 shows a flow diagram of the method of indicating the battery level of the battery 30 of the aerosol generating device 1 for generating an aerosol from the aerosol generating substance contained in the consumable article 100 according to the embodiment of the present invention.

[0032] The method comprises the following steps: determining the amount of charge remaining in the battery 30 (step S 1000); calculating the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 (step S

2000); and displaying an information, said information indicating the calculated number of consumable articles that can be fully used with the determined amount of charge remaining in the battery 30 (S 3000).

[0033] In the following, further details of these steps are elaborated.

[0034] In the embodiments of the present invention the control unit 50 may determine the amount of charge remaining in the battery 30 based on different measurements. The particular manner of determining the amount of charge remaining in the battery 30 is not to be seen as limiting to the present invention.

[0035] The calculation of the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 can be performed in an initial calibration process or in a learning process as elaborated further below.

[0036] The initial calibration process relates to the initial use of the aerosol generating device 1. The initial use may be understood in the sense of the user intends to start a first aerosol generating session.

[0037] In the memory of the aerosol generating device 1 an initial information comprising a pre-determined amount (Z0) of charge to fully use one consumable article 100 is stored. This pre-determined amount of charge (Z0) to fully use one consumable article 100 may be obtained in laboratory settings during tests performed on the aerosol generating device 1 or other aerosol generating device comprising a battery with the same or similar characteristics as the aerosol generating device 1 of the present embodiment and/or one consumable article or may be obtained by way of theoretical calculations. This information may than be pre-stored in the aerosol generating device 1 as the pre-determined amount (Z0) of charge to fully use one consumable article 100. Pre-stored means that when the user purchases the aerosol generating device 1 this information is stored in the memory of the aerosol generating device 1.

[0038] For the initial calibration the control unit 50 determines the amount of charge remaining in the battery 30 and calculates the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 based on the pre-stored amount of charge (Z0) to use one consumable article 100 and the determined amount of charge remaining in the battery 30. The control unit 50 then carries out the step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30. The control unit 50 carrying out the step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 may involve the control unit 50 sending an instruction to the output unit 40 to display the information indicating the calculated number. The information indicating the calculated number may be displayed to the user through numerical representation or a visual or graphical repre-

sentation as elaborated further below.

[0039] As the user uses the aerosol generating device 1, the control unit 50 calculates the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 in the learning process as elaborated below. The learning process is advantageous since with the progress of use of the aerosol generating device 1 the battery 30 may degrade, such that the above-elaborated pre-stored amount of charge (Z0) to use one consumable article 100 may not correspond to the amount of charge to use one consumable article 100 with the current battery characteristics.

[0040] The control unit 50 determines a first value (Y) for the amount of charge remaining in the battery 30 before a consumable article 100 is used. The first value (Y) may be determined, for example, at the start of supplying electrical power for using the consumable article or a predetermined time period before the start of supplying electrical power for using the consumable article or based on a pre-determined triggering signal received by the control unit 50. Examples of such triggering signal are described further below.

[0041] The control unit 50 determines further a second value (X) for the amount of charge remaining in the battery 30 after the consumable article 100 is fully used.

[0042] The second value (X) is subtracted from the first value (Y) and an amount (Z1) of charge needed to fully use one consumable article 100 as the result of subtracting the second value (X) from the first value (Y) is determined. This determined amount (Z1) of charge needed to fully use one consumable article 100 is stored. The control unit 50 may store the determined amount (Z1) in the memory described above.

[0043] The control unit 50 carries out the step of determining the amount of charge needed to fully use one consumable article 100 for the next consumptions, or in other words, each next time one consumable article 100 is fully used, the amount of charge needed to fully use the consumable article 100 is determined as elaborated above such that data Z2, Z3,...Zx are generated and stored in the memory described above.

[0044] The step of calculating the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 may be carried out in different ways elaborated here below.

[0045] In one embodiment of the present invention the first value (Y) for the amount of charge remaining in the battery 30 before the consumable article 100 is used is divided with the last stored amount (Zx) of charge needed to fully use one consumable article (last consumption) to thereby obtain a first division result. The first division result may be rounded down to the nearest whole number to thereby calculate the number of consumable articles 100 that can be fully used to generate the aerosol with the charge remaining in the battery 30.

[0046] In other embodiment of the present invention an average value of the amount (Zav) of charge needed to

fully use one consumable article 100 may be calculated, and the first value (Y) for the amount of charge remaining in the battery 30 before the consumable article 100 is used is divided with said average value of the amount (Zav) of charge needed to fully use one consumable article 100 to thereby obtain a second division result. The second division result may be rounded down to the nearest whole number to thereby calculate the number of consumable articles 100 that can be fully used to generate aerosol with the charge remaining in the battery 30.

[0047] In one embodiment of the present invention the average value of the amount (Zav) of charge needed to fully use one consumable is calculated from a predetermined number x of subsequently stored amounts (Zi,...,Zi+x) (last x consumptions) of charge needed to fully use one consumable.

[0048] Further, in other embodiment of the present invention the average value of the amount (Zav) of charge needed to fully use one consumable article involves determining a time period based on a clock signal, and calculating the average value of the amount (Zav) of charge needed to fully use one consumable from the stored amounts (Zi,...,Zi+x) of charge needed to fully use one consumable article, stored within the determined time period. The length of the time-period may also be pre-stored in the memory elaborated above. For example, if the control unit 50 has an internal clock the internal clock may be used for determining the time period. The time period may be for example one or more hours. If no value (Zi) is found in the time period, because for example the user did not use the aerosol generating device 1 in the time period then the last calculated average value of the amount (Zav) of charge needed to fully use one consumable article 100 is used.

[0049] After the number of consumable articles 100 that can be fully used with the amount of charge remaining in the battery 30 is calculated as elaborated above, the control unit 50 carries out the step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30. The control unit 50 carrying out the step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 may involve the control unit 50 sending an instruction to the output unit 40 to display information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30.

[0050] The step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 may comprise displaying numerical information (numerical representation) or displaying visual or graphical information (graphical representation).

[0051] The numerical representation may comprise

displaying in the output means 40 the calculated number as shown in figure 4A, in this case displaying the number 12. Normally there is no restriction as to the maximum number that can be displayed in this way. In this case the output unit 40 may be a liquid crystal display or LED display.

