(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 260 726 A1**

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

(43) Date of publication:
18.10.2023 Bulletin 2023/42

(21) Application number: **20965143.9**

(22) Date of filing: **11.12.2020**

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

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

(86) International application number:
PCT/JP2020/046199

(87) International publication number:
WO 2022/123761 (16.06.2022 Gazette 2022/24)

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

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

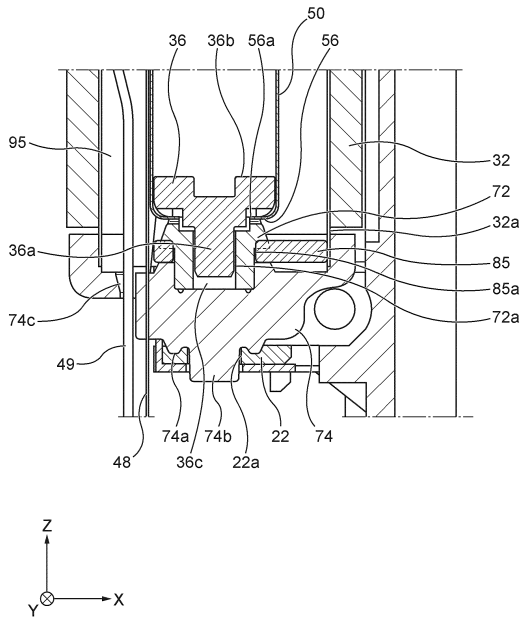
(72) Inventors:
- **SUMII, Tateki**
  Tokyo 130-8603 (JP)
- **INOUE, Yasunobu**
  Tokyo 130-8603 (JP)
- **YAMADA, Manabu**
  Tokyo 130-8603 (JP)
- **MORITA, Keisuke**
  Tokyo 130-8603 (JP)

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

(54) FLAVOR INHALER AND PRESSURE REDUCTION METHOD

(57) To obtain a flavor inhaler capable of reliving a stress to be applied to a member that forms a tightly closed section while curbing a loss of thermal energy generated by a heating portion. The flavor inhaler includes: an accommodating portion that accommodates at least a part of a flavor generating article; a heating portion that is configured to heat the flavor generating article accommodated in the accommodating portion; at least one tightly closed section that is formed at a circumference of the accommodating portion; and an elastic member that configures at least a part of an inner surface of the tightly closed section, a stress being not applied to the elastic member in a state where the heating portion is not operating.

Fig. 8



EP 4 260 726 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a flavor inhaler and a pressure relieving method.

BACKGROUND ART

[0002] Conventionally, flavor inhalers for inhaling flavors or the like without burning materials are known. As such a flavor inhaler, there is a flavor inhaler including an accommodating portion that accommodates a flavor generating article, a heating portion that heats the flavor generating article accommodated in the accommodating portion, and a sleeve that covers the accommodating portion, in which an O-ring is used to form a tightly closed section between the accommodating portion and the sleeve (see PTL 1, for example). At this time, the O-ring secures air tightness by being elastically deformed.

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: International Publication No. WO 2020/035454

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] In the flavor inhaler described in PTL 1, a loss of thermal energy generated by the heating portion is curbed by preventing the air from flowing out while securing an air layer. However, there is a concern that a stress may be applied to a member forming the tightly closed section due to expansion and contraction of air in the tightly closed section with operations of the heating portion and this may induce structural damage.

[0005] The present invention was made in order to solve at least a part of the problem as described above, and an object thereof is to obtain a flavor inhaler and a pressure relieving method capable of relieving a stress to be applied to a member that forms a tightly closed section while curbing a loss of thermal energy generated by the heating portion.

SOLUTION TO PROBLEM

[0006] According to a first aspect of the present invention, a flavor inhaler is provided. The flavor inhaler includes: an accommodating portion that accommodates at least a part of a flavor generating article; a heating portion that is configured to heat the flavor generating article accommodated in the accommodating portion; at least one tightly closed section that is formed at a circumference of the accommodating portion; and an elastic member that configures at least a part of an inner surface of the tightly closed section, a stress being not applied to the elastic member in a state where the heating portion is not operating.

[0007] According to the first aspect of the present invention, at least a part of the inner surface of the tightly closed section is configured of the elastic member to which no stress is applied in the stat where the heating portion is not operating, and it is thus possible to absorb thermal expansion of air inside the tightly closed section by deformation of the elastic member. Therefore, it is possible to obtain a flavor inhaler capable of reliving a stress to be applied to a member that forms the tightly closed section while curbing a loss of thermal energy generated by the heating portion.

[0008] In a second aspect of the present invention, at least a part of an outer surface of the accommodating portion configures at least a part of the inner surface of the tightly closed section in the first aspect.

[0009] According to the second aspect of the present invention, it is possible to effectively curb a loss of thermal energy generated by the heating portion by forming the tightly closed section at a location near the heating portion.

[0010] In a third aspect of the present invention, the tightly closed section is formed on a longitudinal axis of the accommodating portion in the first or second aspect.

[0011] According to the third aspect of the present invention, it is possible to curb localization of a stress to be applied to the member that forms the tightly closed section when air inside the tightly closed section thermally expands, by forming the tightly closed section on the longitudinal axis of the accommodating portion.

[0012] In a fourth aspect of the present invention, the tightly closed section is formed on a side opposite to an abutting surface that abuts an end surface of the flavor generating article accommodated in the accommodating portion in any of the first to third aspects.

[0013] According to the fourth aspect of the present invention, it is possible to curb a loss of thermal energy due to heat transmission from the bottom portion of the accommodating portion by forming the tightly closed section on the side opposite to the abutting surface.

[0014] In a fifth aspect of the present invention, a surface intersecting the longitudinal axis of the accommodating portion is configured of the elastic member in the third or fourth aspect.

[0015] According to the fifth aspect of the present invention, it is possible to curb localization of a stress to be applied to the accommodating portion when air inside the tightly closed section thermally expands, by configuring the surface intersecting the longitudinal axis of the accommodating portion using the elastic member.

[0016] In a sixth aspect of the present invention, the accommodating portion includes a first tubular portion that includes an opening formed at one end and surrounds a circumference of the flavor generating article and an abutting portion that is disposed at the other end

of the tubular portion, is engaged with the tubular portion, and abuts an end surface of the flavor generating article, and an engagement portion between the tubular portion and the abutting portion is disposed to face the elastic member, in any of the first to fifth aspects.

[0017] According to the sixth aspect of the present invention, it is possible to absorb thermal expansion of air inside the tightly closed section by deformation of the elastic member, to reduce a stress to be applied to the engagement portion, and to prevent separation of the engagement portion by disposing the engagement portion between the tubular portion and the abutting portion to face the elastic member.

[0018] In a seventh aspect of the present invention, a restricting portion that is disposed at the elastic member on a side opposite to the tightly closed section and restricts movement of the elastic member is further included in any of the first to sixth aspects.

[0019] According to the seventh aspect of the present invention, the restricting portion restricts movement of the elastic member, and it is thus possible to relieve a stress to be applied to the member that forms the tightly closed section with the elastic member maintaining the tightly closed section.

[0020] In an eighth aspect of the present invention, a first section in which convection of air therein has been reduced and a hole that is formed in an inner surface of the first section and causes inside of the first section and outside of the first section to communicate with each other are further included in any of the first to seventh aspects.

[0021] According to the eighth aspect of the present invention, the hole provided in the inner surface of the first section causes the inside and the outside of the first section to communicate with each other, and it is thus possible to reduce convection of air and to achieve a heat effect by reducing a stress inside the first section when air inside the first section thermally expands.

[0022] In a ninth aspect of the present invention, at least a part of an outer surface of the accommodating portion configures at least a part of the inner surface of the first section in the eighth aspect.

[0023] According to the ninth aspect of the present invention, it is possible to improve a heat insulating effect and to effectively curb a loss of thermal energy generated by the heating portion by forming the first section at a location near the heating portion.

[0024] In a tenth aspect of the present invention, at least one electrical wiring is disposed through the hole formed in the first section in the eighth or ninth aspect.

[0025] According to the tenth aspect of the present invention, it is possible to easily provide an electrical wiring such as an electrode or a sensor at the circumference of the accommodating portion and thereby to configure the flavor inhaler in a compact size.

[0026] In an eleventh aspect of the present invention, the heating portion is disposed inside the first section in any of the eighth to tenth aspects.

[0027] According to the eleventh aspect of the present invention, it is possible to curb escaping of heat generated by the heat generating portion to the outside of the first section by disposing the heating portion inside the first section.

[0028] In a twelfth aspect of the present invention, a second tubular portion that covers the accommodating portion is further included, and at least a part of an inner circumferential surface of the second tubular portion configures at least a part of the inner surface of the first section in any of the eighth to eleventh aspects.

[0029] According to the twelfth aspect of the present invention, it is possible to effectively insulate heat over the entire circumference of the heating portion. Additionally, in a case where the heating portion is disposed inside the first section, it is possible to easily hold heat over the entire circumference of the heating portion.

[0030] In a thirteenth aspect of the present invention, the second tubular portion is a heat insulating portion in any of the eighth to twelfth aspects.

[0031] According to the thirteenth aspect of the present invention, it is possible to further effectively insulate heat by using the heat insulating portion as the second tubular portion.

[0032] A pressure relieving method according to a fourteenth aspect of the present invention includes, in a flavor inhaler including an accommodating portion that accommodates at least a part of a flavor generating article, a heating portion that is configured to heat the flavor generating article accommodated in the accommodating portion, at least one tightly closed section that is formed at a circumference of the accommodating portion, and an elastic member that configures at least a part of an inner surface of the tightly closed section: relieving a pressure rise inside the tightly closed section by the elastic member being deformed when air inside the tightly closed section expands due to an operation of the heating portion.

[0033] According to the fourteenth aspect of the present invention, thermal expansion of air inside the tightly closed section is absorbed by deformation of the elastic member, and it is thus possible to relieve a stress to be applied to the member that forms the tightly closed section while curbing a loss of thermal energy generated by the heating portion.

BRIEF DESCRIPTION OF DRAWINGS

[0034]

Fig. 1A is a schematic front view of a flavor inhaler according to an embodiment.

Fig. 1B is a schematic top view of the flavor inhaler according to the embodiment.

Fig. 1C is a schematic bottom view of the flavor inhaler according to the embodiment.

Fig. 2 is a schematic side sectional view of a flavor generating article.

Fig. 3 is a sectional view of the flavor inhaler along the arrow 3-3 illustrated in Fig. 1B.
Fig. 4A is a perspective view of a chamber.
Fig. 4B is a sectional view of the chamber along the arrow 4B-4B illustrated in Fig. 4A.
Fig. 5A is a sectional view of the chamber along the arrow 5A-5A illustrated in Fig. 4B.
Fig. 5B is a sectional view of the chamber along the arrow 5B-5B illustrated in Fig. 4B.
Fig. 6 is a perspective view of the chamber and the heating portion.
Fig. 7 is a sectional view illustrated in Fig. 5B in a state where the flavor generating article is disposed at a desired position in the chamber.
Fig. 8 is an enlarged sectional view of a first holding portion.
Fig. 9 is an enlarged sectional view of a second holding portion.

