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(54) **AEROSOL GENERATION DEVICE**

(57) An aerosol-generating device comprising: a heating unit for heating an aerosol source; a contact sensor for detecting an action on a predetermined part of a housing surface; and a processor for implementing a function to control heating of the aerosol source by the heating unit, and a function to control actions that can be accepted by the contact sensor, in accordance with an operating mode.

[Fig. 7]

Input action (operating mode)			Vibration pattern
L1		A Example 1: Activate (sleep)	
		B Example 2: Send heating profile (active)	
L2		A Example 1: Sleep (active)	
		B Example 2: Receive heating profile (active)	
L3	 	A Example 1: Modify heating temperature (active)	
		B Example 2: Select brand (active)	
L4		A Example 1: Start heating (active)	
		B Example 2: Stop heating (heating)	
L5		A Example 1: Check remaining battery capacity (active)	

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an aerosol-generating device.

BACKGROUND ART

[0002] Aerosol-generating devices which are portable electronic devices comprise push buttons and sliding switches. These actuators are displaced by a user action and therefore readily produce a sense of the action.

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: WO 2022/123796 A1

SUMMARY OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] Future aerosol-generating devices are expected to employ contact sensors. The use of contact sensors can offer the user novel ways of using the aerosol-generating device.

On the other hand, contact sensors are devices with which there is no mechanical displacement accompanying input of actions. A system for preventing situations in which an unintended operation is implemented without the user being aware of it is therefore needed.

[0005] In light of the problem above, the present disclosure provides technology for preventing unintended operation of an aerosol-generating device employing a contact sensor.

SOLUTION TO PROBLEM

[0006] One aspect of the present disclosure provides an aerosol-generating device comprising: a heating unit for heating an aerosol source; a contact sensor for detecting an action on a predetermined part of a housing surface; and a processor for implementing a function to control heating of the aerosol source by the heating unit, and a function to control actions that can be accepted by the contact sensor, in accordance with an operating mode.

[0007] Moreover, the processor may control a first input action to be acceptable when the operating mode is in a heating mode of the aerosol source, and may control a second input action, different from the first input action, to be acceptable when the operating mode is in a non-heating mode of the aerosol source.

[0008] The processor here may limit acceptance of input actions to action on a specific part when the oper-

ating mode is the aerosol source heating mode.

[0009] The specific part may be at least one housing face.

[0010] Moreover, the first input action may be an action relating to at least one of stopping heating of the aerosol source and checking a physical quantity.

[0011] The physical quantity here may be at least one of: remaining capacity in a battery constituting an electrical power source, number of aerosol sources inhalable with the remaining capacity, remaining amount of the aerosol source being used, remaining number of times for which the aerosol source being used is inhalable or remaining inhalation time, and cumulative value of number of inhalations up to the present time.

[0012] Moreover, the second input action may be an action to modify a control sequence used for heating the aerosol source.

[0013] The second input action here may constitute a first direction action to raise a maximum temperature to above that of the current control sequence, and a second direction action to lower the maximum temperature to below that of the current control sequence, the first direction action and the second direction action being actions in different directions.

[0014] The processor here may permit acceptance of actions by the contact sensor on the condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the heating mode.

[0015] Moreover, the processor may permit acceptance of actions by the contact sensor on the condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the non-heating mode.

[0016] Furthermore, the processor may permit acceptance of actions by the contact sensor only for a predetermined time after detection of the predetermined action by the acceleration sensor.

[0017] The non-heating mode may be at least one of an active mode, a sleep mode, a charging mode, and a pairing mode.

[0018] There may be fewer types of first input actions than types of second input actions.

[0019] Moreover, the processor may comprise: a first processor for controlling heating of the aerosol source by the heating unit; and a second processor for controlling actions that can be accepted by the contact sensor.

ADVANTAGEOUS EFFECTS OF INVENTION

[0020] One aspect of the present disclosure makes it possible to prevent unintended operation of an aerosol-generating device employing a contact sensor.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

[Fig. 1] is a diagram in which a front face side of an aerosol-generating device envisaged by Embodiment 1 is seen from diagonally above.

[Fig. 2] is a diagram to illustrate a state in which an opening is exposed by sliding of a slide cover.

[Fig. 3] is a diagram schematically showing an internal configuration of the main body portion.

[Fig. 4] is a diagram to illustrate a positional relationship of a touch sensor and a vibration motor in Embodiment 1.

[Fig. 5] is a diagram to illustrate a relationship of mounting positions of the touch sensor and the vibration motor.

[Fig. 6] is a diagram to illustrate a transition between operating modes arranged in the aerosol-generating device used in Embodiment 1.

[Fig. 7] is a table illustrating Exemplary Combination 1 of input actions and haptic feedback.

[Fig. 8] is a table illustrating Exemplary Combination 2 of input actions and haptic feedback.

[Fig. 9] is a table illustrating Exemplary Combination 3 of input actions and haptic feedback.

[Fig. 10] is a table illustrating Exemplary Combination 4 of input actions and haptic feedback.

[Fig. 11] is a diagram to illustrate other feedback.

[Fig. 12] is a diagram to illustrate differences in parts where input is possible in a heating mode and a non-heating mode.

[Fig. 13] is a table illustrating other relationships of input actions and haptic feedback.

[Fig. 14] is a flowchart illustrating input action acceptance processing envisaged by Embodiment 4.

[Fig. 15] is a flowchart illustrating input action acceptance processing envisaged by Embodiment 5.

[Fig. 16] is a diagram to illustrate a positional relationship of nine touch sensors and the vibration motor in Embodiment 6.

[Fig. 17] is a diagram to illustrate a relationship of touch sensor arrangement and input actions in Embodiment 6.

[Fig. 18] is a diagram to illustrate an enabled region and a disabled region for input actions during sleep mode.

[Fig. 19] is a diagram to illustrate differences in parts where input is possible in a heating mode and a non-heating mode.

[Fig. 20] is a diagram to illustrate a positional relationship of a touch sensor and a vibration motor in Embodiment 7.

[Fig. 21] is a diagram to illustrate an example of a downward swiping action.

[Fig. 22] is a diagram to illustrate an example of an upward swiping action.

[Fig. 23] is a table illustrating exemplary combinations of input actions and haptic feedback in Embodiment 7.

[Fig. 24] is a diagram to illustrate another positional relationship of a touch sensor and a vibration motor

in Embodiment 7.

[Fig. 25] is a diagram in which an aerosol-generating device envisaged by Embodiment 8 is seen from diagonally above.

[Fig. 26] is a diagram to illustrate another positional relationship of a touch sensor and a vibration motor in Embodiment 8.

[Fig. 27] is a diagram in which an aerosol-generating device 1 envisaged by Embodiment 9 is seen from diagonally above.

[Fig. 28] is a diagram to illustrate a relationship of mounting positions of a touch sensor and a vibration motor in Embodiment 10.

[Fig. 29] is a table illustrating differences in input actions in aerosol-generating devices due to differences in types of aerosol source and heating temperatures.

EMBODIMENTS OF THE INVENTION

[0022] Embodiments relating to the present disclosure will be described below with reference to the drawings. In the drawings, identical parts are indicated by identical reference signs.

<Terms>

[0023] An aerosol-generating device according to each embodiment is a form of electronic cigarette. In the following description, a substance generated by the aerosol-generating device will be referred to as an aerosol. An aerosol refers to a mixture of minute liquid or solid particles suspended in a gas, and air or another gas.

[0024] The embodiments describe aerosol-generating devices which generate the aerosol without associated burning.

[0025] Moreover, inhalation of the aerosol generated by the aerosol-generating device will also be referred to as a "puff".

[0026] In each embodiment, an aerosol-generating device to which it is possible to attach a solid aerosol source is described. It should be noted that a container for accommodating the solid aerosol source will be referred to as both a "capsule" and a "stick-type substrate", depending on the form of product. Capsules and stick-type substrates are consumables. Capsules and stick-type substrates therefore have fixed criteria for replacement.

<Embodiment 1>

[0027] Embodiment 1 describes an aerosol-generating device of the type in which a stick-type substrate accommodating a solid aerosol source is heated at a high temperature (e.g., 200°C or greater).

<Example of external appearance>

[0028] An example of the external appearance of an aerosol-generating device used in Embodiment 1 will first be described.

[0029] Fig. 1 is a diagram in which a front face side of an aerosol-generating device 1 envisaged by Embodiment 1 is seen from diagonally above.

[0030] The aerosol-generating device 1 used in this embodiment has a size such that a user can hold it in one hand. The aerosol-generating device 1 comprises a main body portion 10 and a slide cover 20.

[0031] The main body portion 10 is essentially a solid object with six faces. Specifically, each face of the main body portion 10 is connected to another adjacent face by a curved surface. An opening 10A (not depicted here; see fig. 2) for attachment/detachment of a cylindrical stick-type substrate 30 (see fig. 3) is provided in an upper face of the main body portion 10.

[0032] The external appearance of the main body portion 10 is defined by surfaces of a housing. The main body portion 10 is divided into an inside space and an outside space by the housing. The entire surface of the main body portion 10 will also be referred to as the "housing surface" in this embodiment. Furthermore, one part of the surface of the main body portion 10 will also be referred to as a "housing face".

[0033] The slide cover 20 is a component capable of sliding along the upper face of the main body portion 10. In the case of fig. 1, the opening 10A is covered by the slide cover 20. A state in which the opening 10A is covered by the slide cover 20, as shown in fig. 1, is referred to as a "closed state". Furthermore, a sliding position of the slide cover 20 in this state is referred to as a "closed position".

[0034] Fig. 2 is a diagram to illustrate a state in which the opening 10A is exposed by sliding of the slide cover 20. Corresponding reference signs are given in fig. 2 for parts that correspond to those of fig. 1. As shown in fig. 2, a state in which the opening 10A is exposed is referred to as an "open state". Furthermore, a sliding position of the slide cover 20 in this state is referred to as an "open position".

[0035] The opening 10A forms an opening end of a substantially cylindrical holding portion 109 (see fig. 3) in which the stick-type substrate 30 is held. The opening 10A therefore has a substantially circular shape. The slide cover 20 shown in fig. 2 is slid along a guide groove (not depicted) formed on the upper face of the main body portion 10 or a rear side thereof.

[0036] The face on which the thumb is positioned when the main body portion 10 is gripped in the right hand with the slide cover 20 positioned on top will be referred to below as the front face. In other words, the face facing the user when the opening 10A is positioned on the left side of the main body portion 10 from the user's perspective refers to the front face.

<Internal configuration>

[0037] Fig. 3 is a diagram schematically showing an internal configuration of the main body portion 10. The stick-type substrate 30 is mounted in the opening 10A of the main body portion 10 shown in fig. 3.

[0038] The internal configuration shown in fig. 3 is intended to illustrate the components provided in the main body portion 10 and positional relationships therebetween. For this reason, the external appearance of the components, etc. shown in fig. 3 does not always match the external views described above.

[0039] The main body portion 10 is configured by a power source unit 101, a sensor unit 102, a notification unit 103, a memory unit 104, a communication unit 105, a control unit 106, a heating unit 107, a heat insulating portion 108, and a holding portion 109.

[0040] The stick-type substrate 30 shown in fig. 3 is held in the holding portion 109. The user inhales the aerosol while the stick-type substrate 30 is fitted in the holding portion 109.

[0041] The power source unit 101 is a unit for supplying power to each component. The power source unit 101 uses a secondary battery to store power required by the main body portion 10. A lithium ion secondary battery is used as the secondary battery, for example. The secondary battery can be charged from an external power source. In the case of Embodiment 1, the external power source is connected via a USB connector which is not depicted. The USB connector is provided on a bottom face of the main body portion 10, for example.

[0042] The sensor unit 102 is an electronic component for detecting various types of information relating to the main body portion 10.

[0043] The sensor unit 102 is a magnetic sensor used to detect the sliding position of the slide cover 20 (see fig. 1), for example. The magnetic sensor is placed within the movable range of the slide cover 20 and detects the intensity of a magnetic field commensurate with the sliding position of the slide cover 20. Incidentally, the magnetic field to be detected is generated by a magnet attached to the slide cover 20. The control unit 106 detects whether the sliding position of the slide cover 20 is the open position or the closed position by means of magnetic field intensity information notified from the magnetic sensor.

[0044] The sensor unit 102 includes a pressure sensor such as a microphone capacitor, or a flow rate sensor, for example. The flow rate sensor notifies the control unit 106 of information indicating a change in air pressure or a flow of air accompanying inhalation, for example.

[0045] The sensor unit 102 is a contact sensor for detecting input of user actions, for example. A touch sensor 102A (see fig. 4) is used as the contact sensor in this embodiment. The touch sensor 102A is provided on a predetermined part of the housing surface used

for inputting actions. In the case of this embodiment, the touch sensor 102A is a sensor for detecting contact of the user's hand or finger, etc. as a change in electrostatic capacitance, and is arranged on a rear face side of the housing corresponding to the predetermined part. The control unit 106 detects input of user actions by means of information on the change in electrostatic capacitance notified from the touch sensor 102A. The information on the change in electrostatic capacitance includes not only a coordinate position where contact has been detected, but also a transition thereof (or trajectory of movement), movement speed, and contact time, etc.

[0046] The sensor unit 102 additionally includes a temperature sensor for detecting the temperature of the heating unit 107, for example. The temperature sensor detects the temperature of the heating unit 107 on the basis of a change in an electrical resistance value of an electrically conductive track of the heating unit 107, for example. The temperature sensor outputs a voltage corresponding to the electrical resistance value at the current time. The control unit 106 calculates the temperature of the heating unit 107 from the output voltage from the temperature sensor. The temperature sensor is used for the purpose of varying the temperature of the heating unit 107 in accordance with a heating profile. Other temperature sensors include a temperature sensor for detecting the temperature around the heating unit 107 and a temperature sensor for detecting the temperature near the surface of the main body portion 10. These two temperature sensors are used from the viewpoint of detecting an unexpected increase in temperature. In other words, these temperature sensors are provided from the viewpoint of safety.

[0047] The notification unit 103 is an electronic component for notifying the user of various types of information relating to the main body portion 10. The notification unit 103 is a vibration device, etc. which causes the main body portion 10 to vibrate, for example. The vibration device is a vibration motor 103A (see fig. 4), for example. A linear resonant actuator (LRA) is used as the vibration motor 103A in this embodiment. The LRA is an actuator of the linear resonance type. The LRA generates vibration perceptible to the user by driving a voice coil at the resonant frequency of a spring. This vibration is perceived by the user through the skin. In this regard, the vibration motor 103A is an example of a haptic device.

[0048] Other notification units 103 include, for example, LEDs and other light-emitting devices, display devices that display text, images and other information, and sound output devices that output sound.

[0049] The light-emitting device expresses information by means of separate illumination and extinguishing of one or more light emission sources, light intensity (i.e., brightness), an illumination pattern or flashing pattern, or a combination of light emission colors, for ex-

ample.

[0050] The display device is, for example, a liquid crystal display or an organic electroluminescence (EL) display, and displays text and/or images on a display surface. The display device notifies remaining amount of aerosol source, remaining capacity in the battery, operating modes, charging errors, operating abnormalities, temperature abnormalities, and other information, for example.

[0051] The sound output device is configured by a speaker and an amplifier, for example, and notifies information by means of voice, volume, frequency of sound, or output pattern (i.e., melody), for example.

[0052] Fig. 4 is a diagram to illustrate the positional relationship of the touch sensor 102A and the vibration motor 103A in Embodiment 1. The touch sensor 102A and the vibration motor 103A are both provided in the inside space of the housing of the main body portion 10. In fig. 4, the attachment positions of the touch sensor 102A and the vibration motor 103A are therefore depicted by broken lines.

[0053] In fig. 4, the touch sensor 102A has a substantially square shape. The touch sensor 102A shown in fig. 4 is placed close to the center of the front face of the main body portion 10.

[0054] The touch sensor 102A is placed in a range where tapping or swiping with the thumb is possible while the main body portion 10 is gripped in the right hand. The touch sensor 102A shown in fig. 4 is therefore placed to the upper face side of the center in the height direction of the main body portion 10. A digit other than the thumb may naturally be used for input actions.

[0055] The dimensions of the touch sensor 102A are set in accordance with the thumb movements envisaged for input of actions. For example, the dimensions of the touch sensor 102A required when only tapping actions are envisaged are smaller than the dimensions of the touch sensor 102A required when swiping actions are envisaged.

[0056] Moreover, when swiping actions in a left-right direction (the X direction in fig. 4) are envisaged as input actions, the X-direction dimension may be longer than the Z-direction dimension, and when swiping actions in an up-down direction (the Z direction in fig. 4) are envisaged, the Z-direction dimension may be longer than the X-direction dimension. Swiping actions in the horizontal direction and the vertical direction are also envisaged in this embodiment, in addition to tapping actions. The substantially square touch sensor 102A is therefore used.

[0057] In the case of this embodiment, the vibration motor 103A is arranged close to the touch sensor 102A. Incidentally, fig. 4 shows a situation in which the vibration motor 103A is arranged close to the center of the touch sensor 102A.

[0058] However, the touch sensor 102A and the vibration motor 103A cannot physically be placed in the

same space. The actual vibration motor 103A is therefore arranged on the rear side of the touch sensor 102A as seen from the front face of the main body portion 10.

[0059] Fig. 5 is a diagram to illustrate the relationship of mounting positions of the touch sensor 102A and the vibration motor 103A. Fig. 5 shows the positional relationship as seen through the inside of the main body portion 10 from the right face side.

[0060] In the case of fig. 5, the vibration motor 103A is positioned inwardly from the touch sensor 102A. In other words, the vibration motor 103A is positioned on the rear face side of the touch sensor 102A.

[0061] In this embodiment, differences in vibration intensity are more readily transmitted to the user by reducing the distance between the vibration motor 103A and the touch sensor 102A.

[0062] The memory unit 104 is an electronic component for storing various types of information relating to operation of the main body portion 10. The memory unit 104 is configured by a nonvolatile semiconductor storage medium such as a flash memory, for example.

[0063] Information stored in the memory unit 104 includes an OS (= operating system) and FW (= firmware), and other programs, for example.

[0064] Furthermore, the information stored in the memory unit 104 includes information relating to control of electronic components, for example. The information relating to control is information relating to inhalation by the user, such as number of inhalations, times at which inhalation has occurred, and cumulative inhalation time. This information is also referred to as an operation log.

[0065] The communication unit 105 is a communication interface for implementing communication between the main body portion 10 and other devices. The communication unit 105 communicates with other devices by means of a system based on any wired or wireless communication standard. Examples of communication standards as referred to here include wireless LAN (= local area network), USB, Wi-Fi (registered trademark), and Bluetooth (registered trademark).

[0066] For example, the communication unit 105 sends the information relating to user inhalation to a smartphone. Furthermore, the communication unit 105 downloads, from a server, update programs and heating profiles defining changes in the temperature of the heating unit 107 in a heating mode.

[0067] The control unit 106 functions as an arithmetic processing device and a control device, and controls operations of the components constituting the main body portion 10 in accordance with various programs.

[0068] Control signals are sent through signal lines different from power supply lines. For example, communication in the main body portion 10 employs a serial communication method such as an I2C (= inter-integrated circuit) communication method, an SPI (= serial peripheral interface) communication method, or a UART (= universal asynchronous receiver transmitter)

communication method.

[0069] The control unit 106 is realized by means of an electronic circuit such as a CPU (= central processing unit), an MCU (= microcontroller unit), an MPU (= microprocessing unit), a GPU (= graphical processing unit), an ASIC (= application-specific integrated circuit), an FPGA (= field programmable gate array), or a DPS (= digital signal processor), for example. The control unit 106 is an example of a processor.

[0070] The control unit 106 may also include a ROM (= read only memory) for storing programs and computation parameters, etc., and a RAM (= random access memory) for temporarily storing suitably changing parameters, etc.

[0071] The control unit 106 executes various types of processing and control through execution of programs.

[0072] The processing and control referred to here include, for example: supply of electricity by the power source unit 101; charging of the power source unit 101; detection of information by the sensor unit 102; notification of information employing the notification unit 103; writing of information to the memory unit 104 or reading of information from the memory unit 104; and sending/receiving of information employing the communication unit 105.

[0073] The control unit 106 additionally controls processing, etc. based on input of information to the electronic components and information output from the electronic components.

[0074] The holding portion 109 is a substantially cylindrical container. In this embodiment, a space inside the holding portion 109 defined by an inner wall and a bottom face will be referred to as an internal space 109A. The internal space 109A is substantially columnar. An opening end of the holding portion 109 corresponds to the opening 10A which is exposed by a sliding operation of the slide cover 20. The stick-type substrate 30 is inserted into the internal space 109A from the opening 10A. It should be noted that the stick-type substrate 30 can be inserted until the tip end thereof touches a bottom portion 109B.

[0075] The stick-type substrate 30 is only partially accommodated in the internal space 109A. A state in which the stick-type substrate 30 is accommodated in the internal space 109A will be referred to as the stick-type substrate 30 being held in the internal space 109A.

[0076] The inner diameter of the substantially cylindrical holding portion 109 is roughly the same as the outer diameter of the stick-type substrate 30. However, the inner diameter of at least part of the holding portion 109 in an axial direction thereof is formed so as to be smaller than the outer diameter of the stick-type substrate 30.

[0077] At that position, the outer circumferential surface of the stick-type substrate 30 is subjected to pressure from the inner wall of the holding portion 109. The stick-type substrate 30 deforms and is held in the inter-

nal space 109A by means of this pressure.

[0078] The holding portion 109 also has a function of defining a flow path for air passing through the stick-type substrate 30. An air inflow hole, which is an inlet for air into the flow path, is disposed in the bottom portion 109B, for example. Moreover, the opening 10A serves as an air outflow hole, which is an outlet for the air.

[0079] In the case of this embodiment, only part of the stick-type substrate 30 is held in the internal space 109A, with the remainder protruding outside from the housing. The part of the stick-type substrate 30 which is held in the internal space 109A will be referred to below as a substrate portion 30A, and the part protruding from the housing will be referred to below as a mouthpiece portion 30B.

