



(11)

EP 4 772 050 A1

(12)

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

(43) Date of publication:
08.07.2026 Bulletin 2026/28

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

(21) Application number: **23950650.4**

(52) Cooperative Patent Classification (CPC):
A24F 40/51

(22) Date of filing: **28.08.2023**

(86) International application number:
PCT/JP2023/030966

(87) International publication number:
WO 2025/046699 (06.03.2025 Gazette 2025/10)

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

Designated Extension States:
BA

Designated Validation States:
KH MA MD TN

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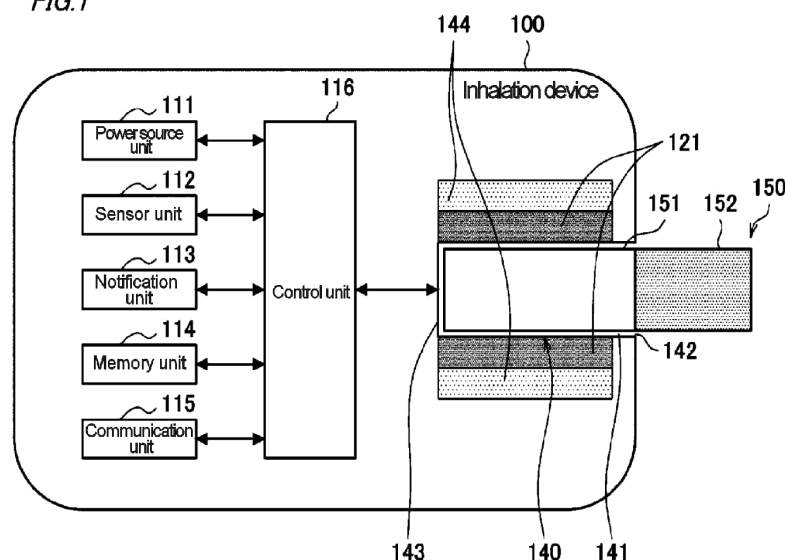
(54) **AEROSOL GENERATION DEVICE**

(57) An inhalation device (100) constituting an example of an aerosol-generating device comprises: an accommodating portion (140) which has an opening (142) at one end and accommodates a portion of a stick-type substrate (150) inserted through the opening (142); a pressure sensor for outputting a value relating to

pressure which is generated as a result of the stick-type substrate (150) accommodated in the accommodating portion (140) being pressed in an insertion direction; and a control unit (116) for detecting inhalation by a user based on an output value of the pressure sensor.

[Fig. 1]

FIG. 1



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Description**ADVANTAGEOUS EFFECTS OF INVENTION****TECHNICAL FIELD**

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

BACKGROUND ART

[0002] Inhalation devices that generate an aerosol with added flavor components and allow a user to inhale the generated aerosol, for example, are conventionally known. There are also inhalation devices such as this which comprise: a holding portion having an internal space; a pressure sensor for detecting pressure applied to an inner wall of the holding portion; and a control unit for identifying placement of a flavor component-generating substrate in the internal space of the holding portion (e.g., see PTL 1 below).

CITATION LIST**PATENT LITERATURE**

[0003] PTL 1: WO 2020/174624 A1

SUMMARY OF INVENTION**TECHNICAL PROBLEM**

[0004] However, the history of research and development into aerosol-generating devices such as the above-mentioned inhalation devices is still at an early stage, and there is room for further investigations into uses of the pressure sensor in aerosol-generating devices.

[0005] The present disclosure provides an aerosol-generating device enabling inhalation by a user to be detected by utilizing a pressure sensor which outputs a value relating to pressure which is generated as a result of an aerosol source-containing substrate being pressed.

SOLUTION TO PROBLEM

[0006] The present disclosure relates to: an aerosol-generating device for generating an aerosol from an aerosol source-containing substrate, the aerosol-generating device comprising:

an accommodating portion which has an opening at one end and accommodates a portion of the substrate inserted through the opening;
a pressure sensor for outputting a value relating to pressure which is generated as a result of the substrate accommodated in the accommodating portion being pressed in an insertion direction; and
a control unit for detecting inhalation by a user based on an output value of the pressure sensor.

[0007] The present disclosure makes it possible to provide an aerosol-generating device enabling inhalation by a user to be detected by utilizing a pressure sensor which outputs a value relating to pressure which is generated as a result of an aerosol source-containing substrate being pressed.

BRIEF DESCRIPTION OF DRAWINGS**[0008]**

Fig. 1 is a schematic diagram schematically showing an example of an inhalation device 100 according to the embodiment.

Fig. 2A is a front view of the inhalation device 100.

Fig. 2B is a top view of the inhalation device 100.

Fig. 2C is a bottom view of the inhalation device 100.

Fig. 3 is a view in cross section of the inhalation device 100 as seen along the arrows 3-3 shown in fig. 2B.

Fig. 4A is an oblique view of a chamber 50.

Fig. 4B is a view in cross section of the chamber 50 as seen along the arrows 4B-4B shown in fig. 4A.

Fig. 5A is a view in cross section of the chamber 50 as seen along the arrows 5A-5A shown in fig. 4B.

Fig. 5B is a view in cross section of the chamber 50 as seen along the arrows 5B-5B shown in fig. 4B.

Fig. 6 is an oblique view of the chamber 50 and a heater 40.

Fig. 7 is the view in cross section shown in fig. 5B in a state in which a stick-type substrate 150 is arranged inside the chamber 50 at a heating position.

Fig. 8 is an oblique view showing air flow paths in the inhalation device 100.

Fig. 9 is a cross-sectional enlargement around a first holding portion 37.

Fig. 10 shows an example of characteristics of a pressure sensor 55.

Fig. 11 shows a first example of a time-series transition of an electrical resistance value of the pressure sensor 55.

Fig. 12 shows a second example of a time-series transition of the electrical resistance value of the pressure sensor 55.

Fig. 13 shows a third example of a time-series transition of the electrical resistance value of the pressure sensor 55.

Fig. 14 shows an example of a heating profile in the embodiment.

Fig. 15 is a flowchart showing an example of processing implemented by a control unit 116.

Fig. 16 shows another exemplary arrangement (1) of the pressure sensor 55.

Fig. 17 shows another exemplary arrangement (2) of the pressure sensor 55.

Fig. 18 shows another exemplary arrangement (3) of the pressure sensor 55.

DESCRIPTION OF EMBODIMENTS

[0009] An embodiment of an aerosol-generating device according to the present disclosure will be described in detail below. The following embodiment is an exemplary case in which the aerosol-generating device according to the present disclosure is applied to an inhalation device. It should be noted that the following embodiment does not limit the invention disclosed in the claims, and not all of the features described in the following embodiment are essential. In addition, two or more of the plurality of features described in the following embodiment may be combined in any way. Furthermore, hereinafter, identical or similar elements may be assigned identical or similar reference signs, and descriptions thereof will be omitted or simplified as appropriate.

Configuration of inhalation device

[0010] The inhalation device of this embodiment, which constitutes an example of the aerosol-generating device of the present disclosure, is a device for generating a substance to be inhaled by a user. The substance generated by means of the inhalation device according to this embodiment is described below as an aerosol, but this is not limiting, and the substance generated may equally be a gas.

Outline configuration of inhalation device

[0011] An example of the outline configuration of the inhalation device of the embodiment will be described first of all. Fig. 1 is a schematic diagram schematically showing an example of an inhalation device 100 according to the embodiment. As shown in fig. 1, the inhalation

device 100 comprises: a power source unit 111, a sensor unit 112, a notification unit 113, a memory unit 114, a communication unit 115, a control unit 116, a heating unit 121, an accommodating portion 140, and a heat insulating portion 144.

[0012] The power source unit 111 stores electrical power. The power source unit 111 then supplies the electrical power to each component of the inhalation device 100 in accordance with control performed by the control unit 116. Furthermore, the power source unit 111 may be configured to be chargeable by means of power received from an external power source which is not depicted. The power source unit 111 is configured by a rechargeable battery such as a lithium ion secondary battery, for example.

[0013] The sensor unit 112 acquires various types of information relating to the inhalation device 100. The sensor unit 112 is configured by, for example, a pressure sensor such as a strain gauge or a condenser microphone, a flow rate sensor, or a temperature sensor such as a thermistor, and acquires values associated with inhalation by a user.

[0014] As an example, the sensor unit 112 comprises a pressure sensor 55 for outputting a value relating to pressure which is generated as a result of a stick-type substrate 150 (to be described later) accommodated in the accommodating portion 140 being pressed in an insertion direction. Furthermore, the pressure sensor 55 may output a value relating to pressure which is generated as a result of the stick-type substrate 150 being inserted into the accommodating portion 140. The details of the pressure sensor 55 will be described later, and a description will therefore not be given here.

[0015] Furthermore, the sensor unit 112 may include an input device, such as an operating button or an operating switch, for accepting input of information (operations in other words) from the user. A switch of a switch unit 103 which will be described later may be taken as an example of this input device.

[0016] The notification unit 113 notifies the user of information. The notification unit 113 is configured by a light-emitting device which emits light, a display device which displays images, a sound output device which outputs sound, or a vibration device which vibrates, etc., for example. Here, the light-emitting device may be realized by a light-emitting element such as an LED (Light-Emitting Diode), and a drive circuit for causing the light-emitting element to emit light, and the like. Furthermore, the display device may be a liquid crystal display or an OLED display (OLED: Organic Light-Emitting Diode). The sound output device may be a speaker, for example. The vibration device may be a vibrator comprising a motor and an eccentric weight attached to a rotary shaft of the motor, for example.

[0017] The memory unit 114 stores various information (e.g., programs and data) allowing the inhalation device 100 to operate. The memory unit 114 is configured by a non-volatile storage medium such as a flash memory, for

example.

[0018] The communication unit 115 is a communication interface capable of performing communication conforming to any wired or wireless communication standard. Examples of communication standards that are used include standards that employ Wi-Fi (registered trademark), Bluetooth (registered trademark), BLE (Bluetooth Low Energy; registered trademark), NFC (Near-Field Communication), or LPWA (Low Power Wide Area), for example.

[0019] The control unit 116 functions as an arithmetic processing device and a control device, and controls overall operation within the inhalation device 100 in accordance with various programs stored in the memory unit 114, etc. For example, the control unit 116 controls the supply of power from the power source unit 111 to each component including the heating unit 121 which will be described later. The control unit 116 is realized by a CPU (central processing unit) or an electronic circuit such as a microprocessor, for example. As an example, the control unit 116 may be realized by an MCU (Micro Controller Unit).

[0020] The accommodating portion 140 has an internal space 141, and holds a stick-type substrate 150 while accommodating a portion of the stick-type substrate 150 in the internal space 141. The accommodating portion 140 has an opening 142 at one end, allowing the internal space 141 to communicate with the outside, and accommodates the stick-type substrate 150 which has been inserted into the internal space 141 from the opening 142. That is to say, the accommodating portion 140 has the opening 142 at one end and accommodates a portion of the stick-type substrate 150 inserted through the opening 142.

[0021] For example, the accommodating portion 140 is a cylindrical body comprising the opening 142 and a bottom portion 143 serving as a bottom surface, and defines a columnar internal space 141. The stick-type substrate 150 accommodated in the accommodating portion 140 is supplied with air via an air flow path which is provided in the internal space 141 or is connected to the internal space 141. An example of this air flow path will be described later with the aid of fig. 8, etc.

[0022] The stick-type substrate 150 is an example of an aerosol source-containing substrate, and comprises a substrate portion 151 and mouthpiece portion 152. The substrate portion 151 contains an aerosol source. The aerosol source includes a tobacco-derived or non-tobacco-derived flavor component. If the inhalation device 100 is a medical inhaler such as a nebulizer, the aerosol source may include a drug. The aerosol source may, for example, be a liquid such as water or a polyhydric alcohol, for example glycerol or propylene glycol, containing the tobacco-derived or non-tobacco-derived flavor component, or may be a solid including the tobacco-derived or non-tobacco-derived flavor component.

[0023] In a state in which the stick-type substrate 150 is held (accommodated in other words) in the accommo-

dating portion 140, at least part of the substrate portion 151 is accommodated in the internal space 141, and at least part of the mouthpiece portion 152 protrudes from the opening 142. Then, when the user holds the mouthpiece portion 152 protruding from the opening 142 in their mouth and inhales, air flows into the internal space 141 via the air flow path, and reaches the inside of the user's mouth together with the aerosol generated from the substrate portion 151.

[0024] The heating unit 121 heats the aerosol source to atomize the aerosol source, thereby generating the aerosol. In the example shown in fig. 1, the heating unit 121 is configured as a film heater formed by laying out a conductive track (i.e., a heating track) configured by a heating resistive element having a correlation between electrical resistance value and temperature, and is arranged to cover the outer circumference of the accommodating portion 140. The heating unit 121 then generates heat when supplied with power from the power source unit 111. When the heating unit 121 generates heat with the stick-type substrate 150 inserted in the accommodating portion 140 (in other words the internal space 141), the substrate portion 151 of the stick-type substrate 150 is heated from the outer circumference, and an aerosol is generated.

[0025] A heating resistive element having PTC (positive temperature coefficient) characteristics, where the electrical resistance value increases in proportion to a rise in temperature, may be adopted as the heating resistive element of the heating unit 121, an example being nichrome or stainless steel.

[0026] The heat insulating portion 144 prevents heat transfer from the heating unit 121 to other components. For example, the heat insulating portion 144 is configured from a vacuum heat insulating material or an aerogel heat insulating material, or the like.

[0027] A configuration example of the inhalation device 100 has been described above. The inhalation device 100 is, of course, not limited to the configuration described above, and may adopt various configurations, such as those illustrated below by way of example.

[0028] As one example, the heating unit 121 may have a blade-like form and may be arranged so as to protrude into the internal space 141 from the bottom portion 143 of the accommodating portion 140. In this case, the blade-like heating unit 121 is inserted into the substrate portion 151 of the stick-type substrate 150 and heats the substrate portion 151 of the stick-type substrate 150 from the inside. As another example, the heating unit 121 may be arranged so as to cover the bottom portion 143 of the accommodating portion 140. Furthermore, the heating unit 121 may be configured by a combination of two or more from among a first heating unit covering the outer circumference of the accommodating portion 140, a blade-like second heating unit, and a third heating unit covering the bottom portion 143 of the accommodating portion 140.

[0029] As another example, the accommodating por-

tion 140 may include an opening and closing mechanism such as a hinge for opening and closing part of an outer shell that forms the internal space 141. Then, by opening and closing the outer shell, the accommodating portion 140 may accommodate and clamp the stick-shaped substrate 150 that has been inserted into the internal space 141. In that case, the heating unit 121 may be provided on the part of the accommodating portion 140 gripping the stick-type substrate 150, and may heat the stick-type substrate 150 while pressing same.

[0030] Furthermore, the means for atomizing the aerosol source may be induction heating. In this case, the inhalation device 100 comprises at least an electromagnetic induction source such as a coil for generating a magnetic field, instead of the heating unit 121. A susceptor which generates heat by means of induction heating may be provided in the inhalation device 100, or may be contained in the stick-type substrate 150.

Specific configuration of inhalation device

[0031] An example of the specific configuration of the inhalation device 100 will be described next. It should be noted that inhalation on the inhalation device 100 by a user will also be referred to below as a "puff" or "puffing".

[0032] Fig. 2A is a front view of the inhalation device 100. Fig. 2B is a top view of the inhalation device 100. Fig. 2C is a bottom view of the inhalation device 100. An X-Y-Z orthogonal coordinate system may be applied to the drawings used in the description below for convenience of description. In this coordinate system, the Z-axis is oriented vertically upward, the X-Y plane is arranged cutting across the inhalation device 100 in a horizontal direction, and the Y-axis is arranged extending from the front surface to the rear surface of the inhalation device 100. The Z-axis may also refer to the direction of insertion of the stick-type substrate 150 accommodated in a chamber 50 (to be described later), or to the axial direction of the chamber 50. Furthermore, the X-axis is a direction orthogonal to the Y-axis and Z-axis, and the X-axis and Y-axis are radial directions orthogonal to the axial direction, or a radial direction of the chamber 50.

[0033] As shown in fig. 2A-2C, the inhalation device 100 comprises an outer housing 101, a slide cover 102, and a switch unit 103. The outer housing 101 constitutes the outermost housing of the inhalation device 100, and is sized to fit in a user's hand. When the user is using the inhalation device 100, the user can inhale (i.e., take a puff of) the aerosol while holding the inhalation device 100 in their hand. The outer housing 101 is constructed by assembling a plurality of members, for example. For example, various types of resins such as polycarbonate, ABS (acrylonitrile-butadiene-styrene) resin, or PEEK (polyether ether ketone), or various types of metals such as aluminum or stainless steel may be used for the members constituting the outer housing 101.