DESCRIPTION OF EMBODIMENTS

[0035] Hereinafter, embodiments of the present invention will be described with reference to the drawings. In the drawings described below, the same reference signs will be applied to the same or corresponding components, and repeated description will be omitted.

[0036] Fig. 1A is a schematic front view of a flavor inhaler 100 according to an embodiment. Fig. 1B is a schematic top view of the flavor inhaler 100 according to the embodiment. Fig. 1C is a schematic bottom view of the flavor inhaler 100 according to the embodiment. In the drawings described in the specification, an X-Y-Z orthogonal coordinate system may be added for convenience of description. In the coordinate system, the Z axis is directed vertically upward, the X-Y plane is disposed to cut the flavor inhaler 100 in the horizontal direction, and the Y axis is disposed to extend from the front surface to the rear surface of the flavor inhaler 100. The Z axis can also be regarded as an insertion direction of the flavor generating article to be accommodated in a chamber 50 of an atomization portion 30, which will be described later, or a longitudinal axis direction of the chamber 50. Also, the X axis is a direction that perpendicularly intersects the Y axis and the Z axis, and the X axis and the Y axis can also be regarded as directions that perpendicularly intersect the longitudinal axis direction, that is, the radial direction of the chamber 50.

[0037] The flavor inhaler 100 according to the present embodiment is configured to generate an aerosol containing a flavor by heating a flavor generating article of a stick type having a flavor source containing an aerosol source, for example.

[0038] As illustrated in Figs. 1A to 1C, the flavor inhaler 100 has an outer housing 101, a slide cover 102, and a switch portion 103. The outer housing 101 configures the outermost housing of the flavor inhaler 100 and has a size with which it fits in a user's hand. The user can hold the flavor inhaler 100 with his/her hand and inhale the aerosol when the user uses the flavor inhaler 100. The outer housing 101 may be configured by assembling a plurality of members. The outer housing 101 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, or a polymer alloy or the like containing polyether ether ketone (PEEK) or a plurality of types of polymers, or metal such as aluminum, in particular.

[0039] The outer housing 101 has an opening, which is not illustrated, for receiving the flavor generating article, and the slide cover 102 is slidably attached to the outer housing 101 to close the 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 illustrated in Figs. 1A and 1B) at which the opening of the outer housing 101 is closed and an open position at which the opening is open. It is possible to cause the slide cover 102 to move between the closed position and the open position by the user manually operating the slide cover 102, for example. In this manner, the slide cover 102 is able to permit or restrict access to the flavor generating article inside the flavor inhaler 100.

[0040] The switch portion 103 is used to switch ON and OFF of an operation of the flavor inhaler 100. For example, power is supplied from a power source, which is not illustrated, to a heater, which is not illustrated, and it is possible to heat the flavor generating article without burning the flavor generating article, by the user operating the switch portion 103 in a state where the flavor generating article is inserted into the flavor inhaler 100. Note that the switch portion 103 may be a switch provided outside the outer housing 101 or may be a switch located inside the outer housing 101. In a case where the switch is located inside the outer housing 101, the switch is indirectly pressed by pressing the switch portion 103 on the surface of the outer housing 101. In the present embodiment, an example in which the switch of the switch portion 103 is located inside the outer housing 101 will be described.

[0041] The flavor inhaler 100 may further have a terminal, which is not illustrated. The terminal can be an interface that connects the flavor inhaler 100 to an external power source, for example. In a case where the power source included in the flavor inhaler 100 is a chargeable battery, the external power source can cause a current to flow to the power source and charge the power source by connecting the external power source to the terminal. Also, data related to the operation of the flavor inhaler 100 may be able to be transmitted to an external device by connecting a data transmission cable to the terminal.

[0042] Next, the flavor generating article used by the flavor inhaler 100 according to the present embodiment will be described. Fig. 2 is a schematic side sectional view of the flavor generating article 110. In the present embodiment, the flavor inhaler 100 and the flavor generating article 110 can configure a smoking system. In the example illustrated in Fig. 2, the flavor generating

article 110 has a smokable article 111, a tubular member 114, a hollow filter portion 116, and a filter portion 115.

[0043] The smokable article 111 is rolled by a first roll paper 112. The tubular member 114, the hollow filter portion 116, and the filter portion 115 are rolled by a second roll paper 113 that is different from the first roll paper 112. The second roll paper 113 also rolls a part of the first roll paper 112 that rolls the smokable article 111. In this manner, the tubular member 114, the hollow filter portion 116, and the filter portion 115 are coupled to the smokable article 111. However, the second roll paper 113 may be omitted, and the tubular member 114, the hollow filter portion 116, and the filter portion 115 may be coupled to the smokable article 111 by using the first roll paper 112. A lip release agent 117 for promoting the user's lip release from the second roll paper 113 is applied to the outer surface of the second roll paper 113 in the vicinity of an end portion thereof on the side of the filter portion 115. The part of the flavor generating article 110 to which the lip release agent 117 is applied functions as a mouthpiece of the flavor generating article 110.

[0044] The smokable article 111 can contain a flavor source such as tobacco, for example, and an aerosol source. Also, the first roll paper 112 for rolling the smokable article 111 can be a sheet member with breathability. The tubular member 114 can be a paper pipe or a hollow filter. Although the flavor generating article 110 includes the smokable article 111, the tubular member 114, the hollow filter portion 116, and the filter portion 115 in the illustrated example, the configuration of the flavor generating article 110 is not limited thereto. For example, the hollow filter portion 116 may be omitted, and the tubular member 114 and the filter portion 115 may be disposed to be adjacent to each other.

[0045] Next, an internal structure of the flavor inhaler 100 will be described. Fig. 3 is a sectional view of the flavor inhaler 100 along the arrow 3-3 illustrated in Fig. 1B. As illustrated in Fig. 3, an inner housing 10 is provided inside the outer housing 101 of the flavor inhaler 100. The inner housing 10 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, or a polymer alloy or the like containing polyether ether ketone (PEEK) or a plurality of types of polymers, or metal such as aluminum, in particular. Note that the inner housing 10 is preferably made of PEEK in terms of heat resistance and strength. A power source portion 20 and the atomization portion 30 are provided in the inner space of the inner housing 10.

[0046] The power source portion 20 includes a power source 21. The power source 21 can be a chargeable battery or a non-chargeable battery, for example. The power source 21 is electrically connected to the atomization portion 30. The power source 21 can thus supply power to the atomization portion 30 to appropriately heat the flavor generating article 110.

[0047] The atomization portion 30 includes the chamber 50 (corresponding to an example of a first tubular portion) that is made of metal and extends in the insertion direction (Z-axis direction) of the flavor generating article 110, a heater 40 that covers a part of the chamber 50, a heat insulating portion 32 (corresponding to an example of a second tubular portion), and a substantially tubular insertion guide member 34 that abuts an opening 52 (see Fig. 4A) of the chamber 50 as illustrated in the drawing. The chamber 50 is configured to surround the circumference of the flavor generating article 110. The heater 40 is configured to include a heating portion 42 (see Fig. 6) that comes into contact with an outer circumferential surface of the chamber 50 and heats the flavor generating article 110 inserted into the chamber 50.

[0048] Also, a bottom member 36 (corresponding to an example of an abutting portion) is provided at the bottom portion of the chamber 50 as illustrated in the drawing. A bottom member 36 may function as a stopper that abuts the flavor generating article 110 inserted into the chamber 50 in the insertion direction of the flavor generating article 110 and positions the flavor generating article 110. Here, the chamber 50 and the bottom member 36 configures an accommodating portion that accommodates at least a part of the flavor generating article 110. The bottom member 36 may be formed of a resin material, for example. The bottom member 36 has unevenness in the surface which the flavor generating article 110 abuts, and can define a first air flow path, which the flavor generating article 110 abuts and through which air can be supplied to an air inlet port of the flavor generating article 110, that is, a first air flow path which communicates with the flavor generating article 110 accommodated in the accommodating portion. The bottom member 36 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, a polymer alloy or the like containing polyether ether ketone (PEEK) or a plurality of types of polymers, or metal such as aluminum, in particular. Note that the bottom member 36 is preferably formed of a material with a low heat conductivity to prevent heat from being transmitted to the heat insulating portion 32 and the like.

[0049] The heat insulating portion 32 has a substantially tubular shape as a whole and is disposed to cover the chamber 50. The heat insulating portion 32 may be a sheet formed of a foamed material, for example, and may contain an aerogel. The insertion guide member 34 is provided between the slide cover 102 at the closed position and the chamber 50. The insertion guide member 34 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, or a polymer alloy or the like containing polyether ether ketone (PEEK) or a plurality of types of polymers, in particular. Note that the insertion guide member 34 may be formed of metal, glass, ceramics, or the like. Also, the insertion guide member 34 is preferably made of PEEK in terms of heat resistance. The insertion guide member 34 communicates with the outside of the flavor inhaler 100 when the slide cover 102 is at the open position, and the insertion guide member 34 guides in-

sertion of the flavor generating article 110 into the chamber 50 by inserting the flavor generating article 110 into the insertion guide member 34. It is possible to easily insert the flavor generating article 110 into the chamber 50 by providing the insertion guide member 34.

[0050] The flavor inhaler 100 further has a first holding portion 37 and a second holding portion 38 that hold both ends of the chamber 50 and the heat insulating portion 32. The first holding portion 37 is disposed to hold the end portions of the chamber 50 and the heat insulating portion 32 on the negative direction side of the Z axis. The second holding portion 38 is disposed to hold the end portions of the chamber 50 and the heat insulating portion 32 on the side of the slide cover 102 (the positive direction side of the Z axis). Details of the first holding portion 37 and the second holding portion 38 will be described later.

[0051] Next, a structure of the chamber 50 will be described. Fig. 4A is a perspective view of the chamber 50. Fig. 4B is a sectional view of the chamber 50 along the arrow 4B-4B illustrated in Fig. 4A. Fig. 5A is a sectional view of the chamber 50 along the arrow 5A-5A illustrated in Fig. 4B. Fig. 5B is a sectional view of the chamber 50 along the arrow 5B-5B illustrated in Fig. 4B. Fig. 6 is a perspective view of the chamber 50 and the heater 40.

[0052] As illustrated in Figs. 4A and 4B, the chamber 50 may have a tubular shape including the opening 52 into which the flavor generating article 110 is inserted and a tubular side wall portion 60 that accommodates the flavor generating article 110. A flange portion 52a is formed at an end portion that defines the opening 52 of the chamber 50. The chamber 50 is preferably formed of a material with heat resistance and a small coefficient of thermal expansion and can be formed of, for example, stainless steel. Note that the chamber 50 may be formed of a resin such as PEEK, glass, ceramics, or the like as well as metal. This enables effective heating of the flavor generating article 110 from the chamber 50. Note that the chamber 50 is not limited to the tubular shape and may have a cup shape.

