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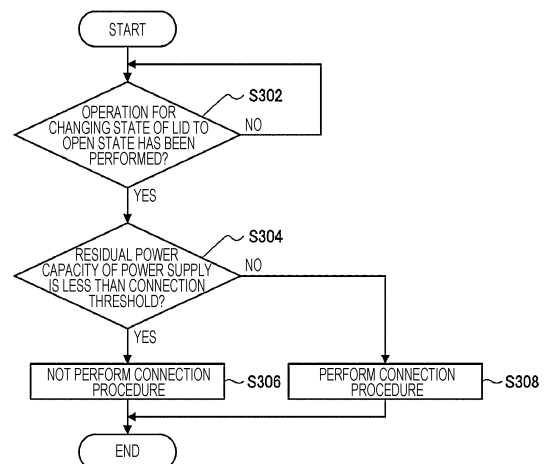
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(54) **SUCTION DEVICE AND PROGRAM**

(57) [Problem] To provide a mechanism with which it is possible to perform communication suited to the remaining amount of power in a suction device. [Solution] This suction device comprises a communication unit that communicates with another device, a heating unit that heats an aerosol-source-containing base material and generates an aerosol, a power supply unit that accumulates and supplies electric power for operation of the suction device, and a control unit that controls the operation of the suction device. The control device compares the remaining amount of power in the power supply unit and a threshold value, and controls the possibility of executing a procedure for establishing a connection between the suction device and the other communication device on the basis of the result of comparison.

FIG. 7



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Description

Technical Field

[0001] The present invention relates to an inhaler device and a program.

Background Art

[0002] Inhaler devices for generating material to be inhaled by users, such as electronic cigarettes and nebulizers, are widely used. For example, an inhaler device generates an aerosol containing a flavor component by using a substrate including, for example, an aerosol source for generating an aerosol and a flavor source for imparting the flavor component to the generated aerosol. The user inhales the aerosol containing the flavor component, generated by the inhaler device, so that the user can taste the flavor.

[0003] In recent years, technologies have been developed to further improve the quality of user experience in the use of inhaler devices. For example, Patent Literature 1 listed below discloses a technology in which, when the residual power capacity of an inhaler device is not enough to finish one unused substrate, heating of the substrate is not carried out.

Citation List

Patent Literature

[0004] Patent Literature 1: WO 2020/084757 A1

Summary of Invention

Technical Problem

[0005] Incidentally, in recent years, studies have been carried out in which inhaler devices provided with the communication function communicate with terminal devices such as smartphones to enable provision of various services. In Patent Literature 1 described above, however, no consideration is given to the communication function to be provided for the inhaler device.

[0006] The present invention has been made in consideration of the problem described above, and an object of the present invention is to provide a solution for performing communication suitably for the residual power capacity of an inhaler device.

Solution to Problem

[0007] To address the problem described above, according to an aspect of the present invention, there is provided an inhaler device including a communicator configured to communicate with another device, a heater configured to heat a substrate containing an aerosol source to generate an aerosol, a power supply configured

to store and supply electric power for operation of the inhaler device, and a controller configured to control operation of the inhaler device. The controller is configured to compare a residual power capacity of the power supply with a threshold and, based on a comparison result, provide control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device.

[0008] The controller may be configured to, when the residual power capacity of the power supply is more than or equal to the threshold, perform the procedure, and when the residual power capacity of the power supply is less than the threshold, not perform the procedure.

[0009] The procedure may include transmitting and receiving a signal for establishing connection.

[0010] The procedure may include transmitting a signal for triggering start of the procedure.

[0011] The procedure may include causing the inhaler device and the other communication device to exchange encryption keys used for encryption of information to be transmitted and received between the inhaler device and the other communication device.

[0012] The controller may be configured to, when the residual power capacity of the power supply is more than or equal to the threshold, supply electric power to the communicator, and when the residual power capacity of the power supply is less than the threshold, not supply electric power to the communicator.

[0013] The threshold may be a value greater than or equal to an amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times.

[0014] The threshold may be a value greater than or equal to the sum of the amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times and the amount of electric power used to perform the procedure.

[0015] The threshold may be a value greater than or equal to the sum of the amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times, the amount of electric power used to perform the procedure, and the amount of electric power used for accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times.

[0016] The accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times may include transmission with the communicator of battery information that is information indicating a state of the power supply.

[0017] The accompanying communication performed between the inhaler device and the other communication

device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times may include transmission with the communicator of state information including information indicating a state of the heater.

[0018] The accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times may include transmission with the communicator of log information acquired when the operation of heating the substrate with the heater to generate an aerosol is performed.

[0019] The log information may include information indicating the count of times an aerosol is inhaled during a time period from start to end of the operation for generating the aerosol with the heater.

[0020] The log information may include information indicating the time when an aerosol is inhaled during a time period from start to end of the operation for generating the aerosol with the heater.

[0021] The predetermined number of times may be 1.

[0022] The controller may be configured to identify the substrate targeted for heating and set the threshold based on an identification result about the substrate.

[0023] The controller may be configured to control operation of the heater based on a heating profile specifying changes with time of a target resistance value that is a target value of resistance of the heater and set the threshold based on the heating profile in use.

[0024] The inhaler device may further include an opening in which the substrate is insertable and a lid with which the opening is openable and closable. In the inhaler device, the controller may be configured to, in response to a release of the lid from the opening as a trigger, provide control to determine whether to perform the procedure.

[0025] To address the problem described above, according to another aspect of the present invention, there is provided a program for causing a computer to execute a process. The computer is configured to control an inhaler device including a communicator configured to communicate with another device, a heater configured to heat a substrate containing an aerosol source to generate an aerosol, and a power supply configured to store and supply electric power for operation of the inhaler device. The process includes comparing a residual power capacity of the power supply with a threshold and, based on a comparison result, providing control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device.

Advantageous Effects of Invention

[0026] As described above, the present invention provides a solution for performing communication suitably for the residual power capacity of an inhaler device.

Brief Description of Drawings

[0027]

- 5 [Fig. 1] Fig. 1 is a schematic diagram of an inhaler device according to an internal configuration example.
- [Fig. 2] Fig. 2 is an overall perspective view of an inhaler device according to an embodiment.
- 10 [Fig. 3] Fig. 3 is an overall perspective view of the inhaler device according to the embodiment in the state in which a stick substrate is held in the inhaler device.
- [Fig. 4] Fig. 4 illustrates an example of a configuration of a system according to the embodiment.
- 15 [Fig. 5] Fig. 5 is a sequence diagram illustrating an example of an overall process relating to a heating session performed in the system according to the embodiment.
- [Fig. 6] Fig. 6 is a sequence diagram illustrating an example of an overall process relating to charging performed in the system according to the embodiment.
- 20 [Fig. 7] Fig. 7 is a flowchart illustrating an example of a flow of a connection control process based on the residual power capacity, implemented by the inhaler device according to the embodiment.
- 25 [Fig. 7] Fig. 7 is a flowchart illustrating an example of a flow of a connection control process based on the residual power capacity, implemented by the inhaler device according to the embodiment.

Description of Embodiments

- 30 **[0028]** Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. It should be noted that in this specification and accompanying drawings, structural elements having substantially the same functional configurations are assigned the same reference numerals, and redundant descriptions thereof are not repeated.
- 35

1. Configuration example of inhaler device

- [0029]** 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.
- 45 Alternatively, the material generated by the inhaler device may be gas.

(1) Internal configuration example

- 50 **[0030]** Fig. 1 is a schematic diagram of an inhaler device according to an internal configuration example. As illustrated in Fig. 1, an inhaler device 100 according to the present configuration example includes a power supply 111, a sensor 112, a notifier 113, a memory 114, a communicator 115, a controller 116, a heater 121, a holder 140, and a heat insulator 144.

[0031] The power supply 111 stores electric power. The power supply 111 supplies electric power to the

structural elements of the inhaler device 100 under the control of the controller 116. The power supply 111 may be a rechargeable battery such as a lithium ion secondary battery.

[0032] The sensor 112 acquires various items of information regarding the inhaler device 100. In an example, the sensor 112 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 112 may be an input device that receives information input by the user, such as a button or a switch.

[0033] The notifier 113 provides information to the user. The notifier 113 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.

[0034] The memory 114 stores various items of information for operation of the inhaler device 100. The memory 114 may be a non-volatile storage medium such as flash memory.

[0035] The communicator 115 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).

[0036] The controller 116 functions as an arithmetic processing unit and a control circuit, and controls the overall operations of the inhaler device 100 in accordance with various programs. The controller 116 includes a central processing unit (CPU), and an electronic circuit such as a microprocessor, for example.

[0037] 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 the flow path of air to be supplied to the stick substrate 150. The air inlet hole that is an inlet of air to the flow path is provided, for example, at the bottom 143. The air outlet hole that is the outlet of air from the flow path is the opening 142.

[0038] The stick substrate 150 includes a substrate 151 and an inhalation port 152. The substrate 151 includes an aerosol source. In the present configuration example, the aerosol source is not limited to liquid and may be 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 through the airflow path (not

illustrated), and the air and an aerosol generated from the substrate 151 reach inside the mouth of the user.

[0039] The heater 121 heats the aerosol source to atomize the aerosol source and generate the aerosol. In the example illustrated in Fig. 1, the heater 121 has a film-like shape and surrounds the outer circumference of the holder 140. Subsequently, heat produced from the heater 121 heats the substrate 151 of the stick substrate 150 from the outer circumference, generating the aerosol. When electric power is supplied to the heater 121 from the power supply 111, the heater 121 produces heat. In an example, the electric power may be supplied in response to the sensor 112 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 112 detecting an end of the user's inhalation and/or an input of predetermined information.

[0040] The heat insulator 144 prevents heat from transferring from the heater 121 to the other structural elements. For example, the heat insulator 144 may be a vacuum heat insulator or an aerogel heat insulator.

[0041] The configuration example of the inhaler device 100 has been described above. The inhaler device 100 is not limited to the above configuration, and may be configured in various ways as exemplified below.

[0042] In an example, the heater 121 may have a blade-like shape, and may be disposed so that the heater 121 protrudes from the bottom 143 of the holder 140 toward the internal space 141. In this case, the heater 121 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 121 may be disposed so that the heater 121 covers the bottom 143 of the holder 140. In still another example, the heater 121 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.

[0043] 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 sandwich the stick substrate 150 inserted into the internal space 141 by opening and closing the outer shell. In this case, the heater 121 may be at the sandwiching position of the holder 140 and may produce heat while pressing the stick substrate 150.

[0044] In addition, means for atomizing the aerosol source is not limited to heating by the heater 121. For example, the means for atomizing the aerosol source may be induction heating.

(2) External configuration example

[0045] Fig. 2 is an overall perspective view of the inhaler device 100 according to the present embodiment. Fig. 3 is an overall perspective view of the inhaler device according to the present embodiment in the state in which the stick substrate 150 is held in the inhaler device.

[0046] As illustrated in Figs. 2 and 3, the inhaler device 100 includes a top housing 11A, a bottom housing 11B, a cover 12, a switch 13, a lid 14, a vent hole 15, and a cap 16. The top housing 11A and the bottom housing 11B are attached to each other to form an outer housing 11 that is the outermost portion of the inhaler device 100. The outer housing 11 is small enough to be held in a user's hand. When a user uses the inhaler device 100, the user holds the inhaler device 100 with a hand to inhale the flavor.

[0047] The top housing 11A has an opening that is not illustrated in the drawings. The cover 12 is attached to the top housing 11A such that the opening is closed. As illustrated in Fig. 3, the cover 12 has the opening 142 into which the stick substrate 150 can be inserted. The lid 14 is configured such that the opening 142 of the cover 12 can be made open or closed. Specifically, the lid 14 is attached to the cover 12 in the manner in which the lid 14 is movable along the surface of the cover 12 between a first position at which the opening 142 is closed by the lid 14 and a second position at which the lid 14 is released from the opening 142. As a result, the lid 14 enables or limits access of the stick substrate 150 to the inside (the internal space 141 illustrated in Fig. 1) of the inhaler device 100. The state in which the lid 14 is at the second position so that the lid 14 is released from the opening 142 is hereinafter also referred to as the release state. The state in which the lid 14 is at the first position so that the opening 142 is closed by the lid 14 is hereinafter also referred to as the close state.

[0048] The switch 13 is usable to turn on or off the inhaler device 100. For example, the user operates the switch 13 in the state in which the stick substrate 150 has been inserted in the internal space 141 through the opening 142 as illustrated in Fig. 3; in response to this, the power supply 111 supplies electric power to the heater 121, so that the stick substrate 150 is heated instead of being burnt. When the stick substrate 150 is heated, an aerosol is generated from the aerosol source included in the stick substrate 150; the flavor of a flavor source is contained in the aerosol. The user sucks at the portion of the stick substrate 150 protruded from the inhaler device 100 (the portion illustrated in Fig. 3, specifically the inhalation port 152) to inhale the aerosol containing the flavor.