[0034] The outer housing 101 has an opening (not depicted) for receiving the stick-type substrate 150,

and the slide cover 102 is slidably attached to the outer housing 101 so as to close this opening. Specifically, the slide cover 102 is configured to be movable along an outer surface of the outer housing 101 between a closed position (the position shown in Fig. 2A and 2B) for closing the opening of the outer housing 101 and an open position for opening the opening. When the slide cover 102 is in the closed position, the stick-type substrate 150 is restricted from accessing the interior of the inhalation device 100 (e.g., the inside of the accommodating portion 140). Meanwhile, when the slide cover 102 is in the open position, the stick-type substrate 150 is permitted to access the interior of the inhalation device 100 (e.g., the inside of the accommodating portion 140). The slide cover 102 is an example of a cover member in the present disclosure. For example, the user can manually operate the slide cover 102 to move the slide cover 102 between the closed position and the open position.

[0035] The switch unit 103 is used to switch the operation of the inhalation device 100 on and off. As one example, when the switch unit 103 is operated while the stick-type substrate 150 is inserted in the inhalation device 100, power may be supplied to a heating member 42 which will be described later, whereby the stick-type substrate 150 is heated.

[0036] It should be noted that the switch unit 103 may be a switch provided outside the outer housing 101, or may be a switch located inside the outer housing 101. If the switch is located inside the outer housing 101, the switch is indirectly pressed by pressing the switch unit 103 on the surface of the outer housing 101.

[0037] Furthermore, the inhalation device 100 may further comprise a terminal which is not depicted. This terminal functions as an interface for electrically connecting the inhalation device 100 with an external power source, for example. Furthermore, the terminal may also be used to connect the inhalation device 100 with an external device (e.g., the user's smartphone). In that case, a data transmission cable may be connected to the terminal, and the inhalation device 100 and the external device may be connected via this data transmission cable so that data, etc. relating to operation of the inhalation device 100 can be transferred between the inhalation device 100 and the external device.

[0038] Fig. 3 is a view in cross section of the inhalation device 100 as seen along the arrows 3-3 shown in fig. 2B. As shown in fig. 3, an inner housing 10 is provided inside the outer housing 101 of the inhalation device 100. The inner housing 10 may be composed of various types of resins such as described above, for example. A power source 20 and an atomization unit 30 are provided in an internal space of the inner housing 10.

[0039] The power source 20 is a rechargeable battery constituting the abovementioned power source unit 111, and is electrically connected to the atomization unit 30. This allows the power source 20 to supply power to the atomization unit 30.

[0040] The atomization unit 30 comprises: a chamber

50, a heater 40 covering a portion of the chamber 50, a heat insulating portion 32, and a substantially cylindrical insertion guide member 34 abutting an opening 52 (see fig. 4A) of the chamber 50.

[0041] The chamber 50 is a cylindrical member extending in the insertion direction (Z-axis direction) of the stick-type substrate 150, and is configured to allow insertion of the stick-type substrate 150 therein.

[0042] The heater 40 is provided so as to contact an outer circumferential surface of the chamber 50, and comprises a heating member 42 (see fig. 6) for heating stick-type substrate 150 which has been inserted into the chamber 50.

[0043] Furthermore, a bottom member 36 serving as a member constituting the abovementioned bottom portion 143 is provided on the bottom portion of the chamber 50. The bottom member 36 is provided on the bottom portion of the chamber 50 and abuts an end portion of the stick-type substrate 150 accommodated in the chamber 50 to thereby function as a stopper for positioning the stick-type substrate 150 inside the chamber 50. The accommodating portion 140 is configured by the chamber 50 and the bottom member 36, for example.

[0044] Furthermore, the bottom member 36 may have unevenness on an abutment face 36c (see fig. 9) with the stick-type substrate 150. A first air flow path AF1 (see fig. 8) communicating with the stick-type substrate 150 accommodated in the chamber 50 is formed by this unevenness on the abutment face 36c of the bottom member 36 with the stick-type substrate 150.

[0045] The bottom member 36 also functions as a movable member which moves in the insertion direction as a result of the stick-type substrate 150 accommodated in the chamber 50 being pressed in the insertion direction, although this will be described in detail later.

[0046] The bottom member 36 is made of various types of resins such as described above, for example. Note that the bottom member 36 is preferably formed by a material having low thermal conductivity, in order to inhibit heat transfer to the heat insulating portion 32, etc.

[0047] The heat insulating portion 32 constitutes the abovementioned heat insulating portion 144, for example. The heat insulating portion 32 is substantially cylindrical overall, and is arranged so as to cover the chamber 50. The heat insulating portion 32 comprises an aerogel sheet, for example.

[0048] The insertion guide member 34 is provided between the opening, provided in the outer housing 101, for receiving the stick-type substrate 150, and the chamber 50, while also being provided in abutment with the opening 52 of the chamber 50 and guiding insertion of the stick-type substrate 150 into the chamber 50. Providing an insertion guide member 34 such as this allows for easy insertion of the stick-type substrate 150 into the chamber 50.

[0049] The insertion guide member 34 is made of various types of resins such as described above, for example. The insertion guide member 34 is preferably

made of PEEK from the perspective of heat resistance.

[0050] The inhalation device 100 further comprises a first holding portion 37 and a second holding portion 38 for holding both ends of the chamber 50 and the heat insulating portion 32. The first holding portion 37 is arranged to hold end portions of the chamber 50 and the heat insulating portion 32 on the Z-axis negative direction side. The second holding portion 38 is arranged to hold end portions of the chamber 50 and the heat insulating portion 32 on the slide cover 102 side (Z-axis positive direction side).

[0051] Furthermore, the inhalation device 100 also comprises the abovementioned pressure sensor 55. The pressure sensor 55 is provided facing a tip end face 36d (see fig. 9) of the bottom member 36 on the opposite side to the abutment face 36c with the stick-type substrate 150 in the insertion direction of the stick-type substrate 150, for example. Furthermore, the pressure sensor 55 is provided in a state of contact with the tip end face 36d of the bottom member 36, and outputs a value relating to pressure which is generated as a result of being pressed by the bottom member 36 which has moved in the insertion direction.

Chamber

[0052] Fig. 4A is an oblique view of the chamber 50. Fig. 4B is a view in cross section of the chamber 50 as seen along the arrows 4B-4B shown in fig. 4A. Fig. 5A is a view in cross section of the chamber 50 as seen along the arrows 5A-5A shown in fig. 4B. Fig. 5B is a view in cross section of the chamber 50 as seen along the arrows 5B-5B shown in fig. 4B. Fig. 6 is an oblique view of the chamber 50 and the heater 40.

[0053] As shown in fig. 4A and 4B, the chamber 50 is a cylindrical member comprising: an opening 52 into which the stick-type substrate 150 is inserted, and a cylindrical side wall portion 60 for accommodating the stick-type substrate 150, for example. The chamber 50 is preferably made of a material that is heat resistant and has a low coefficient of thermal expansion, and is made of stainless steel, for example. This allows for efficient heating of the stick-type substrate 150 from the chamber 50. It should be noted that the chamber 50 may be made of a material other than a metal, such as PEEK or other resin, glass, ceramic, or the like.

[0054] As shown in Fig. 4B and Fig. 5B, the side wall portion 60 includes contact portions 62 and spaced-apart portions 66. When the stick-type substrate 150 is disposed at a predetermined heating position inside the chamber 50, the contact portions 62 contact or press a portion of the stick-type substrate 150 on a plane intersecting the insertion direction of the stick-type substrate 150, and the spaced-apart portions 66 are spaced apart from the stick-type substrate 150. It should be noted here that the heating position refers to a position at which the stick-type substrate 150 is suitably heated, or a position of the stick-type substrate 150 when the user smokes

using the inhalation device 100.

[0055] The side wall portion 60 comprises the contact portions 62 and the spaced-apart portions 66, so the cross-sectional shape of the side wall portion 60 orthogonal to the axial direction (Z-axis direction) of the chamber 50 is elliptical, which is to say non-circular. Here, the accommodating portion 140 comprises the chamber 50 and the bottom member 36 which is formed by a different member from the chamber 50, so even if the chamber 50 has a different shape, such as elliptical or square cylindrical, for example, the bottom member 36 can be finely processed and processability of the accommodating portion 140 can be improved, regardless of the shape of the chamber 50.

[0056] The contact portions 62 each have an inner surface 62a and an outer surface 62b. The spaced-apart portions 66 each have an inner surface 66a and an outer surface 66b. As shown in fig. 6, the heater 40 is arranged on the outer surface 62b of the contact portions 62. As a result, the heat generated by the heating member 42 of the heater 40 is transmitted to the stick-type substrate 150 contacting the contact portions 62. The heater 40 is preferably arranged on the outer surfaces 62b of the contact portions 62 without a gap. Moreover, the heater 40 may comprise an adhesive layer. In that case, the heater 40 comprising the adhesive layer is preferably arranged on the outer surface 62b of the contact portions 62 without a gap.

[0057] As shown in fig. 4A and 5B, the outer surfaces 62b of the contact portions 62 are planar. Since the outer surfaces 62b of the contact portions 62 are planar, if a strip-shaped electrode 48 is connected to the heater 40 arranged on the outer surface 62b of the contact portions 62, as shown in fig. 6, flexing of the strip-shaped electrode 48 can be inhibited. As shown in fig. 4B and 5B, the inner surfaces 62a of the contact portions 62 are planar. Furthermore, as shown in fig. 4B and 5B, the contact portions 62 have a uniform thickness.

[0058] As shown in fig. 4A, 4B and 5B, the chamber 50 has two contact portions 62 in the circumferential direction of the chamber 50, and the two contact portions 62 face each other and are substantially parallel to each other. The distance between the inner surfaces 62a of the two contact portions 62 is, at least partially, preferably less than the width of the section of the stick-type substrate 150 that is arranged between the pressing portions 62 when inserted in the chamber 50.

[0059] As shown in Fig. 5B, the inner surfaces 66a of the spaced-apart portions 66 may have a generally arc-shaped cross-section in a plane orthogonal to the axial direction (Z-axis direction) of the chamber 50. Furthermore, the spaced-apart portions 66 are arranged so as to be adjacent to the contact portions 62 in the circumferential direction.

[0060] As shown in fig. 5B, a bottom portion 56 of the chamber 50 has a hole 56a through which the bottom member 36 shown in fig. 3 penetrates so as to be disposed inside the chamber 50. The bottom member 36 is

provided inside the bottom portion 56 of the chamber 50. The bottom member 36 provided in the bottom portion 56 supports a portion of the stick-type substrate 150 inserted in the chamber 50, in such a way as to expose at least a portion of the end face of the stick-type substrate 150. The bottom portion 56 then supports a portion of the stick-type substrate 150 in such a way that the exposed end face of the stick-type substrate 150 communicates with voids 67 (see fig. 7), which will be described later.

[0061] As shown in fig. 4A and fig. 4B, the chamber 50 preferably has a cylindrical non-holding portion 54 between the opening 52 and the side wall portion 60. A gap may be formed between the non-holding portion 54 and the stick-type substrate 150 in a state in which the stick-type substrate 150 is located at the heating position in the chamber 50. Furthermore, as shown in fig. 4A and 4B, the chamber 50 preferably has first guide portions 58 having a tapered surface 58a that connects an inner surface of the non-holding portion 54 and the inner surfaces 62a of the contact portions 62.

Heater

[0062] As shown in fig. 6, the heater 40 comprises the heating member 42 constituting the heating unit 121 described above. The heating member 42 may be a film heater provided with a heating track, for example. The heating member 42 is preferably disposed so as to heat the contact portions 62 without coming into contact with the spaced-apart portions 66 of the chamber 50. In other words, the heating member 42 is preferably arranged only on the outer surface of the contact portions 62. The heating member 42 may have a difference in heating capacity between parts that heat the spaced-apart portions 66 of the chamber 50 and parts that heat the contact portions 62. Specifically, the heating member 42 may be configured to heat the contact portions 62 to a higher temperature than the spaced-apart portions 66. For example, it is possible to adjust the arrangement density of the heating track of the heating member 42 on the contacts portions 62 and the spaced-apart portions 66. Furthermore, the heating member 42 may also be wound around the outer circumference of the chamber 50 with substantially the same heating capacity around the entire circumference of the chamber 50.

[0063] As shown in fig. 6, the heater 40 preferably includes, in addition to the heating member 42, an electrically-insulating member 44 that covers at least one face of the heating element 42. In this embodiment, the electrically-insulating member 44 is arranged covering both faces of the heating member 42. Here, the bottom member 36 may be arranged so as not to overlap the heating member 42 in the axial direction of the chamber 50. This makes heat from the heating member 42 less likely to be transmitted to the bottom member 36, and can also inhibit heat-induced deterioration of the bottom member 36.

[0064] Fig. 7 is the view in cross section shown in fig.

5B in a state in which the stick-type substrate 150 is arranged inside the chamber 50 at the heating position. As shown in fig. 7, when the stick-type substrate 150 is arranged at the heating position inside the chamber 50, the stick-type substrate 150 is contacted and pressed by the contact portions 62 of the chamber 50. Meanwhile, voids 67 are formed between the stick-type substrate 150 and the spaced-apart portions 66. The voids 67 enable communication between the opening 52 of the chamber 50 and the end face of the stick-type substrate 150 positioned inside the chamber 50. This allows air that has flowed in from the opening 52 of the chamber 50 to pass through the voids 67 and flow into the inside of the stick-type substrate 150. In other words, a second air flow path (the voids 67) is(are) formed between the stick-type substrate 150 and the spaced-apart portions 66.

Air flow paths in the inhalation device

[0065] Fig. 8 is an oblique view showing air flow paths in the inhalation device 100. It should be noted that the stick-type substrate 150 is omitted from the drawing of fig. 8. As shown in fig. 8, a second air flow path AF2 formed between the stick-type substrate 150 and the spaced-apart portion 66 communicates with the first air flow path AF1 formed in the bottom member 36, and the first air flow path AF1 communicates with a third air flow path AF3 passing through the inside of the stick-type substrate 150.

[0066] In the inhalation device 100, air which has been introduced into the accommodating portion 140 formed by the chamber 50 and the bottom member 36 is thus supplied to the stick-type substrate 150 through the second air flow path AF2 and the first air flow path AF1 before arriving inside the user's mouth, so the inhalation device 100 does not need to be separately provided with a flow path for introducing air to be supplied to the stick-type substrate 150. The structure of the inhalation device 100 can therefore be simplified while the inhalation device 100 can also be made more compact. The air introduced into the accommodating portion 140 can also be supplied to the stick-type substrate 150 after being warmed as it passes through the second air flow path AF2. This allows for efficient heating of the stick-type substrate 150, enabling generation of an aerosol with more flavor components added, for example. The user can therefore be provided with a high-quality smoking experience.

Configuration around first holding portion

[0067] Fig. 9 is a cross-sectional enlargement around the first holding portion 37. As shown in fig. 9, the bottom member 36 engages with the bottom portion 56 of the chamber 50. This allows the bottom member 36 to be positioned and supported inside the chamber 50. Furthermore, the bottom member 36 provided in the bottom portion 56 of the chamber 50 has a shaft portion

36a protruding outside the chamber 50 through the hole 56a in the chamber 50. A flat face 36b, for example, is provided on a portion of the outer circumferential surface of the shaft portion 36a.

5 **[0068]** The first holding portion 37 comprises: a support portion 72 which is an example of a support portion in the present disclosure; a heater cushion 74 which is another example of a support portion in the present disclosure; and a ring 85.

10 **[0069]** The support portion 72 is configured to receive the shaft portion 36a of the bottom member 36 and to support the chamber 50. Specifically, the bottom portion 56 of the chamber 50 is supported by being sandwiched between the bottom member 36 and the support portion 72. The support portion 72 is made of various types of resins such as described above, a metal, glass, or ceramic, etc., for example. The support portion 72 is preferably made of PEEK from the perspective of heat resistance.

20 **[0070]** Furthermore, the support portion 72 has a flat face 72a facing the flat face 36b of the shaft portion 36a. Engagement of the flat face 36b of the shaft portion 36a with the flat face 72a of the support portion 72 makes it possible to prevent rotation of the support portion 72 relative to the chamber 50.

25 **[0071]** Furthermore, the bottom member 36 has a tip end face 36d as the face on the opposite side to the abutment face 36c abutting the stick-type substrate 150 inserted in the chamber 50, more specifically, as the end face on the Z-axis negative direction side of the shaft portion 36a. As described above, the pressure sensor 55 is provided in a state of contact with the tip end face 36d, facing the tip end face 36d in the insertion direction (i.e., the Z-axis direction) of the stick-type substrate 150, for example.

30 **[0072]** Furthermore, the pressure sensor 55 is provided on a chassis member 200 which is harder than the pressure sensor 55, for example. The chassis member 200 is a framework member of the inhalation device 100 and is made of a metal or the like, for example. In this way, displacement of the pressure sensor 55 when it is pressed can be inhibited to a greater extent than when the pressure sensor 55 is provided on a flexible member. It should be noted that the chassis member 200 is fixed to the abovementioned inner housing 10 by means of a fixing portion which is not depicted, for example. Furthermore, the chassis member 200 may constitute part of the inner housing 10.