[0053] As illustrated in Figs. 4B and 5B, the side wall portion 60 includes contact portions 62 and a separated portion 66. When the flavor generating article 110 is disposed at a desired position in the chamber 50, the contact portion 62 comes into contact with or pressurizes a part of the flavor generating article 110 on the surface that intersects the insertion direction of the flavor generating article 110, and the separated portion 66 is separated from the flavor generating article 110. Note that in the specification, "the desired position in the chamber 50" means the position at which the flavor generating article 110 is appropriately heated or the position of the flavor generating article 110 when the user smokes.

[0054] Since the side wall portion 60 includes the contact portion 62 and the separated portion 66, the sectional shape of the side wall portion 60 that perpendicularly intersects the longitudinal axis direction of the chamber 50 is an oval shape, that is, a non-cylindrical shape. At this time, the accommodating portion is configured of the chamber 50 and the bottom member 36 that is formed of a member different from the chamber 50, and it is thus possible to finely work the bottom member 36 regardless of the shape of the chamber 50 and to improve workability of the accommodating portion even in a case where the chamber 50 has an irregular shape such as an oval shape or a square tube shape, for example.

[0055] The contact portion 62 includes an inner surface 62a and an outer surface 62b. The separated portion 66 includes an inner surface 66a and an outer surface 66b. As illustrated in Fig. 6, the heater 40 is disposed on the outer surface 62b of the contact portion 62. In this manner, heat generated by the heating portion 42 of the heater 40 is transmitted to the flavor generating article 110 that is in contact with the contact portion 62. The heater 40 is preferably disposed on the outer surface 62b of the contact portion 62 with no gap therebetween. Note that the heater 40 may include an adhesive layer. In that case, the heater 40 including the adhesive layer is preferably disposed on the outer surface 62b of the contact portion 62 with no gap therebetween.

[0056] As illustrated in Figs. 4A and 5B, the outer surface 62b of the contact portion 62 is a planar surface. It is possible to prevent a strip-shaped electrode 48 from being bent in a case where the strip-shaped electrode 48 is connected to the heater 40 disposed on the outer surface 62b of the contact portion 62 as illustrated in Fig. 6 by the outer surface 62b of the contact portion 62 being a planar surface. As illustrated in Figs. 4B and 5B, the inner surface 62a of the contact portion 62 is a planar surface. Also, the thickness of the contact portion 62 is uniform as illustrated in Figs. 4B and 5B.

[0057] As illustrated in Figs. 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 in parallel with each other. The distance of at least a part between the inner surfaces 62a of the two contact portions 62 is preferably shorter than the width of the flavor generating article 110 inserted into the chamber 50 at the location disposed between the contact portions 62.

[0058] As illustrated in Fig. 5B, the inner surface 66a of the separated portion 66 can have an arc-shaped section as a whole in the plane that perpendicularly intersects the longitudinal direction (Z-axis direction) of the chamber 50. Also, the separated portion 66 is disposed to be adjacent to the contact portions 62 in the circumferential direction.

[0059] As illustrated in Fig. 4B, the chamber 50 can have a hole 56a at the bottom portion 56 thereof such that the bottom member 36 illustrated in Fig. 3 penetrates therethrough and is disposed inside the chamber 50. The bottom member 36 provided at the bottom portion 56 supports a part of the flavor generating article 110 inserted into the chamber 50 with at least a part of an end surface of the flavor generating article 110 exposed. Also, the bottom portion 56 can support a part of the flavor

generating article 110 with the exposed end surface of the flavor generating article 110 communicating with a clearance 67 (see Fig. 7), which will be described later.

[0060] As illustrated in Figs. 4A and 4B, the chamber 50 preferably has a tubular non-holding portion 54 between the opening 52 and the side wall portion 60. A clearance can be formed between the non-holding portion 54 and the flavor generating article 110 in a state where the flavor generating article 110 is positioned at a desired position in the chamber 50. Also, as illustrated in Figs. 4A and 4B, the chamber 50 preferably has a first guide portion 58 including a tapered surface 58a that connects the inner surface of the non-holding portion 54 to the inner surfaces 62a of the contact portions 62.

[0061] As illustrated in Fig. 6, the heater 40 has a heating portion 42. The heating portion 42 may be a heating track, for example. The heating portion 42 is preferably disposed to heat the contact portions 62 without coming into contact with the separated portion 66 of the chamber 50. In other words, the heating portion 42 is preferably disposed only on the outer surfaces of the contact portions 62. The heating portion 42 may have a difference in heating capability between a part heating the separated portion 66 of the chamber 50 and a part heating the contact portions 62. Specifically, the heating portion 42 may be configured to heat the contact portions 62 to a higher temperature than that of the separated portion 66. For example, disposition densities of the heating track of the heating portion 42 in the contact portions 62 and the separated portion 66 can be adjusted. Also, the heating portion 42 may be wound around the outer circumference of the chamber 50 while exhibiting substantially the same heating capability over the entire circumference of the chamber 50. As illustrated in Fig. 6, the heater 40 preferably has an electrically insulating member 44 that covers at least one surface of the heating portion 42 in addition to the heating portion 42. In the present embodiment, the electrically insulating member 44 is disposed to cover both surfaces of the heating portion 42.

[0062] Fig. 7 is a sectional view illustrated in Fig. 5B in a state where the flavor generating article 110 is disposed at a desired position in the chamber 50. As illustrated in Fig. 7, once the flavor generating article 110 is disposed at a desired position in the chamber 50, the flavor generating article 110 can come into contact with and be pressed by the contact portions 62 of the chamber 50. On the other hand, the clearance 67 is formed between the flavor generating article 110 and the separated portion 66. The clearance 67 can communicate with the opening 52 of the chamber 50 and the end surface of the flavor generating article 110 located in the chamber 50. In this manner, air flowing from the opening 52 of the chamber 50 can pass through the clearance 67 and flow to the inside of the flavor generating article 110. In other words, a second air flow path (clearance 67) is formed between the flavor generating article 110 and the separated portion 66.

[0063] Next, structures of the first holding portion 37 and the second holding portion 38 that hold the chamber 50 and the heat insulating portion 32 will be described. Fig. 8 is an enlarged sectional view of the first holding portion 37. Fig. 9 is an enlarged sectional view of the second holding portion 38.

[0064] As illustrated in Fig. 8, the bottom member 36 is engaged with the bottom portion 56 of the chamber 50. Also, the bottom member 36 may be fixed to the inside of the bottom portion 56 of the chamber 50 with an adhesive or the like. Note that the adhesive interposed between the bottom member 36 and the bottom portion 56 may be configured of a resin material such as an epoxy resin. Instead, an inorganic adhesive such as cement or welding may also be used. It is thus possible to position and support the bottom member 36 inside the chamber 50. Also, the bottom member 36 provided inside the bottom portion 56 of the chamber 50 includes a shaft portion 36a projecting to the outside of the chamber 50 through the hole 56a of the chamber 50. The first holding portion 37 includes a support portion 72, a heater cushion 74 (corresponding to an example of an elastic member), and a ring 85.

[0065] The support portion 72 includes an opening 72a into which the shaft portion 36a of the bottom member 36 is inserted and is configured to receive the shaft portion 36a of the bottom member 36 and support the chamber 50. Specifically, the bottom portion 56 of the chamber 50 is sandwiched between and supported by the bottom member 36 and the support portion 72. The support portion 72 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, a polymer alloy containing polyether ether ketone (PEEK) or a plurality of types of polymers, or the like, in particular. Note that the support portion 72 may be formed of metal, glass, ceramics, or the like. Additionally, the support portion 72 is preferably made of PEEK in terms of heat resistance.

[0066] The heater cushion 74 is configured to accommodate and support one end of the support portion 72. The heater cushion 74 may be formed of an elastic material such as silicone rubber, for example. Note that in a case where silicone rubber is used, a preferable range of Shore A hardness is 40 to 60 and can be appropriately selected in accordance with deformation of the heater cushion 74. Also, the heater cushion 74 is configured to be positioned by and fixed to a fixed portion 22 (corresponding to an example of a restricting portion) fixed to the inner housing, which is not illustrated. Note that the fixed portion 22 may be the inner housing itself.

[0067] The heater cushion 74 is disposed to face the heat insulating portion 32 with a gap therebetween and restricts movement of the heat insulating portion 32 in the longitudinal axis direction of the chamber 50. Therefore, the heat insulating portion 32 is prevented from moving with no limit in the longitudinal axis direction of the chamber 50, and the heat insulating portion 32 is thus prevented from colliding against another member (such as the inner housing 10, for example). In addition, the

heater cushion 74 is formed of an elastic material, and it is thus possible to relieve a stress to be applied to the heat insulating portion 32 and thereby to prevent breakage of the heat insulating portion 32 even in a case where the heater cushion 74 comes into contact with the heat insulating portion 32.

[0068] Here, the heater cushion 74 includes a projecting portion 74a, a positioning portion 74b, and an opening portion 74c (corresponding to an example of a hole). The projecting portion 74a is configured to project in a direction opposite to the chamber 50 and abut the fixed portion 22. In this manner, the projecting portion 74a is engaged with the fixed portion 22, and the heater cushion 74 is supported.

[0069] The positioning portion 74b is configured to project in a direction opposite to the chamber 50 and be engaged with the positioning hole 22a formed in the fixed portion 22. In this manner, the heater cushion 74 is held by and fixed to the fixed portion 22 such that it does not cause positional deviation.

[0070] The opening portion 74c is an opening for allowing an electrode 48 of the heater 40 illustrated in Fig. 6 and a wiring 49 of a temperature sensor, which is not illustrated, to pass therethrough. It is possible to extend the electrode 48 of the heater 40 substantially in parallel with the longitudinal axis direction of the chamber 50 by providing the opening portion 74c in the heater cushion 74.

[0071] The ring 85 includes an opening 85a into which the support portion 72 is inserted and may be sandwiched between and fixed by the support portion 72 and the heater cushion 74. The ring 85 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, a polymer alloy containing polyether ether ketone (PEEK) or a plurality of types of polymers, or the like, in particular. Note that the ring 85 may be formed of metal, glass, ceramics, or the like. Also, the ring 85 is preferably made of PEEK in terms of heat resistance. The ring 85 is disposed to face a support material 32a, which is provided on the inner circumferential surface of the heat insulating portion 32 as will be described later, with a gap therebetween and restricts movement of the heat insulating portion 32 in the radial direction of the chamber 50. Therefore, the heat insulating portion 32 is prevented from moving with no limit in the radial direction of the chamber 50, and the heat insulating portion 32 is thus prevented from colliding against another member (such as the inner housing 10, for example). Also, it is possible to restrict, from the inside of the heat insulating portion 32, movement of the heat insulating portion 32 in the radial direction of the chamber 50 and thereby to reduce the size of the flavor inhaler 100.

