



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

(43) Date of publication:
12.01.2022 Bulletin 2022/02

(51) Int Cl.:
A24F 47/00 (2020.01)

(21) Application number: **19918853.3**

(86) International application number:
PCT/JP2019/009303

(22) Date of filing: **08.03.2019**

(87) International publication number:
WO 2020/183520 (17.09.2020 Gazette 2020/38)

(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

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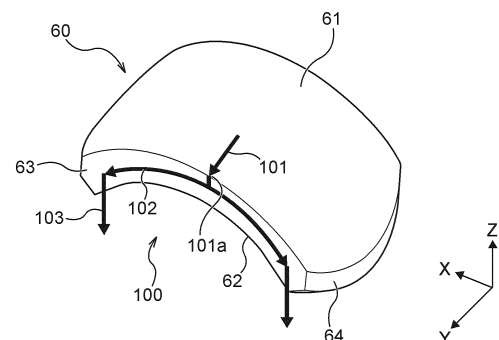
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(54) **INHALATION DEVICE CARTRIDGE AND INHALATION DEVICE EQUIPPED WITH SAME**

(57) Provided is an inhalation device cartridge. The inhalation device cartridge comprises a liquid storage portion configured to store liquid, an atomizing portion configured to atomize the liquid, a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomizing portion, and a gas introducing passage configured to introduce gas into the liquid storage portion. The liquid transporting member includes a first surface and a second surface intersecting with each other. The gas introducing passage includes a first portion extending along the first surface of the liquid transporting member and a second portion communicating with the first portion and extending along the second surface.

Fig. 8



Description

TECHNICAL FIELD

[0001] The invention relates to inhalation device cartridges and inhalation devices equipped with same.

BACKGROUND ART

[0002] Flavor inhalation devices for inhaling flavors without material burning have been conventionally known. Known as such flavor inhalation devices are, for example, liquid heating-type inhalation devices. The liquid heating-type inhalation devices supply users' mouths with aerosol that is generated by atomizing a flavor-containing aerosol producing material, such as nicotine, or allow aerosol that is generated by atomizing a non-flavor-containing aerosol producing material, such as nicotine, to pass through a flavor source (for example, a tobacco source) and then supply the aerosol to users' mouths.

[0003] Some liquid heating-type inhalation devices comprise a tank or a reservoir that stores liquid for generating aerosol, and a heater that atomizes the liquid. Some of such inhalation devices include an atomizer assembly that is formed by winding a coilshaped heater around a wick that is fluidly connected to a tank (see Patent Literature 1, for example).

CITATION LIST

PATENT LITERATURE

[0004] PTL 1: U.S. Patent No. 8,528,569

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] An object of the invention is to provide an inhalation device cartridge and an inhalation device which have novel structures.

SOLUTION TO PROBLEM

[0006] One embodiment of the invention provides an inhalation device cartridge. This inhalation device cartridge comprises a liquid storage portion configured to store liquid, an atomizing portion configured to atomize the liquid, a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomizing portion, and a gas introducing passage configured to introduce gas into the liquid storage portion. The liquid transporting member includes a first surface and a second surface which intersect with each other. The gas introducing passage includes a first portion extending along the first surface of the liquid transporting member and a second portion communicating with the first portion and extending along the second sur-

face.

[0007] Another embodiment of the invention provides an inhalation device equipped with the above-mentioned inhalation device cartridge.

BRIEF DESCRIPTION OF DRAWINGS

[0008]

Fig. 1 is a perspective view of an entire inhalation device according to the present embodiment.

Fig. 2 is a perspective view of a cartridge.

Fig. 3 is a perspective view of the cartridge.

Fig. 4 is a sectional view of the cartridge shown in Fig. 3 taken along an X-axis.

Fig. 5 is a sectional view of the cartridge shown in Fig. 3 taken along a Y-axis.

Fig. 6 is a sectional view selectively showing a cartridge body of the cartridge shown in Fig. 5 taken along a VI - VI line as viewed in an arrow direction.

Fig. 7 is a sectional enlarged perspective view of a distal end side of the cartridge shown in Fig. 4.

Fig. 8 is a perspective view showing a gas introducing passage formed in the cartridge together with a liquid transporting member.

Fig. 9 is a perspective view selectively showing the liquid transporting member and a first retaining member of the cartridge.

Fig. 10 is a perspective view selectively showing the first retaining member of the cartridge.

Fig. 11 is a perspective view selectively showing a second retaining member and the liquid transporting member of the cartridge.

Fig. 12 is a perspective view selectively showing the second retaining member of the cartridge.

Fig. 13 is a perspective view selectively showing the second retaining member of the cartridge.

DESCRIPTION OF EMBODIMENTS

[0009] Embodiments of the invention will be discussed below with reference to the attached drawings. In the drawings discussed below, similar or corresponding constituent elements are provided with the same reference signs, and overlapping explanations will be omitted.

[0010] Fig. 1 is a perspective view of an entire inhalation device according to the present embodiment. As illustrated in Fig. 1, the inhalation device 10 includes a mouthpiece 11, a cartridge 20 (which is an example of an inhalation device cartridge), and a battery portion 12. The cartridge 20 atomizes a liquid containing an aerosol producing material, such as glycerin and propylene glycol, and supplies the atomized aerosol to the mouthpiece 11. The aerosol producing material may contain, for example, nicotine or the like.

[0011] The battery portion 12 supplies electric power to the cartridge 20. The mouthpiece 11 guides the aerosol generated in the cartridge 20 to a user's mouth. After the

inhalation device 10 is used for a predetermined period of time, the mouthpiece 11 and the cartridge 20 can be replaced. The battery portion 12, however, can be used more than once. It is possible to replace only the cartridge 20 without replacing the mouthpiece 11.

[0012] The present embodiment is discussed on the premise that the inhalation device 10 is provided with the cartridge 20 that is replaceable. However, the inhalation device 10 does not have to be thus configured and may be a single-use product fabricated by integrating a component that will be explained below as the cartridge 20 with the battery portion 12. The present embodiment is further discussed on the premise that the inhalation device 10 is provided with the mouthpiece 11. The inhalation device 10, however, does not have to be configured that way. Although, according to the present embodiment, the cartridge 20 and the mouthpiece 11 are configured as separate members, the cartridge 20 and the mouthpiece 11 may be formed integrally.

[0013] The cartridge 20 illustrated in Fig. 1 will be now discussed. Figs. 2 and 3 are perspective views of the cartridge 20. Fig. 4 is a sectional view of the cartridge 20 shown in Fig. 3 taken along an X-axis. Fig. 5 is a sectional view of the cartridge 20 shown in Fig. 3 taken along a Y-axis. Fig. 6 is a sectional view selectively showing a cartridge body of the cartridge shown in Fig. 5 taken along a VI - VI line as viewed in an arrow direction. Fig. 7 is a sectional enlarged perspective view of a distal end side of the cartridge 20 shown in Fig. 4.

[0014] In Figs. 2 to 5, the cartridge 20 includes a proximal end 21 and a distal end 22. The proximal end 21 is an end portion located close to the mouthpiece 11 shown in Fig. 1, that is, closer to the user's mouth than the distal end 22 while the inhalation device 10 is being used by the user. The distal end 22 is an end portion located close to the battery portion 12, that is, farther from the user's mouth than the proximal end 21 while the inhalation device 10 is being used by the user.

[0015] According to the present embodiment, for the sake of convenience, a direction connecting the proximal end 21 and the distal end 22, that is, a longitudinal direction of the cartridge 20 (vertical direction on Figs. 2 to 5) is referred to as a Z-axis direction. One of two directions intersecting with the Z-axis direction, which is a direction in which a pair of electrodes 82 mentioned later is arranged (horizontal direction on Fig. 4), is referred to as an X-axis direction. The other of the two directions, which is a direction intersecting with both the Z- and Y-axis directions (horizontal direction on Fig. 5) is referred to as a Y-axis direction.

[0016] The cartridge 20 is provided with a substantially cylindrical cartridge body 30, a proximal end-side end wall 40, a liquid transporting member 60, an atomization unit 80, and a distal end-side end portion 90. The proximal end-side end wall 40 is a ring-like member with a center hole functioning as an aerosol outlet 41. The distal end-side end portion 90 is a cap-like member including an end wall 90a and a circumferential wall 90b. The cartridge

20 is further provided with a second retaining member 50 located on a proximal end 21 side of the liquid transporting member 60 and a first retaining member 70 located on a distal end 22 side of the liquid transporting member 60. The liquid transporting member 60 is therefore retained inside the cartridge 20 in a position held between the second retaining member 50 and the first retaining member 70. According to the present embodiment, the second retaining member 50 is disposed on the proximal end 21 side of the liquid transporting member 60, and the first retaining member 70 is disposed on the distal end 22 side of the liquid transporting member 60. However, this is not the only configuration of the first and second retaining members 70 and 50. The first retaining member 70 may be disposed on the proximal end 21 side of the liquid transporting member 60, and the second retaining member 50 may be disposed on the distal end 22 side of the liquid transporting member 60. Also, the second retaining member 50 and the first retaining member 70 may be disposed in a width direction so as to hold the liquid transporting member 60 therebetween. The width direction here means a direction intersecting with the longitudinal direction of the cartridge 20 (Z-axis direction).

[0017] As shown in Figs. 5 and 6, the cartridge body 30 includes a cylindrical side wall 31 and an inside wall 32 provided inside the cartridge body 30 and having an L-shaped longitudinal section. Inside the cartridge body 30, the inside wall 32 forms a liquid storage portion 33 that stores the liquid containing an aerosol producing material, and an aerosol channel 34 through which aerosol generated by the atomization unit 80 passes.