[0049] The vent hole 15 is a vent hole for introducing air into the internal space 141. The air taken in from the vent hole 15 to the inside of the inhaler device 100 is, for example, introduced from the air inlet hole formed at the bottom 143 of the holder 140 into the internal space 141. The cap 16 is configured such that the cap 16 is attach-

able to the bottom housing 11B in a detachable manner. The cap 16 is attached to the bottom housing 11B, so that the vent hole 15 is formed between the bottom housing 11B and the cap 16. The cap 16 may have, for example, a through-hole or notch, which is not illustrated in the drawings. In this specification, the longitudinal direction of the inhaler device 100 is the direction in which the stick substrate 150 is inserted into the opening 142. Of the inhaler device 100 in this specification, the side from which fluid such as air flows in (for example, the vent hole 15 side) is deemed as the upstream side, and the side from which fluid such as air flows out (for example, the opening 142 side) is deemed as the downstream side.

2. Technical feature

(1) System configuration example

[0050] Fig. 4 illustrates an example of a configuration of a system 1 according to the present embodiment. As illustrated in Fig. 4, the system 1 includes the inhaler device 100 and a terminal device 200.

25 Configuration of the inhaler device 100

[0051] The inhaler device 100 is configured as described above. In the following, the user's action of inhaling an aerosol generated by the inhaler device 100 is also simply referred to as "inhalation" or "puff". The user's action of inhaling is also referred to as puff action in the following.

[0052] The inhaler device 100 according to the present embodiment uses a substrate containing an aerosol source to generate an aerosol to be inhaled by a user. The heater 121 heats the substrate containing the aerosol source to generate an aerosol. The stick substrate 150 is an example of the substrate in the present embodiment.

40 Configuration of the terminal device 200

[0053] The terminal device 200 is a device used by the user of the inhaler device 100. For example, the terminal device 200 is implemented by any information processing device such as a smartphone, tablet terminal, or wearable device. As illustrated in Fig. 4, the terminal device 200 includes an inputter 210, an outputter 220, a communicator 230, a memory 240, and a controller 250.

[0054] The inputter 210 has a function of receiving inputs of various kinds of information. The inputter 210 may include an input device for receiving inputs of information by the user. Examples of the input device include a button, a keyboard, a touch panel, and a microphone. The inputter 210 may also include various sensors such as image sensors.

[0055] The outputter 220 has a function of outputting information. The outputter 220 may include an output de-

vice for providing information for the user. Examples of the output device include a display device for displaying information, a light-emitting device for illumination, a vibration device for vibration, and a sound output device for outputting 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 inputted from the controller 250, so that the user is notified of the information.

[0056] The communicator 230 is a communication interface for transmitting and receiving information between the terminal device 200 and other devices. The communicator 230 provides communication in conformity with a wired or wireless communication standard. The communication standard is, for example, wireless local area network (LAN), wired LAN, Wi-Fi (registered trademark), or Bluetooth (registered trademark).

[0057] The memory 240 stores various kinds of information for operation of the terminal device 200. The memory 240 is implemented by, for example, a non-volatile storage medium such as a flash memory.

[0058] The controller 250 functions as an arithmetic processing unit or control unit to provide overall control on operations in the terminal device 200 in accordance with various programs. The controller 250 is implemented by, for example, a central processing unit (CPU) or an electronic circuit such as a microprocessor. Additionally, the controller 250 may include a read-only memory (ROM) for storing, for example, programs and operational parameters for use and a random-access memory (RAM) for temporarily storing parameters that may change according to circumstances. The terminal device 200 performs different operations under the control of the controller 250. An example of the operations controlled by the controller 250 is processing information inputted with the inputter 210, outputting information with the outputter 220, transmitting and receiving information with the communicator 230, and storing and reading information with the memory 240. The controller 250 also controls other operations performed by the terminal device 200, including, for example, inputting information to the structural elements and operations based on information outputted by the structural elements.

[0059] The function of the controller 250 may be implemented using an application. The application may be preinstalled or downloaded. The function of the controller 250 may be implemented by progressive web apps (PWA).

Inter-device communication

[0060] The inhaler device 100 is operable to communicate with other devices. The communication links used for communication between the inhaler device 100 and other devices may be wireless or wired links. In this specification, the communication links are wireless links in the

description.

[0061] In particular, the inhaler device 100 establishes connection with another paired device and transmits and receives information. Pairing is the operation of exchanging information between two devices and store the information. An example of the information to be exchanged is identification information of the other paired device such as a service set identifier (SSID) and information about an encryption key to be used to encrypt information to be transmitted and received.

[0062] The inhaler device 100 and the terminal device 200 firstly carry out pairing and afterward transmit and receive information. It is desirable that the wireless communication standard used for wireless communication between the inhaler device 100 and the terminal device 200 is a short-distance wireless communication standard such as Bluetooth. In this case, when the inhaler device 100 and the terminal device 200 are positioned within the range that enables short-distance wireless communication, the inhaler device 100 and the terminal device 200 can establish connection and communicate with each other. In the following, the inhaler device 100 and the terminal device 200 performs communication in conformity with Bluetooth Low Energy (BLE) (registered trademark).

[0063] The connection between the inhaler device 100 and the terminal device 200 may be established when a predetermined condition is satisfied. An example of the predetermined condition is that the state of the lid 14 is changed to the release state. Another example of the predetermined condition is that charging of the power supply 111 is started. For example, when the inhaler device 100 is connected to an external power supply via a Universal Serial Bus (USB), the inhaler device 100 starts charging of the power supply 111. When any of these predetermined conditions is satisfied, the inhaler device 100 starts transmission of advertising data, establishes connection with the terminal device 200 having received the advertising data, and starts transmission and reception of information.

[0064] The connection between the inhaler device 100 and the terminal device 200 may be disconnected when a predetermined condition is satisfied. An example of the predetermined condition is that the state of the lid 14 is changed to the close state. Another example of the predetermined condition is that charging of the power supply 111 is stopped. For example, when the connection with the external power supply is disconnected, the inhaler device 100 stops charging of the power supply 111. For example, when any of these predetermined conditions is satisfied, no user operation has been detected for a predetermined time or longer, and information has not been transmitted and received, the inhaler device 100 disconnects connection with the terminal device 200.

(2) Setting information

[0065] The terminal device 200 is operable to configure

operation of the inhaler device 100. For example, the terminal device 200 displays a setting screen for configuring operation of the inhaler device 100. The setting screen displays present settings about the inhaler device 100 and receives inputs of information to change the settings. The terminal device 200 generates setting information based on information inputted by the user and transmits the setting information to the inhaler device 100.

[0066] The setting information is information used to configure settings about operation of the inhaler device 100. The inhaler device 100 receives the setting information from the terminal device 200. The inhaler device 100 configures settings based on the received setting information and operates in accordance with the settings. The setting information is typically information used to change settings on the inhaler device 100. The inhaler device 100 changes settings based on the received setting information. With this configuration, the user can configure desired settings on the inhaler device 100 by using the terminal device 200.

[0067] While the setting information is being transmitted, the terminal device 200 may display information indicating how the transmission is progressing. For example, the terminal device 200 may display a progress bar in which the extent of progress increases from 0 to 100 percent with the amount of data having been transmitted, from the start to end of transmission of the setting information. With this configuration, the user can monitor how transmission of the setting information is progressing.

[0068] When the inhaler device 100 has completed configuration based on the setting information, the inhaler device 100 transmits to the terminal device 200 a setting completion notification indicating that configuration has been completed. In response to receiving the setting completion notification, the terminal device 200 may display a screen indicating that the inhaler device 100 has completed configuration. With this configuration, the user can be informed that the inhaler device 100 has completed configuration based on the setting information.

[0069] When the terminal device 200 receives the setting completion notification, the terminal device 200 outputs information indicating the settings after change. For example, after displaying the screen indicating that the inhaler device 100 has completed configuration, the terminal device 200 displays the setting screen indicating the settings after change. With this configuration, the user can be informed of the settings after change.

(3) Communication function setting

[0070] The setting information may include information indicating whether to enable a communication function of the inhaler device 100. In other words, the setting information may include information indicating whether to permit communication using the communicator 115. Depending on the received setting information, the inhaler device 100 enables or disables the communication func-

tion. When the communication function is enabled, the communicator 115 is operable to communicate with the terminal device 200. When the communication function is disabled, the communicator 115 is inoperable to communicate with the terminal device 200. With this configuration, the user can enable or disable the communication function of the inhaler device 100.

[0071] In the case in which the communication function is disabled, when a predetermined condition is satisfied, the inhaler device 100 may enable the communication function. An example of the predetermined condition is that an operation according to a predetermined operating pattern is performed. The operating pattern will be described in detail later. When the predetermined condition is satisfied, the inhaler device 100 starts transmission of advertising data, establishes connection with the terminal device 200 having received the advertising data, and starts transmission and reception of information.

(4) Heating profile

[0072] The inhaler device 100 controls operation of the heater 121 based on a heating profile. The heating profile is information indicating changes with time of a target value of a parameter relating to operation of the heater 121. An example of the parameter is temperature of the heater 121. In this case, the heating profile is information specifying changes of target temperature with time; the target temperature is a target value of temperature of the heater 121. The inhaler device 100 controls the temperature of the heater 121 such that changes with time of actually measured temperature (hereinafter also referred to as actual temperature) of the heater 121 are the same as the changes with time of target temperature specified in the heating profile. With this configuration, an aerosol is generated as planned in the heating profile. The heating profile is typically designed such that the user can taste optimum flavor when the user inhales the aerosol generated from the stick substrate 150. As such, by controlling operation of the heater 121 based on the heating profile, the user can enjoy optimum flavor.

[0073] The controller 116 controls operation of the heater 121 based on the deviation between the target temperature specified in the heating profile and the actual temperature of the heater 121. More specifically, the controller 116 controls the temperature of the heater 121 based on the deviation between the target temperature corresponding to the elapsed time since control of operation of the heater 121 according to the heating profile starts and the actual temperature. The temperature of the heater 121 may be controlled by, for example, a known feedback control technology. Specifically, the controller 116 causes electric power from the power supply 111 to be supplied to the heater 121 in the pulse form of pulse width modulation (PWM) or pulse frequency modulation (PFM). In this case, the controller 116 can control the temperature of the heater 121 by controlling the duty ratio of pulse of electric power.

[0074] In feedback control, based on, for example, the difference between actual temperature and target temperature, the controller 116 can control electric power supplied to the heater 121, in other words, for example, the duty ratio described above. The feedback control may be implemented by, for example, a proportional-integral-differential (PID) controller.

Alternatively, the controller 116 may provide simple ON-OFF control. For example, the controller 116 may provide heating with the heater 121 until the actual temperature reaches a target temperature; when the actual temperature reaches the target temperature, the controller 116 may stop heating with the heater 121; when the actual temperature drops below the target temperature, the controller 116 may again provide heating with the heater 121.

[0075] It is possible to quantitate the temperature of the heater 121 by, for example, measuring or estimating the resistance (more accurately, the electrical resistance) of the heater 121 (more accurately, a thermal resistor forming the heater 121). This is because the resistance of thermal resistor changes with temperature. The resistance of a thermal resistor can be estimated by, for example, measuring the amount of voltage drop across the thermal resistor. The amount of voltage drop across a thermal resistor can be measured with a voltage sensor that measures the difference between potentials across the thermal resistor. In another example, the temperature of the heater 121 may be measured with a temperature sensor disposed close to the heater 121.

[0076] As described above, when the resistance 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 of the heater 121. The resistance of the heater 121 thus can represent the target temperature of the heater 121. This means that another example of the parameter of the heating profile is the resistance of the heater 121 corresponding to the target temperature. In this case, the heating profile is information specifying changes of target resistance with time; the target resistance is a target value of resistance of the heater 121. The inhaler device 100 controls the resistance of the heater 121 such that changes with time of actual resistance of the heater 121 are the same as the changes with time of target resistance specified by the heating profile. The resistance of the heater 121 may be controlled by, for example, a known feedback control technology. Specifically, the controller 116 causes electric power from the power supply 111 to be supplied to the heater 121 in the pulse form of PWM or PFM. In this case, the controller 116 can control the resistance of the heater 121 by controlling the duty ratio of pulse of electric power. With this configuration, the actual temperature of the heater 121 can be changed in the same manner as in the case in which the heating profile specifies changes of target temperature with time.

[0077] Although the temperature of the heater 121 and the resistance of the heater 121 are in correspondence relation, the resistance corresponding to the temperature

of the heater 121 depends on the properties of the heater 121 and the environmental temperature. Hence, when the properties of the heater 121 or the environmental temperature varies, the target resistance corresponding to a particular target temperature also varies.

[0078] The time period from start to end of the process of generating the aerosol using the stick substrate 150, more specifically, the time period for 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 when heat application according to the heating profile is started. The end of the heating session is when the amount of the aerosol being generated becomes insufficient. The heating session consists of a preliminary heating period as the first half and a puff available period as the second half. The puff available period is a period for which a sufficient amount of aerosol is expected to be generated. The preliminary heating period is a period from start of heating until start of the puff available period. The heating provided for the preliminary heating period is also referred to as preliminary heating.

[0079] The heating session may include a period for which no electric power is supplied to the heater 121. In an example, the heating profile may include a period for which the temperature of the heater 121 is temporarily decreased; for this period, supply of electric power to the heater 121 may be stopped. In another example, supply of electric power to the heater 121 may be stopped at a predetermined time prior to the end of the puff available period, that is, a predetermined time prior to the end of the heating session. Also for these periods without supply of electric power to the heater 121, a sufficient amount of aerosol is generated with the residual heat left in the heater 121 and the stick substrate 150.

