



(11)

EP 4 212 045 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
19.07.2023 Bulletin 2023/29

(51) International Patent Classification (IPC):
A24F 40/65 ^(2020.01)

(21) Application number: **20965933.3**

(52) Cooperative Patent Classification (CPC):
A24F 40/65

(22) Date of filing: **16.12.2020**

(86) International application number:
PCT/JP2020/047042

(87) International publication number:
WO 2022/130545 (23.06.2022 Gazette 2022/25)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **AOYAMA, Tatsunari**
Tokyo 130-8603 (JP)
• **AKAO, Takeshi**
Tokyo 130-8603 (JP)
• **NAGAHAMA, Toru**
Tokyo 130-8603 (JP)

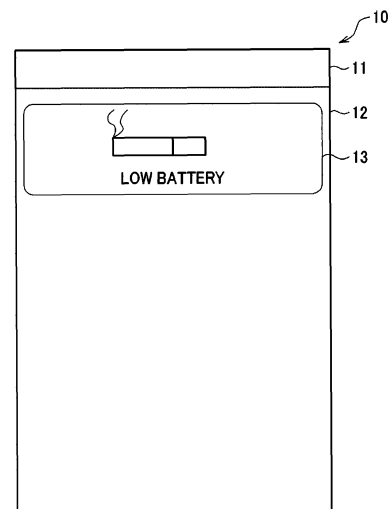
(71) Applicant: **Japan Tobacco Inc.**
Tokyo 105-6927 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(54) **CONTROL METHOD, INHALATION DEVICE, TERMINAL DEVICE, AND PROGRAM**

(57) [Problem] To provide a mechanism by which a user can be notified of information related to an inhalation device in a timely manner. [Solution] Provided is a control method for controlling processing for notifying a user of information, the processing performed by a system comprising: an inhalation device for generating an aerosol by using a base material; and a terminal device that communicates with the inhalation device. The control method includes: determining whether the inhalation device has enough remaining power to be able to perform processing a prescribed number of times to generate the aerosol; and, according to the determination results, controlling the processing to notify the user, by means of the terminal device, of information that indicates the remaining power.

FIG. 5



EP 4 212 045 A1

Description

Technical Field

5 **[0001]** The present invention relates to a control method, an inhaler device, a terminal device, and a program.

Background Art

10 **[0002]** Inhaler devices that generate material to be inhaled by users, such as electronic cigarettes and nebulizers, are widespread. For example, an inhaler device uses a substrate containing an aerosol source for generating an aerosol, a flavor source for imparting a flavor component to the generated aerosol, and the like, to generate the aerosol having the flavor component imparted. The user can taste a flavor by inhaling the aerosol generated by the inhaler device and having the flavor component imparted.

15 **[0003]** In recent years, it has been considered to provide various services by installing a communication function in an inhaler device and causing the inhaler device and a terminal device such as a smartphone to communicate with each other. For example, Patent Literature 1 below discloses a technique in which a terminal device displays a remaining electric power of an inhaler device based on information received from the inhaler device.

Citation List

20

Patent Literature

[0004] Patent Literature 1: WO 2020/006311 A1

25 Summary of Invention

Technical Problem

30 **[0005]** However, in the technique described in Patent Literature 1 or the like, the information of the inhaler device is displayed when a dedicated application for displaying information of the inhaler device is activated in the terminal device, that is, in response to the user performing an operation for viewing the information of the inhaler device as a trigger. Thus, it has been difficult to timely notify the user of the information to be notified to the user.

[0006] The present invention is made in view of the above problem, and an object of the present invention is to provide a mechanism with which it is possible to timely notify a user of information related to an inhaler device.

35

Solution to Problem

40 **[0007]** To address the above-described problem, an aspect of the present invention provides a control method of controlling processing of notifying a user of information by a system, the system including an inhaler device that generates an aerosol using a substrate, and a terminal device that communicates with the inhaler device. The method includes: determining whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controlling processing of notifying the user of information indicating the remaining electric power by the terminal device in accordance with a result of the determination.

45 **[0008]** The controlling may include determining that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when a remaining electric power of the inhaler device is less than a threshold corresponding to the prescribed number of times, and determining that the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when the remaining electric power of the inhaler device is equal to or more than the threshold corresponding to the prescribed number of times.

50 **[0009]** The control method may further include: setting the threshold in accordance with a user's input.

[0010] The control method may further include: identifying the substrate used by the inhaler device; and setting the threshold in accordance with a result of the identification on the substrate.

[0011] The control method may further include: setting the threshold in accordance with a time at which the remaining electric power is determined.

55 **[0012]** The inhaler device may include a heater that heats the substrate containing an aerosol source, and operate the heater based on a heating profile that defines a time-series transition of a target resistance value that is a target value for a resistance value of the heater. The control method may further include: setting the threshold in accordance with the heating profile used by the inhaler device.

[0013] The processing for generating the aerosol may be processing of heating an aerosol source as a liquid guided from the substrate, and may be executed once for one inhalation by the user. The prescribed number of times may correspond to a number of times the user performs the inhalation.

[0014] The processing for generating the aerosol may be processing of heating the substrate containing an aerosol source and formed in a predetermined shape, and may be executed once for the one substrate. The prescribed number of times may correspond to a number of the substrates to be consumed.

[0015] The prescribed number of times may be one or more.

[0016] The controlling may include controlling the terminal device to display the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times.

[0017] The controlling may include controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power

[0018] The controlling may include displaying the information indicating the remaining electric power of the inhaler device by the terminal device and outputting the information indicating the remaining electric power of the inhaler device by the inhaler device.

[0019] The control method may further include: setting a first notification mode or a second notification mode. When the first notification mode is set, the controlling may include controlling the terminal device to display the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times. When the second notification mode is set, the controlling may include controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power.

[0020] The controlling may include controlling the terminal device to display the information indicating the remaining electric power of the inhaler device in a part of a displayable region of the terminal device.

[0021] The control method may further include: acquiring position information indicating a position at which the inhaler device is chargeable. The controlling may include controlling the terminal device to display the position information.

[0022] The determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times may be executed by the inhaler device.

[0023] The determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times may be executed by the terminal device.

[0024] Also, to address the above-described problem, another aspect of the present invention provides an inhaler device including: a communicator that communicates with a terminal device; a power supply that stores electric power and supplies the electric power for an operation of the inhaler device; a generator that generates an aerosol using a substrate; and a controller that determines whether the power supply has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the communicator to transmit information indicating the remaining electric power to the terminal device in accordance with a result of the determination.

[0025] Also, to address the above-described problem, still another aspect of the present invention provides a terminal device including: a communicator that receives, from an inhaler device that generates an aerosol using a substrate, information indicating a remaining electric power of the inhaler device; an outputter that outputs information; and a controller that determines, based on the information received by the communicator, whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the outputter to output information indicating the remaining electric power in accordance with a result of the determination.

[0026] Also, to address the above-described problem, yet another aspect of the present invention provides a program that causes a computer that controls a terminal device, to execute: based on information indicating a remaining electric power of an inhaler device received by the terminal device from the inhaler device that generates an aerosol using a substrate, determining whether the inhaler device has a remaining electric power that allows processing for generating the aerosol a prescribed number of times to be executed, and controlling the terminal device to output information indicating the remaining electric power in accordance with a result of the determination.

Advantageous Effects of Invention

[0027] As described above, according to the present invention, the mechanism with which it is possible to timely notify the user of the information related to the inhaler device is provided.

Brief Description of Drawings

[0028]

[Fig. 1] Fig. 1 is a schematic diagram of an inhaler device according to a first configuration example.

[Fig. 2] Fig. 2 is a schematic diagram of an inhaler device according to a second configuration example.

[Fig. 3] Fig. 3 is a diagram illustrating an example of a configuration of a system according to a first embodiment.

[Fig. 4] Fig. 4 is a graph presenting an example of a time-series transition of an actual temperature of a heater operated based on a heating profile presented in Table 1.

[Fig. 5] Fig. 5 is a diagram illustrating an example of a display screen displayed by a terminal device according to the embodiment.

[Fig. 6] Fig. 6 is a sequence diagram presenting an example of a flow of notification control processing executed in the system according to the embodiment.

[Fig. 7] Fig. 7 is a sequence diagram presenting an example of a flow of notification control processing executed in a system according to a second embodiment.

Description of Embodiments

[0029] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. In this description and the drawings, structural elements having substantially the same functional configuration are denoted by the same reference numeral, and redundant description thereof will be omitted.

[0030] In this description and the drawings, elements having substantially the same functional configuration may be distinguished from each other by adding different alphabets after the same reference numeral. For example, a plurality of elements having substantially the same functional configuration are distinguished from each other as necessary such as inhaler devices 100A and 100B. However, when it is not necessary to particularly distinguish each of a plurality of elements having substantially the same functional configuration, only the same reference numeral is given. For example, when it is not necessary to particularly distinguish the inhaler devices 100A and 100B, they are simply referred to as an inhaler device 100.

1. Configuration example of inhaler device

[0031] An inhaler device generates material to be inhaled by a user. In the example described below, the material generated by the inhaler device is an aerosol. Alternatively, the material generated by the inhaler device may be gas.

(1) First configuration example

[0032] Fig. 1 is a schematic diagram of the inhaler device according to the first configuration example. As illustrated in Fig. 1, an inhaler device 100A according to the present configuration example includes a power supply unit 110, a cartridge 120, and a flavor imparting cartridge 130. The power supply unit 110 includes a power supply 111A, a sensor 112A, a notifier 113A, a memory 114A, a communicator 115A, and a controller 116A. The cartridge 120 includes a heater 121A, a liquid guide 122, and a liquid storage 123. The flavor imparting cartridge 130 includes a flavor source 131 and a mouthpiece 124. In the cartridge 120 and the flavor imparting cartridge 130, an airflow path 180 is defined.

[0033] The power supply 111A stores electric power. The power supply 111A supplies electric power to the structural elements of the inhaler device 100A under the control of the controller 116A. The power supply 111A may be a rechargeable battery such as a lithium ion secondary battery.

[0034] The sensor 112A acquires various items of information regarding the inhaler device 100A. In an example, the sensor 112A may be a pressure sensor such as a microphone condenser, a flow sensor, or a temperature sensor, and acquire a value generated in accordance with the user's inhalation. In another example, the sensor 112A may be an input device that receives information input by the user, such as a button or a switch.