[0052] The visual or graphical representation may involve the use of indicators in the output unit 40 as shown in figure 4B. The indicators may be LEDs in the form of shapes or symbols, such as dots, circles, triangles, rectangles and similar, placed on a suitable position on the aerosol generating device with enough separation to see individual ones. In other words, the output unit 40 may comprise a plurality of LEDs. The LEDs are lit (illuminated) to show how many consumable articles 100 can be fully used with the determined amount of charge remaining in the battery 30. The number of illuminated LEDs represents the number of consumable articles that can be fully used with the determined amount of charge remaining in the battery 30. In other words, the step of displaying information indicating the calculated number of consumable articles 10 that can be fully used with the determined amount of charge remaining in the battery 30 comprises a step of illuminating one or more indicators based on said calculated number. In this embodiment the number of illuminated indicators is equal to the calculated number.

[0053] In this embodiment of the present invention the indicators are arranged at the top portion of the housing 12 close to the opening 13 through which the user inserts the consumable article 100 in the heating chamber 10 as shown in figure 4B. This position of the indicators, or in other words, this position of the output unit 40 enables that the user sees without difficulty the displayed information when opening the access portion 11 to insert the consumable article 100 in the heating chamber 10. Even further, with arrangement the indicators at the top portion of the housing portion 12 the surface where the user normally handhelds the aerosol generating device 1 is not disturbed by the indicators so that the physical ergonomic advantage of the surface to the user is not disturbed.

[0054] In this embodiment the number of arranged indicators in the output unit 40 is equal to the maximum number of consumable articles that can be fully used when the battery 30 is fully charged.

[0055] In other embodiment of the present invention the number of arranged indicators in the output unit 40 may be smaller than the number of consumable articles 100 that can be fully used when the battery 30 is fully charged. One such embodiment is described further below.

[0056] The control unit 50 may further instruct the transmitting/receiving means to transmit the calculated number of consumable articles 100 that can be fully used with the amount of charge remaining in the battery 30 to an external device that displays the information indicating the number of consumable articles 100 that can be fully

used with the amount of charge remaining in the battery 30. The external device may be for example a smartphone 2 or other electronic device for personal use or a charging case 3 as illustrated in figure 1C.

[0057] Hence, the graphical or numerical representation of the number of consumable articles that can be fully used with the determined amount of charge remaining in the battery 30 is performed by the external device, for example the smartphone 2 or the charging case 3.

[0058] The smartphone 2 may have installed on it an application software for carrying out numerical representation 21 of the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 as shown in figure 5A or graphical representation 22 of the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery as shown in figure 5B. In the numerical representation 21 additional text information may be included as shown in figure 5A. In the graphical representation 22 shapes, such as for example circles, corresponding to the calculated number may be displayed as shown in figure 5B.

[0059] The charging case 3 may comprise output means similar to the output means 40 of the aerosol generating device 1 for displaying the calculated number.

[0060] In one embodiment of the present invention the control unit 50 may further transmit the determined amount of charge remaining in the battery to the smartphone 2 or other electronic device for personal use, such that the step of calculating the number of consumable articles as elaborated is performed by the smartphone 2 (or the other electronic device for personal use) instead of, or in addition to, performing this step by the control unit 50.

[0061] In other words, if the aerosol generating device 1 can connect with the application software of the smartphone 2 the aerosol generating device 1 transmits the determined amount of charge remaining in the battery to the smartphone 2 and the application software of the smartphone 2 carries out the step of calculating the number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 as elaborated above and subsequently carries out the step of displaying information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 as elaborated above.

[0062] The aerosol generating device 1 may connect with the external device such as the smartphone 2, or other electronic device for personal use, or the charging case 3 by means of wireless or wired communication. For this, the transmitting/receiving means 60 of the aerosol generating device 1 may be configured for performing wired or wireless communication. The wireless communication may involve for example short-range wireless communication or long-range communication wireless.

[0063] As elaborated above the control unit 50 may be triggered to determine the first value (Y) for the amount of

charge remaining in the battery 30 based on a pre-determined triggering signal received by the control unit 50. In accordance with the above description triggering is to be understood not only as triggering for determining the first value (Y) for the amount of charge remaining in the battery 30 but as triggering for indicating the battery level of the battery 30 of the aerosol generating device 1 by carrying out the steps of the method elaborated with reference to figure 3 above.

[0064] In one embodiment of the present invention the triggering may involve for example the user opening the access portion 11, for example by moving the slider to open (for example before starting an aerosol generating session) or close (for example after an aerosol generating session is completed) the opening 13 to the heating chamber 10. Accordingly, when the user opens the slider to open the opening 13 to the heating chamber 10 for inserting a consumable article 100 the steps of the method described with reference to figure 3 are carried out and the battery level is indicated as elaborated above. In this way there is no need for the user to further manipulate the aerosol generating device 1 for initiating the battery level indication. This is advantageous since it is not necessary that further means are provided on the aerosol generating device 1 for initiating the battery level indication. It also improves user experience since it informs the user of the remaining battery level (i.e., how many tobacco sticks/-consumable articles can be vaped/used) before starting an aerosol generating session. This is particularly useful if the remaining battery level is not sufficient for finishing one aerosol generating session (for example vape one tobacco stick). Similarly, when the user closes the slider to close the opening 13 to the heating chamber 10 after the aerosol generating session is completed the steps of the method described with reference to figure 3 are carried out and the battery level is indicated as elaborated above. Such battery indication right after vaping is advantageous to help the user predict battery charging and/or the next aerosol generating session.

[0065] In other embodiment of the present invention the triggering may involve the user pressing one or more of the buttons of the input unit 14, or the user inserting the consumable article 100 in the heating chamber 10, or the user tapping lightly on the device, waving or shaking the device.

[0066] In still other embodiment of the present invention the triggering may follow through the external device, for example, the user manipulating the external device, for example the smartphone 2, to request battery indication, for example, through the application software described above.