35 **[0073]** The heater cushion 74 accommodates and supports one end of the support portion 72 and also has a hole 74a, penetrated by the shaft portion 36a of the bottom member 36, in a substantially central part as seen from the Z-axis direction. Furthermore, the heater cushion 74 is formed by an elastic member comprising silicone or the like, supporting the chamber 50 and the bottom member 36 through the support portion 72 while also biasing same to the Z-axis positive direction side. The heater cushion 74 is positioned and fixed by a fixing

portion 22 which is fixed to the abovementioned inner housing 10, for example. It should be noted that the fixing portion 22 may be the inner housing 10 itself.

[0074] The ring 85 has an opening 85a into which the support portion 72 is inserted, the ring 85 being fixed by being sandwiched between the support portion 72 and the heater cushion 74. The ring 85 is made of various types of resins such as described above, a metal, glass, or ceramic, etc., for example. The ring 85 is preferably made of PEEK from the perspective of heat resistance.

[0075] The ring 85 is arranged facing, at an interval, a support material 32a (to be described later) provided on the inner circumferential surface of the heat insulating portion 32, and restricts movement of the heat insulating portion 32 in the radial direction of the chamber 50. The heat insulating portion 32 is therefore prevented from unlimited movement in the radial direction of the chamber 50, therefore preventing the heat insulating portion 32 from striking other members (e.g., the inner housing 10). Furthermore, movement of the heat insulating portion 32 in the radial direction of the chamber 50 can be restricted from inside the heat insulating portion 32, so the inhalation device 100 can be made more compact.

[0076] The heat insulating portion 32 comprises a support material 32a, and a heat insulating layer 32b provided on the outer circumferential surface of the support material 32a. The support material 32a is substantially cylindrical, for example, and is arranged so as to surround the chamber 50. The support material 32a is made of various types of resins such as described above, for example. Furthermore, the heat insulating layer 32b may be an aerogel sheet, for example. The support material 32a is preferably formed thinner than the heat insulating layer 32b (e.g., so as to have a thickness of 1 [mm] or less). In this way it is possible to reduce the heat capacity of the heat insulating portion 32 itself, therefore making it possible to inhibit heat loss in the heat insulating portion 32.

Pressure sensor

[0077] The pressure sensor 55 outputs a value (parameter) relating to pressure. The pressure here is a force applied to the pressure sensor 55 from the outside, for example. In this embodiment, the pressure sensor 55 is configured by a strain gauge such as a metal strain gauge or a semiconductor strain gauge, and is assumed to output an electrical resistance value of its own resistor as the value relating to pressure. The output value of the pressure sensor 55 is input to the MCU, etc. constituting the control unit 116 described above. This allows the control unit 116 to acquire the output value of the pressure sensor 55.

[0078] Fig. 10 shows an example of characteristics of the pressure sensor 55. In fig. 10, the vertical axis represents the electrical resistance value $[\Omega]$ of the pressure sensor 55, and the horizontal axis represents the pressure [N].

[0079] The electrical resistance value of the pressure sensor 55 decreases as pressure increases, as shown by the line R in fig. 10. For example, the electrical resistance value of the pressure sensor 55 is $R_a [\Omega]$ (where $R_a > 0$) when the pressure is $P_a [N]$ (where $P_a > 0$), and the electrical resistance value of the pressure sensor 55 is $R_b [\Omega]$ (where $0 < R_b < R_a$) when the pressure is $P_b [N]$ (where $P_b > P_a$).

(First example of time-series transition of electrical resistance value of pressure sensor)

[0080] Fig. 11 shows a first example of a time-series transition of the electrical resistance value of the pressure sensor 55. The first example described here is an exemplary case where the user has taken puffs. In fig. 11, the vertical axis represents the electrical resistance value $[\Omega]$ of the pressure sensor 55, and the horizontal axis represents timings.

[0081] In fig. 11, the timings t_1 , t_2 , t_3 , t_4 and t_5 are timings at which the user has taken a puff. To give a description with reference also to fig. 3 and 9, etc., when the user takes a puff, the user holds the stick-type substrate 150 in their mouth, with the stick-type substrate 150 accommodated in the chamber 50. When the user holds the stick-type substrate 150 in their mouth, with the stick-type substrate 150 accommodated in the chamber 50, the stick-type substrate 150 is pressed inside the chamber 50 to the Z-axis negative direction side, which is the insertion direction.

[0082] When the stick-type substrate 150 is pressed to the Z-axis negative direction side, the bottom member 36 abutting the stick-type substrate 150 inside the chamber 50 is also pressed to the Z-axis negative direction side, and can move slightly to the Z-axis negative direction side against the resistance of the biasing force to the Z-axis positive direction side produced by the heater cushion 74. When the bottom member 36 moves to the Z-axis negative direction side, the tip end face 36d of the bottom member 36 then presses the pressure sensor 55, and a greater pressure is generated than before puffing.

[0083] As a result of such an increase in pressure associated with puffing, the electrical resistance value of the pressure sensor 55 at the timings t_1 , t_2 , t_3 , t_4 and t_5 falls below $R_1 [\Omega]$, which serves as a predetermined value. Meanwhile, this kind of pressure increase does not occur at timings when there is no puffing, in other words, at timings when the user is not holding the stick-type substrate 150 in their mouth, so the electrical resistance value of the pressure sensor 55 is greater than $R_1 [\Omega]$.

(Second example of time-series transition of electrical resistance value of pressure sensor)

[0084] Fig. 12 shows a second example of a time-series transition of the electrical resistance value of the pressure sensor 55. The second example described here

is an exemplary case in which the user has inserted the stick-type substrate 150 into the chamber 50. Furthermore, soiling such as spilled tobacco leaf and/or condensed aerosol from the stick-type substrate 150 may adhere to the inside of the chamber 50 as a result of the user smoking using the inhalation device 100, but there is assumed to be no such soiling inside the chamber 50 in the second example described here. In fig. 12, the vertical axis represents the electrical resistance value $[\Omega]$ of the pressure sensor 55, and the horizontal axis represents timings.

[0085] In fig. 12, a timing t11 is a timing at which the user inserted the stick-type substrate 150 into the chamber 50. To give a description with reference also to fig. 3 and 9, etc., when the stick-type substrate 150 is inserted into the chamber 50, the stick-type substrate 150 is pressed to the Z-axis negative direction side, which is the insertion direction, inside the chamber 50.

[0086] After this, when the stick-type substrate 150 inserted in the chamber 50 abuts the bottom member 36 inside the chamber 50, the bottom member 36 is also pressed to the Z-axis negative direction side, and can move slightly to the Z-axis negative direction side against the resistance of the biasing force to the Z-axis positive direction side produced by the heater cushion 74. When the bottom member 36 moves to the Z-axis negative direction side, the tip end face 36d of the bottom member 36 then presses the pressure sensor 55, and a greater pressure is generated than before insertion of the stick-type substrate 150 into the chamber 50.

[0087] As a result of such an increase in pressure associated with insertion of the stick-type substrate 150, the electrical resistance value of the pressure sensor 55 at the timing t11 falls below $R2 [\Omega]$, which serves as a predetermined value. Meanwhile, this kind of pressure increase does not occur at a timing before insertion of the stick-type substrate 150 or at a timing after the user has stopped pressing the stick-type substrate 150 because the stick-type substrate 150 has been fully inserted, so the electrical resistance value of the pressure sensor 55 is greater than $R2 [\Omega]$.

[0088] Furthermore, in fig. 12, a timing t12 is a timing at which the user has removed the stick-type substrate 150 from the chamber 50. When the stick-type substrate 150 is removed from the chamber 50, the stick-type substrate 150 moves inside the chamber 50 to the Z-axis positive direction side, which is the opposite direction to the insertion direction.

[0089] When the stick-type substrate 150 moves to the Z-axis positive direction side from the state of abutment with the bottom member 36, the bottom member 36 moves slightly to the Z-axis positive direction side under the biasing force to the Z-axis positive direction side produced by the heater cushion 74. The force (i.e., the pressure) with which the tip end face 36d of the bottom member 36 presses the pressure sensor 55 decreases when the bottom member 36 moves to the Z-axis positive direction side. As a result of such a decrease in pressure

associated with removal of the stick-type substrate 150, the electrical resistance value of the pressure sensor 55 at the timing t12 becomes greater than $R3 [\Omega]$ (where $R3 > R2$), which serves as a predetermined value.

(Third example of time-series transition of electrical resistance value of pressure sensor)

[0090] Fig. 13 shows a third example of a time-series transition of the electrical resistance value of the pressure sensor 55. The third example described here is an exemplary case in which the user has inserted the stick-type substrate 150 into the chamber 50, similarly to the second example shown in fig. 12, but the third example differs from the second example in that the inside of the chamber 50 is soiled in the third example. Note that the description here will focus on differences with the second example shown in fig. 12, and the description of parts which are the same will be omitted or simplified, as appropriate.

[0091] In fig. 13, a timing t21 is a timing at which the user inserted the stick-type substrate 150 into the chamber 50. As described above, when the stick-type substrate 150 is inserted into the chamber 50, the increase in pressure associated with the insertion causes the electrical resistance value of the pressure sensor 55 to fall. When the inside of the chamber 50 is soiled at the time of insertion of the stick-type substrate 150, the internal space of the chamber 50 is then narrowed by this soiling, necessitating a greater force to insert the stick-type substrate 150. When the inside of the chamber 50 is soiled, the user therefore presses the stick-type substrate 150 more forcefully to the Z-axis negative direction side than when there is no soiling, in order to insert the stick-type substrate 150 into the chamber 50.

[0092] Accordingly, when the inside of the chamber 50 is soiled at the time of insertion of the stick-type substrate 150, a greater pressure is generated than when there is no soiling, and the electrical resistance value of the pressure sensor 55 becomes smaller than $R4 [\Omega]$, which is a predetermined value even smaller than abovementioned $R2 [\Omega]$, as shown in fig. 13.

[0093] Note that in the following description, a range from $R2 [\Omega]$ to $R4 [\Omega]$ will also be referred to as a "first range RG1", and a range below $R4 [\Omega]$ will also be referred to as a "second range RG2", as shown in fig. 13.

[0094] Furthermore, in fig. 13, a timing t22 is a timing at which the user removed the stick-type substrate 150 from the chamber 50. As described above, when the stick-type substrate 150 is removed from the chamber 50, the decrease in pressure associated with the removal causes the electrical resistance value of the pressure sensor 55 to become greater than $R3 [\Omega]$.

Control unit

[0095] The control unit 116 can control operation of the inhalation device 100 based on the output value of the

pressure sensor 55. As an example, the control unit 116 detects that the stick-type substrate 150 has been inserted into the chamber 50 (i.e., the accommodating portion 140), based on the output value of the pressure sensor 55. This makes it possible to detect that the stick-type substrate 150 has been inserted into the chamber 50 by utilizing the pressure sensor 55.

[0096] For example, as shown in fig. 12, etc., when the stick-type substrate 150 is inserted into the chamber 50, the increase in pressure associated with the insertion causes the electrical resistance value of the pressure sensor 55 to transition from a state of being greater than $R2 [\Omega]$ to a state of being smaller than $R2 [\Omega]$.

[0097] The control unit 116 therefore acquires the electrical resistance value, which is the output value of the pressure sensor 55, at a predetermined period (e.g., every 5 [ms]), for example, and detects that the stick-type substrate 150 has been inserted into the chamber 50 when this electrical resistance value has transitioned from a state of being greater than $R2 [\Omega]$ to a state of being smaller than $R2 [\Omega]$. That is to say, the control unit 116 detects that the stick-type substrate 150 has been inserted into the chamber 50 based on the time-series transition of the output value of the pressure sensor 55. This makes it possible to accurately detect that the stick-type substrate 150 has been inserted into the chamber 50, based on the output value (electrical resistance value) of the pressure sensor 55, which is a readily available pressure sensor such as a strain gauge. It should be noted that in such a case, $R2 [\Omega]$ is preset by the manufacturer, etc. of the inhalation device 100, for example.

[0098] Furthermore, the control unit 116 may start heating by the heating unit 121 when it has been detected that the stick-type substrate 150 has been inserted into the chamber 50. For example, the control unit 116 may start heating control, which will be described later, on detecting that the stick-type substrate 150 has been inserted into the chamber 50. The user is thus able to cause an aerosol to be generated simply by inserting the stick-type substrate 150 into the chamber 50, without the need for another separate operation. This can therefore reduce work for the user and offer better convenience for the user as compared to when another operation in addition to inserting the stick-type substrate 150 into the chamber 50 is also needed to generate an aerosol.

[0099] As shown in fig. 12 and 13, etc. the output value of the pressure sensor 55 when the stick-type substrate 150 has been inserted into the chamber 50 may differ when the inside of the chamber 50 is soiled and when it is not soiled.

[0100] The control unit 116 may therefore further determine whether or not the inside of the chamber 50 is soiled, based on the output value of the pressure sensor 55 when it has been detected that the stick-type substrate 150 has been inserted into the chamber 50. It is thus also possible to determine whether or not the inside of the chamber 50 is soiled by utilizing the pressure sensor 55.

[0101] For example, the control unit 116 may acquire

the electrical resistance value, which is the output value of the pressure sensor 55, at a predetermined period, and may detect that the stick-type substrate 150 has been inserted into the chamber 50 while also determining that the inside of the chamber 50 is not soiled when this electrical resistance value transitions from a state of being greater than $R2 [\Omega]$ so as to be included in the first range RG1 shown in fig. 13.

[0102] Meanwhile, the control unit 116 may detect that the stick-type substrate 150 has been inserted into the chamber 50 while also determining that the inside of the chamber 50 is soiled when the electrical resistance value of the pressure sensor 55 has transitioned from a state of being greater than $R2 [\Omega]$ so as to be included in the second range RG2 shown in fig. 13.

[0103] It is thus possible to accurately detect, from the output value of the pressure sensor 55, not only whether or not the stick-type substrate 150 has been inserted into the chamber 50, but also whether or not there is soiling inside the chamber 50. It should be noted that in such a case, $R2 [\Omega]$ and $R4 [\Omega]$, i.e., the first range RG1 and the second range RG2, are preset by the manufacturer, etc. of the inhalation device 100, for example.

[0104] The control unit 116 may then start heating by the heating unit 121 when it has been determined that the inside of the chamber 50 is not soiled, and may be configured not to perform heating by the heating unit 121 when it has been determined that the inside of the chamber 50 is soiled. In other words, the control unit 116 may start heating by the heating unit 121 when the output value of the pressure sensor 55 at the time the stick-type substrate 150 was inserted into the chamber 50 is included in the first range RG1, but may be configured not to perform heating by the heating unit 121 when said output value is included in the second range RG2 (in other words, not included in the first range RG1). It is thus possible to inhibit heating by the heating unit 121 when the inside of the chamber 50 is in a soiled state, and heating by the heating unit 121 can be appropriately performed while taking account of the state of the inside of the chamber 50.

[0105] For example, if heating is performed by means of the heating unit 121 with the inside of the chamber 50 in a soiled state, an inferior aerosol or smoke caused by the soiling inside the chamber 50 may be generated, or the heating may cause this soiling to become stuck more strongly to the inside of the chamber 50, making it difficult to remove. If such a situation were to arise, then the user could have an unpleasant feeling, and there could be a drop in the quality of experience provided to the user by the inhalation device 100.

[0106] The control unit 116 is therefore configured not to perform heating by the heating unit 121 when it has been determined that the inside of the chamber 50 is soiled, thereby making it possible to inhibit such a situation from occurring. Accordingly, it is possible to prevent a drop in the quality of experience provided to the user by the inhalation device 100 because of such a situation

occurring.

[0107] Furthermore, when it has been determined that the inside of the chamber 50 is soiled (i.e., when the output value of the pressure sensor 55 at the time the stick-type substrate 150 was inserted into the chamber 50 is included in the second range RG2), the control unit 116 may notify the user, via the notification unit 113 which is capable of notifying the user of information, that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned. When it has been determined that the inside of the chamber 50 is soiled, it is thus possible to prompt the user to check the inside of the chamber 50, and to prompt the user to clean the inside of the chamber 50 if the inside of the chamber 50 is actually soiled.

[0108] As an example, when the notification unit 113 comprises a light-emitting device, the control unit 116 may notify the user that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, by causing this light-emitting device to emit light in a predetermined light emission mode. Here, the predetermined light emission mode may be, for example, a light emission mode which is used only when the user is notified that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, in other words, it may be a light emission mode different from other light emission modes indicating an error or the state of the inhalation device 100. Furthermore, the light emission mode here is a color of light emission, a number of emissions of light (e.g., the number of light-emitting elements being caused to emit light), or a light emission pattern (e.g., flashing), or the like. This enables the user to be notified, in an intuitive manner that is easy to understand, that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned.

[0109] As another example, when the notification unit 113 comprises a vibration device, the control unit 116 may notify the user that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, by causing this vibration device to vibrate in a predetermined vibration mode. Here, the predetermined vibration mode may be, for example, a vibration mode which is used only when the user is notified that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, in other words, it may be a vibration mode different from other vibration modes indicating an error or the state of the inhalation device 100. Furthermore, the vibration mode here is a vibration pattern (e.g., a manner of vibration), intensity of vibration, frequency of vibration, or a vibration time for which vibration lasts, or the like. The user can thus also be notified, in an intuitive manner that is easy to understand, that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned.