[0072] Here, a tightly closed section 36c is formed in a region surrounded by the shaft portion 36a of the bottom member 36, the inner circumferential surface of the opening 72a of the support portion 72, and the heater cushion 74 in a state where the bottom member 36 is engaged with the support portion 72. The tightly closed section 36c is formed on a side opposite to an abutting surface 36b of the bottom member 36 that abuts the flavor generating article 110 accommodated in the accommodating portion.

[0073] At least a part of the inner surface of the tightly closed section 36c, specifically the surface intersecting the longitudinal axis of the chamber 50 is configured of the heater cushion 74 formed of an elastic material as illustrated in the drawing. Note that, the heater cushion 74 is provided such that no stress is applied in a state where the heating portion 42 is not operating, that is, in a state where the heater 40 is not heating the flavor generating article 110.

[0074] Therefore, it is possible to absorb thermal expansion of air inside the tightly closed section 36c by deformation of the heater cushion 74 when the heating portion 42 operates. It is thus possible to relieve a stress to be applied to the member that forms the tightly closed section 36c while curbing a loss of thermal energy generated by the heating portion 42. Also, in a case where the pressure in the tightly closed section 36c is further raised, a gap is formed between the heater cushion 74 and the support portion 72 through deformation of the heater cushion 74, and it is thus possible to cause the raised pressure to escape to a first section 95 which is not tightly closed as will be described later. Additionally, it is possible to curb localization of the stress to be applied to the accommodating portion when air inside the tightly closed section 36c thermally expands, by configuring the surface intersecting the longitudinal axis of the chamber 50 by using the heater cushion 74 formed of an elastic material.

[0075] Also, the tightly closed section 36c thermally separates the bottom member 36 from the heater cushion 74. Therefore, it is possible to curb a loss of thermal energy due to heat transmission from the bottom portion of the accommodating portion that is not covered with the heat insulating portion 32, that is, the bottom member 36.

[0076] Note that the engagement portion between the chamber 50 and the bottom member 36 configuring the accommodating portion is disposed to face the heater cushion 74 as illustrated in the drawing. With such disposition, it is possible to absorb thermal expansion of air inside the tightly closed section 36c by deformation of the heater cushion 74, to reduce a stress to be applied to the engagement portion between the chamber 50 and the bottom member 36, and to prevent separation between the chamber 50 and the bottom member 36.

[0077] Additionally, the fixed portion 22 is disposed at the heater cushion 74 on the side opposite to the tightly closed section 36c and positions and fixes the heater cushion 74. Therefore, movement of the heater cushion 74 is restricted by the fixed portion 22, and it is possible to relieve a stress to be applied to the member that forms the tightly closed section 36c with the heater cushion 74 maintaining the tightly closed section 36c.

[0078] Note that although the present embodiment has been described on the assumption that the tightly closed

section 36c is formed on the side opposite to the abutting surface 36b of the bottom member 36 that abuts the flavor generating article 110 accommodated in the accommodating portion, the present invention is not limited thereto. In other words, at least a part of the outer surface, such as a side surface or a bottom surface, of the accommodating portion may configure at least a part of the tightly closed section. In this case, it is possible to more effectively curb a loss of thermal energy generated by the heating portion by forming the tightly closed section at a location near the heating portion.

[0079] At this time, the tightly closed section is preferably formed on the longitudinal axis of the accommodating portion. It is possible to curb localization of the stress to be applied to the member that forms the tightly closed section when air inside the tightly closed section thermally expands, by forming the tightly closed section on the longitudinal axis of the accommodating portion.

[0080] As illustrated in Fig. 9, the flange portion 52a of the chamber 50 is configured to abut the insertion guide member 34 over the entire circumference. Also, the second holding portion 38 includes a gasket 80 and an annular member 90.

[0081] The gasket 80 is disposed in the surroundings of the non-holding portion 54 of the chamber 50 and is configured to support the chamber 50. The gasket 80 is made of a resin, for example, and may be formed of polycarbonate (PC), an acrylonitrile-butadiene-styrene (ABS) resin, or a polymer alloy or the like containing polyether ether ketone (PEEK) or a plurality of types of polymers, in particular. Note that the gasket 80 may be formed of metal, glass, ceramics, or the like. Also, the gasket 80 is preferably made of PEEK in terms of heat resistance. The annular member 90 is configured to be engaged with and support the insertion guide member 34 and the gasket 80. The annular member 90 can be formed of an elastic member such as silicone rubber, for example. In a case where silicone rubber is used, a preferred range of Shore A hardness is 40 to 60 and can be appropriately selected in accordance with deformation of the annular member 90. Also, the annular member 90 is configured to be positioned at and fixed to the fixed portion 22 that is fixed to the inner housing, which is not illustrated.

[0082] The gasket 80 and the annular member 90 are disposed to cover the circumference of the abutting location between the chamber 50 and the insertion guide member 34. It is thus possible to prevent an aerosol generated in the chamber 50 from leaking from the abutting location between the chamber 50 and the insertion guide member 34 to the inside of the inner housing of the flavor inhaler 100.

[0083] Also, the gasket 80 and the annular member 90 are disposed to face the heat insulating portion 32 with a gap therebetween and restrict movement of the heat insulating portion 32 in the longitudinal axis direction of the chamber 50. Therefore, the heat insulating portion 32 is prevented from moving with no limit in the longitudinal axis direction of the chamber 50, and the heat insulating portion 32 is thus prevented from colliding against another member (such as the inner housing 10, for example). Also, the annular member 90 is formed of an elastic member, and it is thus possible to relieve a stress to be applied to the heat insulating portion 32 and thereby to prevent breakage of the heat insulating portion 32 even in a case where the annular member 90 comes into contact with the heat insulating portion 32.

[0084] Also, the gasket 80 is disposed to face the inner circumferential surface of the heat insulating portion 32 with a gap therebetween and restricts movement of the heat insulating portion 32 in the radial direction of the chamber 50. Therefore, the heat insulating portion 32 is prevented from moving with no limit in the radial direction of the chamber 50, and the heat insulating portion 32 is thus prevented from colliding against another member (such as the inner housing 10, for example). Also, it is possible to restrict, from the inside of the heat insulating portion 32, movement of the heat insulating portion 32 in the radial direction of the chamber 50 and thereby to reduce the size of the flavor inhaler 100.

[0085] Here, the first section 95 is formed in a region surrounded by the chamber 50, the heat insulating portion 32, the heater cushion 74, and the gasket 80 as illustrated in Figs.8 and 9. The first section 95 is not tightly closed, and the inside and the outside of the first section 95 communicate with each other by the opening portion 74c provided at the heater cushion 74. Here, the opening portion 74c is a hole formed in the inner surface of the first section 95 and is configured to satisfy at least one of conditions that (1) the sectional area of the opening portion 74c is equal to or less than 40 mm^2, (2) the opening portion 74c is a single hole, and (3) the sectional area of the opening portion 74c is equal to or less than 3% of the inner area of the first section 95. Therefore, the opening portion 74c causes the inside and the outside of the first section 95 to communicate with each other, and it is thus possible to reduce convection of air and to achieve a heat effect by reducing a stress inside the first section 95 when air in the first section 95 thermally expands.

[0086] Also, at least a part of the outer surface of the accommodating portion configures at least a part of the inner surface of the first section 95 as illustrated in the drawing. It is thus possible to improve a heat insulating effect and to effectively curb a loss of thermal energy generated by the heating portion 42 by forming the first section 95 at a location near the heating portion 42. Additionally, the heating portion 42 is disposed inside the first section 95. Therefore, it is possible to curb escaping of heat generated by the heating portion 42 to the outside of the first section 95. Furthermore, at least a part of the inner circumferential surface of the heat insulating portion 32 configures at least a part of the inner surface of the first section 95 as illustrated in the drawing. It is thus possible to prevent a stress accompanying an operation of the heating portion 42 from being applied to the heat insulating portion 32 including a foamed material that is

easily deformed by a stress from the outside. Moreover, it is possible to effectively insulate heat over the entire circumference of the heating portion 42 and to easily hold the heat of the heating portion 42 disposed inside the first section 95 over the entire circumference of the heating portion 42. Furthermore, it is possible to further improve the heat insulating effect by using the heat insulating portion 32.

[0087] Also, at least a part of the outer circumferential surface of the chamber 50 configures at least a part of the inner surface of the first section 95 as illustrated in the drawing. In this manner, a stress accompanying an operation of the heating portion 42 is not applied to the first section 95, and it is thus possible to easily provide an electrical wiring such as an electrode or a sensor at the circumference of the chamber 50 and to configure the flavor inhaler 100 in a compact size.

[0088] Although the embodiment of the present invention has been described above, the present invention is not limited to the above embodiment, and various modification can be made within the scope of the technical idea described in the claims, the specification, and the drawings. Note that any shapes and materials that are not directly described in the specification and the drawings also fall within the scope of the technical idea of the invention of the present application as long as the effects and the advantages of the invention of the present application can be achieved.

[0089] For example, although the flavor inhaler 100 according to the present embodiment has a so-called counterflow-type air flow path through which air flowing from the opening 52 of the chamber 50 is supplied to the end surface of the flavor generating article 110, the present invention is not limited thereto, and the flavor inhaler 100 may have a so-called bottom flow-type air flow path through which air is supplied from the bottom portion 56 of the chamber 50 to the inside of the chamber 50. Also, the heating portion 42 is not limited to a resistance heating type and may be an induction heating type. In that case, the heating portion 42 can heat the chamber 50 through induction heating. Also, in a case where the flavor generating article 110 has a susceptor, the heating portion 42 can heat the susceptor of the flavor generating article 110 through induction heating.

REFERENCE SIGNS LIST

[0090]

22 Fixed portion
32 Insulating portion
36 Bottom member
36b Abutting surface
36c Tightly closed section
37 First holding portion
38 Second holding portion
42 Heating Portion
50 Chamber
52 Opening
62 Contact portion
66 Separated portion
72 Support portion
74 Heater cushion
80 Gasket
85 Ring
90 Annular member
95 First section
100 Flavor inhaler
110 Flavor generating article

Claims

1. A flavor inhaler comprising:

an accommodating portion that accommodates at least a part of a flavor generating article;
a heating portion that is configured to heat the flavor generating article accommodated in the accommodating portion;
at least one tightly closed section that is formed at a circumference of the accommodating portion; and
an elastic member that configures at least a part of an inner surface of the tightly closed section, wherein a stress is not applied to the elastic member in a state where the heating portion is not operating.

2. The flavor inhaler according to claim 1, wherein at least a part of an outer surface of the accommodating portion configures at least a part of the inner surface of the tightly closed section.

3. The flavor inhaler according to claim 1 or 2, wherein the tightly closed section is formed on a longitudinal axis of the accommodating portion.