[0067] In the embodiment elaborated above with reference to figure 4B the graphical representation of the information indicating the calculated number of consumable articles that can be fully used with the determined amount of charge remaining in the battery 30 involved illuminating a number of LEDs (indicators), said number of illuminated LEDs being equal to the calculated number

of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30. This approach requires rather large number of arranged LEDs on the aerosol generating device 1 since the number of LEDs that can be illuminated should be equal to the number of consumable articles 100 that can be fully used when the battery 300 is fully charged. In other words, the size of the output unit 40 is in such case rather large. Therefore, rather large surface for arranging such large number of LEDs (the output unit 40) on the aerosol generating device 1 is needed.

[0068] However, due to the limited size of the aerosol generating device 1 that is a handheld device as elaborated above it may be preferred that the number of LEDs arranged on the aerosol generating device 1 is smaller than the number of consumable articles 100 that can be fully used when the battery 30 is fully charged. Therefore, there is a need for determining an illumination pattern with which the information indicating the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 can be displayed in a manner that is easily comprehensible for the user without any harm to the clean design of the aerosol generating device 1 and without disturbing the physical ergonomic advantage such design has for the user as well as being in compliance with the limited size of the aerosol generating device 1.

[0069] Therefore, in a further embodiment of the present invention a predetermined number of indicators that can be illuminated in the output unit 40 is arranged on the aerosol generating device 1 and this predetermined number is smaller than the number of consumable articles 100 that can be fully used when the battery 30 is fully charged.

[0070] In this embodiment of the present invention an illumination pattern for illuminating the indicators based on the calculated number of consumable articles 100 and a predetermined threshold is determined. Determining an illumination pattern for the indicators comprises determining a number of indicators to be illuminated of the predetermined number of arranged indicators and determining a colour of illumination based on the calculated number of consumable articles 100 and the predetermined threshold. The predetermined threshold may be the predetermined number of indicators arranged on the aerosol generating device 1 or may be a multiple of the predetermined number indicators arranged on the aerosol generating device 1.

[0071] The indicators may be LEDs that are capable of emitting light in different colours.

[0072] In one embodiment of the present invention the predetermined number of LEDs is four. In this embodiment of the present invention each LED is capable of emitting light at least in three different colours.

[0073] Figure 6 shows schematic view of the arrangement of the four LEDs (output unit 40) on the aerosol generating device 1. As shown in figure 6 the four LEDs are arranged in a line along the direction of extending of

the housing portion 12 and are arranged in the lower part of the housing portion 12. Since the four LEDs are arranged in the lower part of the aerosol generating device 1 they are arranged away from the position of handholding the aerosol generating device 1 so that the physical ergonomic advantage of the contact surface of the aerosol generating device 1 with the hand of the user is not disturbed.

[0074] Details of the illumination pattern are shown schematically in figure 7.

[0075] A first colour of each LED, for example white colour, indicates that five consumable articles 100 may be fully used with the determined amount of charge remaining in the battery 30. When there are four LEDs illuminated in the first colour, for example the white colour, this means that from sixteen to more than twenty consumable articles 100 may be fully used with the determined amount of charge remaining in the battery 30.

[0076] When there are three LEDs illuminated in the first colour (and one LED is not emitting light, or is dark), this means that from eleven to fifteen consumable articles may be fully used with the determined amount 100 of charge remaining in the battery 30.

[0077] When there are two LEDs illuminated in the first colour (and two other LEDs are dark) this means that from six to ten consumable articles 100 may be fully used with the determined amount of charge remaining in the battery 30.

[0078] If there is one LED illuminated in the first colour (and three LEDs are dark) this means that five consumable articles 100 can be fully used with the determined amount of charge remaining in the battery 30.

[0079] Once the calculated number of consumable articles 100 that can be fully used with the determined amount of charge remaining in the battery 30 reaches four, the colour of illumination is changed to a second colour, for example yellow. In this case each LED illuminated with the second colour corresponds to one consumable article 100 that can be fully used with the determined amount of charge remaining in the battery 30.

Therefore, when all four LEDs are illuminated with the second colour this means that four consumable articles 100 can be fully used with the determined amount of charge remaining in the battery 30. When three LEDs are illuminated with the second colour (and one LED is dark) this means that three consumable articles 100 can be fully used with the determined amount of charge remaining in the battery 30. When two LEDs are illuminated with the second colour (and two LEDs are dark) this means that two consumable articles 100 can be fully used with the determined amount of charge remaining in the battery 30.

[0080] However, when the calculated number of consumable articles that can be fully used with the determined amount of charge remaining in the battery 30 is one than the colour of illumination is changed to a third colour, for example red. Accordingly one LED illuminated with red colour (for example the lowest LED in figure 7

and the other three LEDs being dark) indicates that only one consumable article 100 can be fully used with the determined amount of charge remaining in the battery 30. In this way the user can easily understand that only one consumable article 100 can be fully used with the determined amount of charge remaining in the battery 30 and that charging of the battery 30 is needed.

[0081] In summary, in the above a method has been shown for indicating a battery level of a battery 30 of an aerosol generating device 1 in terms of the number of consumable articles 100 that can be fully used with the amount of charge remaining in the battery 30. With this the user can easily understand how many consumable articles 100 may be fully used with the amount of charge remaining in the battery 30. Further, the manner of displaying is also in accordance with the limited size of the aerosol generating device 1 and further does not disturb the physical ergonomic advantage of the contact surface of the aerosol generating device 1 with the hand of the user is not disturbed.

[0082] Although detailed embodiments have been described, these only serve to provide a better understanding of the invention defined by the appended claims and are not be seen as limiting.

Claims

1. A method of indicating a battery level of a battery (30) of an aerosol generating device (1) for generating an aerosol from an aerosol generating substance contained in a consumable article (100), the method comprising the steps of:

determining (S 1000) the amount of charge remaining in the battery (30);
 calculating (S 2000) the number of consumable articles (100) that can be fully used with the determined amount of charge remaining in the battery (30); and
 displaying (S 3000) an information, said information indicating the calculated number of consumable articles (100) that can be fully used with the determined amount of charge remaining in the battery (30).

2. The method of claim 1, wherein the step of determining (S 100) comprises:
 determining a first value for the amount of charge remaining in the battery (30) before a consumable article (100) is used.
3. The method of claim 2, wherein the step of determining (S 1000) further comprises:

determining a second value for the amount of charge remaining in the battery (30) after the consumable article (100) is fully used,

the method further comprising:

subtracting the second value from the first value,
 determining an amount of charge needed to fully use one consumable article (100) as the result of subtracting the second value from the first value, and
 storing the determined amount of charge needed to fully use one consumable article (100).

