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CA 2972090 A1 2015/12/30

(21) 2 972 090

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2015/06/22
(87) Date publication PCT/PCT Publication Date: 2015/12/30
(85) Entrée phase nationale/National Entry: 2017/04/07
(86) N° demande PCT/PCT Application No.: JP 2015/067841
(87) N° publication PCT/PCT Publication No.: 2015/199014
(30) Priorité/Priority: 2014/06/24 (JP2014-129729)

(51) Cl.Int./Int.Cl. *E03C 1/042* (2006.01), *A47K 3/02* (2006.01), *A47K 3/28* (2006.01)

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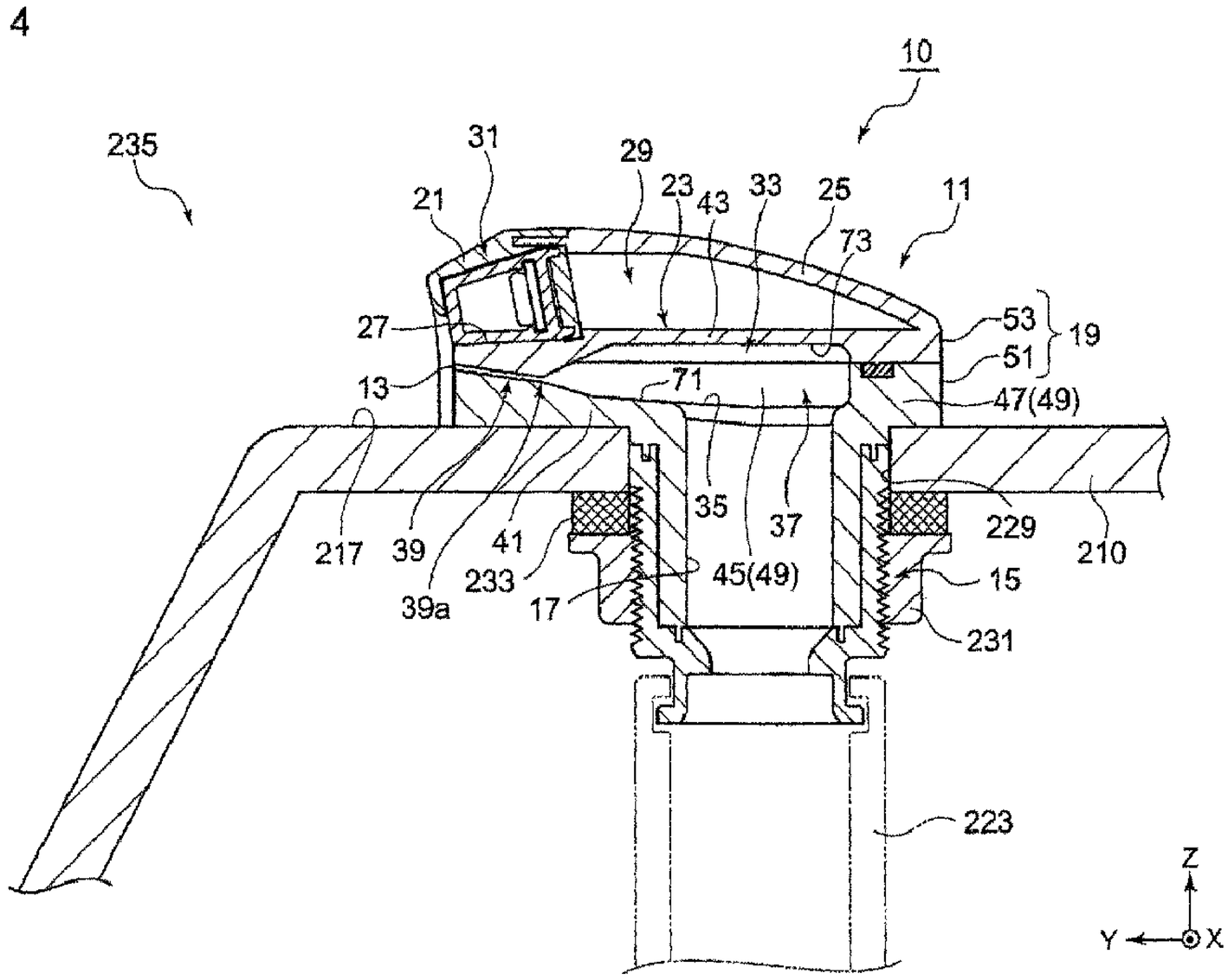
(54) Titre : DISPOSITIF D'EVACUATION D'EAU ET DISPOSITIF DE BAIGNOIRE
(54) Title: WATER DISCHARGE DEVICE AND BATHTUB DEVICE