[0080] The user may be notified of when the puff available period starts and when the puff available period starts. Additionally, the user may be notified of when a predetermined time before the end of the puff available period is reached (for example, when the supply of electric power to the heater 121 is stopped). In this case, following this notification, the user can puff during the puff available period.

[0081] During the heating session, more specifically, during the puff available period, it is assumed that one or more puffs are performed.

[0082] When the number of puffs having been performed by the user since heating of the stick substrate 150 was started reaches a predetermined upper limit, the inhaler device 100 may stop the heating. In other words, when the number of puffs having been detected in the heating session (more specifically, the puff available period) reaches the predetermined upper limit, the heating session may be suspended. The predetermined upper limit is set to a value corresponding to a count of puffs with which it is assumed that the aerosol source has been exhausted. This configuration prevents the case in which after many puffs are performed, when the aerosol source is exhausted in early stages, heating

based on the heating profile is still continuously carried out; as a result, strange flavor can be delivered to the user.

[0083] The setting information may include information indicating the heating profile. In this case, the controller 116 controls operation of the heater 121 based on the heating profile indicated by the received information. With this configuration, the user can set a desired heating profile on the inhaler device 100.

[0084] The setting information may include information indicating the predetermined upper limit about the number of puffs in the heating session. In this case, the controller 116 stops heating with the heater 121 when the number of puffs detected in the heating session reaches the upper limit indicated by the received information. With this configuration, the user can set a desired upper limit on the inhaler device 100.

(5) Operating pattern

[0085] The inhaler device 100 includes an operating unit on which the user performs physical operations. The operating unit is an example of the sensor 112; the operating unit detects various operations performed by the user. A set of operations on the operating unit is herein-after also referred to as an operating pattern. The setting information may include information indicating an operating pattern. With this configuration, the user can set a desired operating pattern on the inhaler device 100.

[0086] The controller 116 sets an operating pattern indicated by the received setting information and controls operation of the heater 121 in accordance with the operating pattern that is set. In an example, when particular operations corresponding to the operating pattern that is set is performed, the controller 116 starts heating with the heater 121. A plurality of combinations of an operating pattern and a process to be performed when particular operations corresponding to the operating pattern are performed may be set. In this case, the controller 116 performs the process associated with the operating pattern corresponding to the particular operations performed on the inhaler device 100 out of the plurality of operating patterns. With this configuration, the user can control operation of the heater 121 by using a desired operating pattern.

[0087] The operating unit may include a button on which the user performs a pressing operation. An example of the button is the switch 13. In this case, the operating pattern includes an operation of pressing the switch 13. The operation of pressing the switch 13 may be divided into short-press, with which the switch 13 is pressed and released after a short time, and long-press, with which the switch 13 is released after a relatively long time since pressed. An example of the operating pattern is to perform short-press twice and then long-press once. The information indicating the operating pattern included in the setting information includes information indicating changes with time of the state of the switch 13. Changes

with time of the state of the switch 13 indicate whether the switch 13 is in the pressed state or the unpressed state. In the setting information, the number of times of short-press and long-press, the timings (specifically, order and intervals) of short-press and long-press, the time length of long-press, and other specifics are set as the operating pattern. With this configuration, the user can set a desired operating pattern regarding the switch 13 on the inhaler device 100.

[0088] An example of the operating unit is the lid 14. In this case, the operating pattern includes operations of opening and closing the opening 142 using the lid 14. An example of the operating pattern is operations of opening and closing the opening 142 using the lid 14. The information indicating the operating pattern included in the setting information includes information indicating changes with time of the state of the lid 14. Changes with time of the state of the lid 14 indicate whether the lid 14 is in the release state or the close state. In the setting information, the number of times of the operation for changing the state of the lid 14 to the release state, the number of times of the operation for changing the state of the lid 14 to the close state, and the timings (specifically, order and intervals) of these operations are set as the operating pattern. With this configuration, the user can set a desired operating pattern regarding the lid 14 on the inhaler device 100.

[0089] The operating pattern may be a set of the operation of pressing the switch 13 and the operations of opening and closing the opening 142 using the lid 14. An example of the operating pattern is operations of opening the opening 142 using the lid 14 and subsequently performing short-press on the switch 13 twice and then long-press once. The information indicating the operating pattern included in the setting information includes information indicating changes with time of the state of the switch 13 and the state of the lid 14. With this configuration, the user can set a desired operating pattern regarding the switch 13 and the lid 14 on the inhaler device 100.

(6) Lock function

[0090] The inhaler device 100 has a lock function. The lock function is a function of providing control to enable or disable heating with the heater 121. To prohibit heating with the heater 121 is also referred to as lock. In the following, to permit heating with the heater 121 is also referred to as unlock.

[0091] In the unlocked state, when a user operation of providing an instruction to start heating is performed, the inhaler device 100 starts heating with the heater 121. An example of the operation for providing an instruction to start heating is to press the switch 13. By contrast, in the locked state, when a user operation of providing an instruction to start heating is performed, the inhaler device 100 does not start heating with the heater 121. With this configuration, in the locked state, for example, when the switch 13 is pressed by accident in the bag, heating with

the heater 121 is not started. As such, the safety in the use of the inhaler device 100 is improved.

First lock function

[0092] The operating pattern may be set with a first lock function of providing control to enable or disable heating with the heater 121 depending on the user operation. In the case in which the first lock function is enabled, when an operation corresponding to the operating pattern that is set with the first lock function is performed, the controller 116 permits heating with the heater 121. By contrast, in the case in which the first lock function is enabled, when no operation corresponding to the operating pattern that is set with the first lock function is performed, the controller 116 prohibits heating with the heater 121. When the user performs the operation corresponding to the operating pattern that is set with the first lock function, the locked state with the first lock function is changed to the unlocked state. In the unlocked state, for example, when the switch 13 is pressed, heating with the heater 121 is started.

[0093] With this configuration, unless any operation corresponding to the operating pattern that is set with the first lock function is performed, the unlocked state is not initiated. This prevents misuse by someone other than the user, for example a child, and the safety in the use of the inhaler device 100 is improved.

[0094] After the locked state with the first lock function is changed to the unlocked state, when a predetermined condition is satisfied, the unlocked state may be changed again to the locked state. An example of the predetermined condition is that after heating with the heater 121 is ended, the stick substrate 150 is pulled out, and the state of the lid 14 is changed to the close state. Another example of the predetermined condition is that the operation corresponding to the operating pattern that is set with the first lock function is performed again.

[0095] The setting information may include information indicating whether to enable the first lock function. In this case, the controller 116 enables or disables the first lock function based on the setting information. For example, when the setting information includes information indicating that the first lock function is to be enabled, the controller 116 enables the first lock function. In this case, unless any operation corresponding to the operating pattern that is set with the first lock function is performed, the unlocked state is not initiated. By contrast, when the setting information includes information indicating that the first lock function is to be disabled, the controller 116 disables the first lock function. In this case, the locked state with the first lock function is not initiated, and thus, the user can start heating with the heater 121 by simply pressing the switch 13.

[0096] With this configuration, in limited cases such as when the user is at home and it is assumed that their children can cause misuse, the user enables the first lock function. As such, safety is improved. By contrast, in cas-

es in which it is not assumed that their children can cause misuse, for example when the user is at work, the user disables the first lock function. As such, the need for the operation of initiating the unlocked state is eliminated, thereby improving usability.

Second lock function

[0097] The state of communication using the communicator 115 may be used for a second lock function of providing control to enable or disable heating with the heater 121 depending on the state of communication using the communicator 115. In the case in which the second lock function is enabled, when the communicator 115 is in communication with the terminal device 200, the controller 116 permits heating with the heater 121. By contrast, in the case in which the second lock function is enabled, when the communicator 115 is not in communication with the terminal device 200, the controller 116 prohibits heating with the heater 121. As used herein, the state in which the communicator 115 is in communication with the terminal device 200 includes, for example, the state in which connection according to a short-distance wireless communication standard such as Bluetooth is established between the inhaler device 100 and the terminal device 200. The user can change the locked state with the second lock function to the unlocked state by causing connection according to a short-distance wireless communication standard to be established between the inhaler device 100 and the terminal device 200. In the unlocked state, for example, when the switch 13 is pressed, heating with the heater 121 is started.

[0098] With this configuration, the unlocked state is initiated only when the inhaler device 100 and the terminal device 200 are positioned within the range that enables short-distance wireless communication, and the inhaler device 100 and the terminal device 200 are in communication with each other; otherwise, the unlocked state is not initiated. As a result, while the user is out of the home carrying the terminal device 200, it is possible to prevent misuse of the inhaler device 100 left at home by, for example, their child. As such, the safety in the use of the inhaler device 100 is improved. By contrast, when the user uses the inhaler device 100 carrying the terminal device 200, the unlocked state is automatically initiated. As such, the need for the operation of initiating the unlocked state is eliminated, thereby improving usability.

[0099] The setting information may include information indicating whether to enable the second lock function. In this case, the controller 116 enables or disables the second lock function based on the setting information. For example, when the setting information includes information indicating that the second lock function is to be enabled, the controller 116 enables the second lock function. In this case, unless the inhaler device 100 and the terminal device 200 are in communication with each other, the unlocked state is not initiated. By contrast, when the setting information includes information indicating

that the second lock function is to be disabled, the controller 116 disables the second lock function. In this case, the locked state with the second lock function is not initiated, and thus, irrespective of whether the inhaler device 100 and the terminal device 200 are in communication with each other, the user can start heating with the heater 121 by simply pressing the switch 13.

[0100] With this configuration, whether to enable or disable the second lock function is changeable as desired, and as a result, usability is improved.

Third lock function

[0101] The state of the lid 14 is used for a third lock function of providing control to enable or disable heating with the heater 121 depending on the state of the lid 14. In the case in which the third lock function is enabled, when the state of the lid 14 is the release state, the controller 116 permits heating with the heater 121. By contrast, in the case in which the third lock function is enabled, when the state of the lid 14 is the close state, the controller 116 prohibits heating with the heater 121. When the state of the lid 14 is the close state, the inhaler device 100 is at least in the state in which the stick substrate 150 is not inserted. Thus, if heating is performed while the state of the lid 14 is the close state, heating is performed without the stick substrate 150 inserted, which is called dry burn. In this respect, the third lock function prevents dry burn.

[0102] In view of preventing dry burn, it is desirable that the third lock function always remains enabled. Needless to say, the setting information may include information indicating whether to enable or disable the third lock function; and whether to enable or disable the third lock function may be changed based on the setting information.

Combined use of multiple lock functions

[0103] A plurality of lock functions may be used together. For example, the first lock function, the second lock function, and the third lock function may be used together.

[0104] The condition for initiating the unlocked state based on the first lock function and the second lock function may be an OR condition (that is, a logical disjunction). Specifically, when either the condition for initiating the unlocked state based on the first lock function or the condition for initiating the unlocked state based on the second lock function is satisfied, it may be possible that the unlocked state is initiated. When neither the condition for initiating the unlocked state based on the first lock function or the condition for initiating the unlocked state based on the second lock function is satisfied, it may be possible that the unlocked state is not initiated. Specifically, in the case in which the first lock function and the second lock function are enabled, when the operation corresponding to the operating pattern that is set with the first lock function is performed, or the communicator 115 is in commu-

nication with the terminal device 200, the controller 116 permits heating with the heater 121. When no operation corresponding to the operating pattern that is set with the first lock function is performed, and the communicator 115 is not in communication with the terminal device 200, the controller 116 prohibits heating with the heater 121. With this configuration, it is possible to initiate the unlocked state by using either the first lock function or the second lock function. As such, usability is improved.

[0105] Further, the OR condition according to the first lock function and the second lock function described above and the condition for initiating the unlocked state based on the third lock function may create an AND condition (that is, a logical conjunction). Specifically, when the third condition for initiating the unlocked state is satisfied, and either the condition for initiating the unlocked state based on the first lock function or the condition for initiating the unlocked state based on the second lock function is satisfied, it may be possible that the unlocked state is initiated. When the third condition for initiating the unlocked state is not satisfied, or neither the condition for initiating the unlocked state based on the first lock function or the condition for initiating the unlocked state based on the second lock function is satisfied, it may be possible that the unlocked state is not initiated. Specifically, in the case in which the first lock function, the second lock function, and the third lock function are enabled, when the state of the lid 14 is the release state, and when the operation corresponding to the operating pattern that is set with the first lock function is performed, or the communicator 115 is in communication with the terminal device 200, the controller 116 permits heating with the heater 121. When the state of the lid 14 is the close state, or when no operation corresponding to the operating pattern that is set with the first lock function is performed, and the communicator 115 is not in communication with the terminal device 200, the controller 116 prohibits heating with the heater 121. With this configuration, while preventing dry burn, it is possible to initiate the unlocked state by using either the first lock function or the second lock function. As such, safety is secured, and usability is improved.

(7) Battery information

[0106] The inhaler device 100 transmits battery information that is information indicating the state of the power supply 111 for storing and supplying electric power for operation of the inhaler device 100. This configuration enables the terminal device 200 to monitor the state of the power supply 111 based on the battery information.

[0107] The battery information may include information indicating the residual power capacity of the power supply 111. An example of the information indicating the residual power capacity of the power supply 111 is information indicating the ratio of the residual capacity to the maximum value of electric power storable in the power supply 111 as a reference value. This configuration en-

ables the terminal device 200 to detect low residual power capacity and provide for the user a suggestion that the power supply 111 is to be charged.