[0035] The notifier 113A provides information to the user. The notifier 113A may be a light-emitting device that emits light, a display device that displays an image, a sound output device that outputs sound, or a vibration device that vibrates.

[0036] The memory 114A stores various items of information for operation of the inhaler device 100A. The memory 114A may be a non-volatile storage medium such as flash memory.

[0037] The communicator 115A is a communication interface capable of communication in conformity with any wired or wireless communication standard. Such a communication standard may be, for example, Wi-Fi (registered trademark) or Bluetooth (registered trademark).

[0038] The controller 116A functions as an arithmetic processing unit and a control circuit, and controls the overall operations of the inhaler device 100A in accordance with various programs. The controller 116A includes an electronic circuit such as a central processing unit (CPU) and a microprocessor, for example.

[0039] The liquid storage 123 stores an aerosol source. The aerosol source is atomized to generate an aerosol. The aerosol source is a liquid such as polyhydric alcohol and water. Examples of the polyhydric alcohol include glycerine and propylene glycol. The aerosol source may include a flavor component that is either derived from tobacco or not

derived from tobacco. For the inhaler device 100A that is a medical inhaler such as a nebulizer, the aerosol source may include a medicine.

[0040] The liquid guide 122 guides, from the liquid storage 123, the aerosol source that is the liquid stored in the liquid storage 123, and holds the aerosol source. The liquid guide 122 is, for example, a wick formed by twining fiber material such as glass fiber or porous material such as porous ceramic. In this case, the capillary action of the wick guides the aerosol source stored in the liquid storage 123.

[0041] The heater 121A heats the aerosol source to atomize the aerosol source and generate the aerosol. In the example illustrated in Fig. 1, the heater 121A includes a coil wound around the liquid guide 122. When the heater 121A produces heat, the aerosol source held by the liquid guide 122 is heated and atomized to generate the aerosol. The heater 121A produces heat when receiving electric power from the power supply 111A. In an example, the electric power may be supplied in response to the sensor 112A detecting a start of the user's inhalation and/or an input of predetermined information. Subsequently, the supply of the electric power may be stopped in response to the sensor 112A detecting an end of the user's inhalation and/or an input of predetermined information.

[0042] The flavor source 131 is a structural element for imparting a flavor component to the aerosol. The flavor source 131 may include a flavor component that is either derived from tobacco or not derived from tobacco.

[0043] The airflow path 180 is a flow path of air to be inhaled by the user. The airflow path 180 has a tubular structure having an air inlet hole 181 and an air outlet hole 182 at both ends. The air inlet hole 181 is an inlet of air into the airflow path 180, and the air outlet hole 182 is an outlet of the air from the airflow path 180. The liquid guide 122 is on the airflow path 180 at an upstream position (closer to the air inlet hole 181), and the flavor source 131 is on the airflow path 180 at a downstream position (closer to the air outlet hole 182). Air flowing in through the air inlet hole 181 when the user inhales mixes with the aerosol generated by the heater 121A. Subsequently, as indicated by an arrow 190, the mixture fluid of the aerosol and the air passes through the flavor source 131 and is conveyed to the air outlet hole 182. When the mixture fluid of the aerosol and the air passes through the flavor source 131, the flavor component included in the flavor source 131 is imparted to the aerosol.

[0044] The mouthpiece 124 is to be held in a mouth of the user during inhalation. The mouthpiece 124 has the air outlet hole 182. When the user inhales with the mouthpiece 124 in his/her mouth, the mixture fluid of the aerosol and the air enters the oral cavity of the user.

[0045] The configuration example of the inhaler device 100A has been described above. The inhaler device 100A is not limited to the above configuration, and may be configured in various ways as exemplified below.

[0046] In an example, the inhaler device 100A does not have to include the flavor imparting cartridge 130. In this case, the cartridge 120 includes the mouthpiece 124.

[0047] In another example, the inhaler device 100A may include various types of aerosol sources. Still another type of aerosol may be generated by mixing a plurality of types of aerosols generated from the plurality of types of aerosol sources in the airflow path 180 and causing a chemical reaction.

[0048] In addition, means for atomizing the aerosol source is not limited to heating by the heater 121A. For example, the means for atomizing the aerosol source may be vibration atomization or induction heating.

(2) Second configuration example

[0049] Fig. 2 is a schematic diagram of the inhaler device according to the second configuration example. As illustrated in Fig. 2, an inhaler device 100B according to the present configuration example includes a power supply 111B, a sensor 112B, a notifier 113B, a memory 114B, a communicator 115B, a controller 116B, a heater 121B, a holder 140, and a heat insulator 144.

[0050] The power supply 111B, the sensor 112B, the notifier 113B, the memory 114B, the communicator 115B, and the controller 116B are substantially the same as the respective corresponding structural elements included in the inhaler device 100A according to the first configuration example.

[0051] The holder 140 has an internal space 141, and holds a stick substrate 150 in a manner partially accommodated in the internal space 141. The holder 140 has an opening 142 that allows the internal space 141 to communicate with outside. The holder 140 holds the stick substrate 150 that is inserted into the internal space 141 through the opening 142. For example, the holder 140 may be a tubular body having the opening 142 and a bottom 143 on its ends, and may define the pillar-shaped internal space 141. The holder 140 also has a function of defining a flow path of air supplied to the stick substrate 150. For example, the bottom 143 has an air inlet hole that is an inlet of air into the flow path. On the other hand, an air outlet hole which is an outlet of the air from the flow path is the opening 142.

[0052] The stick substrate 150 includes a substrate 151 and an inhalation port 152. The substrate 151 includes an aerosol source. In this configuration example, the aerosol source is not limited to a liquid, but may be a solid. The stick substrate 150 held by the holder 140 includes the substrate 151 at least partially accommodated in the internal space 141 and the inhalation port 152 at least partially protruding from the opening 142. When the user inhales with the inhalation port 152 protruding from the opening 142 in his/her mouth, air flows into the internal space 141 from the air inlet hole

(not illustrated), and the air and an aerosol generated from the substrate 151 reach inside the mouth of the user.

[0053] The heater 121B has a configuration similar to that of the heater 121A according to the first configuration example. However, in the example illustrated in Fig. 2, the heater 121B has a film-like shape and surrounds the outer circumference of the holder 140. Subsequently, heat produced from the heater 121B heats the substrate 151 of the stick substrate 150 from the outer circumference, generating the aerosol.

[0054] The heat insulator 144 prevents heat from transferring from the heater 121B to the other structural elements. For example, the heat insulator 144 may be a vacuum heat insulator or an aerogel heat insulator.

[0055] The configuration example of the inhaler device 100B has been described above. The inhaler device 100B is not limited to the above configuration, and may be configured in various ways as exemplified below.

[0056] In an example, the heater 121B may have a blade-like shape, and may be disposed so that the heater 121B protrudes from the bottom 143 of the holder 140 toward the internal space 141. In this case, the heater 121B having the blade-like shape is inserted into the substrate 151 of the stick substrate 150 and heats the substrate 151 of the stick substrate 150 from its inside. In another example, the heater 121B may be disposed so that the heater 121B covers the bottom 143 of the holder 140. In still another example, the heater 121B may be implemented as a combination of two or more selected from a first heater that covers the outer circumference of the holder 140, a second heater having the blade-like shape, and a third heater that covers the bottom 143 of the holder 140.

[0057] In another example, the holder 140 may include an opening/closing mechanism that at least partially opens and closes an outer shell defining the internal space 141. Examples of the opening/closing mechanism include a hinge. In addition, the holder 140 may hold the stick substrate 150 while sandwiching the stick substrate 150 inserted into the internal space 141 by opening and closing the outer shell. In this case, the heater 121B may be at the sandwiching position of the holder 140 and may produce heat while pressing the stick substrate 150.

[0058] In addition, means for atomizing the aerosol source is not limited to heating by the heater 121B. For example, the means for atomizing the aerosol source may be induction heating.

[0059] In addition, the inhaler device 100B may also include the heater 121A, the liquid guide 122, the liquid storage 123, and the airflow path 180 according to the first configuration example. The air outlet hole 182 of the airflow path 180 may also serve as an air inlet hole to supply air to the internal space 141. In this case, a mixture fluid of the air and an aerosol generated by the heater 121A flows into the internal space 141, mixes further with an aerosol generated by the heater 121B, and then reaches the oral cavity of the user.

2. First embodiment

(1) Configuration example of system

[0060] Fig. 3 is a diagram illustrating an example of a configuration of a system 1 according to the present embodiment. As illustrated in Fig. 3, the system 1 includes the inhaler device 100 and a terminal device 200.

- Configuration of inhaler device 100

[0061] The inhaler device 100 according to the present embodiment generates an aerosol that is inhaled by a user using a substrate. The heater 121 is an example of a generator that generates an aerosol using a substrate. The cartridge 120 and the flavor imparting cartridge 130 according to the first configuration example and the stick substrate 150 according to the second configuration example are examples of the substrate according to the present embodiment. The inhaler device 100 generates an aerosol using a substrate attached to the inhaler device 100. In the first configuration example, the cartridge 120 and the flavor imparting cartridge 130 connected to the power supply unit 110 are examples of the substrate attached to the inhaler device 100. In the second configuration example, the stick substrate 150 inserted into the inhaler device 100 is an example of the substrate attached to the inhaler device 100.

[0062] The heater 121 may heat an aerosol source as a liquid guided from a substrate. For example, as described in the first configuration example, the inhaler device 100 may heat an aerosol source guided from the liquid storage 123 by the liquid guide 122 to generate an aerosol.

[0063] The heater 121 may heat a substrate containing an aerosol source and formed in a predetermined shape. An example of the predetermined shape is a stick shape. For example, as described in the second configuration example, the inhaler device 100 may heat the stick substrate 150 to generate an aerosol. Another example of the predetermined shape is a card shape. Still another example of the predetermined shape is a cube shape.

[0064] The inhaler device 100 may employ any configuration example between the above-described first configuration example and second configuration example. Hereinafter, an example in which the inhaler device 100 employs the second configuration example is mainly described for simplifying the description. Also, hereinafter, user's inhalation of an aerosol generated by the inhaler device 100 is also simply referred to as "inhalation" or "puff". An action of the user's inhalation is hereinafter also referred to as a puff action.

- Configuration of terminal device 200

[0065] The terminal device 200 is used by the user of the inhaler device 100. For example, the terminal device 200 is constituted by any information processing device, such as a smartphone, a tablet terminal, or a wearable device. As illustrated in Fig. 3, the terminal device 200 includes an inputter 210, an outputter 220, a communicator 230, a memory 240, and a controller 250.