[0018] More specifically, the inside wall 32 includes a plate-like first wall portion 32a extending in the Z-axis direction and a second wall portion 32b extending from a proximal end 21-side end portion of the first wall portion 32a in the Y-axis direction. One main surfaces 35a of the first wall portion 32a and a distal end 22-side main surface of the second wall portion 32b form the liquid storage portion 33 in consort with a circumferentially partial portion of an inner peripheral surface of the side wall 31. The other main surface 35b of the first wall portion 32a forms the aerosol channel 34 in consort with a remaining circumferential portion of the inner peripheral surface of the side wall 31. In other words, inside the cartridge body 30, the aerosol channel 34 and the liquid storage portion 33 are adjacently disposed in the Y-axis direction, and the aerosol channel 34 and the liquid storage portion 33 are separated from each other by the first wall portion 32a and the second wall portion 32b.

[0019] The cartridge 20 according to the present embodiment may be an open tank that can be replenished with the liquid stored in the liquid storage portion 33 or a closed tank that cannot be replenished with the liquid stored in the liquid storage portion 33. The liquid stored in the liquid storage portion 33 may be infiltrated in fibrous material.

[0020] As shown in Figs. 2 and 5, the proximal end-

side end wall 40 is connected to a proximal end 21-side end portion of the side wall 31. Formed in the proximal end-side end wall 40 is the aerosol outlet 41 communicating with the aerosol channel 34. The aerosol generated by the atomization unit 80 passes through the aerosol channel 34 to be discharged outside the cartridge 20 from the aerosol outlet 41. If the inhalation device 10 is provided with the mouthpiece 11 as shown in Fig. 1, the aerosol discharged from the aerosol outlet 41 reaches the inside of the user's mouth through the mouthpiece 11. If the inhalation device 10 is not provided with the mouthpiece 11, the aerosol discharged from the aerosol outlet 41 directly reaches the inside of the user's mouth.

[0021] As shown in Figs. 5 and 7, the second retaining member 50 includes a proximal end 21-side circumferential wall 50a that is fitted onto the inside of the side wall 31 and the inside wall 32, and a distal end 22-side circumferential wall 50b that is surrounded by a circumferential wall 90b of a distal end-side end portion 90 and abuts on an end wall 90a of the distal end-side end portion 90. The second retaining member 50 has a liquid supply hole 51 for supplying the liquid stored in the liquid storage portion 33 to the liquid transporting member 60. The second retaining member 50 is disposed on a distal end 22 side of the liquid storage portion 33. The liquid supply hole 51 has a substantially rectangular shape. Long sides of the liquid supply hole 51 extend in the X-axis direction, and short sides in the Y-axis direction. A proximal end 21 side of the second retaining member 50 is fitted onto the inside the side wall 31 and the inside wall 32, whereby the liquid stored in the liquid storage portion 33 passes only through the liquid supply hole 51.

[0022] As shown in Figs. 5 and 7, the liquid transporting member 60 is disposed on the distal end 22 side of the liquid storage portion 33 and of the second retaining member 50 so as to cover the liquid supply hole 51. A heater (atomizing portion) mentioned later is placed in a distal end 22-side surface of the liquid transporting member 60. The liquid transporting member 60 transports the liquid of the liquid storage portion 33 toward the heater (atomizing portion). According to the present embodiment, therefore, the liquid storage portion 33, the liquid transporting member 60, and the heater (atomizing portion) are arranged in the longitudinal direction of the cartridge 20 (Z-axis direction on the drawings), and the liquid transporting member 60 also transports the liquid in the longitudinal direction of the cartridge 20 (Z-axis direction on the drawings). In the present embodiment, the arrangement direction of the liquid storage portion 33, the liquid transporting member 60, and the heater (atomizing portion) and the liquid transporting direction of the liquid transporting member 60 may be either parallel or intersect with the longitudinal direction of the cartridge 20 (Z-axis direction on the drawings). The liquid transporting member 60 may be formed of any porous member that is configured to transport a liquid containing an aerosol producing material toward the heater. The liquid transporting member 60 comes into tight contact with the heat-

er and therefore is preferably formed of a flexible fibrous material, such as cotton and glass fiber. The liquid transporting member 60 may be formed of a plurality of porous members, for example, by forming cotton layers. The liquid transporting member 60 according to the present embodiment is a band-like cotton that is curved so that a center portion thereof protrudes toward the distal end 22 side.

[0023] As shown in Figs. 5 and 7, the first retaining member 70 is disposed on the distal end 22 side of the liquid transporting member 60 and has an outer peripheral surface that is fit onto the inside of the distal end 22-side circumferential wall 50b of the second retaining member 50. The first retaining member 70 opens to expose a part of the liquid transporting member 60 toward the distal end 22. The liquid transporting member 60 is retained by the second retaining member 50 and the first retaining member 70.

[0024] As shown in Fig. 7, the atomization unit 80 includes a heater (atomizing portion) 81, a pair of electrodes 82, and an electrode retaining member 83. The electrodes 82 in a pair are arranged in a direction intersecting with the longitudinal direction of the cartridge 20 (Z-axis direction). For example, the electrodes 82 are arranged in the X-axis direction on the figure. The heater 81 is configured to heat and atomize the liquid transported by the liquid transporting member 60. The heater 81 according to the present embodiment is a linear heater (elongated heating element). The heater 81, however, may have a mesh or plate-like shape. The heater 81 further may be a meander-shaped heater having an elongated shape as a whole which includes a plurality of curved portions arranged in a continuous manner or a plurality of straight and curved portions arranged in a continuous manner. An ultrasonic transducer, instead of the heater, may be utilized to atomize the liquid.

[0025] The heater 81 is disposed in the distal end 22-side surface of the liquid transporting member 60. A chamber 84 is formed between the distal end 22-side surface of the liquid transporting member 60 and the electrode retaining member 83. The chamber 84 is a space for the heater 81 to atomize the liquid. The chamber 84 is in communication with the aerosol channel 34 shown in Fig. 5.

[0026] The heater 81 is provided in such a position as to overlap with the liquid supply hole 51 as viewed in the liquid transporting direction of the liquid transporting member 60 (Z-axis direction on the drawings). This makes it possible to preferentially supply the liquid to the vicinity of the heater 81 using the liquid transporting member 60 and thus improve an atomization efficiency. More preferably, the liquid supply hole 51 is provided over an area having a length equal to or greater than the entire length of the heater 81 in the X-axis direction (longitudinal direction) as viewed in the liquid transporting direction of the liquid transporting member 60 (Z-axis direction on the drawings). The entire length of the heater 81 thus extends over a portion of the liquid transporting member

60 which is sufficiently supplied with the liquid. This further improves the atomization efficiency.

[0027] As described above, the liquid transporting member 60 covers the liquid supply hole 51 with a proximal end 21-side surface thereof to seal the liquid storage portion 33 and supplies the liquid to the heater 81 through the distal end 22-side surface thereof. In this manner, the present embodiment is so configured that the liquid transporting member 60 functions to seal the liquid storage portion 33 and further functions to supply the liquid to the heater 81. This reduces the number of peripheral components of the liquid transporting member 60 and simplifies a peripheral structure of the liquid transporting member 60 and therefore that of the atomization unit 80.

[0028] The electrodes 82 in a pair are electrically and mechanically connected by spot welding or the like to respective ends of the heater 81. The electrodes 82 in a pair are positioned by the first retaining member 70 to fasten the heater 81 on the distal end 22-side surface of the liquid transporting member 60. The electrode retaining member 83 retains the pair of electrodes 82. The electrode retaining member 83 is configured to engage with a distal end 22-side end portion of the first retaining member 70. The electrodes 82 in a pair are configured to be connected to battery terminals, not shown, of the battery portion 12 when the cartridge 20 and the battery portion 12 of Fig. 1 are assembled together. This enables the battery portion 12 to supply electric power to the heater 81 through the pair of electrodes 82.

[0029] As shown in Figs. 3 and 7, the distal end-side end portion 90 includes the circumferential wall 90b that is connected to a distal end 22-side end portion of the side wall 31. Formed in the distal end-side end portion 90 is an air inlet 91 communicating with the chamber 84. When the user inhales air from the mouthpiece 11, the air flows from the air inlet 91 into the chamber 84 as shown by an arrow in Fig. 5. The air then flows through the aerosol channel 34 while absorbing the aerosol generated in the chamber 84 by the heater 81 to reach the aerosol outlet 41.

[0030] The following is an example of an assembly procedure of the cartridge 20. First, the liquid transporting member 60 is disposed on the second retaining member 50. The liquid transporting member 60 is fastened after the first retaining member 70 is placed on the liquid transporting member 60. The second retaining member 50, the liquid transporting member 60, and the first retaining member 70 that are integrated together are inserted into the cartridge body 30 in which the liquid is stored. Next, the atomization unit 80 is disposed on the first retaining member 70, and the distal end-side end portion 90 is attached to a distal end 22 side of the cartridge body 30 to fasten the atomization unit 80. The proximal end-side end wall 40 is attached to a proximal end 21 side of the cartridge body 30.

[0031] In the cartridge 20 thus assembled, the liquid of the liquid transporting member 60 is evaporated by the generation of aerosol. The liquid in the liquid storage

portion 33 is therefore transferred to the liquid transporting member 60, which reduces the liquid in the liquid storage portion 33. When the liquid in the liquid storage portion 33 is transferred to the liquid transporting member 60, the air enters the liquid storage portion 33, and gas-liquid exchange takes place. In the cartridge 20 according to the present embodiment, a gas introducing passage is formed. The gas introducing passage is for introducing air into the liquid storage portion 33 and carrying out the gas-liquid exchange. The gas introducing passage will be discussed below with reference to Figs. 8 to 13.