[0080] The aerosol source is accommodated in at least the substrate portion 30A. The aerosol source is a substance which is atomized by heating so as to generate an aerosol.

[0081] The aerosol source includes cut tobacco, and also processed products obtained by molding a tobacco raw material into a granular form, a sheet form or a powder form, or other tobacco-derived substances.

[0082] In addition, the aerosol source may also include non-tobacco-derived substances produced from plants other than tobacco, such as mint or herb. The aerosol source may include a flavoring component such as menthol, for example.

[0083] When the main body portion 10 is a medical inhaler, the aerosol source may include a drug to be inhaled by a patient. It should be noted that the aerosol source is not limited to a solid, and may equally be a polyhydric alcohol such as glycerol or propylene glycol, or may be a liquid such as water, for example.

[0084] At least part of the mouthpiece portion 30B is held in the user's mouth during inhalation. When the user inhales with the mouthpiece portion 30B held in their mouth, air flows into the internal space 109A from the air inflow hole. The air that has flowed in reaches the user's mouth after passing through the internal space 109A and the substrate portion 30A. The air reaching the user's mouth contains the aerosol generated by the substrate portion 30A.

[0085] The heating unit 107 is formed by a heater or other heat-generating element. The heating unit 107 is formed by any material such as a metal or polyimide. The heating unit 107 is constructed in the form of a film, for example, and is fitted to an inner wall surface of the holding portion 109 defining the internal space 109A.

[0086] The aerosol source contained in the stick-type substrate 30 is heated and atomized by the heat generated by the heating unit 107. The atomized aerosol source is mixed with air, etc., and an aerosol is generated.

[0087] In fig. 3, the outer circumferential region of the stick-type substrate 30 is initially heated, with the range of heating steadily moving toward the center.

[0088] Atomization of the aerosol source therefore starts from the outer circumferential region of the stick-type substrate 30 and steadily moves toward the center.

5 **[0089]** The heating unit 107 generates heat by means of electrical supply from the power source unit 101. Electrical supply to the heating unit 107 is permitted when a predetermined user action has been detected by means of the sensor unit 102, for example.
10 Predetermined user actions here include the action to open/close the slide cover 20 (see fig. 1), and an action on the contact sensor (e.g., the touch sensor 102A).

[0090] Moreover, inhalation by the user becomes possible when the temperature of the stick-type substrate 30 heated by means of the heating unit 107 reaches a predetermined temperature. A change over time in the target temperature from the start of heating to the end of heating is stored in the memory unit 104 as a heating profile. The heating profile is an example of a control sequence. Inhalation of the aerosol by the user is sensed by means of the flow rate sensor, etc. in the sensor unit 102 and is saved in the memory unit 104.
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[0091] Electrical supply to the heating unit 107 is stopped when a predetermined time has elapsed since the start of heating or when a predetermined user action is sensed. The predetermined action is removal of the stick-type substrate 30, for example.
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[0092] Furthermore, in the example of fig. 3, the heating unit 107 is disposed at the outer circumferential portion of the stick-type substrate 30, but the heating unit 107 may equally be a blade-like metal piece which is inserted into the stick-type substrate 30.
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[0093] Alternatively, an induction heating method, for example, may be used to atomize the aerosol source. In this type of heating method, the heating unit 107 has at least an electromagnetic induction source such as a coil that generates a magnetic field. In this case, a susceptor is disposed at a position overlapping the magnetic field generated by the electromagnetic induction source. The susceptor generates heat in association with generation of the magnetic field, and heats the aerosol source. The susceptor may be a metal piece that is built into the stick-type substrate 30. When a metal piece acting as the heating unit 107 is built into the stick-type substrate 30, a coil for inductively heating the metal piece is disposed around the holding portion 109. Alternatively, the susceptor may be disposed at an outer circumferential portion of the stick-type substrate 30 within the main body portion 10, and a coil serving as an electromagnetic induction source may be wound around the outer circumferential portion thereof.
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[0094] The heat insulating portion 108 is a member for reducing propagation of heat generated by the heating unit 107 to the surrounding area. The heat insulating portion 108 is therefore disposed so as to cover at least the outer circumferential surface of the heating unit 107.
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[0095] For example, the heat insulating portion 108 is configured by a vacuum insulating material or an aerogel insulating material, etc. A vacuum insulating material is a heat insulating material in which a state of high vacuum is created by wrapping glass wool and silica (silicon powder), etc. in a resin film, for example, so that heat conduction by gas is as close as possible to zero.

<Operating modes>

[0096] Fig. 6 is a diagram to illustrate a transition between operating modes arranged in the aerosol-generating device 1 (see fig. 1) used in Embodiment 1.

[0097] The aerosol-generating device 1 used in Embodiment 1 has nine operating modes. These nine modes are: charging mode M1, sleep mode M2, error modes M3, M4, pairing mode M5, active mode M6, initialization mode M7, heating mode M8, and heating end mode M9.

[0098] Note that charging mode M1, sleep mode M2, error modes M3, M4, pairing mode M5, and active mode M6 are examples of non-heating modes. Furthermore, initialization mode M7, heating mode M8, and heating end mode M9 are examples of heating modes.

[0099] The operating modes will be described in order below.

• Charging mode M1

[0100] Charging mode M1 is a mode in which the secondary battery is charged by using the USB cable. Deep discharge and over-discharge of the secondary battery are also detected in charging mode M1.

• Sleep mode M2

[0101] Sleep mode M2 is a mode in which most functions are stopped. In other words, sleep mode M2 is a mode in which less power is consumed than in other modes.

[0102] However, detection of the closed state of the slide cover 20 (see fig. 1), monitoring of the state of the secondary battery, and detection of transitions to other operating modes are possible. Incidentally, a dedicated processor (referred to below as a "remaining capacity meter IC") is used for monitoring the state of the secondary battery. The remaining capacity meter IC is a separate processor from the MCU.

[0103] The transition from charging mode M1 to sleep mode M2 is made, for example, when the USB cable is removed during charging. When a function is provided to warn the user by means of vibration or sound, etc. that the USB cable has been disconnected during charging, the switch to sleep mode M2 need not be made immediately.

[0104] The transition from active mode M6 to sleep mode M2 is made, for example, when the slide cover 20 has moved from the open position to the closed

position, when a predetermined action has been detected through the touch sensor 102A (see fig. 4), or when a state of non-action persists for a predetermined time or greater.

[0105] The transition from sleep mode M2 to active mode M6 is made, for example, when the slide cover 20 has moved from the closed position to the open position, or when an activation action has been detected through the touch sensor 102A.

[0106] The transition from sleep mode M2 to charging mode M1 is made, for example, when the USB cable is connected.

• Error mode M3

[0107] Error mode M3 is a mode which appears temporarily when there has been a recoverable error such as a temperature abnormality.

[0108] When there is a transition to error mode M3, an error notification is output and sleep mode M2 is restored after a given time has elapsed or after a predetermined condition resolving the error has been met. Vibration of a given intensity is used for the error notification, for example.

[0109] There may also be a transition to error mode M3 from charging mode M1, active mode M6, initialization mode M7, and heating mode M8.

• Error mode M4

[0110] Error mode M4 is a mode which appears when there has been a non-recoverable error such as deep discharge, secondary battery lifespan, or short-circuit, for example. Transitions from error mode M4 to other modes are prohibited.

• Pairing mode M5

[0111] Pairing mode M5 is a mode for pairing with an external device, for example. Bluetooth is used for pairing, for example.

[0112] The transition from sleep mode M2 to pairing mode M5 is made, for example, when a pairing action has been detected through the touch sensor 102A.

• Active mode M6

[0113] Active mode M6 is a mode in which most functions apart from heating are available. Active mode M6 enables, for example: sending of heating profiles to an external device; reception of heating profiles from an external device; modification of heating profiles used for heating the stick-type substrate 30 (heating temperature modification); a change of brand of stick-type substrate 30 to be heated; and checking of various types of information, etc.

[0114] The transition from sleep mode M2 to active mode M6 is made, for example, when the slide cover

20 has moved from the closed position to the open position, or when an activation action has been detected through the touch sensor 102A.

[0115] The transition from active mode M6 to sleep mode M2 is made when the slide cover 20 has moved from the open position to the closed position, when a predetermined action has been detected through the touch sensor 102A (see fig. 4), or when a state of non-action persists for a predetermined time or greater while in active mode M6.

[0116] The transition from active mode M6 to initialization mode M7 is made when an action to instruct the start of heating through the touch sensor 102A has been detected while the slide cover 20 is in the open position.

[0117] There may also be a transition to charging mode M1 or pairing mode M5 from active mode M6.

- Initialization mode M7

[0118] Initialization mode M7 is a mode which is implemented before heating of the stick-type substrate 30 is started.

[0119] Initial settings and preheating, etc. are implemented in initialization mode M7. In the initial settings, the heating profile used for heating the stick-type substrate 30 is read in, for example. Preheating refers to the stick-type substrate 30 being preheated in order to generate a given amount of aerosol from immediately after the start of heating mode M8.

[0120] Note that initialization mode M7 transitions to error mode M3 if an error occurs during initialization. Examples of errors during initialization include failure to read a heating profile and removal of the stick-type substrate 30.

- Heating mode M8

[0121] Heating mode M8 is a mode for generating an aerosol by heating the stick-type substrate 30.

[0122] The stick-type substrate 30 is heated on the basis of the heating profile. The heating profile defines a relationship between the time elapsed from the start of heating and a target temperature at each time point. The control unit 106 controls the heating unit 107 ON/OFF so that the measured temperature at each elapsed time is consistent with the target temperature. Heat is generated when the heating unit 107 is controlled ON (when the heater is energized), and heat generation is stopped when the heating unit 107 is controlled OFF (when energization of the heater is stopped).

[0123] The transition from initialization mode M7 to heating mode M8 is made by completion of the initial settings. Note that heating mode M8 transitions to error mode M3 if an error occurs during heating. Examples of errors during heating include detection of an abnormal temperature beyond the target temperature, and re-

moval of the stick-type substrate 30.

- Heating end mode M9

[0124] Heating end mode M9 is a mode for implementing processing at the end of heating.

[0125] The processing at the end of heating may be updating management data, for example. The management data may include, for example, number of inhalations on the present occasion, cumulative number of inhalations, and cumulative number of stick-type substrates 30.

[0126] The transition from heating mode M8 to heating end mode M9 is made, for example, when a predetermined time defined in the heating profile has elapsed, or when there has been a heating termination action through the touch sensor 102A.

[0127] The transition from heating end mode M9 to active mode M6 is made when the processing at the end has been completed.

<Combinations of input actions and haptic feedback>

[0128] Exemplary combinations of input actions to the touch sensor 102A (see fig. 4) and haptic feedback from the vibration motor 103A (see fig. 4) will be described below. Four exemplary combinations will be described below for each type of input action. It goes without saying that the exemplary combinations are only examples and should not be construed as excluding other exemplary combinations.

[0129] Only one command can be assigned to one input action in one operating mode. Accordingly, where multiple commands are illustrated for one input action in one operating mode, such illustration is confined to reference examples, and only one of the multiple commands is used for implementation in an actual device.

<Exemplary Combination 1: Tapping action and swiping action>

[0130] Fig. 7 is a table illustrating Exemplary Combination 1 of input actions and haptic feedback. Exemplary Combination 1 envisages tapping actions and swiping actions as input actions.

[0131] It should be noted that linear movements are envisaged for swiping actions in Exemplary Combination 1. Up/down/left/right finger movements are envisaged, for example. Diagonally upward movements and diagonally downward movements may naturally also be combined.

[0132] Only four types of instructions can be assigned to one operating mode when up/down/left/right finger movements are envisaged for swiping actions, but eight types of instructions can be assigned to one operating mode by combining diagonally upward and diagonally downward movements.

[0133] Different vibration patterns are used as haptic

feedback. Vibration patterns within the broad sense include different numbers of times of vibration with the same vibration intensity (also including different timings of vibration output) and different intensities of vibration with the same number of times of vibration. Acceptance of user actions can be perceived by the user by a difference in vibration pattern.

[0134] Furthermore, the feedback vibration pattern allows the user to anticipate the content of control to be implemented by the control unit 106 (see fig. 3). Additionally, the user is able to confirm the content of the control implemented by the control unit 106 (see fig. 3) and the content of responses by the control unit 106 by means of the intensity of feedback vibration.

[0135] The description above relates to the user having intentionally performed an input action, but the vibration feedback also has the effect of making the user aware of an unintentional finger movement having been accepted as an input action. The user can cancel implementation of unintended operations as a result.

<Upward swiping action>

[0136] L1, the first line from the top of the table, illustrates two commands and the vibration pattern associated with an "upward swiping action".

• Example 1 (L1-A)

[0137] For example, when there has been an "upward swiping action" during sleep mode M2, the control unit 106 (see fig. 3) changes from a sleep state to an active state. That is to say, the operating mode is shifted from sleep mode M2 to active mode M6.

[0138] In this case, there is an increase in the intensity of feedback vibration the longer the distance of upward movement of the finger. The LRA used as the vibration motor 103A has a fast response speed of approximately 20 ms-30 ms. The vibration intensity therefore gradually increases in proportion to the distance of movement of the finger, making it easier for the user to actually feel that their action is being accepted.

• Example 2 (L1-B)

[0139] For example, when there has been an "upward swiping action" during active mode M6, "send heating profile" is implemented. This action is possible only when the aerosol-generating device 1 (see fig. 1) is compatible with the function for sending heating profiles to an external device. Again, there is an increase in the intensity of feedback vibration the longer the distance of upward movement of the finger.

[0140] It should be noted that when there has been an upward swiping action on an aerosol-generating device 1 which is incompatible with the function for sending heating profiles, this swiping action is treated as invalid, the operating mode is shifted to error mode

M3, error vibration (e.g., high-intensity continuous vibration or a distinctive vibration pattern) is fed back, or an error sound is fed back.

[0141] In the case of fig. 7, the upward swiping action is used in both sleep mode M2 and active mode M6. However, these are different operating modes so different operations are implemented through the upward swiping action.

10 <Downward swiping action>

[0142] L2, the second line from the top of the table, illustrates two commands and the vibration pattern associated with a "downward swiping action".

• Example 1 (L2-A)

[0143] For example, when there has been a "downward swiping action" during active mode M6, the control unit 106 changes from an active state to a sleep state. That is to say, the operating mode is shifted from active mode M6 to sleep mode M2. In this case, there is a reduction in the intensity of feedback vibration the longer the distance of downward movement of the finger.

• Example 2 (L2-B)

[0144] For example, when there has been a "downward swiping action" during active mode M6, "receive heating profile" is implemented. This action is possible only when the aerosol-generating device 1 is compatible with adding or modifying heating profiles. Again, there is a reduction in the intensity of feedback vibration the longer the distance of downward movement of the finger.

[0145] It should be noted that when there has been a downward swiping action on an aerosol-generating device 1 which is incompatible with the function for receiving heating profiles, this swiping action is treated as invalid, the operating mode is shifted to error mode M3, error vibration is fed back, or an error sound is fed back.

45 <Swiping action in both left/right directions>

[0146] L3, the third line from the top of the table, illustrates two commands and the vibration pattern associated with a "swiping action in both left/right directions".

• Example 1 (L3-A)

[0147] For example, when there has been a "swiping action in the right direction" or a "swiping action in the left direction" during active mode M6, "modify heating temperature" is implemented.

[0148] In the case of fig. 7, the swiping action in the

right direction is accepted as an action to raise the heating temperature to above the current temperature.

[0149] Meanwhile, the swiping action in the left direction is accepted as an action to lower the heating temperature to below the current temperature.

[0150] The modification of the heating temperature is implemented in predetermined steps each time a swiping action is detected.

[0151] In the case of this embodiment, modification of the heating temperature means modifying the maximum temperature defined in the heating profile. Incidentally, the maximum amount of aerosol generated also generally increases the higher the maximum temperature.

[0152] In the case of fig. 7, the modified temperature is associated with vibration intensity. Accordingly, the intensity of feedback vibration increases the higher the modified temperature, and the intensity of feedback vibration decreases the lower the modified temperature.

[0153] It should be noted that an example of modifying only the maximum temperature in the heating profile is described in the example of fig. 7, but the left/right direction swiping actions may also be associated with switching the heating profile.

[0154] For example, when the control unit 106 handles five types of heating profiles and each heating profile is assigned a management number from "1" to "5", the management number may be updated by the direction of the swiping action. For example, one swiping action in the right direction may increase the management number by 1. For example, when the management number before the swiping action is "3", then the management number is changed to "4" by a swiping action in the right direction. Furthermore, one swiping action in the left direction may decrease the management number by 1. For example, when the management number before the swiping action is "3", then the management number is changed to "2" by one swiping action in the left direction.

[0155] Incidentally, when there have been swiping actions in the right direction to the maximum value in the management numbers, then the management number may be changed to the minimum value, or the current management number may be maintained. Similarly, when there have been swiping actions in the left direction to the minimum value in the management numbers, then the management number may be changed to the maximum value, or the current management number may be maintained.

[0156] It should be noted that when there has been a left or right swiping action on an aerosol-generating device 1 which is incompatible with the function for modifying temperature, this swiping action is treated as invalid, the operating mode is shifted to error mode M3, error vibration is fed back, or an error sound is fed back.

• Example 2 (L3-B)

[0157] For example, when there has been a "swiping action in the right direction or the left direction" during active mode M6, "select brand" of stick-type substrate 30 is implemented. In the case of fig. 7, there are three brands of stick-type substrate 30 with which the control unit 106 is compatible, namely "brand A", "brand B", and "brand C".

[0158] For example, a swiping action in the right direction may be associated with "change from brand A to brand B" or "change from brand B to brand C", and a swiping action in the left direction may be associated with "change from brand C to brand B" or "change from brand B to brand A".

[0159] The function for changing brand may be limited to cases where heating profiles corresponding to the brand of stick-type substrate 30 are available.

[0160] In fig. 7, when the brand following the change is "brand A", vibration of a specific intensity is fed back once, when the brand following the change is "brand B", vibration of a specific intensity is fed back twice, and when the brand following the change is "brand C", vibration of a specific intensity is fed back three times.

[0161] The number of times of feedback vibration varies according to the different brand, so the user can not only confirm that the change of brand has been accepted, but also confirm what the brand is following the change.

[0162] It should be noted that when there has been a left or right swiping action on an aerosol-generating device 1 which is incompatible with the function for changing brand, this swiping action is treated as invalid, the operating mode is shifted to error mode M3, error vibration is fed back, or an error sound is fed back.

<Tapping action (long press)>

[0163] L4, the fourth line from the top of the table, illustrates two commands and the vibration pattern associated with a "tapping action (long press)". In this embodiment, a tap detection time exceeding a threshold is assumed to be a "long pressing action", and a tap detection time not exceeding the threshold is assumed to be a "short pressing action".

[0164] It should be noted that a "tapping action" refers to an action in which the position of a finger detected by the touch sensor 102A is static or largely unchanging, and a "swiping action" refers to an action in which the position of a finger detected by the touch sensor 102A moves or changes. Incidentally, a double tap action or the like may also be used instead of a tapping action (long press).

• Example 1 (L4-A)

[0165] For example, when there has been a "tapping

action (long press)" during active mode M6, this is accepted by the control unit 106 as an action to "start heating". In this case, the control unit 106 shifts from active mode M6 to initialization mode M7. It should be noted that the control unit 106 maintains vibration of a given intensity for a given time. Here, the completion of acceptance of actions is notified by means of feedback.

[0166] It should be noted that the feedback vibration continues for a fixed period of time, but the output of vibration is started after at least a time equal to or greater than a threshold has elapsed from the completion of acceptance of the tapping action, or is started after the end of the tapping action.

• Example 2 (L4-B)

[0167] For example, when there has been a "tapping action (long press)" during heating mode M8, this is accepted by the control unit 106 as an action to "stop heating". In this case, the control unit 106 shifts from heating mode M8 to heating end mode M9. Again, the control unit 106 maintains vibration of a given intensity for a given time. Here, the completion of acceptance of actions is notified by means of feedback.

[0168] In the case of fig. 7, the tapping action (long press) is used not only in heating mode M8, but also in active mode M6, which is one of the non-heating modes. However, these are different operating modes so different operations are implemented through the tapping action (long press).

<Tapping action (short press)>

[0169] L5, the fifth line from the top of the table, illustrates a command and the vibration pattern associated with a "tapping action (short press)".

• Example 1 (L5-A)

[0170] For example, when there has been a "tapping action (short press)" during active mode M6, this is accepted by the control unit 106 as an action to "check remaining battery capacity". In this case, the control unit 106 feeds back a vibration pattern commensurate with the remaining battery capacity acquired from the remaining capacity meter IC. The vibration pattern here stays at a fixed vibration intensity and only the number of times of vibration is different.

[0171] For example, if the remaining battery capacity is 10% or less, no vibration feedback is implemented.

[0172] For example, if the remaining battery capacity is greater than 10% and no greater than 60%, vibration is fed back once.

[0173] For example, if the remaining battery capacity is greater than 60% and no greater than 90%, vibration is fed back twice.

[0174] For example, if the remaining battery capacity is greater than 90%, vibration is fed back three times.

[0175] It should be noted that the remaining battery capacity may be fed back by differences in vibration intensity rather than number of times of vibration. For example, if the remaining battery capacity is 10% or less, no vibration feedback is implemented. For example, if the remaining battery capacity is greater than 10% and no greater than 60%, vibration of a first intensity may be fed back, if the remaining battery capacity is greater than 60% and no greater than 90%, vibration of a second intensity (>first intensity) may be fed back, and if the remaining battery capacity is greater than 90%, vibration of a third intensity (>second intensity) may be fed back.

[0176] In the case of fig. 7, when the operating mode is sleep mode M2, only an upward swiping action is controlled to be acceptable. This means that even if a downward swiping action, a left/right direction swiping action, or a tapping action is detected during sleep mode M2, the control unit 106 (see fig. 3) disables these input actions. In other words, operations not intended by the user are prevented unless an input action acceptable in sleep mode M2 is intentionally input by the user.