[0066] The inputter 210 has a function of receiving an input of various items of information. The inputter 210 may include an input device that receives an input of information from the user. Examples of the input device include a button, a keyboard, a touch panel, and a microphone. In addition, the inputter 210 may include various sensors such as an image sensor.

[0067] The outputter 220 has a function of outputting information. The outputter 220 may include an output device that outputs information to the user. Examples of the output device include a display device that displays information, a light-emitting device that emits light, a vibration device that vibrates, and a sound output device that outputs sound. An example of the display device is a display. An example of the light-emitting device is a light emitting diode (LED). An example of the vibration device is an eccentric motor. An example of the sound output device is a speaker. The outputter 220 outputs information input from the controller 250 to notify the user of the information.

[0068] The communicator 230 is a communication interface for transmitting and receiving information between the terminal device 200 and another device. The communicator 230 performs communication in conformity with any wired or wireless communication standard. Such a communication standard may be, for example, Universal Serial Bus (USB), Wi-Fi (registered trademark), or Bluetooth (registered trademark).

[0069] The memory 240 stores various items of information. The memory 240 may be a non-volatile storage medium such as flash memory.

[0070] The controller 250 functions as an arithmetic processing unit or a control circuit, and controls the overall operations of the terminal device 200 in accordance with various programs. The controller 250 includes an electronic circuit, such as a central processing unit (CPU) or a microprocessor, for example. In addition, the controller 250 may include a read only memory (ROM) that stores a program to be used, calculation parameters, and the like, and a random access memory (RAM) that temporarily stores parameters that change as appropriate. The terminal device 200 executes various processing under the control of the controller 250. Examples of the processing controlled by the controller 250 include processing of information input by the inputter 210, an output of information by the outputter 220, transmission and reception of information by the communicator 230, and storage and reading of information by the memory 240. The controller 250 also controls other processing executed by the terminal device 200, such as an input of information to each structural element and processing based on information output from each structural element.

[0071] Note that the function of the controller 250 may be implemented using an application. The application may be preinstalled or may be downloaded. Alternatively, the function of the controller 250 may be implemented by progressive web apps (PWA).

- Inter-device communication

[0072] The inhaler device 100 can communicate with another device. Communication between the inhaler device 100 and another device may use a wireless or wired communication link. In the present embodiment, the communication link is described as a wireless communication link.

[0073] In particular, the inhaler device 100 establishes connection with the other paired device to transmit and receive information. Pairing is processing in which two devices exchange information with each other and store the information. Examples of the information to be exchanged include identification information of a partner such as a service set identifier (SSID), and information related to an encryption key used for encrypting information to be transmitted and received.

[0074] The inhaler device 100 and the terminal device 200 first perform pairing and then transmit and receive information. It is desirable that a wireless communication standard used for wireless communication between the inhaler device 100 and the terminal device 200 is a short-range wireless communication standard such as Bluetooth. In this case, when the inhaler device 100 and the terminal device 200 are located within a range in which the short-range wireless communication is possible, the inhaler device 100 and the terminal device 200 can establish connection and communicate with each other. In the following description, it is assumed that the inhaler device 100 and the terminal device 200 perform communication in conformity with Bluetooth Low Energy (BLE, registered trademark).

(2) Heating profile

[0075] The inhaler device 100 controls the operation of the heater 121 based on the heating profile. The heating profile is information indicating a time-series transition of a target value for a parameter related to the operation of the heater 121. An example of the parameter is the temperature of the heater 121. In this case, the heating profile is information

that defines a time-series transition of a target temperature that is a target value for the temperature of the heater 121. The inhaler device 100 controls the temperature of the heater 121 so that a time-series transition of an actually measured temperature (hereinafter, also referred to as an actual temperature) of the heater 121 becomes similar to the time-series transition of the target temperature defined in the heating profile. Accordingly, an aerosol is generated as planned in the heating profile. The heating profile is typically designed to optimize the flavor that the user tastes when the user inhales the aerosol generated from the stick substrate 150. Thus, by controlling the operation of the heater 121 based on the heating profile, it is possible to optimize the flavor that the user tastes.

[0076] The heating profile includes one or more combinations of an elapsed time since a start of heating and a target temperature to be reached within the elapsed time. Then, the controller 116 controls the temperature of the heater 121 based on the difference between the current actual temperature and the target temperature in the heating profile corresponding to the elapsed time since the start of the current heating. The control on the temperature of the heater 121 can be implemented by, for example, known feedback control. Specifically, the controller 116 causes the electric power from the power supply 111 to be supplied to the heater 121 in the form of a pulse by pulse width modulation (PWM) or pulse frequency modulation (PFM). In this case, the controller 116 can control the temperature of the heater 121 by adjusting the duty ratio of the electric power pulse.

[0077] In the feedback control, the controller 116 may control the electric power supplied to the heater 121, for example, the above-described duty ratio, based on the difference or the like between the actual temperature and the target temperature. The feedback control may be, for example, a proportional-integral-differential controller (PID controller). Alternatively, the controller 116 may perform simple ON-OFF control. For example, the controller 116 may execute heating by the heater 121 until the actual temperature reaches the target temperature, stop heating by the heater 121 when the actual temperature has reached the target temperature, and execute heating again by the heater 121 when the actual temperature becomes lower than the target temperature.

[0078] The temperature of the heater 121 can be quantified by, for example, measuring or estimating a resistance value (more accurately, an electrical resistance value) of the heater 121 (more accurately, a heat producing resistor constituting the heater 121). This is because the resistance value of the heat producing resistor changes with the temperature. The resistance value of the heat producing resistor can be estimated, for example, by measuring the amount of voltage drop in the heat producing resistor. The amount of voltage drop in the heat producing resistor can be measured by a voltage sensor that measures the potential difference applied to the heat producing resistor. In another example, the temperature of the heater 121 can be measured by a temperature sensor installed near the heater 121.

[0079] A time section from the start to the end of processing of generating an aerosol using the stick substrate 150, more specifically, a time section during which the heater 121 operates based on the heating profile is hereinafter also referred to as a heating session. The start of the heating session is a timing at which heating based on the heating profile is started. The end of the heating session is a timing at which a sufficient amount of aerosol is no longer generated. The heating session consists of a preheating period in the former half and a puffable period in the latter half. The puffable period is a period during which a sufficient amount of aerosol is expected to be generated. The preheating period is a period from the start of heating to the start of the puffable period. The heating performed during the preheating period is also referred to as preheating.

[0080] An example of the heating profile is presented in Table 1 below.

[Table 1]

Time section	Elapsed time since start of heating Target	temperature
Initial temperature rise section	25 seconds	295°C
	35 seconds	295°C
Intermediate temperature drop section	45 seconds	230°C
Temperature re-rise section	180 seconds	230°C
	260 seconds	260°C
	355 seconds	260°C
Heating end section	Later	-

[0081] The time-series transition of the actual temperature of the heater 121 when the controller 116 controls the operation of the heater 121 in accordance with the heating profile presented in Table 1 will be described with reference to Fig. 4. Fig. 4 is a graph presenting an example of the time-series transition of the actual temperature of the heater 121 operated based on the heating profile presented in Table 1. The horizontal axis of this graph indicates time (second). The vertical axis of this graph indicates the temperature of the heater 121. A line 21 in this graph indicates a time-series

transition of the actual temperature of the heater 121. Also, points 22 (22A to 22F) in this graph indicate target temperatures defined in the heating profile. As presented in Fig. 4, the actual temperature of the heater 121 changes in a manner similar to the time-series transition of the target temperature defined in the heating profile.

[0082] As presented in Table 1, the heating profile first includes an initial temperature rise section. The initial temperature rise section is a time section included at the beginning of the heating profile and is a section in which the target temperature set at the end is higher than an initial temperature. The initial temperature is a temperature expected as the temperature of the heater 121 before the start of heating. An example of the initial temperature is any temperature such as 0°C. Another example of the initial temperature is a temperature corresponding to the atmospheric temperature. As presented in Fig. 4, in accordance with the target temperature set in the initial temperature rise section, the actual temperature of the heater 121 reaches 295°C 25 seconds after the start of heating and is maintained at 295°C until 35 seconds after the start of heating. Accordingly, it is expected that the temperature of the stick substrate 150 reaches a temperature at which a sufficient amount of aerosol is generated. By raising the temperature to 295°C at a stroke immediately after the start of heating, it is possible to end the preheating early and start the puffable period early. Although Fig. 4 presents an example in which the initial temperature rise section and the preheating period coincide with each other, the initial temperature rise section and the preheating period may be different from each other.

[0083] As presented in Table 1, the heating profile then includes an intermediate temperature drop section. The intermediate temperature drop section is a time section after the initial temperature rise section and is a time section in which the target temperature set at the end is lower than the target temperature set at the end of the initial temperature rise section. As presented in Fig. 4, the actual temperature of the heater 121 drops from 295°C to 230°C from 35 seconds to 45 seconds after the start of heating in accordance with the target temperature set in the intermediate temperature drop section. In such a section, supply of electric power to the heater 121 may be stopped. Even in this case, a sufficient amount of aerosol is generated by the remaining heat of the heater 121 and the stick substrate 150. When the heater 121 is maintained at a high temperature, the aerosol source contained in the stick substrate 150 is rapidly consumed, and there may be an inconvenience that the flavor that the user tastes is too strong. In this regard, it is possible to avoid such an inconvenience and improve the quality of a user's puff experience by providing the temperature drop section in the middle.

[0084] As presented in Table 1, the heating profile then includes a temperature re-rise section. The temperature re-rise section is a time section after the intermediate temperature drop section and is a time section in which the target temperature set at the end is higher than the target temperature set at the end of the intermediate temperature drop section. As presented in Fig. 4, the actual temperature of the heater 121 rises stepwise from 230°C to 260°C from 45 seconds to 355 seconds after the start of heating in accordance with the target temperature set in the temperature re-rise section. When the temperature of the heater 121 is continuously decreased, the temperature of the stick substrate 150 is also decreased. Thus, the generation amount of aerosol may be decreased, and the flavor that the user tastes may be deteriorated. In this regard, by raising the temperature again after decreasing the temperature, it is possible to prevent a deterioration of the flavor that the user tastes even in the latter half of the heating session.