[0110] As another example, when the notification unit 113 comprises a display device, the control unit 116 may notify the user that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be

cleaned, by causing this display device to display a predetermined image or message. Here, the predetermined image may be, for example, an icon indicating that the inside of the chamber 50 needs to be cleaned. Furthermore, the predetermined message may be, for example, a message saying: "Please clean inside heating chamber". The user can thus also be notified, in an intuitive manner that is easy to understand, that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned.

[0111] Furthermore, the control unit 116 may also cause the user to be notified, by means of another device capable of communicating with the inhalation device 100, that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, by sending predetermined information via the communication unit 115 to this other device. In this case, the control unit 116 may cause the user to be notified that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned, by causing a display device, provided in the other device capable of communicating with the inhalation device 100, to display a predetermined image or message such as described above. The user can thus be notified that the inside of the chamber 50 is soiled and/or that the inside of the chamber 50 needs to be cleaned even if the inhalation device 100 is not provided with the notification unit 113.

[0112] Furthermore, the control unit 116 may also detect that the stick-type substrate 150 has been removed from the chamber 50, based on the output value of the pressure sensor 55. It is thus also possible to detect that the stick-type substrate 150 has been removed from the chamber 50 by utilizing the pressure sensor 55.

[0113] For example, as shown in fig. 12, etc., when the stick-type substrate 150 is removed from the chamber 50, the decrease in pressure associated with the removal causes the electrical resistance value of the pressure sensor 55 to transition from a state of being smaller than $R3 [\Omega]$ to a state of being greater than $R3 [\Omega]$.

[0114] The control unit 116 therefore acquires the electrical resistance value, which is the output value of the pressure sensor 55, at a predetermined period, for example, and detects that the stick-type substrate 150 has been removed from the chamber 50 when the electrical resistance value of the pressure sensor 55 has transitioned from a state of being smaller than $R3 [\Omega]$ to a state of being greater than $R3 [\Omega]$, after it has been detected that the stick-type substrate 150 is inserted in the chamber 50. That is to say, the control unit 116 detects that the stick-type substrate 150 has been removed from the chamber 50 based on the time-series transition of the output value of the pressure sensor 55. This makes it possible to accurately detect that the stick-type substrate 150 has been removed from the chamber 50, based on the output value (electrical resistance value) of the pressure sensor 55, which is a readily available pressure sensor such as a strain gauge. It should be noted that in such a case, $R3 [\Omega]$ is preset by the manufacturer, etc.

of the inhalation device 100, for example.

[0115] Furthermore, the control unit 116 may terminate heating by the heating unit 121 when it has been detected that the stick-type substrate 150 has been removed from the chamber 50 during heating by the heating unit 121. For example, the control unit 116 may terminate heating control, which will be described later, on detecting that the stick-type substrate 150 has been removed from the chamber 50 while heating control is in progress. It is thus possible to inhibit power from being wasted and the inhalation device 100 from reaching a high temperature because of continued heating by the heating unit 121 despite the stick-type substrate 150 having been removed from the chamber 50. Better safety of the inhalation device 100 and better user convenience can therefore be envisaged.

[0116] Furthermore, the control unit 116 detects inhalation (i.e., puffing) by the user, based on the output value of the pressure sensor 55, for example. This makes it possible to detect puffing by utilizing the pressure sensor 55.

[0117] For example, as shown in fig. 11, when a puff is taken, the increase in pressure associated with the puff causes the electrical resistance value of the pressure sensor 55 to transition from a state of being greater than $R1 [\Omega]$ to a state of being smaller than $R1 [\Omega]$.

[0118] The control unit 116 therefore acquires the electrical resistance value, which is the output value of the pressure sensor 55, at a predetermined period, for example, and detects a puff when this electrical resistance value has transitioned from a state of being greater than $R1 [\Omega]$ to a state of being smaller than $R1 [\Omega]$. That is to say, the control unit 116 detects a puff based on the time-series transition of the output value of the pressure sensor 55. This makes it possible to accurately detect a puff, based on the output value (electrical resistance value) of the pressure sensor 55, which is a readily available pressure sensor such as a strain gauge. It should be noted that in such a case, $R1 [\Omega]$ is preset by the manufacturer, etc. of the inhalation device 100, for example.

[0119] Furthermore, the control unit 116 heats the stick-type substrate 150 by controlling the temperature of the heating unit 121 in accordance with a pre-prepared heating profile, for example. The heating profile is, for example, information defining a time-series transition of a target temperature, which is a target value of the temperature of the heating unit 121 (e.g., the heating member 42), and is prestored in the memory unit 114, etc. The heating profile is typically designed such that, when the user inhales the aerosol generated by the inhalation device 100, the flavor tasted by the user is optimized. The user can be provided with a high-quality smoking experience (inhalation experience) by generating an aerosol while controlling the temperature of the heating unit 121 on the basis of such a heating profile. It should be noted that control of the temperature of the heating unit 121 based on the heating profile will also be referred to

below simply as "heating control".

[0120] Fig. 14 shows an example of the heating profile in this embodiment. In fig. 14, the vertical axis represents the temperature $[\text{°C}]$ of the heating unit 121. Furthermore, in fig. 14, the horizontal axis represents time $[\text{sec}]$, and more specifically, the elapsed time since the start of heating control.

[0121] In a heating profile $Pr1$ shown in fig. 14, for example, a target temperature corresponding to the elapsed time from 0 $[\text{s}]$ to $T1 [\text{s}]$ (where $T1 > 0$) is defined as $Tp1 [\text{°C}]$, a target temperature corresponding to the elapsed time from $T1 [\text{s}]$ to $T2 [\text{s}]$ (where $T2 > T1$) is defined as $Tp2 [\text{°C}]$ (where $Tp2 < Tp1$), and a target temperature corresponding to the elapsed time from $T2 [\text{s}]$ to $T3 [\text{s}]$ (where $T3 > T2$) is defined as $Tp3 [\text{°C}]$ (where $Tp3 > Tp2$).

[0122] According to such heating profile $Pr1$, when heating control is started, the control unit 116 first of all raises the temperature of the heating unit 121 to $Tp1 [\text{°C}]$, then lowers the temperature to $Tp2 [\text{°C}]$ for a time, and thereafter once again raises the temperature to $Tp3 [\text{°C}]$. The control unit 116 then terminates heating control when $T3 [\text{s}]$ has elapsed after the start of heating control.

[0123] Furthermore, when puffing has been detected a predetermined number of times (e.g., 15 times) during heating by the heating unit 121, or when a state of no puffing being detected has continued for a predetermined time (e.g., 60 $[\text{s}]$), the control unit 116 may terminate heating by the heating unit 121 at that point in time. In this way, heating by the heating unit 121 can be suitably terminated while taking account of the situation of user inhalation, offering better convenience for the user.

[0124] In the heating control, the control unit 116 controls the temperature of the heating unit 121 on the basis of a deviation between the target temperature corresponding to the elapsed time from the start of heating control, and the true temperature of the heating unit 121 (also referred to below as the "actual temperature"). Specifically, at this time, the control unit 116 controls the temperature of the heating unit 121 so that the time-series transition of the actual temperature of the heating unit 121 is similar to the time-series transition of the target temperature defined in the heating profile.

[0125] The temperature control of the heating unit 121 can be realized by known feedback control, for example. For example, the control unit 116 may cause power from the power source unit 111 to be supplied to the heating unit 121 in the form of pulses by pulse width modulation (PWM) or pulse frequency modulation (PFM). In such case, the control unit 116 can perform temperature control of the heating unit 121 by adjusting the duty ratio of the power pulse.

[0126] In the feedback control, the control unit 116 only needs to control the power supplied to the heating unit 121, e.g., said duty ratio, on the basis of the difference between the actual temperature and the target temperature, etc. Furthermore, the feedback control may be, for example, PID control (Proportional-Integral-Differential

Controller). Alternatively, the control unit 116 may perform simple ON-OFF control. For example, the control unit 116 may perform heating by the heating unit 121 until the actual temperature reaches the target temperature, stop heating by the heating unit 121 when the actual temperature has reached the target temperature, and once again perform heating by the heating unit 121 when the actual temperature falls below the target temperature.

[0127] It should be noted that the temperature of the heating unit 121 can be acquired (quantified, in other words) by measuring or estimating the electrical resistance value of a heating resistive element constituting the heating unit 121, for example. This is because the electrical resistance value of the heating resistive element varies with temperature. The electrical resistance value of the heating resistive element can be estimated (or namely, acquired) by measuring the amount of voltage drop at the heating resistive element, for example. The amount of voltage drop at the heating resistive element can be measured (or namely, acquired) by a voltage sensor measuring a potential difference applied to the heating resistive element.

[0128] A period in which a sufficient amount of aerosol is expected to be generated in the inhalation device 100 will also be referred to as an "inhalation-possible period". Furthermore, a period from when heating control is started until the inhalation-possible period is started will also be referred to as a "preheating period". A timing at which the temperature of the heating unit 121 is expected to reach the initial target temperature so that the heating unit 121 is at a sufficiently high temperature is typically the timing at which the inhalation-possible period starts.

[0129] In the example shown in fig. 14, a period between 0 [s] and T11 [s] of the elapsed time from the start of heating control is the preheating period, and a period between T11 [s] and T3 [s] is the inhalation-possible period. Here, T11 [s] is greater than T10 [s], which is the elapsed time at which the temperature of the heating unit 121 is expected to reach the initial target temperature T1 [°C], and is smaller than T1 [s], which is the elapsed time at which the temperature starts to drop to Tp2 [°C], which is the target temperature following Tp1 [°C]. Moreover, when the preheating period moves to the inhalation-possible period, the control unit 116 notifies the user via the notification unit 113 that the inhalation-possible period has been reached, for example. On receiving the notification, the user then starts smoking (i.e., puffing).

[0130] In order to acquire the output value of the pressure sensor 55, the control unit 116 supplies the pressure sensor 55 with predetermined power from the power source unit 111 (e.g., the power source 20). The pressure sensor 55 is preferably supplied with electricity only when the output value of the pressure sensor 55 is needed for control purposes, from the perspective of reducing power consumption in the inhalation device 100.

[0131] Therefore, when the control unit 116 is configured to detect puffing on the basis of the output value of

the pressure sensor 55, the control unit 116 may start electrical supply to the pressure sensor 55 once the inhalation-possible period where puffing is possible has been reached. In other words, the control unit 116 may start electrical supply to the pressure sensor 55 when a given time (e.g., T11 [s]) has elapsed since heating by the heating unit 121 started. Electrical supply to the pressure sensor 55 can thus be restricted during periods where there is a low possibility of puffing, such as immediately after the start of heating by the heating unit 121, so a reduction in power consumption can be envisaged as compared to when there is a constant electrical supply to the pressure sensor 55.

[0132] Furthermore, when the control unit 116 is configured to detect insertion of the stick-type substrate 150 into the chamber 50 on the basis of the output value of the pressure sensor 55, the control unit 116 may start electrical supply to the pressure sensor 55 once the slide cover 102 has reached the open position. In other words, the control unit 116 may start electrical supply to the pressure sensor 55 once there is a state where the slide cover 102 permits the stick-type substrate 150 to access the chamber 50. Thus, by starting electrical supply to the pressure sensor 55 once there is a state in which the stick-type substrate 150 can be inserted into the chamber 50 (i.e., the accommodating portion 140), a reduction in power consumption can be envisaged as compared to when there is a constant electrical supply to the pressure sensor 55.

Example of processing implemented by control unit

[0133] An example of processing implemented by the control unit 116 will be described next. Fig. 15 is a flowchart showing an example of processing implemented by the control unit 116.

[0134] As shown in fig. 15, the control unit 116 first of all determines whether or not the slide cover 102 is in the open position (step S1). It can be determined whether or not the slide cover 102 is in the open position based on the output value of a Hall sensor or the like for detecting the position of the slide cover 102.

[0135] When it has been determined that the slide cover 102 is not in the open position, i.e., that the slide cover 102 is in the closed position (step S1: NO), the control unit 116 repeats the processing of step S1 until the slide cover 102 is in the open position. When it has been determined that the slide cover 102 is in the open position (step S1: YES), the control unit 116 starts electrical supply to the pressure sensor 55 from the power source unit 111 (e.g., the power source 20) (step S2).

[0136] The control unit 116 then determines whether or not the stick-type substrate 150 has been inserted into the chamber 50, based on the output value of the pressure sensor 55 (step S3). When it has been determined that the stick-type substrate 150 is not inserted in the chamber 50 (step S3: NO), the control unit 116 repeats the processing of step S3 until it is determined that the

stick-type substrate 150 has been inserted into the chamber 50.

[0137] When it has been determined that the stick-type substrate 150 has been inserted into the chamber 50 (step S3: Yes), the control unit 116 determines whether or not the inside of the chamber 50 is soiled, based on the output value of the pressure sensor 55 when the stick-type substrate 150 was inserted in the chamber 50 (step S4). When it has been determined that the inside of the chamber 50 is not soiled (step S4: NO), the control unit 116 starts heating control (step S5).

[0138] The control unit 116 then determines whether or not the stick-type substrate 150 has been removed from the chamber 50 (step S6). When it has been determined that the stick-type substrate 150 has been removed from the chamber 50 (step S6: YES), the control unit 116 advances to the processing of step S10 which will be described later.

[0139] When it has been determined that the stick-type substrate 150 has not been removed from the chamber 50 (step S6: NO), the control unit 116 determines whether or not puffs have been taken a predetermined number of times (e.g., 15 times) during the current heating control (step S7). When it has been determined that puffs have been taken a predetermined number of times (step S7: YES), the control unit 116 advances to the processing of step S10 which will be described later.

[0140] When it has been determined that puffs have not been taken a predetermined number of times (step S7: NO), the control unit 116 determines whether or not a predetermined time (e.g., T3 [s]) has elapsed from the start of the current heating control (step S8). When it has been determined that the predetermined time has elapsed (step S8: YES), the control unit 116 advances to the processing of step S10 which will be described later.

[0141] When it has been determined that the predetermined time has not elapsed (step S7: YES), the control unit 116 determines whether or not a state of no puffing being detected has continued for a predetermined time (e.g., 60 [s]) (step S9). When it has been determined that a state of no puffing being detected has not continued for the predetermined time (step S9: NO), the control unit 116 returns to the processing of step S6.

[0142] When it has been determined that a state of no puffing being detected has continued for the predetermined time (step S9: YES), the control unit 116 terminates the heating control (step S10), stops electrical supply to the pressure sensor 55 (step S11), and terminates the processing series shown in fig. 15.

[0143] Furthermore, when it has been determined in the processing of step S4 that the inside of the chamber 50 is soiled (step S4: YES), the control unit 116 notifies the user that the inside of the chamber 50 needs to be cleaned (step S12), and advances to the processing of step S11. In this case, the control unit 116 does not perform heating control even if it is detected that the stick-type substrate 150 has been inserted into the cham-

ber 50. This makes it possible to prevent an inferior aerosol or smoke caused by the soiling inside the chamber 50 from being generated, and to prevent the soiling from becoming stuck to the inside of the chamber 50.

[0144] As described above, according to the embodiment, the control unit 116 can detect inhalation (i.e., puffing) by the user based on the output value of the pressure sensor 55 for outputting a value relating to pressure which is generated as a result of the stick-type substrate 150 being pressed. This enables inhalation by the user to be suitably detected by utilizing the pressure sensor 55 in the inhalation device 100.

[0145] Furthermore, according to the embodiment, the control unit 116 can perform heating by the heating member 42 when the output value of the pressure sensor 55 at the time the stick-type substrate 150 was inserted into the accommodating portion 140 is included in the first range RG1, and can be configured not to perform heating by the heating unit 121 when the output value of the pressure sensor 55 at the time the stick-type substrate 150 was inserted into the accommodating portion 140 is included in the second range RG2. This makes it possible to determine the state of the accommodating portion 140 by utilizing the pressure sensor 55 in the inhalation device 100, and to suitably perform heating by the heating unit 121 while taking account of this state.

[0146] Furthermore according to the embodiment, the inhalation device 100 comprises the bottom member 36 serving as a movable member which moves in the insertion direction as a result of the stick-type substrate 150 accommodated in the accommodating portion 140 being pressed in the insertion direction, and the pressure sensor 55 faces the bottom member 36 in the insertion direction, and outputs a value relating to the pressure which is generated as a result of the pressure sensor 55 being pressed by the bottom member 36 which has moved in the insertion direction. The pressure sensor 55 can thus be arranged separated from the accommodating portion 140 and/or the stick-type substrate 150 by virtue of a configuration such that the pressure sensor 55 is pressed by the bottom member 36 serving as the movable member. As a result, even if the accommodating portion 140 and/or the stick-type substrate 150 reaches a high temperature during aerosol generation, the pressure sensor 55 is easily protected from the temperature thereof. In addition, according to the embodiment, the pressure sensor 55 can be pressed by utilizing the bottom member 36, so there is no separate need for a dedicated component solely for pressing the pressure sensor 55. This enables the structure of the inhalation device 100 to be simplified.