[0177] Furthermore, when the operating mode is heating mode M8, only a tapping action (long press) can be accepted. This means that even if an input action other than a tapping action (long press) is detected during heating mode M8, the control unit 106 does not treat this as a valid input action. As a result, heating mode M8 will not be forcibly stopped unless a tapping action (long press) is detected.

[0178] Moreover, upward swiping actions, downward swiping actions, left/right direction swiping actions, and tapping actions are assigned when the operating mode is active mode M6.

[0179] Active mode M6 is a mode in which most functions apart from heating are available, as described above. Various instructions are therefore assigned to the three types of swiping actions and the two types of tapping actions. However, only one instruction is assigned to one input action. Only one of the two "downward swiping actions" illustrated in fig. 7 is therefore assigned. For example, only "sleep" is assigned to a "downward swiping action" in active mode M6.

[0180] The same also applies to left/right direction swiping actions. For example, only "modify heating temperature" is assigned to a "left/right direction swiping action" in active mode M6.

<Exemplary Combination 2: Rotational swiping action>

[0181] Fig. 8 is a table illustrating Exemplary Combination 2 of input actions and haptic feedback.

[0182] Unlike Exemplary Combination 1, Exemplary Combination 2 envisages only swiping actions as input actions. However, the swiping actions in Exemplary Combination 2 are substantially circular movements rather than linear movements. An exemplary case is

envisaged where the finger is moved clockwise or counterclockwise from the position initially tapped (origin) so as to describe a circle.

[0183] In the case of fig. 8, when movement in an arc shape which is roughly a half-circumference (180°) or greater and a rotation direction have been detected, this is considered to be a rotational swiping action.

[0184] It should be noted that a rotational swiping action requires an arc-shaped movement. A rotational swiping action is therefore less likely to be performed unintentionally than the swiping actions and tapping actions described in Exemplary Combination 1.

[0185] As a result, the combination of operating mode and rotational swiping actions makes it less likely that an operation not intended by the user will be implemented by the aerosol-generating device 1 (see fig. 1) than in Exemplary Combination 1.

[0186] Incidentally, tapping actions could also be included in the input actions, although this is not illustrated in fig. 8.

<Clockwise swiping action>

[0187] L1, the first line from the top of the table, illustrates two commands and the vibration pattern associated with a "clockwise swiping action".

• Example 1 (L1-A)

[0188] For example, when there has been a "clockwise swiping action" during sleep mode M2, the control unit 106 (see fig. 3) changes from a sleep state to an active state. That is to say, the operating mode is shifted from sleep mode M2 to active mode M6. In this case, there is an increase in the intensity of feedback vibration the longer the distance of clockwise movement of the finger.

• Example 2 (L1-B)

[0189] For example, when there has been a "clockwise swiping action" during active mode M6, this is accepted by the control unit 106 as an action to "start heating". In this case, the control unit 106 shifts from active mode M6 to initialization mode M7. Again, there is an increase in the intensity of feedback vibration the longer the distance of clockwise movement of the finger.

<Counterclockwise swiping action>

[0190] L2, the second line from the top of the table, illustrates two commands and the vibration pattern associated with a "counterclockwise swiping action".

• Example 1 (L2-A)

[0191] For example, when there has been a "counter-

clockwise swiping action" during active mode M6, the control unit 106 changes from an active state to a sleep state. That is to say, the operating mode is shifted from active mode M6 to sleep mode M2. In this case, there is a reduction in the intensity of feedback vibration the longer the distance of counterclockwise movement of the finger.

• Example 2 (L2-B)

[0192] For example, when there has been a "counterclockwise swiping action" during heating mode M8, this is accepted by the control unit 106 as an action to "stop heating". In this case, the control unit 106 shifts from heating mode M8 to heating end mode M9. Again, there is a reduction in the intensity of feedback vibration the longer the distance of counterclockwise movement of the finger.

[0193] In the case of fig. 8, the "counterclockwise swiping action" is used not only in heating mode M8, but also in active mode M6, which is one of the non-heating modes. However, these are different operating modes so different operations are implemented through the counterclockwise swiping action.

<Clockwise or counterclockwise swiping action>

[0194] L3, the third line from the top of the table, illustrates a command and the vibration pattern associated with a "clockwise swiping action" and a "counterclockwise swiping action". This swiping action corresponds to the "swiping action in both left/right directions" in fig. 7.

• Example 1 (L3-A)

[0195] For example, when there has been a "swiping action in the right direction" or a "swiping action in the left direction" during active mode M6, "modify heating temperature" is implemented.

[0196] In the case of fig. 8, the clockwise swiping action is accepted as an action to raise the heating temperature to above the current temperature.

[0197] Meanwhile, the counterclockwise swiping action is accepted as an action to lower the heating temperature to below the current temperature.

[0198] The modification of the heating temperature is implemented in predetermined steps each time a swiping action is detected.

[0199] The swiping actions in both rotational directions are indistinguishable on their own from the above-mentioned "swiping action in the right direction" and "swiping action in the left direction". When the swiping actions in both rotational directions are used here, they can therefore no longer be used for the activation or sleep described above.

[0200] Again, the intensity of feedback vibration increases the higher the modified temperature, and the

intensity of feedback vibration decreases the lower the modified temperature.

<Exemplary Combination 3: Arc swiping action>

[0201] Fig. 9 is a table illustrating Exemplary Combination 3 of input actions and haptic feedback.

[0202] Exemplary Combination 3 also envisages only swiping actions as input actions. However, the swiping actions in Exemplary Combination 3 are substantially arcuate movements rather than linear or substantially circular movements. An exemplary case is envisaged where the finger is moved clockwise or counterclockwise from the position initially tapped (origin) by roughly a half-circumference or roughly a quarter-circumference.

[0203] In the case of fig. 9, when movement in an arc shape which is less than roughly a half-circumference (180°) and a rotation direction have been detected, this is considered to be an arc swiping action.

[0204] This arc swiping action also requires an arc-shaped movement. An arc swiping action is therefore less likely to be performed unintentionally than the swiping actions and tapping actions described in Exemplary Combination 1.

[0205] As a result, the combination of operating mode and arc swiping actions makes it less likely that an operation not intended by the user will be implemented on the aerosol-generating device 1 (see fig. 1) than in Exemplary Combination 1.

[0206] Incidentally, tapping actions may also be included in the input actions, although this is not illustrated in fig. 9.

<Lower-semicircular swiping action>

[0207] L1, the first line from the top of the table, illustrates two commands and the vibration pattern associated with a "lower semicircle swiping action". The lower-semicircular swiping action refers to a counterclockwise movement describing roughly a semicircle from the position initially tapped (origin). In this case, the position where the swiping action ends (end point) is at roughly the same height as the origin.

• Example 1 (L1-A)

[0208] For example, when there has been a "lower-semicircular swiping action" during sleep mode M2, the control unit 106 (see fig. 3) changes from a sleep state to an active state. That is to say, the operating mode is shifted from sleep mode M2 to active mode M6. In this case, there is an increase in the intensity of feedback vibration the longer the distance of counterclockwise movement of the finger.

• Example 2 (L1-B)

[0209] For example, when there has been a "lower-semicircular swiping action" during active mode M6, this is accepted by the control unit 106 as an action to "start heating". In this case, the control unit 106 shifts from active mode M6 to initialization mode M7. Again, there is an increase in the intensity of feedback vibration the longer the distance of counterclockwise movement of the finger.

[0210] It should be noted that both Example 1 and Example 2 describe cases in which a lower semicircle is described in a counterclockwise direction, but a lower semicircle may equally be described in a clockwise direction.

<Upper-semicircular swiping action>

[0211] L2, the second line from the top of the table, illustrates two commands and the vibration pattern associated with an "upper-semicircular swiping action". The upper-semicircular swiping action refers to a clockwise movement describing roughly a semicircle from the position initially tapped (origin). In this case, the position where the swiping action ends (end point) is at roughly the same height as the origin.

• Example 1 (L2-A)

[0212] For example, when there has been an "upper-semicircular swiping action" during active mode M6, the control unit 106 changes from an active state to a sleep state. That is to say, the operating mode is shifted from active mode M6 to sleep mode M2. In this case, there is a reduction in the intensity of feedback vibration the longer the distance of clockwise movement of the finger.

• Example 2 (L2-B)

[0213] For example, when there has been an "upper-semicircular swiping action" during heating mode M8, this is accepted by the control unit 106 as an action to "stop heating". In this case, the control unit 106 shifts from heating mode M8 to heating end mode M9. Again, there is a reduction in the intensity of feedback vibration the longer the distance of clockwise movement of the finger.

[0214] It should be noted that both Example 1 and Example 2 describe cases in which an upper semicircle is described in a clockwise direction, but an upper semicircle may equally be described in a counterclockwise direction.

<Clockwise or counterclockwise quarter-circle arc swiping action>

[0215] L3, the third line from the top of the table,

illustrates a command and the vibration pattern associated with a "clockwise swiping action describing a quarter-circle arc" and a "counterclockwise swiping action describing a quarter-circle arc". This swiping action also corresponds to the "swiping action in both left/right directions" in fig. 7. It should be noted that the arcs in fig. 9 are part of a lower semicircle.

• Example 1 (L3-A)

[0216] For example, when there has been a "counterclockwise swiping action describing a quarter-circle arc" or a "clockwise swiping action describing a quarter-circle arc" during active mode M6, "modify heating temperature" is implemented.

[0217] In the case of fig. 9, the counterclockwise swiping action describing a quarter-circle arc is accepted as an action to raise the heating temperature to above the current temperature.

[0218] Meanwhile, the clockwise swiping action describing a quarter-circle arc is accepted as an action to lower the heating temperature to below the current temperature.

[0219] Again, the intensity of feedback vibration increases the higher the modified temperature, and the intensity of feedback vibration decreases the lower the modified temperature.

<Exemplary Combination 4: Other swiping actions>

[0220] Fig. 10 is a table illustrating Exemplary Combination 4 of input actions and haptic feedback. Exemplary Combination 4 also envisages only swiping actions as input actions. However, the swiping actions in Exemplary Combination 4 envisage linear movements to draw characters, figures and other patterns with a single stroke.

[0221] Note that tapping actions may also be included in the input actions, although this is not illustrated in fig. 10.

<Z-shaped swiping action>

[0222] L1, the first line from the top of the table, illustrates two commands and the vibration pattern associated with a "Z-shaped swiping action". The Z-shaped swiping action is effective for ensuring the distance of finger movement within limited dimensions. Moreover, other possible characters also include: include "C", "J", "L", "M", "N", "S", "U", "V", "W", "2", "3", "6", "7", "8" and "9", etc.

[0223] There is less likelihood of these patterns being unintentionally drawn than of a linear movement or a tapping action.

• Example 1 (L1-A)

[0224] For example, when there has been a "Z-

shaped swiping action" during sleep mode M2, the control unit 106 (see fig. 3) changes from a sleep state to an active state. That is to say, the operating mode is shifted from sleep mode M2 to active mode M6. In this case, there is an increase in the intensity of feedback vibration the longer the distance of movement of the finger drawing the Z shape.

• Example 2 (L1-B)

[0225] For example, when there has been a "Z-shaped swiping action" during active mode M6, this is accepted by the control unit 106 as an action to "start heating". In this case, the control unit 106 shifts from active mode M6 to initialization mode M7. Again, there is an increase in the intensity of feedback vibration the longer the distance of movement of the finger drawing the Z shape.

<Downward swiping action>

[0226] L2, the second line from the top of the table, illustrates two commands and the vibration pattern associated with a "downward swiping action".

• Example 1 (L2-A)

[0227] For example, when there has been a "downward swiping action" during active mode M6, the control unit 106 changes from an active state to a sleep state. That is to say, the operating mode is shifted from active mode M6 to sleep mode M2. In this case, there is a reduction in the intensity of feedback vibration the longer the distance of downward movement of the finger.

• Example 2 (L2-B)

[0228] For example, when there has been a "downward swiping action" during heating mode M8, this is accepted by the control unit 106 as an action to "stop heating". In this case, the control unit 106 shifts from heating mode M8 to heating end mode M9. Again, there is a reduction in the intensity of feedback vibration the longer the distance of downward movement of the finger.

[0229] In the case of fig. 10, the downward swiping action is used in both active mode M6 and heating mode M8. However, these are different operating modes so different operations are implemented through the downward swiping action.

<Diagonal swiping actions>

[0230] L3, the third line from the top of the table, illustrates two commands and the vibration pattern associated with a "swiping action diagonally up to the right" and a "swiping action diagonally down to the left".

• Example 1 (L3-A)

[0231] For example, when there has been a "swiping action diagonally up to the right" or a "swiping action diagonally down to the left" during active mode M6, "modify heating temperature" is implemented.

[0232] In the case of fig. 10, the swiping action diagonally up to the right is accepted as an action to raise the heating temperature to above the current temperature.

[0233] Meanwhile, the swiping action diagonally down to the left is accepted as an action to lower the heating temperature to below the current temperature.

[0234] In the case of fig. 10 also, the modified temperature is associated with vibration intensity. Accordingly, the intensity of feedback vibration increases the higher the modified temperature, and the intensity of feedback vibration decreases the lower the modified temperature.

<Other feedback>

[0235] The examples of actions described above envisage feedback during input actions and feedback with respect to the results of actions, but feedback for other purposes will be described here.

[0236] Fig. 11 is a diagram to illustrate other feedback.

[0237] Fig. 11 illustrates two types of notifications.

[0238] The first notification is a notification of "detect start of action". The first notification is effective when there is a time difference between the timing of inputting an action and the corresponding output of vibration feedback, as is the case with "modify heating temperature", "select brand", and "check remaining battery capacity", for example.

[0239] When the position of the touch sensor 102A is unclear, the user may feel unsure that their action is being detected.

[0240] However, if there is vibration feedback at the time when the start of an action was detected due to a finger touching a predetermined position, for instance, the user can continue to input the action with confidence.

[0241] Moreover, this vibration feedback is also produced when the user's finger accidentally touches the touch sensor 102A. This feedback allows the user to be made aware that an unintentional finger movement has been detected as the start of an action, and the user can forestall an unintended operation, for instance by releasing their finger from the touch sensor 102A.

[0242] Note that the vibration intensity used to notify "detect start of action" is ST1. The vibration intensity ST1 is intended only for notifying detection and should therefore be lower than the vibration intensity used for other feedback. The vibration motor 103A serving as the vibration source is at a short distance from the fingertip, so vibration feedback can be transmitted to the

user even with a low vibration intensity.

[0243] Incidentally, the first notification may be combined with input of other actions described above. The second notification is a notification of "acceptance of action complete".

[0244] The descriptions above assumed that the user's finger movements and times of actions were correctly recognized as the input actions illustrated, but in actual fact there may also be cases where the user's finger movements and times of actions are not recognized as the input actions described above. For example, if the distance of movement of the finger is extremely short, or if the time of a tap is extremely short, the finger movement may be indistinguishable from input of other actions.

[0245] In such cases, the user's perception may not match the actual operation. For example, it could happen that heating is not started, heating is not stopped, or the heating temperature is not modified.

[0246] The second notification therefore provides a function of giving vibration feedback to notify "acceptance of action complete". The vibration intensity used for this notification is ST2. As shown in fig. 11, the vibration intensity ST2 is greater than the vibration intensity ST1 and is distinguishable from the vibration intensity ST1.

[0247] The feedback with the vibration intensity ST2 is output at the time when acceptance of the action has been completed. A user who has perceived the vibration intensity ST2 can therefore be made aware that, even though their action is unfinished, the action has been accepted as a specific input action.

[0248] As a result, the user can stop the input action without any hesitation. In the absence of this notification, the user would need to continue inputting the action without being sure.

[0249] Furthermore, the use of the second notification means that, if the user realizes as a result of the first notification that an unintentional finger movement has been accepted as the start of an input action, the absence of the second notification enables the user to confirm that an unintended operation will not be implemented.

<Advantageous Effects>

[0250] The input actions that can be accepted in each operating mode are predefined in the aerosol-generating device 1 (see fig. 1) according to this embodiment. User actions are therefore not accepted as valid input actions unless the user intentionally performs a specific input action commensurate with the current operating mode. Unintended operation of the aerosol-generating device 1 can be prevented as a result.

[0251] Furthermore, in the case of the upward swiping action and the downward swiping action in fig. 7, vibration associated with movement of the finger is fed back. When an input action is intentional, the user can

therefore be given the actual sense of their action being accepted as a valid input action.

[0252] Meanwhile, when an unintentional finger movement has been accepted as an input action, the vibration feedback allows the user to be made aware that their unintentional finger movement is being accepted as an input action. Unintended operation of the aerosol-generating device 1 can be prevented as a result.

[0253] Furthermore, in the case of the left/right direction swiping action, etc. in fig. 7, the result of the accepted instruction is fed back by vibration. When an input action is intentional, the user can therefore be given the actual sense of their action being accepted as a valid input action.

[0254] Meanwhile, when an unintentional finger movement has been accepted as an input action, the vibration feedback allows the user to be made aware that their unintentional finger movement has been accepted as an input action. As a result, the user can take measures such as canceling an operation which was unintentionally performed or returning to the state before the operation was performed.

[0255] Furthermore, the aerosol-generating device 1 according to this embodiment is provided with a function for feeding back, by vibration, detection of the start of an action. When the input action is intentional, the user can therefore be given the actual sense of their current finger movement having been detected as the start of an action.

[0256] Meanwhile, when an unintentional finger movement has been accepted as an input action, detection of the start of the action being fed back by vibration allows the user to be made aware that their unintentional finger movement has been detected as the start of an action. Unintended operation of the aerosol-generating device 1 can be prevented as a result.

[0257] Furthermore, the aerosol-generating device 1 according to this embodiment is provided with a function for feeding back, by vibration, completion of acceptance of an action. When the input action is intentional, the user can therefore be made aware that completion of the current input action has been detected, at the point in time of detection. As a result, the user has no need to continue an unnecessary input action while remaining unaware that the action has been completed.

[0258] Meanwhile, even if an unintentional finger movement has been detected as the start of an action, the user can be made aware that an unintended operation has not been implemented, as long as this is before completion of acceptance of the action being fed back by vibration. Furthermore, when completion of acceptance of the action has been fed back by vibration, implementation of an unintended operation can be prevented through an action to cancel the action which was implemented, or similar.

<Embodiment 2>

[0259] This embodiment describes a case in which the part of the touch sensor 102A which accepts input actions is limited in accordance with the operating mode.

[0260] In this embodiment, the part where input actions are possible is limited in heating mode.

[0261] Fig. 12 is a diagram to illustrate differences in parts where input is possible in the heating mode and the non-heating mode. In fig. 12, the part of the touch sensor 102A where input actions can be accepted (i.e., the enabled part) is indicated by the white area, and the part which cannot be used for accepting input actions (i.e., the disabled part) is indicated by shading.

[0262] In fig. 12, the tapping action (long press) shown in fig. 7 is envisaged as an input action which can be accepted in the heating mode.

[0263] In the heating mode shown in fig. 12, only a roughly central area of the touch sensor 102A is set as a region where input actions can be accepted.

[0264] Note that, in the case of fig. 12, the part where input actions can be accepted (the white area) in the heating mode is roughly square-shaped. The roughly square-shaped part here is an example of a specific part.

[0265] As long as it is a partial region of the touch sensor 102A, the part where input actions are enabled may be the top left corner, top right corner, bottom right corner, or bottom left corner of the touch sensor 102A. Here, it is possible to reduce the likelihood of an erroneous action being accepted as an input action by setting the part where input actions are enabled in a place which is difficult to reach with the thumb while the main body portion 10 is gripped in the hand. For example, when the main body portion 10 is gripped in the right hand, the part where input actions are enabled may be provided on the left hand side of the touch sensor 102A which is difficult for the thumb to reach accidentally.

[0266] Furthermore, the shape of the part where input actions can be accepted is not limited to a square and it may equally be rectangular or substantially circular.

[0267] A tapping action is an action which is more easily done accidentally than a swiping action, etc., but because the enabled part where input actions can be accepted is limited to a portion of the touch sensor 102A, it is possible to avoid unintended heating stoppages. In other words, it is possible to prevent an unintended operation (a heating stoppage in this example) from being implemented unless the user intentionally performs an action on the specific part.

[0268] Meanwhile, in the case of this embodiment, there are no restrictions provided on the part for accepting input actions in the non-heating mode. That is to say, the whole of the touch sensor 102A is used as a part where input actions can be accepted.

[0269] The part where input actions can be accepted

may of course also be separately defined in the non-heating mode. For example, an outer edge portion or outer peripheral portion of the touch sensor 102A may be excluded from the part where input actions are possible, or conversely, only the outer edge portion or outer peripheral portion of the touch sensor 102A may be set as the part where input actions are possible.

[0270] It should be noted that the part where input actions are enabled may be set by the user themselves. For example, the user may set the part where input actions are enabled while looking at an operating screen of a smartphone paired by Bluetooth.

[0271] Furthermore, in the description above, the part where input actions can be accepted is substantially square-shaped to take account of the tapping action (long press) envisaged in the heating mode, but when the input action envisaged is a swiping action, the shape of the part which is used to accept input actions may be defined in accordance with the orientation of the swiping action.

[0272] For example, for an operating mode envisaging upward swiping actions and downward swiping actions, the part where input actions can be accepted may be set as a rectangular part which is longer in the vertical direction than the horizontal direction.

[0273] Similarly, for an operating mode envisaging left-direction swiping actions and right-direction swiping actions, the part where input actions can be accepted may be set as a rectangular part which is longer in the horizontal direction than the vertical direction.

<Advantageous Effects>

[0274] In the aerosol-generating device 1 (see fig. 1) according to this embodiment, the part that accepts input actions envisaged in the heating mode is limited to a portion of the touch sensor 102A. Operations not intended by the user can therefore be made less likely than when the whole of the touch sensor 102a is used to accept input actions. Furthermore, in the case of fig. 12, even if the user unintentionally performs a tapping action (long press) on the outer peripheral region of the touch sensor 102A, that action will not be treated as a valid input action. An unintended operation (a heating stoppage here) will therefore not be implemented.

[0275] Incidentally, even if a tapping action (long press) were performed on the outer peripheral region of the touch sensor 102A, vibration feedback notifying detection of the start of an action illustrated in fig. 11 would not be provided.

