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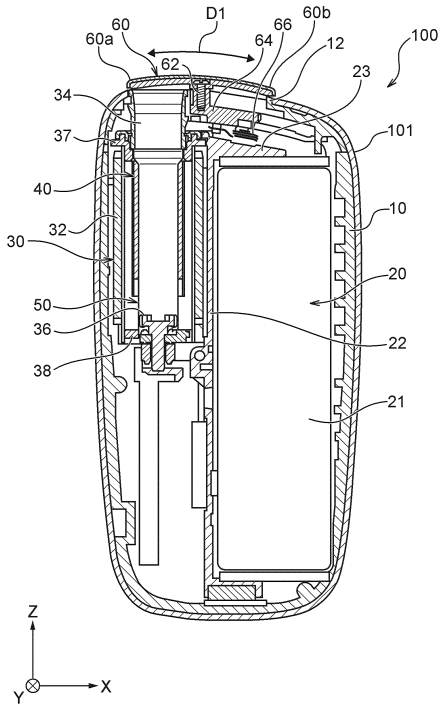
(54) **FLAVOR ASPIRATOR**

(57) The present invention further blocks the entry of a foreign object into an opening in which a consumable of a flavor inhaler is inserted. A flavor inhaler capable of heating a consumable is provided. This flavor inhaler includes a main body including an opening portion in which the consumable is inserted, a cover unit movable between a closing position, at which the cover unit closes the opening portion, and an opening position, at which the cover unit opens the opening portion, and a protrusion portion provided between the cover unit located at the closing position and the main body. The protrusion portion is provided on the cover unit or the main body. A space is formed between the protrusion portion and the cover unit or the main body on which the protrusion portion is not provided.

Fig. 3



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Description

TECHNICAL FIELD

[0001] The present invention relates to a flavor inhaler.

BACKGROUND ART

[0002] Conventionally, there have been known flavor inhalers for inhaling a flavor or the like without burning a material. The flavor inhalers include, for example, a chamber that contains a flavor generation article, and a heater that heats the flavor generation article contained in the chamber. Further, such a flavor inhaler has been known to include an opening for inserting a consumable (a tobacco stick or the like) containing the flavor generation article into the chamber and an opening/closing mechanism for preventing entry of dust and the like from outside on this opening (refer to PTL 1).

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: Japanese Patent Application Laid-Open No. 2020-14433

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] In the case where the flavor inhaler includes such an opening and an opening/closing mechanism, a foreign object such as dust may enter inside the flavor inhaler, more specifically, inside the chamber where the flavor generation article is heated via the opening from a space between the housing of the flavor inhaler and the opening/closing mechanism (a cover). Further, the presence of a relatively large space between such a housing and an opening/closing mechanism, if any, may cause the opening/closing mechanism to largely rattle.

[0005] One of objects of the present invention is to further block the entry of a foreign object into an opening in which a consumable of a flavor inhaler is inserted. Further, one of objects of the present invention is to further restrain the rattling of a cover that opens/closes the opening in which the consumable of the flavor inhaler is inserted.

SOLUTION TO PROBLEM

[0006] According to a first aspect, a flavor inhaler capable of heating a consumable is provided. This flavor inhaler includes a main body including an opening portion in which the consumable is inserted, a cover unit movable between a closing position, at which the cover unit closes the opening portion, and an opening position, at which the cover unit opens the opening portion, and a protrusion portion provided between the cover unit located at the closing position and the main body. The protrusion portion is provided on the cover unit or the main body. A space is formed between the protrusion portion and the cover unit or the main body on which the protrusion portion is not provided.

[0007] According to the first aspect, due to the presence of the protrusion portion between the cover unit located at the closing position and the main body, a space between the cover unit located at the closing position and the main body can be narrowed. As a result, the entry of a foreign object into the opening portion and the large rattling of the cover unit can be blocked. Further, since the space is formed between the protrusion portion and the cover unit or the main body on which the protrusion portion is not provided, the interference of the protrusion portion and the cover unit or the main body with each other can be prevented. More specifically, when the cover unit is opened/closed, the sliding movement between the protrusion portion and the cover unit or the main body can be prevented, and therefore a user can smoothly operate the cover unit.

[0008] According to a second aspect, in the first aspect, the protrusion portion is out of contact with the cover unit or the main body on which the protrusion portion is not provided when the cover unit is moved between the closing position and the opening position.

[0009] According to the second aspect, when the cover unit is opened/closed, the protrusion portion and the cover unit or the main body do not slide on each other, and therefore the user can smoothly operate the cover unit.

[0010] According to a third aspect, in the first or second aspect, the cover unit is movable between the opening position and the closing position in a first direction. The protrusion portion is provided between at least one of both end portions of the cover unit located at the closing position in the first direction and the main body.

[0011] If the cover unit rattles with the protrusion portion ever provided between the central portion of the cover unit and the main body, the cover unit may further rattle with the protrusion portion serving as a pivot point. According to the third aspect, even when the cover unit rattles, the rattling of the cover unit can be efficiently restrained with the aid of the protrusion portion between the at least one end portion of the cover unit and the main body. Further, since the protrusion portion is present between the at least one end portion of the cover unit and the main body, the entry of a foreign object into between the cover unit and the main body can be blocked.

[0012] According to a fourth aspect, in any of the first to third aspects, the protrusion portion is provided on the main body. The cover unit includes a recessed portion at a position that faces the protrusion portion in a state of being located at the closing position.

[0013] According to the fourth aspect, the cover unit includes the recessed portion, and therefore the sliding movement of the protrusion portion provided on the main body on the cover unit can be further prevented when

the cover unit is moved from the closing position to the opening position, and therefore the user can smoothly operate the cover unit.

[0014] According to a fifth aspect, in any of the first to fourth aspects, the main body includes an outer housing and an inner member contained in the outer housing. The protrusion portion is constituted by a part of the inner member exposed from the outer housing to outside.

[0015] According to the fifth aspect, the protrusion portion is constituted by a part of the inner member different from the outer housing, which makes it possible to, for example, make the outer housing from metal and make the protrusion portion and the inner member from relatively easily workable resin or the like.

[0016] According to a sixth aspect, in any of the first to fifth aspects, the flavor inhaler further includes a slider coupled with the cover unit, and a spring configured to bias the slider to thus bias the cover unit to the opening position or the closing position.

[0017] According to a seventh aspect, in the sixth aspect, the flavor inhaler further includes a magnet provided to the slider, and a Hall sensor configured to detect a magnetic field of the magnet when the cover unit is located at the opening position or the closing position.

[0018] According to the seventh aspect, the opening/closing state of the cover unit can be detected using the Hall sensor.

[0019] According to an eighth aspect, in the sixth or seventh aspect, the spring is made from a non-magnetic material.

[0020] According to the eighth aspect, the spring is made from the non-magnetic material, and therefore the magnetization of the spring by the magnet is avoided and the Hall sensor can be prevented from detecting a magnetic field of the magnetized spring in the case where the flavor inhaler includes the magnet and the Hall sensor. As a result, the occurrence of erroneous detection of the opening/closing state of the cover unit can be reduced.

[0021] According to a ninth aspect, in any of the first to eighth aspects, the main body includes a guide member configured to guide the insertion of the consumable. The cover unit located at the opening position covers at least a part of the guide member.

[0022] According to the ninth aspect, the flavor inhale prevents the guide member from being completely exposed even when the cover unit is located at the opening position, thereby being able to discourage the user from accessing inside the main body, thereby deterring, for example, the component members of the main body such as the guide member from being disassembled or the main body from being altered.

[0023] According to a tenth aspect, in any of the first to ninth aspects, the cover unit is slidable relative to the main body in the first direction. The protrusion portion is an elongated protrusion portion extending in a second direction perpendicular to the first direction.

[0024] According to the tenth aspect, the protrusion portion extends in the second direction, and therefore the rattling can be restrained at the both end portions of the cover unit in the second direction.

[0025] According to an eleventh aspect, in any of the first to tenth aspects, the protrusion portion is provided on the main body. The cover unit includes a first portion that faces the protrusion portion in the state of being located at the closing position, and a second portion that faces the protrusion portion in a state of being located at the opening position. A distance between the first portion and the protrusion portion in the state that the cover unit is located at the closing position is shorter than a distance between the second portion and the protrusion portion in the state that the cover unit is located at the opening position.

[0026] According to the eleventh aspect, in the state that the cover unit is located at the closing position, the space between the cover unit (the first portion) and the protrusion portion is relatively small, and therefore the large rattling of the cover unit can be restrained. On the other hand, in the state that the cover unit is located at the opening position, the space between the cover unit

[0027] (the second portion) and the protrusion portion is relatively large, and therefore the interference of the cover unit and the protrusion portion with each other can be prevented and the friction can be reduced between the cover unit and the protrusion portion when the cover unit is moved from the closing position to the opening position.

[0028] According to a twelfth aspect, in any of the first to eleventh aspects, the cover unit overlaps the protrusion portion as viewed from an insertion direction of the consumable when the cover unit is located at the opening position or the closing position.

[0029] According to the twelfth aspect, the protrusion portion is covered with the cover unit, and can be less visible from outside. Therefore, the designability of the flavor inhaler can remain hardly affected by the protrusion portion.

[0030] According to a thirteenth aspect, a flavor inhaler capable of heating a consumable is provided. The flavor inhaler includes an opening portion in which the consumable is inserted, a cover unit movable between a closing position, at which the cover unit closes the opening portion, and an opening position, at which the cover unit opens the opening portion, a slider coupled with the cover unit, and a spring configured to bias the slider to thus bias the cover unit to the opening position or the closing position. The slider includes a slider main body, a first coupling portion extending from the slider main body, and a first flange portion provided on a part of an outer peripheral surface of the first coupling portion. The spring includes a coil portion, a first arm extending from the coil portion, and a first wound portion formed on one end of the first arm and wound around the first coupling portion. The first arm overlaps the first flange portion as viewed from an extension direction of the first coupling portion when the cover unit is located at the opening position or the closing position.

[0031] According to the thirteenth aspect, the first flange portion is provided on a part of the outer peripheral surface of the first coupling portion, and therefore the first wound portion can be easily engaged with the first coupling portion compared to a configuration in which the flange portion is provided over the entire circumference of the outer peripheral surface of the first coupling portion. Further, the first arm of the coil portion constantly overlaps the first flange portion, and this can make it difficult for the spring to be detached from the first coupling portion when the cover unit is moved between the opening position and the closing position.

[0032] According to a fourteenth aspect, in the thirteenth aspect, the spring includes a second arm extending from the coil portion and a second wound portion formed at one end of the second arm. The flavor inhaler includes a second coupling portion around which the second wound portion is wound, and a second flange portion provided on a part of an outer peripheral surface of the second coupling portion. The second arm overlaps the second flange portion as viewed from an extension direction of the second coupling portion when the cover unit is located at the opening position or the closing position.