4. The method according to claim 3, wherein the step of determining (S 1000) and storing the amount of charge needed to fully use one consumable article (100) is performed each time a consumable article (100) is fully used.

5. The method of any one of claims 1 to 4, wherein the step of
 calculating (S 2000) the number of consumable articles (100) that can be fully used with the determined amount of charge remaining in the battery (30) comprises:
 dividing the first value with the last stored amount of charge needed to fully use one consumable article to thereby obtain a first division result.

6. The method of any one of claims 1 to 4, wherein the step of
 calculating (S 2000) the number of consumable articles that can be fully used with the determined amount of charge remaining in the battery (30) comprises:

calculating an average value of the amount of charge needed to fully use one consumable article (100), and
 dividing the first value with said average value of the amount of charge needed to fully use one consumable article (100) to thereby obtain a second division result.

7. The method of claim 1, further comprising the step of transmitting the amount of charge remaining in the battery (30) to an electronic device (2, 3), such that the step of calculating (S 2000) the number of consumable articles (100) is performed by the electronic device.
8. The method of claim 7, wherein the electronic device (2, 3) is a smartphone (2) or a charging case (3).
9. The method of claim 1, wherein the step of displaying (S 3000) information indicating the calculated number of consumable articles (100) that can be fully used with the determined amount of charge remaining in the battery (30) comprises displaying the cal-

culated number.

10. The method of claim 1, wherein the step of displaying (S 3000) information indicating the calculated number of consumable articles (100) that can be fully used with the determined amount of charge remaining in the battery (30) comprises a step of illuminating one or more indicators based on said calculated number.
11. The method of claim 10, wherein a predetermined number of indicators are arranged on the aerosol generation device (1), and the method further comprising: determining an illumination pattern for the indicators based on the calculated number of consumable articles (100) and a predetermined threshold.
12. The method of claim 11, wherein determining an illumination pattern for the indicators comprises determining a number of indicators to be illuminated of the predetermined number of indicators and determining a colour of illumination based on the calculated number of consumable articles (100) and the predetermined threshold.
13. The method of claim 11, wherein the predetermined number of indicators arranged on the aerosol generating device (1) is four.
14. An aerosol generating device (1) for generating an aerosol comprising:
- a heating chamber (10) configured so that a user can place a consumable article (100) containing an aerosol generating substance into said heating chamber (10);
 - a heater (20) configured to supply heat to the heating chamber (10) to thereby heat the aerosol generating substance in the consumable article (100);
 - a battery (30) configured to supply electrical power to the heater (20);
 - an output unit (40) for displaying an information to the user; and
 - a control unit (50) configured to carry out the method according to any one of claims 1 to 13.
15. A system comprising an aerosol generating device according to claim 14 and a charging case (3), said charging case (3) comprising a display for displaying said calculated number.

Patentansprüche

1. Verfahren zur Anzeige eines Batteriestands einer Batterie (30) einer Aerosolerzeugungsvorrichtung

(1) zum Erzeugen eines Aerosols aus einer Aerosolerzeugungssubstanz, die in einem Verbrauchsartikel (100) enthalten ist, wobei das Verfahren die folgenden Schritte umfasst:

Bestimmen (S 1000) der in der Batterie (30) verbleibenden Ladungsmenge;
Berechnen (S 2000) der Anzahl von Verbrauchsartikeln (100), die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können; und
Anzeigen (S 3000) einer Information, wobei die Information die berechnete Anzahl von Verbrauchsartikeln (100) anzeigt, die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können.

2. Verfahren nach Anspruch 1, wobei der Schritt des Bestimmens (S 100) umfasst:
Bestimmen eines ersten Wertes für die in der Batterie (30) verbleibende Ladungsmenge, bevor ein Verbrauchsartikel (100) verwendet wird.

3. Verfahren nach Anspruch 2, wobei der Schritt des Bestimmens (S 1000) weiter umfasst:

Bestimmen eines zweiten Wertes für die in der Batterie (30) verbleibende Ladungsmenge, nachdem der Verbrauchsartikel (100) vollständig aufgebraucht ist, wobei das Verfahren weiter umfasst:

Subtrahieren des zweiten Wertes vom ersten Wert,
Bestimmen einer Ladungsmenge, die zum vollständigen Aufbrauchen eines Verbrauchsartikels (100) erforderlich ist, als das Ergebnis des Subtrahierens des zweiten Werts vom ersten Wert, und
Speichern der bestimmten Ladungsmenge, die zum vollständigen Aufbrauchen eines Verbrauchsartikels (100) erforderlich ist.

4. Verfahren nach Anspruch 3, wobei der Schritt des Bestimmens (S1000) und Speicherns der zum vollständigen Aufbrauchen eines Verbrauchsartikels (100) erforderlichen Ladungsmenge jedes Mal ausgeführt wird, wenn ein Verbrauchsartikel (100) vollständig aufgebraucht ist.

5. Verfahren nach einem der Ansprüche 1 bis 4, wobei der Schritt des Berechnens (S 2000) der Anzahl von Verbrauchsartikeln (100), die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können, umfasst:

- Dividieren des ersten Werts durch die zuletzt gespeicherte Ladungsmenge, die benötigt wird, um einen Verbrauchsartikel vollständig aufzubreuchen, um dadurch ein erstes Divisionsergebnis zu erhalten.
6. Verfahren nach einem der Ansprüche 1 bis 4, wobei der Schritt des Berechnens (S 2000) der Anzahl von Verbrauchsartikeln, die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können, umfasst:
- Berechnen eines Durchschnittswerts der Ladungsmenge, die zum vollständigen Aufbrauchen eines Verbrauchsartikels (100) erforderlich ist, und
- Dividieren des ersten Wertes durch den Durchschnittswert der Ladungsmenge, die zum vollständigen Aufbrauchen eines Verbrauchsartikels (100) erforderlich ist, um dadurch ein zweites Divisionsergebnis zu erhalten.
7. Verfahren nach Anspruch 1, weiter umfassend den Schritt des Übertragens der in der Batterie (30) verbleibenden Ladungsmenge an eine elektronische Vorrichtung (2, 3), so dass der Schritt des Berechnens (S 2000) der Anzahl von Verbrauchsartikeln (100) durch die elektronische Vorrichtung ausgeführt wird.
8. Verfahren nach Anspruch 7, wobei die elektronische Vorrichtung (2, 3) ein Smartphone (2) oder ein Ladegehäuse (3) ist.
9. Verfahren nach Anspruch 1, wobei der Schritt des Anzeigens (S 3000) von Informationen, die die berechnete Anzahl von Verbrauchsartikeln (100) anzeigen, die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können, ein Anzeigen der berechneten Anzahl umfasst.
10. Verfahren nach Anspruch 1, wobei der Schritt des Anzeigens (S 3000) von Informationen, die die berechnete Anzahl von Verbrauchsartikeln (100) anzeigen, die mit der bestimmten verbleibenden Ladungsmenge in der Batterie (30) vollständig aufgebraucht werden können, einen Schritt des Beleuchtens einer oder mehrerer Indikatoren basierend auf der berechneten Anzahl umfasst.
11. Verfahren nach Anspruch 10, wobei eine vorbestimmte Anzahl von Indikatoren an der Aerosolerzeugungsvorrichtung (1) angeordnet sind, und das Verfahren weiter umfasst:
- Bestimmen eines Beleuchtungsmusters für die Indikatoren basierend auf der berechneten Anzahl von Verbrauchsartikeln (100) und einem vorbestimmten Schwellenwert.
12. Verfahren nach Anspruch 11, wobei das Bestimmen eines Beleuchtungsmusters für die Indikatoren ein Bestimmen einer Anzahl von Indikatoren, die beleuchtet werden sollen, von der vorbestimmten Anzahl von Indikatoren und ein Bestimmen einer Beleuchtungsfarbe basierend auf der berechneten Anzahl von Verbrauchsartikeln (100) und dem vorbestimmten Schwellenwert umfasst.
13. Verfahren nach Anspruch 11, wobei die vorbestimmte Anzahl von an der Aerosolerzeugungsvorrichtung (1) angeordneten Indikatoren vier beträgt.
14. Aerosolerzeugungsvorrichtung (1) zum Erzeugen eines Aerosols, umfassend:
- eine Heizkammer (10), die so konfiguriert ist, dass ein Benutzer einen Verbrauchsartikel (100), der eine Aerosolerzeugungssubstanz enthält, in die Heizkammer (10) legen kann;
- eine Heizvorrichtung (20), die dazu konfiguriert ist, Wärme an die Heizkammer (10) zu liefern, um dadurch die Aerosolerzeugungssubstanz im Verbrauchsartikel (100) zu erhitzen;
- eine Batterie (30), die dazu konfiguriert ist, elektrischer Energie an die Heizvorrichtung (20) zu liefern;
- eine Ausgabeeinheit (40) zum Anzeigen einer Information für den Benutzer; und eine Steuereinheit (50), die dazu konfiguriert ist, das Verfahren nach einem der Ansprüche 1 bis 13 auszuführen.
15. System, umfassend eine Aerosolerzeugungsvorrichtung nach Anspruch 14 und ein Ladegehäuse (3), wobei das Ladegehäuse (3) eine Anzeige zum Anzeigen der berechneten Anzahl umfasst.

Revendications

1. Procédé destiné à indiquer un niveau de batterie d'une batterie (30) d'un dispositif de génération d'aérosol (1) destiné à générer un aérosol à partir d'une substance de génération d'aérosol contenue dans un article consommable (100), le procédé comprenant les étapes consistant à :
- déterminer (S 1000) la quantité de charge restant dans la batterie (30) ;
- calculer (S 2000) le nombre d'articles consommables (100) qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30) ; et
- afficher (S 3000) une information, ladite infor-

- mation indiquant le nombre calculé d'articles consommables (100) qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30).
2. Procédé selon la revendication 1, dans lequel l'étape de détermination (S 100) comprend :
déterminer une première valeur pour la quantité de charge restant dans la batterie (30) avant qu'un article consommable (100) soit utilisé.
3. Procédé selon la revendication 2, dans lequel l'étape de détermination (S 1000) comprend en outre :
déterminer une seconde valeur pour la quantité de charge restant dans la batterie (30) après que l'article consommable (100) soit entièrement utilisé,
le procédé comprenant en outre :
soustraire la seconde valeur de la première valeur,
déterminer une quantité de charge nécessaire pour utiliser entièrement un article consommable (100) comme le résultat d'une soustraction de la seconde valeur par rapport à la première valeur, et
stocker la quantité de charge déterminée nécessaire pour utiliser entièrement un article consommable (100).
4. Procédé selon la revendication 3, dans lequel l'étape de détermination (S 1000) et de stockage de la quantité de charge nécessaire pour utiliser entièrement un article consommable (100) est mise en œuvre à chaque fois qu'un article consommable (100) est entièrement utilisé.
5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel l'étape consistant à calculer (S 2000) le nombre d'articles consommables (100) qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30) comprend :
diviser la première valeur par la dernière quantité de charge stockée nécessaire pour utiliser entièrement un article consommable pour ainsi obtenir un premier résultat de division.
6. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel l'étape consistant à calculer (S 2000) le nombre d'articles consommables qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30) comprend :
calculer une valeur moyenne de la quantité de charge nécessaire pour utiliser entièrement un article consommable (100), et
diviser la première valeur par ladite valeur moyenne de la quantité de charge nécessaire pour utiliser entièrement un article consommable (100) pour ainsi obtenir un second résultat de division.
7. Procédé selon la revendication 1, comprenant en outre l'étape consistant à transmettre la quantité de charge restant dans la batterie (30) à un dispositif électronique (2, 3), de telle sorte que l'étape consistant à calculer (S 2000) le nombre d'articles consommables (100) est mise en œuvre par le dispositif électronique.
8. Procédé selon la revendication 7, dans lequel le dispositif électronique (2, 3) est un téléphone intelligent (2) ou un étui de charge (3).
9. Procédé selon la revendication 1, dans lequel l'étape consistant à afficher (S 3000) l'information indiquant le nombre calculé d'articles consommables (100) qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30) comprend l'affichage du nombre calculé.
10. Procédé selon la revendication 1, dans lequel l'étape consistant à afficher (S 3000) l'information indiquant le nombre calculé d'articles consommables (100) qui peuvent être entièrement utilisés avec la quantité de charge déterminée restant dans la batterie (30) comprend une étape consistant à éclairer un ou plusieurs indicateurs sur la base dudit nombre calculé.
11. Procédé selon la revendication 10, dans lequel un nombre prédéterminé d'indicateurs sont agencés sur le dispositif de génération d'aérosol (1), et le procédé comprenant en outre :
déterminer un motif d'éclairage pour les indicateurs sur la base du nombre calculé d'articles consommables (100) et d'un seuil prédéterminé.
12. Procédé selon la revendication 11, dans lequel la détermination d'un motif d'éclairage pour les indicateurs comprend la détermination d'un nombre d'indicateurs à éclairer du nombre prédéterminé d'indicateurs et la détermination d'une couleur d'éclairage sur la base du nombre calculé d'articles consommables (100) et du seuil prédéterminé.
13. Procédé selon la revendication 11, dans lequel le nombre prédéterminé d'indicateurs agencés sur le dispositif de génération d'aérosol (1) est de quatre.
14. Dispositif de génération d'aérosol (1) destiné à générer un aérosol comprenant :