<Embodiment 3>

[0276] This embodiment describes another example of input actions that can be accepted in the heating mode and the non-heating mode.

[0277] Fig. 13 is a table illustrating other relationships of input actions and haptic feedback. Corresponding

reference signs are given in fig. 13 for parts that correspond to those of fig. 7.

[0278] In the case of fig. 13, the instruction to "start heating" is changed from a tapping action (long press) to an upward swiping action in active mode M6.

[0279] Furthermore, "modify heating profile" is added to the left/right direction swiping action in active mode M6. It should be noted that modifying the heating profile corresponds to modifying the heating temperature.

[0280] Incidentally, the right direction swiping action in fig. 13 is an example of a first direction action to raise the maximum heating temperature to above the current maximum heating temperature. Meanwhile, the left direction swiping action in fig. 13 is an example of a second direction action to lower the maximum heating temperature to below the current maximum heating temperature.

[0281] Furthermore, the upward swiping action, downward swiping action, and left/right direction swiping action are examples of a second input action associated with the non-heating mode.

[0282] In addition, in the case of fig. 13, the tapping action (long press) and the tapping action (short press) are assigned to the heating mode

[0283] Here, the tapping action (long press) and the tapping action (short press) are examples of a first input action assigned to heating mode M8.

[0284] In the case of this embodiment, the input actions assigned to heating mode M8 and the input actions assigned to the non-heating mode are different.

[0285] Fig. 13 differs from fig. 7 in that the tapping action (short press) is set as a "check remaining battery capacity" action while the heating mode is in progress.

[0286] The remaining battery capacity here is an example of a physical quantity. In addition to the remaining battery capacity, other examples of physical quantities to be checked include: number of stick-type substrates 30 (i.e., aerosol sources) inhalable with the current remaining battery capacity; remaining amount of the aerosol source being used (where it is possible to calculate a consumed amount or remaining amount of the aerosol source from the time elapsed from the start of heating or number of inhalations); remaining number of times for which the aerosol source being used is inhalable (where one stick-type substrate 30 is inhalable for a defined number of times); the remaining inhalation time (e.g., 30 seconds); or a cumulative value of the number of inhalations up to the present time.

[0287] In this embodiment, only checking of the remaining battery capacity is assigned to the tapping action (short press), but the abovementioned physical quantities may equally be associated with other input actions (e.g., double tap, orientation of flicking action, etc.). Of course, one physical quantity is assigned to one input action.

<Advantageous Effects>

[0288] In the aerosol-generating device 1 (see fig. 1) according to this embodiment, physical quantities such as the remaining battery capacity can be checked, in addition to heating being stopped in heating mode M8.

[0289] The user can immediately check physical quantities that are a source of concern even during aerosol inhalation.

[0290] Furthermore, the user can also modify the heating profile or maximum heating temperature which is used for heating the stick-type substrate 30 in the non-heating mode (specifically, active mode M6).

<Embodiment 4>

[0291] This embodiment describes a case where a predetermined action needs to be detected by an acceleration sensor as a prerequisite to enabling input actions on the touch sensor 102A constituting the contact sensor.

[0292] Fig. 14 is a flowchart illustrating input action acceptance processing envisaged by Embodiment 4. The symbol S shown in the drawings means "step". The processing operations shown in fig. 14 are implemented by the control unit 106 (see fig. 3).

[0293] The control unit 106 first of all determines whether or not the current operating mode is the heating mode (step 1). A negative result is obtained in step 1 when the current operating mode is the non-heating mode. In this case, the control unit 106 determines whether or not the touch sensor 102A has detected an input action (step 2). An input action here means an input action assigned to the current operating mode.

[0294] A negative result is obtained in step 2 when an input action is not detected. In this case, the control unit 106 repeats the determination of step 2.

[0295] Meanwhile, an affirmative result is obtained in step 2 when an input action has been detected. In this case, the control unit 106 performs control commensurate with the input action assigned to the current operating mode during the non-heating mode (step 3). In the case of fig. 14, the control unit 106 terminates the processing after performing the control above, and returns to the determination of step 1.

[0296] Meanwhile, an affirmative result is obtained in step 1 when the current operating mode is the heating mode. In this case, the control unit 106 determines whether or not the acceleration sensor has detected a predetermined action (step 4). Examples of predetermined actions include: an action of shaking the main body portion 10 (see fig. 1) up and down, an action of shaking the main body portion 10 horizontally, and an action of double tapping a part of the main body portion 10 other than the touch sensor 102A (e.g., the back face).

[0297] A negative result is obtained in step 4 when a predetermined action is not detected. In this case, the

control unit 106 repeats the determination of step 4.

[0298] Meanwhile, when a predetermined action has been detected, the control unit 106 permits acceptance of actions by the touch sensor 102A only within a predetermined time (e.g., 5 seconds) from detection of the predetermined action by the acceleration sensor (step 5).

[0299] The predetermined time here is an example. Note that if the predetermined time is excessively short, the input action will not be completed within the predetermined time. It would be difficult for input actions to be accepted as a result. Meanwhile, if the predetermined time is excessively long, there is a possibility of an unintentional action being erroneously recognized as an input action.

[0300] Note that the predetermined time may also be adjusted by the user. The predetermined time should be adjusted on the operating screen of a smartphone paired by Bluetooth, for example.

[0301] After step 5 has been performed, the control unit 106 determines whether or not the current time is within the predetermined time (step 6).

[0302] A negative result is obtained in step 6 when the current time is not within the predetermined time. In this case the control unit 106 terminates the processing.

[0303] In contrast to this, an affirmative result is obtained in step 6 when the current time is within the predetermined time. In this case, the control unit 106 determines whether or not the touch sensor 102A has detected an input action (step 7). An input action here means an input action assigned to the heating mode.

[0304] A negative result is obtained in step 7 when an input action is not depicted. In this case, the control unit 106 returns to step 6 and repeats the processing described above.

[0305] Note that an affirmative result is obtained in step 7 when an input action has been detected. In this case, the control unit 106 performs control commensurate with the input action during the heating mode (step 8). For example, stoppage of heating or a physical quantity to be checked is notified by means of vibration. In the case of fig. 14, the control unit 106 terminates the processing after performing the control above, and returns to the determination of step 1.

<Advantageous Effects>

[0306] In the aerosol-generating device 1 (see fig. 1) according to this embodiment, a predetermined action needs to be detected by the acceleration sensor as a prerequisite to acceptance of the input actions envisaged in the heating mode. That is to say, input actions cannot be accepted by the touch sensor 102A during the heating mode unless an intentional predetermined action associated with a change in acceleration has been detected. This makes it less likely that an unintended operation will be implemented as compared to

when there is no prerequisite for a predetermined action to be detected by the acceleration sensor. In other words, anything other than an intentional input action combined with detection by the acceleration sensor can be excluded.

[0307] Furthermore, acceptance of input actions by the touch sensor 102A is limited to within a predetermined time from detection of the predetermined action by the acceleration sensor, thereby reducing the likelihood of unintended operations being implemented.

<Embodiment 5>

[0308] This embodiment describes another example where a predetermined action needs to be detected by an acceleration sensor as a prerequisite to enabling input actions on the touch sensor 102A constituting the contact sensor.

[0309] Fig. 15 is a flowchart illustrating input action acceptance processing envisaged by Embodiment 5. Corresponding reference signs are given in fig. 15 for parts that correspond to those of fig. 14. The control unit 106 first of all determines whether or not the current operating mode is the non-heating mode (step 11). This is the difference with Embodiment 4.

[0310] A negative result is obtained in step 11 when the current operating mode is the heating mode. In this case, the control unit 106 determines whether or not the touch sensor 102A has detected an input action (step 2). Incidentally, an input action here means an input action assigned to the heating mode.

[0311] A negative result is obtained in step 2 when an input action is not detected. In this case, the control unit 106 repeats the determination of step 2.

[0312] Meanwhile, an affirmative result is obtained in step 2 when an input action has been detected. In this case, the control unit 106 performs control commensurate with the input action during the heating mode (step 12). In the case of fig. 15, the control unit 106 terminates the processing after performing the control above, and returns to the determination of step 11.

[0313] Meanwhile, an affirmative result is obtained in step 11 when the current operating mode is the non-heating mode. In this case, the control unit 106 determines whether or not the acceleration sensor has detected a predetermined action (step 4).

[0314] A negative result is obtained in step 4 when a predetermined action is not detected. In this case, the control unit 106 repeats the determination of step 4.

[0315] Meanwhile, when a predetermined action has been detected, the control unit 106 permits acceptance of actions by the touch sensor 102A only within a predetermined time (e.g., 5 seconds) from detection of the predetermined action by the acceleration sensor (step 5).

[0316] After step 5 has been performed, the control unit 106 determines whether or not the current time is within the predetermined time (step 6).

[0317] A negative result is obtained in step 6 when the current time is not within the predetermined time. In this case the control unit 106 terminates the processing.

[0318] In contrast to this, an affirmative result is obtained in step 6 when the current time is within the predetermined time. In this case, the control unit 106 determines whether or not the touch sensor 102A has detected an input action (step 7). An input action here means an input action assigned to the current operating mode which is a non-heating mode.

[0319] A negative result is obtained in step 7 when an input action is not depicted. In this case, the control unit 106 returns to step 6 and repeats the processing described above.

[0320] Note that an affirmative result is obtained in step 7 when an input action has been detected. In this case, the control unit 106 performs control commensurate with the input action assigned to the current operating mode during the non-heating mode (step 13). For example, when the current operating mode is sleep mode M2, this is switched to active mode M6. Furthermore, when the current operating mode is active mode, the remaining battery capacity is notified.

[0321] In the case of fig. 15, the control unit 106 terminates the processing after performing the control above, and returns to the determination of step 1.

<Advantageous Effects>

[0322] In the aerosol-generating device 1 (see fig. 1) according to this embodiment, a predetermined action needs to be detected by the acceleration sensor as a prerequisite to acceptance of the input actions envisaged in the non-heating mode. That is to say, input actions cannot be accepted by the touch sensor 102A during the non-heating mode unless an intentional predetermined action associated with a change in acceleration has been detected. This makes it less likely that an unintended operation will be implemented as compared to when there is no prerequisite for a predetermined action to be detected by the acceleration sensor. In other words, anything other than an intentional input action combined with detection by the acceleration sensor can be excluded.

[0323] Furthermore, acceptance of input actions by the touch sensor 102A is limited to within a predetermined time from detection of the predetermined action by the acceleration sensor, thereby reducing the likelihood of unintended operations being implemented.

<Embodiment 6>

[0324] Another example of the contact sensor will be described in this embodiment. Accordingly, the external appearance and other components and functions are the same as those of Embodiment 1, except for the parts associated with the contact sensor.

[0325] In the case of this embodiment, the contact sensor is configured by nine touch sensors 102A.

[0326] Fig. 16 is a diagram to illustrate the positional relationship of the nine touch sensors 102A and the vibration motor 103 in Embodiment 6. Corresponding reference signs are given in fig. 16 for parts that correspond to those of fig. 4.

[0327] This embodiment differs from Embodiment 1 in that the nine substantially circular touch sensors 102A are arranged in 3 rows $\times$ 3 columns. Incidentally, the placement of the vibration motor 103A is roughly the same as in Embodiment 1.

[0328] The nine touch sensors 102A are arranged on the rear face side of the housing on the front face side, and the vibration motor 103A is arranged inwardly from the nine touch sensors 102A. In the case of this embodiment, each of the nine touch sensors 102A detects finger contact. Finger contact will therefore not be detected if the finger touches the gap areas between the nine touch sensors 102A. In the case of this embodiment, tapping actions are therefore carried out by detecting contact on any one of the nine touch sensors 102A. Furthermore, input actions involving a pattern are detected as a pattern which is formed by joining, in succession, coordinate positions of the touch sensors 102A which have detected finger contact.

[0329] Fig. 17 is a diagram to illustrate the relationship of touch sensor 102A arrangement and input actions in Embodiment 6.

[0330] In fig. 17, the positions of the touch sensors 102A located in the first row from the top are represented by P1n (n=1,2,3), the positions of the touch sensors 102A located in the second row from the top are represented by P2n (n=1,2,3), and the positions of the touch sensors 102A located in the third row from the top are represented by P3n (n=1,2,3).

[0331] Note that n=1 means the left hand end, n=2 means the middle, and n=3 means the right hand end.

[0332] For example, an upward swiping action is detected when finger contact in the order of P31→P21→P11 has been detected. The same also applies when finger contact has been detected in the order of P32→P22→P12, and when finger contact has been detected in the order of P33→P23→P13.

[0333] Meanwhile, a downward swiping action is detected when finger contact has been detected in the order of P11→P21→P31. The same also applies when finger contact has been detected in the order of P12→P22→P32, and when finger contact has been detected in the order of P13→P23→P33.

[0334] In other words, when finger contact has been detected in the order of arrangement of three touch sensors 102A positioned in the same column, this is judged to be an upward swiping action or a downward swiping action.

[0335] Similarly, when finger contact has been detected in the order of arrangement of three touch sensors 102A positioned in the same row, this is judged to

be a right swiping action or a left swiping action.

[0336] Incidentally, when finger contact has been detected in the order of P31→P22→P13, or when finger contact has been detected in the order of P33→P22→P11, this is detected as a diagonally upward swiping action.

[0337] Furthermore, when finger contact has been detected in the order of P11→P22→P33, or when finger contact has been detected in the order of P13→P22→P31, this is detected as a diagonally downward swiping action.

<Other Example 1>

[0338] In the case of the description above, all nine touch sensors 102A are constantly operative, but only three of the touch sensors 102A positioned in the second row may be operative during sleep mode M2. That is to say, only the second row may be enabled as an input region, and the first and third rows may be disabled regions. In this case, power can be saved because only three of the touch sensors 102A are operative.

[0339] Fig. 18 is a diagram to illustrate the enabled region and the disabled regions for input actions during sleep mode M2. Corresponding reference signs are given in fig. 18 for parts that correspond to those of fig. 16.

[0340] In fig. 18, the touch sensors 102A in the first and third rows corresponding to the disabled regions are represented by shading.

[0341] Incidentally, only the three touch sensors 102A positioned in the second row are enabled, so a tapping action, a swiping action in the right direction, or a swiping action in the left direction is assigned to the input action for activation.

<Other Example 2>

[0342] Fig. 18 was described in regard to a case where only some of the nine touch sensors 102A are enabled as input regions in sleep mode M2 which is a non-heating mode, but only some of the nine touch sensors 102A may be set as enabled regions during heating mode, as illustrated in fig. 12.

[0343] Fig. 19 is a diagram to illustrate differences in parts where input is possible in the heating mode and the non-heating mode. Corresponding reference signs are given in fig. 19 for parts that correspond to those of fig. 17.

[0344] In the case of fig. 19, all nine of the touch sensors 102A are controlled as enabled regions in the non-heating mode, but only the touch sensor 102A positioned at P22 is an enabled region in the heating mode, with the other eight touch sensors 102A being controlled as disabled regions. A tapping action during the heating mode will therefore not be accepted as a valid input action unless it is performed on the touch

sensor 102A positioned at P22.

<Other Example 3>

[0345] In the description given above, a case where three touch sensors 102A arranged in a line have detected finger contact in succession is considered as an input action, but the action may be deemed an input action at the stage where two touch sensors 102A arranged in a line have detected finger contact in succession. For example, when finger contact has been detected in the order of P31→P21, or when finger contact has been detected in the order of P21→P11, this may be considered as an upward swiping action. The same also applies to other input actions.

<Other Example 4>

[0346] In the description given above, a case where three touch sensors 102A arranged in a line have detected finger contact in succession is considered as an input action, but the action may be deemed an input action as long as three touch sensors 102A across three rows detect finger contact. For example, when finger contact has been detected in the order of P31→P21→P12, this may also be considered as an upward swiping action. The same also applies to other input actions.

<Other Example 5>

[0347] In the description given above, a case was described where the nine touch sensors 102A are arranged in 3 rows/3 columns, but the number and arrangement of touch sensors 102A may be varied so that they are arranged in 2 rows/2 columns, 4 rows/4 columns, 2 rows/3 columns, or 3 rows/4 columns, etc.

<Embodiment 7>

[0348] Another exemplary arrangement of the contact sensor will be described in this embodiment. Accordingly, the external appearance and other components and functions are the same as those of Embodiment 1, except for the parts associated with the arrangement of the contact sensor.

[0349] In the case of this embodiment, the contact sensor is provided in a region of the main body portion 10 (see fig. 1) extending from the upper face across the side face.

[0350] Fig. 20 is a diagram to illustrate the positional relationship of the touch sensor 102A and the vibration motor 103A in Embodiment 7. Corresponding reference signs are given in fig. 20 for parts that correspond to those of fig. 1.

[0351] In the case of fig. 20, the touch sensor 102A is arranged so as to extend from the right hand side of the upper face across the right side face, facing toward the

front face of the main body portion 10. This arrangement assumes that the face on the opposite side to the front face (i.e., the back face) of the main body portion 10 is gripped with the right hand, and actions are performed with the right thumb.

[0352] The two faces across which the touch sensor 102A extends are not limited to the upper face and the right side face, and may be any faces such as the upper face and the left side face, the upper face and the front face, or the upper face and the back face, for example.

[0353] This embodiment envisages two types of swiping actions and one type of tapping action on the touch sensor 102A.

[0354] Fig. 21 is a diagram to illustrate an example of a downward swiping action. Corresponding reference signs are given in fig. 21 for parts that correspond to those of fig. 20.

[0355] The arrow in the drawing represents the downward swiping action. In the case of fig. 21, the downward swiping action assumes a swiping action extending from the upper face across the right side face.

[0356] Fig. 22 is a diagram to illustrate an example of an upward swiping action. Corresponding reference signs are given in fig. 22 for parts that correspond to those of fig. 20.

[0357] The arrow in the drawing represents the upward swiping action. In the case of fig. 22, the upward swiping action assumes a swiping action extending from the right side face across the upper face.

[0358] Fig. 23 is a table illustrating exemplary combinations of input actions and haptic feedback in Embodiment 7.

[0359] As described above, this embodiment envisages a downward swiping action, an upward swiping action, a tapping action (short press), and a tapping action (long press) as input actions.

<Downward swiping action>

[0360] L1, the first line from the top of the table, illustrates two commands and the vibration pattern associated with a "downward swiping action".

• Example 1 (L1-A)

[0361] For example, when there has been a "downward swiping action" during sleep mode M2, the control unit 106 (see fig. 3) changes from a sleep state to an active state. That is to say, the operating mode is shifted from sleep mode M2 to active mode M6. In this case, there is an increase in the intensity of feedback vibration the longer the distance of downward movement of the finger.

• Example 2 (L1-B)

[0362] For example, when there has been a "down-

ward swiping action" during active mode M6, this is accepted by the control unit 106 as an action to "start heating". In this case, the control unit 106 shifts from active mode M6 to initialization mode M7. Again, there is an increase in the intensity of feedback vibration the longer the distance of downward movement of the finger.

<Upward swiping action>

[0363] L2, the second line from the top of the table, illustrates one command and the vibration pattern associated with an "upward swiping action".

• Example 1 (L2-A)

[0364] For example, when there has been an "upward swiping action" during active mode M6, the control unit 106 changes from an active state to a sleep state. That is to say, the operating mode is shifted from active mode M6 to sleep mode M2. In this case, there is a reduction in the intensity of feedback vibration the longer the distance of upward movement of the finger.

[0365] Note that the downward swiping action and the upward swiping action are examples of the second input action.

<Tapping action (long press)>

[0366] L3, the third line from the top of the table, illustrates a command and the vibration pattern associated with a "tapping action (long press)".

• Example 1 (L3-A)

[0367] For example, when there has been a "tapping action (long press)" during heating mode M8, this is accepted by the control unit 106 as an action to "stop heating". In this case, the control unit 106 shifts from heating mode M8 to heating end mode M9.

<Tapping action (short press)>

[0368] L4, the fourth line from the top of the table, illustrates a command and the vibration pattern associated with a "tapping action (short press)".

• Example 1 (L4-A)

[0369] For example, when there has been a "tapping action (short press)" during heating mode M8, this is accepted by the control unit 106 as an action to "check remaining battery capacity". In this case, the control unit 106 feeds back a vibration pattern commensurate with the remaining battery capacity acquired from the remaining capacity meter IC.

[0370] Note that the tapping action (long press) and the tapping action (short press) are examples of the

first input action.

<Other configurations>

[0371] Fig. 24 is a diagram to illustrate another positional relationship of the touch sensor 102A and the vibration motor 103A in Embodiment 7. Corresponding reference signs are given in fig. 24 for parts that correspond to those of fig. 20.

[0372] In the case of the aerosol-generating device 1 shown in fig. 24, the touch sensor 102A is provided on an upper portion of the right side face, facing toward the front face. This arrangement also envisages actions with the thumb of the right hand holding the main body portion 10. Furthermore, the aerosol-generating device 1 shown in fig. 24 also envisages upward/downward swiping actions and two types of tapping actions.

<Embodiment 8>

[0373] This embodiment describes another example of the external appearance of the aerosol-generating device 1.

[0374] However, the other components and functions are the same as those of Embodiment 1, except for the arrangement of the contact sensor and haptic device associated with the different external appearance.

[0375] Fig. 25 is a diagram in which the aerosol-generating device 1 envisaged by Embodiment 8 is seen from diagonally above. Corresponding reference signs are given in fig. 25 for parts that correspond to those of fig. 1.

[0376] The external appearance of the aerosol-generating device 1 envisaged by this embodiment is substantially cylindrical, and the opening 10A into which the stick-type substrate 30 (see fig. 3) is inserted is disposed in the upper face. In the case of fig. 25, there is no slide cover 20 (see fig. 1) provided to open/close the opening 10A.

[0377] In the case of fig. 25, the touch sensor 102A is arranged over the whole circumference on the housing rear side on the upper portion side of the main body portion 10. This embodiment allows the user to grip the main body portion 10 without having to think about orientation, and allows input actions with the thumb. Incidentally, the heating unit 107 (see fig. 3) and the heat insulating portion 108 (see fig. 3), neither of which is depicted here, are arranged on the outer periphery of the internal space 109A, and the touch sensor 102A is positioned on the outer side thereof.