[0032] Fig. 8 is a perspective view showing a gas introducing passage 100 formed in the cartridge 20 together with the liquid transporting member 60. In Fig. 8, the liquid transporting member 60 includes a distal end 22-side main surface 61, an opposite surface 62 to the main surface 61, and side surfaces 63, 64 connecting the main surface 61 and the opposite surface 62. According to the present embodiment, the main surface 61 and the side surfaces 63 of the liquid transporting member 60 respectively form a first surface and second surfaces which intersect with each other. In an example shown in Fig. 8, the side surfaces 63 are flat surfaces orthogonal to the Y-axis direction. The side surfaces 64 are curved surfaces disposed adjacently to the side surfaces 63 between the main surface 61 and the opposite surface 62. According to the present embodiment, the main surface 61 of the liquid transporting member 60 faces the distal end 22 side of the cartridge 20. Instead, however, the main surface 61 of the liquid transporting member 60 may face the proximal end 21 side of the cartridge 20 or may be opposite to an inner circumferential surface of the cartridge body 30. A groove in any shape may be formed at least in one of the surfaces of the liquid transporting member 60. At least a part of the gas introducing passage 100 may extend along an interior space of the groove.

[0033] The gas introducing passage 100 includes a first portion 101, second portions 102, and third portions 103. The first portion 101 extends in the Y-axis direction along the main surface 61 (first surface) of the liquid transporting member 60. The second portions 102 are in communication with the first portion 101, separated in the X-axis direction and an opposite direction to the X-axis direction, and extend along the respective side surfaces 63 (second surfaces) of the liquid transporting member 60. The third portions 103 bend from the respective second portions 102, extend in an opposite direction to the Z-axis direction, and come into communication with the liquid storage portion 33. In the example shown in Fig. 8, the second portions 102 are separated into two channels in the side surfaces 63 (second surfaces). However, the second portions 102 may be a single channel or may be separated into three or more channels. Likewise, the first portion 101 may be a single channel or may be separated into two, three or more channels. Furthermore, the third portions 103 may be a single channel or may be separated into two, three or more channels.

[0034] Since the first portion 101 and the second por-

tions 102 communicating with each other extend in the intersecting first and second surfaces, and the second portions 102 and the third portions 103 bend as described above, the gas introducing passage 100 is increased in channel resistance. This restrains the liquid from flowing in a reverse direction within the gas introducing passage 100 and thus restrains the liquid in the liquid storage portion 33 from flowing backward through the gas introducing passage 100 to leak to the chamber 84 side. In general, channel resistance is proportional to fluid density, so that resistance acting on a gas that flows forward through a channel is much smaller than resistance acting on a liquid that flows backward through the same channel. The increase of channel resistance of the gas introducing passage 100 therefore does not make any substantial effect on the air flow in a forward direction of the gas introducing passage 100, that is, the gas-liquid exchange. The gas introducing passage 100 may include not only the channel formed in one of the side surfaces 63 but also a channel formed in the side surface 63 of the liquid transporting member 60 which faces in an opposite direction to the Y-axis direction of the liquid transporting member 60. The gas introducing channel 100 may include a channel formed in the curved side surface 64 of the liquid transporting member 60.

[0035] The following discussion explains the first portion 101, the second portions 102, and the third portions 103 in detail. Fig. 9 is a perspective view selectively showing the liquid transporting member 60 and the first retaining member 70 of the cartridge 20. Fig. 10 is a perspective view selectively showing the first retaining member 70 of the cartridge 20. In Figs. 9 and 10, the first retaining member 70 includes a bottom portion (first bottom portion) 71, a groove portion 72, an abutting portion 73, and a guide portion 74. The bottom portion 71 faces the main surface 61 of the liquid transporting member 60. The groove portion 72 is formed in the bottom portion 71. The abutting portion 73 abuts on the inside of the second retaining member 50. The guide portion 74 determines an attachment position of the pair of electrodes 82.

[0036] The first portion 101 includes an interior space of the groove portion 72 of the first retaining member 70. The groove portion 72 is provided with an open end portion 72a at an upstream side of the first portion 101 in the gas introducing passage 100. The open end portion 72a of the groove portion 72 functions as an air inlet. As described above, the present embodiment is so configured that the first retaining member 70 that is a single member functions to retain the liquid transporting member 60 and further functions to form a part of the gas introducing passage 100. This reduces the number of peripheral components of the liquid transporting member 60 and simplifies a peripheral structure of the liquid transporting member 60. As shown in Fig. 10, the groove portion 72 is formed into a tapered groove that is gradually decreased in size toward a downstream side of the first portion 101 in the gas introducing passage 100. This accelerates the entry of air into the first portion 101 through

the groove portion 72. The groove portion 72 may be a straight groove having uniform depth. The groove portion 72 is terminated before reaching a downstream end 101a of the first portion 101 in the gas introducing passage 100. The first retaining member 70 is therefore in contact with the main surface 61 (first surface) of the liquid transporting member 60 in the vicinity of the downstream end 101a of the first portion 101. The gas introducing passage 100 is increased in channel resistance in the vicinity of the downstream end 101a, which prevents a backward flow of the liquid from the liquid storage portion 33.

[0037] Fig. 11 is a perspective view selectively showing the second retaining member 50 and the liquid transporting member 60 of the cartridge 20. Figs. 12 and 13 are perspective views selectively showing the second retaining member 50 of the cartridge 20. In Figs. 11 to 13, the second retaining member 50 includes the circumferential wall 50a, the circumferential wall 50b, a bottom portion (second bottom portion) 52, the liquid supply hole 51, wall portions 53, through-holes 54, ribs 55, and a communicating portion 56.

[0038] The bottom portion 52 faces the opposite surface 62 of the liquid transporting member 60. The circumferential wall 50a is fitted in the inside of the side wall 31 and the inside wall 32. The circumferential wall 50b is surrounded by the circumferential wall 90b of the distal end-side end portion 90 and abuts on the end wall 90a of the distal end-side end portion 90. The liquid supply hole 51 is formed in the bottom portion 52. The wall portions 53 face the respective side surfaces 63 (second surfaces) of the liquid transporting member 60. The through-holes 54 are formed in one of the wall portions 53 and communicate with the liquid storage portion 33. The ribs 55 are fit into grooves formed in an inner circumferential surface of the side wall 31 and of the inside wall 32. The communicating portion 56 connects the chamber 84 and the aerosol channel 34. The through-holes 54 connect a distal end 22-side space of the second retaining member 50 and an interior space of the liquid storage portion 33. A gap may be provided between each of the wall portion 53 of the second retaining member 50 and each of the side surfaces 63 (second surfaces) of the liquid transporting member 60.

[0039] Each of the second portions 102 of the gas introducing passage 100 is formed between the corresponding wall portion 53 of the second retaining member 50 and the corresponding side surface 63 (second surface) of the liquid transporting member 60. Since the present embodiment thus provides the second retaining member 50 as a single member with the function of retaining the liquid transporting member 60 and the function of forming a part of the gas introducing passage 100, the number of the peripheral components of the liquid transporting member 60 is reduced, and the peripheral structure of the liquid transporting member 60 is simplified. As described above, the liquid supply hole 51 for supplying the liquid stored in the liquid storage portion 33 toward the liquid transporting member 60 is formed in the bottom

portion 52 of the second retaining member 50. The second retaining member 50 as a single member therefore further functions to supply the liquid to the liquid transporting member 60, which simplifies the peripheral structure of the liquid transporting member 60.

[0040] The third portions 103 of the gas introducing passage 100 are in communication with the respective second portions 102 and extend through the through-holes 54 to communicate with the liquid storage portion 33. More specifically, the third portions 103 of the gas introducing passage 100 bend from the respective second portions 102. Since the present embodiment thus provides the second retaining member 50 as a single member with the function of retaining the liquid transporting member 60 and the function of forming a part of the gas introducing passage 100, the number of the peripheral components of the liquid transporting member 60 is reduced, and the peripheral structure of the liquid transporting member 60 is simplified. Furthermore, since the third portions 103 bend from the respective second portions 102, the gas introducing passage 100 is increased in conduit resistance. This makes it possible to prevent the backward flow of the liquid from the liquid storage portion 33 and therefore restrain a liquid leakage through the gas introducing passage 100.

[0041] As shown in Figs. 11 and 12, upstream ends 103a of the third portions 103 in the gas introducing passage 100 are provided at different positions from the downstream end 101a of the first portion 101 as viewed in the liquid transporting direction of the liquid transporting member 60 (namely, the Z-axis direction). This increases the entire length of the gas introducing passage 100 and thus increases the conduit resistance of the gas introducing passage 100 as a whole. Consequently, it is possible to prevent the backward flow of the liquid from the liquid storage portion 33 and restrain the liquid leakage through the gas introducing passage 100. Since the liquid supply hole 51 and the through-holes 54 are separate holes in the second retaining member 50, the second retaining member 50 as a single member supplies the liquid to the liquid transporting member 60 and at the same time forms a part of the gas introducing passage 100. This simplifies the peripheral structure of the liquid transporting member 60.

[0042] In the cartridge 20 where the gas introducing passage 100 configured as above is formed, negative pressure is created in the liquid storage portion 33 by decrease of the liquid stored in the liquid storage portion 33. As a result, the air introduced into the cartridge 20 from the air inlet 91 or another opening passes through the first portion 101, the second portions 102, and the third portions 103 of the gas introducing passage 100 to be introduced into the liquid storage portion 33. The gas-liquid exchange accordingly takes place.