une chambre de chauffage (10) configurée de sorte qu'un utilisateur puisse placer un article consommable (100) contenant une substance de génération d'aérosol dans ladite chambre de chauffage (10) ; 5

un moyen de chauffage (20) configuré pour alimenter en chaleur la chambre de chauffage (10) pour ainsi chauffer la substance de génération d'aérosol dans l'article consommable (100) ; 10

une batterie (30) configurée pour alimenter en énergie électrique le moyen de chauffage (20) ;

une unité de sortie (40) pour afficher une information à l'utilisateur ; et

une unité de commande (50) configurée pour réaliser le procédé selon l'une quelconque des revendications 1 à 13. 15

15. Système comprenant un dispositif de génération d'aérosol selon la revendication 14 et un étui de charge (3), ledit étui de charge (3) comprenant un affichage pour afficher ledit nombre calculé. 20

25

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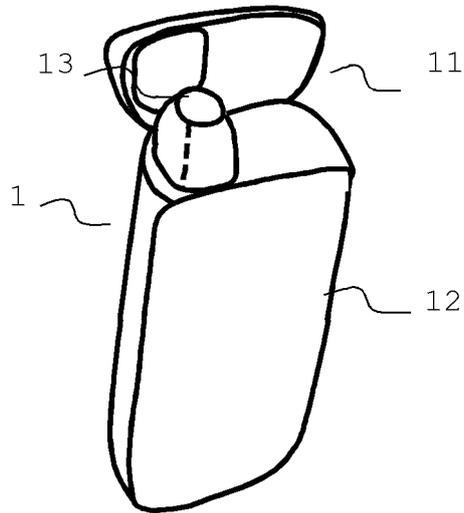