4. The flavor inhaler according to any one of claims 1 to 3, wherein the tightly closed section is formed on a side opposite to an abutting surface that abuts an end surface of the flavor generating article accommodated in the accommodating portion.

5. The flavor inhaler according to claim 3 or 4, wherein a surface intersecting the longitudinal axis of the accommodating portion is configured of the elastic member.

6. The flavor inhaler according to any one of claims 1 to 5,

wherein the accommodating portion includes a first tubular portion that includes an opening formed at one end and surrounds a circumference of the flavor generating article, and

an abutting portion that is disposed at the other end of the first tubular portion, is engaged with the first tubular portion, and abuts an end surface of the flavor generating article, and
an engagement portion between the first tubular portion and the abutting portion is disposed to face the elastic member.

7. The flavor inhaler according to any one of claims 1 to 6, further comprising a restricting portion that is disposed at the elastic member on a side opposite to the tightly closed section and restricts movement of the elastic member.

8. The flavor inhaler according to any one of claims 1 to 7, further comprising:

a first section in which convection of air therein has been reduced; and
a hole that is formed in an inner surface of the first section and causes inside of the first section and outside of the first section to communicate with each other.

9. The flavor inhaler according to claim 8, wherein at least a part of an outer surface of the accommodating portion configures at least a part of the inner surface of the first section.

10. The flavor inhaler according to claim 8 or 9, wherein at least one electrical wiring is disposed through the hole formed in the first section.

11. The flavor inhaler according to any one of claims 8 to 10, wherein the heating portion is disposed inside the first section.

12. The flavor inhaler according to any one of claims 8 to 11, further comprising:

a second tubular portion that covers the accommodating portion,
wherein at least a part of an inner circumferential surface of the second tubular portion configures at least a part of the inner surface of the first section.

13. The flavor inhaler according to any one of claims 8 to 12, wherein the second tubular portion is a heat insulating portion.

14. A pressure relieving method performed in a flavor inhaler including

an accommodating portion that accommodates at least a part of a flavor generating article,
a heating portion that is configured to heat the flavor generating article accommodated in the accommodating portion,
at least one tightly closed section that is formed at a circumference of the accommodating portion, and
an elastic member that configures at least a part of an inner surface of the tightly closed section,
the method comprising:
relieving a pressure rise inside the tightly closed section by the elastic member being deformed when air inside the tightly closed section expands due to an operation of the heating portion.

Fig. 1A

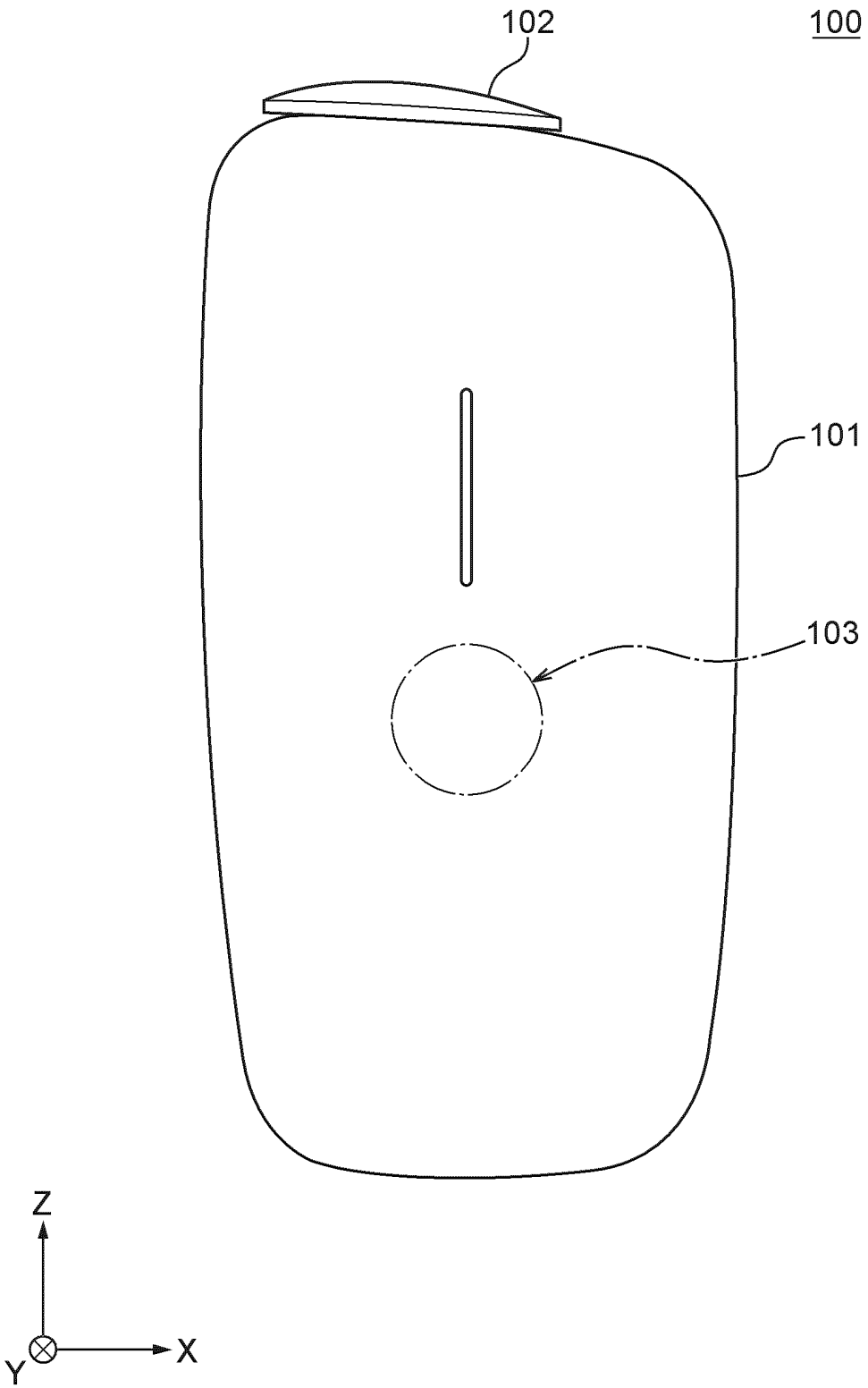


Fig. 1B

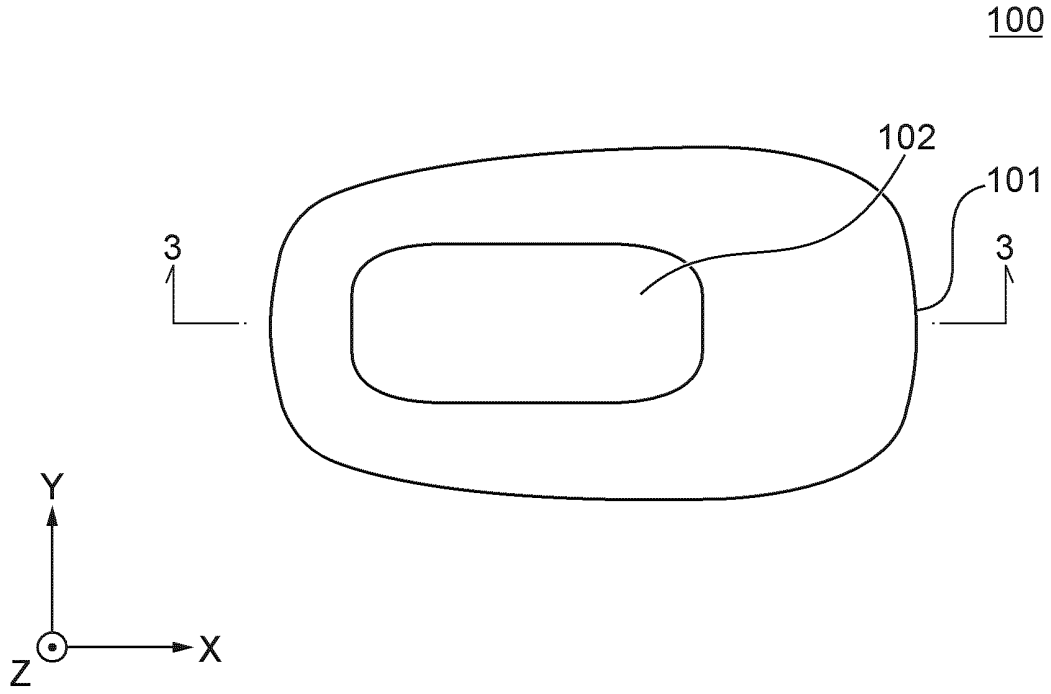
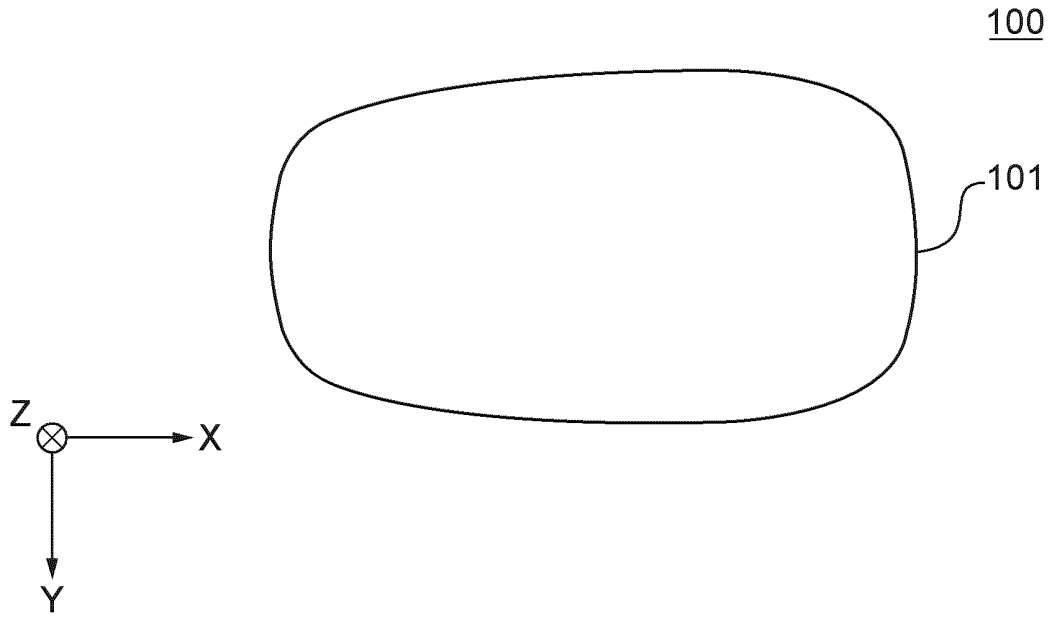