[0085] As presented in Table 1, the heating profile includes a heating end section at the end. The heating end section is a time section after the temperature re-rise section and is a time section in which heating is not performed. The target temperature does not have to be set. As presented in Fig. 4, the actual temperature of the heater 121 drops 355 seconds after the start of heating, the timing which belongs to the heating end section. Supply of electric power to the heater 121 may be ended 355 seconds after the start of heating. Even in this case, a sufficient amount of aerosol is generated by the remaining heat of the heater 121 and the stick substrate 150. In the example presented in Fig. 4, the puffable period, that is, the heating session ends 365 seconds after the start of heating.

[0086] The user may be notified of a timing at which the puffable period starts and a timing at which the puffable period ends. Further, the user may be notified of a timing a predetermined time before the end of the puffable period (for example, a timing at which supply of electric power to the heater 121 ends). In this case, the user can puff in the puffable period with reference to the notification.

- Supplement related to resistance value

[0087] As described above, when the resistance value of the heater 121 changes with the temperature of the heater 121, it can be said that the temperature of the heater 121 is synonymous with the resistance value of the heater 121. Thus, the target temperature of the heater 121 can also be indicated by the resistance value of the heater 121. That is, a parameter in the heating profile may be the resistance value of the heater 121 corresponding to the target temperature. In this case, the heating profile is information that defines a time-series transition of a target resistance value that is a target value for the resistance value of the heater 121. The inhaler device 100 controls the resistance value of the heater 121 so that a time-series transition of an actual resistance value of the heater 121 becomes similar to the time-series transition of the target resistance value defined in the heating profile. The control on the resistance value of the heater 121 can be implemented by, for example, known feedback control. Specifically, the controller 116 causes the electric

power from the power supply 111 to be supplied to the heater 121 in the form of a pulse by pulse width modulation (PWM) or pulse frequency modulation (PFM). In this case, the controller 116 can control the resistance value of the heater 121 by adjusting the duty ratio of the electric power pulse. With this configuration, it is possible to cause the actual temperature of the heater 121 to transition in a manner similar to the case where the heating profile defines the time-series transition of the target temperature.

[0088] Although the temperature of the heater 121 has a correspondence relation to the resistance value of the heater 121, the resistance value corresponding to the temperature of the heater 121 depends on the characteristics of the heater 121 and the environmental temperature. Thus, when the characteristics of the heater 121 or the environmental temperature is different, even though the target temperature is the same, the target resistance value having a correspondence relation to the target temperature becomes a different value.

(3) Notification processing of remaining electric power

[0089] The inhaler device 100 controls processing of notifying the user of information by the system 1. Specifically, the inhaler device 100 determines whether the inhaler device 100 (that is, the power supply 111) has a remaining electric power that allows processing for generating an aerosol to be executed a prescribed number of times. Then, the inhaler device 100 controls processing of notifying the user of information indicating the remaining electric power by the terminal device 200 in accordance with a result of the determination. With this configuration, it is possible to notify the user of the information indicating the remaining electric power of the inhaler device 100 at a timing at which it is determined to be notified by the inhaler device 100.

[0090] Specifically, the inhaler device 100 transmits the information indicating the remaining electric power to the terminal device 200 in accordance with the result of the determination. An example of the information indicating the remaining electric power transmitted from the inhaler device 100 to the terminal device 200 is the ratio of the current remaining electric power when the full charge capacity of the inhaler device 100 is assumed as 100%. Then, the terminal device 200 outputs the received information indicating the remaining electric power. The terminal device 200 may output the received information as it is, or may output the information after processing the information into a form having a higher effect of prompting the user to perform charging, such as information indicating that the remaining electric power is low. Here, regardless of whether a dedicated application for displaying information of the inhaler device 100 is being activated, the terminal device 200 outputs the information in response to reception of the information indicating the remaining electric power from the inhaler device 100 as a trigger. With this configuration, it is possible to notify the user of the information indicating the remaining electric power of the inhaler device 100 at a timing at which it is determined to be notified by the inhaler device 100.

[0091] When the remaining electric power of the power supply 111 is less than a threshold corresponding to the prescribed number of times, the inhaler device 100 determines that the power supply 111 does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times. In contrast, when the remaining electric power of the power supply 111 is equal to or more than the threshold corresponding to the prescribed number of times, the inhaler device 100 determines that the power supply 111 has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times. With this configuration, it is possible to accurately determine whether the power supply 111 has the remaining electric power capable of executing the processing for generating the aerosol by the prescribed number of times by determining the remaining electric power using the threshold corresponding to the prescribed number of times. Hereinafter, the threshold corresponding to the prescribed number of times is also referred to as a notification threshold.

[0092] When it is determined that the power supply 111 does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times, the inhaler device 100 performs control so that the information indicating the remaining electric power of the inhaler device 100 is displayed by the terminal device 200. Specifically, when it is determined that the power supply 111 does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times, the inhaler device 100 transmits the information indicating the remaining electric power to the terminal device 200. Then, the terminal device 200 displays the received information indicating the remaining electric power. With this configuration, it is possible to notify the user of the information indicating the remaining electric power only when the remaining electric power of the power supply 111 becomes less than the notification threshold. Thus, it is possible to prompt the user to perform charging at an appropriate timing.

[0093] The terminal device 200 may display the information indicating the remaining electric power of the inhaler device 100, and the inhaler device 100 may output the information indicating the remaining electric power of the inhaler device 100. For example, when the remaining electric power of the power supply 111 becomes less than the notification threshold, the inhaler device 100 transmits information indicating the remaining electric power to the terminal device 200, and then notifies the user of the information indicating the remaining electric power by the notifier 113. With this configuration, both the inhaler device 100 and the terminal device 200 can notify the user of the information indicating

the remaining electric power

[0094] The information indicating the remaining electric power of the inhaler device 100 may be displayed by the terminal device 200 or in a part of a displayable region of the terminal device 200. This point will be described in detail with reference to Fig. 5. Fig. 5 is a diagram illustrating an example of a display screen displayed by the terminal device 200 according to the present embodiment. As illustrated in Fig. 5, a display screen 10 includes a status bar 11 at the top. The status bar is a region for displaying various items of information related to the terminal device 200, such as the radio wave state of the terminal device 200, the remaining electric power, and the time. In a display region 12 of the display screen 10 other than the status bar 11, a home screen or an application screen such as a game is displayed. As illustrated in Fig. 5, a notification 13 displaying the information indicating the remaining electric power of the inhaler device 100 overlaps in a certain region of the display region 12. For example, the notification 13 may be displayed in a pop-up manner in response to that the terminal device 200 has received the information indicating the remaining electric power from the inhaler device 100 as a trigger. The notification 13 displays that the remaining electric power of the inhaler device 100 is low, and thus it is possible to prompt the user to charge the inhaler device 100. Also, since the notification 13 merely overlaps in the certain region of the display region 12, it is possible to prevent the notification 13 from excessively disturbing the display in the display region 12.

[0095] The terminal device 200 may acquire position information indicating a position at which the inhaler device 100 is chargeable and display the acquired position information. For example, it is expected that charging facilities capable of charging the inhaler device 100 are distributed in a town, and position information of the charging facilities is managed by a server. In this case, the terminal device 200 inquires of the server about the charging facility nearest to the current position. Then, the terminal device 200 displays the position information of the nearest charging facility received from the server. It is desirable that the terminal device 200 displays the position information of the charging facility together with the information indicating the remaining electric power. With this configuration, it is possible to prompt the user to charge the inhaler device 100 at the nearest charging facility.

- Setting of notification threshold

[0096] The processing for generating the aerosol is processing of heating a substrate containing an aerosol source and formed in a predetermined shape, and is executed once for one substrate. Thus, the prescribed number of times corresponds to the number of substrates to be consumed. Regarding the inhaler device 100 according to the second configuration example, the processing for generating the aerosol is executed once for one stick substrate 150, and the prescribed number of times corresponds to the number of stick substrates 150 to be consumed. Consumption here means that heating the stick substrate 150 based on the heating profile is executed from the beginning to the end without interruption. That is, the notification threshold corresponds to the remaining electric power that allows the prescribed number of stick substrates 150 to be consumed. Then, the inhaler device 100 determines whether the power supply 111 has the remaining electric power that allows the prescribed number of stick substrates 150 to be consumed. With this configuration, when the power supply 111 does not have the electric power that allows the prescribed number of stick substrates 150 to be consumed, the user is notified of the information indicating the remaining electric power. Thus, it is possible to prompt the user to perform charging at an appropriate timing.

[0097] The prescribed number of times is one or more. With this configuration, it is possible to notify the user of the information indicating the remaining electric power when the inhaler device 100 does not have the remaining electric power that allows one or more prescribed number of stick substrates 150 to be consumed.

[0098] The inhaler device 100 may set the notification threshold in accordance with a user's input. For example, when the prescribed number of times is input by the user, the inhaler device 100 sets the notification threshold according to the input prescribed number of times. The user's input may be directly performed on the inhaler device 100 or may be indirectly performed via the terminal device 200. With this configuration, it is possible to notify the user of the information indicating the remaining electric power when the inhaler device 100 does not have the remaining electric power that allows the number of stick substrates 150 designated by the user to be consumed. That is, it is possible to notify the user of the information indicating the remaining electric power at a timing that the user wants to know.

[0099] The inhaler device 100 may identify the stick substrate 150 that is used to generate the aerosol. For example, identification information such as a two-dimensional code for identifying the stick substrate 150 may be attached to the stick substrate 150. In this case, the inhaler device 100 identifies the stick substrate 150 by reading the identification information attached to the inserted stick substrate 150. Then, the inhaler device 100 may set the notification threshold in accordance with a result of the identification on the stick substrate 150. For each stick substrate 150, the way of change in temperature may be different, and the electric power required to consume one stick substrate 150 may be different. In this regard, with this configuration, it is possible to notify the user of the information indicating the remaining electric power at an appropriate timing suitable for the stick substrate 150.

[0100] The inhaler device 100 may set the notification threshold in accordance with a time at which the remaining electric power is determined. For example, the inhaler device 100 sets the notification threshold in accordance with

whether it is a time at which the user can easily secure the time for charging. As an example, at the time before the user goes to bed in the evening, the inhaler device 100 sets the notification threshold by setting the number of stick substrates 150 (for example, five) expected to be consumed in the next one day as the prescribed number of times. As another example, at the time when the user is active in the daytime, the inhaler device 100 sets the notification threshold by setting the number of stick substrates 150 (for example, one) expected to be consumed in the most recent one hour as the prescribed number of times. With this configuration, it is possible to notify the user of the information indicating the remaining electric power at a timing corresponding to the time allowance of the user

[0101] As described above, the inhaler device 100 operates the heater 121 based on the heating profile. The inhaler device 100 may switch the heating profile to be used. For example, the inhaler device 100 switches the heating profile to be used in accordance with a user's operation or in accordance with the stick substrate 150 to be used. At this time, the inhaler device 100 may set the notification threshold in accordance with the heating profile to be used. For each heating profile, the target temperature and time length may be different and the electric power required to consume one stick substrate 150 may be different. In this regard, with this configuration, it is possible to notify the user of the information indicating the remaining electric power at an appropriate timing suitable for the heating profile.