FIG. 4



(57) Abrégé/Abstract:
The present invention comprises a water discharge member (19) that has a discharge passage (33) formed therein. The discharge passage (33) is formed from a discharge port (13) that is for discharging water, a storage chamber (37) that is for collecting water

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(57) Abrégé(suite)/Abstract(continued):
that flows in from an upstream side, and a narrowed flow channel (39) that is for sending the water that is inside the storage chamber (37) to the discharge port (13). The discharge member (19) is configured by assembling a lower side segment member (51) and an upper side segment member (53). The discharge port (13), the storage chamber (37), and the narrowed flow channel (39) are each delimited by both the lower side segment member (51) and the upper side segment member (53).

[ABSTRACT]

A water discharge device comprises a water discharge member 19 formed with a discharge passage 33 at an inner portion thereof. The discharge passage 33 comprises: a water discharge port 13 for discharging water; a reservoir chamber 37 for storing water flowing therein from an upstream side; and a constricting flow path 39 for feeding water in the reservoir chamber 37 to the water discharge port 13. the water discharge member 19 is formed by a lower dividing member 51 and an upper dividing member 53 assembled to each other, and each of the water discharge port 13, the reservoir chamber 37, and the constricting flow path 39 is defined by both of the lower dividing member 51 and the upper dividing member 53.

WATER DISCHARGE DEVICE AND BATHTUB DEVICE

[TECHNICAL FIELD]

[0001] The present invention relates to a water discharge device for discharging water and a bathtub device including the water discharge device.

[BACKGROUND ART]

[0002] In the related art, a water discharge device that discharges a water flow of a film shape is known (e.g. see patent document 1). This is installed on a bathtub and a water flow is discharged from a water discharge port. A discharged water flow of a film shape falling like a waterfall has excellent appearance and also provides relaxing effects such as by falling onto a shoulder of a bather.

[CITATION LIST]

[Patent Document]

[0003] [patent document 1] JP 4066459 B2

[SUMMARY OF THE INVENTION]

[PROBLEM TO BE SOLVED BY THE INVENTION]

[0004] In the water discharge device of patent document 1, a water passage that leads water to the water discharge port is formed inside a device main body and the water passage of the device main body is formed by a single component. The device main body is considered to be integrally molded by a metal casting product. When a portion having a hollow cross section is integrally molded by a single component, generally it is difficult to ensure accuracy in dimensions of the inner wall surface thereof and thus roughness of the inner wall surface tends to be high. Especially when the device main body is integrally molded by a metal casting

product, an inner wall surface thereof is the casting surface and thus the surface tends to be more roughly. A rough surface tends to cause disturbance in a water flow flowing in the water passage. Disturbance in the shape of a discharged water flow may disadvantageously deteriorate excellent appearance.

[0005] The present invention has been devised in consideration to such disadvantages with an object to provide technique capable of suppressing disturbance in the shape of a discharged water flow.

[MEANS TO SOLVE THE PROBLEM]

[0006] In order to solve the above disadvantage, a water discharge device of an aspect of the present invention is comprising: a water discharge member formed with a discharge passage at an inner portion thereof, wherein the discharge passage comprises: a water discharge port for discharging water; a reservoir chamber for storing water flowing therein from an upstream side; and a constricting flow path for feeding water in the reservoir chamber to the water discharge port, the water discharge member is formed by a first dividing member and a second dividing member assembled to each other, and each of the water discharge port, the reservoir chamber, and the constricting flow path is defined by both of the first dividing member and the second dividing member.

According to this aspect, inner wall surfaces of the discharge passage can be exposed to an external space over an area ranging from the water discharge port to the reservoir chamber when the respective dividing members are exploded. Upon forming a portion having a hollow cross section, a degree of difficulty in molding is generally lower in the case of a plurality of components separately molded to expose inner wall surfaces thereof

to the external space than in the case of a single component integrally molded. This also facilitates ensuring accuracy in dimensions of the inner wall surfaces thereof. This facilitates suppression of roughness of the inner wall surfaces of the discharge passage and disturbance in the shape of a discharged water flow caused by the surface roughness.