[0108] The battery information may include information indicating degradation of the power supply 111. In an example, whether the power supply 111 is degraded may be determined using State of Health (SOH). In this case, given that the full charge capacity at the initial time is 100%, when the ratio of the full charge capacity at the present time is lower than or equal to a predetermined threshold, the controller 116 determines that the power supply 111 is degraded. In another example, whether the power supply 111 is degraded may be determined using cycle count. In this case, the controller 116 adds one cycle to the count every time the total of accumulated charging current reaches the full charge capacity; when the count exceeds a predetermined threshold, the controller 116 determines that the power supply 111 is degraded. When it is determined that the power supply 111 is degraded, the battery information including the information indicating degradation of the power supply 111 is transmitted. This configuration enables the terminal device 200 to detect degradation of the power supply 111 and provide for the user a suggestion that degradation of the power supply 111 is to be dealt with.

[0109] The battery information may be transmitted when connection between the inhaler device 100 and the terminal device 200 is established. In an example, connection is established at a time before heating with the heater 121 is started, such as the time when the state of the lid 14 is changed from the close state to the release state; at this time, the battery information may be transmitted. This configuration enables the user to be notified of the state of the power supply 111 before the stick substrate 150 is heated. In another example, connection is established when charging of the power supply 111 is started; at this time, the battery information may be transmitted. This configuration enables the user to be notified of the state of the power supply 111 before charging.

[0110] The battery information may be transmitted before connection between the inhaler device 100 and the terminal device 200 is disconnected. In an example, at a time after heating with the heater 121 is ended, such as the time when the state of the lid 14 is changed from the release state to the close state, the battery information may be transmitted. This configuration enables the user to be notified of the state of the power supply 111 after the stick substrate 150 is heated. In another example, when charging of the power supply 111 is ended, the battery information may be transmitted. This configuration enables the user to be notified of the state of the power supply 111 after charging.

[0111] The inhaler device 100 may notify the user of the battery information using the notifier 113. This configuration enables the user to be notified of the state of the power supply 111 by using only the inhaler device 100.

(8) Log information

[0112] The inhaler device 100 stores log information in the memory 114. The log information is information that is acquired in the use of the inhaler device 100 by the user and stored in the memory 114. The inhaler device 100 transmits the log information stored in the memory 114 to the terminal device 200. It is assumed that the inhaler device 100 and the terminal device 200 are not always connected to each other. Hence, the inhaler device 100 continues to collect the log information while the inhaler device 100 is not connected to the terminal device 200; when the inhaler device 100 is connected to the terminal device 200, the inhaler device 100 transmits the collected log information.

[0113] The terminal device 200 forwards the log information received from the inhaler device 100 to another device. An example of the other device is a server for providing services relating to the inhaler device 100. The server collects and analyzes the log information to use the log information for services such as update of the firmware on the inhaler device 100.

Information acquired in heating session

[0114] The log information may include information acquired in the heating session, specifically in one heating session. When heating with the heater 121 is performed, the memory 114 stores information acquired in the heating session as the log information. With this configuration, it is possible to later examine the states during the heating session.

[0115] The information acquired in the heating session may include information for identifying the heating session. An example of the information for identifying the heating session is inhalation start time information indicating a time when puff is performed for the first time in the heating session, that is, a time when puff is performed for the first time since heating is started. With this configuration, it is possible to later examine intervals between heating sessions and the number of heating sessions per day.

[0116] The information acquired in the heating session may include information indicating the causal condition of the grant of permission for heating with the heater 121. The information indicating the causal condition of the grant of permission for heating includes one of the following kinds of information: information indicating that heating is permitted by the first lock function, information indicating that heating is permitted by the second lock function, and information indicating that the first lock function and the second lock function are disabled. In the case in which the first lock function is enabled, when the operation corresponding to the operating pattern that is set with the first lock function is performed to initiate the unlocked state, and heating is performed, the information indicating the causal condition of the grant of permission for heating includes the information indicating that heat-

ing is permitted by the first lock function. In the case in which the second lock function is enabled, when the unlocked state is initiated because the inhaler device 100 and the terminal device 200 is in communication with each other, and heating is performed, the information indicating the causal condition of the grant of permission for heating includes the information indicating that heating is permitted by the second lock function. In the case in which both of the first lock function and the second lock function are disabled, when heating is performed, the information indicating the causal condition of the grant of permission for heating includes the information indicating that the first lock function and the second lock function are disabled. With this configuration, it is possible to perform an analysis about the use of the first lock function and the second lock function.

[0117] The information acquired in the heating session may include the time length of the heating session. With this configuration, it is possible to later examine the time length of the heating session.

[0118] The information acquired in the heating session may include the information indicating the number of puffs performed during the heating session. With this configuration, it is possible to later examine the number of puffs performed during the heating session.

[0119] The information acquired in the heating session may include information indicating the time when puff is performed in the heating session. A plurality of puffs may be performed during the heating session. In this case, the information acquired in the heating session includes information about one or more puffs, indicating the time when each puff is performed in the heating session. With this configuration, it is possible to later examine the timing of puff performed in the heating session.

[0120] The information acquired in the heating session may include information indicating the degradation state of the power supply 111. The information indicating the degradation state of the power supply 111 may be, for example, given that the full charge capacity at the initial time is 100%, the ratio of the full charge capacity at the present time, or may be the number of times the total of accumulated charging current has reached the full charge capacity. With this configuration, it is possible to later examine the transition of the degradation state.

Information indicating operational history

[0121] The log information may include information indicating the operational history of the inhaler device 100. With this configuration, it is possible to later examine the history of operations performed so far by the inhaler device 100.

[0122] The information indicating the operational history may include the total time for which the heater 121 has performed heating since the inhaler device 100 was activated for the first time. With this configuration, it is possible to examine the time length for which heating with the heater 121 has been performed in the entire life

cycle of the inhaler device 100.

[0123] The information indicating the operational history may include the time having elapsed since the inhaler device 100 was activated for the first time. With this configuration, it is possible to examine the time length of the entire life cycle of the inhaler device 100.

[0124] The information indicating the operational history may include the number of times the heater 121 has performed heating since the inhaler device 100 was activated for the first time. With this configuration, it is possible to examine the number of times of heating in the entire life cycle of the inhaler device 100.

[0125] The information indicating the operational history may include the history of errors having occurred since the inhaler device 100 was activated for the first time. With this configuration, it is possible to examine errors having occurred in the entire life cycle of the inhaler device 100.

20 Information indicating residual power capacity

[0126] The log information may include the information indicating the residual power capacity of the power supply 111. The memory 114 stores as the log information the information indicating the residual power capacity out of the battery information acquired to be transmitted to the terminal device 200. With this configuration, it is possible to later examine the transition of the residual power capacity of the power supply 111.

30 Information acquired during charging

[0127] The log information may include information acquired during charging. When the power supply 111 is charged, the memory 114 stores as the log information the information acquired during charging of the power supply 111.

[0128] An example of the information acquired during charging is information indicating the time when charging is started and information indicating the residual power capacity at the charging start time point. Another example of the information acquired during charging is information indicating the time when charging is ended and information indicating the residual power capacity at the charging end time point. With this configuration, it is possible to examine the history of charging by the user.

Timing of log information transmission

50 **[0129]** The terminal device 200 may control the timing of transmission of the log information by the inhaler device 100. Specifically, the terminal device 200 transmits to the inhaler device 100 a log request for an operation for transmitting the log information. The inhaler device 100 performs the operation requested by the received log request. For example, the terminal device 200 transmits a log request that the inhaler device 100 transmit the log information, the inhaler device 100 receives the

log request and transmits the log information. This configuration enables the inhaler device 100 to transmit the log information at proper timings under the control of the terminal device 200.

(9) State information

[0130] The inhaler device 100 transmits state information indicating the state of the inhaler device 100 to the terminal device 200. This configuration enables the terminal device 200 to monitor in real time the state of the inhaler device 100 based on the received state information.

Information indicating state of heater 121

[0131] The state information may include information indicating the state of the heater 121. In particular, the state information may include information indicating how heating with the heater 121 is progressing. During the heating session, the inhaler device 100 transmits the state information indicating how heating with the heater 121 is progressing. This configuration enables the terminal device 200 to monitor in real time the state of the heater 121 during the heating session based on the state information.

[0132] In an example, the state information may include information indicating that heating with the heater 121 has been started. The inhaler device 100 transmits the state information when heating based on the heating profile is started.

[0133] In another example, the state information may include information indicating that preliminary heating has been ended, in other words, the puff available period has started. The inhaler device 100 transmits the state information, for example, when a predetermined time has elapsed since heating based on the heating profile was started.

[0134] In another example, the state information may include information indicating a predetermined time prior to the end of the puff available period. The inhaler device 100 transmits the state information, for example, when supply of electric power to the heater 121 is ended.

[0135] In another example, the state information may include information indicating that the puff available period has ended. The inhaler device 100 transmits the state information, for example, when a predetermined time has elapsed since supply of electric power to the heater 121 was ended.

Information indicating state of lid 14

[0136] The state information may include information indicating the state of the lid 14. In an example, the state information may include information indicating that the state of the lid 14 is the release state or the close state. When the state of the lid 14 is changed, the inhaler device 100 transmits the state information indicating the state

of the lid 14 after change. This configuration enables the terminal device 200 to monitor in real time the state of the lid 14 based on the state information.

5 Information indicating state of charge of power supply 111

[0137] The state information may include information indicating the state of charge of the power supply 111. In an example, the state information may include information indicating the ratio of the present level of charge to the full charge capacity of the power supply 111. The inhaler device 100 is operable to transmit during charging the state information including the information indicating the state of charge of the power supply 111. This configuration enables the terminal device 200 to monitor in real time the state of charge of the power supply 111 based on the state information.

20 (10) Connection control based on residual power capacity

[0138] The inhaler device 100 compares the residual power capacity of the power supply 111 with a threshold. Based on the comparison result, the inhaler device 100 provides control to determine whether to perform a procedure for establishing connection between the inhaler device 100 and another device (specifically, the terminal device 200). With this configuration, whether to establish connection between the inhaler device 100 and the terminal device 200 is determined based on the residual power capacity of the inhaler device 100. As a result, the inhaler device 100 is operable to perform communication suitably for the residual power capacity. In the following, the threshold described above is also referred to as the connection threshold, and the procedure described above is also referred to as the connection procedure.

[0139] Specifically, when the residual power capacity of the power supply 111 is more than or equal to the connection threshold, the inhaler device 100 performs the connection procedure; when the residual power capacity of the power supply 111 is less than the connection threshold, the inhaler device 100 does not perform the connection procedure. This means that the inhaler device 100 performs the connection procedure in limited cases in which the residual power capacity is at an adequate level that is more than or equal to the connection threshold. This configuration avoids the case in which although the residual power capacity is at an inadequate level, the connection procedure is performed, and the residual power capacity becomes insufficient.

[0140] The connection procedure includes transmitting and receiving signals for establishing connection. More specifically, the connection procedure performed by the inhaler device 100 includes transmitting a signal for triggering the start of the connection procedure. An example of the signal for triggering the start of the connection procedure is advertising data. The connection

procedure performed by the inhaler device 100 also includes, after transmitting advertising data, waiting to receive a signal transmitted by the terminal device 200 having received the advertising data. While waiting to receive the signal, the inhaler device 100 receives from the terminal device 200 a connection request that is a signal for requesting connection; in response to this, the inhaler device 100 establishes connection with the terminal device 200.

[0141] The connection procedure may include pairing. When the inhaler device 100 and the terminal device 200 are not paired, pairing is firstly performed, and connection is then established. In this case, the connection procedure includes at least causing the inhaler device 100 and the terminal device 200 to exchange encryption keys used for encryption of information to be transmitted and received between the inhaler device 100 and the terminal device 200. With this configuration, when the inhaler device 100 and the terminal device 200 are not paired, it is possible to provide control to determine whether to perform the connection procedure, while taking into account the amount of electric power for pairing.

[0142] The connection procedure can be triggered by a release of the lid 14 from the opening 142, in other words, triggered by a change of the state of the lid 14 to the release state. As a result, in response to a release of the lid 14 from the opening 142 as a trigger, the inhaler device 100 may provide control to determine whether to perform the connection procedure. Specifically, in response to a release of the lid 14 from the opening 142 as a trigger, the inhaler device 100 may compare the residual power capacity of the power supply 111 with the connection threshold, and based on the comparison result, the inhaler device 100 may provide control to determine whether to perform the connection procedure. In the state in which the lid 14 is released from the opening 142, the stick substrate 150 is heated. In this respect, with this configuration, it is possible to provide control to determine whether to perform the connection procedure, while taking into account the amount of electric power to be used for heating of the stick substrate 150 in later stages.

Setting of connection threshold

[0143] The connection threshold is a value greater than or equal to the amount of electric power used to perform an operation of heating the stick substrate 150 with the heater 121 to generate an aerosol a predetermined number of times. The operation of heating the stick substrate 150 to generate an aerosol is performed once for one stick substrate 150; the predetermined number of times corresponds to the number of stick substrates 150 consumed. Here, to consume means to heat the stick substrate 150 based on the heating profile from start to end without interruption. Thus, the connection threshold is a value greater than or equal to the amount of electric power used to consume the predetermined number of

stick substrates 150. With this configuration, in limited cases in which the residual power capacity of the power supply 111 is greater than or equal to the amount of electric power used to consume the predetermined number of stick substrates 150, the connection procedure is performed. As a result, it is possible to avoid the case in which when the connection procedure is performed, the predetermined number of stick substrates 150 are not consumed due to the shortage of the residual power capacity.