(4) Flow of processing

[0102] Fig. 6 is a sequence diagram presenting an example of a flow of notification control processing executed in the system 1 according to the present embodiment. The inhaler device 100 and the terminal device 200 are involved in this sequence

[0103] As presented in Fig. 6, first, the inhaler device 100 sets a notification threshold (step S102). For example, the inhaler device 100 sets the notification threshold based on at least one of a user's input for setting the notification threshold, a result of identification on the inserted stick substrate 150, a current time, and a heating profile to be used.

[0104] Then, the inhaler device 100 determines whether the remaining electric power of the power supply 111 is less than the notification threshold (step S104). When it is determined that the remaining electric power of the power supply 111 is equal to or more than the notification threshold (step S104: NO), the inhaler device 100 waits until the remaining electric power of the power supply 111 becomes less than the notification threshold.

[0105] In contrast, when it is determined that the remaining electric power of the power supply 111 is less than the notification threshold (step S104: YES), the inhaler device 100 transmits information indicating the remaining electric power to the terminal device 200 (step S106).

[0106] When receiving the information indicating the remaining electric power, the terminal device 200 displays the received information indicating the remaining electric power (step S108).

3. Second embodiment

[0107] In the first embodiment, the example in which the inhaler device 100 controls the processing of notifying the user of information by the system 1 has been described. In contrast, in a second embodiment, the terminal device 200 controls the processing of notifying the user of information by the system 1. Hereinafter, differences from the first embodiment will be mainly described.

[0108] The inhaler device 100 transmits information indicating the remaining electric power to the terminal device 200. For example, the inhaler device 100 periodically transmits the information indicating the remaining electric power. Then, the terminal device 200 determines whether the inhaler device 100 has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times based on the received information. Then, the terminal device 200 outputs the information indicating the remaining electric power in accordance with a result of the determination. The determination method and the output method are as described above in the first embodiment. The setting of the notification threshold may also be executed by the terminal device 200. In this case, information required for setting the notification threshold, such as the result of the identification on the stick substrate 150, is appropriately transmitted from the inhaler device 100 to the terminal device 200. With this configuration, it is possible to notify the user of the information indicating the remaining electric power of the inhaler device 100 at a timing at which it is determined to be notified, similarly to the first embodiment. Further, with this configuration, it is possible to reduce a processing load in the inhaler device 100.

[0109] A flow of processing according to the present embodiment will be described in detail with reference to Fig. 7.

[0110] Fig. 7 is a sequence diagram presenting an example of a flow of notification control processing executed in the system 1 according to the present embodiment. The inhaler device 100 and the terminal device 200 are involved in this sequence

[0111] As presented in Fig. 7, first, the terminal device 200 sets a notification threshold (step S202). For example, the terminal device 200 sets the notification threshold based on at least one of a user's input for setting the notification threshold, a result of identification on the stick substrate 150 inserted into the inhaler device 100, a current time, and a

heating profile to be used by the inhaler device 100.

[0112] Then, the inhaler device 100 transmits information indicating the remaining electric power of the power supply 111 (step S204). The inhaler device 100 periodically transmits the information indicating the remaining electric power of the power supply 111.

[0113] When receiving the information indicating the remaining electric power of the power supply 111, the terminal device 200 determines whether the remaining electric power of the power supply 111 is less than the notification threshold (step S206). When it is determined that the remaining electric power of the power supply 111 is equal to or more than the notification threshold (step S206: NO), the terminal device 200 waits until the remaining electric power of the power supply 111 becomes less than the notification threshold.

[0114] In contrast, when it is determined that the remaining electric power of the power supply 111 is less than the notification threshold (step S206: YES), the terminal device 200 displays information indicating the remaining electric power (step S208).

4. Modifications

(1) First modification

[0115] Although the example in which the inhaler device 100 employs the second configuration example has been described in the above embodiment, the inhaler device 100 employing the first configuration example can also execute similar processing.

[0116] In the first configuration example, the processing for generating the aerosol is processing of heating the aerosol source guided from the cartridge 120 (more specifically, the liquid storage 123), and is executed once for one inhalation by the user. Thus, the prescribed number of times corresponds to the number of times the user performs the inhalation. That is, the notification threshold corresponds to the remaining electric power that allows a prescribed number of puffs to be performed. Then, the inhaler device 100 determines whether the power supply 111 has a remaining electric power that allows the prescribed number of puffs to be performed. With this configuration, when the power supply 111 does not have the electric power that allows the prescribed number of puffs to be performed, the user is notified of the information indicating the remaining electric power. Thus, also in the inhaler device 100 according to the first configuration example, it is possible to prompt the user to perform charging at an appropriate timing.

(2) Second modification

[0117] In the above-described embodiment, the terminal device 200 outputs the information indicating the remaining electric power of the inhaler device 100 in accordance with the result of the determination on the remaining electric power, that is, when the remaining electric power of the power supply 111 is less than the notification threshold; however, the present invention is not limited to this example. The terminal device 200 may output the information indicating the remaining electric power of the inhaler device 100 regardless of the result of the determination on the remaining electric power, that is, regardless of whether the remaining electric power of the power supply 111 is less than the notification threshold. In this case, the inhaler device 100 transmits information indicating the remaining electric power of the inhaler device 100 regardless of the result of the determination on the remaining electric power. Then, the terminal device 200 displays the received information. With this configuration, the user can always check the remaining electric power of the inhaler device 100.

[0118] A first notification mode or a second notification mode may be set in the system 1. For example, the system 1 sets a notification mode designated by the user. When the first notification mode is set, the system 1 performs the notification control described in the above embodiment. That is, when the first notification mode is set and when it is determined that the inhaler device 100 does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times, the terminal device 200 displays the information indicating the remaining electric power of the inhaler device 100. In contrast, when the second notification mode is set, the system 1 performs the notification control described in the above modification. That is, when the second notification mode is set, regardless of the result of the determination on the remaining electric power, the inhaler device 100 transmits the information indicating the remaining electric power of the inhaler device 100 to the terminal device 200. Then, the terminal device 200 displays the information indicating the remaining electric power of the inhaler device 100 regardless of the result of the determination on the remaining electric power. With this configuration, since it is possible to receive the notification in the notification mode useful for the user, it is possible to improve usability.

5. Supplement

[0119] Although the preferred embodiments of the present invention have been described in detail with reference to

the accompanying drawings, the present invention is not limited to these examples. It will be apparent to those who have ordinary knowledge in the technical field to which the present invention pertains that various changes and modifications can be made within the scope of the technical idea as defined in the appended claims. It is to be understood that the changes and modifications also obviously pertain to the technical scope of the present invention.

[0120] Note that the series of processing performed by each device described in the present description may be implemented using any of software, hardware, and a combination of software and hardware. A program constituting the software is stored in advance in, for example, a recording medium (non-transitory media) provided inside or outside each device. For example, each program is read into a RAM and executed by a processor such as a CPU at the time of execution by a computer that controls each device described in the present description. The recording medium is, for example, a magnetic disk, an optical disk, a magnetooptical disk, a flash memory, or the like. The computer program may be distributed via a network, for example, without using a recording medium.

[0121] Also, the processing described using the sequence diagrams in the present description do not have to be executed in the illustrated order. Some of the processing steps may be performed in parallel. Also, an additional processing step may be employed, or the processing steps may be partially omitted.

[0122] The following configurations also pertain to the technical scope of the present invention.

(1) A control method of controlling processing of notifying a user of information by a system, the system including an inhaler device that generates an aerosol using a substrate, and a terminal device that communicates with the inhaler device, the method comprising:

determining whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controlling processing of notifying the user of information indicating the remaining electric power by the terminal device in accordance with a result of the determination.

(2) The control method according to said (1),

wherein the controlling includes determining that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when a remaining electric power of the inhaler device is less than a threshold corresponding to the prescribed number of times, and determining that the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when the remaining electric power of the inhaler device is equal to or more than the threshold corresponding to the prescribed number of times.

(3) The control method according to said (2), further comprising:

setting the threshold in accordance with a user's input.

(4) The control method according to said (2) or (3), further comprising:

identifying the substrate used by the inhaler device; and

setting the threshold in accordance with a result of the identification on the substrate.

(5) The control method according to any one of said (2) to (4), further comprising:

setting the threshold in accordance with a time at which the remaining electric power is determined.

(6) The control method according to any one of said (2) to (5),

wherein the inhaler device includes a heater that heats the substrate containing an aerosol source, and operates the heater based on a heating profile that defines a time-series transition of a target resistance value that is a target value for a resistance value of the heater, and

wherein the control method further comprises:

setting the threshold in accordance with the heating profile used by the inhaler device.

(7) The control method according to any one of said (1) to (6),

wherein the processing for generating the aerosol is processing of heating an aerosol source as a liquid guided from the substrate, and is executed once for one inhalation by the user, and

wherein the prescribed number of times corresponds to a number of times the user performs the inhalation.

(8) The control method according to any one of said (1) to (6),

wherein the processing for generating the aerosol is processing of heating the substrate containing an aerosol source and formed in a predetermined shape, and is executed once for the one substrate, and wherein the prescribed number of times corresponds to a number of the substrates to be consumed.

(9) The control method according to any one of said (1) to (8),

wherein the prescribed number of times is one or more.

(10) The control method according to any one of said (1) to (9),

wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times.

(11) The control method according to any one of said (1) to (9),

wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power

(12) The control method according to said (10) or (11),

wherein the controlling includes displaying the information indicating the remaining electric power of the inhaler device by the terminal device and outputting the information indicating the remaining electric power of the inhaler device by the inhaler device.

(13) The control method according to any one of said (1) to (12), further comprising:

setting a first notification mode or a second notification mode,

wherein, when the first notification mode is set, the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times, and

wherein, when the second notification mode is set, the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power

(14) The control method according to any one of said (1) to (13),

wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device in a part of a displayable region of the terminal device.