[0007] The reservoir chamber may be formed such that a pair of wall surfaces of the discharge passage, which are opposite to each other, spread in directions away from each other from an entrance of the constricting flow path.

According to this aspect, the water pressure in the reservoir chamber is lowered and thus the flow velocity of water can be easily lowered. This allows for effectively straightening a flow in the reservoir chamber in such a manner as to uniform a flow velocity.

[0008] The water discharge member may further comprise a spacer that is disposed inside the discharge passage and maintains a space between the pair of wall surfaces of the discharge passage opposite to each other.

According to this aspect, even when such a load to narrow the space in the discharge passage is applied to the water discharge member, this space can be maintained, thereby facilitating suppression of disturbance in the shape of a discharged water flow.

[0009] The spacer may be disposed in the reservoir chamber.

According to this aspect, even when a water flow is divided by the spacer, the divided water flows are facilitated to join at an early stage before reaching the water discharge port, thereby

facilitating suppression of disturbance in the shape of a discharged water flow caused by divided water flows.

[0010] The first dividing member and the second dividing member may include a plurality of butting surfaces butted to each other and a seal member that is interposed between the multiple butting surfaces and seals between the plurality of butting surfaces.

This aspect allows for regulating leakage of water in the discharge passage from between the butting surfaces to the outside.

[0011] The first dividing member and the second dividing member may be an upper dividing member and a lower dividing member, respectively, having shapes of the water discharge member divided into an upper part and a lower part, respectively. The plurality of butting surfaces may be provided opposite to each other in a up-and-down direction and the seal member may be disposed in a groove portion formed on the butting surface of the lower dividing member.

According to this aspect, the upper dividing member can be assembled to the lower dividing member in a state where the seal member is mounted in the groove portion without bonded thereto, thereby enhancing workability upon assembling.

[0012] The water discharge member may have a positioning structure that positions the first dividing member and the second dividing member upon assembling the first dividing member and the second dividing member.

This aspect facilitates positioning of the dividing members upon assembling the dividing members, thereby enhancing workability upon assembling.

[0013] The water discharge member may have a peripheral wall portion surrounding the discharge passage from three directions of both sides in a lateral width direction of the discharge passage and a depth side opposite to the water discharge port. The first dividing member and the second dividing member may be coupled by a plurality of fixing tools disposed with intervals along an inner peripheral wall surface of the peripheral wall portion. The plurality of fixing tools may be disposed such that an interval in an intermediate portion in a lateral width direction of the water discharge member is narrower than an interval in both end portions thereof.

According to this aspect, the interval between the fixing tools can be wide and the number of the fixing tools can be reduced in the intermediate portion of the water discharge member while in the both end portions thereof the interval between the fixing tools can be narrower to effectively resist bending moment. This allows for stably maintaining the state where the dividing members are coupled to each other.

[0014] The first dividing member and the second dividing member may be a resin-molded product.

According to this aspect, a casting surface such as in a metal casting product is not generated on the inner wall surface of the discharge passage and surface roughness can be greatly suppressed as compared to a metal casting product.

[0015] The water discharge port may be formed into a laterally long slit shape. The discharge passage may be formed to be laterally long in a direction in which the water discharge port extends.

[0016] Another aspect of the present invention relates to a bathtub

device. A bathtub device comprises the water discharge device of the aspect described above and a bathtub installed with the water discharge device.

[ADVANTAGEOUS EFFECTS OF THE INVENTION]

[0017] According to the present invention, disturbance in the shape of a discharged water flow can be suppressed.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0018] Fig. 1 is a perspective view illustrating a water discharge device in use according to an embodiment.

Fig. 2 is a diagram of a configuration illustrating a water supply system used in the water discharge device according to the embodiment.

Fig. 3 is a front view of the water discharge device according to the embodiment.

Fig. 4 is a cross-sectional view taken along a line A-A in Fig. 3.

Fig. 5(a) is a plan view illustrating a discharge passage of a water discharge member according to the embodiment. Fig. 5(b) is a plan view illustrating a spacer.