[0144] The predetermined number of times may be 1. In this case, in limited cases in which the residual power capacity is enough to consume one stick substrate 150, the inhaler device 100 performs the connection procedure. With this configuration, it is possible to avoid the case in which when the connection procedure is performed, even one stick substrate 150 is not consumed.

[0145] The inhaler device 100 according to the present embodiment performs the connection procedure before starting heating of the stick substrate 150. This is for the purpose of communicating with the terminal device 200 during, before, or after heating of the stick substrate 150. For this reason, it is desirable that the connection threshold be determined by taking into account the electric power used for communication of these occasions.

[0146] It is thus desirable that the connection threshold be a value greater than or equal to the sum of the amount of electric power used to perform the operation of heating the stick substrate 150 with the heater 121 to generate an aerosol the predetermined number of times and the amount of electric power used to perform the connection procedure. Here, the amount of electric power used to perform the connection procedure is, for example, the amount of electric power used to transmit advertising data and wait to receive the connection request. With this configuration, in limited cases in which the residual power capacity of the power supply 111 is greater than or equal to the connection threshold determined by taking into account the amount of electric power used to perform the connection procedure, the connection procedure is performed. As a result, it is possible to avoid the case in which because the connection procedure is performed, the residual power capacity becomes insufficient, and the predetermined number of stick substrates 150 are not consumed.

[0147] It is further desirable that the connection threshold be a value greater than or equal to the sum of the amount of electric power used to perform the operation of heating the stick substrate 150 with the heater 121 to generate an aerosol the predetermined number of times, the amount of electric power used to perform the connection procedure, and the amount of electric power used for accompanying communication performed between the inhaler device 100 and the terminal device 200 while the operation of heating the stick substrate 150 with the heater 121 to generate an aerosol is performed the predetermined number of times. While the predetermined number of stick substrates 150 are being consumed, var-

ious kinds of accompanying communication are performed, which will be described in detail later. In this respect, with this configuration, in limited cases in which the residual power capacity of the power supply 111 is greater than or equal to the connection threshold determined by taking into account the amount of electric power used for accompanying communication performed while the predetermined number of stick substrates 150 are consumed, the connection procedure is performed. As a result, it is possible to avoid the case in which because the connection procedure is performed, the residual power capacity becomes insufficient, and the predetermined number of stick substrates 150 are not consumed, or the accompanying communication is not performed.

[0148] An example of the accompanying communication performed while the predetermined number of stick substrates 150 are consumed is transmission by the inhaler device 100 of the battery information. In an example, the inhaler device 100 may establish connection with the terminal device 200 at a time before heating with the heater 121 is started, such as the time when the state of the lid 14 is changed from the close state to the release state; at this time, the inhaler device 100 may transmit the battery information. In another example, at a time after heating with the heater 121 is ended, such as the time when the state of the lid 14 is changed from the release state to the close state, the inhaler device 100 may transmit the battery information. For this, the connection threshold may be set by taking into account the amount of electric power used to transmit the battery information. With this configuration, it is possible to avoid the case in which because the connection procedure is performed, the residual power capacity becomes insufficient, and the predetermined number of stick substrates 150 are not consumed, or accompanying transmission of the battery information is not performed.

[0149] An example of the accompanying communication performed while the predetermined number of stick substrates 150 are consumed is transmission by the inhaler device 100 of the state information indicating the state of the heater 121. In an example, during the heating session, the inhaler device 100 can transmit the state information indicating how heating with the heater 121 is progressing. For this, the connection threshold may be set by taking into account the amount of electric power used to transmit the state information. With this configuration, it is possible to avoid the case in which because the connection procedure is performed, the residual power capacity becomes insufficient, and the predetermined number of stick substrates 150 are not consumed, or accompanying transmission of the state information is not performed.

[0150] An example of the accompanying communication performed while the predetermined number of stick substrates 150 are consumed is transmission by the inhaler device 100 of the log information acquired when the operation of heating the stick substrate 150 to generate an aerosol is performed. In an example, the inhaler

device 100 can transmit the log information acquired during the heating session after the heating session ends. For this, the connection threshold may be set by taking into account the amount of electric power used to transmit the log information. With this configuration, it is possible to avoid the case in which because the connection procedure is performed, the residual power capacity becomes insufficient, and the predetermined number of stick substrates 150 are not consumed, or accompanying transmission of the log information is not performed.

[0151] The inhaler device 100 may identify the stick substrate 150 targeted for heating. The stick substrate 150 targeted for heating is the stick substrate 150 inserted in the inhaler device 100. For example, identification information for identifying the stick substrate 150 such as a two-dimensional code may be attached to the stick substrate 150. In this case, the inhaler device 100 reads the identification information attached to the inserted stick substrate 150 to identify the stick substrate 150. The inhaler device 100 may set the connection threshold based on the identification result about the stick substrate 150. Changes in temperature can vary among individual stick substrates 150, and thus, the amount of electric power used to consume one stick substrate 150 can also vary. In this respect, with this configuration, it is possible to provide control to determine whether to perform the connection procedure, suitably to each stick substrate 150.

[0152] As described above, the inhaler device 100 causes the heater 121 to operate based on the heating profile. The inhaler device 100 may change the heating profile for use. For example, the inhaler device 100 changes the heating profile for use depending on the user operation or the stick substrate 150 to be used. At this time, the inhaler device 100 may set the connection threshold depending on the heating profile for use. The target temperature and the time length can vary among individual heating profiles, and thus, the amount of electric power used to consume one stick substrate 150 can also vary. In this respect, with this configuration, it is possible to provide control to determine whether to perform the connection procedure, suitably to each heating profile.

45 Operation when residual power capacity is less than connection threshold

[0153] When the residual power capacity of the power supply 111 is less than the connection threshold, the inhaler device 100 does not perform the connection procedure. When the residual power capacity of the power supply 111 is less than the connection threshold, the inhaler device 100 may provide other kinds of control.

[0154] An example of the other kinds of control is not heating the stick substrate 150. When the residual power capacity of the power supply 111 is less than the connection threshold, if the stick substrate 150 is heated, heating can be suspended in the middle of the heating

profile due to the shortage of the residual power capacity. In this respect, with this configuration, it is possible to avoid the case in which the stick substrate 150 is not completely consumed due to the shortage of the residual power capacity.

[0155] An example of the other kinds of control is heating the stick substrate 150. For example, it can be assumed that although the residual power capacity of the power supply 111 is less than the connection threshold, the connection threshold is a value greater than or equal to the amount of electric power used to perform an operation of heating the stick substrate 150 with the heater 121 to generate an aerosol a predetermined number of times. In such a case, by reducing power consumption by not communicating with the terminal device 200, it is possible to perform the operation of heating the stick substrate 150 with the heater 121 to generate an aerosol the predetermined number of times. With this configuration, although no service based on communication between the inhaler device 100 and the terminal device 200 is provided, it is possible to provide an aerosol for the user.

[0156] An example of the other kinds of control is notifying the user of information indicating that the residual power capacity of the power supply 111 is less than the connection threshold. The inhaler device 100 provides the information using the notifier 113.

(11) Process flow

Overall process relating to heating session

[0157] Fig. 5 is a sequence diagram illustrating an example of an overall process relating to the heating session performed in the system 1 according to the present embodiment. The inhaler device 100 and the terminal device 200 are involved in this sequence.

[0158] As illustrated in Fig. 5, firstly, the inhaler device 100 receives an operation for changing the state of the lid 14 to the release state (step S102).

[0159] Subsequently, the inhaler device 100 and the terminal device 200 establish connection (step S104). For example, the inhaler device 100 transmits advertising data, and the inhaler device 100 and the terminal device 200 having received advertising data perform the procedure for establishing connection.

[0160] Next, the inhaler device 100 transmits the battery information to the terminal device 200 (step S106).

[0161] Subsequently, the inhaler device 100 initiates the unlocked state (step S108). For example, because the state of the lid 14 is the release state, and regarding the second lock function, the inhaler device 100 is in communication with the terminal device 200, the inhaler device 100 initiates the unlocked state.

[0162] Next, the inhaler device 100 receives the operation for providing an instruction to start heating (step S110).

[0163] Subsequently, the inhaler device 100 starts heating based on the heating profile (step S112).

[0164] Next, the inhaler device 100 transmits the state information including the information indicating the state of the heater 121 to the terminal device 200 (step S114).

[0165] Subsequently, the inhaler device 100 determines whether the heating session has ended (step S116). For example, when the time having elapsed since heating based on the heating profile is started exceeds a predetermined threshold, the inhaler device 100 determines that the heating session has ended. Alternatively, when the number of puffs performed during the heating session reaches the predetermined upper limit, the inhaler device 100 determines that the heating session has ended. When it is determined that the heating session has not ended (NO in step S116), the process returns again to step S114.

[0166] When it is determined that the heating session has ended (YES in step S116), the inhaler device 100 determines whether an operation for changing the state of the lid 14 to the close state has been performed (step S118). When it is determined that an operation for changing the state of the lid 14 to the close state has not been performed (NO in step S118), the inhaler device 100 waits until an operation for changing the state of the lid 14 to the close state is performed.

[0167] When it is determined that an operation for changing the state of the lid 14 to the close state has been performed (YES in step S118), the inhaler device 100 transmits the state information including information indicating that the state of the lid 14 has been changed to the close state, and the battery information to the terminal device 200 (step S120).

[0168] Next, the terminal device 200 transmits the setting information to the inhaler device 100 (step S122). Next, in response to receiving the setting information, the inhaler device 100 configures settings based on the received setting information (step S124). The inhaler device 100 then transmits the setting completion notification to the terminal device 200 (step S126). When no user input for changing the settings on the inhaler device 100 is performed on the terminal device 200, the operations in steps S 122 to S 126 are not performed.

[0169] Subsequently, the terminal device 200 transmits to the inhaler device 100 the log request for the operation for transmitting the log information (step S128).

[0170] Next, in response to receiving the log request, the inhaler device 100 transmits the requested log information to the terminal device 200 (step S130). For example, as the log information, the inhaler device 100 transmits information acquired in steps S112 to S116 during the heating session.

[0171] Afterward, the inhaler device 100 and the terminal device 200 disconnect connection (step S132). For example, when no user operation has been detected for a predetermined time or longer, and no log request is received, the inhaler device 100 disconnects connection with the terminal device 200.

Overall process relating to charging

[0172] Fig. 6 is a sequence diagram illustrating an example of an overall process relating to charging performed in the system 1 according to the present embodiment. The inhaler device 100 and the terminal device 200 are involved in this sequence.

[0173] As illustrated in Fig. 6, firstly, the inhaler device 100 starts charging (step S202). When the inhaler device 100 is connected to the external power supply, the inhaler device 100 starts charging.

[0174] Subsequently, the inhaler device 100 and the terminal device 200 establish connection (step S204). For example, the inhaler device 100 transmits advertising data, and the inhaler device 100 and the terminal device 200 having received advertising data perform the procedure for establishing connection.

[0175] Next, the inhaler device 100 transmits the battery information to the terminal device 200 (step S206).

[0176] Subsequently, the inhaler device 100 transmits the state information including the information indicating the state of charge of the power supply 111 to the terminal device 200 (step S208).

[0177] Next, the inhaler device 100 determines whether charging has ended (step S210). When the connection with the external power supply is disconnected, the inhaler device 100 stops charging. When it is determined that charging has not ended (NO in step S210), the process returns again to step S208.

[0178] When it is determined that charging has ended (YES in step S210), the inhaler device 100 transmits the state information including information indicating the state of charge of the power supply 111, and the battery information to the terminal device 200 (step S212).

[0179] Subsequently, the terminal device 200 transmits the setting information to the inhaler device 100 (step S214). Next, in response to receiving the setting information, the inhaler device 100 configures settings based on the received setting information (step S216). The inhaler device 100 then transmits the setting completion notification to the terminal device 200 (step S218). When no user input for changing the settings on the inhaler device 100 is performed on the terminal device 200, the operations in steps S214 to S218 are not performed.

[0180] Subsequently, the terminal device 200 transmits to the inhaler device 100 the log request for the operation for transmitting the log information (step S220).

[0181] Next, in response to receiving the log request, the inhaler device 100 transmits the requested log information to the terminal device 200 (step S222). For example, as the log information, the inhaler device 100 transmits information acquired during charging performed in steps S202 to S210.

[0182] Afterward, the inhaler device 100 and the terminal device 200 disconnect connection (step S224). For example, when no user operation has been detected for a predetermined time or longer, and no log request is received, the inhaler device 100 disconnects connection

with the terminal device 200.

Connection control process based on residual power capacity

[0183] Fig. 7 is a flowchart illustrating an example of a flow of a connection control process based on the residual power capacity, implemented by the inhaler device 100 according to the present embodiment.