[0033] According to the fourteenth aspect, the second flange portion is provided on a part of the outer peripheral surface of the second coupling portion, and therefore the second wound portion can be easily engaged with the second coupling portion compared to a configuration in which the flange portion is provided over the entire circumference of the outer peripheral surface of the second coupling portion. Further, the second arm of the coil portion constantly overlaps the second flange portion, and this can make it difficult for the spring to be detached from the second coupling portion when the cover unit is moved between the opening position and the closing position.

[0034] According to a fifteenth aspect, in the fourteenth aspect, the first flange portion and the second flange portion are provided on the first coupling portion and the second coupling portion, respectively, in such a manner that the first flange portion and the second flange portion face each other when the cover unit is located at an intermediate position between the opening position and the closing position.

[0035] According to the fifteenth aspect, this configuration causes the first arm and the second arm to be located between the first coupling portion and the second coupling portion. In this case, when the cover unit is moved between the closing position and the opening position, the first arm and the second arm can apply a stress to the first coupling portion and the second coupling portion. This leads to application of almost no force derived from the spring from the first coupling portion and the second coupling portion to the first wound portion and the second wound portion, thereby being able to make it unlikely for the first wound portion and the second wound portion to be broken and for the spring to be detached from the first coupling portion and the second coupling pin portion.

BRIEF DESCRIPTION OF DRAWINGS

[0036]

Fig. 1A is a schematic front view of a flavor inhaler according to a present embodiment.
Fig. 1B is a schematic top view of the flavor inhaler according to the present embodiment.
Fig. 1C is a schematic bottom view of the flavor inhaler according to the present embodiment.
Fig. 2 is a schematic side cross-sectional view of a consumable.
Fig. 3 is a cross-sectional view of the flavor inhaler as viewed from arrows 3-3 illustrated in Fig. 1B.
Fig. 4 is an external view of the flavor inhaler near a protrusion portion.
Fig. 5 is an external view of the flavor inhaler near the protrusion portion as viewed from an X-axis negative direction.
Fig. 6 is an external perspective view of the flavor inhaler with a slide cover removed therefrom.
Fig. 7A is an enlarged view near the slide cover of the flavor inhaler illustrated in Fig. 3.
Fig. 7B is an enlarged view near the slide cover located at an opening position of the flavor inhaler.
Fig. 8 is a perspective view of a slider as viewed from inside a main body.
Fig. 9 is a schematic view illustrating how a spring is attached.
Fig. 10 is an enlarged cross-sectional perspective view of the slider.

DESCRIPTION OF EMBODIMENTS

[0037] In the following description, an embodiment of the present invention will be described with reference to the drawings. In the drawings that will be described below, identical or corresponding components will be indicated by the same reference numerals, and redundant descriptions will be omitted.

[0038] Fig. 1A is a schematic front view of a flavor inhaler 100 according to the present embodiment. Fig. 1B is a schematic top view of the flavor inhaler 100 according to the present embodiment. Fig. 1C is a schematic bottom view of the flavor inhaler 100 according to the present embodiment. In the drawings that will be described in the present specification, an X-Y-Z orthogonal coordinate system may be set for convenience of the description. In this coordinate system, a Z axis extends vertically upward. An X-Y plane is laid so as to cut across the flavor inhaler 100 horizontally. A Y axis is disposed so as to extend from the front side to the back side of the flavor inhaler 100. The Z axis can also be said to be an insertion direction of a consumable contained in a chamber 50 of an atomization unit 30, which will be described below.

Further, the X-axis direction can also be said to be a device longitudinal direction in a plane perpendicular to the insertion direction of the consumable or a direction in which a heating unit and a power source unit are lined up. The Y-axis direction can also be said to be a device lateral direction in the plane perpendicular to the insertion direction of the consumable.

[0039] The flavor inhaler 100 according to the present embodiment is configured to, for example, generate an aerosol that contains a flavor by heating a stick-type consumable provided with a flavor source including an aerosol source.

[0040] As illustrated in Figs. 1A to 1C, the flavor inhaler 100 includes a slide cover 60 (corresponding to one example of a cover unit) and a main body 120. The main body 120 includes an outer housing 101 and a switch unit 103. The outer housing 101 constitutes the outermost housing of the flavor inhaler 100, and is sized so as to be contained inside a user's hand. When the user uses the flavor inhaler 100, the user can inhale the aerosol while holding the main body 120 with his/her hand. The outer housing 101 may be constructed by assembling a plurality of members.

[0041] As illustrated in Fig. 1B, the outer housing 101 includes an opening portion 101a in which the consumable is inserted. The slide cover 60 is slidably attached to the outer housing 101 so as to close this opening portion 101a. More specifically, the slide cover 60 is configured movably along the outer surface of the outer housing 101 between a closing position (the position illustrated in Fig. 1A), at which the slide cover 60 closes the opening portion 101a of the outer housing 101, and an opening position (the position illustrated in Fig. 1B), at which the slide cover 60 opens the opening portion 101a. For example, the user can move the slide cover 60 to the closing position and the opening position by operating the slide cover 60 manually. As a result, the side cover 60 can permit or restrict access of the consumable to inside the flavor inhaler 100.

[0042] The switch unit 103 is used to switch on and off the actuation of the flavor inhaler 100. For example, the user can cause power to be supplied from a not-illustrated power source to the not-illustrated heating unit and the heating unit to heat the consumable without burning it by operating the switch unit 103 in a state that the consumable is inserted in the flavor inhaler 100. The switch unit 103 may include a switch provided outside the outer housing 101 or may include a switch located inside the outer housing 101. In the case where the switch is located inside the outer housing 101, the switch is indirectly pressed by pressing of the switch unit 103 on the surface of the outer housing 101. The present embodiment will be described citing the example in which the switch of the switch unit 103 is located inside the outer housing 101.

[0043] The flavor inhaler 100 may further include a not-illustrated terminal. The terminal can be an interface that connects the flavor inhaler 100 to, for example, an external power source. In a case where the power source provided to the flavor inhaler 100 is a rechargeable battery, a current can be supplied from the external power source to the power source to recharge the power source by connecting the external power source to the terminal. Further, the flavor inhaler 100 may be configured in such a manner that data relating to the actuation of the flavor inhaler 100 can be transmitted to an external apparatus by connecting a data transmission cable to the terminal.

[0044] Next, the consumable used in the flavor inhaler 100 according to the present embodiment will be described. Fig. 2 is a schematic side cross-sectional view of the consumable 110. In the present embodiment, a smoking system can be constituted by the flavor inhaler 100 and the consumable 110. In the example illustrated in Fig. 2, the consumable 110 includes a smokable substance 111, a tubular member 114, a hollow filter unit 116, and a filter unit 115. The smokable substance 111 is wrapped with first rolling paper 112. The tubular member 114, the hollow filter unit 116, and the filter unit 115 are wrapped with second rolling paper 113 different from the first rolling paper 112. The second rolling paper 113 is also wrapped around a part of the first rolling paper 112 wrapped around the smokable substance 111. As a result, the tubular member 114, the hollow filter unit 116, and the filter unit 115, and the smokable substance 111 are joined with each other. However, the second rolling paper 113 may be omitted, and the tubular member 114, the hollow filter unit 116, and the filter unit 115, and the smokable substance 111 may be joined with each other using the first rolling paper 112. An opening hole V may be provided on the tubular member 114 and the second rolling paper 113 covering this tubular member 114. The opening hole V is normally a hole for promoting an inflow of air from outside that is generated due to the user's inhalation, and a component flowing in from the smokable substance 111 and the temperature of the air can be lowered with the aid of this inflow of the air. A lip release agent 117, which is used to make it difficult for the user's lip to stick to the second rolling paper 113, is applied to the outer surface near the end portion of the second rolling paper 113 on the filter unit 115 side. A portion of the consumable 110 to which the lip release agent 117 is applied functions as a mouthpiece of the consumable 110.

[0045] The smokable substance 111 can include the flavor source such as tobacco and the aerosol source. Further, the first rolling paper 112 wrapped around the smokable substance 111 can be a breathable sheet member. The tubular member 114 can be a paper tube or a hollow filter. The consumable 110 includes the smokable substance 111, the tubular member 114, the hollow filter unit 116, and the filter unit 115 in the illustrated example, but the configuration of the consumable 110 is not limited thereto. For example, the hollow filter unit 116 may be omitted, and the tubular member 114 and the filter unit 115 may be disposed adjacent to each other.

[0046] Next, the inner structure of the flavor inhaler 100

will be described. Fig. 3 is a cross-sectional view of the flavor inhaler 100 as viewed from arrows 3-3 illustrated in Fig. 1B. In Fig. 3, the slide cover 60 is located at the closing position. As illustrated in Fig. 3, an inner housing 10 (corresponding to one example of an inner member) is contained inside the outer housing 101 of the flavor inhaler 100. The inner housing 10 is made from, for example, resin, and, especially, can be made from polycarbonate (PC), ABS (Acrylonitrile-Butadiene-Styrene) resin, PEEK (polyetheretherketone), a polymer alloy containing a plurality of kinds of polymers, or the like, or metal such as aluminum. The inner housing 10 is preferably made from PEEK from viewpoints of heat resistance and strength. However, the material of the inner housing 10 is not especially limited. The power source unit 20 and the atomization unit 30 are provided in the inner space of the inner housing 10. Further, the outer housing 101 is made from, for example, resin, and, especially, can be made from polycarbonate (PC), ABS (Acrylonitrile-Butadiene-Styrene) resin, PEEK (polyetheretherketone), a polymer alloy containing a plurality of kinds of polymers, or the like, or metal such as aluminum.

[0047] The power source unit 20 includes a power source 21. The power source 21 can be, for example, a rechargeable battery or a non-rechargeable battery. The power source 21 is electrically connected to the atomization unit 30 via a not-illustrated PCB (Printed Circuit Board) or the like. Due to that, the power source 21 can supply power to the atomization unit 30 so as to appropriately heat the consumable 110.

[0048] As illustrated, the atomization unit 30 includes the chamber 50 extending in the insertion direction of the consumable 110 (the Z-axis direction), the heating unit 40 surrounding a part of the chamber 50, a heat insulation unit 32, and a substantially tubular insertion guide member 34 (corresponding to one example of a guide member). The chamber 50 is configured to contain the consumable 110. The chamber 50 is preferably made from a material heat-resisting and having a low coefficient of thermal expansion, and can be made from, for example, metal such as stainless steel, resin such as PEEK, glass, or ceramic. A bottom member 36 may be provided on the bottom portion of the chamber 50 as illustrated. The bottom member 36 can function as a stopper that positions the consumable 110 inserted in the chamber 50. The bottom member 36 has a recess/protrusion on a surface with which the consumable 110 is in abutment, and can define a space capable of supplying air to the surface with which the consumable 110 is in abutment. The bottom member 36 can be made from, for example, a resin material such as PEEK, metal, glass, or ceramic, but is not especially limited thereto. Further, the material for making the bottom member 36 may be a low thermally conductive member compared to the material for making the chamber 50. In a case where the bottom member 36 is joined with the bottom portion of the chamber 50, an adhesive that can be made from a resin material such as epoxy resin or an inorganic material can be used therefor.