[0147] An embodiment of an aerosol-generating device according to the present disclosure was described above, but it goes without saying that the present disclosure is not limited to such an embodiment. It is obvious that a person skilled in the art will be able to conceive of a number of variant examples or modified examples within the scope disclosed in the claims, and any such variant

examples or modified examples are naturally understood to fall within the technical scope of the present disclosure. Furthermore, the components in the embodiments described above may be combined in any way within a scope that does not depart from the essential point of the invention.

[0148] For example, in the embodiment described above, the inhalation device 100 had what is known as a counterflow air flow path, in which air that has flowed in from the opening 52 of the chamber 50 is supplied to the end face of the stick-type substrate 150, but this is not limiting. For example, the inhalation device 100 may also have what is known as a bottom-flow air flow path, in which air is supplied into the chamber 50 from the bottom portion 56 of the chamber 50.

[0149] Furthermore, in the embodiment described above, the pressure sensor 55 was configured to be pressed by the bottom member 36 serving as the movable member, but this is not limiting.

[0150] Fig. 16 shows another exemplary arrangement (1) of the pressure sensor 55. As shown in fig. 16, the pressure sensor 55 may face the support portion 72 in the insertion direction of the stick-type substrate 150, for example, and may output a value relating to the pressure which is generated as a result of being pressed by the support portion 72 which has moved in the insertion direction. That is to say, the support portion 72 may serve as the movable member for pressing the pressure sensor 55. In such a case, the pressure sensor 55 can be pressed by utilizing the support portion 72 instead of the bottom member 36, so there is no separate need for a dedicated component solely for pressing the pressure sensor 55. This enables the structure of the inhalation device 100 to be simplified. Furthermore, in such a case, even if the stick-type substrate 150 is forcefully pressed, the force thereof is distributed by the bottom member 36 and the support portion 72, so it is possible to inhibit excessive pressure from being generated on the pressure sensor 55, which protects the pressure sensor 55.

[0151] Fig. 17 shows another exemplary arrangement (2) of the pressure sensor 55. As shown in fig. 17, the pressure sensor 55 may face the heater cushion 74 in the insertion direction of the stick-type substrate 150, for example, and may output a value relating to the pressure which is generated as a result of the pressure sensor 55 being pressed by the heater cushion 74 which has moved (or deformed) in the insertion direction. That is to say, the heater cushion 74 may serve as the movable member for pressing the pressure sensor 55. In such a case, the pressure sensor 55 can be pressed by utilizing the heater cushion 74 instead of the bottom member 36, so there is no separate need for a dedicated component solely for pressing the pressure sensor 55. This enables the structure of the inhalation device 100 to be simplified. Furthermore, in such a case, even if the stick-type substrate 150 is forcefully pressed, the force thereof is distributed by the bottom member 36, the support portion 72, and the

heater cushion 74, so it is possible to inhibit excessive pressure from being generated on the pressure sensor 55, which protects the pressure sensor 55.

[0152] Furthermore, a pressure sensor 55 for outputting a value relating to the pressure which is generated as a result of the stick-type substrate 150 accommodated in the chamber 50 (i.e., the accommodating portion 140) being pressed in the insertion direction, and a pressure sensor 55 for outputting a value relating to pressure which is generated as a result of the stick-type substrate 150 being inserted into the chamber 50, may each be separately provided.

[0153] Fig. 18 shows another exemplary arrangement (3) of the pressure sensor 55. As shown in fig. 18, the pressure sensor 55 may be provided on an inner wall 34a of the insertion guide member 34, for example, and may output a value relating to the pressure which is generated as a result of the inner wall 34a being pressed. The pressure sensor 55 can thus also be pressed by utilizing the insertion guide member 34, so there is no separate need for a dedicated component solely for pressing the pressure sensor 55. This enables the structure of the inhalation device 100 to be simplified.

[0154] Furthermore, if there is no need to detect inhalation (i.e., puffing) based on the output value of the pressure sensor 55, then the pressure sensor 55 which faces the bottom member 36 out of the pressure sensors 55 shown in fig. 18 may be omitted, for example. In this case, the control unit 116 may start heating by the heating unit 121 when the output value of the pressure sensor 55 provided on the inner wall 34a, for outputting a value relating to the pressure which is generated as a result of the stick-type substrate 150 being inserted into the chamber 50, is included in the first range RG1, but may be configured not to perform heating by the heating unit 121 when said output value is included in the second range RG2.

[0155] The present specification, etc. sets forth at least the following features. Corresponding components, etc. in the embodiments described above are shown by way of example in parentheses, but there is no limitation to such components.

(1) An aerosol-generating device (inhalation device 100) for generating an aerosol from an aerosol source-containing substrate (stick-type substrate 150), the aerosol-generating device comprising:

an accommodating portion (accommodating portion 140) which has an opening (opening 142) at one end and accommodates a portion of the substrate inserted through the opening; a pressure sensor (pressure sensor 55, sensor unit 112) for outputting a value relating to pressure which is generated as a result of the substrate accommodated in the accommodating portion being pressed in an insertion direction; and

a control unit (control unit 116) for detecting inhalation by a user based on an output value of the pressure sensor.

When the user holds the substrate, which is accommodated in the accommodating portion, in their mouth in order to inhale the aerosol generated by means of the aerosol-generating device, the substrate is pressed in the insertion direction inside the accommodating portion. According to (1), the control unit can detect inhalation by the user based on the output value of the pressure sensor for outputting a value relating to pressure which is generated as a result of the substrate accommodated in the accommodating portion being pressed in the insertion direction. This enables inhalation by the user to be suitably detected by utilizing the pressure sensor in the aerosol-generating device.

(2) The aerosol-generating device as disclosed in (1), wherein the control unit detects the inhalation based on a time-series transition of the output value. According to (2), inhalation by the user can be accurately detected on the basis of the output value of the pressure sensor.

(3) The aerosol-generating device as disclosed in (2), wherein

the pressure sensor has a characteristic of an electrical resistance value which becomes smaller as the pressure becomes greater, and outputs the electrical resistance value as the output value, and the control unit detects the inhalation when the electrical resistance value has transitioned to a state of being smaller than a first predetermined value (R1).

According to (3), inhalation by the user can be accurately detected on the basis of the output value (electrical resistance value) of a pressure sensor which is readily available, such as a strain gauge.

(4) The aerosol-generating device as disclosed in any of (1) to (3), wherein

the aerosol-generating device further comprises a heating unit (heating unit 121, heating member 42) for heating the substrate accommodated in the accommodating portion, and during heating by the heating unit, the control unit terminates the heating when the inhalation has been detected a predetermined number of times, or when a state of no inhalation being detected has continued for a predetermined time.

According to (4), heating by the heating unit can be suitably terminated while taking account of the situation of user inhalation, offering better convenience for the user.

(5) The aerosol-generating device as disclosed in (4), wherein

the control unit further controls electrical supply to the pressure sensor, and starts electrical supply to the pressure sensor when a given time has elapsed since heating by the heating unit started.

According to (5), electrical supply to the pressure sensor can be restricted during periods where there is a low possibility of inhalation, such as immediately after the start of heating by the heating unit, so a reduction in power consumption can be envisaged as compared to when there is a constant electrical supply to the pressure sensor.

(6) The aerosol-generating device as disclosed in any of (1) to (4), wherein the control unit further detects that the substrate portion has been inserted into the accommodating portion, based on the output value.

According to (6), insertion of the substrate into the accommodating portion can also be detected by utilizing the pressure sensor in the aerosol-generating device.

(7) The aerosol-generating device as disclosed in (6), wherein

the aerosol-generating device further comprises a heating unit (heating unit 121, heating member 42) for heating the substrate accommodated in the accommodating portion, and the control unit starts heating by the heating unit when it has been detected that the substrate has been inserted into the accommodating portion.

According to (7), the user is able to cause an aerosol to be generated simply by inserting the substrate into the accommodating portion, without the need for another separate operation. This can therefore reduce work for the user and offer better convenience for the user as compared to when another operation in addition to inserting the substrate into the accommodating portion is also needed to generate an aerosol.

(8) The aerosol-generating device as disclosed in (7), wherein

the control unit further determines whether or not the inside of the accommodating portion is soiled, based on the output value when it has been detected that the substrate has been inserted into the accommodating portion, and starts heating by the heating unit when it has been determined that the inside of the accommodating portion is not soiled.

According to (8), it is also possible to determine whether or not the inside of the accommodating

portion is soiled, by utilizing the pressure sensor in the aerosol-generating device. Heating by the heating unit can then be started on the basis of a determination that the inside of the accommodating portion is not soiled, so it is possible to inhibit heating from being performed by the heating unit while the inside of the accommodating portion is soiled.

(9) The aerosol-generating device as disclosed in any of (1) to (8), wherein

the control unit further detects that the substrate has been removed from the accommodating portion, based on the output value.

According to (9), removal of the substrate from the accommodating portion can also be detected by utilizing the pressure sensor in the aerosol-generating device.

(10) The aerosol-generating device as disclosed in (9), wherein

the aerosol-generating device further comprises a heating unit (heating unit 121, heating member 42) for heating the substrate accommodated in the accommodating portion, and the control unit terminates heating by the heating unit when it has been detected that the substrate has been removed from the accommodating portion during the heating.

According to (10), it is possible to inhibit power from being wasted and the aerosol-generating device from reaching a high temperature because of continued heating by the heating unit despite the substrate having been removed from the accommodating portion.

(11) The aerosol-generating device as disclosed in any of (1) to (10), wherein

the aerosol-generating device further comprises a movable member (bottom member 36, support portion 72, heater cushion 74) which moves in the insertion direction as a result of the substrate accommodated in the accommodating portion being pressed in the insertion direction, and the pressure sensor faces the movable member in the insertion direction, and outputs a value relating to the pressure which is generated as a result of being pressed by the movable member which has moved in the insertion direction.

According to (11), the pressure sensor can be arranged separated from the accommodating portion and/or the substrate by virtue of a configuration such that the pressure sensor is pressed by the movable member. As a result, even if the accommodating portion and/or the substrate reaches a high temperature during aerosol generation, the pressure sensor is easily protected from the temperature thereof.

(12) The aerosol-generating device as disclosed in

(11), wherein

the pressure sensor is provided on a chassis member (chassis member 200) which is harder than the pressure sensor.

According to (12), displacement of the pressure sensor when it is pressed can be inhibited to a greater extent than when the pressure sensor is provided on a flexible member. This enables inhalation by the user to be accurately detected on the basis of the output value of the pressure sensor.

(13) The aerosol-generating device as disclosed in (11) or (12), wherein

the accommodating portion comprises:

a chamber (chamber 50) which is a cylindrical member extending in the insertion direction and is configured to be capable of internally accommodating the substrate; and a bottom member (bottom member 36) which is provided at a bottom portion of the chamber forming another end of the accommodating portion, and abuts an end portion of the substrate accommodated in the chamber, and the movable member constitutes the bottom member.

The accommodating portion of an aerosol-generating device sometimes comprises a chamber which is a cylindrical member extending in the direction of insertion of a substrate, and a bottom member which is provided at the bottom portion of the chamber. According to (13), the pressure sensor can be pressed by utilizing the bottom member of such an aerosol-generating device, so there is no separate need for a dedicated component solely for pressing the pressure sensor. This enables the structure of the aerosol-generating device to be simplified.

(14) The aerosol-generating device as disclosed in (11) or (12), wherein

the accommodating portion comprises:

a chamber (chamber 50) which is a cylindrical member extending in the insertion direction and is configured to be capable of internally accommodating the substrate; and a bottom member (bottom member 36) which is provided at a bottom portion of the chamber forming another end of the accommodating portion, and abuts an end portion of the substrate accommodated in the chamber, the aerosol-generating device further comprises a support portion (support portion 72, heater cushion 74) for supporting the chamber, and the movable member constitutes the support portion.

The accommodating portion of an aerosol-generat-

ing device sometimes comprises a chamber which is a cylindrical member extending in the direction of insertion of a substrate, and a bottom member which is provided at the bottom portion of the chamber, and a support portion for supporting the chamber is sometimes further provided. According to (14), the pressure sensor can be pressed by utilizing the support portion of such an aerosol-generating device, so there is no separate need for a dedicated component solely for pressing the pressure sensor. This enables the structure of the aerosol-generating device to be simplified. Furthermore, according to (14), even if the substrate is forcefully pressed, the force thereof is distributed by the bottom member and the support portion, so it is possible to inhibit excessive pressure from being generated on the pressure sensor, which protects the pressure sensor.

(15) The aerosol-generating device as disclosed in (13) or (14), wherein

a first air flow path (first air flow path AF1) communicating with the substrate accommodated in the chamber is formed on an abutment face (abutment face 36c) of the bottom member with the substrate,
the chamber comprises:

a contact portion (contact portion 62) which contacts the accommodated substrate; and
a spaced-apart portion (spaced-apart portion 66) which is adjacent to the contact portion in a circumferential direction and is spaced apart from the accommodated substrate,
and

a second air flow path (second air flow path AF2) communicating with the first air flow path is formed between the spaced-apart portion and the accommodated substrate.

According to (15), air which has been introduced into the accommodating portion formed by the chamber and the bottom member is supplied to the substrate through the second air flow path and the first air flow path, so there is no separate need for a flow path for introducing air to be supplied to the substrate. This enables the structure of the aerosol-generating device to be simplified.

REFERENCE SIGNS LIST

[0156]

100 Inhalation device (aerosol-generating device)
112 Sensor unit (pressure sensor)
116 Control unit
121 Heating unit

140 Accommodating portion
150 Stick-type substrate (substrate)
200 Chassis member
36 Bottom member (movable member)
36c Abutment face
42 Heating member (heating unit)
50 Chamber
55 Pressure sensor
62 Contact portion
66 Spaced-apart portion
72 Support portion (movable member)
74 Heater cushion (movable member, support portion)
AF1 First air flow path
AF2 Second air flow path

Claims

1. An aerosol-generating device for generating an aerosol from an aerosol source-containing substrate, the aerosol-generating device comprising:

an accommodating portion which has an opening at one end and accommodates a portion of the substrate inserted through the opening;
a pressure sensor for outputting a value relating to pressure which is generated as a result of the substrate accommodated in the accommodating portion being pressed in an insertion direction; and
a control unit for detecting inhalation by a user based on an output value of the pressure sensor.

2. The aerosol-generating device as claimed in claim 1, wherein
the control unit detects the inhalation based on a time-series transition of the output value.

3. The aerosol-generating device as claimed in claim 2, wherein

the pressure sensor has a characteristic of an electrical resistance value which becomes smaller as the pressure becomes greater, and outputs the electrical resistance value as the output value, and
the control unit detects the inhalation when the electrical resistance value has transitioned to a state of being smaller than a first predetermined value.

4. The aerosol-generating device as claimed in any one of claims 1 to 3, wherein

the aerosol-generating device further comprises a heating unit for heating the substrate accommodated in the accommodating portion, and

- during heating by the heating unit, the control unit terminates the heating when the inhalation has been detected a predetermined number of times, or when a state of no inhalation being detected has continued for a predetermined time. 5
5. The aerosol-generating device as claimed in claim 4, wherein 10
- the control unit
further controls electrical supply to the pressure sensor, and
starts electrical supply to the pressure sensor when a given time has elapsed since heating by the heating unit started. 15
6. The aerosol-generating device as claimed in any one of claims 1 to 4, wherein 20
- the control unit further detects that the substrate portion has been inserted into the accommodating portion, based on the output value.
7. The aerosol-generating device as claimed in claim 6, wherein 25
- the aerosol-generating device further comprises a heating unit for heating the substrate accommodated in the accommodating portion, and the control unit starts heating by the heating unit when it has been detected that the substrate has been inserted into the accommodating portion. 30
8. The aerosol-generating device as claimed in claim 7, wherein 35
- the control unit
further determines whether or not the inside of the accommodating portion is soiled, based on the output value when it has been detected that the substrate has been inserted into the accommodating portion, and 40
- starts heating by the heating unit when it has been determined that the inside of the accommodating portion is not soiled. 45
9. The aerosol-generating device as claimed in any one of claims 1 to 8, wherein 50
- the control unit further detects that the substrate has been removed from the accommodating portion, based on the output value.
10. The aerosol-generating device as claimed in claim 9, wherein 55
- the aerosol-generating device further comprises a heating unit for heating the substrate accommodated in the accommodating portion, and
- the control unit terminates heating by the heating unit when it has been detected that the substrate has been removed from the accommodating portion during the heating.
11. The aerosol-generating device as claimed in any one of claims 1 to 10, wherein
- the aerosol-generating device further comprises a movable member which moves in the insertion direction as a result of the substrate accommodated in the accommodating portion being pressed in the insertion direction, and the pressure sensor faces the movable member in the insertion direction, and outputs a value relating to the pressure which is generated as a result of being pressed by the movable member which has moved in the insertion direction.
12. The aerosol-generating device as claimed in claim 11, wherein
- the pressure sensor is provided on a chassis member which is harder than the pressure sensor.
13. The aerosol-generating device as claimed in claim 11 or 12, wherein
- the accommodating portion comprises:
- a chamber which is a cylindrical member extending in the insertion direction and is configured to be capable of internally accommodating the substrate; and
a bottom member which is provided at a bottom portion of the chamber forming another end of the accommodating portion, and abuts an end portion of the substrate accommodated in the chamber, 30
- and
the movable member constitutes the bottom member.
14. The aerosol-generating device as claimed in claim 11 or 12, wherein
- the accommodating portion comprises:
- a chamber which is a cylindrical member extending in the insertion direction and is configured to be capable of internally accommodating the substrate; and
a bottom member which is provided at a bottom portion of the chamber forming another end of the accommodating portion, and abuts an end portion of the substrate accommodated in the chamber, 35
- the aerosol-generating device further comprises a support portion for supporting the chamber, and
the movable member constitutes the support

portion.