[0043] The cartridge 20 thus configured comprises the liquid storage portion 33 configured to store liquid, the heater 81 configured to atomize liquid, the liquid transporting member 60 configured to transport the liquid

stored in the liquid storage portion 33 toward the heater 81, and the gas introducing passage 100 configured to introduce gas into the liquid storage portion 33. The liquid transporting member 60 includes the main surface 61 and the side surfaces 63 which intersect with each other. The gas introducing passage 100 includes the first portion 101 extending along the main surface 61 of the liquid transporting member 60, and the second portions 102 communicating with the first portion 101 and extending along the side surfaces 63. The gas introducing passage 100 is therefore increased in conduit resistance. It is then possible to restrain the liquid stored in the liquid storage portion from flowing backward in the gas introducing passage 100 for gas-liquid exchange to leak to the atomization chamber side.

[0044] The embodiments according to the invention have been discussed. The invention, however, does not necessarily have to be made in accordance with the above-described embodiments. The invention may be modified in various ways in a scope of the technical ideas discussed in the claims, specification and drawings. Any shape and material that provide the operation and advantageous effects of the invention fall in the scope of technical ideas of the invention even if no direct reference is made to such a shape and material in the description, claims and drawings.

[0045] Several modes disclosed in the present application will be described below.

[0046] A first mode provides an inhalation device cartridge comprising a liquid storage portion configured to store liquid, an atomizing portion configured to atomize the liquid, a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomizing portion, and a gas introducing passage configured to introduce gas into the liquid storage portion. The liquid transporting member includes a first surface and a second surface intersecting with each other. The gas introducing passage includes a first portion extending along the first surface of the liquid transporting member, and a second portion communicating with the first portion and extending along the second surface.

[0047] According to a second mode, in the inhalation device cartridge of the first mode, the atomizing portion is disposed in the first surface of the liquid transporting member.

[0048] According to a third mode, in the inhalation device cartridge of the first or second mode, the inhalation device cartridge further comprises a first retaining member including a first bottom portion that faces the first surface of the liquid transporting member and a groove portion that is formed in the first bottom portion, the first retaining member retaining the liquid transporting member. The first portion of the liquid transporting member includes an interior space of the groove portion.

[0049] According to a fourth mode, in the inhalation device cartridge of the third mode, the groove portion includes an open end portion at an upstream side of the first portion in the gas introducing passage.

[0050] According to a fifth mode, in the inhalation device cartridge of the third or fourth mode, the groove portion has a depth that is gradually decreased toward a downstream side of the first portion in the gas introducing passage.

[0051] According to a sixth mode, in the inhalation device cartridge of any one of the third to fifth modes, the groove portion is terminated before reaching a downstream end of the first portion in the gas introducing passage.

[0052] According to a seventh mode, in the inhalation device cartridge of any one of the first to sixth modes, the inhalation device cartridge further includes a second retaining member including a wall portion that faces the second surface of the liquid transporting member, the second retaining member retaining the liquid transporting member. The second portion is formed between the wall portion and the second surface.

[0053] According to an eighth mode, in the inhalation device cartridge of the seventh mode, the second retaining member includes a second bottom portion facing an opposite surface to the first surface in the liquid transporting member, and a liquid supply hole that is formed in the second bottom portion and supplies the liquid stored in the liquid storage portion toward the liquid transporting member.

[0054] According to a ninth mode, in the inhalation device cartridge of the eighth mode, the atomizing portion is provided in such a position as to overlap with the liquid supply hole as viewed in a liquid transporting direction of the liquid transporting member.

[0055] According to a 10th mode, in the inhalation device cartridge of the ninth mode, the atomizing portion includes a heating element having an elongated shape, and the liquid supply hole is provided over an area with a length equal to or greater than an entire longitudinal length of the heating element as viewed in the liquid transporting direction of the liquid transporting member.

[0056] According to an 11th mode, in the inhalation device cartridge of any one of the seventh to 10th modes, the second retaining member includes a through-hole communicating with inside of the liquid storage portion, and the gas introducing passage includes a third portion communicating with the second portion and extending through the through-hole.

[0057] According to a 12th mode, in the inhalation device cartridge of the 11th mode, the third portion of the gas introducing passage bends from the second portion.

[0058] According to a 13th mode, in the inhalation device cartridge of the 11th or 12th mode, the third portion of the gas introducing passage includes an upstream end that is provided at a different position from the downstream end of the first portion as viewed in the liquid transporting direction of the liquid transporting member.

[0059] According to a 14th mode, in the inhalation device cartridge of any one of the 11th to 13th modes, the liquid supply hole and the through-hole are separate holes.

[0060] A 15th mode provides an inhalation device comprising the inhalation device cartridge according to any one of the first to 14th modes.

[0061] An inhalation device according to a 16th mode, comprising a liquid storage portion configured to store liquid, an atomizing portion configured to atomize the liquid, a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomizing portion, and a gas introducing passage configured to introduce gas into the liquid storage portion. The liquid transporting member includes a first surface and a second surface intersecting with each other. The gas introducing passage includes a first portion extending along the first surface of the liquid transporting member, and a second portion communicating with the first portion and extending along the second surface.

REFERENCE SIGN LIST

[0062]	
10:	Inhalation device
11:	Mouthpiece
12:	Battery
20:	Cartridge
21:	Proximal end
22:	Distal end
30:	Cartridge body
31:	Side wall
32:	Inside wall
32a:	First wall portion
32b:	Second wall portion
33:	Liquid storage portion
34:	Aerosol channel
35a:	Main surface
35b:	Main surface
40:	Proximal end-side end wall
41:	Aerosol outlet
50:	Second retaining member
50a:	Circumferential wall
50b:	Circumferential wall
51:	Liquid supply hole
52:	Bottom portion
53:	Wall portion
54:	Through-hole
55:	Rib
56:	Communicating portion
60:	Liquid transporting member
61:	Main surface (First surface)
62:	Opposite surface
63:	Side surface (Second surface)
64:	Side surface
70:	First retaining member
71:	Bottom portion
72:	Groove portion
72a:	Open end portion
73:	Abutting portion
74:	Guide portion

80: Atomization unit
 81: Heater
 82: Electrode
 83: Electrode retaining member
 84: Chamber
 90: Distal end-side end portion
 90a: End wall
 90b: Circumferential wall
 91: Air inlet
 100: Gas introducing passage
 101: First portion
 101a: Downstream end
 102: Second portion
 103: Third portion
 103a: Upstream end

Claims

1. An inhalation device cartridge comprising:

a liquid storage portion configured to store liquid;
 an atomization unit configured to atomize the liquid;
 a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomization unit; and
 a gas introducing passage configured to introduce gas into the liquid storage portion, the liquid transporting member including a first surface and a second surface intersecting with each other, and
 the gas introducing passage including a first portion extending along the first surface of the liquid transporting member, and a second portion communicating with the first portion and extending along the second surface.

2. The inhalation device cartridge according to Claim 1, wherein the atomization unit is disposed in the first surface of the liquid transporting member.

3. The inhalation device cartridge according to Claim 1 or 2, further comprising:

a first retaining member including a first bottom portion that faces the first surface of the liquid transporting member and a groove portion that is formed in the first bottom portion, the first retaining member retaining the liquid transporting member, wherein the first portion of the gas introducing passage includes an interior space of the groove portion.

4. The inhalation device cartridge according to Claim 3, wherein the groove portion includes an open end portion at an upstream side of the first portion in the

gas introducing passage.

5. The inhalation device cartridge according to Claim 3 or 4, wherein the groove portion has a depth that is gradually decreased toward a downstream side of the first portion in the gas introducing passage.

6. The inhalation device cartridge according to any one of Claims 3 to 5, wherein the groove portion is terminated before reaching a downstream end of the first portion in the gas introducing passage.

7. The inhalation device cartridge according to any one of Claims 1 to 6, further comprising:

a second retaining member including a wall portion that faces the second surface of the liquid transporting member, the second retaining member retaining the liquid transporting member, and wherein the second portion of the gas introducing passage is formed between the wall portion and the second surface.

8. The inhalation device cartridge according to Claim 7, wherein the second retaining member includes a second bottom portion facing an opposite surface to the first surface in the liquid transporting member, and a liquid supply hole that is formed in the second bottom portion and supplies the liquid stored in the liquid storage portion toward the liquid transporting member.

9. The inhalation device cartridge according to Claim 8, wherein the atomizing portion is provided in such a position as to overlap with the liquid supply hole as viewed in a liquid transporting direction of the liquid transporting member.

10. The inhalation device cartridge according to Claim 9,

wherein the atomizing portion includes a heating element having an elongated shape, and wherein the liquid supply hole is provided over an area with a length equal to or greater than an entire longitudinal length of the heating element as viewed in the liquid transporting direction of the liquid transporting member.

11. The inhalation device cartridge according to any one of Claims 7 to 10,

wherein the second retaining member includes a through-hole communicating with inside of the liquid storage portion, and

wherein the gas introducing passage includes a third portion communicating with the second portion and extending through the through-hole.