[0049] The heating unit 40 is configured to heat the consumable 110 contained in the chamber 50 in contact with the outer peripheral surface of the chamber 50. More specifically, the heating unit 40 includes a heating element such as a heating track and an electric insulation sheet covering at least one surface of the heating element.

[0050] The heat insulation unit 32 is generally substantially tubular, and is disposed so as to surround the chamber 50. The heat insulation unit 32 can include, for example, an aerogel sheet. The insertion guide member 34 is made from a resin material such as PEEK, PC, or ABS, and is provided between the slide cover 60 located at the closing position and the chamber 50. Further, the flavor inhaler 100 includes a first holding unit 37 and a second holding unit 38 for holding the heat insulation unit 32. The first holding unit 37 and the second holding unit 38 can be made from, for example, elastomer such as silicone rubber. As illustrated in Fig. 3, the first holding unit 37 holds the end portion of the heat insulation unit 32 on the Z-axis positive direction side. Further, the second holding unit 38 holds the end portion of the heat insulation unit 32 on the Z-axis negative direction side.

[0051] The insertion guide member 34 has a function of guiding the insertion of the consumable 110. More specifically, when the slide cover 60 is located at the opening position, the insertion guide member 34 is in communication with the opening portion 101a of the flavor inhaler 100 illustrated in Fig. 1B, and guides insertion of the consumable 110 into the chamber 50 according to insertion of the consumable 110 into the insertion guide member 34. In the present embodiment, the insertion guide member 34 can contact the chamber 50, and therefore the insertion guide member 34 is preferably made from PEEK from a viewpoint of heat resistance.

[0052] The flavor inhaler 100 includes a first chassis 22 extending in the Z-axis direction between the power source 21 and the atomization unit 30, and a second chassis 23 extending so as to cover the slide cover 60 side of the power source 21. The first chassis 22 and the second chassis 23 are configured to define a space where the power source 21 is contained in the inner housing 10.

[0053] As illustrated in Fig. 3, the slide cover 60 is movable between the opening position and the closing position in a first direction D1. The slide cover 60 includes a first end portion 60a on a closer side to the insertion guide member 34 in the first direction D1, and a second end portion 60b on an opposite side from the first end portion 60a in the first direction D1. As illustrated in Fig. 7B that will be described below, the slide cover 60 preferably covers at least a part of the insertion guide member 34 when the slide cover 60 is located at the opening position. Due to this configuration, the flavor inhale 100 prevents the insertion guide member 34 from being completely exposed even when the slide cover 60 is located at the opening position, thereby being able to discourage the

user from accessing inside the main body 120, thereby deterring, for example, the component members of the main body 120 such as the insertion guide member 34 from being disassembled or the main body 120 from being altered.

[0054] The flavor inhaler 100 further includes a slider 64 coupled with the slide cover 60. The slider 64 can be attached slidably relative to a part of the inner housing 10 of the main body 120. Due to this configuration, the slide cover 60 coupled with the slider 64 is slidable along the outer surface of the outer housing 101 of the main body 120. The slide cover 60 can be fixed to the slider 64 using a screw 62. In the present embodiment, the slider 64 can be fixed to a part of the inner housing 10 via a spring 66. The spring 66 can be configured to bias the slider 64 to thus bias the slider cover 60 to the opening position or the closing position.

[0055] As described above, a foreign object such as dust may enter inside the flavor inhaler 100, more specifically, inside the chamber 50 via the opening portion 101a (refer to Fig. 1B) from a space between the slide cover 60 and the outer housing 101. Further, the presence of a relatively large space between the slide cover 60 and the outer housing 101, if any, may cause the slide cover 60 to rattle around the portion where the slide cover 60 is fixed via the screw 62. In light thereof, in the present embodiment, the flavor inhaler 100 includes a protrusion portion 12 between the slide cover 60 located at the closing position and the main body 120.

[0056] Fig. 4 is an external view of the flavor inhaler 100 near the protrusion portion 12. Fig. 5 is an external view of the flavor inhaler 100 near the protrusion portion 12 as viewed from the X-axis negative direction. Fig. 6 is an external perspective view of the flavor inhaler 100 with the slide cover 60 removed therefrom. As illustrated, the protrusion portion 12 slightly protrudes (toward the slide cover 60) outward from the outer housing 101 of the main body 120. In the present embodiment, the protrusion portion 12 is provided on the main body 120 so as to protrude from the main body 120 side, but is not limited thereto and may be provided on the surface of the slide cover 60 that faces the main body 120. Further, in the present embodiment, a space is formed between the protrusion portion 12 and the slide cover 60. In other words, the protrusion portion 12 is out of contact with the slide cover 60. More specifically, when the slide cover 60 is located at the closing position, a space is formed between the protrusion portion 12 and the slide cover 60. Due to the presence of the protrusion portion 12 between the slide cover 60 located at the closing position and the main body 120, the space between the slide cover 60 located at the closing position and the main body 120 can be narrowed. As a result, the entry of a foreign object into the opening portion 101a and the large rattling of the slide cover 60 can be blocked. Further, since the space is formed between the protrusion portion 12 and the slide cover 60 or the main body 120 on which the protrusion portion 12 is not provided, the interference of the protrusion portion 12 and the slide cover 60 or the main body 120 with each other can be prevented. More specifically, when the slide cover 60 is opened/closed, the sliding movement between the protrusion portion 12 and the slide cover 60 or the main body 120 can be prevented, and therefore the user can smoothly operate the slide cover 60.

[0057] In the present embodiment, the protrusion portion 12 and the slide cover 60 may slide on each other (contact each other) when the slide cover 60 is opened/closed. It is also conceivable to adjust the dimensions of the slide cover 60 and the outer housing 101 without providing the protrusion portion 12 to reduce the space between the slide cover 60 and the outer housing 101. In this case, when the slide cover 60 is moved, the slide cover 60 and the outer housing 101 may be in planar contact with each other, thereby hindering the opening/closing operation of the slide cover 60 and causing wear of the slide cover 60 and the outer housing 101. On the other hand, in the present embodiment, the space between the slide cover 60 and the main body 120 is narrowed with the aid of the protrusion portion 12, and therefore the contact area can be relatively reduced even when the protrusion portion 12 and the slide cover 60 or the outer housing 101 slide on each other. As a result, the deterioration of the opening/closing operation of the slide cover 60 and the wear of the slide cover 60 and the outer housing 101 can be curbed. However, preferably, the protrusion portion 12 is out of contact with the slide cover 60 or the main body 120 on which the protrusion portion 12 is not provided when the slide cover 60 is moved between the closing position and the opening position. Due to that, when the slide cover 60 is opened/closed, the protrusion portion 12 and the slide cover 60 or the main body 120 do not slide on each other, and therefore the user can further smoothly operate the slide cover 60.

[0058] The protrusion portion 12 can be provided between at least one of the first end portion 60a or the second end portion 60b of the slide cover 60 and the main body 120. In other words, the protrusion portion 12 may be provided between the first end portion 60a and the main body 120, may be provided between the second end portion 60b and the main body 120, or may be provided between each of the first end portion 60a and the second end portion 60b and the main body 120. In the present embodiment, the protrusion portion 12 is provided between the second end portion 60b of the slide cover 60 and the main body 120 as illustrated in Figs. 3 to 6. If the slide cover 60 rattles with the protrusion portion 12 ever provided between the central portion of the slide cover 60 (for example, near the screw 62) and the main body 120, the slide cover 60 may further rattle with the protrusion portion 12 serving as a pivot point. In the present embodiment, even when the slide cover 60 rattles, the rattling of the slide cover 60 can be efficiently restrained due to the protrusion portion 12 between at least one end portion of the slide cover 60 and the main

body 120. Further, since the protrusion portion 12 is present between at least one end portion of the slide cover 60 and the main body 120, the entry of a foreign object into between the slide cover 60 and the main body 120 can be blocked.

[0059] As illustrated in Figs. 3 to 6, the protrusion portion 12 is preferably constituted by a part of the inner housing 10. In other words, a part of the inner housing 10 can protrude from the outer housing 101 and the protrusion portion 12 can be formed by that. Due to this configuration, the protrusion portion 12 is made of a member different from the outer housing 101, which makes it possible to, for example, make the outer housing 101 from metal and make the protrusion portion 12 and the inner housing 10 from relatively easily workable resin or the like.

[0060] As illustrated in Figs. 5 and 6, the protrusion portion 12 is preferably an elongated protrusion portion extending in the Y-axis direction. More specifically, the protrusion portion 12 is preferably an elongated protrusion portion extending in a second direction D2 (the Y-axis direction) perpendicular to the first direction D1. Due to this configuration, the rattling can be restrained at the both end portions of the slide cover 60 in the second direction D2. For the protrusion portion 12, a shape designed so as not to interfere when the slide cover 60 is opened/closed can be appropriately employed according to the shape of the surface that faces the protrusion portion 12.

[0061] As illustrated in Figs. 4 and 5, the slide cover 60 preferably overlaps the protrusion portion 12 as viewed from the Z-axis direction (the insertion direction of the consumable 110) when the slide cover 60 is located at the closing position. Similarly, as illustrated in Fig. 7B that will be described below, the slide cover 60 preferably overlaps the protrusion portion 12 as viewed from the Z-axis direction (the insertion direction of the consumable 110) when the slide cover 60 is located at the opening position. Due to this configuration, the protrusion portion 12 is covered with the slide cover 60, and can be less visible from outside. Therefore, the designability of the flavor inhaler 100 can remain hardly affected by the protrusion portion 12. More specifically, in the present embodiment, the length of the protrusion portion 12 in the second direction D2 is shorter than the length of the slide cover 60 in the second direction D2 as illustrated in Fig. 5.

[0062] As illustrated in Fig. 6, the slide cover 60 preferably includes a first recessed portion 61 (corresponding to one example of a first portion) at a position that faces the protrusion portion 12 in the state of being located at the closing position. More specifically, in the present embodiment, the slide cover 60 includes a facing surface 60c that faces the main body 120. The first recessed portion 61 shaped in correspondence with the protrusion portion 12 can be formed on the facing surface 60c of the second end portion 60b of the slide cover 60. Due to this configuration, the sliding movement of the protrusion portion 12 provided on the main body 120 on the slide cover 60 can be further prevented when the slide cover 60 is moved from the closing position to the opening position, and therefore the user can smoothly operate the slide cover 60.