15. The aerosol-generating device as claimed in claim 13 or 14, wherein

a first air flow path communicating with the substrate accommodated in the chamber is formed on an abutment face of the bottom member with the substrate,
the chamber comprises:
a contact portion which contacts the accommodated substrate; and
a spaced-apart portion which is adjacent to the contact portion in a circumferential direction and is spaced apart from the accommodated substrate,
and
a second air flow path communicating with the first air flow path is formed between the spaced-apart portion and the accommodated substrate.

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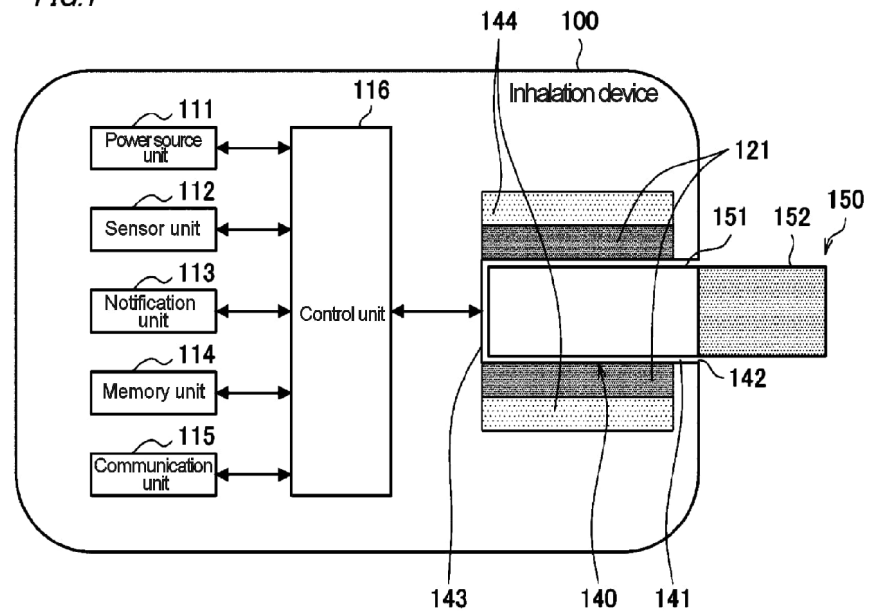
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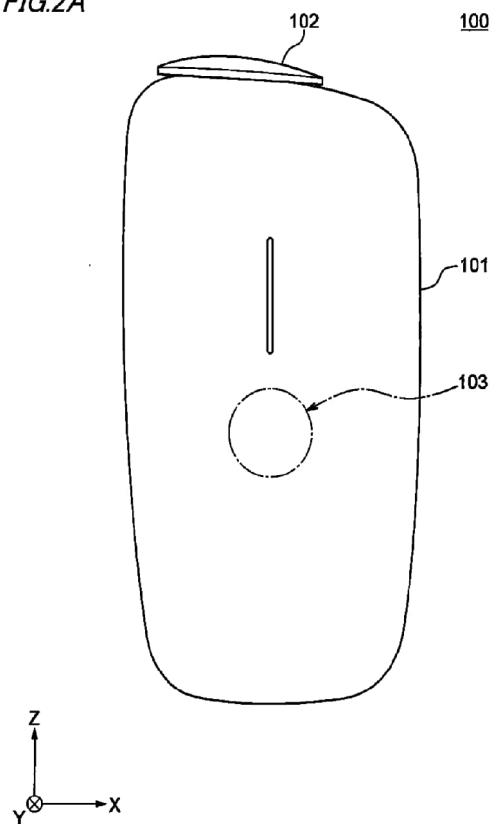
[Fig. 1]

FIG.1

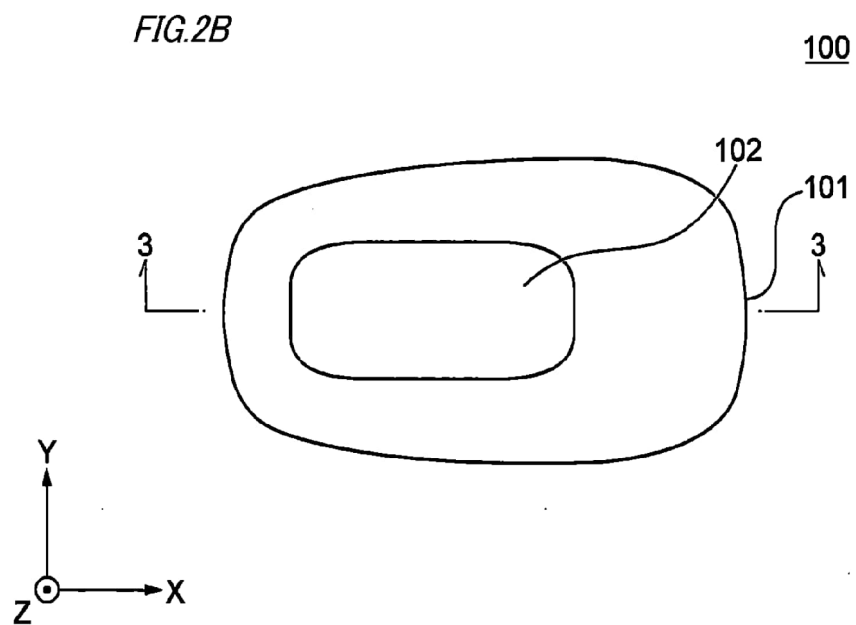


[Fig. 2A]

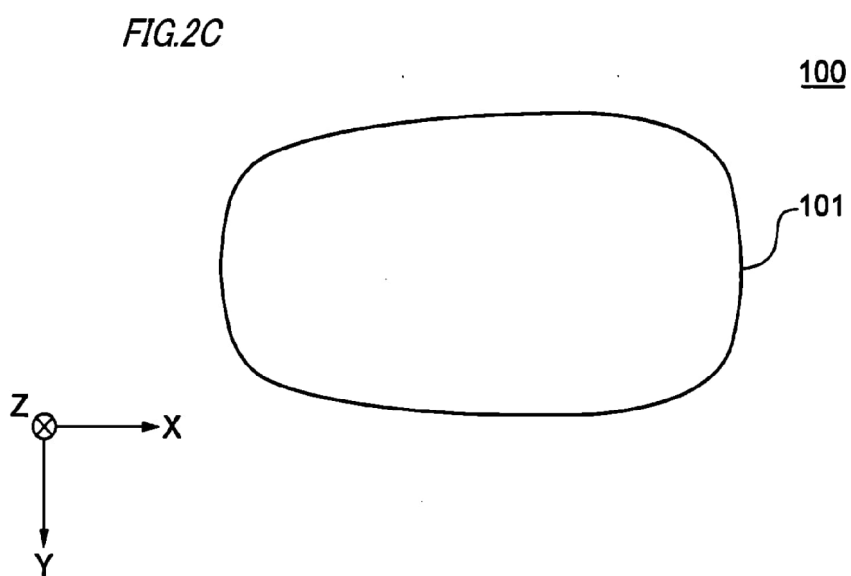
FIG.2A



[Fig. 2B]

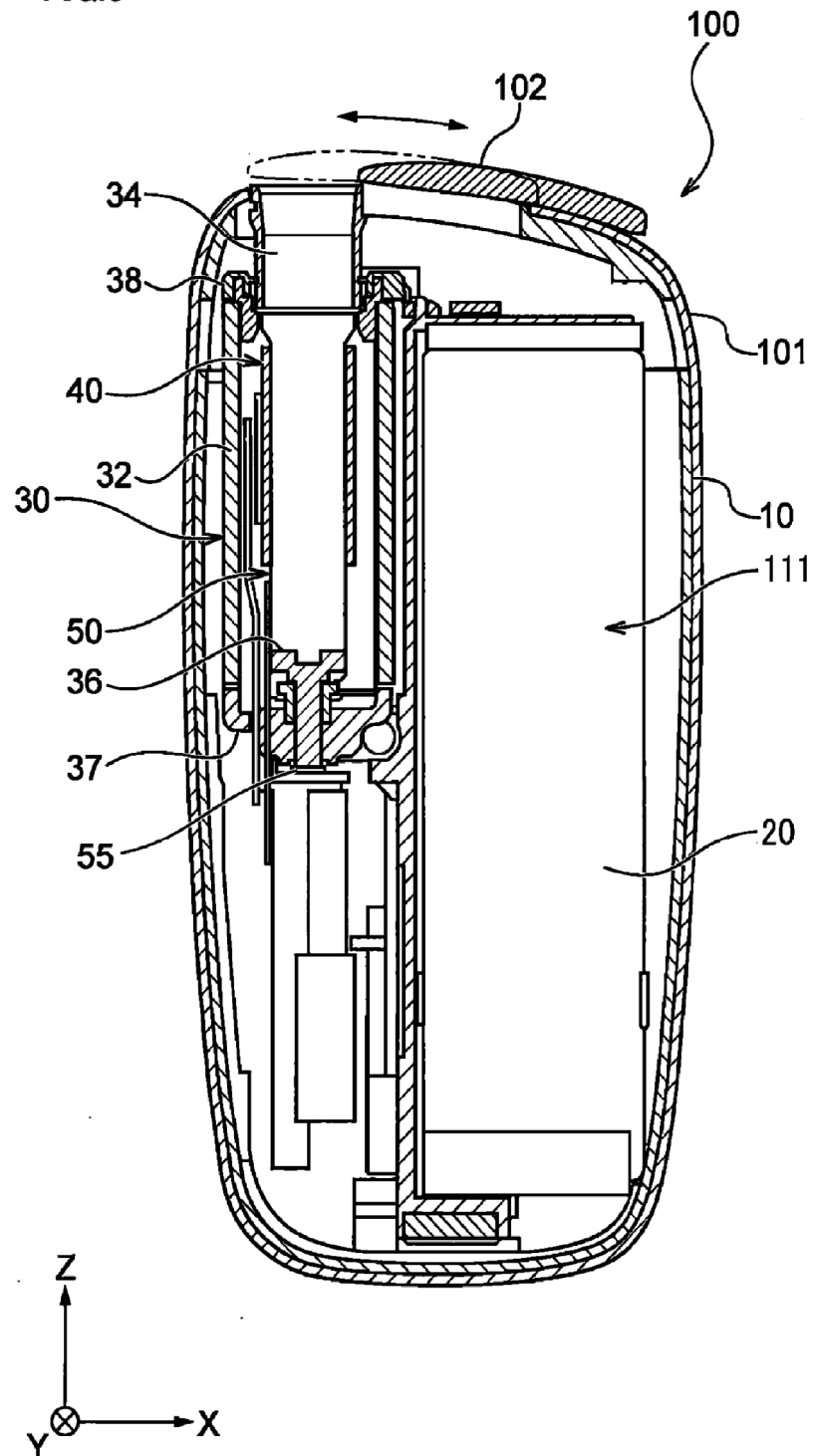


[Fig. 2C]



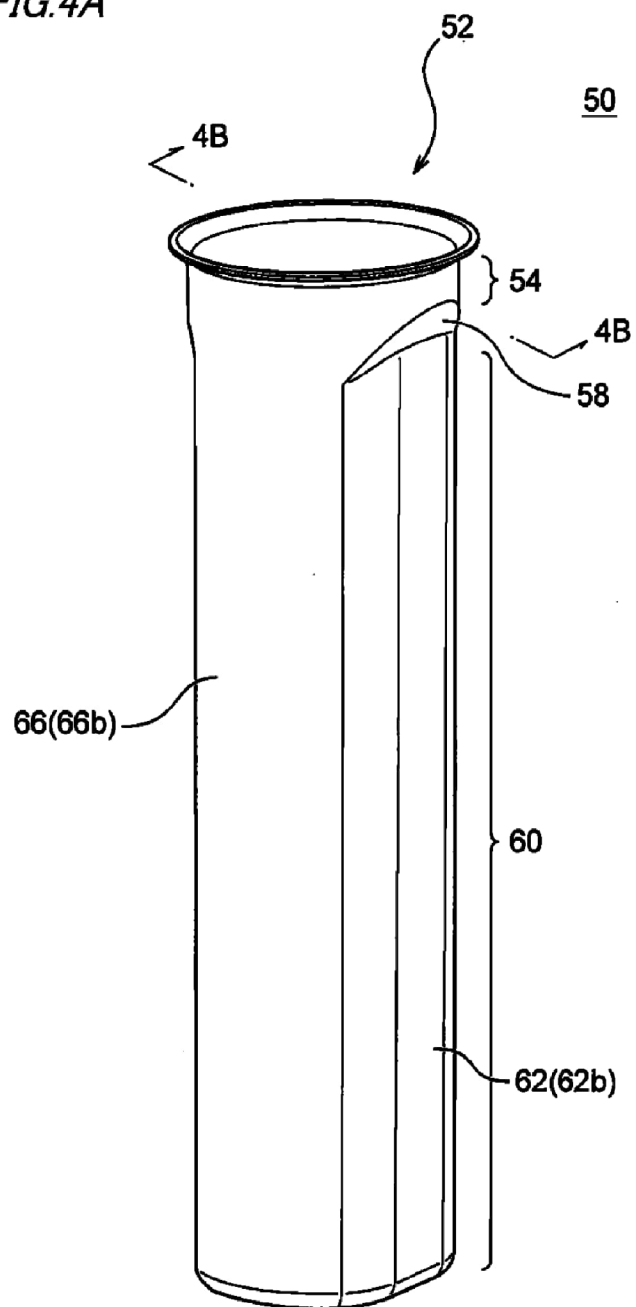
[Fig. 3]

FIG. 3

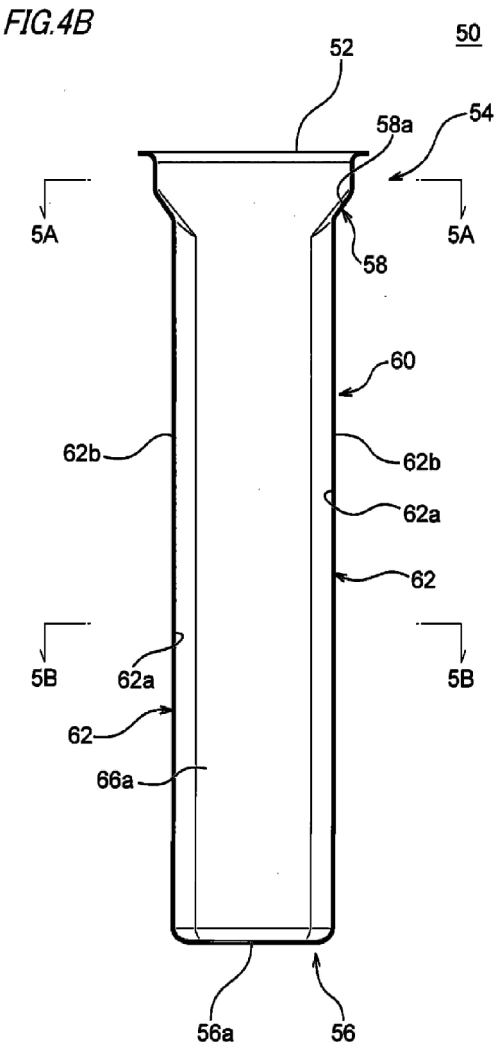


[Fig. 4A]

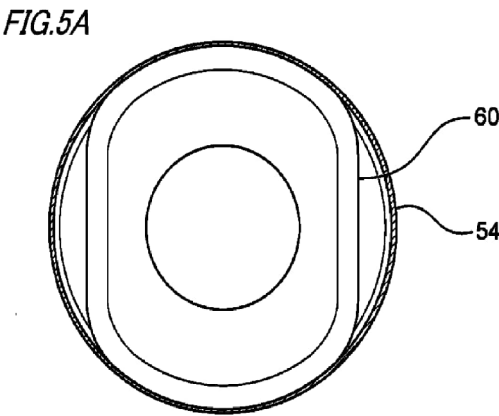
FIG. 4A



[Fig. 4B]