[0184] As illustrated in Fig. 7, firstly, the controller 116 determines whether an operation for changing the state of the lid 14 to the release state has been performed (step S302). For example, when the state of the lid 14 is changed from the close state to the release state, the controller 116 determines that an operation for changing the state of the lid 14 to the release state is performed. When it is determined that an operation for changing the state of the lid 14 to the release state has not been performed (NO in step S302), the controller 116 waits until an operation for changing the state of the lid 14 to the release state is performed.

[0185] When it is determined that an operation for changing the state of the lid 14 to the release state has been performed (YES in step S302), the controller 116 determines whether the residual power capacity of the power supply 111 is less than the connection threshold (step S304).

[0186] When it is determined that the residual power capacity of the power supply 111 is less than the connection threshold (YES in step S304), the controller 116 does not perform the connection procedure (step S306). Afterward, the process ends.

[0187] When the residual power capacity of the power supply 111 is more than or equal to the connection threshold (NO in step S304), the controller 116 performs the connection procedure (step S308). Afterward, the process ends.

3. Supplement

[0188] A preferred embodiment of the present invention has been described in detail with reference to the accompanying drawings, but the present invention is not limited to this example. It is understood that various modifications and alterations within the scope of the technical idea indicated in the appended claims may occur to those skilled in the art and are also embraced within the technical scope of the present invention.

[0189] In the embodiment described above, the connection procedure controlled based on whether the residual power capacity of the power supply 111 is less than the connection threshold is exemplified by the operations including transmitting advertising data and pairing. However, the present invention is not limited to this example. The connection procedure controlled based on whether the residual power capacity of the power supply 111 is less than the connection threshold may include supplying electric power from the power supply 111 to

the communicator 115. Specifically, when the residual power capacity of the power supply 111 is more than or equal to the connection threshold, it may be possible that the controller 116 supplies electric power to the communicator 115; when the residual power capacity of the power supply 111 is less than the connection threshold, it may be possible that the controller 116 does not supply electric power to the communicator 115. For example, in the state in which electric power is supplied to the communicator 115 (for example, a Bluetooth communication module), when the residual power capacity of the power supply 111 becomes less than the connection threshold, the controller 116 stops supply of electric power to the communicator 115. With this configuration, when the residual power capacity of the power supply 111 is less than the connection threshold, the communication function of the inhaler device 100 is stopped. As a result, power consumption for communication is reduced. As such, it is possible to more securely avoid the case in which the residual power capacity becomes insufficient.

[0190] In the embodiment described above, the example in which the inhaler device 100 heats the stick substrate 150 as the substrate containing an aerosol source to generate an aerosol is described, but the shape of the substrate is not limited to a stick-like shape. Another example of the shape of the substrate is a card-like shape. Another example of the shape of the substrate is a cube. Further, the inhaler device 100 may use, for example, a substrate shaped as a capsule including only a flavor source without containing any aerosol source to generate an aerosol to be inhaled by the user. In an example, a first substrate containing an aerosol source is provided, and a second substrate shaped as a capsule including a flavor source is positioned downstream with respect to the first substrate. When the aerosol generated by heating the first substrate passes through the second substrate, the flavor source included in the second substrate imparts flavor to the aerosol; the aerosol is delivered to the user.

[0191] The series of operations performed by the device described in this specification may be implemented by software, hardware, or a combination of software and hardware. A program as software is previously stored, for example, inside the device or in external storage media (non-transitory media). For example, when a computer for controlling the device described in this specification runs the program, the program is loaded on a RAM and executed by a processor such as a CPU. The storage medium may be, for example, a magnetic disk, optical disk, magneto-optical disk, or flash memory. Instead of using the storage medium, the computer program described above may be, for example, delivered through a network.

[0192] The operations described using a flowchart and sequence diagrams in this specification are not necessarily performed in the order illustrated. Some of the operational steps may be parallelly performed. Alternatively, additional operational steps may be used, or some

operational steps may be removed.

[0193] The following configurations are also embraced within the technical scope of the present invention.

(1) An inhaler device includes

a communicator configured to communicate with another device;
a heater configured to heat a substrate containing an aerosol source to generate an aerosol;
a power supply configured to store and supply electric power for operation of the inhaler device; and
a controller configured to control operation of the inhaler device.
In the inhaler device, the controller is configured to compare a residual power capacity of the power supply with a threshold and, based on a comparison result, provide control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device.

(2) In the inhaler device according to (1),

the controller is configured to
when the residual power capacity of the power supply is more than or equal to the threshold, perform the procedure, and
when the residual power capacity of the power supply is less than the threshold, not perform the procedure.

(3) In the inhaler device according to (1) or (2), the procedure includes transmitting and receiving a signal for establishing connection.

(4) In the inhaler device according to (3), the procedure includes transmitting a signal for triggering start of the procedure.

(5) In the inhaler device according to (3) or (4), the procedure includes causing the inhaler device and the other communication device to exchange encryption keys used for encryption of information to be transmitted and received between the inhaler device and the other communication device.

(6) In the inhaler device according to any one of (1) to (5),

the controller is configured to
when the residual power capacity of the power supply is more than or equal to the threshold, supply electric power to the communicator, and
when the residual power capacity of the power supply is less than the threshold, not supply electric power to the communicator.

(7) In the inhaler device according to any one of (1) to (6),

the threshold is a value greater than or equal to the amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times.

(8) In the inhaler device according to any one of (1) to (7),

the threshold is a value greater than or equal to the sum of the amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times and the amount of electric power used to perform the procedure.

(9) In the inhaler device according to any one of (1) to (8),

the threshold is a value greater than or equal to the sum of the amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times, the amount of electric power used to perform the procedure, and the amount of electric power used for accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times.

(10) In the inhaler device according to (9), the accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of battery information that is information indicating the state of the power supply.

(11) In the inhaler device according to (9) or (10), the accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of state information including information indicating the state of the heater.

(12) In the inhaler device according to any one of (9) to (11),

the accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of log information acquired when the operation of heating the substrate with the heater to generate an aerosol is performed.

(13) In the inhaler device according to (12), the log information includes information indicating the count of times an aerosol is inhaled during a time period from start to end of the operation for gener-

ating the aerosol with the heater.

(14) In the inhaler device according to (12) or (13), the log information includes information indicating the time when an aerosol is inhaled during a time period from start to end of the operation for generating the aerosol with the heater.

(15) In the inhaler device according to any one of (7) to (14),

the predetermined number of times is 1.

(16) In the inhaler device according to any one of (1) to (15),

the controller is configured to identify the substrate targeted for heating and set the threshold based on an identification result about the substrate.

(17) In the inhaler device according to any one of (1) to (16),

the controller is configured to control operation of the heater based on a heating profile specifying changes with time of a target resistance value that is a target value of resistance of the heater and set the threshold based on the heating profile in use.

(18) The inhaler device according to any one of (1) to (17) further includes

an opening in which the substrate is insertable; and

a lid with which the opening is openable and closable.

In the inhaler device, the controller is configured to, in response to a release of the lid from the opening as a trigger, provide control to determine whether to perform the procedure.

(19) A program is configured to cause a computer to execute a process. The computer is configured to control an inhaler device including a communicator configured to communicate with another device, a heater configured to heat a substrate containing an aerosol source to generate an aerosol, and a power supply configured to store and supply electric power for operation of the inhaler device.

[0194] The process includes comparing a residual power capacity of the power supply with a threshold and, based on a comparison result, providing control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device.

Reference Signs List

[0195]

1	system
100	inhaler device
111	power supply
112	sensor
113	notifier

114 memory
 115 communicator
 116 controller
 140 holder
 141 internal space
 142 opening
 143 bottom
 144 heat insulator
 150 stick substrate
 151 substrate
 152 inhalation port
 11 outer housing
 11A top housing
 11B bottom housing
 12 cover
 13 switch
 14 lid
 15 vent hole
 16 cap
 200 terminal device
 210 inputter
 220 outputter
 230 communicator
 240 memory
 250 controller

Claims

1. An inhaler device comprising:

a communicator configured to communicate with another device;
 a heater configured to heat a substrate containing an aerosol source to generate an aerosol;
 a power supply configured to store and supply electric power for operation of the inhaler device; and
 a controller configured to control operation of the inhaler device, wherein
 the controller is configured to compare a residual power capacity of the power supply with a threshold and, based on a comparison result, provide control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device.

2. The inhaler device according to claim 1, wherein

the controller is configured to
 when the residual power capacity of the power supply is more than or equal to the threshold, perform the procedure, and
 when the residual power capacity of the power supply is less than the threshold, not perform the procedure.

3. The inhaler device according to claim 1 or 2, wherein the procedure includes transmitting and receiving a signal for establishing connection.

5 4. The inhaler device according to claim 3, wherein the procedure includes transmitting a signal for triggering start of the procedure.

10 5. The inhaler device according to claim 3 or 4, wherein the procedure includes causing the inhaler device and the other communication device to exchange encryption keys used for encryption of information to be transmitted and received between the inhaler device and the other communication device.

15 6. The inhaler device according to any one of claims 1 to 5, wherein

20 the controller is configured to
 when the residual power capacity of the power supply is more than or equal to the threshold, supply electric power to the communicator, and
 when the residual power capacity of the power supply is less than the threshold, not supply electric power to the communicator.

25 7. The inhaler device according to any one of claims 1 to 6, wherein
 30 the threshold is a value greater than or equal to an amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times.

35 8. The inhaler device according to any one of claims 1 to 7, wherein
 40 the threshold is a value greater than or equal to a sum of an amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times and an amount of electric power used to perform the procedure.

45 9. The inhaler device according to any one of claims 1 to 8, wherein
 50 the threshold is a value greater than or equal to a sum of an amount of electric power used to perform an operation of heating the substrate with the heater to generate an aerosol a predetermined number of times, an amount of electric power used to perform the procedure, and an amount of electric power used for accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times.

55 10. The inhaler device according to claim 9, wherein the accompanying communication performed be-

tween the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of battery information that is information indicating a state of the power supply.

11. The inhaler device according to claim 9 or 10, wherein
the accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of state information including information indicating a state of the heater. 10
12. The inhaler device according to any one of claims 9 to 11, wherein
the accompanying communication performed between the inhaler device and the other communication device while the operation of heating the substrate with the heater to generate an aerosol is performed the predetermined number of times includes transmission with the communicator of log information acquired when the operation of heating the substrate with the heater to generate an aerosol is performed. 20 25 30
13. The inhaler device according to claim 12, wherein the log information includes information indicating a count of times an aerosol is inhaled during a time period from start to end of the operation for generating the aerosol with the heater. 35
14. The inhaler device according to claim 12 or 13, wherein
the log information includes information indicating a time when an aerosol is inhaled during a time period from start to end of the operation for generating the aerosol with the heater. 40
15. The inhaler device according to any one of claims 7 to 14, wherein
the predetermined number of times is 1. 45
16. The inhaler device according to any one of claims 1 to 15, wherein
the controller is configured to identify the substrate targeted for heating and set the threshold based on an identification result about the substrate. 50
17. The inhaler device according to any one of claims 1 to 16, wherein
the controller is configured to control operation of the heater based on a heating profile specifying changes 55

with time of a target resistance value that is a target value of resistance of the heater and set the threshold based on the heating profile in use.

- 5 18. The inhaler device according to any one of claims 1 to 17, further comprising:

an opening in which the substrate is insertable; and
a lid with which the opening is openable and closable, wherein
the controller is configured to, in response to a release of the lid from the opening as a trigger, provide control to determine whether to perform the procedure. 15
19. A program for causing a computer to execute a process, the computer being configured to control an inhaler device including a communicator configured to communicate with another device, a heater configured to heat a substrate containing an aerosol source to generate an aerosol, and a power supply configured to store and supply electric power for operation of the inhaler device, the process comprising:
comparing a residual power capacity of the power supply with a threshold and, based on a comparison result, providing control to determine whether to perform a procedure for establishing connection between the inhaler device and the other communication device. 20 25 30