[0063] Fig. 7A is an enlarged view near the slide cover 60 of the flavor inhaler 100 illustrated in Fig. 3. Fig. 7B is an enlarged view near the slide cover 60 located at the opening position of the flavor inhaler 100. As illustrated in Figs. 6 and 7A, the slide cover 60 includes the first recessed portion 61 that faces the protrusion portion 12 in the insertion direction of the consumable 110 in the state of being located at the closing position. Further, as illustrated in Figs. 7A and 7B, the slide cover 60 includes a second recessed portion 63 (corresponding to one example of a second portion) that faces the protrusion portion 12 in the insertion direction of the consumable 110 in the state that the slide cover 60 is located at the opening position. As illustrated in Figs. 7A and 7B, the second recessed portion 63 is a recessed portion deeper than the first recessed portion 61, as a result of which, the thickness of the slide cover 60 at a portion corresponding to the second recessed portion 63 is thinner than the thickness of the slide cover 60 at a portion corresponding to the first recessed portion 61. Further, in the present embodiment, the second recessed portion 63 is disposed adjacent to the first recessed portion 61, and can be located on the surface of the slide cover 60 that faces the main body 120 between the first recessed portion 61 and the screw 62.

[0064] As illustrated in Figs. 7A and 7B, preferably, the distance between the first recessed portion 61 and the protrusion portion 12 in the state that the slide cover 60 is located at the closing position is shorter than the distance between the second recessed portion 63 and the protrusion portion 12 in the state that the slide cover 60 is located at the opening position. Due to this configuration, in the state that the slide cover 60 is located at the closing position, the space between the first recessed portion 61 and the protrusion portion 12 is relatively small, and therefore the large rattling of the slide cover 60 can be restrained. On the other hand, the space between the second recessed portion 63 and the protrusion portion 12 is relatively large in the state that the slide cover 60 is located at the opening position. Therefore, the interference of the slide cover 60 and the protrusion portion 12 with each other can be prevented, and the friction can be reduced between the slide cover 60 and the protrusion portion 12 when the slide cover 60 is moved from the closing position to the opening position.

[0065] Fig. 8 is a perspective view of the slider 64 as viewed from inside the main body 120. Fig. 9 is a schematic view illustrating how the spring 66 is attached. Fig. 10 is an enlarged cross-sectional perspective view of the slider 64. As illustrated in Fig. 8, the slider 64 includes a slider main body 64c and a coupling pin 64a (corresponding to one example of a first coupling portion) extending from the slider main body 64c. The coupling pin 64a extends toward the opposite side from the coupling side

with the slide cover 60. Further, a first flange portion 64b is provided to the coupling pin 64a on a part of the outer peripheral surface thereof. The first flange portion 64b can also be said to be a portion formed on the distal end side of the coupling pin 64a and protruding from the outer peripheral surface of the coupling pin 64a. The first flange portion 64b is not formed over the entire circumference of the outer peripheral surface of the coupling pin 64a, and is formed on only a part of the outer peripheral surface thereof. More specifically, for example, the first flange portion 64b can be formed along a half of the circumference of the outer peripheral surface of the coupling pin 64a. Further, the inner housing 10 includes a coupling pin 14 (corresponding to one example of a second coupling portion) for coupling with the spring 66. A second flange portion 64b is provided to the coupling pin 14 on a part of the outer peripheral surface thereof. The second flange portion 14a can also be said to be a portion formed on the distal end side of the coupling pin 14 and protruding from the outer peripheral surface of the coupling pin 14. The second flange portion 14a is not formed over the entire circumference of the outer peripheral surface of the coupling pin 14, and is formed on only a part of the outer peripheral surface thereof. More specifically, for example, the second flange portion 14a can be formed along a half of the circumference of the outer peripheral surface of the coupling pin 14.

[0066] The spring 66 is a so-called torsion spring including a coil portion 66a, a first arm 66b, and a second arm 66d. The first arm 66b extends from one end of the coil portion 66a, and the second arm 66d extends from the other end of the coil portion 66a. A first wound portion 66c, which is wound around the coupling pin 64a, is formed at the distal end of the first arm 66b. More specifically, the first wound portion 66c is wound around the coupling pin 64a between the slider main body 64c and the first flange portion 64b. A second wound portion 66e, which is wound around the coupling pin 14, can be formed at the distal end of the second arm 66d. More specifically, the second wound portion 66e is wound around the coupling pin 14 between the inner housing 10 and the second flange portion 14a.

[0067] The provision of the first flange portion 64b over the entire circumference of the outer peripheral surface of the coupling pin 64a makes it difficult to fit the first wound portion 66c to the coupling pin 64a. On the other hand, in the present embodiment, the first flange portion 64b is provided on a part of the outer peripheral surface of the coupling pin 64a, and therefore the first wound portion 66c can be easily engaged with the coupling pin 64a compared to a configuration in which the flange portion is provided over the entire circumference of the outer peripheral surface of the coupling pin 64a. Similarly, in the present embodiment, the second flange portion 14a is provided on a part of the outer peripheral surface of the coupling pin 14, and therefore the second wound portion 66e can be easily engaged with the coupling pin 14 compared to a configuration in which the flange portion is provided over the entire circumference of the outer peripheral surface of the coupling pin 14.

[0068] Fig. 9 illustrates the shapes of the spring 66 when the slide cover 60 is located at a closing position P1, an opening position P2, and an intermediate position P3 between the closing position P1 and the opening position P2, respectively. Each of the distance between the closing position P1 and the intermediate position P3, and the distance between the opening position P2 and the intermediate position P3 is a distance L1. Further, the centers of the coil portion 66a when the slide cover 60 is located at the closing position P1, the intermediate position P3, and the opening position P2 are indicated as a position Oi, a position O_2, and a position Os, respectively.

[0069] As illustrated in Fig. 9, when the slide cover 60 is located at the closing position P1 and the opening position P2, the first arm 66b preferably overlaps the first flange portion 64b as viewed from an extension direction of the coupling pin 64a. Due to this configuration, the first arm 66b constantly overlaps the first flange portion 64b when the slide cover 60 is moved between the opening position P2 and the closing position P1, and this can make it difficult for the spring 66 to be detached from the coupling pin 64a. Further, as illustrated in Fig. 9, when the slide cover 60 is located at the closing position P1 and the opening position P2, the second arm 66d preferably overlaps the second flange portion 14a as viewed from an extension direction of the coupling pin 14. Due to this configuration, the second arm 66d constantly overlaps the second flange portion 14a when the slide cover 60 is moved between the opening position P2 and the closing position P1, and this can make it difficult for the spring 66 to be detached from the coupling pin 14.

[0070] Further, as illustrated in Fig. 9, preferably, the first flange portion 64b and the second flange portion 14a are provided on the coupling pin 64a and the coupling pin 14, respectively, in such a manner that the first flange portion 64b and the second flange portion 14a face each other when the slide cover 60 is located at the intermediate position P3. This causes the first arm 66b and the second arm 66d to be located between the coupling pin 64a and the coupling pin 14 when the first arm 66b and the second arm 66d overlap the first flange portion 64b and the second flange portion 14a, respectively. In this case, when the slide cover 60 is moved between the closing position P1 and the opening position P2, the first arm 66b and the second arm 66d can apply a stress to the coupling pin 64a and the coupling pin 14. This leads to application of almost no force derived from the spring 66 from the coupling pin 64a and the coupling pin 14 to the first wound portion 66c and the second wound portion 66e, thereby being able to make it unlikely for the first wound portion 66c and the second wound portion 66e to be broken and for the spring 66 to be detached from the coupling pin 64a and the coupling pin 14.

[0071] As illustrated in Fig. 10, a magnet 72 is provided on the slider 64. Further, a Hall sensor 71 is provided on the surface of the second chassis 23 on the slider 64

side. The Hall sensor 71 is configured to detect a magnetic field of the magnet 72. Due to this configuration, the opening/closing state of the slide cover 60 can be detected by the Hall sensor 71. More specifically, for example, when the slide cover 60 is located at the closing position or the opening position, the Hall sensor 71 detects the magnetic field of the magnet 72, and converts this magnetic field into an electric signal and outputs it to the not-illustrated PCB. The not-illustrated PCB can control power fed from the power source 21 so as not to supply power to the heating unit 40 assuming that the slide cover 60 is located at the closing position or the opening position when receiving this electric signal. In the present embodiment, the Hall sensor 71 detects the magnetic field of the magnet 72 when the slide cover 60 is located at the opening position, and the flavor inhaler 100 transitions to a state of permitting power supply from the power source 21 to the heating unit 40 according to an operation performed on the switch unit 103. On the other hand, the flavor inhaler 100 is configured not to permit power supply from the power source 21 to the heating unit 40 even when the switch unit 103 is operated, when the slide cover 60 is located at the closing position.

[0072] The material of the spring 66 can be selected from a metallic wire, such as a piano wire, a copper wire, or austenitic stainless steel, in consideration of a lifetime characteristic. Among them, the spring 66 is preferably made from a non-magnetic material such as austenitic stainless steel. Due to that, the magnetization of the spring 66 by the magnet 72 is avoided, and the Hall sensor 71 can be prevented from detecting a magnetic field of the magnetized spring 66. As a result, the occurrence of erroneous detection of the opening/closing state of the slide cover 60 can be reduced.

[0073] Preferably, the height of the space inside the flavor inhaler 100 where the spring 66 is disposed is not more than twice the thickness of the spring 66. Then, the height of the space where the spring 66 is disposed can refer to the width (the length) of the space in the axial direction of the central axis of the coil portion 66a of the spring 66. Alternatively, the height of the space where the spring 66 is disposed may refer to the width (the length) of the space in the axial direction of the coupling pin 14 or the coupling pin 64a or the width (the length) of the space in the axial direction of the central axis of the circle of the first wound portion 66c or the second wound portion 66e. Further, the thickness of the spring 66 can refer to the length (the thickness) of the spring 66 in the axial direction of the central axis of the coil portion 66a. Since the space where the spring 66 is disposed is limited in this manner, the movable range of the spring 66 in the thickness direction (the axial direction of the central axis of the coil portion 66a) is limited and therefore the spring 66 can be further reliably prevented from being detached.

[0074] Having described the embodiment of the present invention, the present invention shall not be limited to the above-described embodiment, and can be modified in various manners within the scope of the technical idea disclosed in the claims, specification, and drawings. Note that any shape and material not directly described or illustrated in the specification and drawings are still within the scope of the technical idea of the present invention insofar as they allow the present invention to achieve the actions and effects thereof.