12. The inhalation device cartridge according to Claim 5
11,
wherein the third portion of the gas introducing passage bends from the second portion.
13. The inhalation device cartridge according to Claim 10
11 or 12,
wherein the third portion of the gas introducing passage includes an upstream end that is provided at a different position from the downstream end of the first portion as viewed in the liquid transporting direction of the liquid transporting member. 15
14. The inhalation device cartridge according to any one of Claims 11 to 13,
wherein the liquid supply hole and the through-hole are separate holes. 20
15. An inhalation device comprising the inhalation device cartridge according to any one of Claims 1 to 14. 25
16. An inhalation device comprising:

a liquid storage portion configured to store liquid;
an atomizing portion configured to atomize the liquid; 30
a liquid transporting member configured to transport the liquid stored in the liquid storage portion toward the atomizing portion, and
a gas introducing passage configured to introduce gas into the liquid storage portion, 35
the liquid transporting member including a first surface and a second surface intersecting with each other, and
the gas introducing passage including a first portion extending along the first surface of the liquid transporting member, and a second portion communicating with the first portion and extending along the second surface. 40

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Fig. 1

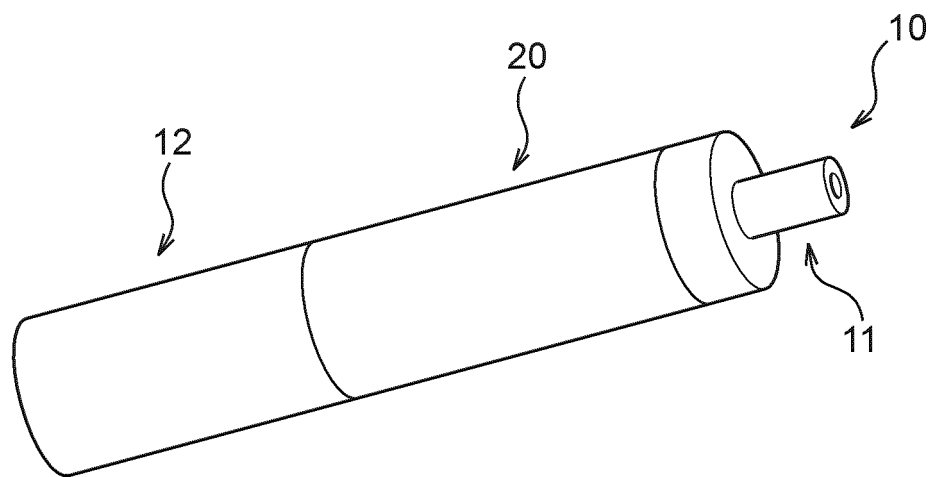


Fig. 2

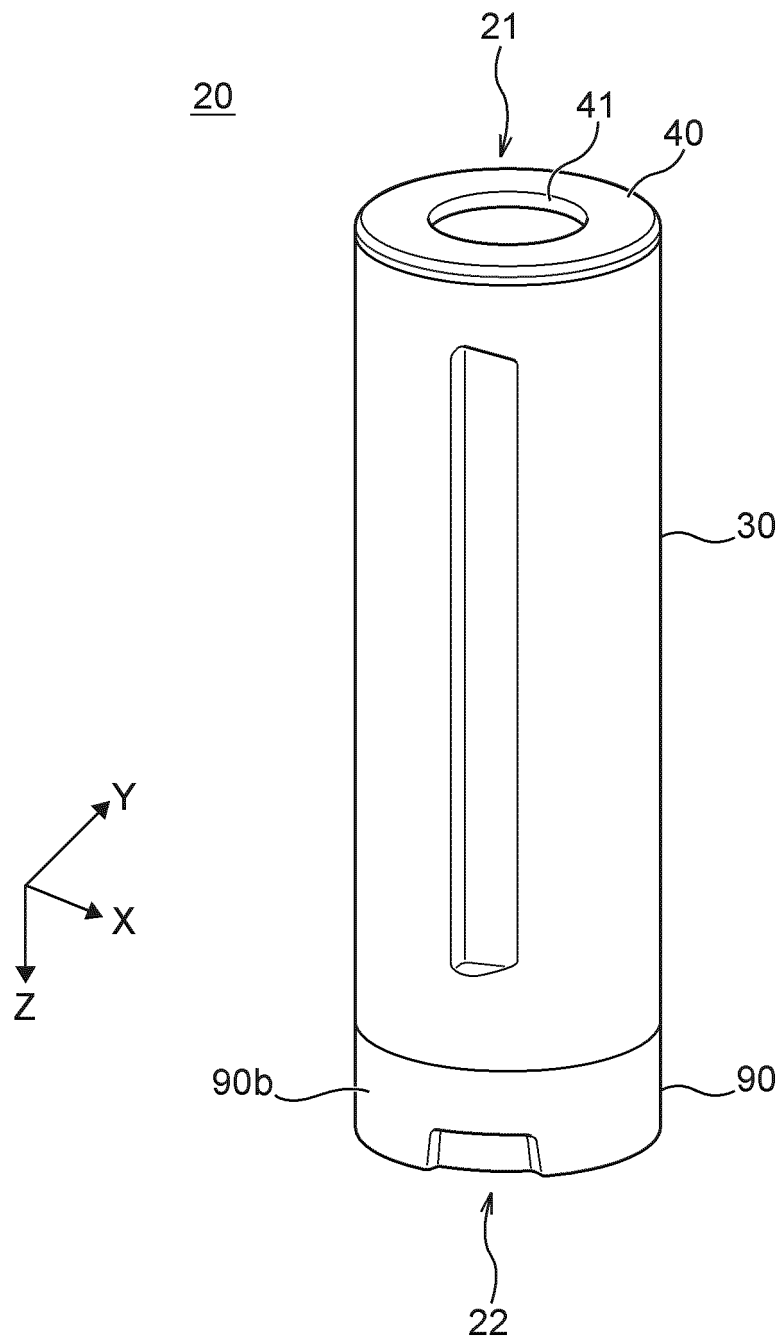


Fig. 3

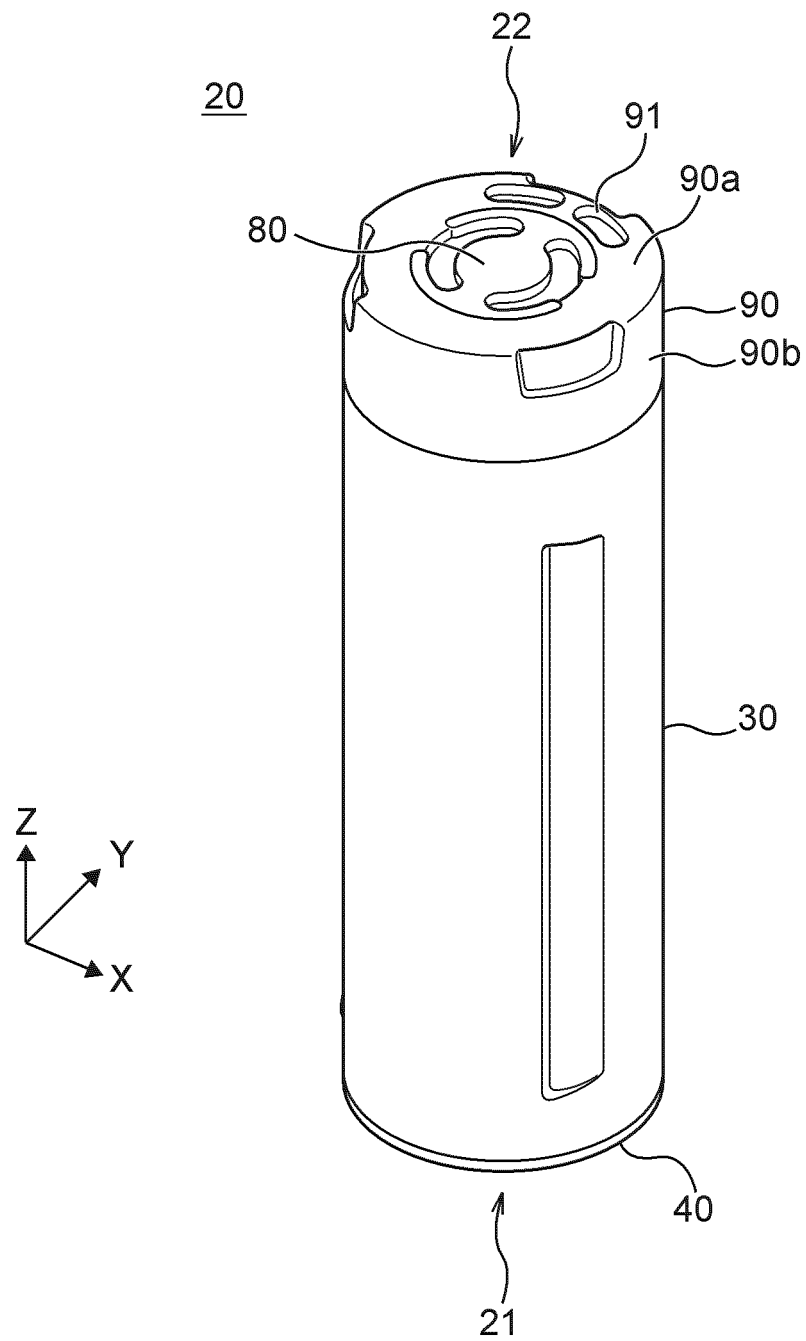


Fig. 4

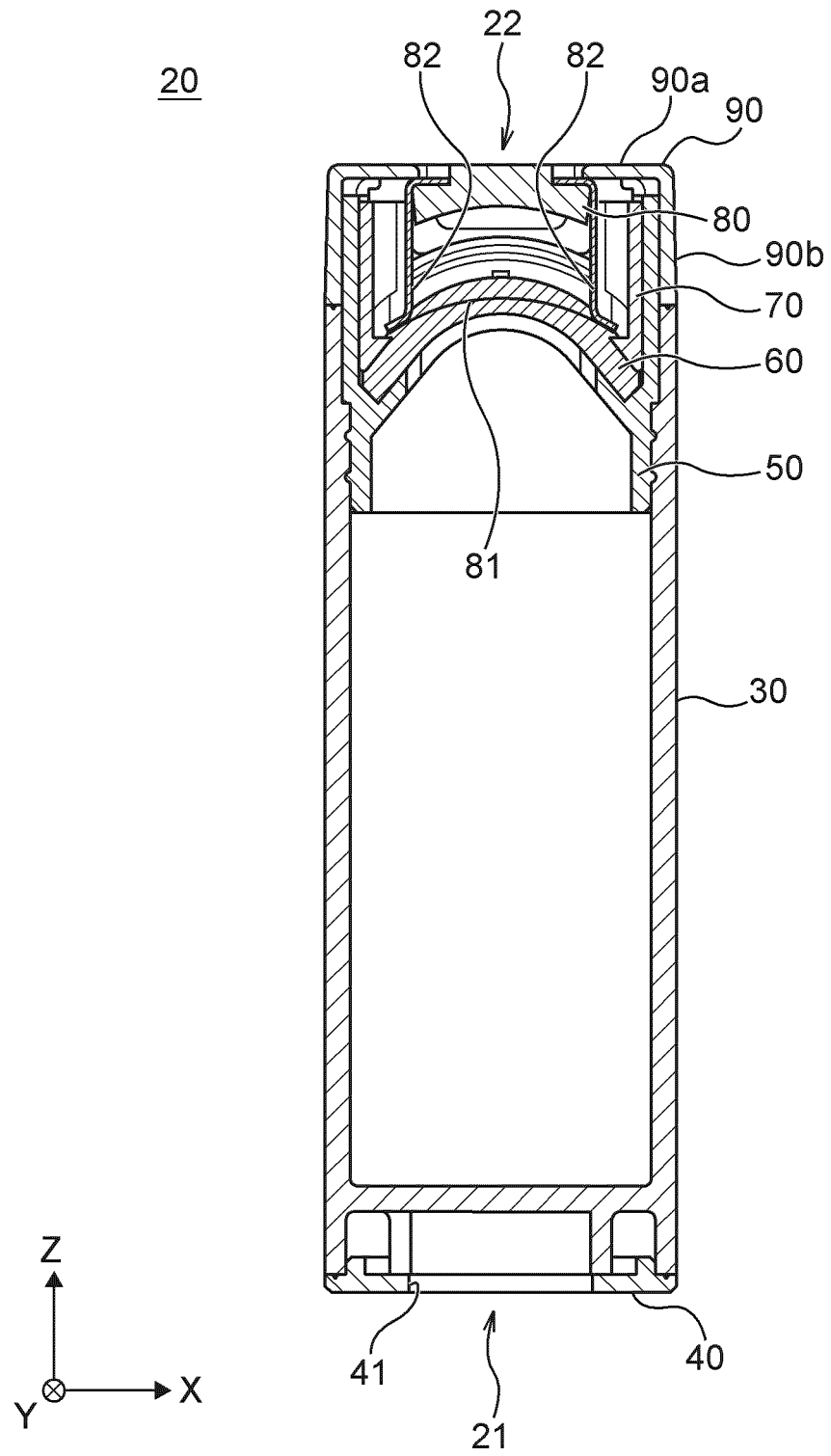


Fig. 5

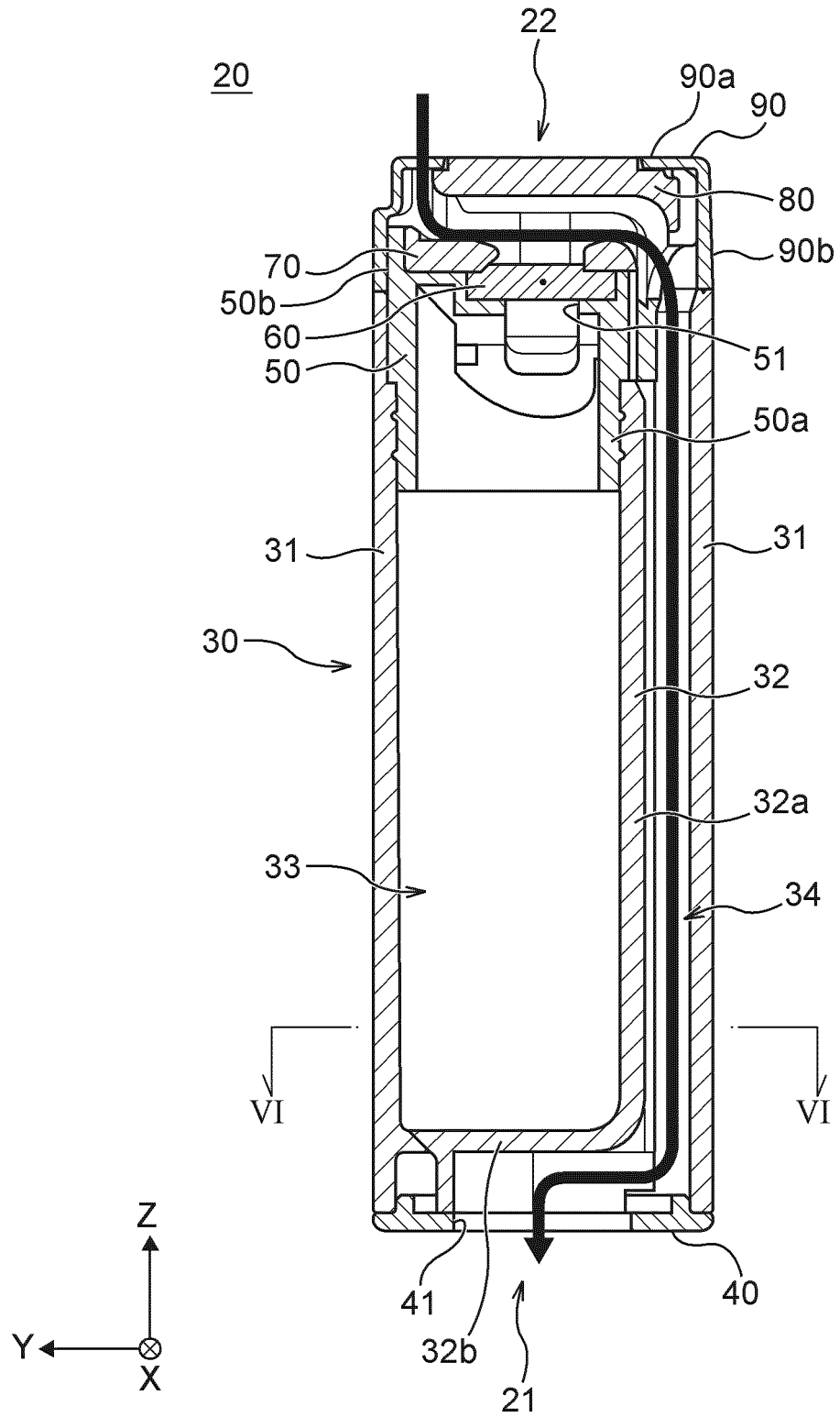


Fig. 6

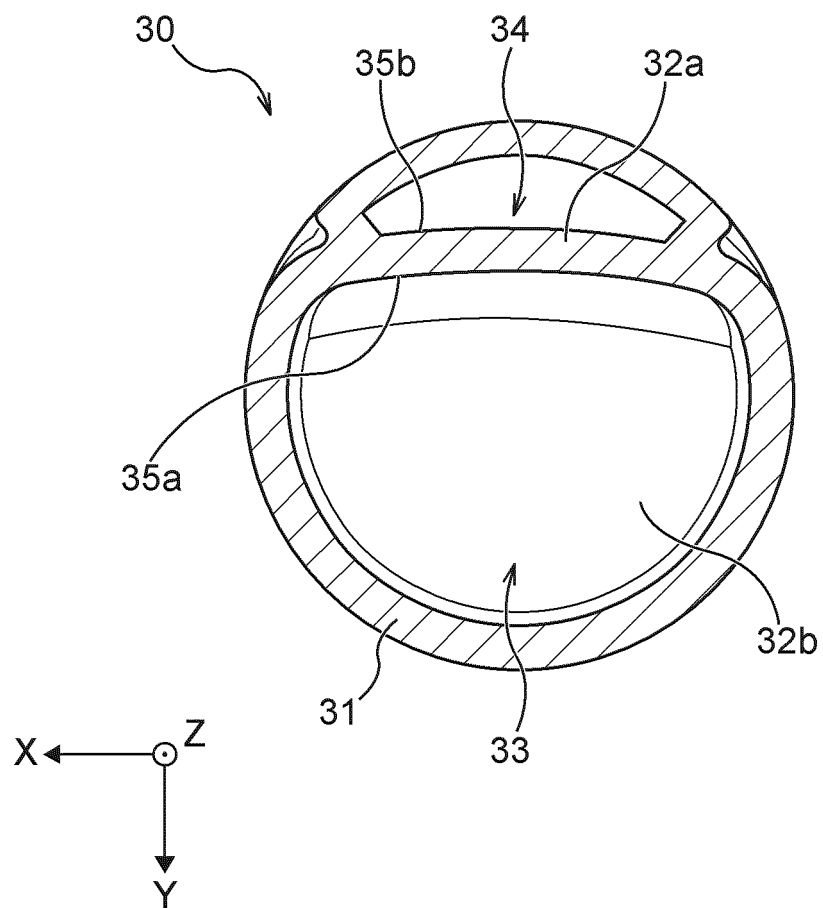