Figure 1A

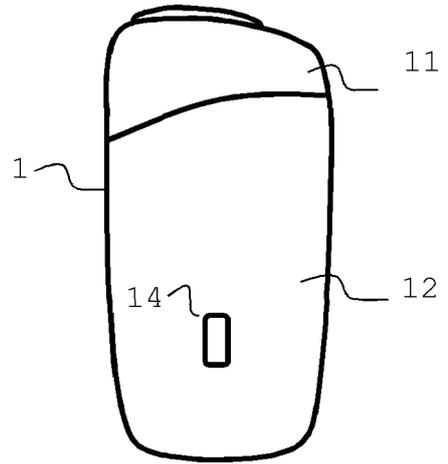


Figure 1B

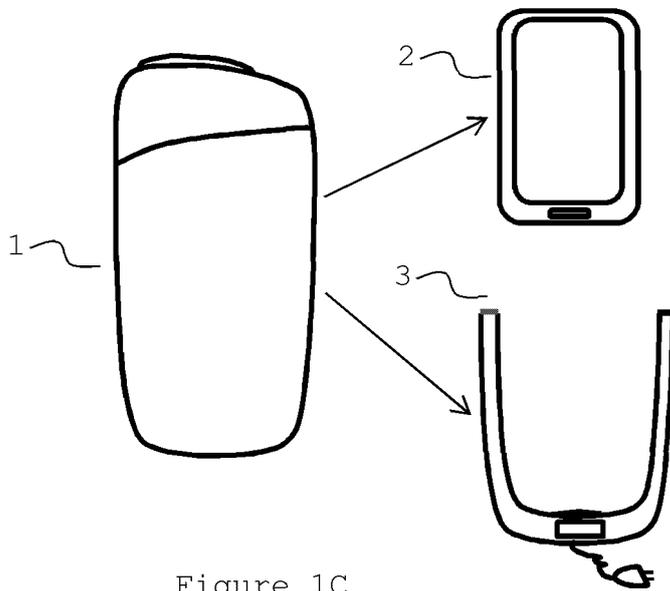


Figure 1C

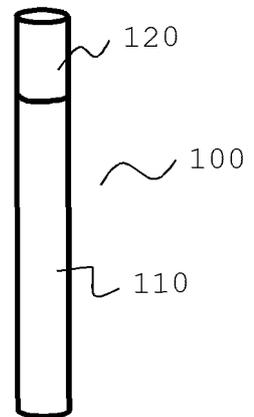


Figure 1D

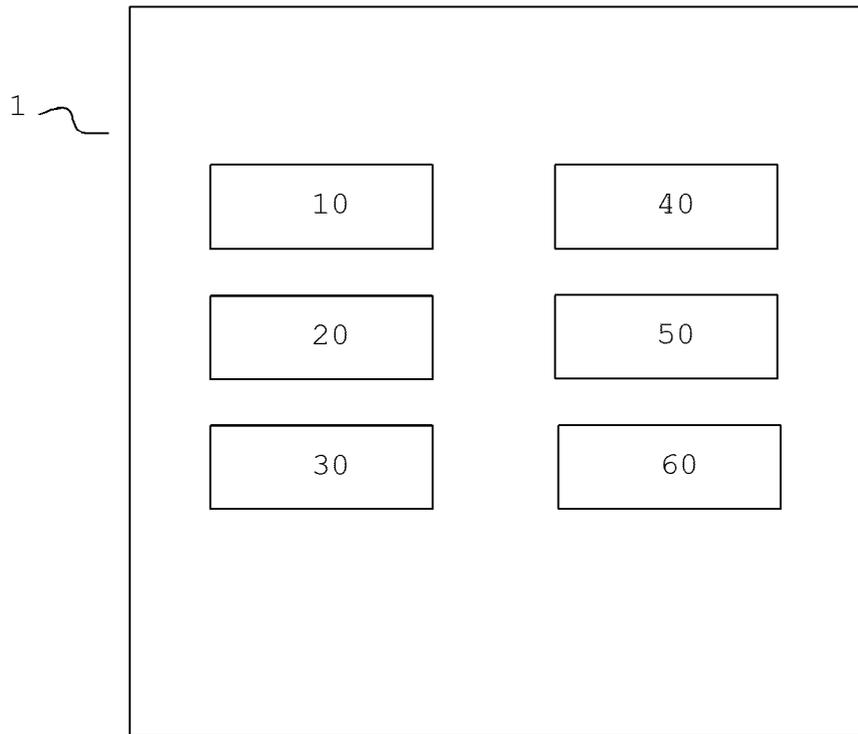


Figure 2

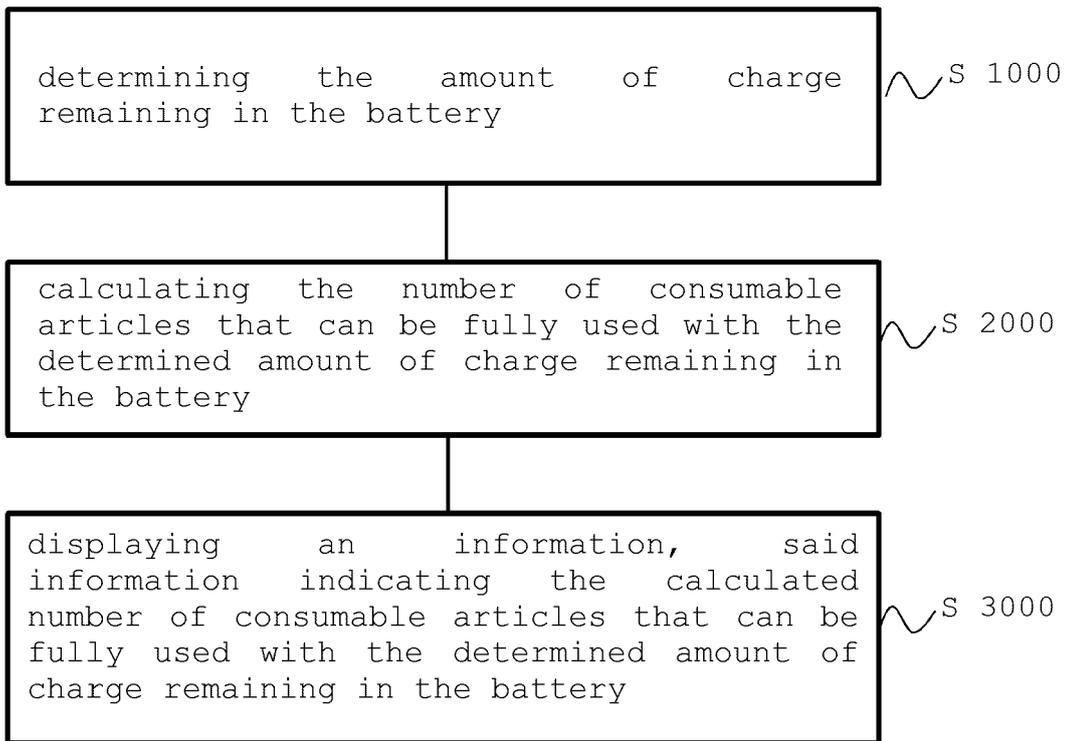


Figure 3

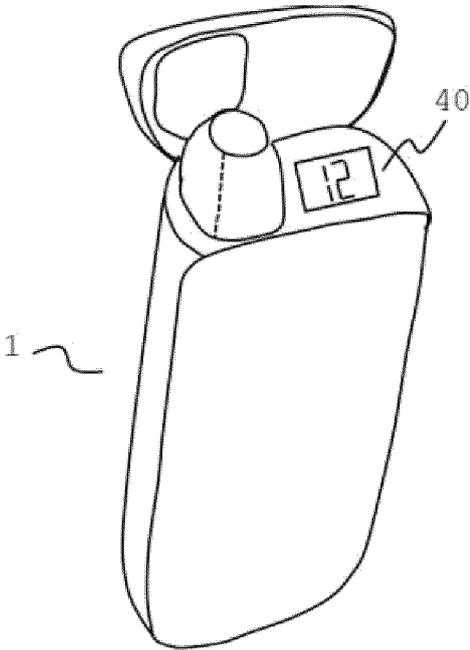


Figure 4A