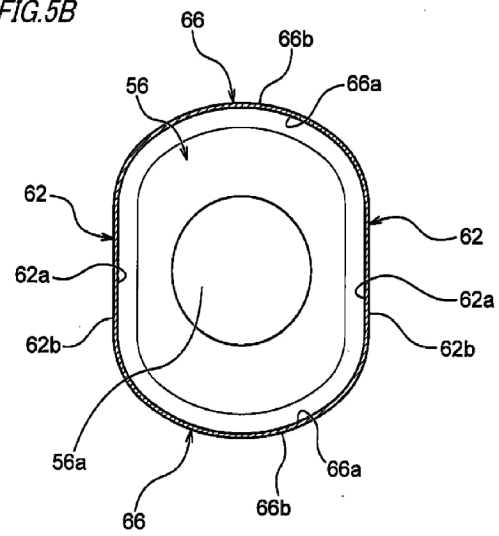


[Fig. 5A]



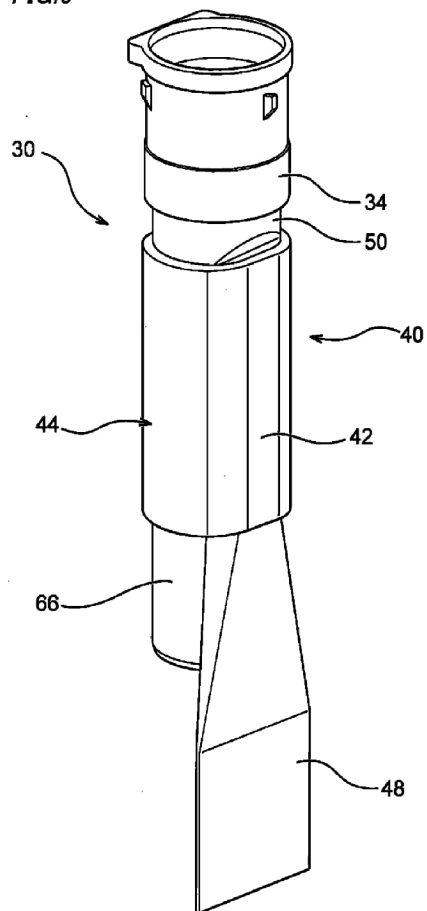
[Fig. 5B]

FIG.5B



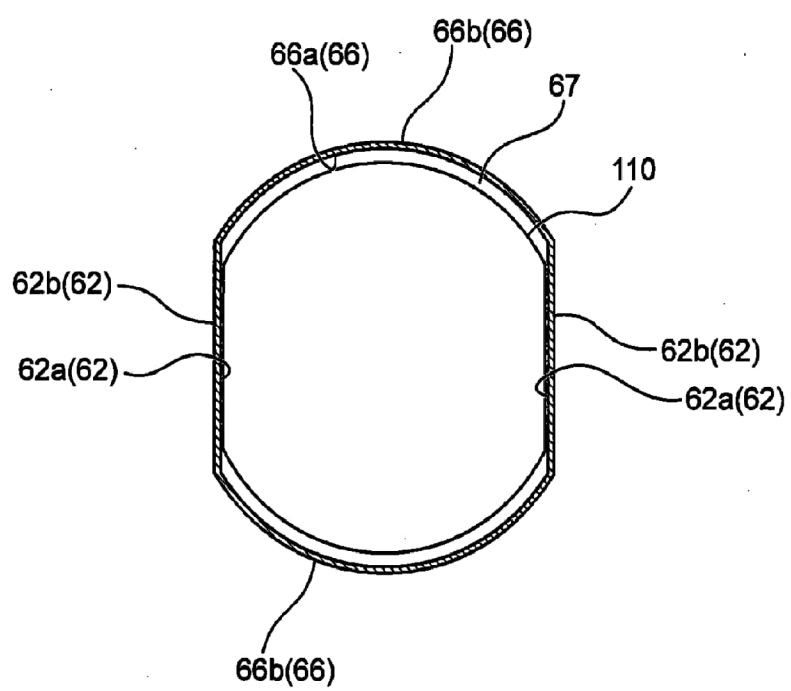
[Fig. 6]

FIG.6



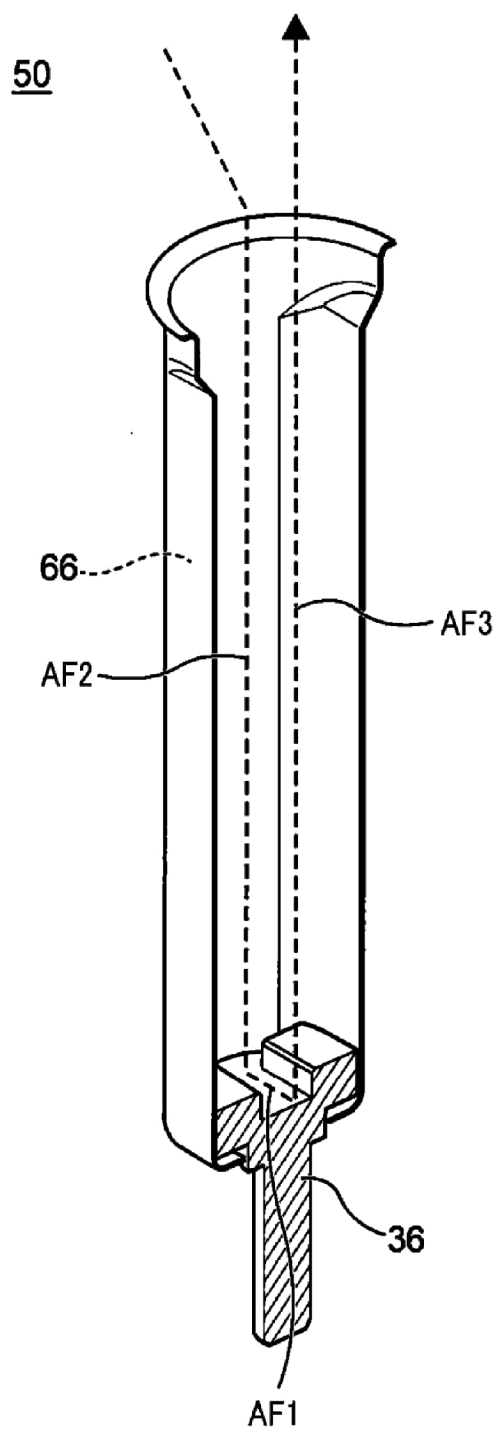
[Fig. 7]

FIG. 7



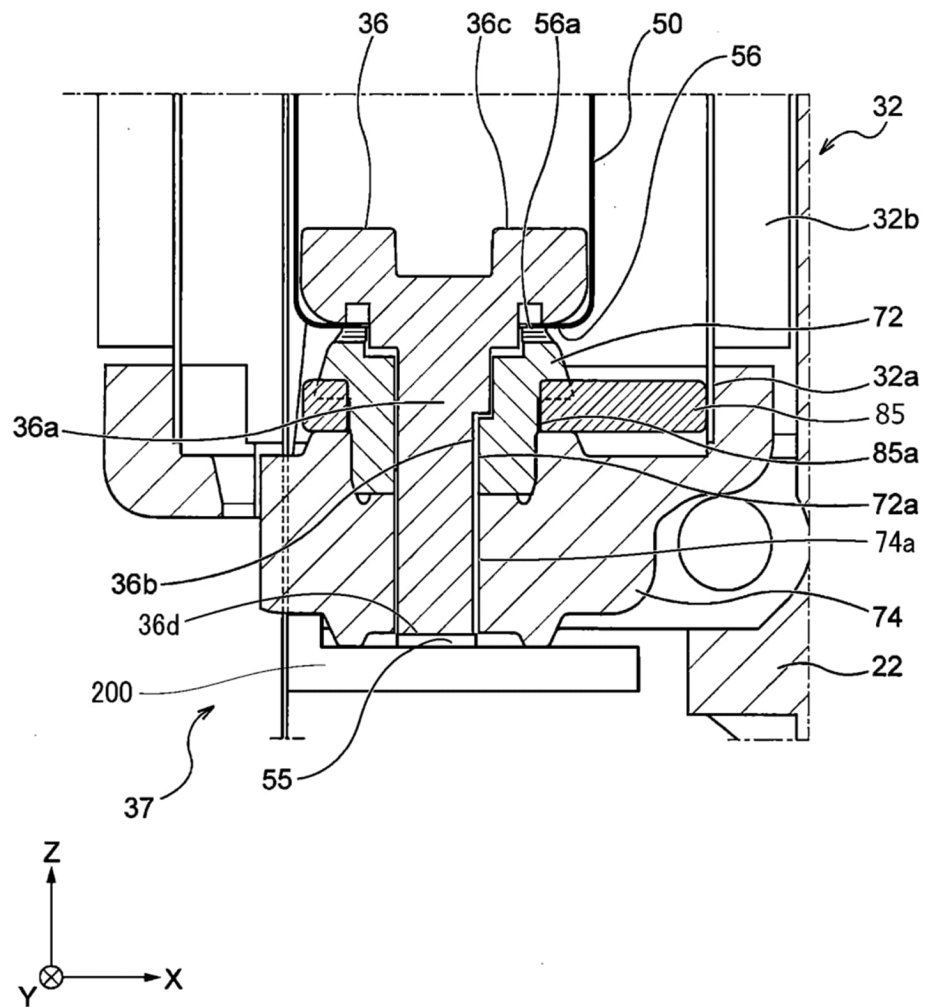
[Fig. 8]

FIG. 8



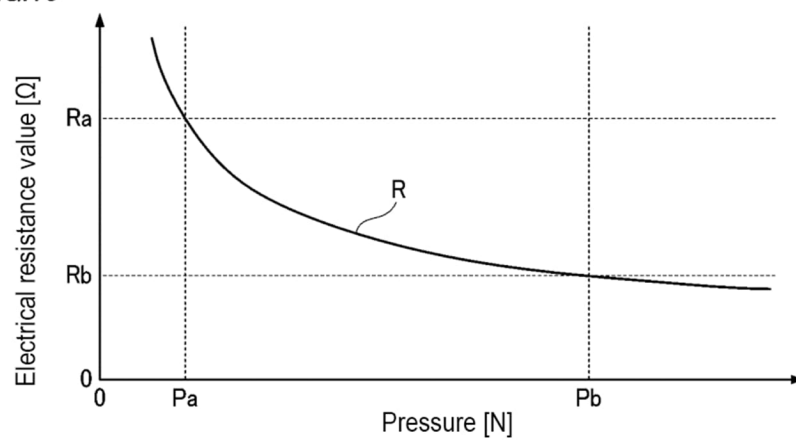
[Fig. 9]

FIG. 9



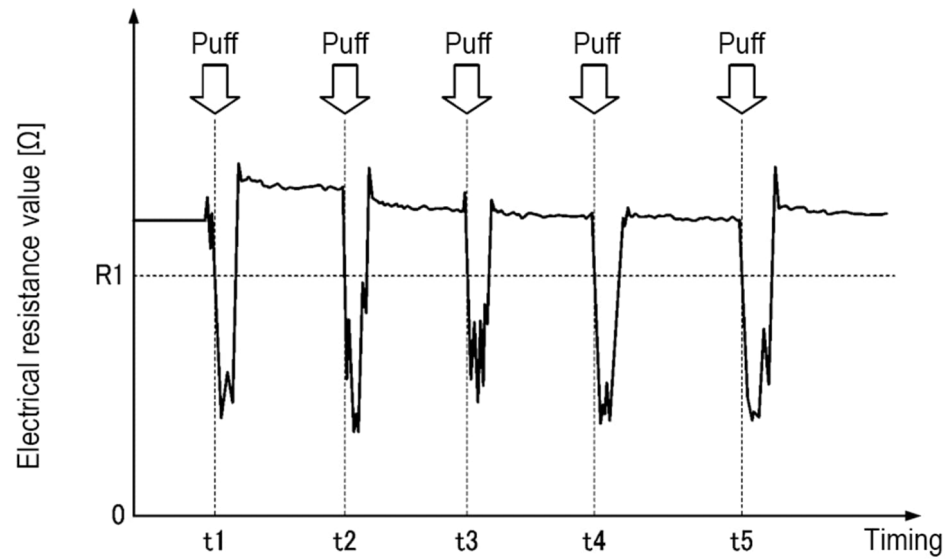
[Fig. 10]

FIG. 10



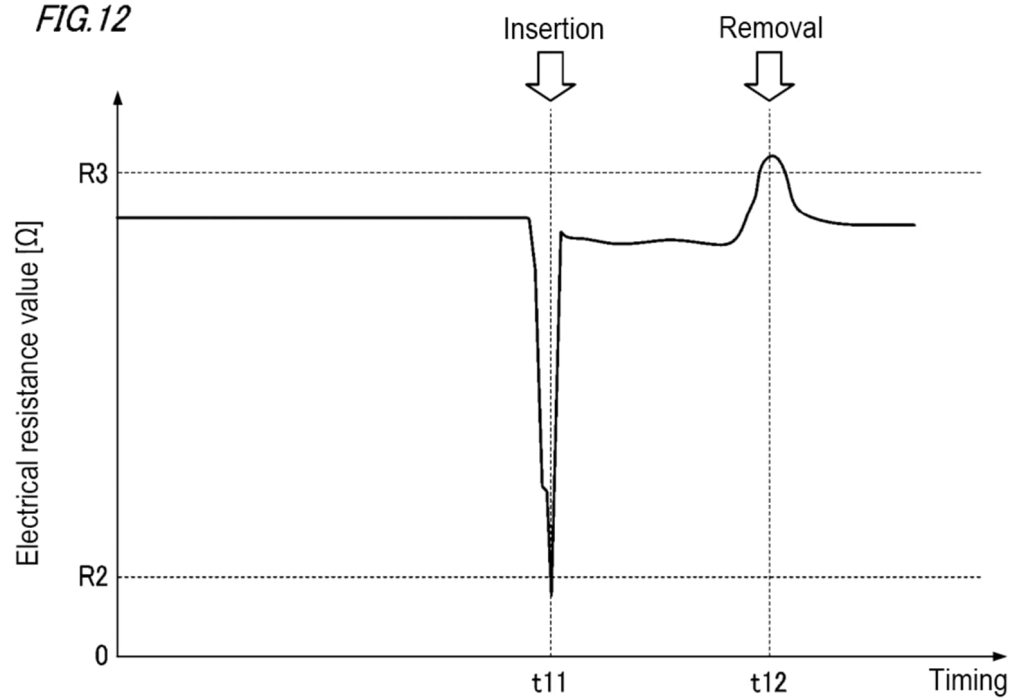
[Fig. 11]

FIG. 11



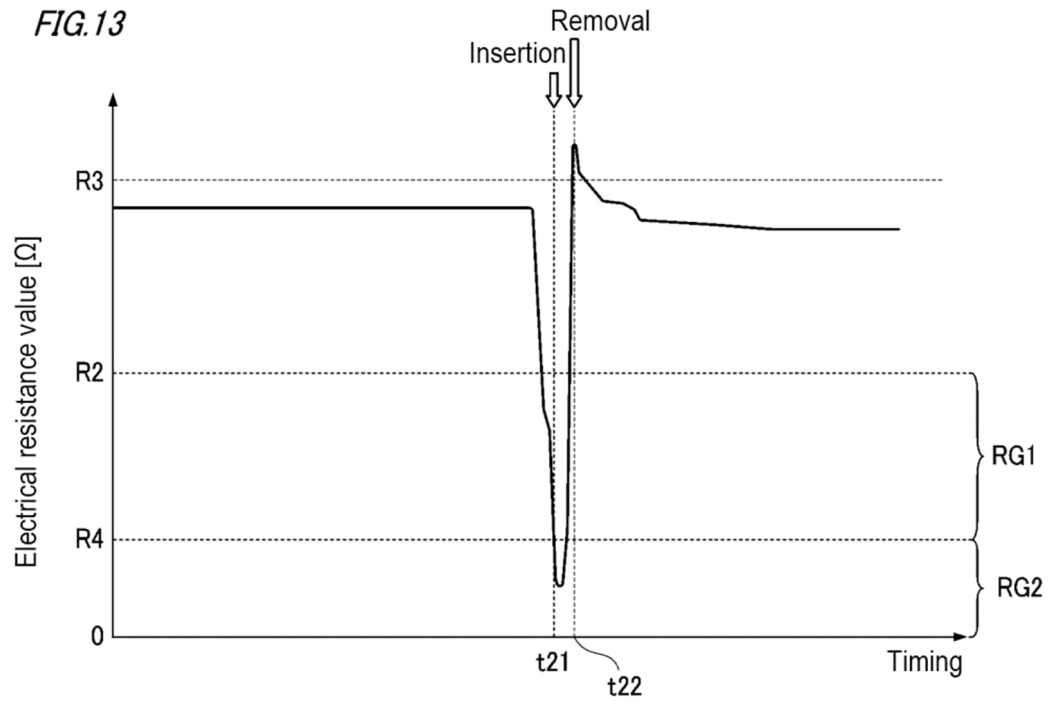
[Fig. 12]