Fig. 6 is an exploded perspective view of the water discharge device according to the embodiment.

Fig. 7(a) is a cross-sectional side view illustrating the discharge passage of the water discharge member according to the embodiment. Fig. 7(b) is a diagram illustrating an upper dividing member and a lower dividing member in an exploded state.

Fig. 8 is a cross-sectional view taken along a line B-B in Fig. 3.

Fig. 9(a) is a cross-sectional view taken along a line D-D

in Fig. 3. Fig. 9(b) is a diagram illustrating the upper dividing member and the lower dividing member in an exploded state.

[MODE FOR CARRYING OUT THE INVENTION]

[0019] Fig. 1 is a perspective view illustrating a water discharge device 10 in use according to the present embodiment.

The water discharge device 10 is used in a bathtub device 200. The bathtub device 200 includes a bathtub 210 in addition to the water discharge device 10. A rim portion 215 of the bathtub 210 is provided with an installment surface 217. The water discharge device 10 includes a device main body 11 to be installed on the installment surface 217. The device main body 11 is formed into a laterally long flat shape. A laterally long discharged water flow W of a film shape is discharged forward from a water discharge port 13.

[0020] Fig. 2 is a diagram of a configuration illustrating a water supply system 220 used in the water discharge device 10.

The water supply system 220 includes a water supply pump 221 provided on an upstream side of the water discharge device 10. The water discharge device 10 includes water introducing portions 15 in addition to the device main body 11. The water supply pump 221 is connected to the water introducing portion 15 via a discharge side pipe 223 and is connected to the bathtub 210 that is a water supply source via a suction side pipe 225. The water supply pump 221 sucks bathtub water 211 in the bathtub 210 through the suction side pipe 225 and pressure-feeds water to the water introducing portion 15 through the discharge side pipe 223 by being driven. The water discharge device 10 discharges the water flow W from the device main body 11 when water is pressure-fed in

the water introducing portion 15.

[0021] Fig. 3 is a front view of the water discharge device 10.

A front portion of the device main body 11 is provided with the laterally long water discharge port 13 of a slit shape. The plurality of water introducing portions 15 is provided in such a manner as to protrude downward from the device main body 11 while spaced in the lateral width direction of the water discharge port 13. Note that in the descriptions below the lateral width direction of the water discharge port 13 is referred to as a direction X, a horizontal direction perpendicular thereto is referred to as a front-and-rear direction Y, and a up-and-down direction is referred to as a up-and-down direction Z. The direction X corresponds with a lateral width direction of the discharge passage 33, which will be described later.

[0022] Fig. 4 is a cross-sectional side view of the water discharge device 10. This is a cross-sectional view taken along a line A-A in Fig. 3.

The water introducing portion 15 is inserted in a through hole 229 formed on the installment surface 217. The water introducing portion 15 is formed with a water introducing passage 17 that supplies water to a downstream side at an inner portion thereof and is connected with the discharge side pipe 223 at a tip portion thereof. A portion of the water introducing portion 15 protruding on the opposite side to the installment surface 217 is attached with a fixing member 231 such as a nut by screwing or other means. The device main body 11 is fixed to the bathtub 210 by interposing the bathtub 210 with the fixing member 231. Note that a seal ring 233 such as an O ring is interposed between the

fixing member 231 and the bathtub 210.

[0023] The device main body 11 is formed by a water discharge member 19 and an outer cover 21 assembled to each other. The water discharge member 19 includes a passage portion 23 formed with the water discharge port 13 at a front portion thereof, top surface portion 25 provided over the passage portion 23, and a lighting attachment portion 27 provided on a front upper surface of the passage portion 23. An upper surface of the top surface portion 25 is provided to be flush with an upper surface of the outer cover 21. These form an upper surface of the device main body 11. A hollow space 29 is provided between the top surface portion 25 and the passage portion 23. The lighting attachment portion 27 is attached with a lighting device 31. The lighting device 31 projects colored light or white light of a predetermined wavelength forward. This results in light projected to the discharged water flow W, a bather, or other objects, thereby providing preferable visual effects.

[0024] The outer cover 21 is detachably attached to the front portion of the water discharge member 19. The outer cover 21 is provided in such a manner as to cover the lighting device 31 from above thereof and to cover both end portions 19a (see Fig. 3) in the lateral width direction X of the water discharge member 19 from the front thereof.