REFERENCE SIGNS LIST

[0075]

10	inner housing
12	protrusion portion
14	second coupling pin
14a	second flange portion
34	insertion guide member
60	slide cover
60a	first end portion
60b	second end portion
60c	facing surface
61	first recessed portion
63	second recessed portion
64	slider
64a	first coupling pin
64b	first flange portion
64c	slider main body
66	spring
66a	coil portion
66b	first arm
66c	first wound portion
66d	second arm
66e	second wound portion
71	Hall sensor
72	magnet
100	flavor inhaler
101	outer housing
101a	opening portion
110	consumable
120	main body
D1	first direction
D2	second direction
P1	closing position
P2	opening position
P3	intermediate position

Claims

1. A flavor inhaler capable of heating a consumable, the flavor inhaler comprising:

a main body including an opening portion in which the consumable is inserted;

a cover unit movable between a closing position, at which the cover unit closes the opening portion, and an opening position, at which the cover unit opens the opening portion; and

a protrusion portion provided between the cover unit located at the closing position and the main body,
wherein the protrusion portion is provided on the cover unit or the main body, and
wherein a space is formed between the protrusion portion and the cover unit or the main body on which the protrusion portion is not provided.

2. The flavor inhaler according to claim 1, wherein the protrusion portion is out of contact with the cover unit or the main body on which the protrusion portion is not provided when the cover unit is moved between the closing position and the opening position.

3. The flavor inhaler according to claim 1 or 2, wherein the cover unit is movable between the opening position and the closing position in a first direction, and wherein the protrusion portion is provided between at least one of both end portions of the cover unit located at the closing position in the first direction and the main body.

4. The flavor inhaler according to any one of claims 1 to 3, wherein the protrusion portion is provided on the main body, and
wherein the cover unit includes a recessed portion at a position that faces the protrusion portion in a state of being located at the closing position.

5. The flavor inhaler according to any one of claims 1 to 4, wherein the main body includes an outer housing and an inner member contained in the outer housing, and
wherein the protrusion portion is constituted by a part of the inner member exposed from the outer housing to outside.

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

a slider coupled with the cover unit; and
a spring configured to bias the slider to thus bias the cover unit to the opening position or the closing position.

7. The flavor inhaler according to claim 6, further comprising:

a magnet provided to the slider; and
a Hall sensor configured to detect a magnetic field of the magnet when the cover unit is located at the opening position or the closing position.

8. The flavor inhaler according to claim 6 or 7, wherein the spring is made from a non-magnetic material.

9. The flavor inhaler according to any one of claims 1 to 8, wherein the main body includes a guide member configured to guide the insertion of the consumable, and
wherein the cover unit located at the opening position covers at least a part of the guide member.

10. The flavor inhaler according to any one of claims 1 to 9, wherein the cover unit is slidable relative to the main body in the first direction, and
wherein the protrusion portion is an elongated protrusion portion extending in a second direction perpendicular to the first direction.

11. The flavor inhaler according to any one of claims 1 to 10, wherein the protrusion portion is provided on the main body,

wherein the cover unit includes a first portion that faces the protrusion portion in the state of being located at the closing position, and a second portion that faces the protrusion portion in a state of being located at the opening position, and
wherein a distance between the first portion and the protrusion portion in the state that the cover unit is located at the closing position is shorter than a distance between the second portion and the protrusion portion in the state that the cover unit is located at the opening position.

12. The flavor inhaler according to any one of claims 1 to 11, wherein the cover unit overlaps the protrusion portion as viewed from an insertion direction of the consumable when the cover unit is located at the opening position or the closing position.

13. A flavor inhaler capable of heating a consumable, the flavor inhaler comprising:

an opening portion in which the consumable is inserted;
a cover unit movable between a closing position, at which the cover unit closes the opening portion, and an opening position, at which the cover unit opens the opening portion;
a slider coupled with the cover unit; and
a spring configured to bias the slider to thus bias the cover unit to the opening position or the closing position,
wherein the slider includes a slider main body, a first coupling portion extending from the slider main body, and a first flange portion provided on a part of an outer peripheral surface of the first coupling portion,
wherein the spring includes a coil portion, a first arm extending from the coil portion, and a first wound portion formed on one end of the first arm and wound around the first coupling portion, and

wherein the first arm overlaps the first flange portion as viewed from an extension direction of the first coupling portion when the cover unit is located at the opening position or the closing position.

14. The flavor inhaler according to claim 13, wherein the spring includes a second arm extending from the coil portion and a second wound portion formed at one end of the second arm,

wherein the flavor inhaler includes a second coupling portion around which the second wound portion is wound, and a second flange portion provided on a part of an outer peripheral surface of the second coupling portion, and
wherein the second arm overlaps the second flange portion as viewed from an extension direction of the second coupling portion when the cover unit is located at the opening position or the closing position.

15. The flavor inhaler according to claim 14, wherein the first flange portion and the second flange portion are provided on the first coupling portion and the second coupling portion, respectively, in such a manner that the first flange portion and the second flange portion face each other when the cover unit is located at an intermediate position between the opening position and the closing position.