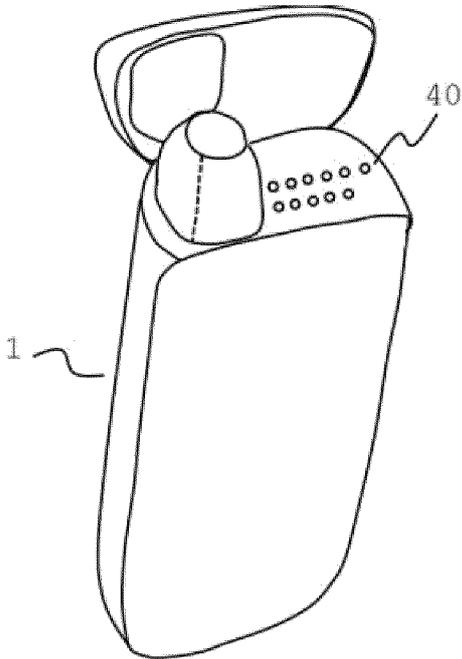


Figure 4B

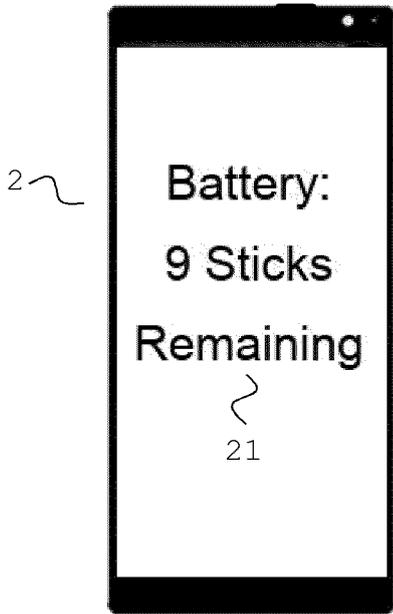


Figure 5A

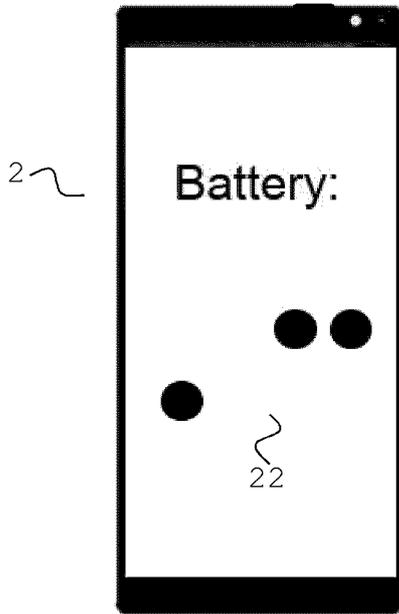


Figure 5B

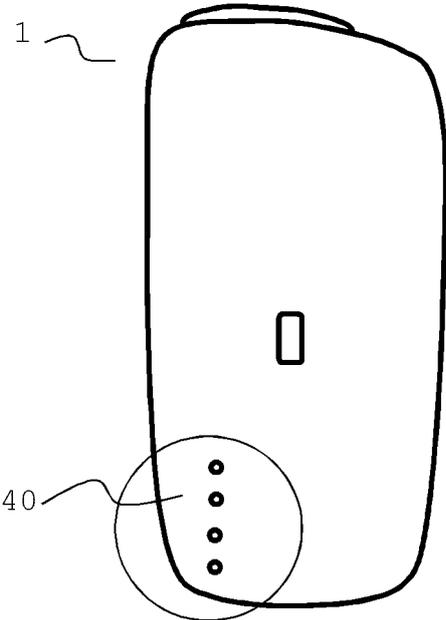
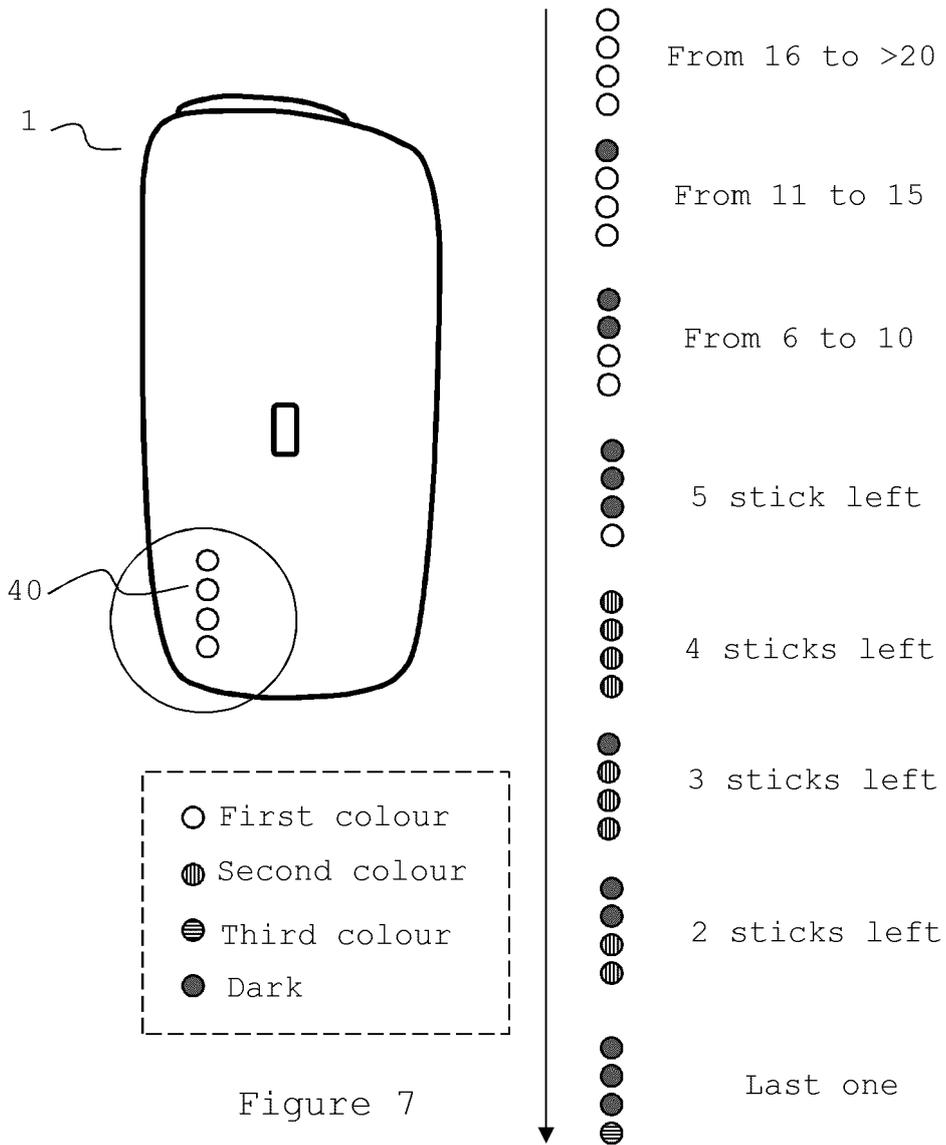


Figure 6



REFERENCES CITED IN THE DESCRIPTION

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