[0025] The passage portion 23 is formed with the discharge passage 33 including the water discharge port 13 an inner portion thereof. The discharge passage 33 communicates the water introducing passage 17 on the upstream side to an external space 235 on the downstream side. The discharge passage 33 has a laterally long

shape in a direction in which the water discharge port 13 extends and is formed by the water discharge port 13, a reservoir chamber 37, and a constricting flow path 39 (will be described later).

[0026] A lower wall surface 71 of the discharge passage 33 is formed with a plurality of inlets 35 that feed water into the reservoir chamber 37. Water flows into the reservoir chamber 37 through the inlet 35 from the water introducing passage 17, which serves as an upstream side, and this water is temporary stored as reserve water. The reservoir chamber 37 is formed such that a pair of the lower wall surface 71 and an upper wall surface 73 of the discharge passage 33, which are opposite to each other in the up-and-down direction, spread in directions away from each other from an entrance 39a of the constricting flow path 39. Note that the lower wall surface 71 and the upper wall surface 73 are opposite to each other in the direction Z perpendicular to the lateral width direction X of the discharge passage 33.

[0027] The constricting flow path 39 is provided at the downstream side of the reservoir chamber 37 and communicates the reservoir chamber 37 with the water discharge port 13. The constricting flow path 39 is formed such that the passage height, which is a space between the pair of the lower wall surface 71 and the upper wall surface 73, is smaller than that of the reservoir chamber 37. The constricting flow path 39 is formed to have substantially a constant passage height over a range from the entrance 39a to the water discharge port 13. The reserve water in the reservoir chamber 37 is fed to the water discharge port 13 through the constricting flow path 39. The reserve water is constricted while passing the constricting flow path 39 and thereby gains flow

velocity. Therefore, the water flow W is vigorously discharged from the water discharge port 13.

[0028] Fig. 5(a) is a plan view illustrating the discharge passage 33. Fig. 5(b) is a plan view of a spacer 69, which will be described later. Fig. 5(a) is also a plan views of a lower dividing member 51, which will be described later.

When a dimension in the lateral width direction X and the front-and-rear direction Y of the discharge passage 33 are regarded as the passage width and the depth dimension, respectively, the discharge passage 33 is formed to have a depth dimension smaller than a passage width in planar view. The discharge passage 33 is formed to be laterally long such that a cross-section thereof (not illustrated) has a passage width bigger than the passage height. Side wall surfaces 33a on both sides of the discharge passage 33 in the lateral width direction X are formed such that the passage width of the discharge passage 33 extends as approaching the water discharge port 13 side from a depth side of the reservoir chamber 37.

[0029] The passage portion 23 includes a lower wall portion 41, an upper wall portion 43, a pair of side wall portions 45, and a rear wall portion 47 as illustrated in Fig. 4 and Fig. 5(a). These inner wall surfaces define the discharge passage 33. The lower wall portion 41 and the upper wall portion 43 are provided to both sides of the discharge passage 33 in the up-and-down direction Z. The pair of side wall portions 45 are provided to the both sides of the discharge passage 33 in the lateral width direction X. The rear wall portion 47 is provided on the depth side of the discharge passage 33 opposite to the water discharge port 13. The

pair of side wall portions 45 and the rear wall portion 47 are provided as a peripheral wall portion 49 surrounding the discharge passage 33 from the three directions of the both sides in the lateral width direction X and the depth side of the discharge passage 33.

[0030] Fig. 6 is an exploded perspective view of the water discharge device 10.

The water discharge member 19 is formed by the lower dividing member 51 as a first dividing member and an upper dividing member 53 as a second dividing member assembled to each other. The dividing members 51 and 53 are resin-molded products and have shapes divided into an upper part and a lower part, respectively, along the peripheral wall portion 49 of the water discharge member 19 as a boundary.

[0031] Fig. 7(a) is a cross-sectional side view enlarging and illustrating the discharge passage 33. Fig. 7(b) is a diagram illustrating the dividing members 51 and 53 in an exploded state.