(15) The control method according to any one of said (1) to (14), further comprising:

acquiring position information indicating a position at which the inhaler device is chargeable,

wherein the controlling includes controlling the terminal device to display the position information.

(16) The control method according to any one of said (1) to (15),

wherein the determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times is executed by the inhaler device.

(17) The control method according to any one of said (1) to (15),

wherein the determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times is executed by the terminal device.

(18) An inhaler device comprising:

a communicator that communicates with a terminal device;

a power supply that stores electric power and supplies the electric power for an operation of the inhaler device;

a generator that generates an aerosol using a substrate; and

a controller that determines whether the power supply has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the communicator to transmit information indicating the remaining electric power to the terminal device in accordance with a result of the determination.

(19) A terminal device comprising:

a communicator that receives, from an inhaler device that generates an aerosol using a substrate, information indicating a remaining electric power of the inhaler device;

an outputter that outputs information; and

a controller that determines, based on the information received by the communicator, whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the outputter to output information indicating the remaining electric power in accordance with a result of the determination.

(20) A program that causes a computer that controls a terminal device, to execute:
 based on information indicating a remaining electric power of an inhaler device received by the terminal device from
 the inhaler device that generates an aerosol using a substrate, determining whether the inhaler device has a remaining
 electric power that allows processing for generating the aerosol a prescribed number of times to be executed, and
 controlling the terminal device to output information indicating the remaining electric power in accordance with a
 result of the determination.

Reference Signs List

[0123]

1 system
 100 inhaler device
 110 power supply unit
 111 power supply
 112 sensor
 113 notifier
 114 memory
 115 communicator
 116 controller
 120 cartridge
 121 heater
 122 liquid guide
 123 liquid storage
 124 mouthpiece
 130 flavor imparting cartridge
 131 flavor source
 140 holder
 141 internal space
 142 opening
 143 bottom
 144 heat insulator
 150 stick substrate
 151 substrate
 152 inhalation port
 180 airflow path
 181 air inlet hole
 182 air outlet hole
 200 terminal device
 210 inputter
 220 outputter
 230 communicator
 240 memory
 250 controller

Claims

1. A control method of controlling processing of notifying a user of information by a system, the system including an inhaler device that generates an aerosol using a substrate, and a terminal device that communicates with the inhaler device, the method comprising:
 determining whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controlling processing of notifying the user of information indicating the remaining electric power by the terminal device in accordance with a result of the determination.
2. The control method according to claim 1,
 wherein the controlling includes determining that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when a remaining

electric power of the inhaler device is less than a threshold corresponding to the prescribed number of times, and determining that the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times when the remaining electric power of the inhaler device is equal to or more than the threshold corresponding to the prescribed number of times.

3. The control method according to claim 2, further comprising:
setting the threshold in accordance with a user's input.

4. The control method according to claim 2 or 3, further comprising:

identifying the substrate used by the inhaler device; and
setting the threshold in accordance with a result of the identification on the substrate.

5. The control method according to any one of claims 2 to 4, further comprising:
setting the threshold in accordance with a time at which the remaining electric power is determined.

6. The control method according to any one of claims 2 to 5,

wherein the inhaler device includes a heater that heats the substrate containing an aerosol source, and operates the heater based on a heating profile that defines a time-series transition of a target resistance value that is a target value for a resistance value of the heater, and
wherein the control method further comprises:

setting the threshold in accordance with the heating profile used by the inhaler device.

7. The control method according to any one of claims 1 to 6,

wherein the processing for generating the aerosol is processing of heating an aerosol source as a liquid guided from the substrate, and is executed once for one inhalation by the user, and
wherein the prescribed number of times corresponds to a number of times the user performs the inhalation.

8. The control method according to any one of claims 1 to 6,

wherein the processing for generating the aerosol is processing of heating the substrate containing an aerosol source and formed in a predetermined shape, and is executed once for the one substrate, and
wherein the prescribed number of times corresponds to a number of the substrates to be consumed.

9. The control method according to any one of claims 1 to 8,
wherein the prescribed number of times is one or more.

10. The control method according to any one of claims 1 to 9,
wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times.

11. The control method according to any one of claims 1 to 9,
wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power.

12. The control method according to claim 10 or 11,
wherein the controlling includes displaying the information indicating the remaining electric power of the inhaler device by the terminal device and outputting the information indicating the remaining electric power of the inhaler device by the inhaler device.

13. The control method according to any one of claims 1 to 12, further comprising:

setting a first notification mode or a second notification mode,
wherein, when the first notification mode is set, the controlling includes controlling the terminal device to display

the information indicating the remaining electric power of the inhaler device when it is determined that the inhaler device does not have the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times, and
 wherein, when the second notification mode is set, the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device regardless of the result of the determination on the remaining electric power.

14. The control method according to any one of claims 1 to 13,
 wherein the controlling includes controlling the terminal device to display the information indicating the remaining electric power of the inhaler device in a part of a displayable region of the terminal device.

15. The control method according to any one of claims 1 to 14, further comprising:

acquiring position information indicating a position at which the inhaler device is chargeable,
 wherein the controlling includes controlling the terminal device to display the position information.

16. The control method according to any one of claims 1 to 15,
 wherein the determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times is executed by the inhaler device.

17. The control method according to any one of claims 1 to 15,
 wherein the determining whether the inhaler device has the remaining electric power that allows the processing for generating the aerosol to be executed the prescribed number of times is executed by the terminal device.

18. An inhaler device comprising:

a communicator that communicates with a terminal device;
 a power supply that stores electric power and supplies the electric power for an operation of the inhaler device;
 a generator that generates an aerosol using a substrate; and
 a controller that determines whether the power supply has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the communicator to transmit information indicating the remaining electric power to the terminal device in accordance with a result of the determination.

19. A terminal device comprising:

a communicator that receives, from an inhaler device that generates an aerosol using a substrate, information indicating a remaining electric power of the inhaler device;
 an outputter that outputs information; and
 a controller that determines, based on the information received by the communicator, whether the inhaler device has a remaining electric power that allows processing for generating the aerosol to be executed a prescribed number of times, and controls the outputter to output information indicating the remaining electric power in accordance with a result of the determination.

20. A program that causes a computer that controls a terminal device, to execute:

based on information indicating a remaining electric power of an inhaler device received by the terminal device from the inhaler device that generates an aerosol using a substrate, determining whether the inhaler device has a remaining electric power that allows processing for generating the aerosol a prescribed number of times to be executed, and controlling the terminal device to output information indicating the remaining electric power in accordance with a result of the determination.