FIG. 1

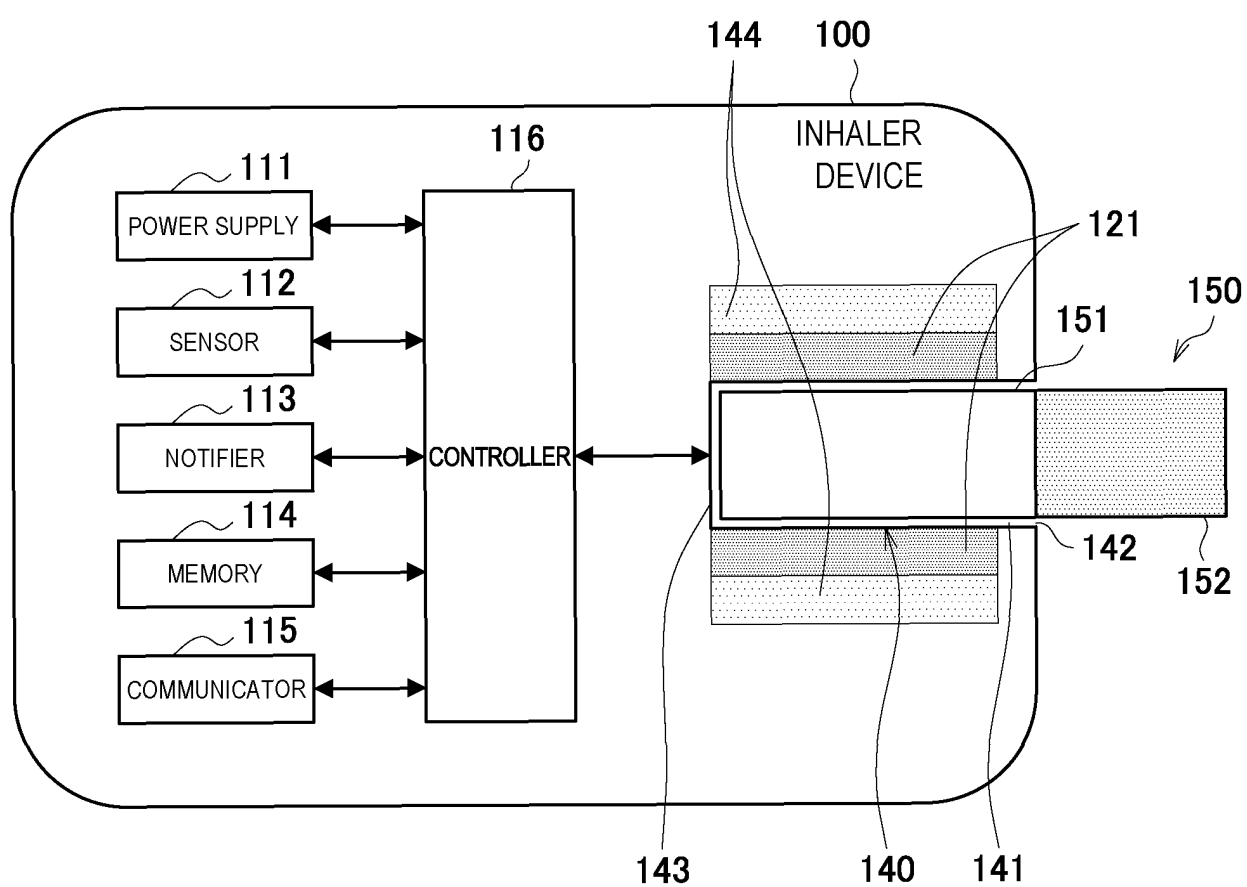


FIG. 2

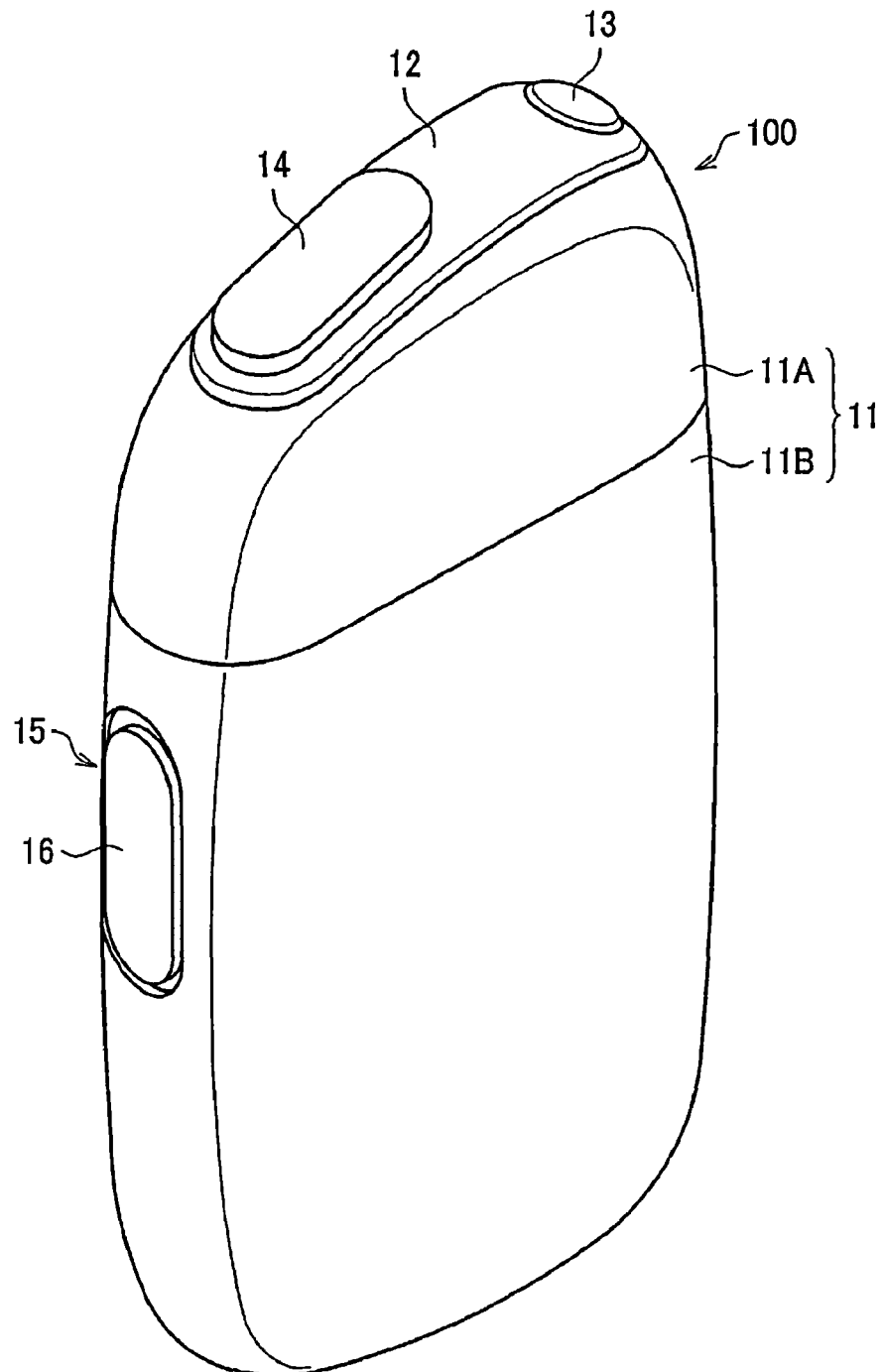


FIG. 3

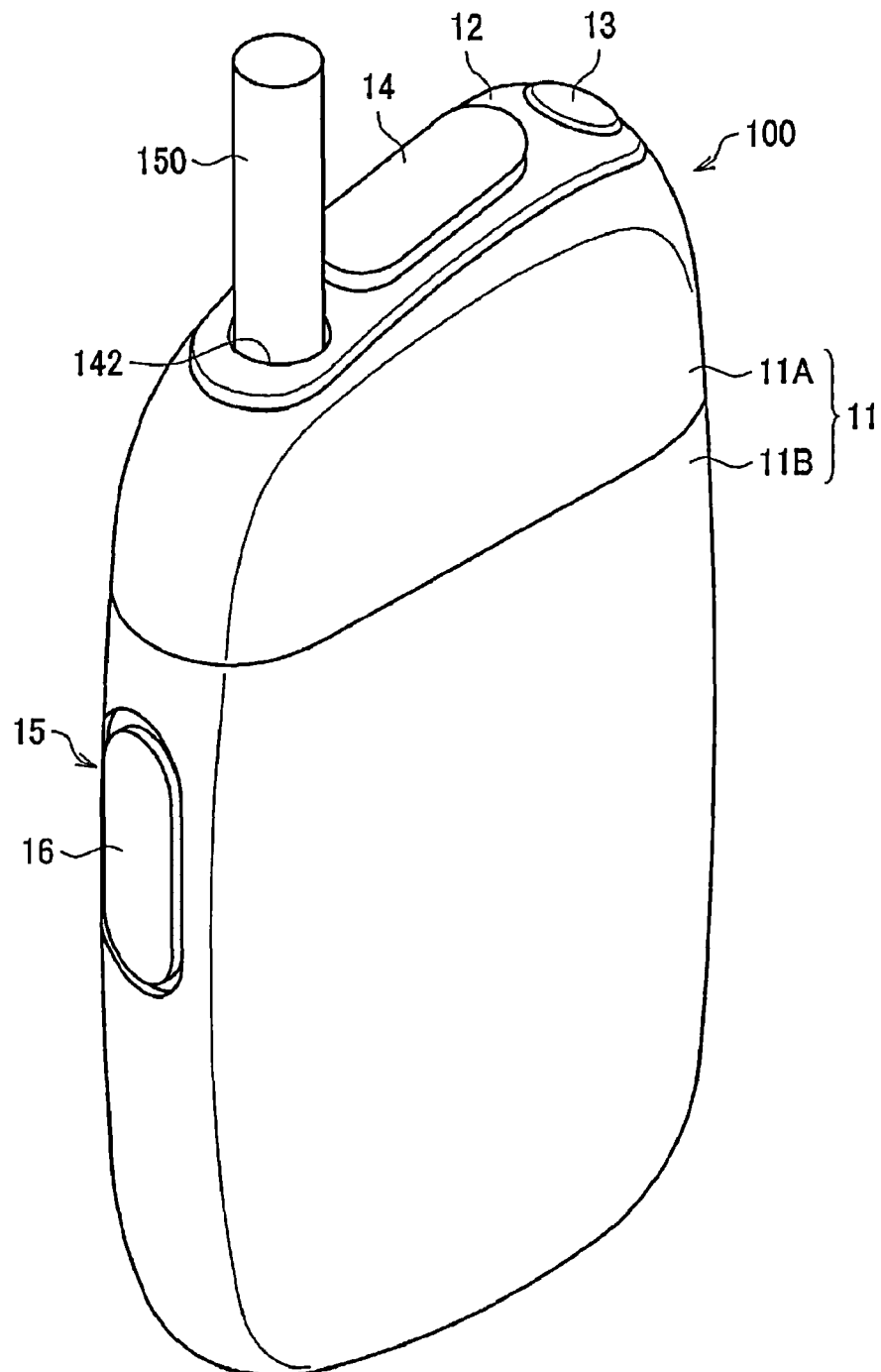


FIG. 4

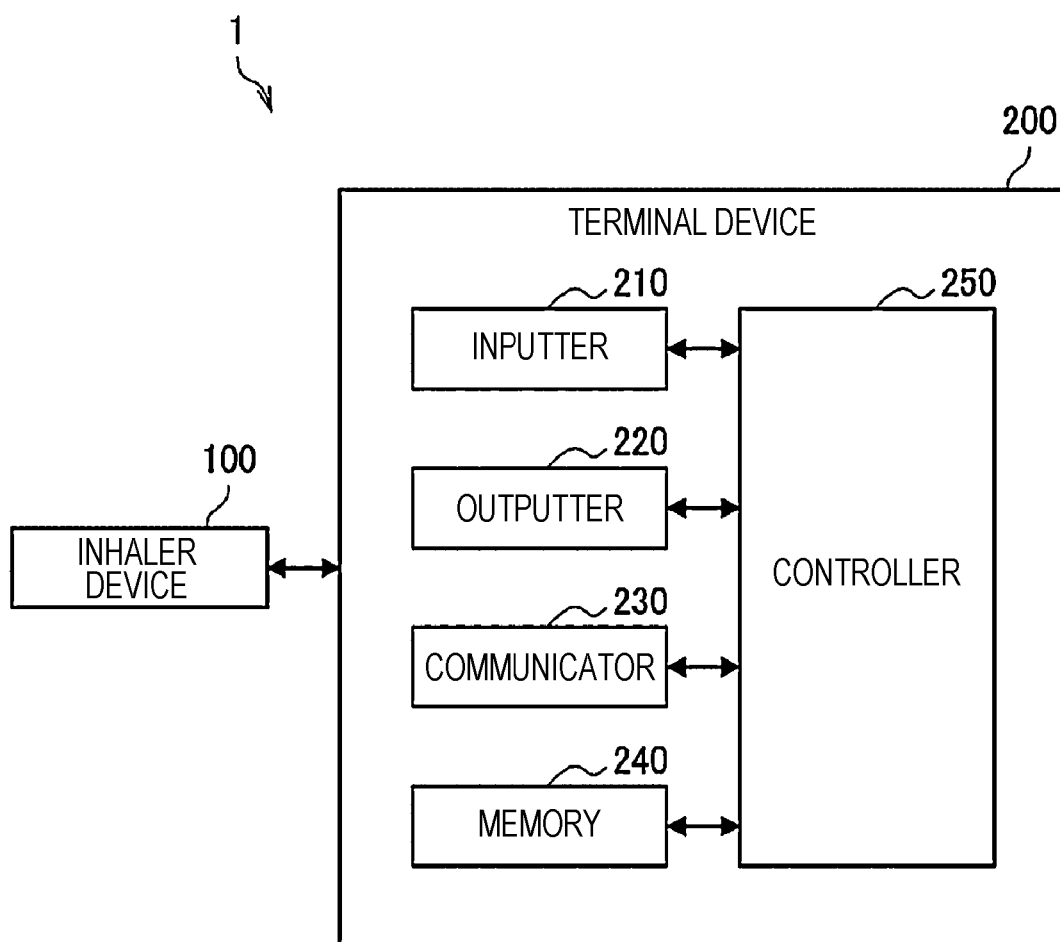


FIG. 5

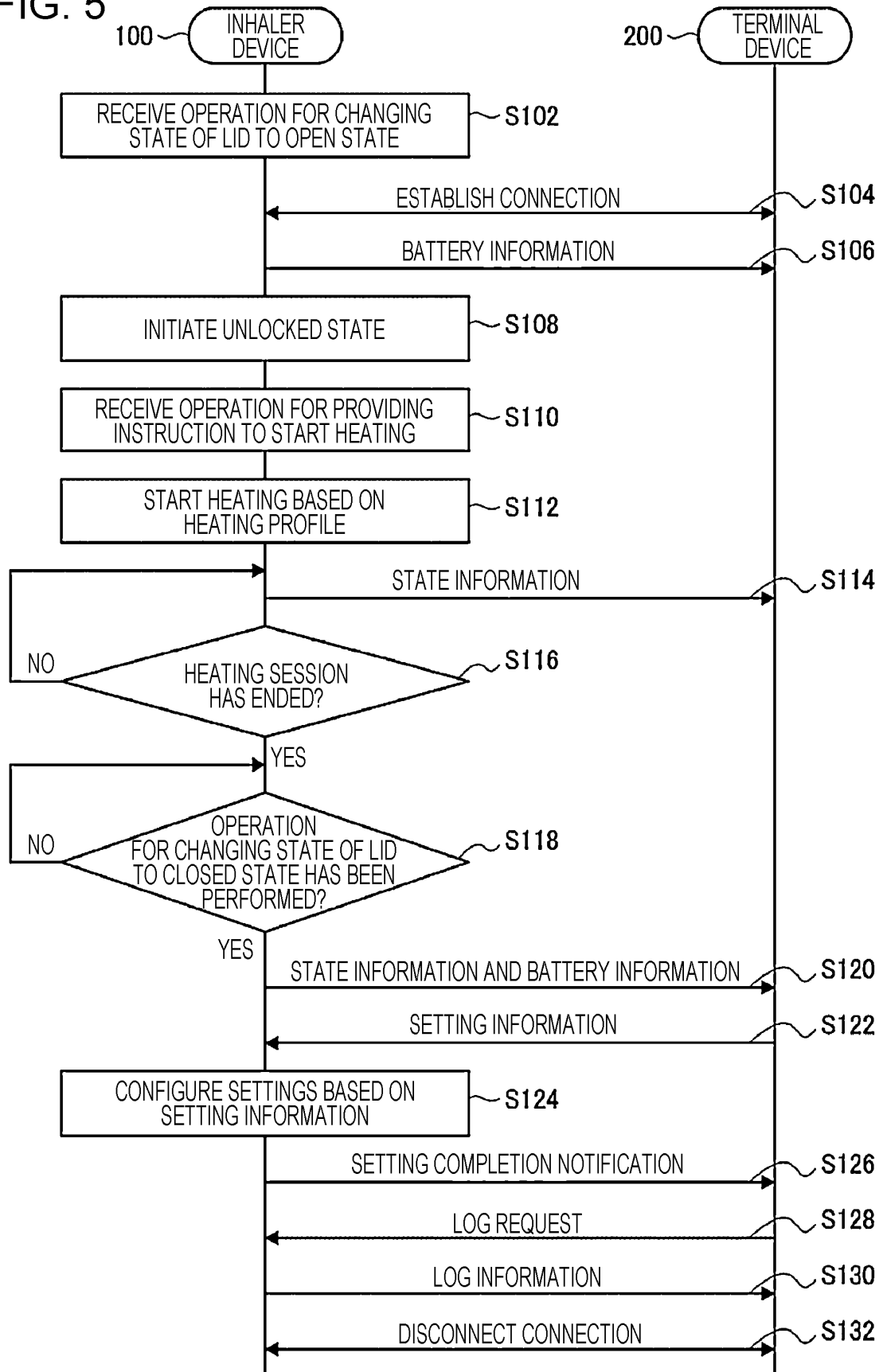


FIG. 6

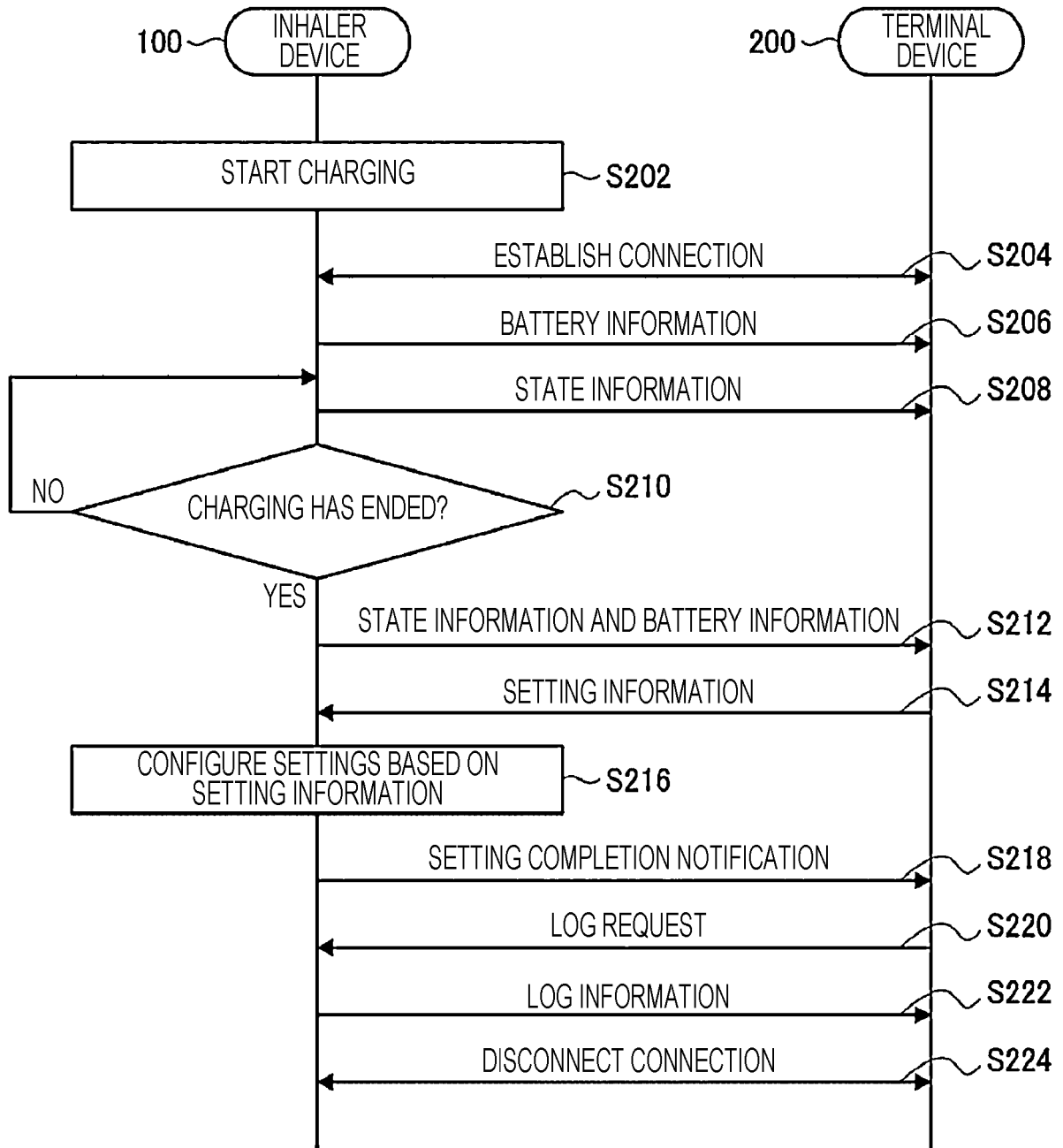
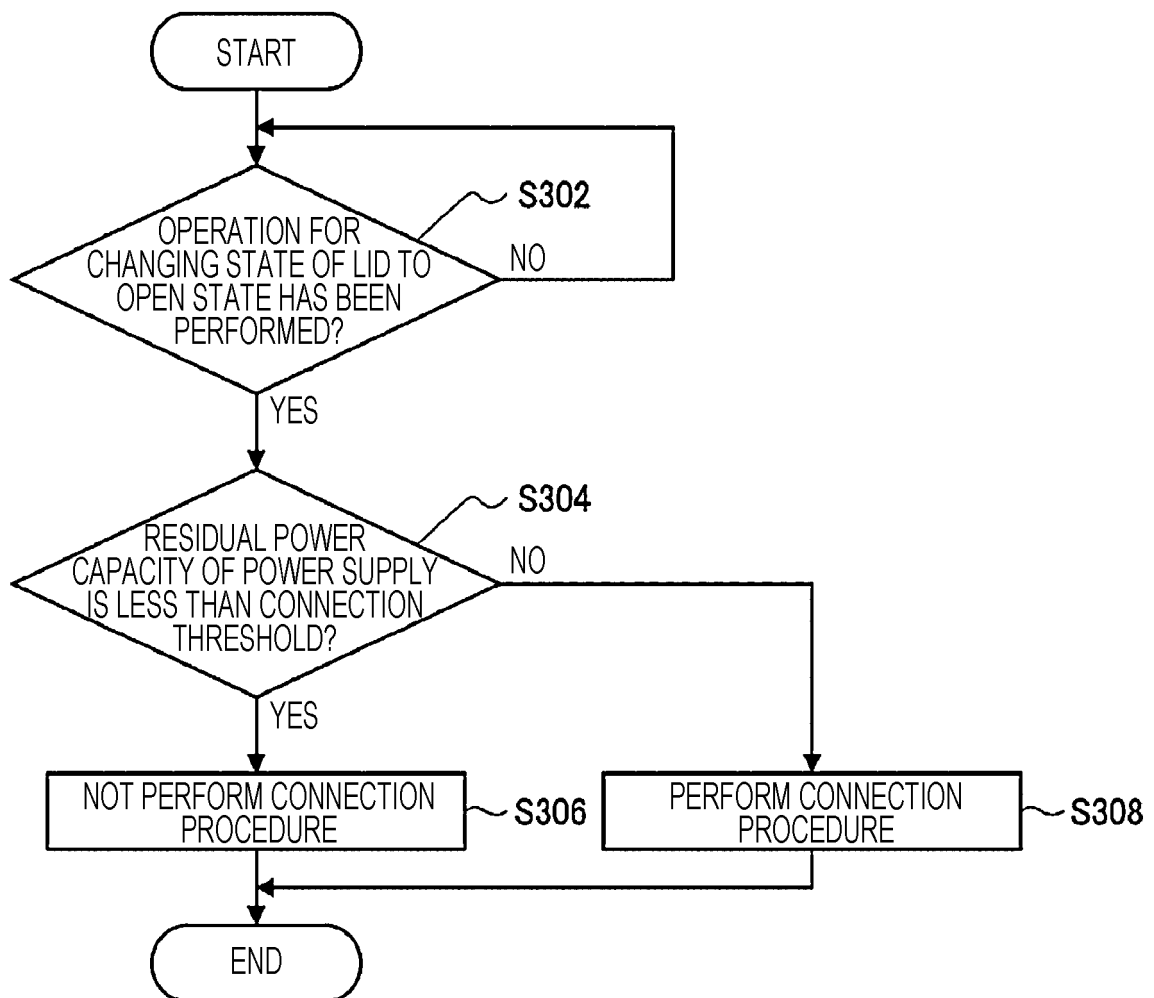


FIG. 7



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/047140

10

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

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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)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2019-524069 A (PHILIP MORRIS PRODUCTS S.A.) 05 September 2019 (2019-09-05) paragraphs [0070]- [0071], [0077]-[0079], fig. 1	1-6, 18-19 7-17
Y A	WO 2020/026320 A1 (JAPAN TOBACCO INC.) 06 February 2020 (2020-02-06) paragraphs [0028], [0031]-[0036], [0063]-[0070], fig. 1, 8A-8B	1-6, 18-19 7-17
Y	JP 2018-533924 A (NICOVENTURES HOLDINGS LTD.) 22 November 2018 (2018-11-22) paragraphs [0042], [0047]	4-6, 18
Y	WO 2020/084757 A1 (JAPAN TOBACCO INC.) 30 April 2020 (2020-04-30) paragraph [0079], fig. 1	18

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Further documents are listed in the continuation of Box C.



See patent family annex.

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* 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