[0378] In the case of fig. 25, the vibration motor 103A is arranged in a central region of the main body portion 10. This is because there is limited space on the upper portion side of the main body portion 10 for arranging the vibration motor 103A. The vibration motor 103A may be arranged in any location as long as the user can perceive differences in vibration intensity.

[0379] The aerosol-generating device 1 shown in fig.

25 enables input actions afforded by up/down/left/right swiping actions and tapping actions, similarly to Embodiment 1. Moreover, diagonally upward and diagonally downward swiping actions may also be used as input actions.

<Other configurations>

[0380] Fig. 26 is a diagram to illustrate another positional relationship of the touch sensor 102A and the vibration motor 103A in Embodiment 8. Corresponding reference signs are given in fig. 26 for parts that correspond to those of fig. 25.

[0381] In the case of the aerosol-generating device 1 shown in fig. 26, the touch sensor 102A is provided so as to extend from the upper face of the main body portion 10 across the side face. Note that the touch sensor 102A is confined to a partial arc section rather than the whole circumference of the main body portion 10. This arrangement also envisages actions with the thumb of the right hand holding the main body portion 10. Furthermore, the aerosol-generating device 1 shown in fig. 26 also envisages upward/downward swiping actions and tapping actions.

<Embodiment 9>

[0382] Fig. 27 is a diagram in which the aerosol-generating device 1 envisaged by Embodiment 9 is seen from diagonally above. Corresponding reference signs are given in fig. 27 for parts which correspond to those of fig. 1 and 20.

[0383] As shown in fig. 27, two touch sensors 102A1 and 102A2 are provided in the aerosol-generating device 1 envisaged by Embodiment 9.

[0384] In the case of fig. 27, the touch sensor 102A1 is provided on the front face of the main body portion 10, and the touch sensor 102A2 is provided extending from the upper face across the right side face of the main body portion 10. This arrangement corresponds to a combination of Embodiment 1 and Embodiment 7.

[0385] When the two touch sensors 102A1 and 102A2 are provided in this way, one instruction may be assigned to both of the two touch sensors 102A, or one instruction may be assigned to only either one of the touch sensors 102A.

[0386] For example, activation and sleeping may be assigned to the touch sensor 102A2 arranged so as to extend from the upper face of the main body portion 10 across the right side face, and sending and receiving of heating profiles may be assigned to the touch sensor 102A1 arranged on the front face of the main body portion 10.

[0387] Note that the vibration motor 103A is arranged in an intermediate area between the two touch sensors 102A1 and 102A2, for example. In the case of fig. 27, the vibration motor 103A is arranged close to the right corner of the front face of the main body portion 10.

When either the touch sensor 102A1 or the touch sensor 102A2 is used for input actions, vibration feedback during the action can therefore be easily transmitted to the user.

[0388] In the case of this embodiment, the touch sensor 102A1 is dedicated to input in the non-heating mode, and the touch sensor 102A2 is dedicated to input in heating mode M8. As a result, this requires the user to intentionally use different input regions. Situations where operations not intended by the user are implemented can be prevented as a result.

<Embodiment 10>

[0389] Fig. 28 is a diagram to illustrate the relationship of mounting positions of the touch sensors 102A1 and 102A2, and the vibration motor 103A in Embodiment 10. Corresponding reference signs are given in fig. 28 for parts that correspond to those of fig. 5.

[0390] Similarly to fig. 5, fig. 28 is also seen through the inside of the main body portion 10 from the right face side. That is to say, fig. 28 shows the positional relationship of the touch sensors 102A1 and 102A2, and the vibration motor 103A arranged in the main body portion 10, as seen therethrough.

[0391] As shown in fig. 28, two touch sensors 102A1 and 102A2 are provided in the aerosol-generating device 1 envisaged by Embodiment 10. One touch sensor 102A1 is provided on the front face of the main body portion 10, and the other touch sensor 102A2 is provided on the rear face of the main body portion 10.

[0392] The touch sensors 102A1 and 102A2 in this embodiment are both roughly square-shaped. When the touch sensor 102A1 and the touch sensor 102A2 are arranged on both faces of the main body portion 10, the control unit 106 may disable input on the face having a large contact area with the fingers or the palm of the hand, and may control the face on the opposite side (i.e., the face on the side that the thumb touches) to be the input face.

[0393] In this case, whether the user is holding the device with the rear face in contact with the right thumb, or with the rear face in contact with the left thumb, in either case the user can start an input action without changing grip.

[0394] Furthermore, as shown in fig. 28, the touch sensor 102A1 may be dedicated to input in the non-heating mode, and the touch sensor 102A2 may be dedicated to input in heating mode M8. As a result, this requires the user to intentionally use different input regions. Situations where operations not intended by the user are implemented can be prevented as a result.

<Other embodiments>

[0395]

(1) Embodiments of the present disclosure were

described above, but the technical scope of the present disclosure is not limited to the scope disclosed in the embodiments above. It will be obvious from the disclosure of the claims that the technical scope of the present disclosure also includes various modifications or improvements made to the embodiment above.

(2) An LRA was given by way of example as the vibration motor in the embodiments described above, but the vibration motor may equally be an ERM (= eccentric rotating mass). An ERM has a structure in which a weight with a biased shape is attached to a rotary shaft of a motor, and is also referred to as an eccentric motor. An ERM having a weight with a larger mass can generate larger vibrations than a weight with a smaller mass. Furthermore, an ERM with a greater rotation speed of the rotary shaft can generate larger vibrations than with a lower rotation speed.

(3) In the embodiments described above, a vibration motor was given by way of example as a haptic device, but a piezoelectric element may equally be used. A piezoelectric element can freely control vibration at 50-500 Hz, at which changes in touch are perceived. Furthermore, piezoelectric elements have a response time of approximately 1 ms, which is shorter than an LRA.

(4) In the embodiments described above, vibration was given as an example of haptic feedback, but electrostatic haptics employing electrostatic force may equally be used. Note that examples of electrostatic haptics include electrical stimulation and electrostatic attraction. Electrical stimulation can be demonstrated by a haptic device constructed with an electrode to which a high voltage is applied and an electrode connected to GND. Electrostatic attraction can be demonstrated by a haptic device comprising an electrode which is charged by application of a voltage, an electrode connected to GND, and an insulator disposed between these two electrodes.

(5) In the embodiments described above, haptic feedback is used as feedback for acceptance of input actions to a contact sensor, but visual feedback using a liquid crystal display or other display device, or an LED or other light-emitting device, may equally be used, or auditory feedback using a buzzer or other sound output device, may equally be used.

(6) In the embodiments described above, haptic feedback is used as feedback for acceptance of input actions to a contact sensor, but an aerosol-generating device which gives no feedback for input actions is also possible.

(7) In the embodiments described above, the single control unit 106 controls the two functions of heating of the stick-type substrate 30 (see fig. 3) by the heating unit 107 and haptic feedback, but a

dedicated processor for controlling heating of the stick-type substrate 30 (see fig. 3) by the heating unit 107, and a dedicated processor for controlling output of the haptic device may equally be provided. The dedicated processor for controlling heating here is an example of a first processor, and the dedicated processor for controlling output of the haptic device is an example of a second processor.

(8) In the embodiments described above, tapping actions and swiping actions were given as examples of input actions, but some of these actions may be substituted with flicking actions, or flicking actions may be combined with these actions.

(9) The embodiments above described a case in which the aerosol source is a solid, but the aerosol source may equally be a liquid. When the aerosol source is a liquid, a system is adopted in which the aerosol source is guided to a narrow tube known as a wick by using the capillary phenomenon, and a coil wound around the wick is heated to thereby vaporize the aerosol source. It should be noted that if the aerosol source is a liquid, the aerosol source is heated in conjunction with inhalation by the user. A container for accommodating the liquid aerosol source is also referred to as a cartridge.

(10) The embodiments above described an aerosol-generating device which generates an aerosol by heating a solid aerosol source, but the aerosol-generating device may equally generate an aerosol by separately heating each of a solid aerosol source and a liquid aerosol source. An aerosol-generating device of this type is also referred to as a hybrid aerosol-generating device.

(11) There are input actions specific to an aerosol-generating device 1 which heats a solid aerosol source at a high temperature (e.g., 200°C or greater), and there are input actions specific to an aerosol-generating device 1 which heats a solid aerosol source at a low temperature (e.g., less than 200°C) or heats a liquid aerosol source, and there are also input actions common to both systems.

[0396] Fig. 29 is a table illustrating differences in input actions in aerosol-generating devices due to differences in types of aerosol source and heating temperatures.

[0397] In fig. 29, the input actions are classified according to combinations of four types of input actions, two types of aerosol sources, and three types of heating systems.

[0398] The four types of input actions relate to "basic operation", "switching", "communication", and "checking".

[0399] The two types of aerosol sources are a solid aerosol source and a liquid aerosol source. Note that the solid aerosol source can be classified as a high-temperature-heating aerosol source and a low-tem-

perature-heating aerosol source.

[0400] The three types of heating systems are a system for heating a solid aerosol source at a high temperature, a system for heating a solid aerosol source at a low temperature, and a system for heating a liquid aerosol source.

[0401] The input actions shown in fig. 29 are associated with the abovementioned tapping actions and swiping actions, etc. and a different vibration pattern is associated with each input action. For example, vibration patterns (e.g., number of times of vibration, vibration intensity, vibration timing) representing: information to be notified (e.g., brand, heating profile, heating temperature, inhalation detection sensitivity, display mode, charging status); quantity (e.g., remaining battery capacity (lifespan), remaining inhalation time, remaining amount of liquid, remaining amount in capsule); or number (e.g., number of inhalations, remaining number of inhalations, remaining number of times of inhalation, cumulative number of times of inhalation), are assigned to switching- or checking-related input actions.

[0402] This makes it possible to realize an aerosol-generating device 1 in which a contact device and haptic feedback are used on a user interface.

<Summary>

[0403] It should be noted that the present disclosure includes the following features.

(1) An aerosol-generating device comprising: a heating unit for heating an aerosol source; a contact sensor for detecting an action on a predetermined part of a housing surface; and a processor for implementing a function to control heating of the aerosol source by the heating unit, and a function to control actions that can be accepted by the contact sensor, in accordance with an operating mode. This aerosol-generating device makes it possible to prevent unintended operation of an aerosol-generating device employing a contact sensor.

(2) The aerosol-generating device as disclosed (1), wherein the processor controls a first input action to be acceptable when the operating mode is in a heating mode of the aerosol source, and controls a second input action, different from the first input action, to be acceptable when the operating mode is in a non-heating mode of the aerosol source.

This aerosol-generating device can require the user to use different input actions depending on the operating mode.

(3) The aerosol-generating device as disclosed in (1) or (2), wherein the processor limits acceptance of input actions to action on a specific part when the operating mode is the aerosol source heating mode.

This aerosol-generating device can require the user to operate a specific part during the heating

mode.

(4) The aerosol-generating device as disclosed in (3), wherein the specific part is at least one housing face.

This aerosol-generating device enables the surface of the housing to be used as an input portion.

(5) The aerosol-generating device as disclosed in (2), wherein the first input action is an action relating to at least one of stopping heating of the aerosol source and checking a physical quantity. This aerosol-generating device also enables physical quantities to be checked while the heating mode is in progress.

(6) The aerosol-generating device as disclosed in (5), wherein the physical quantity is at least one of: remaining capacity in a battery constituting an electrical power source, number of aerosol sources inhalable with the remaining capacity, remaining amount of the aerosol source being used, remaining number of times for which the aerosol source being used is inhalable or remaining inhalation time, and cumulative value of number of inhalations up to the present time.

This aerosol-generating device also enables physical quantities to be checked while the heating mode is in progress.

(7) The aerosol-generating device as disclosed (2), wherein the second input action is an action to modify a control sequence used for heating the aerosol source.

This aerosol-generating device allows acceptance of actions to modify the control sequence during the non-heating mode.

(8) The aerosol-generating device as disclosed in (7), wherein the second input action constitutes a first direction action to raise a maximum temperature to above that of the current control sequence, and a second direction action to lower the maximum temperature to below that of the current control sequence, the first direction action and the second direction action being actions in different directions.

This aerosol-generating device can require the user to perform different actions when the maximum temperature is raised and lowered.

(9) The aerosol-generating device as disclosed in any one of (1)-(8), wherein the processor permits acceptance of actions by the contact sensor on the condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the heating mode.

This aerosol-generating device can require an intentional action associated with a change in acceleration in order to accept input actions during the heating mode.

(10) The aerosol-generating device as disclosed in any one of (1)-(8), wherein the processor permits acceptance of actions by the contact sensor on the

condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the non-heating mode. This aerosol-generating device can require an intentional action associated with a change in acceleration in order to accept input actions during the non-heating mode.

(11) The aerosol-generating device as disclosed in (9) or (10), wherein the processor permits acceptance of actions by the contact sensor only for a predetermined time after detection of the predetermined action by the acceleration sensor.

This aerosol-generating device allows acceptance of only intentional user actions.

(12) The aerosol-generating device as disclosed in (2), wherein the non-heating mode is at least one of an active mode, a sleep mode, a charging mode, and a pairing mode.

This aerosol-generating device can require the user to perform input actions specific to the non-heating mode.

(13) The aerosol-generating device as disclosed in (2), wherein there are fewer types of first input actions than types of second input actions.

This aerosol-generating device is capable of limiting the types of input actions that can be accepted while the heating mode is in progress.

(14) The aerosol-generating device as disclosed in any one of (1)-(13), wherein the processor comprises: a first processor for controlling heating of the aerosol source by the heating unit; and a second processor for controlling actions that can be accepted by a haptic sensor.

[0404] This aerosol-generating device does not require development of a novel processor capable of controlling both the heating unit and the haptic sensor.

REFERENCE SIGNS LIST

[0405] 1... Aerosol-generating device, 10... Main body portion, 10A... Opening, 20... Slide cover, 30... Stick-type substrate, 30A... Substrate portion, 30B... Mouthpiece portion, 101... Power source unit, 102... Sensor unit, 102A... Touch sensor, 103... Notification unit, 103A... Vibration motor, 104... Memory unit, 105... Communication unit, 106... Control unit, 107... Heating unit, 108... Heat insulating portion, 109... Holding portion, 109A... Internal space, 109B... Bottom portion

Claims

1. An aerosol-generating device comprising:
a heating unit for heating an aerosol source;

a contact sensor for detecting an action on a predetermined part of a housing surface; and

a processor for implementing a function to control heating of the aerosol source by the heating unit, and a function to control actions that can be accepted by the contact sensor, in accordance with an operating mode.

2. The aerosol-generating device as claimed in claim 1, wherein
the processor

controls a first input action to be acceptable when the operating mode is in a heating mode of the aerosol source, and
controls a second input action, different from the first input action, to be acceptable when the operating mode is in a non-heating mode of the aerosol source.

3. The aerosol-generating device as claimed in claim 1 or 2, wherein
the processor
limits acceptance of input actions to action on a specific part when the operating mode is the aerosol source heating mode.

4. The aerosol-generating device as claimed in claim 3, wherein
the specific part is at least one housing face.

5. The aerosol-generating device as claimed in claim 2, wherein
the first input action is an action relating to at least one of stopping heating of the aerosol source and checking a physical quantity.

6. The aerosol-generating device as claimed in claim 5, wherein
the physical quantity is at least one of: remaining capacity in a battery constituting an electrical power source, number of aerosol sources inhalable with the remaining capacity, remaining amount of the aerosol source being used, remaining number of times for which the aerosol source being used is inhalable or remaining inhalation time, and cumulative value of number of inhalations up to the present time.

7. The aerosol-generating device as claimed in claim 2, wherein
the second input action is an action to modify a control sequence used for heating the aerosol source.

8. The aerosol-generating device as claimed in claim 7, wherein
the second input action constitutes a first direction action to raise a maximum temperature to above that of the current control sequence, and a second

direction action to lower the maximum temperature to below that of the current control sequence, the first direction action and the second direction action being actions in different directions.

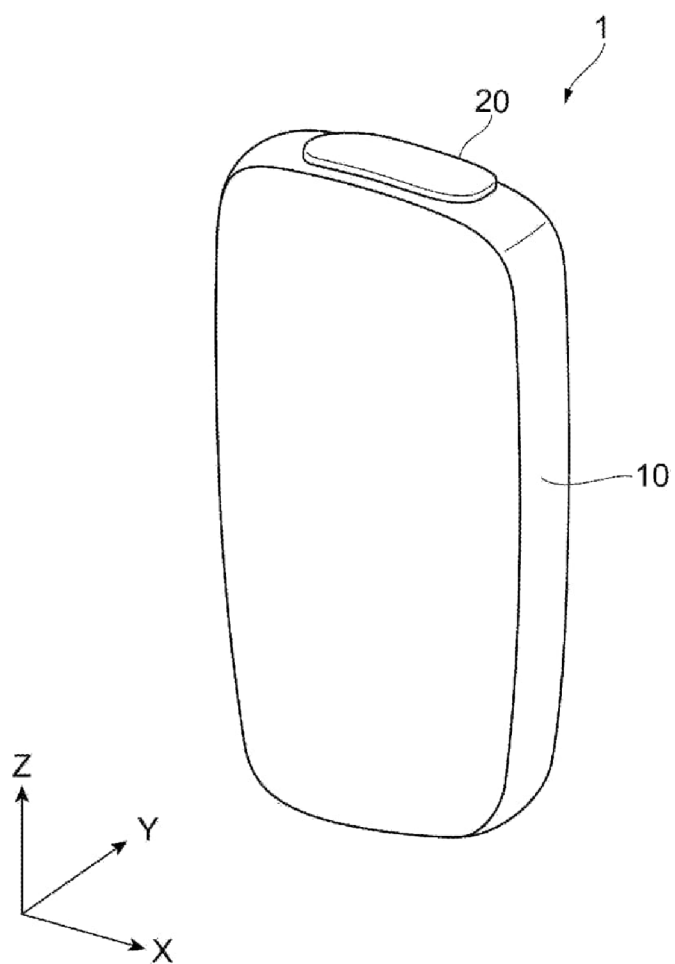
5

9. The aerosol-generating device as claimed in any one of claims 1 to 8, wherein the processor permits acceptance of actions by the contact sensor on the condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the heating mode. 10
10. The aerosol-generating device as claimed in any one of claims 1 to 8, wherein the processor permits acceptance of actions by the contact sensor on the condition that a predetermined action is detected by means of an acceleration sensor, when the operating mode is the non-heating mode. 15 20
11. The aerosol-generating device as claimed in claim 9 or 10, wherein the processor permits acceptance of actions by the contact sensor only for a predetermined time after detection of the predetermined action by the acceleration sensor. 25
12. The aerosol-generating device as claimed in claim 2, wherein the non-heating mode is at least one of an active mode, a sleep mode, a charging mode, and a pairing mode. 30 35
13. The aerosol-generating device as claimed in claim 2, wherein there are fewer types of first input actions than types of second input actions. 40
14. The aerosol-generating device as claimed in any one of claims 1 to 13, wherein the processor comprises:

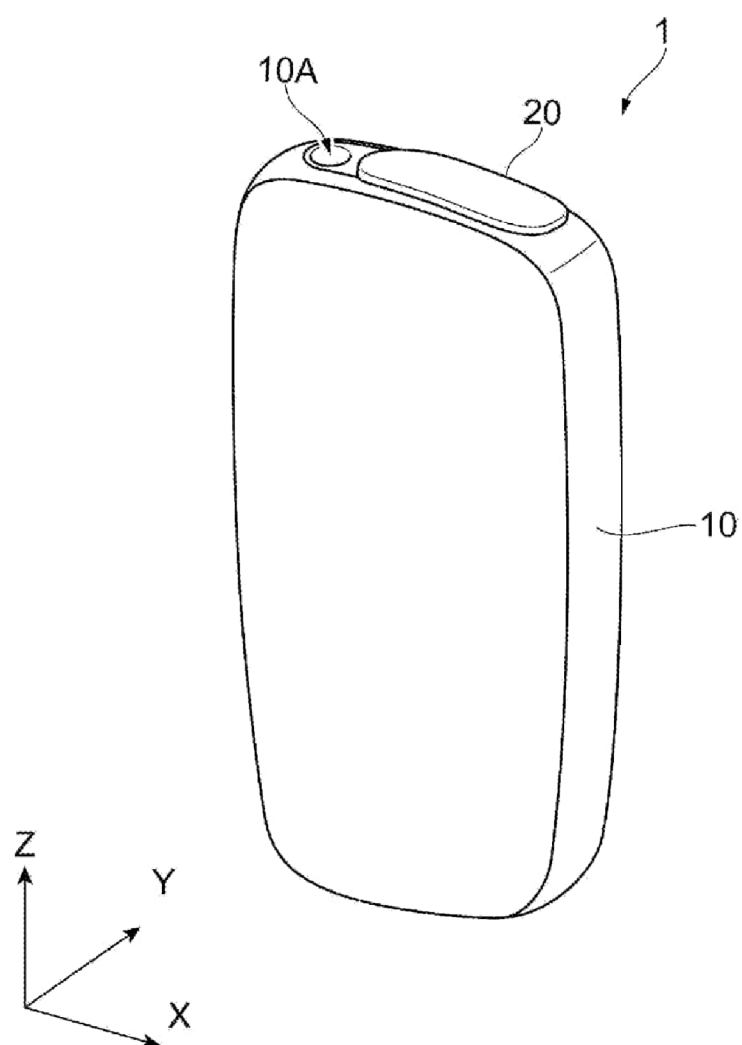
a first processor for controlling heating of the aerosol source by the heating unit; and
a second processor for controlling actions that can be accepted by the contact sensor. 45 50