Fig. 1A

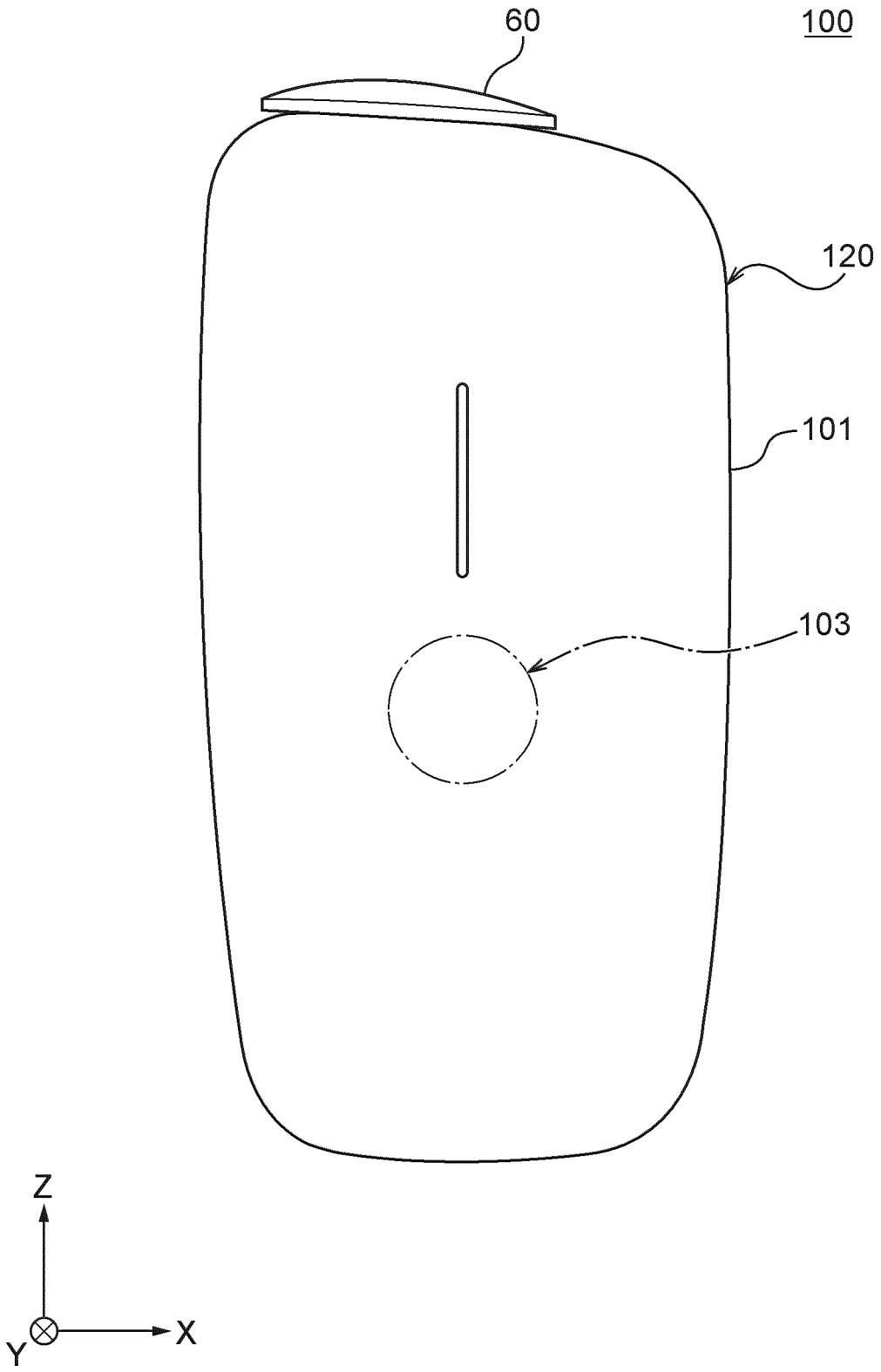


Fig. 1B

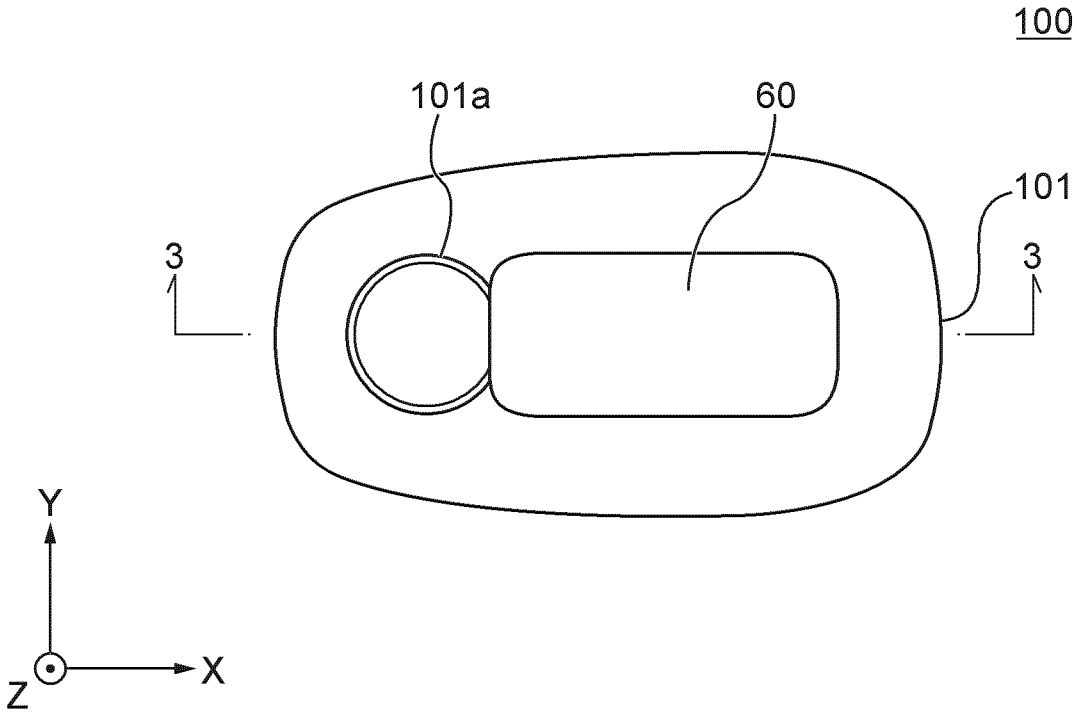
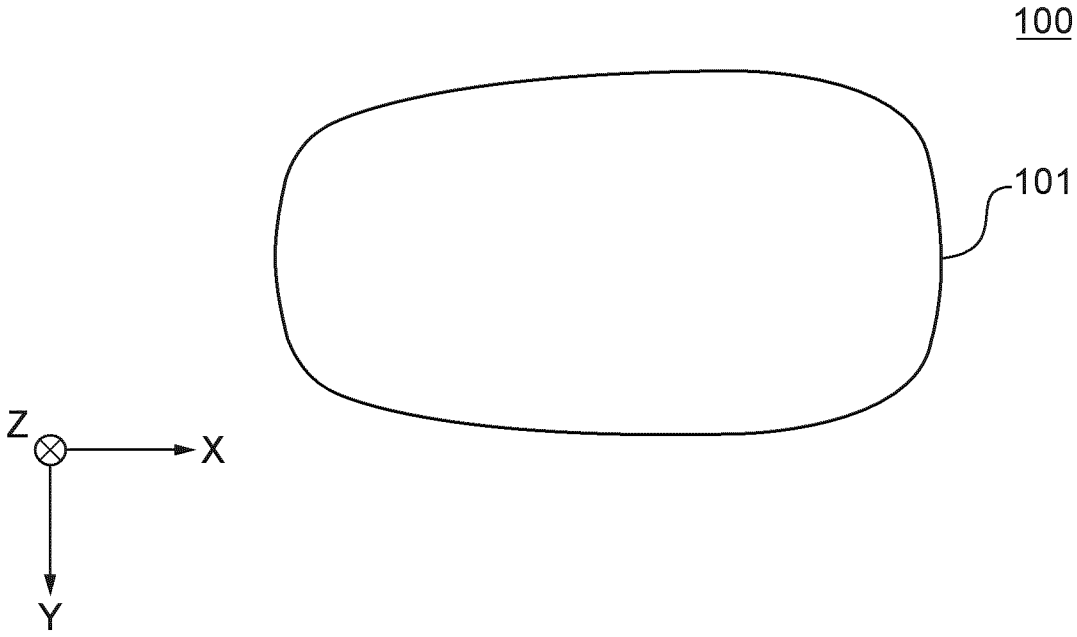