Fig. 7

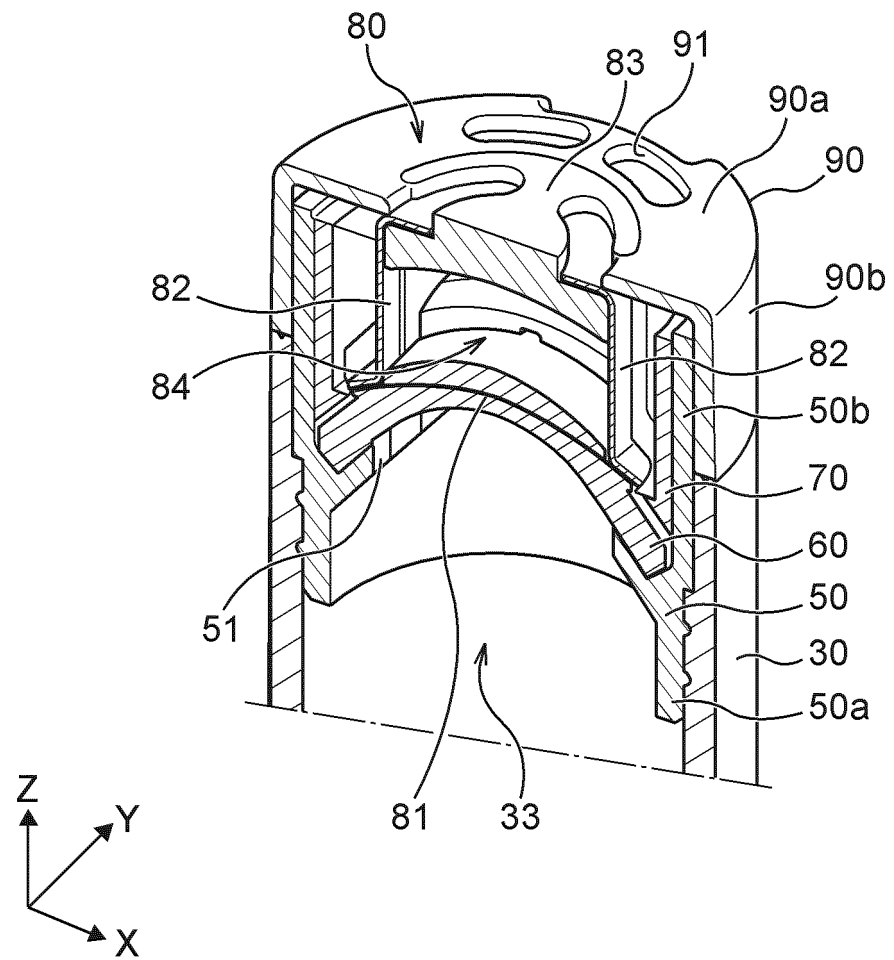


Fig. 8

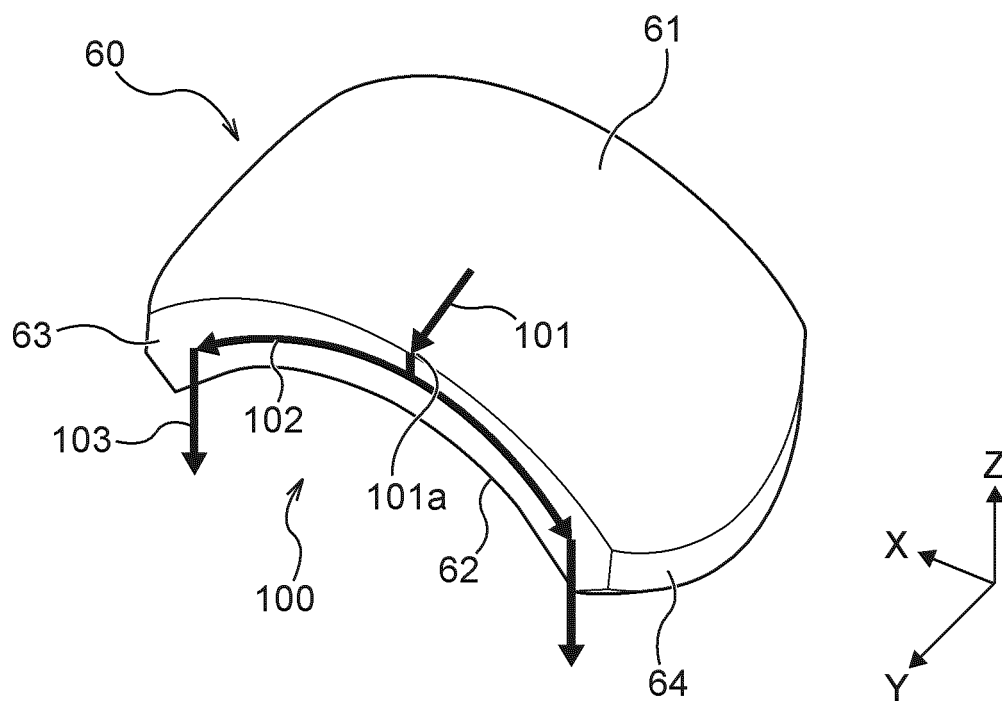


Fig. 9

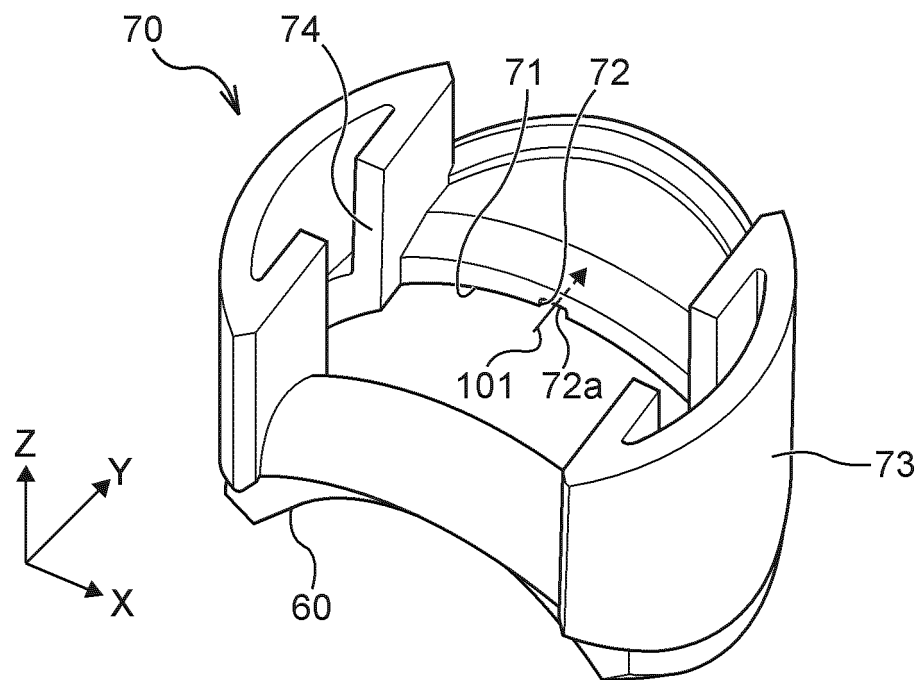


Fig. 10

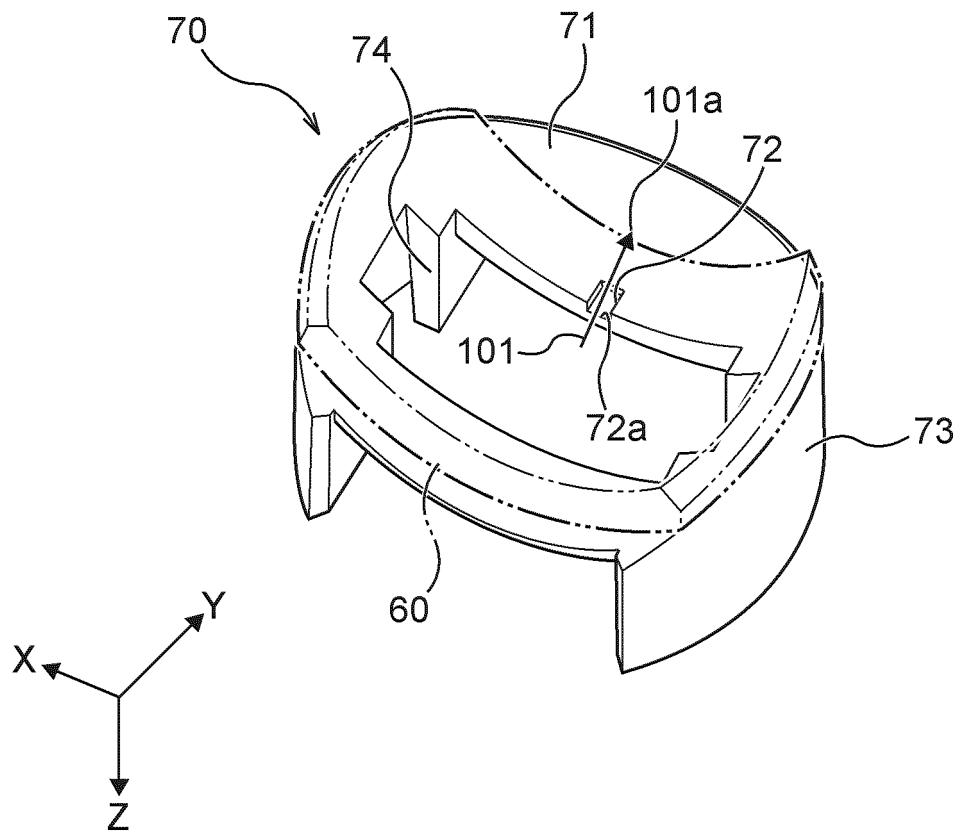


Fig. 11

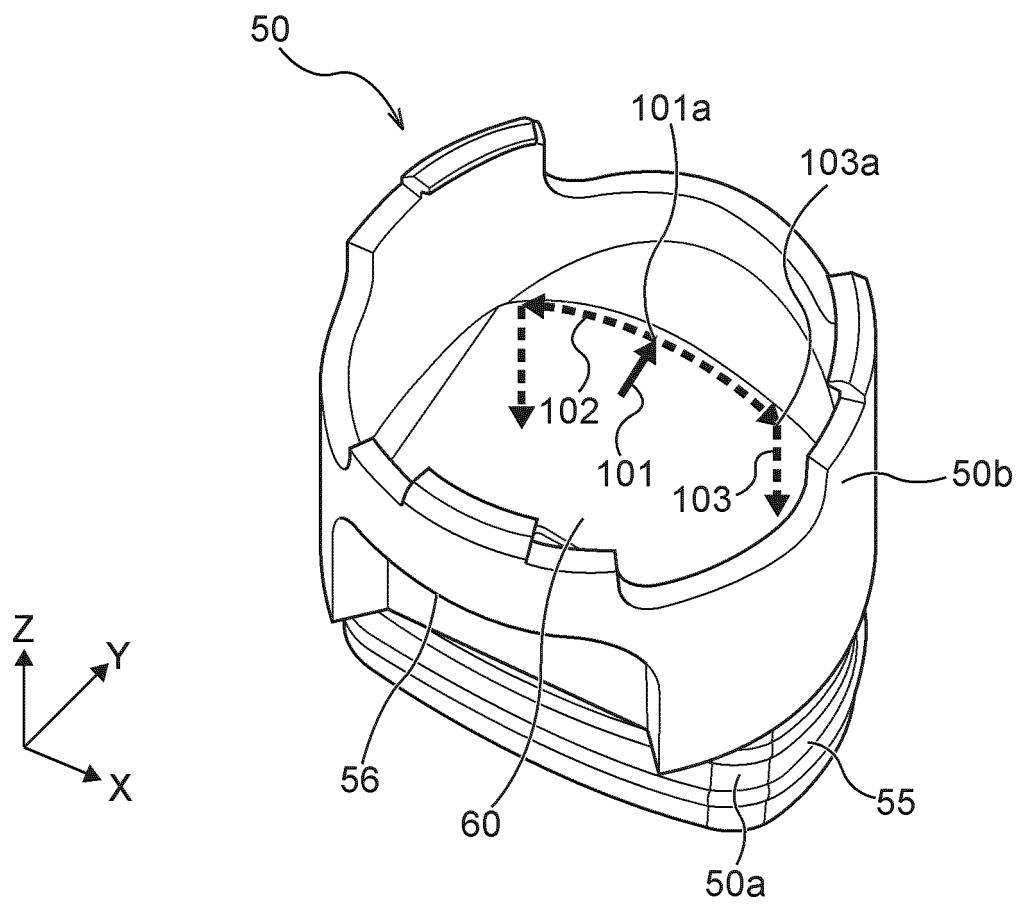


Fig. 12

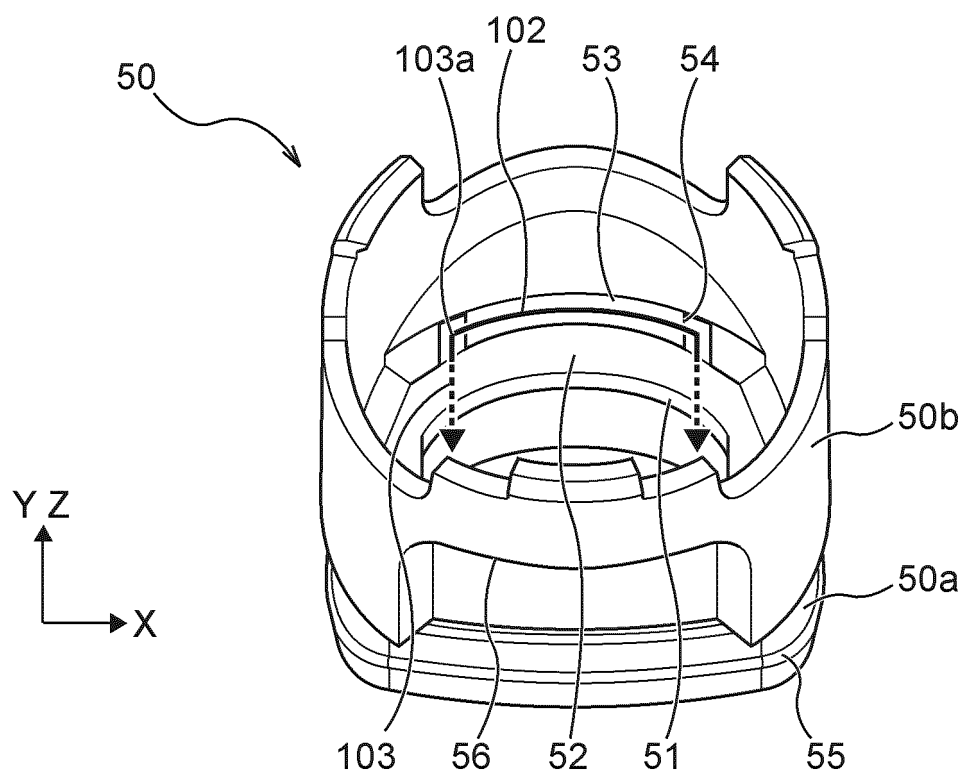
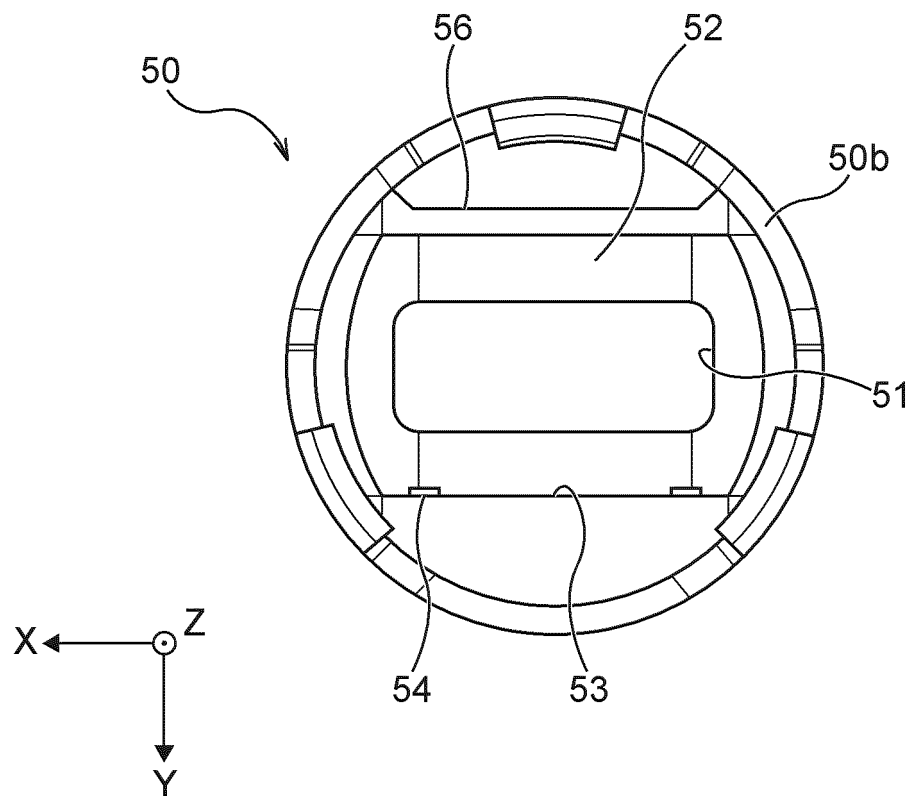


Fig. 13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/009303

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24F47/00 (2006.01) i

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)
Int. Cl. 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 1971-2019
Registered utility model specifications of Japan 1996-2019
Published registered utility model applications of Japan 1994-2019

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	JP 2019-22502 A (MD&C CREATIVE MAISON SA) 14 February 2019, paragraphs [0069]-[0080], fig. 3B & US 2017/0295844 A1 & WO 2017/179043 A1, paragraphs [0088]-[0099], fig. 3B & EP 3316714 A1 & CA 3020806 A1 & KR 10-2018-0125020 A & CN 109068751 A	1-2, 15-16 3-14
A	JP 2018-500016 A (NICOVENTURES HOLDINGS LIMITED) 11 January 2018, paragraph [0040] & US 2017/0333650 A1, paragraph [0049] & GB 2533135 A & WO 2016/092261 A1 & EP 3229621 A1 & AR 102976 A1 & AU 2015359102 A1 & CA 2966828 A1 & KR 10-2017- 0081220 A & CN 106998820 A	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search
17.04.2019

Date of mailing of the international search report
07.05.2019

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Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2019/009303
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2018/0146711 A1 (MAZUR, Ben) 31 May 2018, fig. 2 & WO 2018/099664 A1 & TW 201818835 A	1-16

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 8528569 B [0004]