Fig. 1C



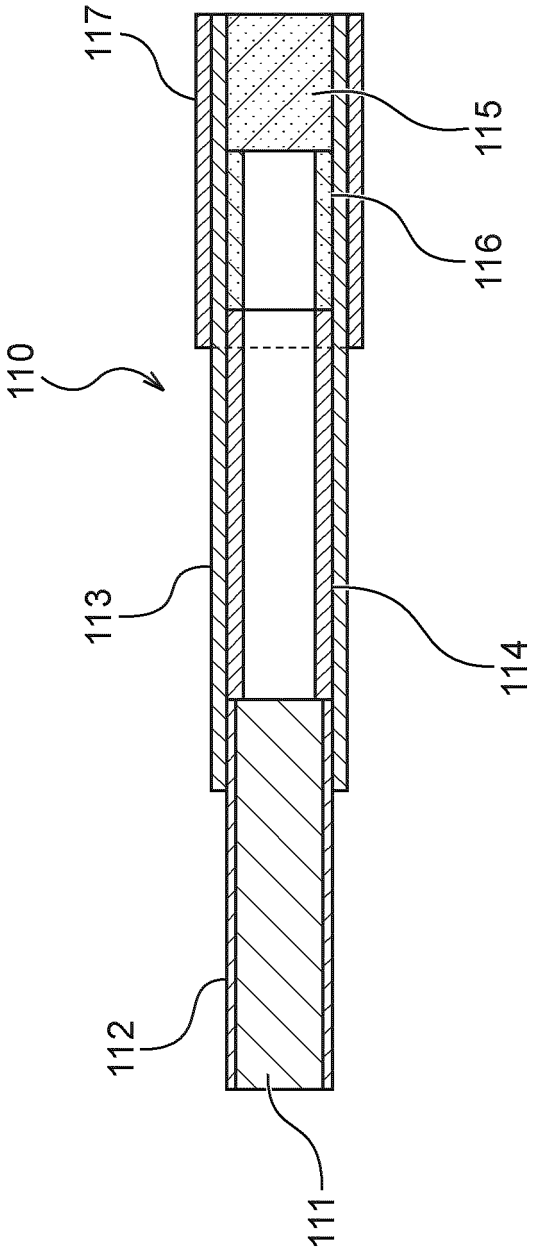


Fig. 2

Fig. 3

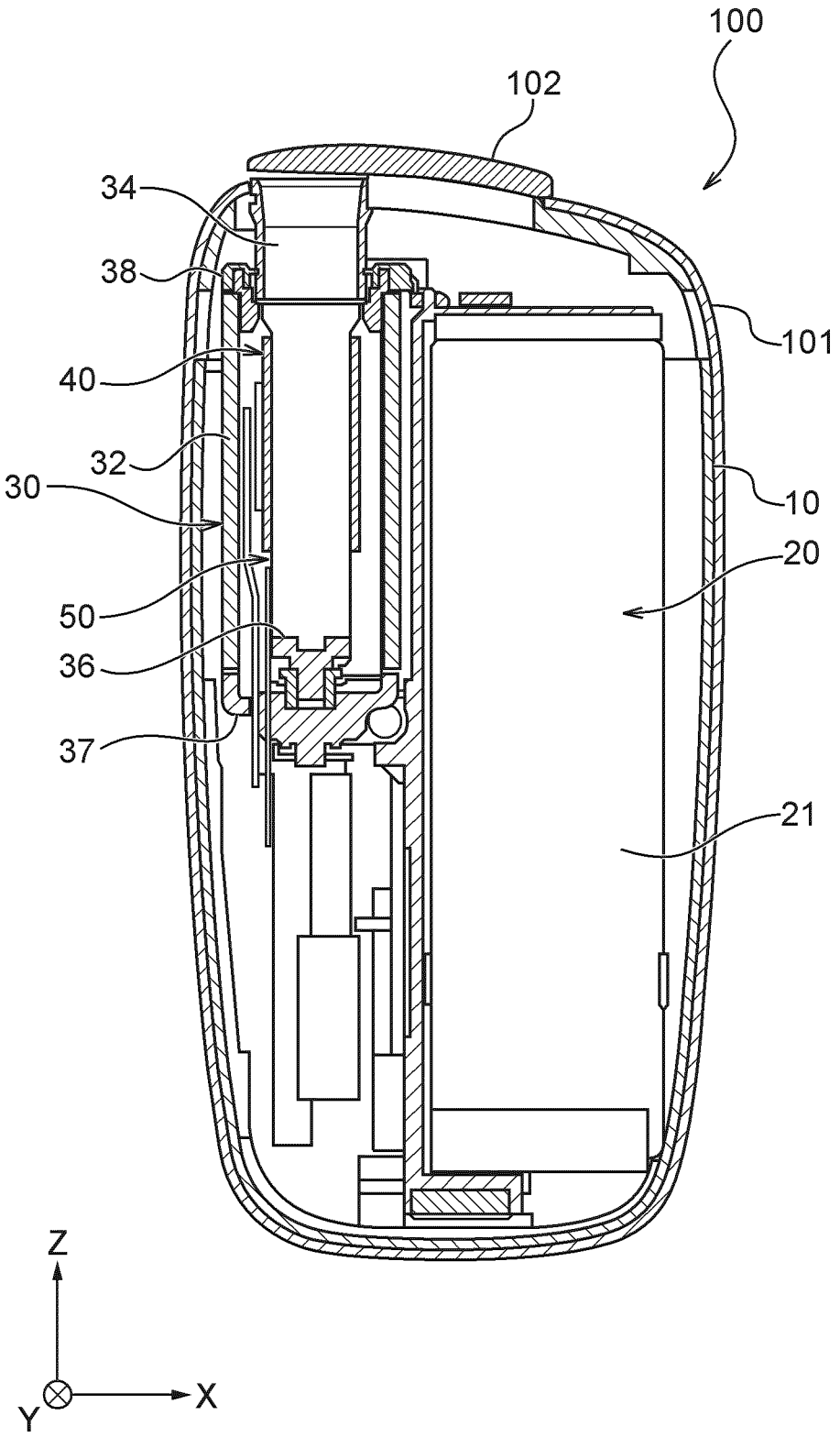


Fig. 4A

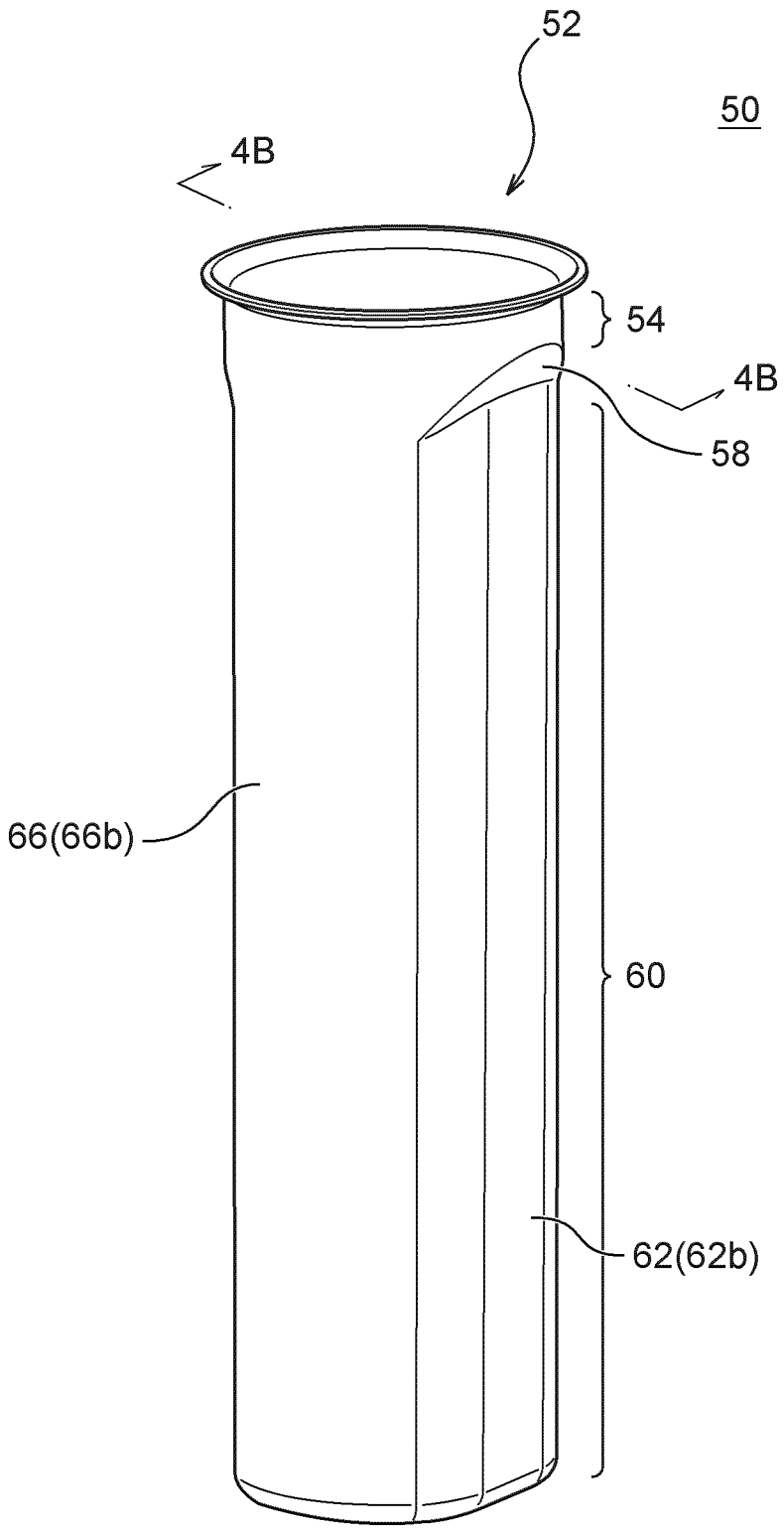


Fig. 4B

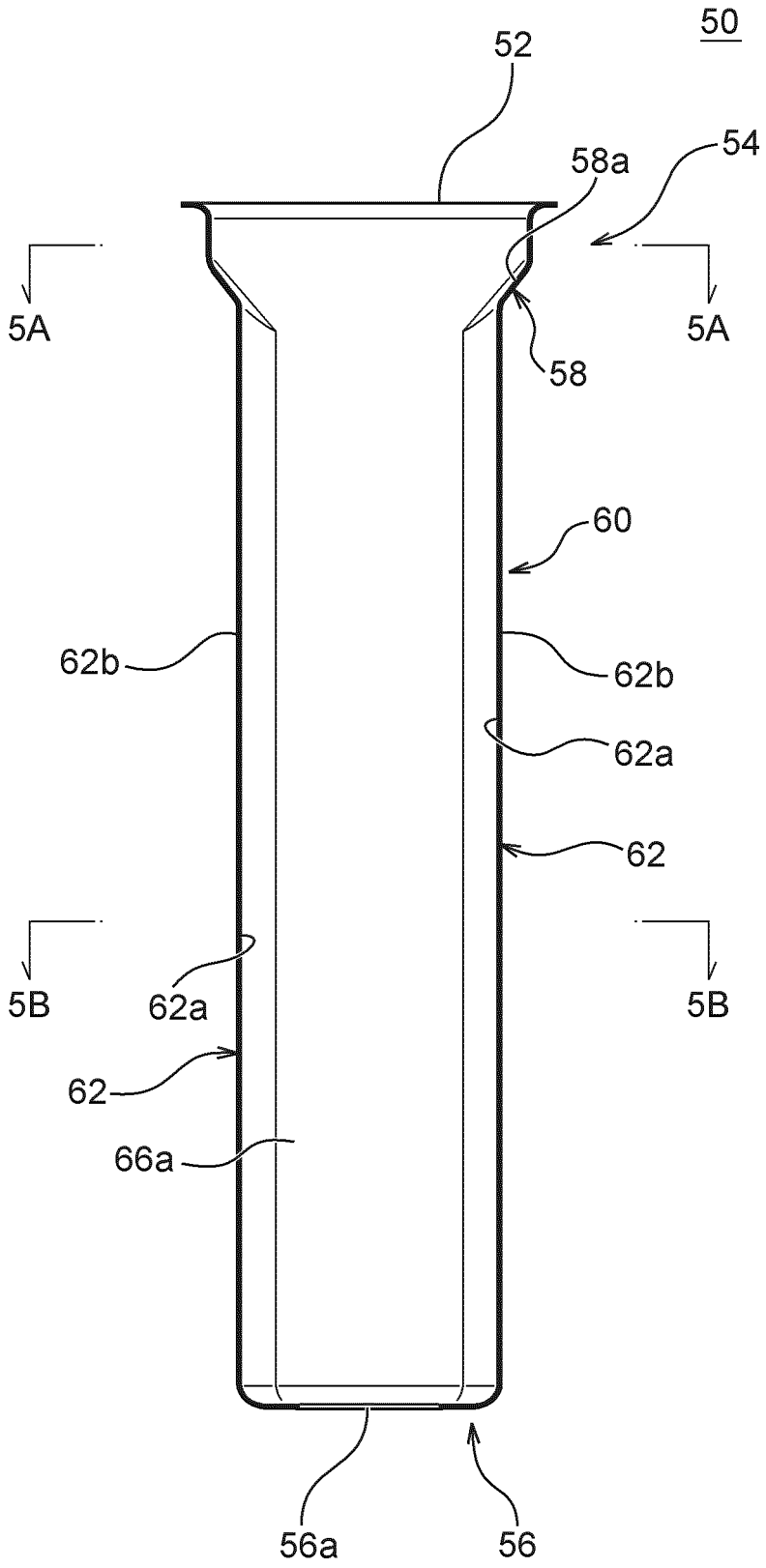


Fig. 5A

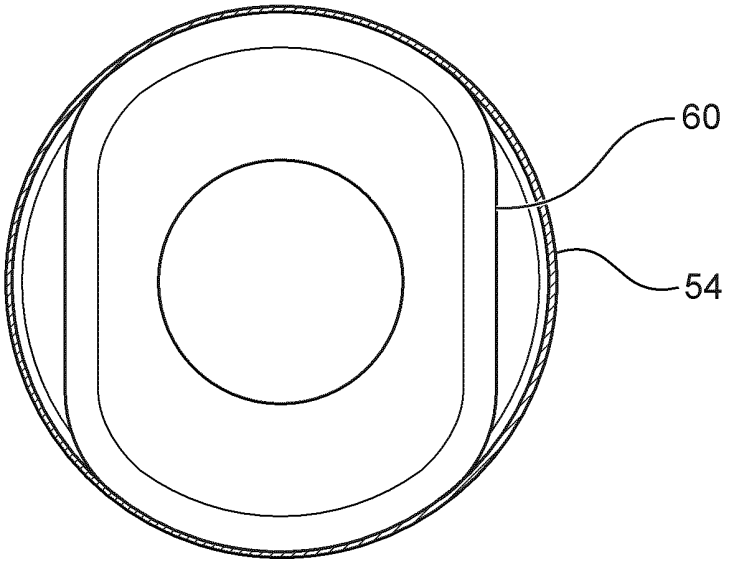


Fig. 5B

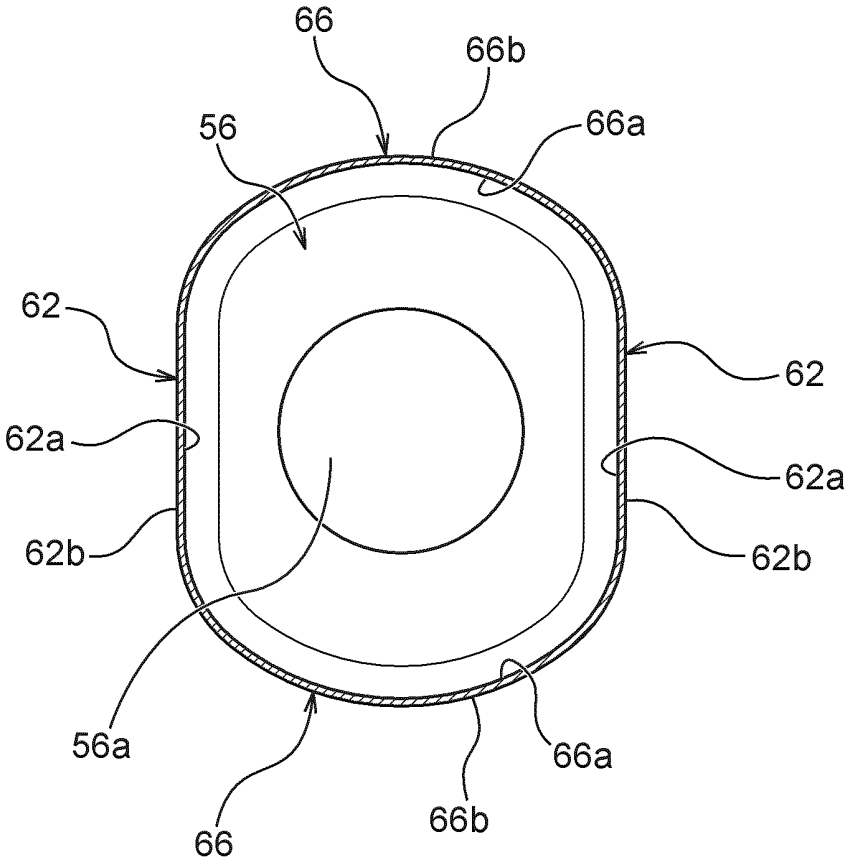


Fig. 6

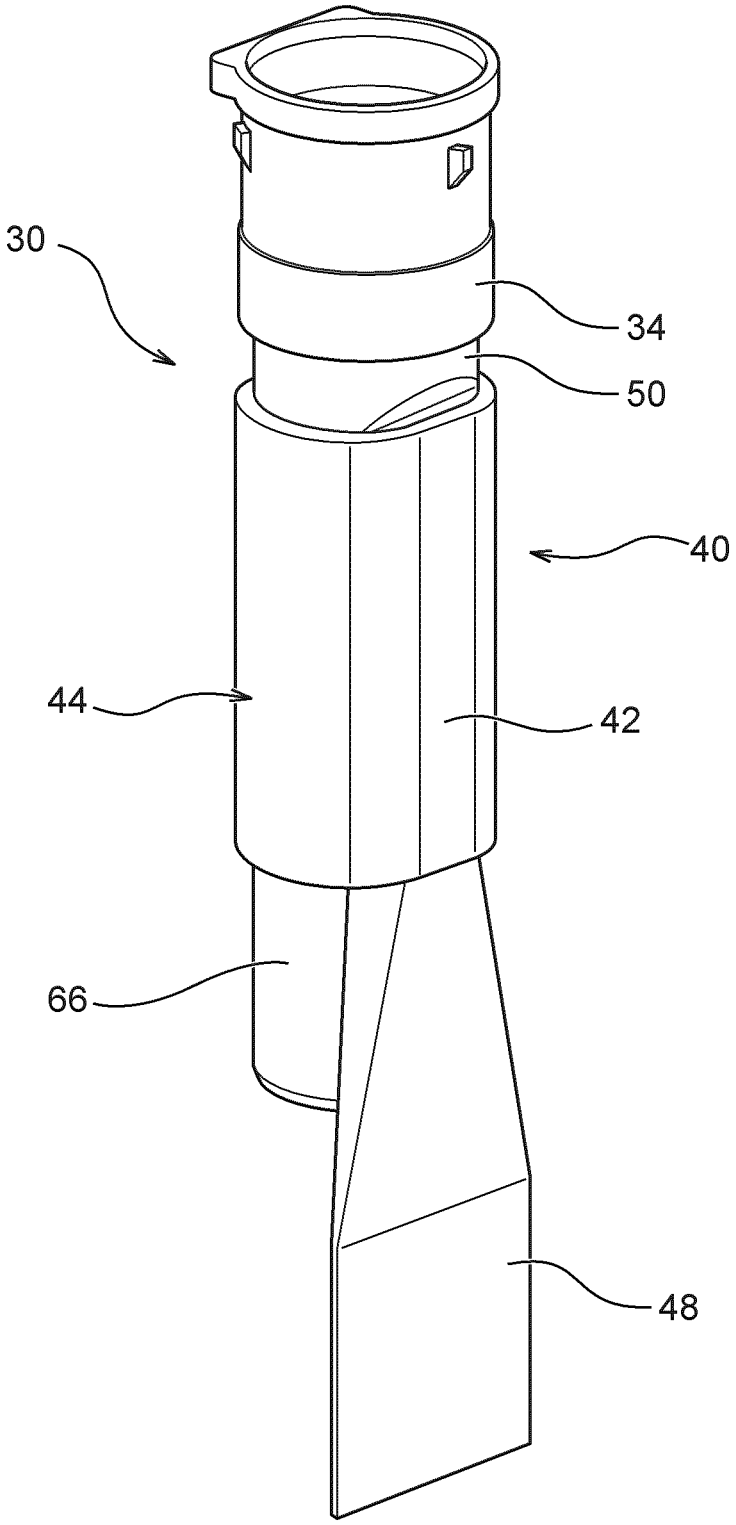


Fig. 7

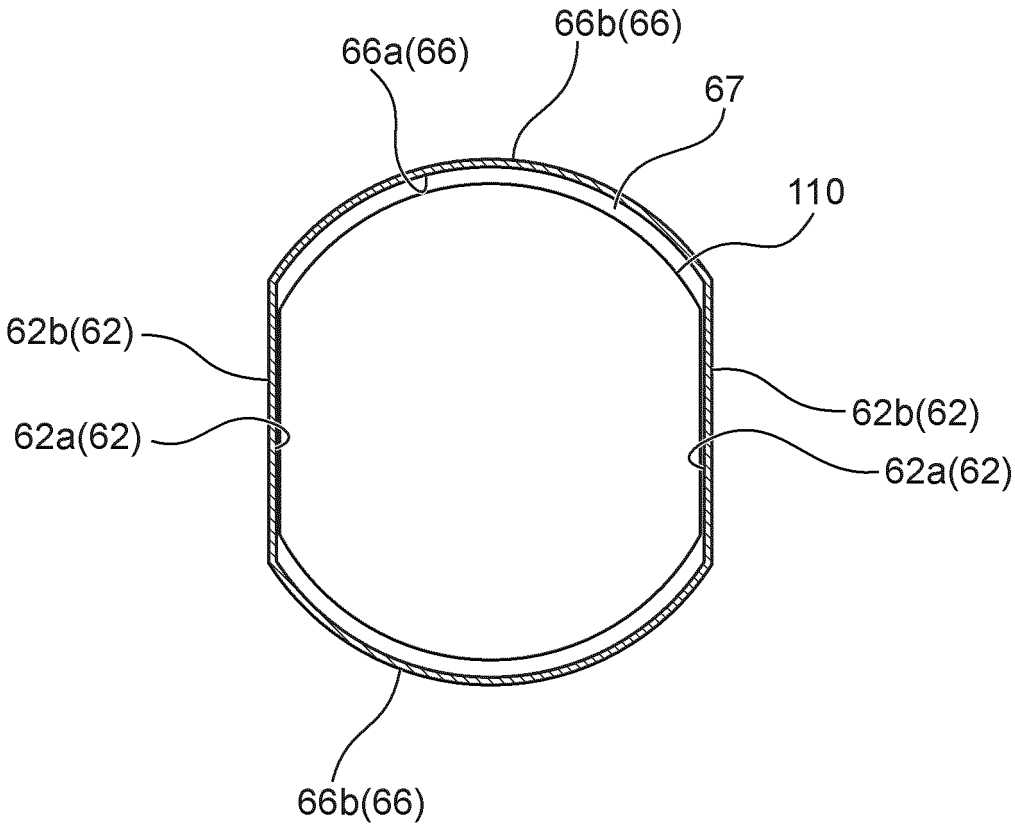


Fig. 8

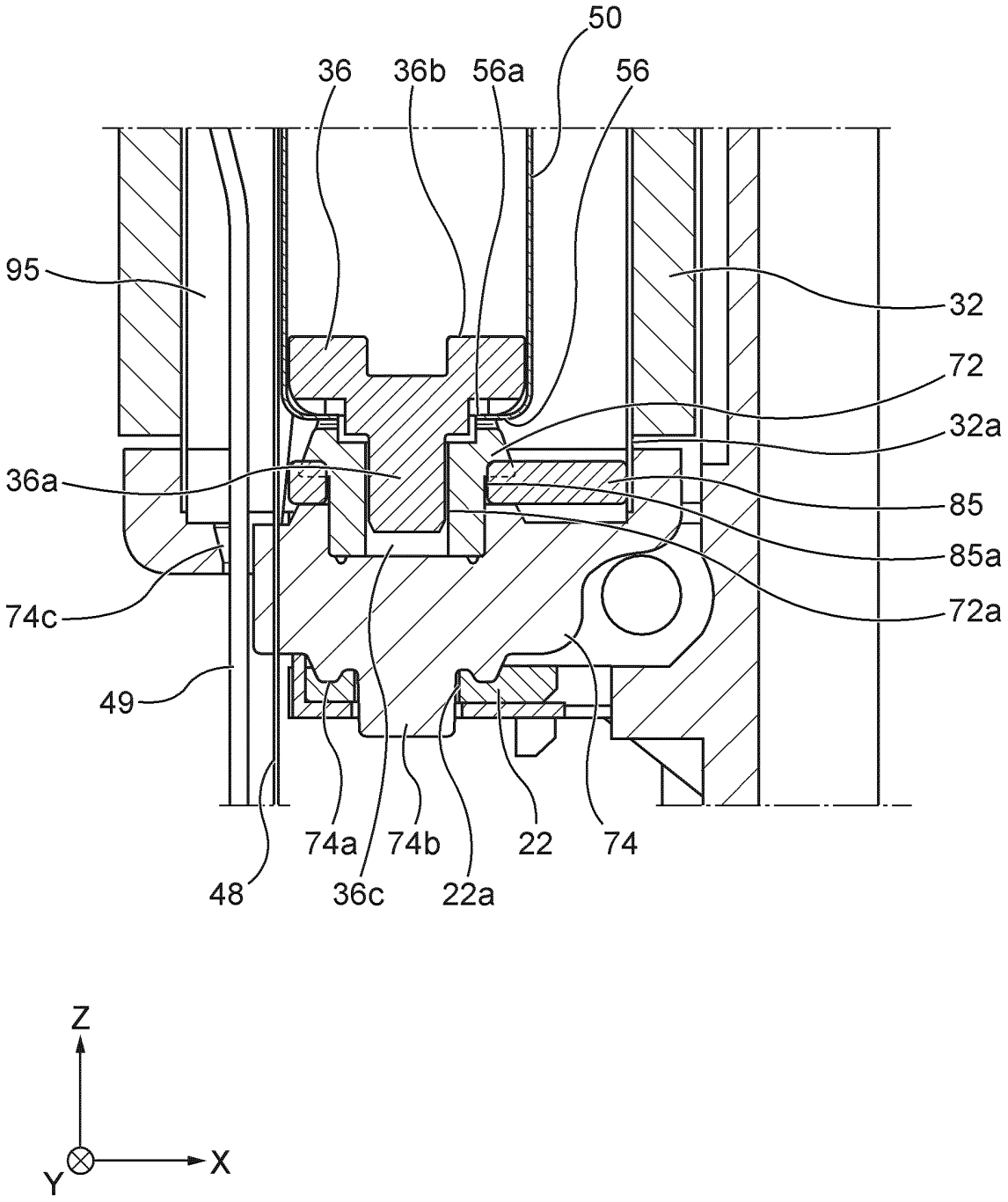
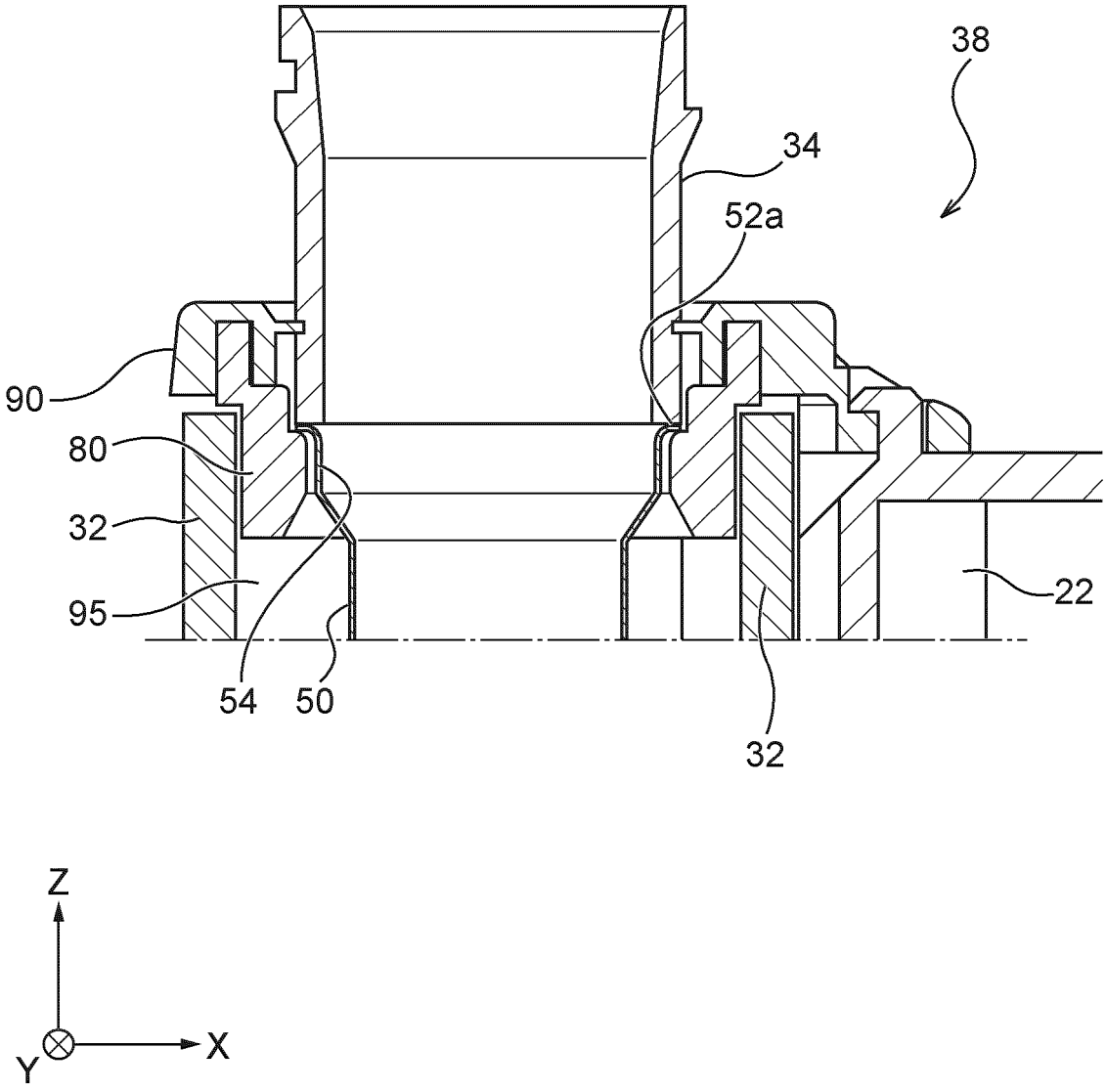

50
36
36b
56a
56
95
32
72
32a
36a
85
85a
74c
72a
49
74a
74b
22
74
48
36c
22a
Z
X
Y

Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/046199

A. CLASSIFICATION OF SUBJECT MATTER
A24F 40/40(2020.01)i
FI: A24F40/40

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)
A24F40/00-A24F47/00

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2021
Registered utility model specifications of Japan	1996-2021
Published registered utility model applications of Japan	1994-2021

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 2020/074604 A1 (JT INTERNATIONAL S. A.) 16 April 2020 (2020-04-16) page 6, line 24 to page 7, line 17, fig. 2	1-6, 8-14 7
A	US 2020/0008477 A1 (SHENZHEN IVPS TECHNOLOGY CO., LTD.) 09 January 2020 (2020-01-09) entire text, all drawings	1-14

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 January 2021 (27.01.2021)	09 February 2021 (09.02.2021)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/046199

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
WO 2020/074604 A1	16 Apr. 2020	(Family: none)	
US 2020/0008477 A1	09 Jan. 2020	EP 3590367 A1 entire text, all drawings CN 210203368 U	

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

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- WO 2020035454 A **[0003]**