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Date of the actual completion of the international search

18 January 2021 (18.01.2021)

Date of mailing of the international search report

02 February 2021 (02.02.2021)

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Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

International application no.

PCT/JP2020/047140

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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2019-524069 A	05 Sep. 2019	WO 2018/001910 A1 specification, page 12, lines 21-36, page 14, lines 5-34, fig. 1	
		EP 3479456 A1	
		TW 201800020 A	
		CA 3022344 A1	
		AU 2017288986 A1	
		SG 11201810688U A	
		CN 109314397 A	
		KR 10-2019-0022498 A	
		MX 2018015117 A	
		BR 112018075286 A2	
		ZA 201806764 B	
WO 2020/026320 A1	06 Feb. 2020	(Family: none)	
JP 2018-533924 A	22 Nov. 2018	US 2018/0303163 A1	
		paragraphs [0053], [0058]	
		WO 2017/055802 A1	
		EP 3355732 A1	
		AU 2016332616 A1	
		CA 2999709 A1	
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		CN 108135269 A	
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		BR 112018006109 A2	
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		CL 2018000794 A1	
		NZ 740653 A	
		HU E045339 T2	
		PL 3355732 T3	
		ES 2751059 T3	
WO 2020/084757 A1	30 Apr. 2020	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2020084757 A1 [0004]