Fig. 1C



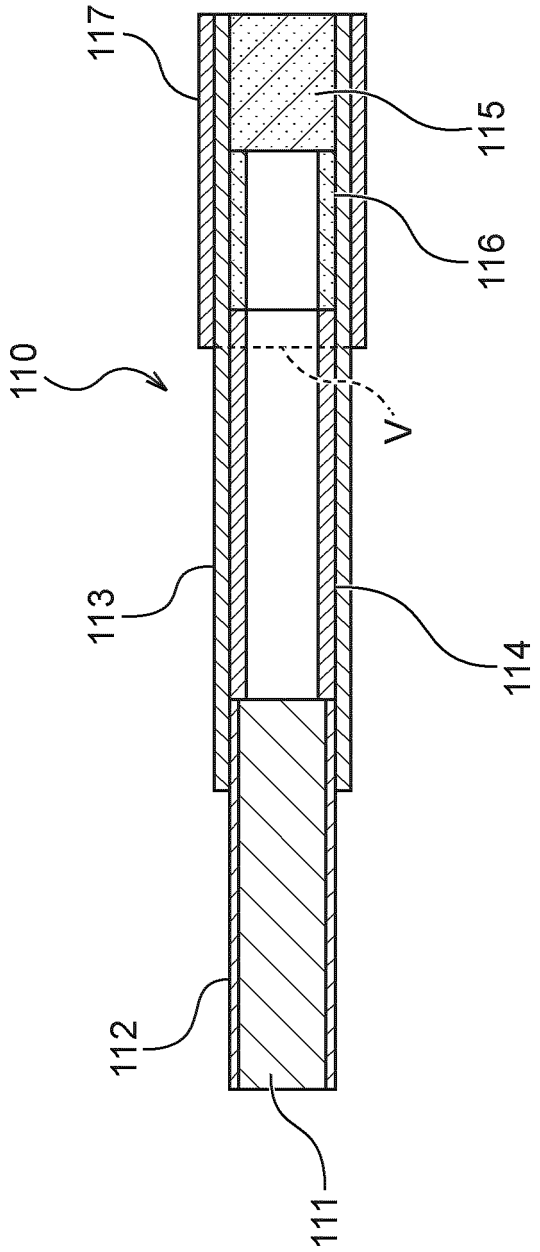


Fig. 2

Fig. 3

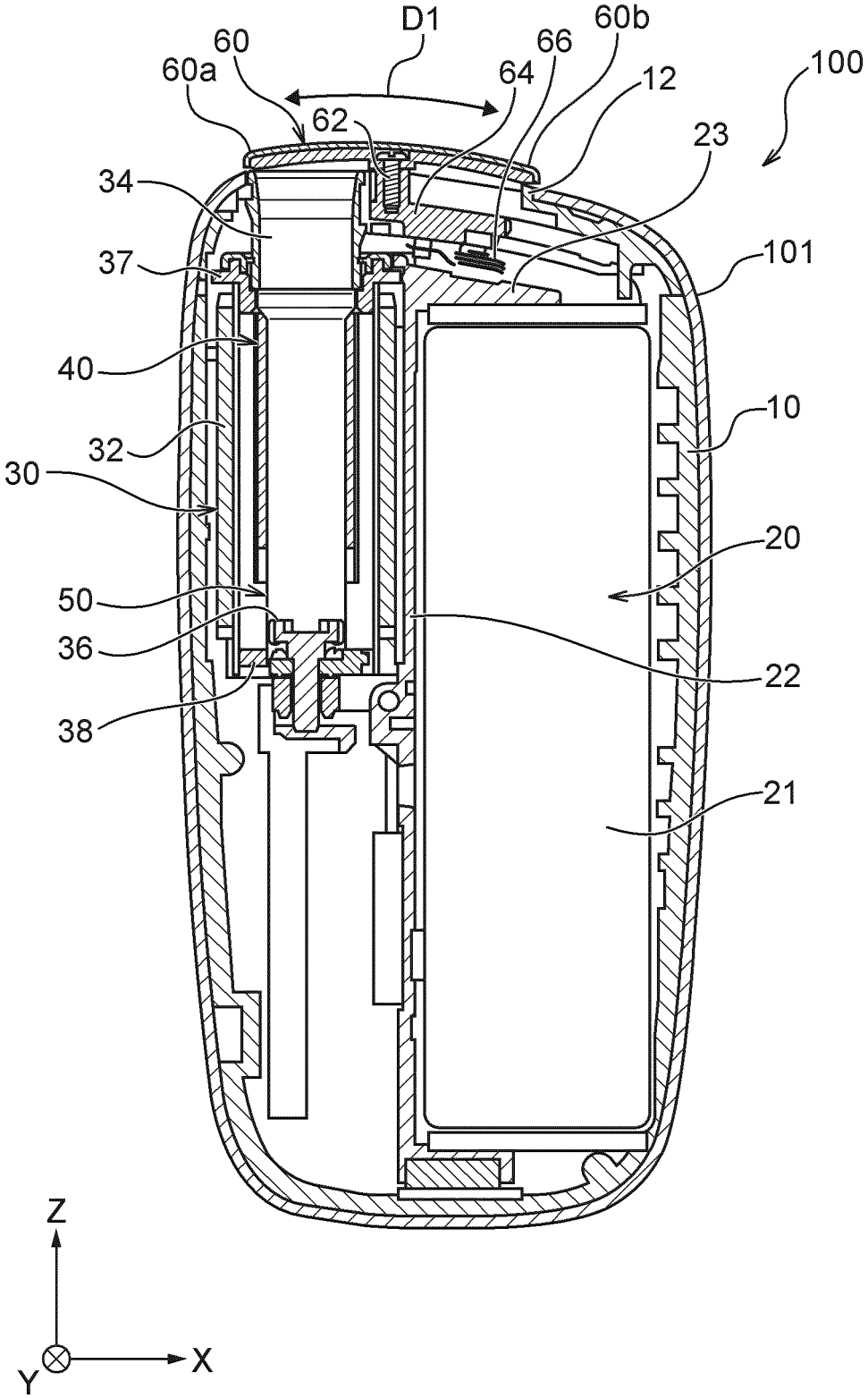

D1
60
60a
60b
66
64
12
100
62
23
34
37
101
40
10
32
30
20
50
36
22
38
21
Z
X
Y

Fig. 4

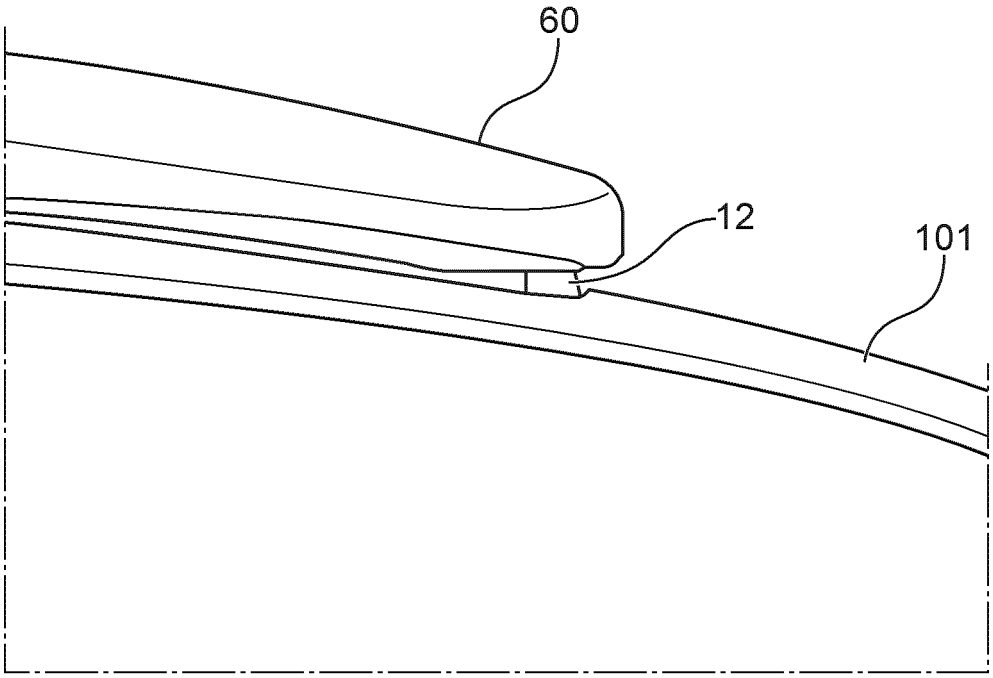


Fig. 5

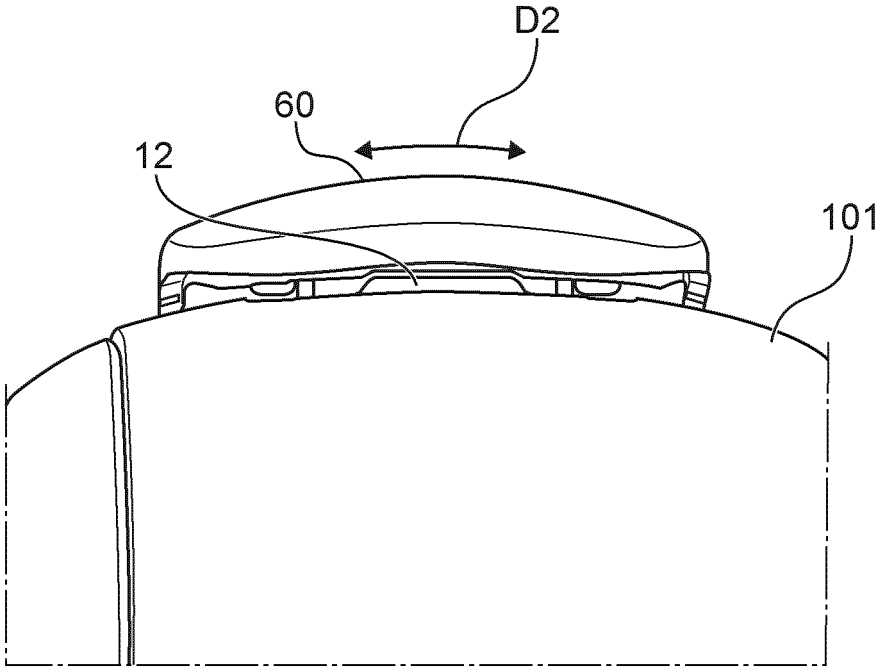


Fig. 6

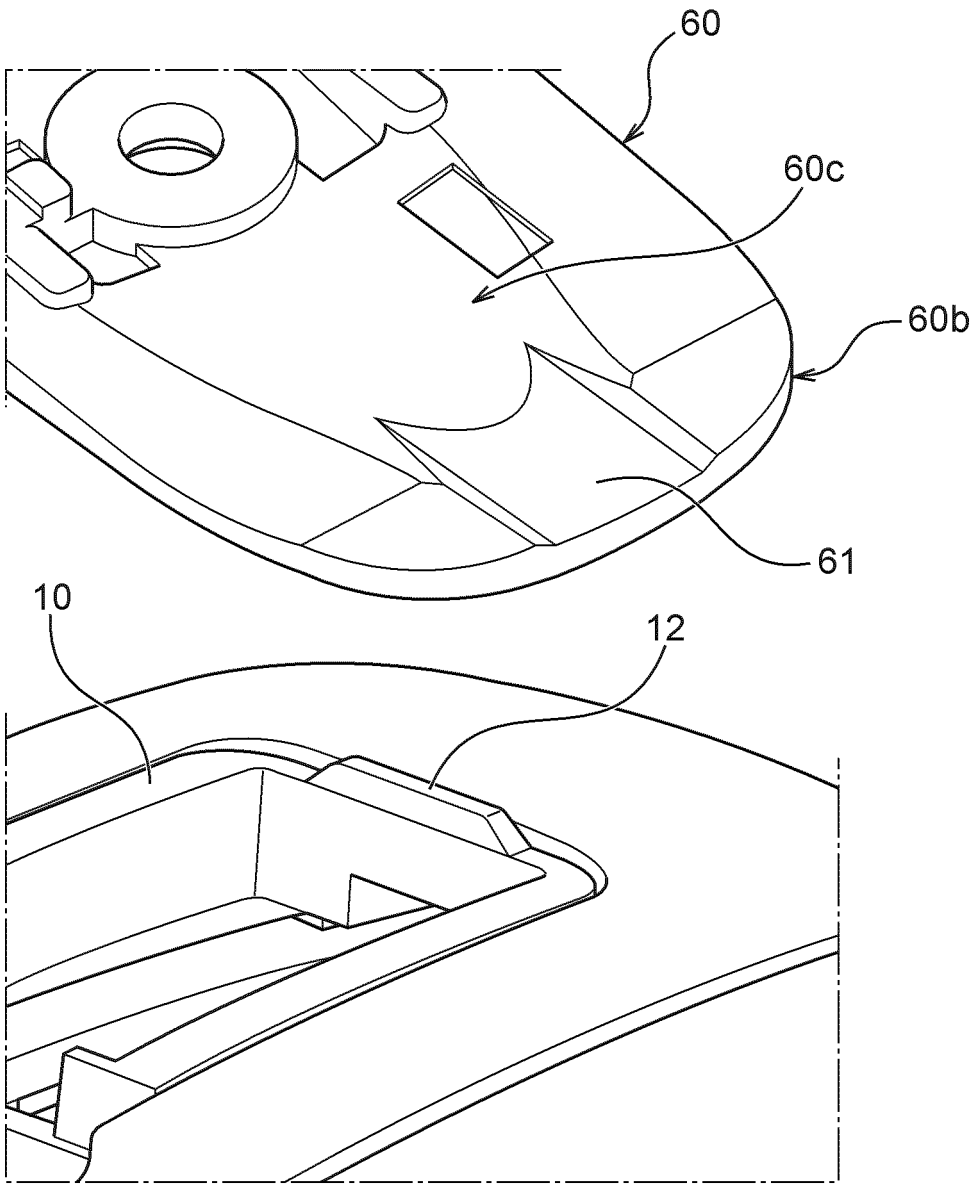


Fig. 7A

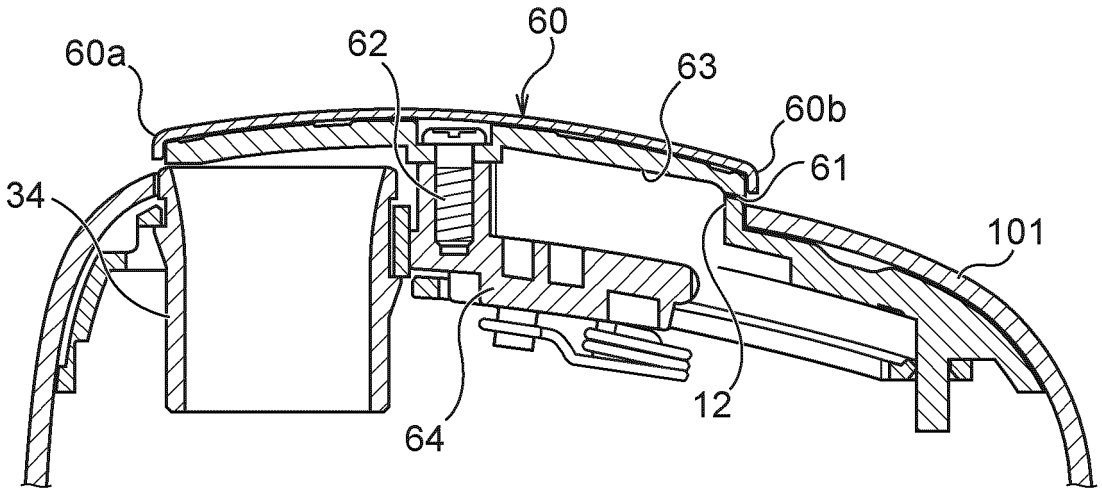


Fig. 7B

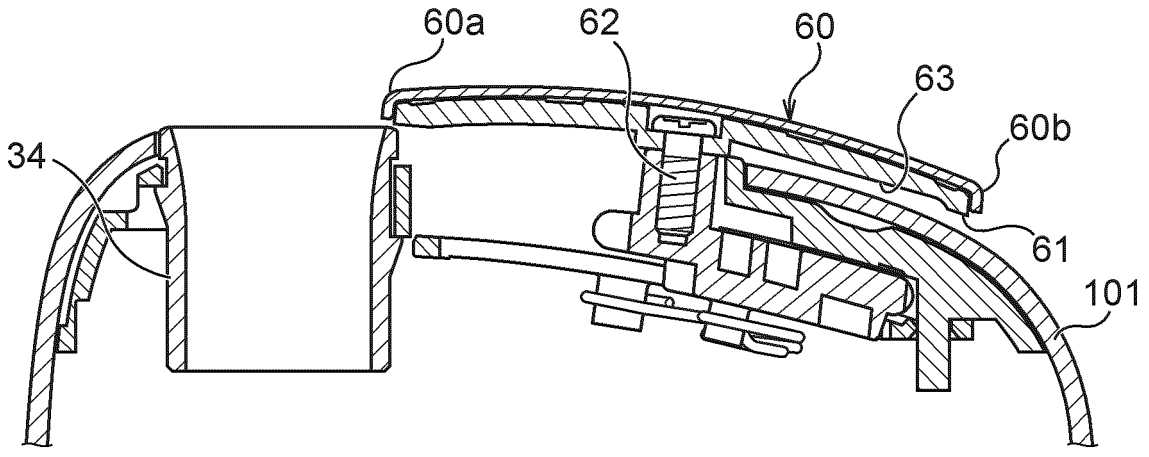


Fig. 8

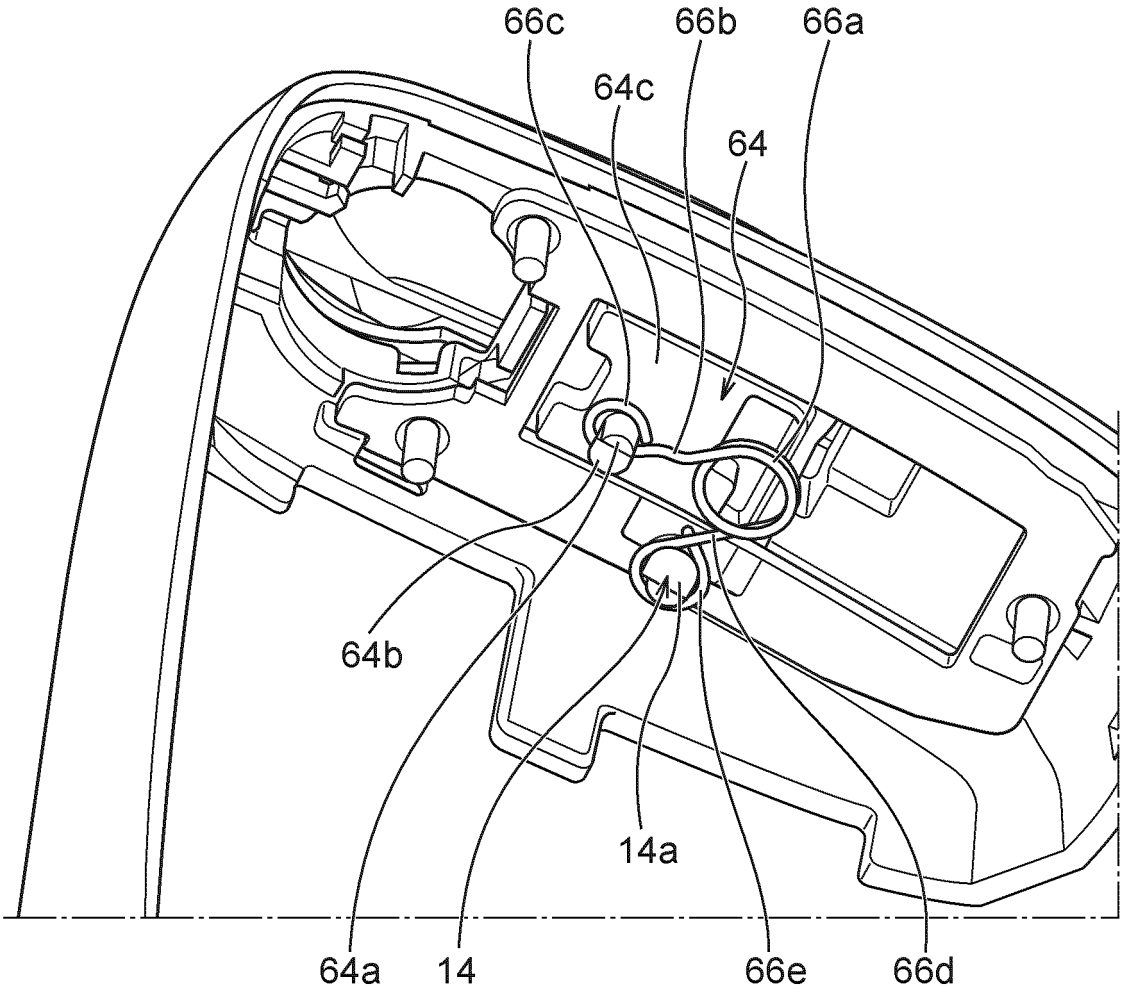


Fig. 9

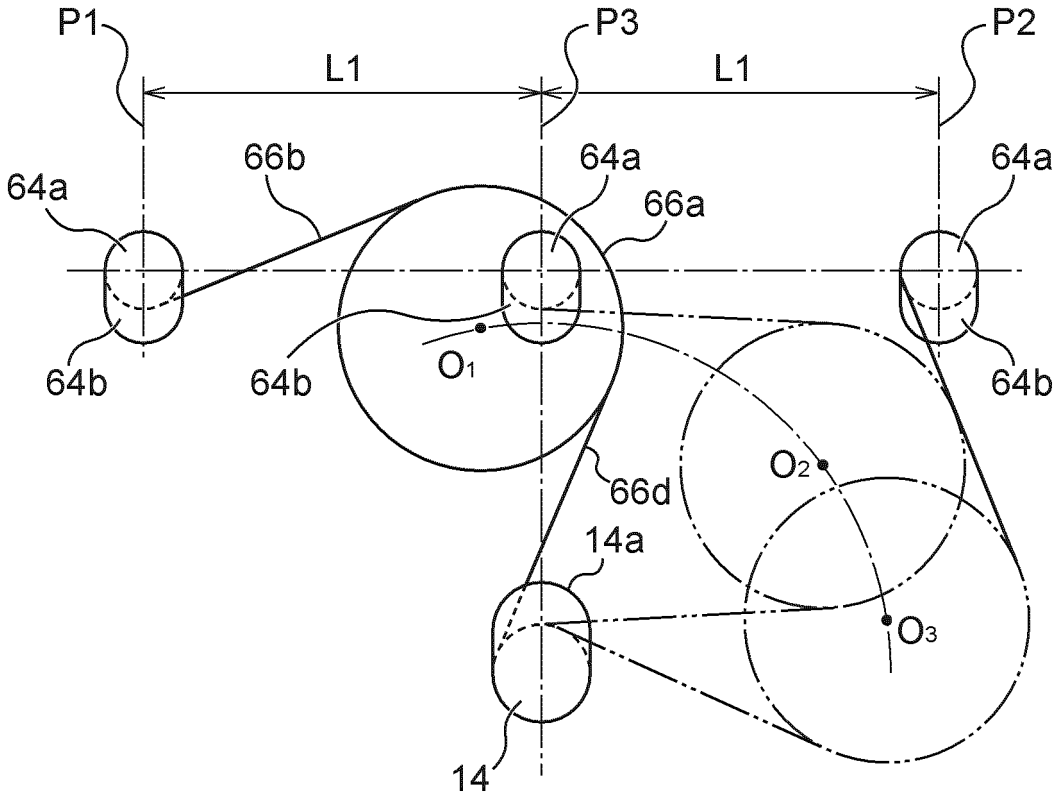
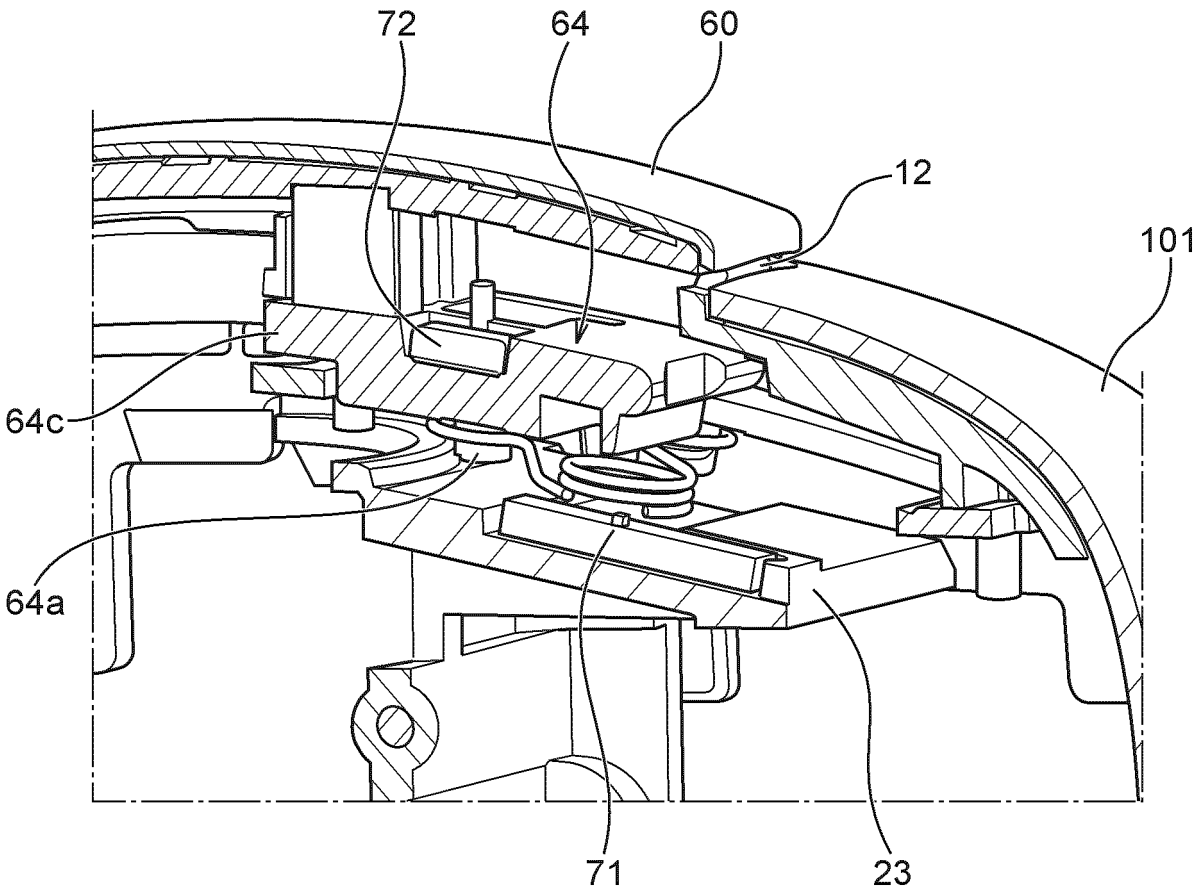


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/014596

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 - 47/00, A61M15/06

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	JP 2012-527222 A (PHILIP MORRIS PRODUCTS S.A) 08 November 2012 (2012-11-08) in particular, see claim 1, paragraphs [0046]-[0050], fig. 1a-1b	1-3, 5
Y	in particular, see claim 1, paragraphs [0046]-[0050], fig. 1a-1b	1-4
A	entire text, all drawings	6-12
Y	JP 2017-533717 A (JT INTERNATIONAL SA) 16 November 2017 (2017-11-16) in particular, see fig. 4	1-4
A	entire text, all drawings	5-12
X	JP 2020-14433 A (NIDEC COPAL CORP) 30 January 2020 (2020-01-30) in particular, see paragraphs [0019], [0028]-[0047], fig. 1-10	13-14
A	entire text, all drawings	15
A	JP 2021-45105 A (NIDEC COPAL CORP) 25 March 2021 (2021-03-25) entire text, all drawings	1-12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
08 June 2021 (08.06.2021)	15 June 2021 (15.06.2021)

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

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/014596

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2012-527222 A	08 Nov. 2012	US 2010/0313901 A1 in particular, see claim 1, paragraphs [0051]-[0055], fig. 1A-1B WO 2010/133342 A1 EP 2253233 A1 CN 102438470 A KR 10-2015-0058569 A	
JP 2017-533717 A	16 Nov. 2017	US 2017/0334605 A1 in particular, see fig. 4 WO 2016/075028 A1 KR 10-2017-0083614 A CN 107105767 A	
JP 2002-14433 A	30 Jan. 2020	(Family: none)	
JP 2021-45105 A	25 Mar. 2021	(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

- JP 2020014433 A **[0003]**