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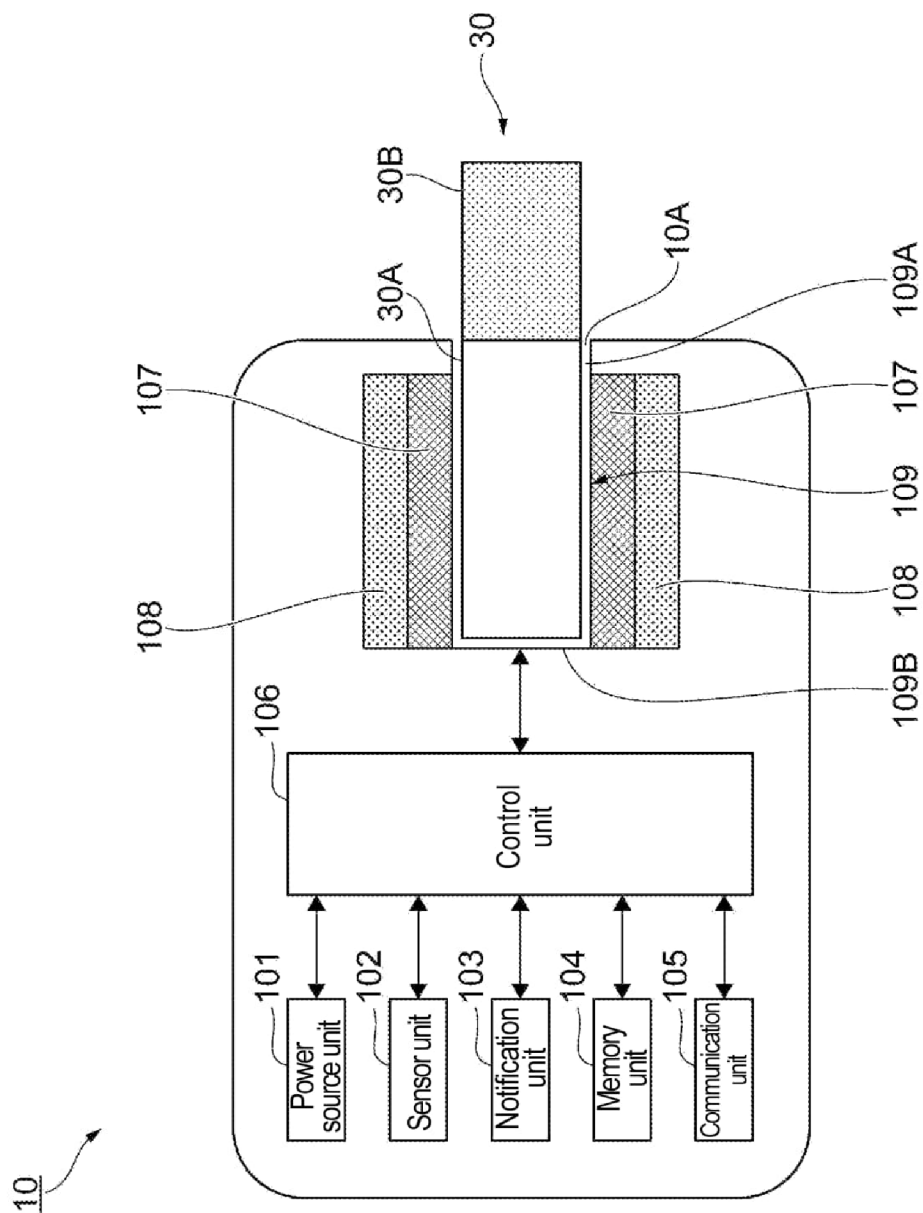
[Fig. 1]



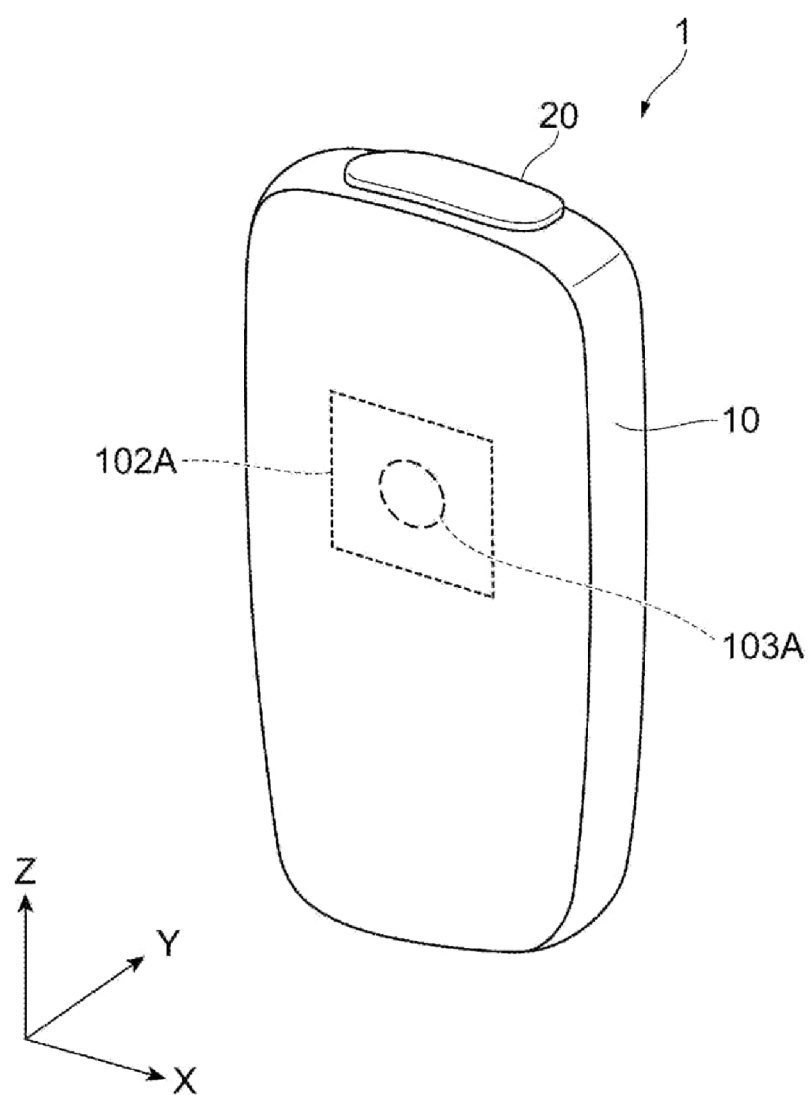
[Fig. 2]



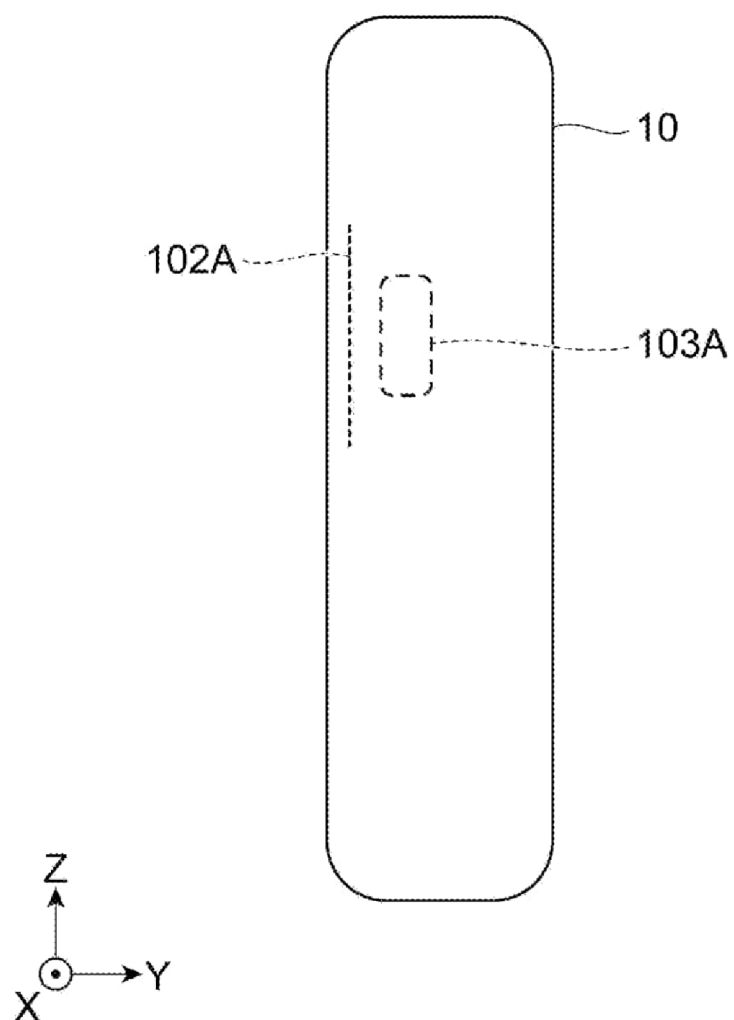
[Fig. 3]



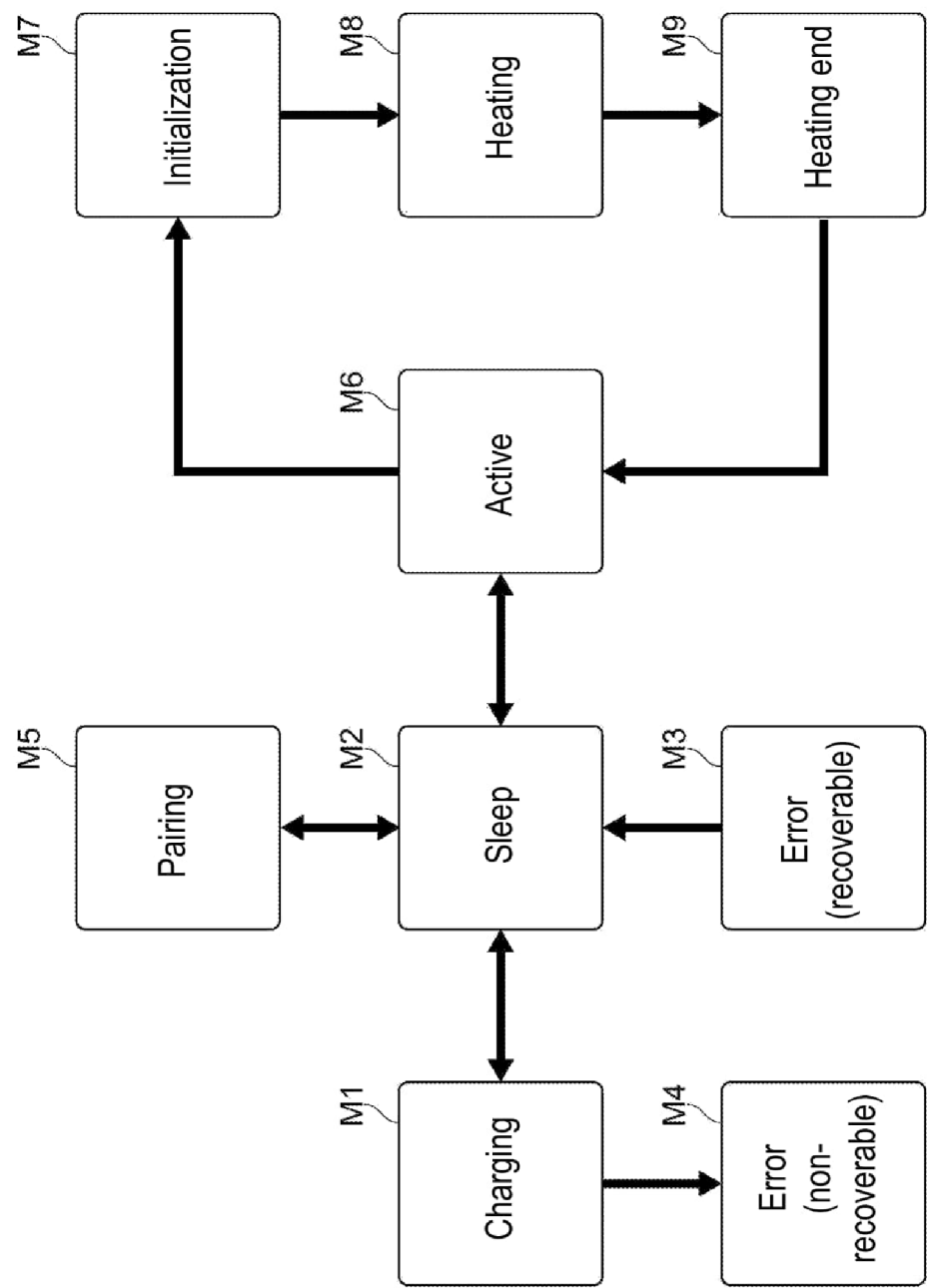
[Fig. 4]



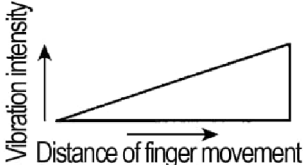
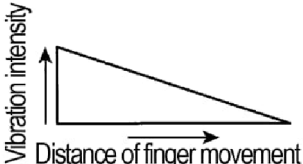
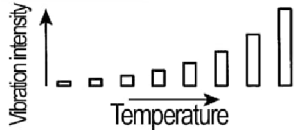
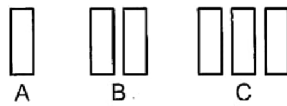
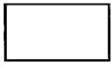
[Fig. 5]



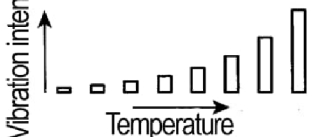
[Fig. 6]



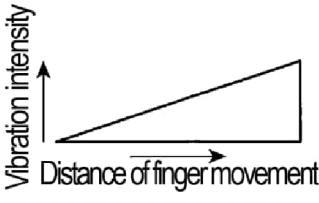
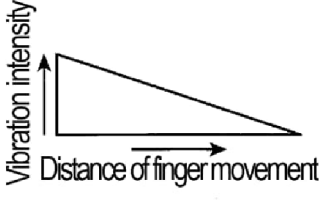
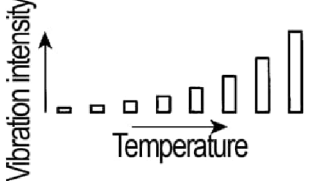
[Fig. 7]

Input action (operating mode)			Vibration pattern
L1		A Example 1: Activate (sleep)	
		B Example 2: Send heating profile (active)	
L2		A Example 1: Sleep (active)	
		B Example 2: Receive heating profile (active)	
L3	 	A Example 1: Modify heating temperature (active)	
		B Example 2: Select brand (active)	
L4	 Long press	A Example 1: Start heating (active)	
		B Example 2: Stop heating (heating)	
L5	 Short press	A Example 1: Check remaining battery capacity (active)	

[Fig. 8]

Input action (operating mode)			Vibration pattern
L1		A	Example 1: Activate (sleep)
		B	Example 2: Start heating (active)
L2		A	Example 1: Sleep (active)
		B	Example 2: Stop heating (heating)
L3		A	Example 1: Modify heating temperature (active)
			 Vibration intensity ↑ Distance of finger movement → Temperature →

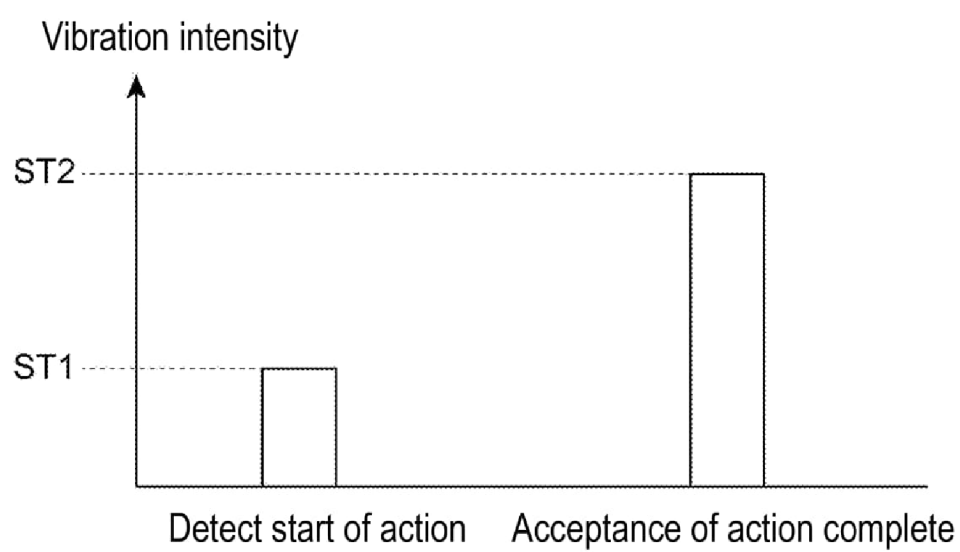
[Fig. 9]

Input action (operating mode)			Vibration pattern
L1		A	Example 1: Activate (sleep)
		B	Example 2: Start heating (active)
L2		A	Example 1: Sleep (active)
		B	Example 2: Stop heating (heating)
L3		A	Example 1: Modify heating temperature (active)
			
			
			

[Fig. 10]

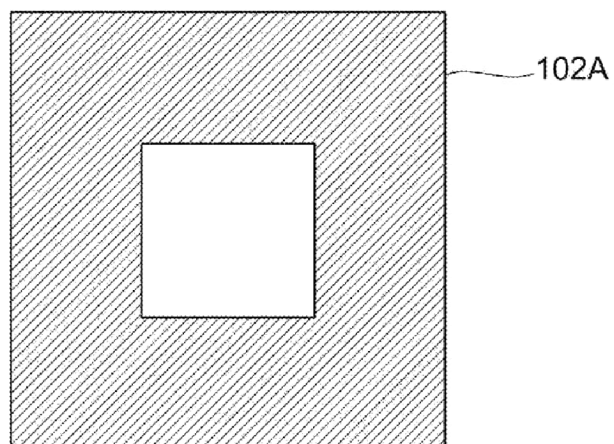
Input action (operating mode)			Vibration pattern
L1		A	Example 1: Activate (sleep)
		B	Example 2: Start heating (active)
L2		A	Example 1: Activate (sleep)
		B	Example 2: Start heating (active)
L3		A	Example 1: Modify heating temperature (active)

[Fig. 11]

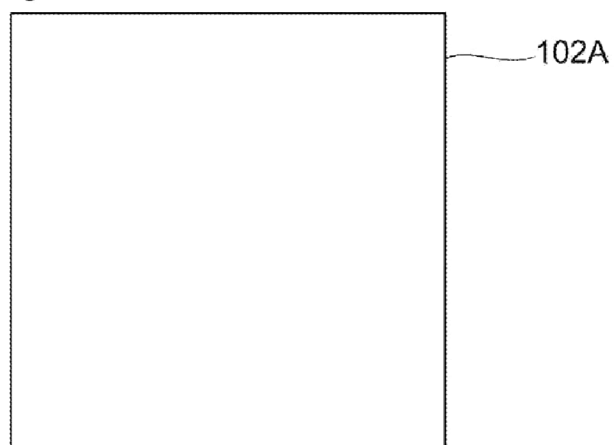


[Fig. 12]

<Heating mode>

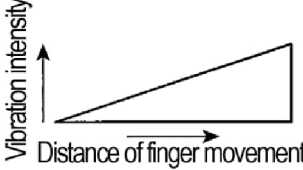
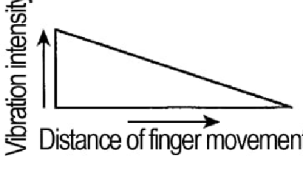
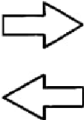
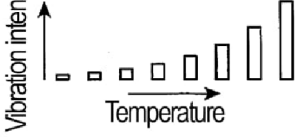
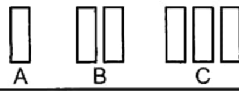
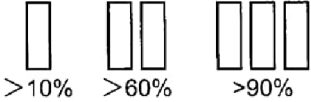