FIG. 12



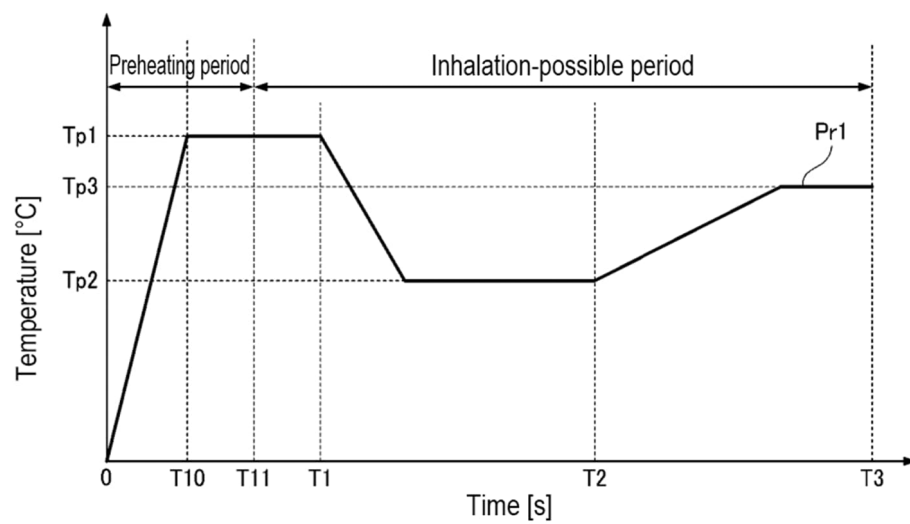
[Fig. 13]

FIG. 13

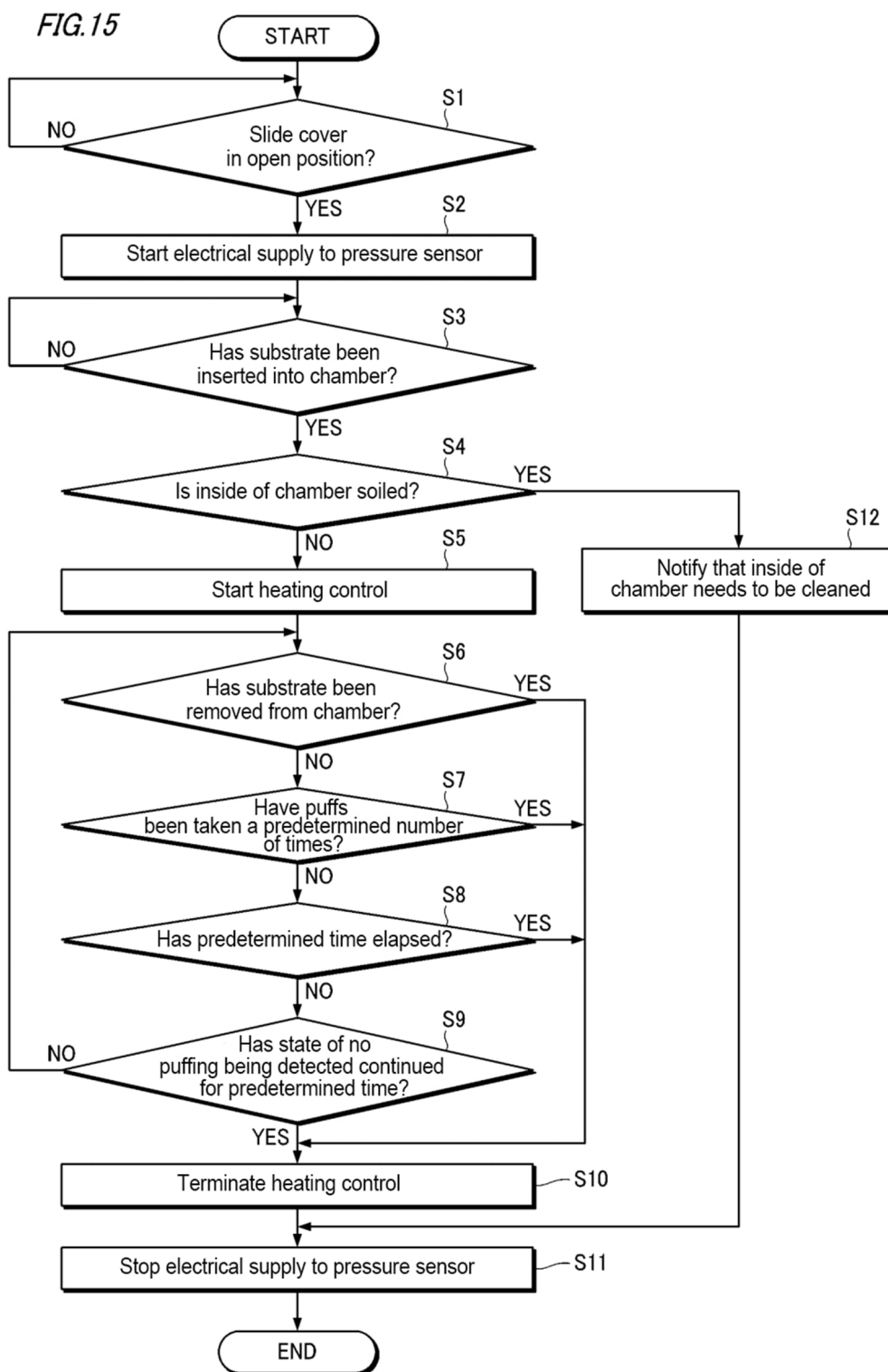


[Fig. 14]

FIG. 14

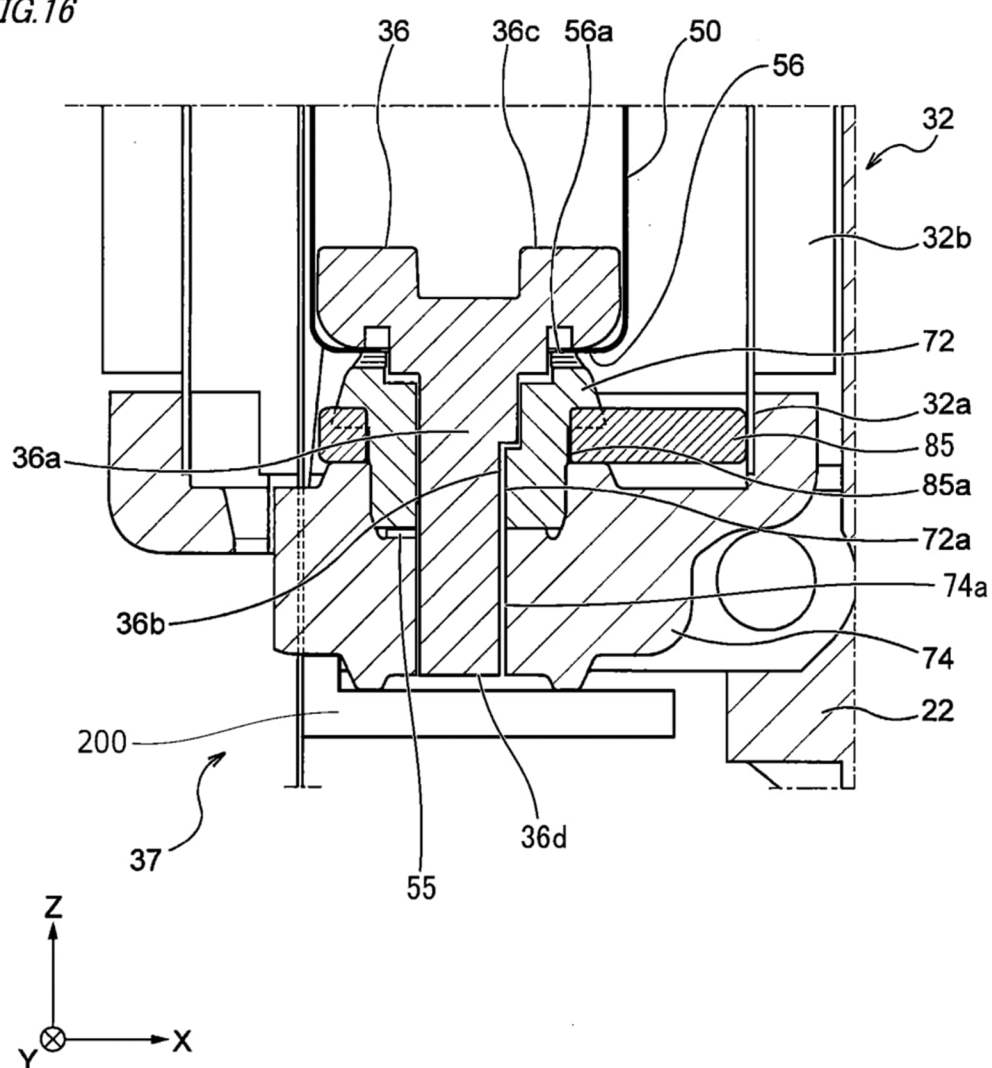


[Fig. 15]



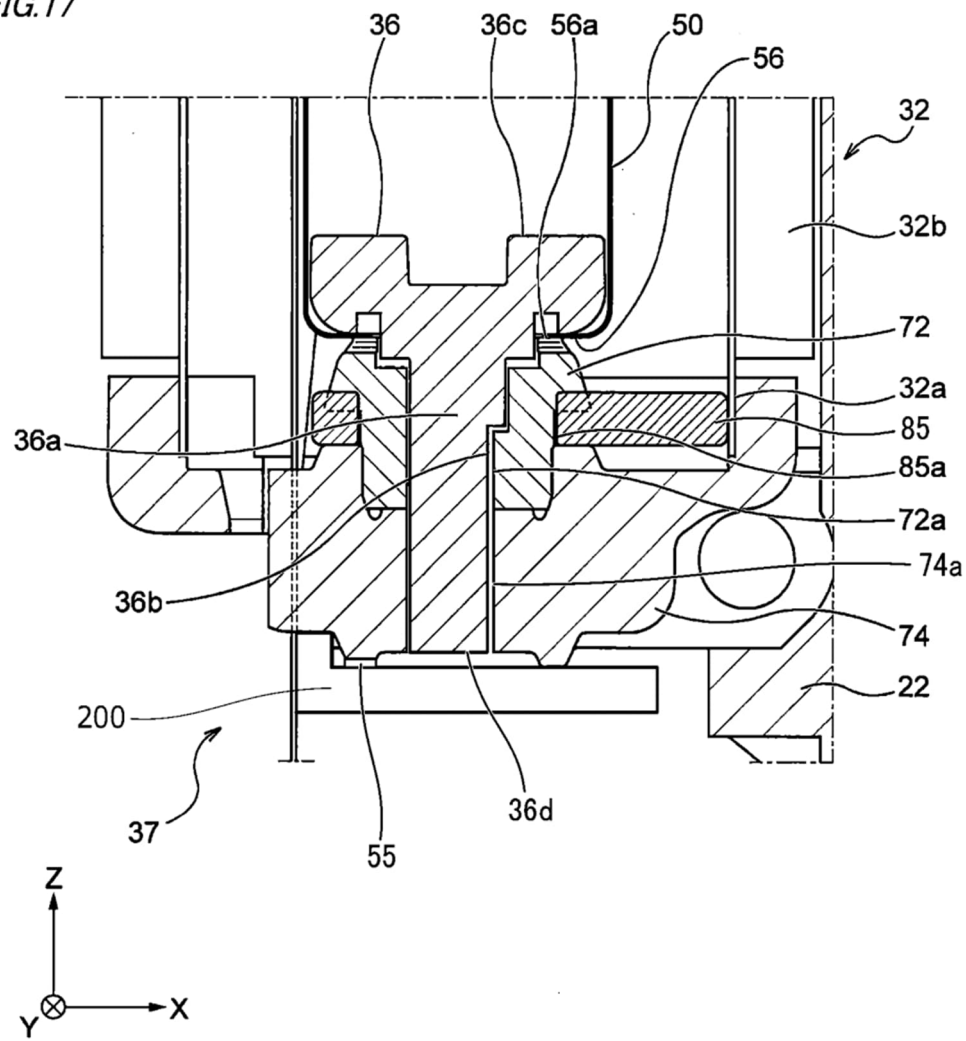
[Fig. 16]

FIG. 16



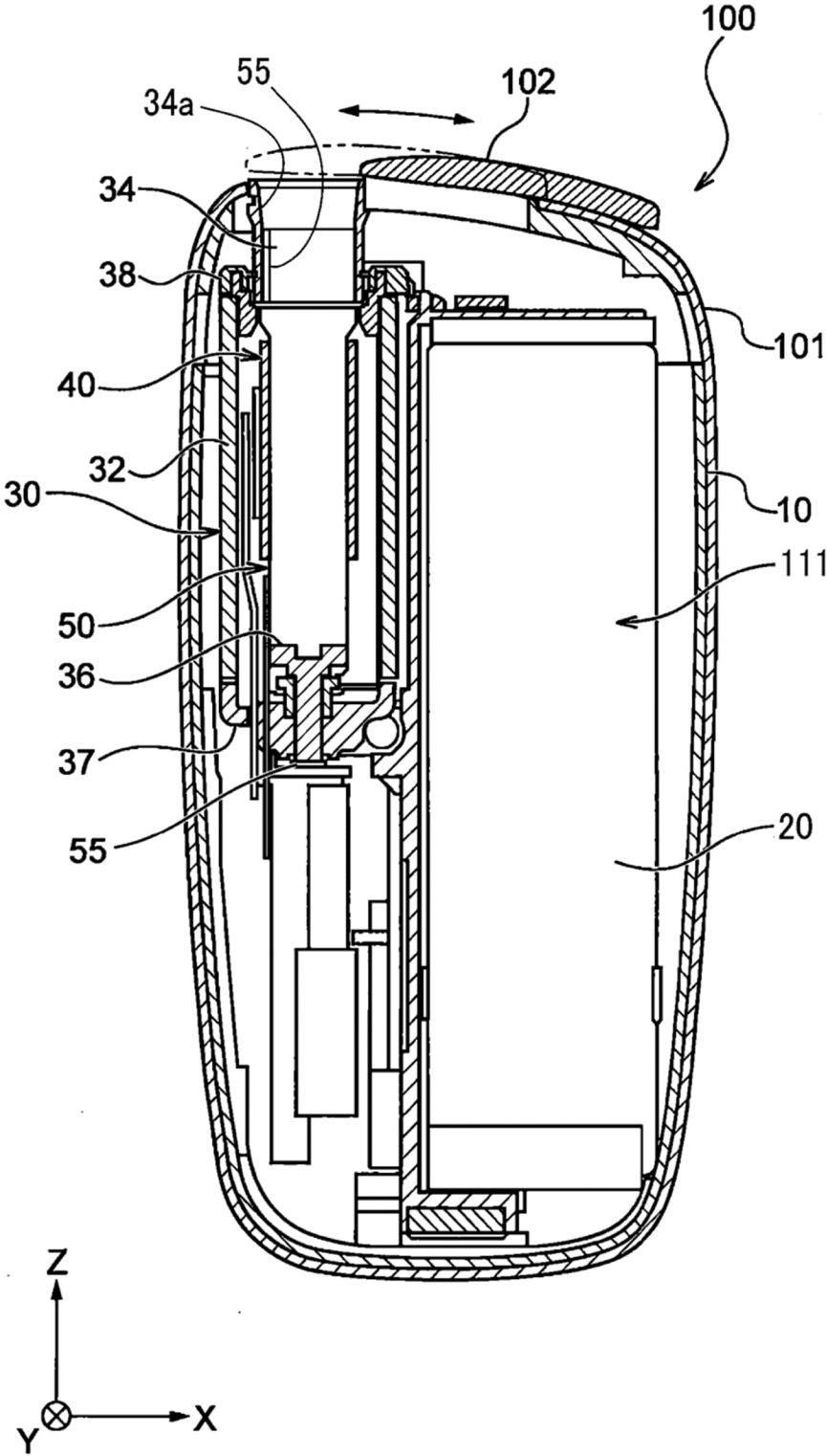
[Fig. 17]

FIG. 17



[Fig. 18]

FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/030966

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 1971-2023

Registered utility model specifications of Japan 1996-2023

Published registered utility model applications of Japan 1994-2023

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.
A	JP 2022-549982 A (KT&G CORPORATION) 30 November 2022 (2022-11-30) entire text, all drawings	1-15
A	WO 2020/174624 A1 (JAPAN TOBACCO INC.) 03 September 2020 (2020-09-03) entire text, all drawings	1-15
A	JP 2022-548524 A (JT INTERNATIONAL S.A.) 21 November 2022 (2022-11-21) entire text, all drawings	1-15
A	JP 2022-520316 A (KT&G CORPORATION) 30 March 2022 (2022-03-30) entire text, all drawings	1-15
A	CN 218515208 U (PINDU BIOTECHNOLOGY (SHENZHEN) CO., LTD.) 24 February 2023 (2023-02-24) entire text, all drawings	1-15

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

Date of the actual completion of the international search

10 October 2023

Date of mailing of the international search report

24 October 2023

Name and mailing address of the ISA/IP

Japan Patent Office (ISA/JP)
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Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2023/030966

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JP 2022-520316 A	30 March 2022	US 2022/0400750 A1 entire text, all drawings WO 2021/141246 A1 KR 10-2021-0088396 A CN 113365510 A	
CN 218515208 U	24 February 2023	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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