FIG. 1

100A

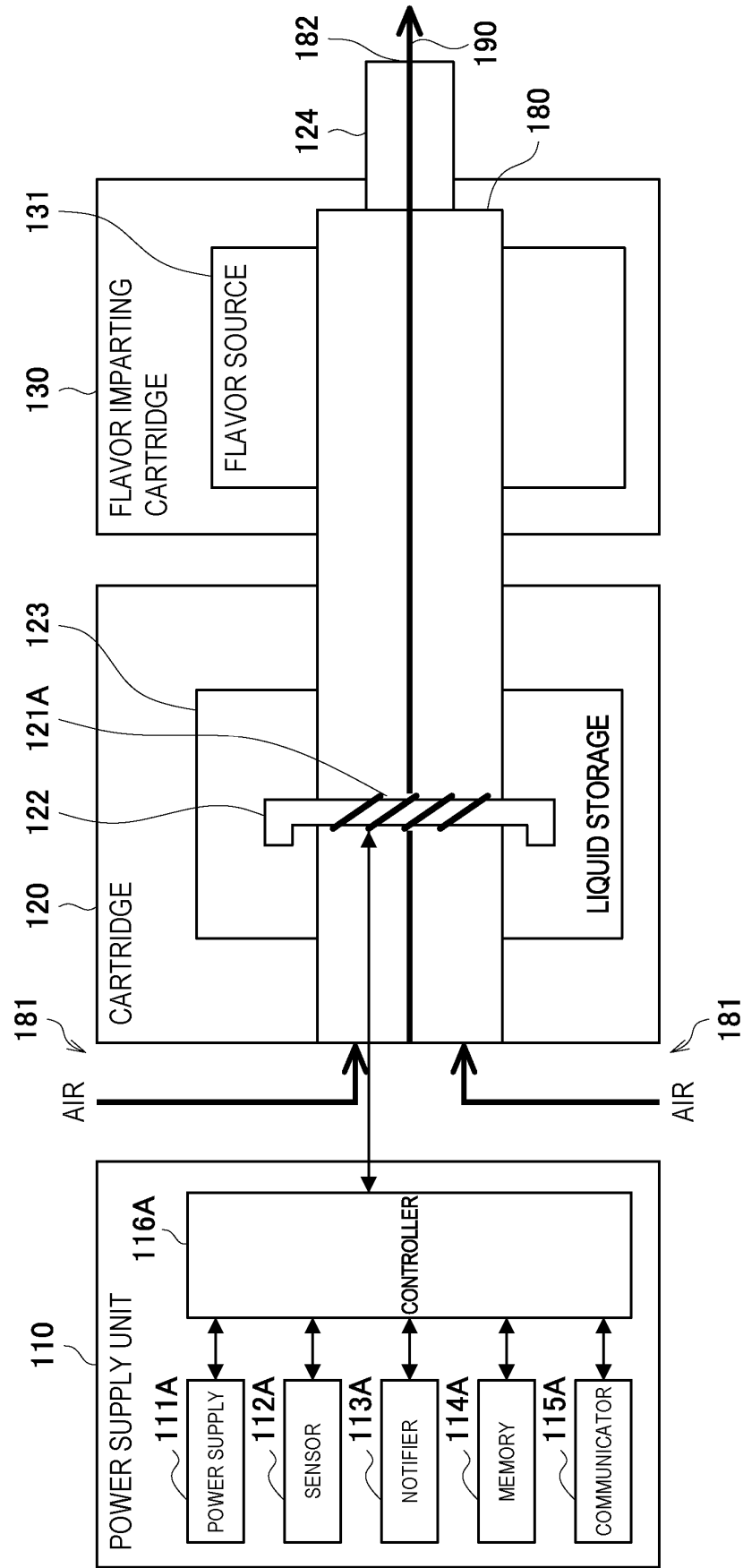


FIG. 2

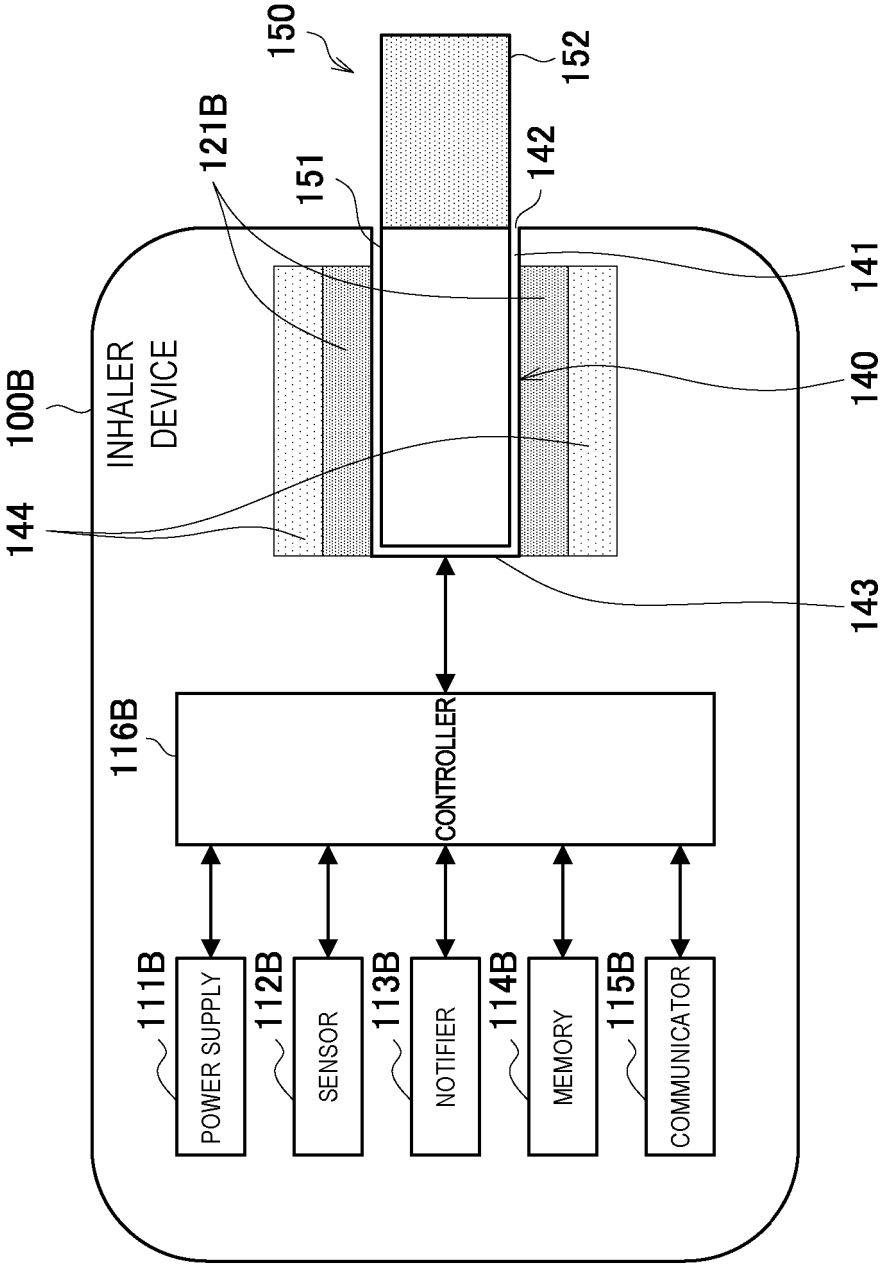


FIG. 3

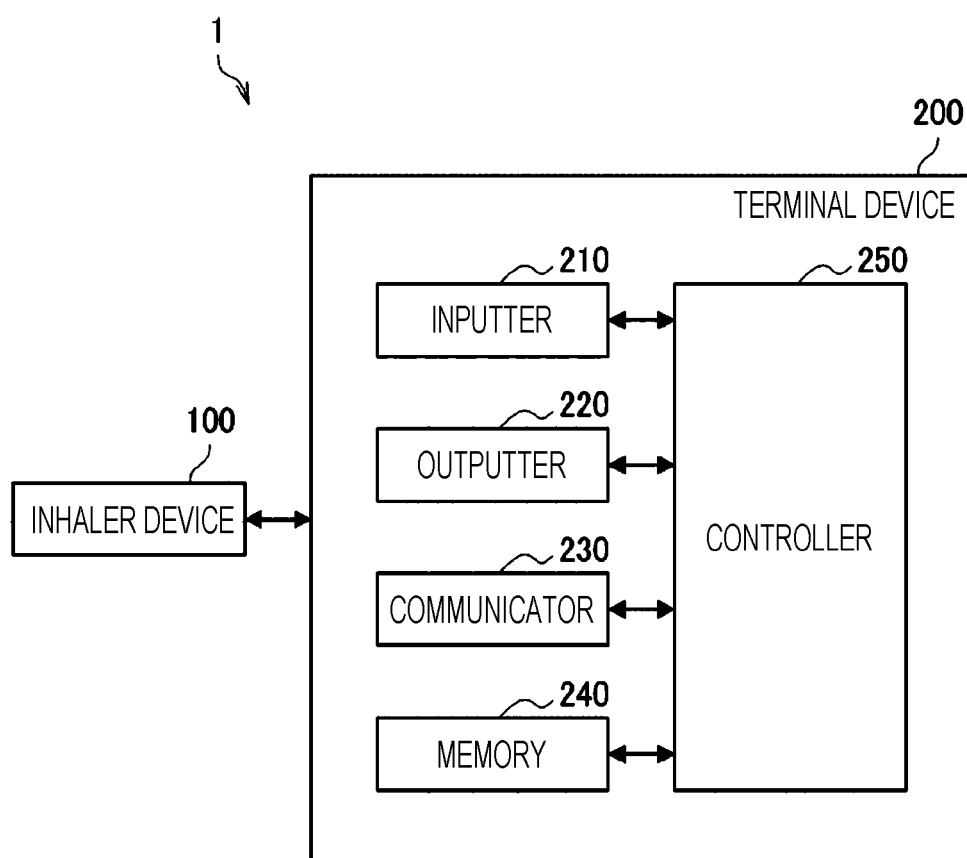


FIG. 4

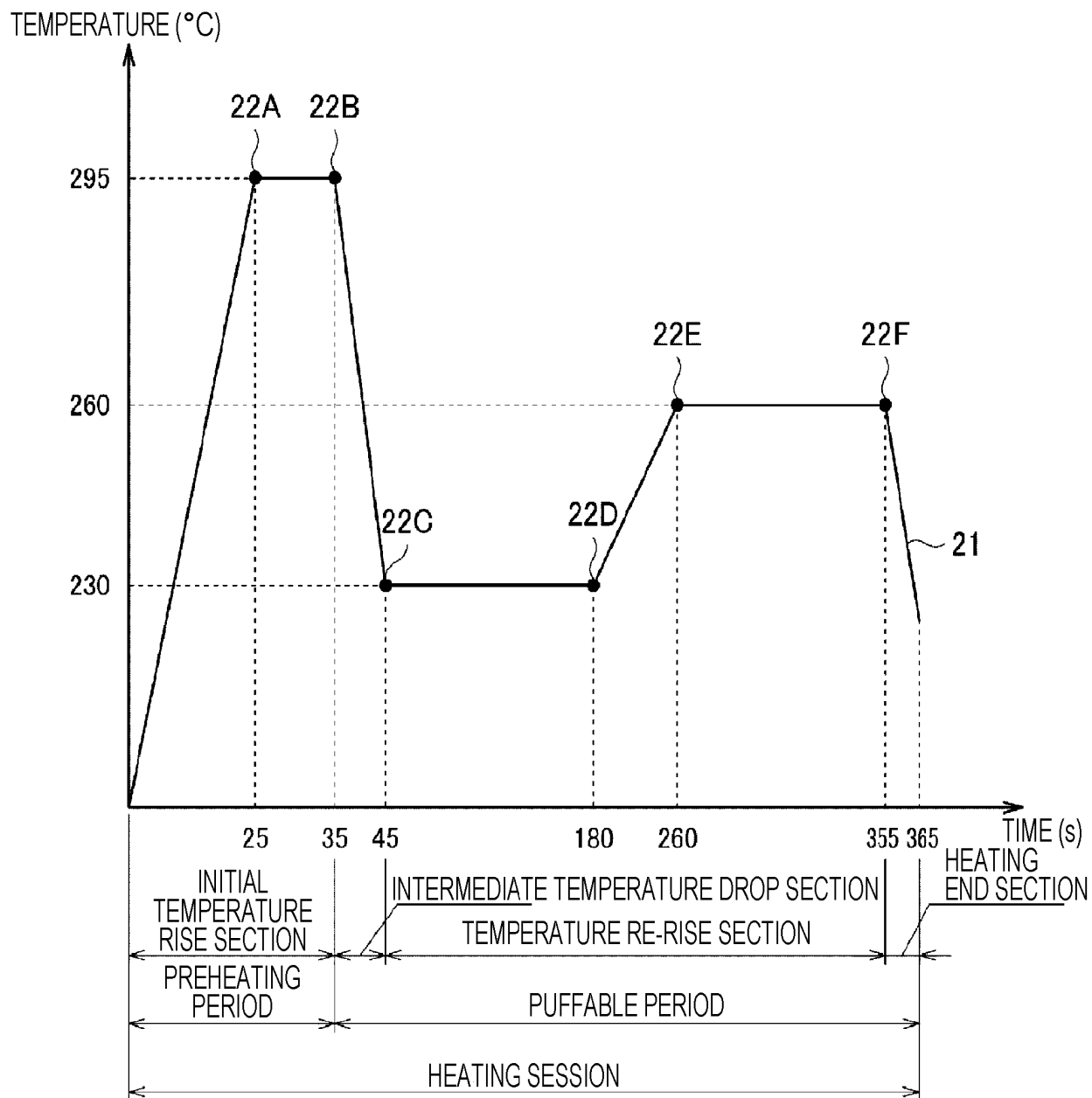


FIG. 5

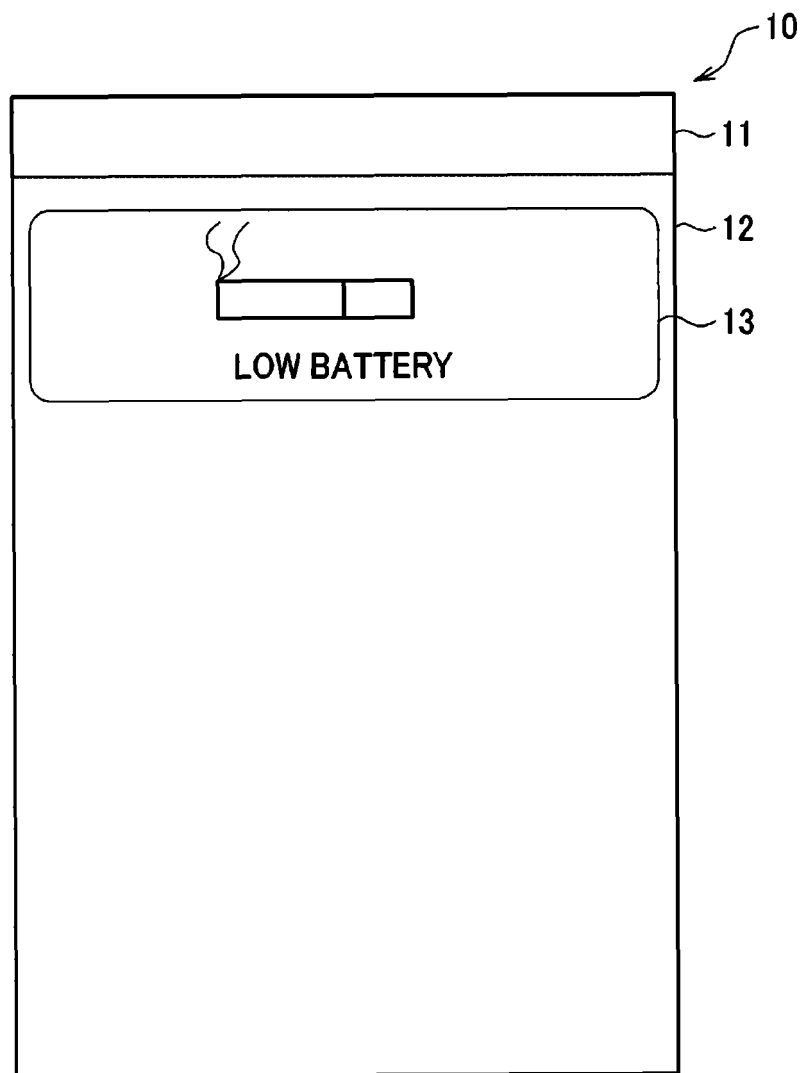


FIG. 6

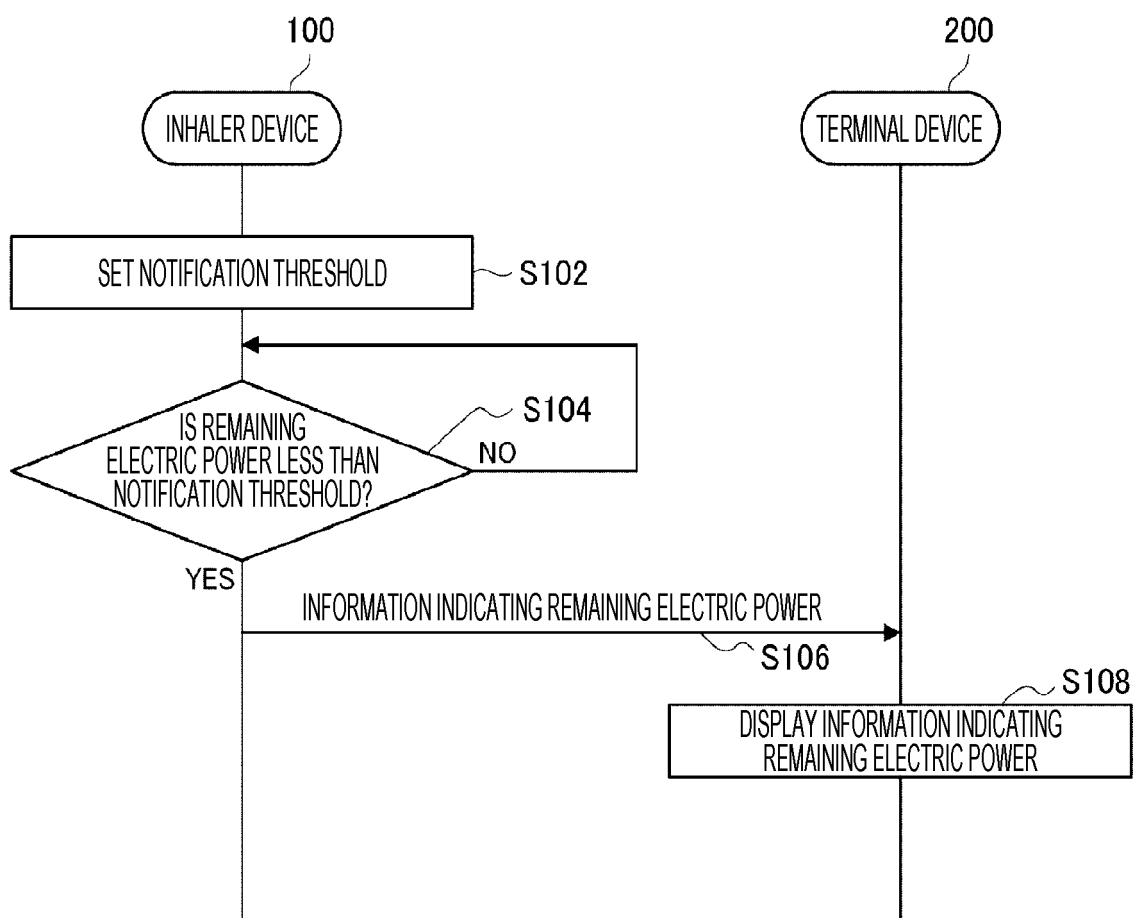
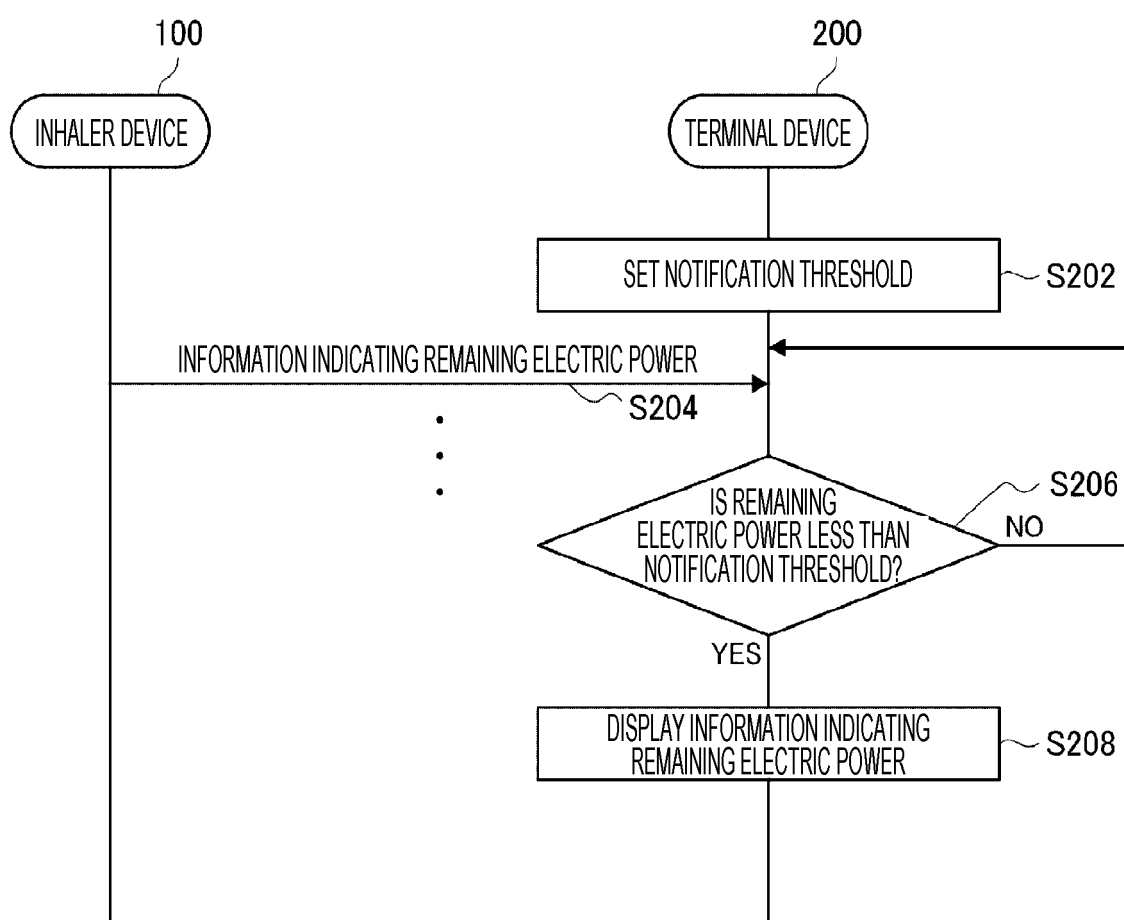


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/047042

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/65 (2020.01) i

FI: A24F40/65

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F40/65

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2021

Registered utility model specifications of Japan 1996-2021

Published registered utility model applications of Japan 1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 108576929 A (SHENZHEN SHUNBAO TECHNOLOGY CO., LTD.) 28 September 2018 (2018-09-28) paragraphs [0041]-[0064], fig. 1-3	1-3, 5, 9-11, 14, 17-20
Y		4, 6-8, 12-13, 15-16
Y	WO 2020/148861 A1 (JAPAN TOBACCO INC.) 23 July 2020 (2020-07-23) paragraphs [0141]-[0142]	4, 6-8, 12-13, 15-16
Y	JP 2020-5602 A (SMV JAPAN CO., LTD.) 16 January 2020 (2020-01-16) paragraphs [0040], [0044], fig. 1	12-13, 15-16
Y	JP 2017-195722 A (SOFTBANK CORP.) 26 October 2017 (2017-10-26) paragraph [0045]	15-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
08 February 2021 (08.02.2021)Date of mailing of the international search report
16 February 2021 (16.02.2021)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application no.

PCT/JP2020/047042

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 108576929 A	28 Sep. 2018	(Family: none)	
WO 2020/148861 A1	23 Jul. 2020	(Family: none)	
JP 2020-5602 A	16 Jan. 2020	(Family: none)	
JP 2017-195722 A	26 Oct. 2017	WO 2017/170614 A1	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2020006311 A1 **[0004]**