<Non-heating mode>

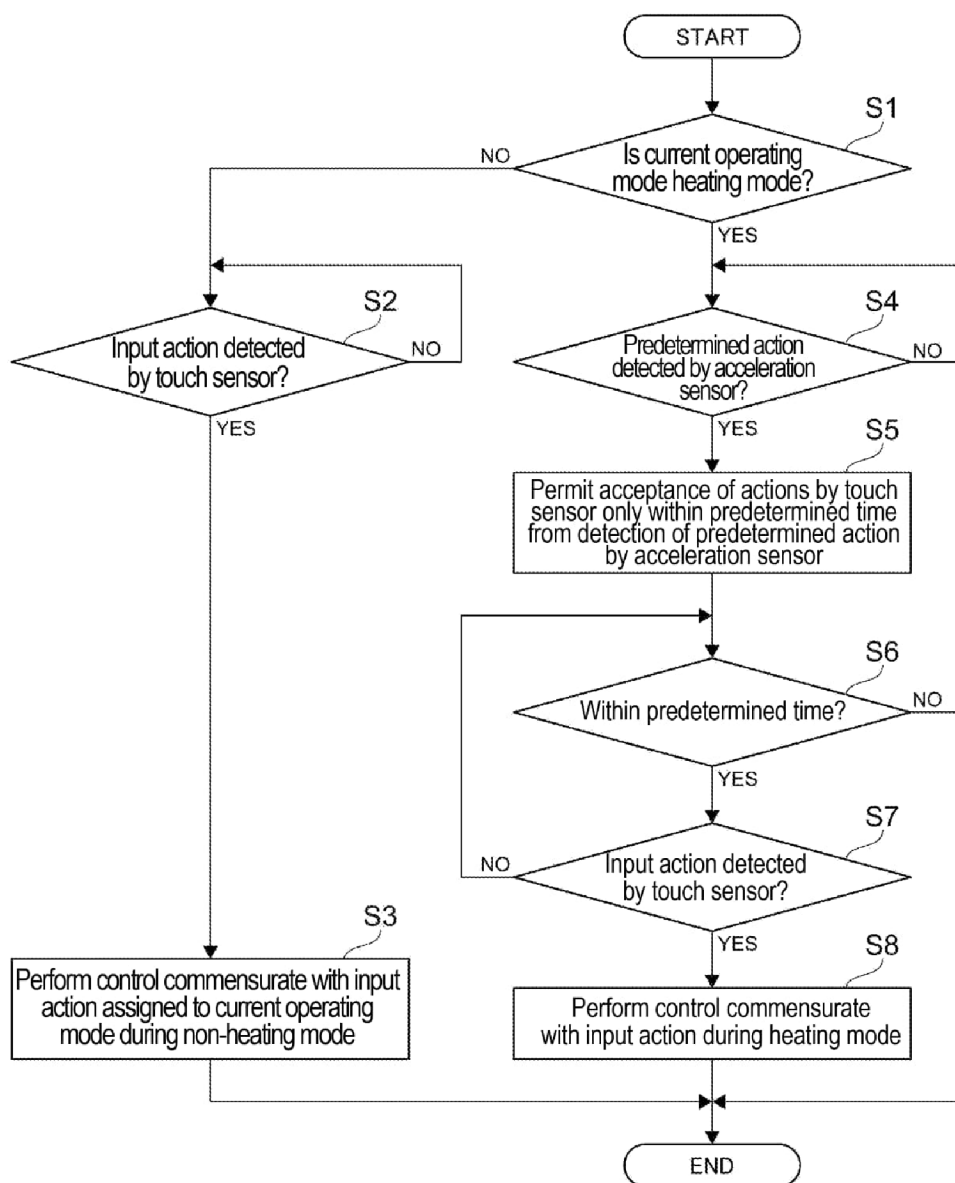


☐ Enabled ☒ Disabled

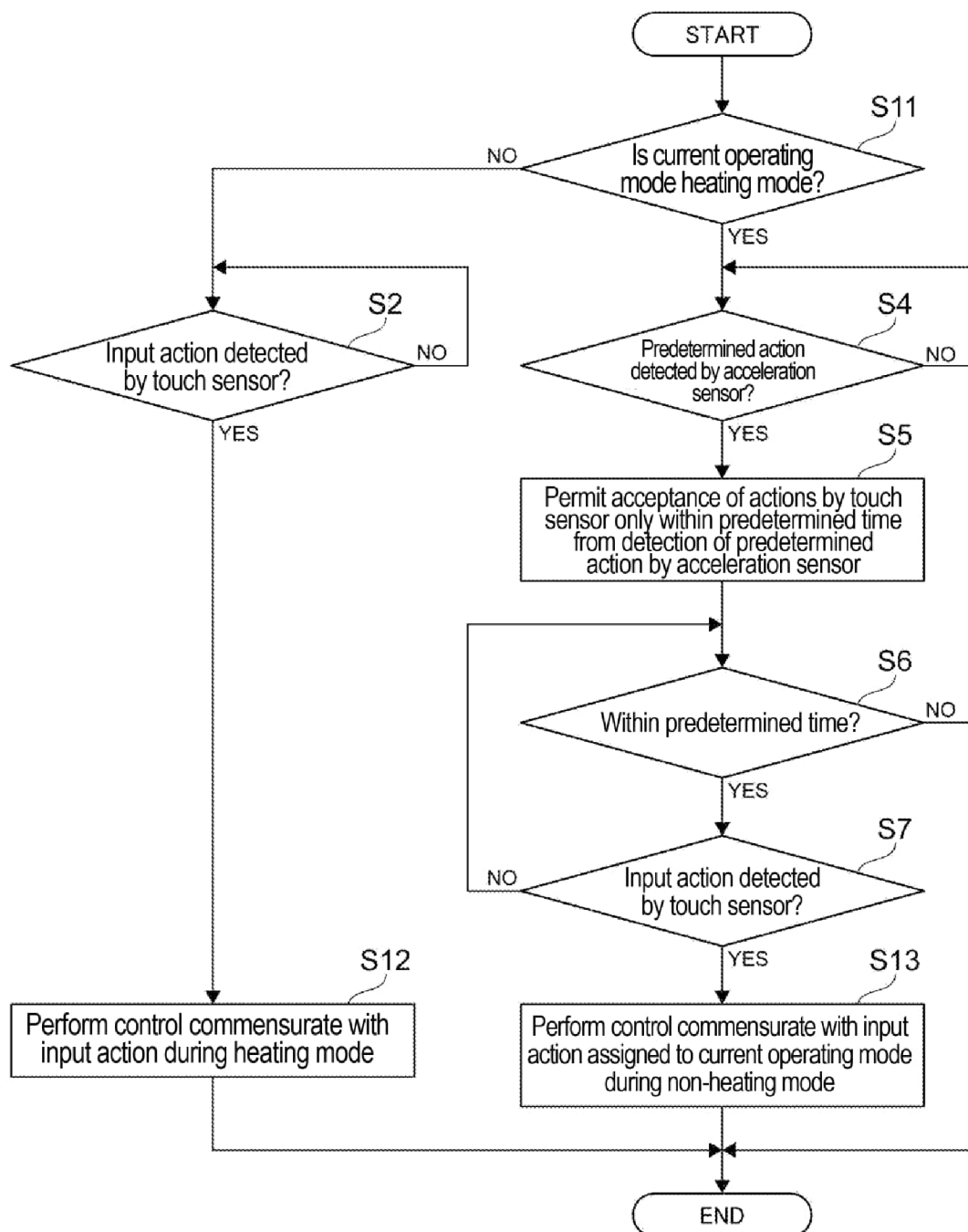
[Fig. 13]

Input action (operating mode)			Vibration pattern
L1		A Example 1: Activate (sleep)	
		B Example 2: Send heating profile (active)	
		C Example 3: Start heating (active)	
L2		A Example 1: Sleep (active)	
		B Example 2: Receive heating profile (active)	
L3		A Example 1: Modify heating temperature (active)	
		B Example 2: Modify heating profile (active)	
		C Example 3: Select brand (active)	
L4	 Long press	A Example 1: Stop heating (heating)	
L5	 Short press	A Example 1: Check remaining battery capacity (heating)	

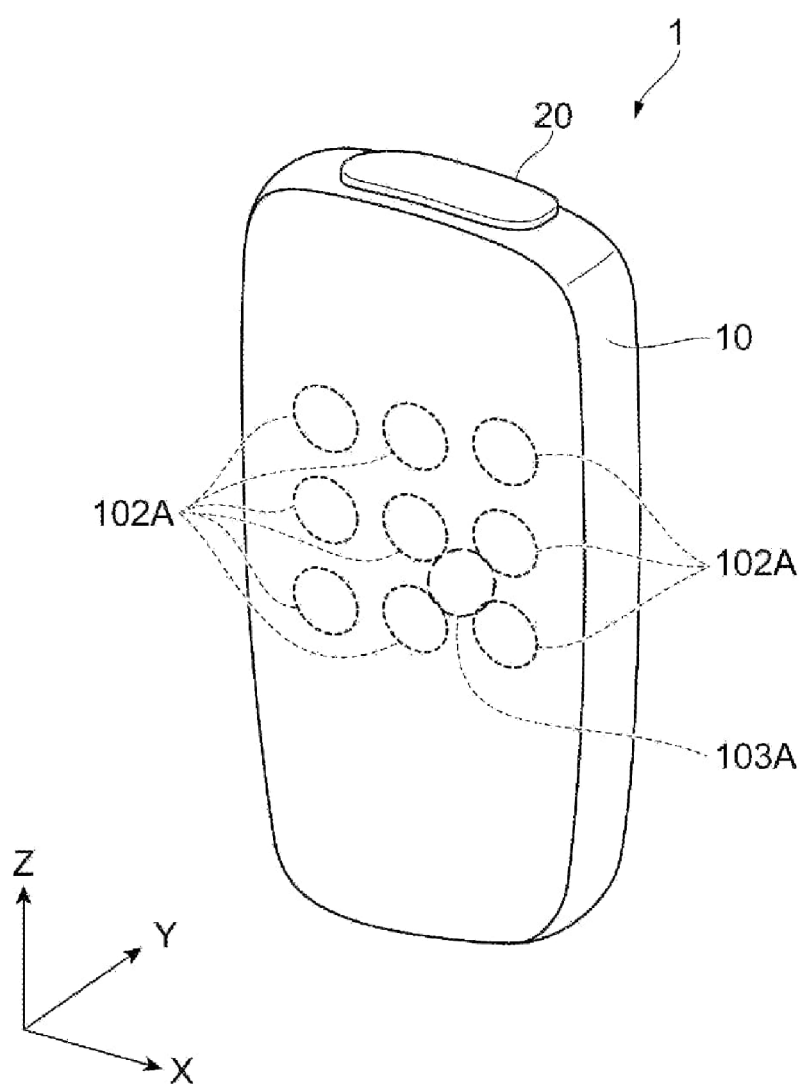
[Fig. 14]



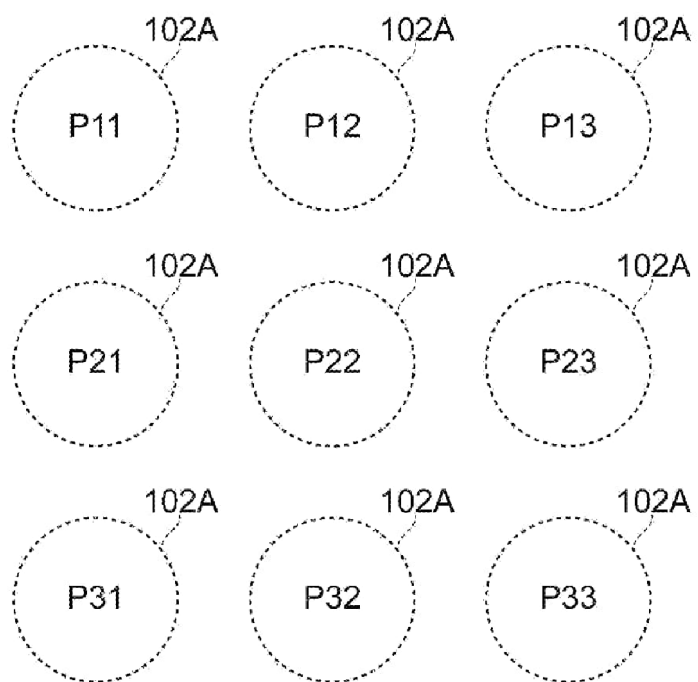
[Fig. 15]



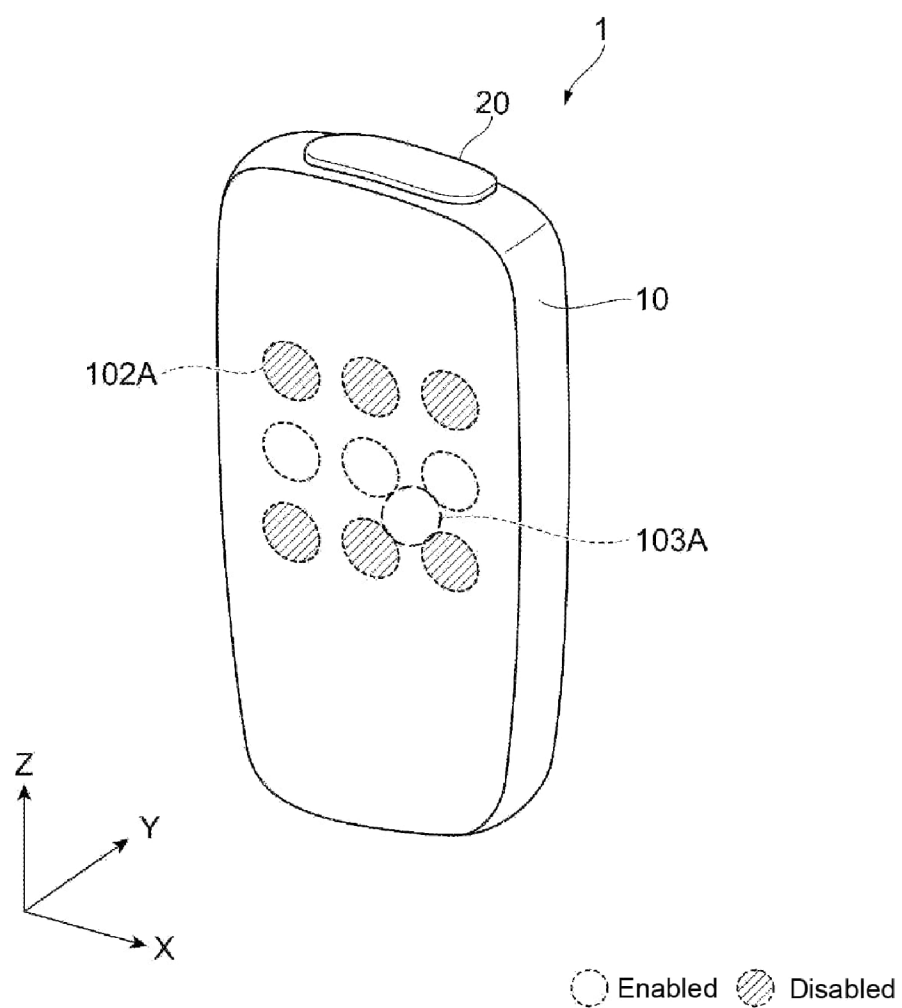
[Fig. 16]



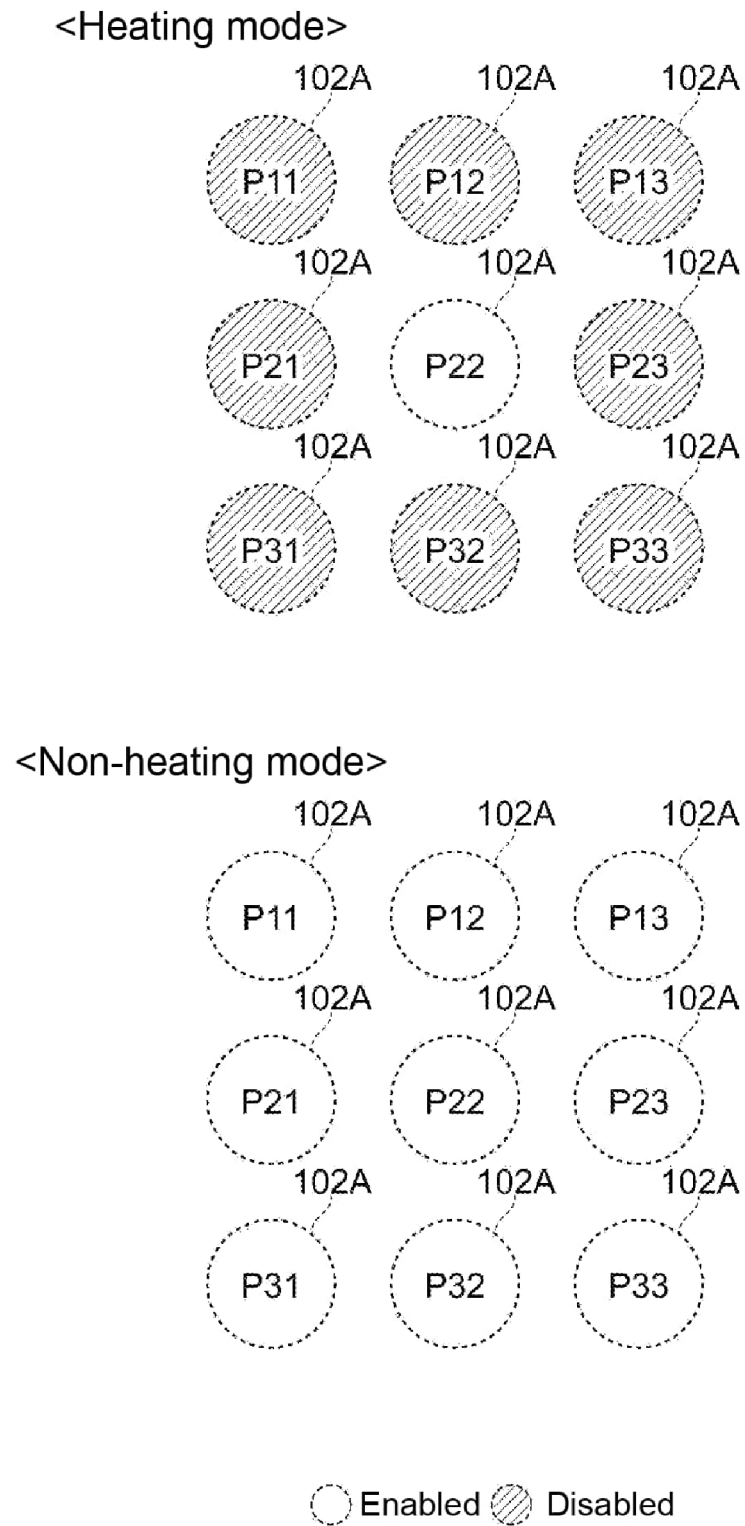
[Fig. 17]



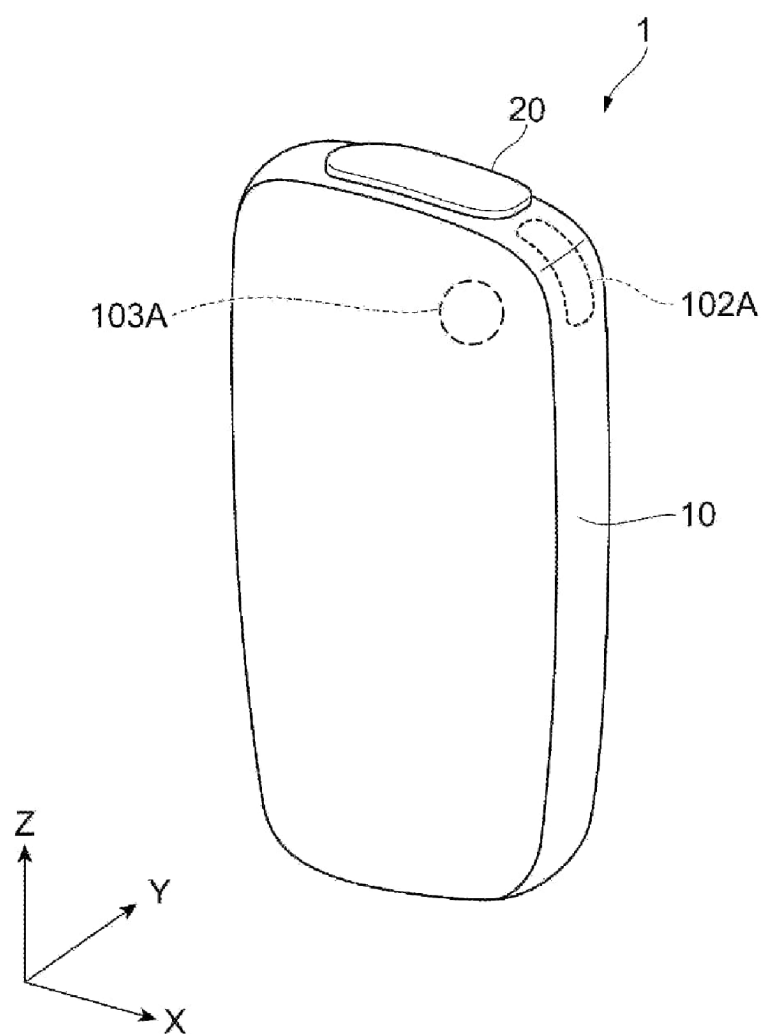
[Fig. 18]



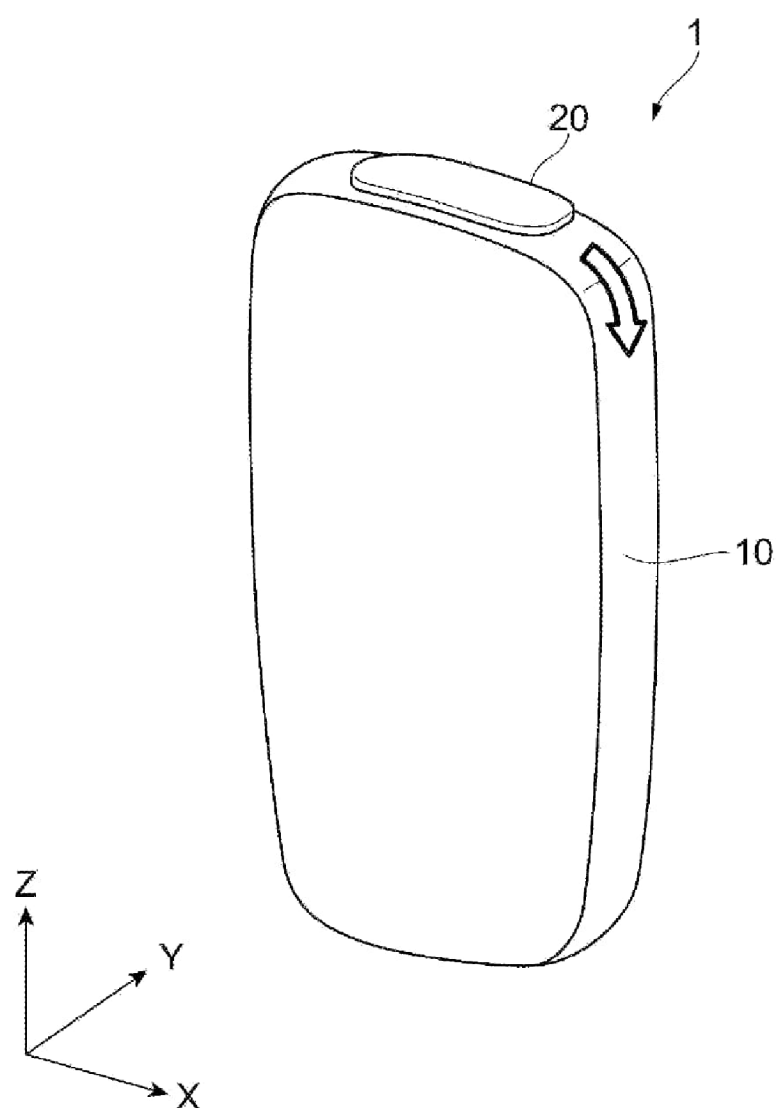
[Fig. 19]



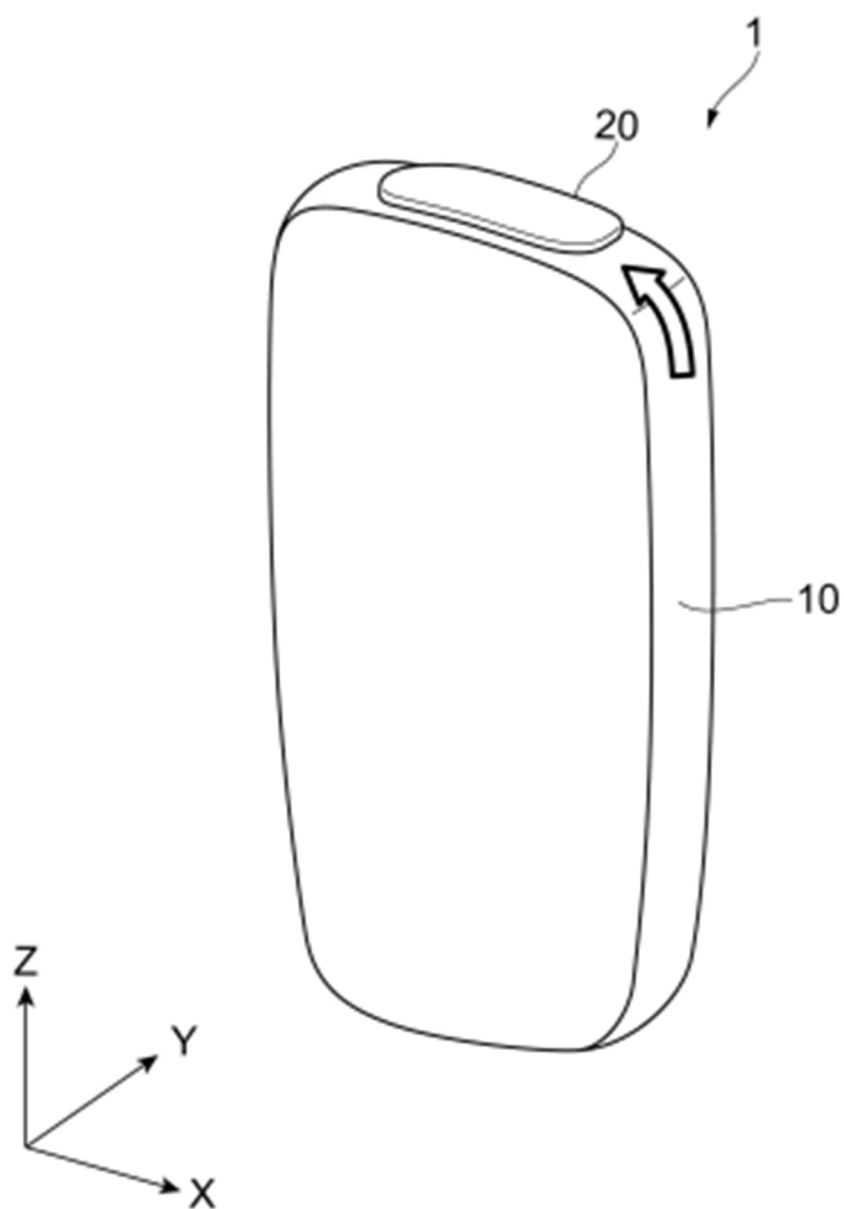
[Fig. 20]



[Fig. 21]

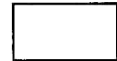
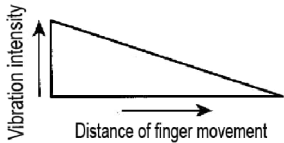
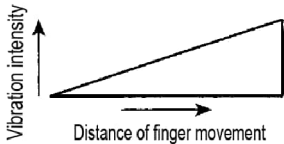


[Fig. 22]

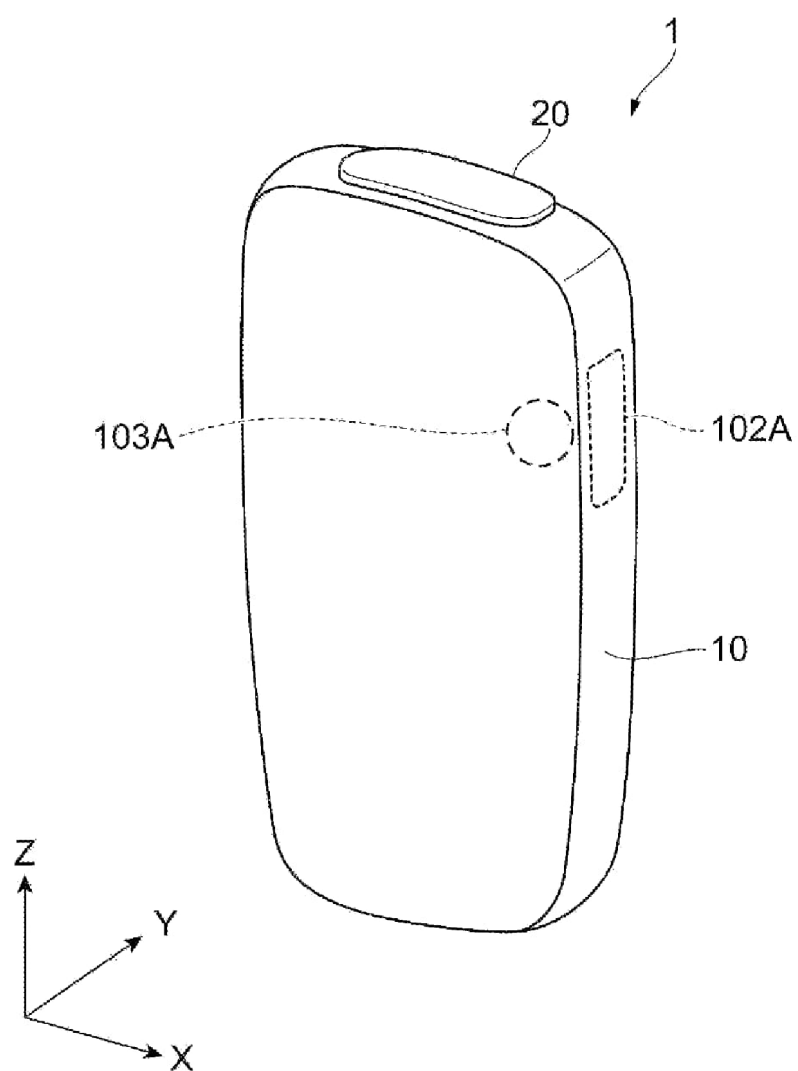


[Fig. 23]

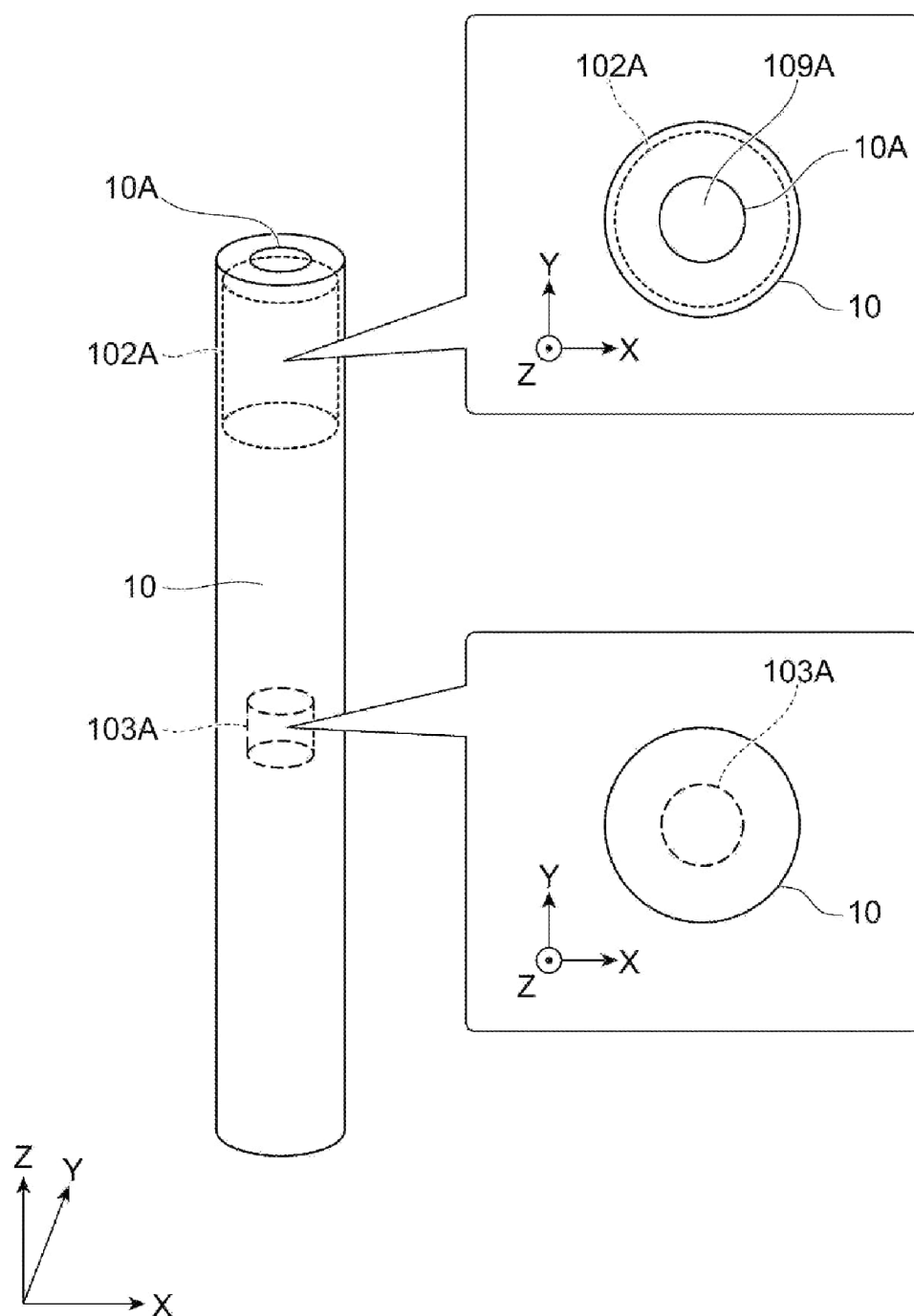
Input action (operating mode)			Vibration pattern
L1		A	Example 1: Activate (sleep)
		B	Example 2: Start heating (active)
L2		A	Example 1: Sleep (active)
L3	 Long press	A	Example 1: Stop heating (heating)
L4	 Short press	A	Example 1: Check remaining battery capacity (heating)



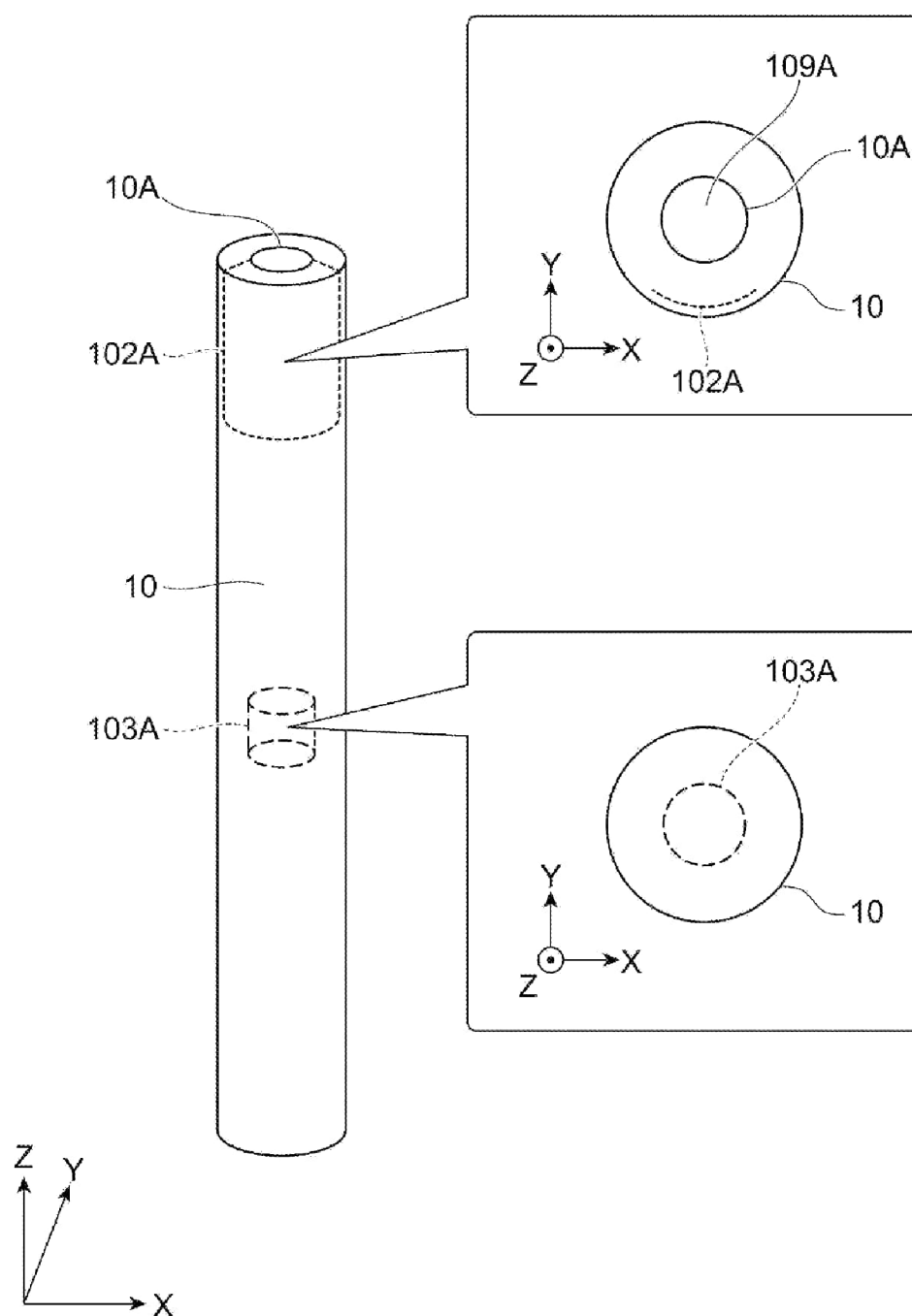
[Fig. 24]



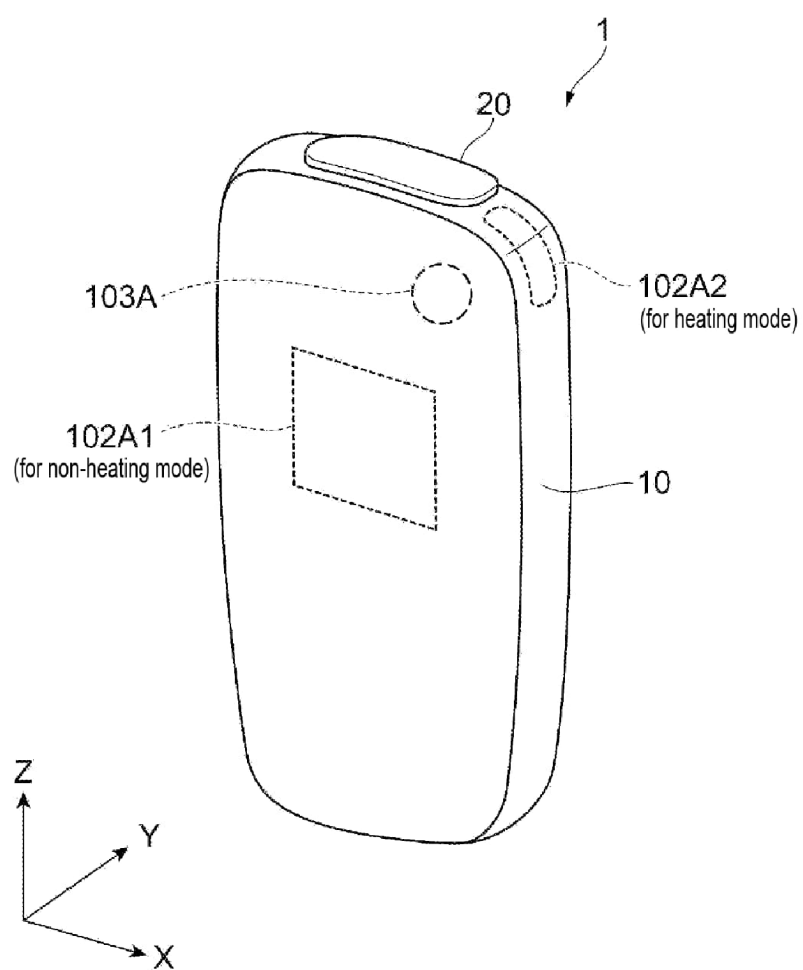
[Fig. 25]



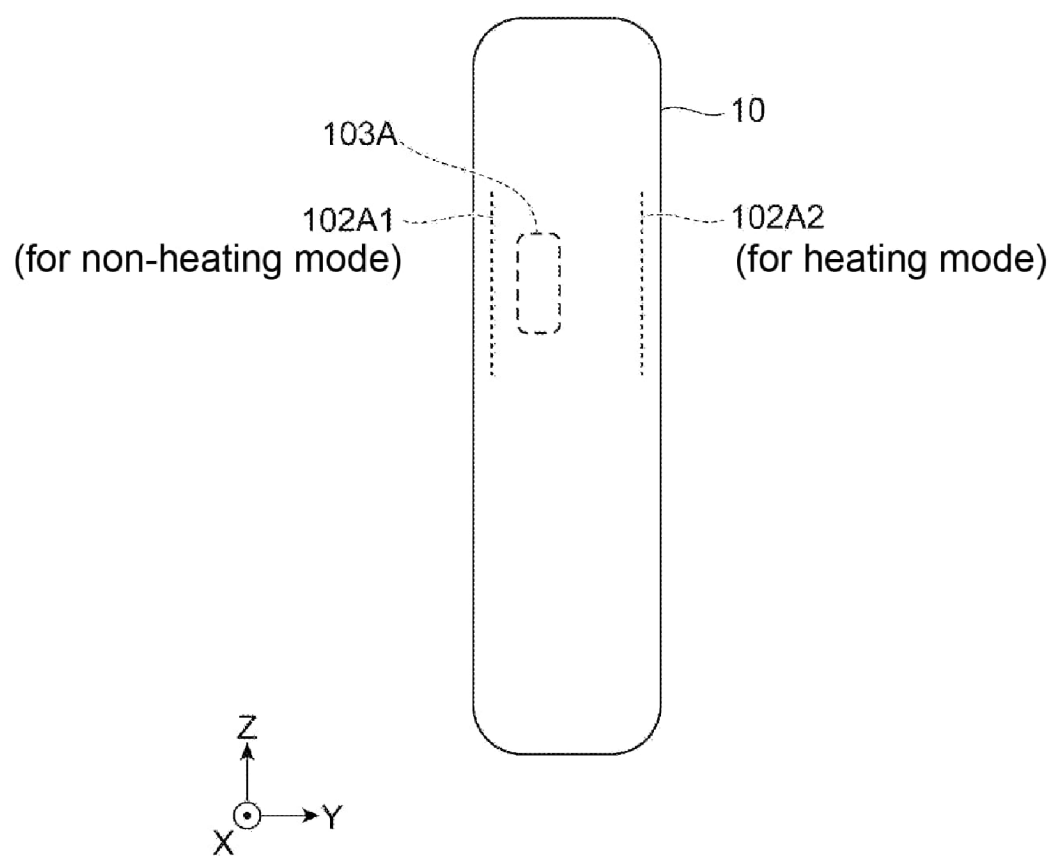
[Fig. 26]



[Fig. 27]



[Fig. 28]



[Fig. 29]

	Common to solid and liquid	Solid (high-temperature heating)	Solid (low-temperature heating) /liquid
Basic operation -related	• Activate • Sleep • Power off • Reset • Cleaning	• Open slide cover • Close slide cover • Lock stick-type substrate • Unlock stick-type substrate • Push out stick-type substrate • Start heating	• Unlock • Lock • Reset puff counter • Lock capsule • Push out capsule • Close cartridge insertion portion • Open cartridge insertion portion
Switching-related	• Modify heating temperature • Select brand • Modify heating profile • Switch display mode • Modify inhalation detection sensitivity • Modify display color	• Modify preheating time • Modify heating time	• Modify output
Communication -related	• Send heating profile • Receive heating profile • Pairing • Cancel pairing		
Checking-related	• Check remaining battery capacity • Check charging status • Check battery lifespan	• Check number of inhalations • Check remaining number of inhalations • Check remaining inhalation time • Check remaining number of times of inhalation	• Check remaining amount of liquid • Check cumulative number of times of inhalation • Check remaining number of times of inhalation • Check remaining amount in capsule • Check cartridge replacement complete • Check capsule replacement complete

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/044511

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/51(2020.01)i

FI: A24F40/51

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)

A24F40/51

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 1971-2024
 Registered utility model specifications of Japan 1996-2024
 Published registered utility model applications of Japan 1994-2024

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2021-193950 A (KURASHI SOUKEN CO., LTD.) 27 December 2021 (2021-12-27) paragraphs [0044]-[0102], fig. 1-7	1-2, 5-6, 9-14 3-4, 7-8
Y A	JP 2017-523785 A (NICOVENTURES HOLDINGS LIMITED) 24 August 2017 (2017-08-24) paragraphs [0034], [0045]	1-2, 5-6, 9-14 3-4, 7-8
Y A	JP 2022-533744 A (KT&G CORPORATION) 25 July 2022 (2022-07-25) paragraphs [0060]-[0063], fig. 1-3	1-2, 5-6, 9-14 3-4, 7-8
Y A	JP 2012-229852 A (MITSUBISHI ELECTRIC CORPORATION) 22 November 2012 (2012-11-22) paragraphs [0013], [0016], [0019]	9-11, 14 3-4, 7-8



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Date of the actual completion of the international search

31 January 2024

Date of mailing of the international search report

13 February 2024

Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
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 Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/044511

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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A		3-4, 7-8
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Information on patent family members

International application No.

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KR 10-2023-0063782 A	09 May 2023	(Family: none)	
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		entire text, all drawings	
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		KR 10-2017-0106454 A	

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