The dividing members 51 and 53 have butting surfaces 55 opposite to each other in the up-and-down direction Z at boundary portions thereof. The butting surface 55 is provided in such a manner as to surround the discharge passage 33 from the three directions similarly to the peripheral wall portion 49. The dividing members 51 and 53 are assembled to each other while the butting surfaces 55 thereof are butted.

[0032] The lower dividing member 51 has a first passage defining portion 57 that partially defines each of the reservoir chamber 37, the constricting flow path 39, and the water discharge port 13. The first passage defining portion 57 is formed by the lower

wall surface 71 of the discharge passage 33 and a part of an inner peripheral wall surface 33b of the peripheral wall portion 49. The first passage defining portion 57 is formed into a recessed shape open upward within a range from a front end side to a depth side thereof. The upper dividing member 53 also has a second passage defining portion 59 that partially defines each of the reservoir chamber 37, the constricting flow path 39, and the water discharge port 13. The second passage defining portion 59 is formed by the upper wall surface 73 of the discharge passage 33 and a part of an inner peripheral wall surface 33b of the peripheral wall portion 49. The second passage defining portion 59 is formed into a convex shape protruding downward in a region S1 ranging from a front end side to an intermediate position thereof in the front-and-rear direction Y. The second passage defining portion 59 is further formed into a concave shape open downward in a region S2 ranging from the intermediate position in the front-and-rear direction Y to a depth side thereof. Each of the water discharge port 13, the reservoir chamber 37, and the constricting flow path 39 is defined by both of the first passage defining portion 57 and the second passage defining portion 59.

[0033] When the dividing members 51 and 53 are disassembled, the wall surfaces 71, 73, and 33b that are inner wall surfaces of the discharge passage 33 are exposed to the external space 235. Here the lower wall surface 71 of the lower dividing member 51 and the upper wall surface 73 of the upper dividing member 53 are exposed to face the external space 235.

[0034] Inside the reservoir chamber 37 of the discharge passage 33, the spacers 69 served as a columnar body are disposed as

illustrated in Fig. 5(a) and Fig. 6. The plurality of spacers 69 is disposed with intervals in the lateral width direction X.

[0035] An outer peripheral surface 69a of the spacer 69 is formed into a round shape in planar view as illustrated in Fig. 5(b). In other words, the outer peripheral surface 69a of the spacer 69 is formed to have a streamlined shape with respect to a water flow flowing in the discharge passage 33. Specifically, an upstream side portion 69b thereof is formed to have a lateral width gradually increasing as approaching the downstream side (lower side in the drawing) of a water flow flowing in the discharge passage 33 while a downstream side portion 69c thereof is formed to have a lateral width gradually decreasing as approaching the downstream side.

[0036] Fig. 8 is a cross-sectional view taken along a line B-B in Fig. 3. The shape of the lower dividing member 51 illustrated in the drawing corresponds to a cross-section taken along line C-C in Fig. 5(a).

The spacer 69 rises from the lower wall surface 71 of the lower dividing member 51, and an upper surface thereof contacts with the upper wall surface 73 of the upper dividing member 53. This allows the spacer 69 to maintain the space between the upper wall surface 73 and the lower wall surface 71 of the discharge passage 33 opposite to each other in the up-and-down direction.

[0037] The water discharge member 19 has a positioning structure 79 formed by a positioning recessed portion 75 and a positioning protruding portion 77 as illustrated in Fig. 3. The positioning structure 79 is provided to the both end portions 19a of the water discharge member 19 in the lateral width direction X.

[0038] Fig. 9(a) is a diagram illustrating a part of a cross-section taken along a line D-D in Fig. 3. Fig. 9(b) is a diagram illustrating the dividing members 51 and 53 in an exploded state. The shape of the lower dividing member 51 illustrated in the drawing corresponds to a cross-section taken along line E-E in Fig. 5(a).

The positioning recessed portion 75 is formed as a bottomed hole open to the butting surface 55 of the lower dividing member 51. The positioning protruding portion 77 is provided to the upper dividing member 53 at a position corresponding to the positioning recessed portion 75 and is formed as a boss protruding from the butting surface 55 thereof.

[0039] When the lower dividing member 51 and the upper dividing member 53 are assembled to each other, a worker positions the dividing members 51 and 53 as illustrated in Fig. 9(b) and thereby the plurality of positioning recessed portions 75 is inserted with the corresponding positioning protruding portions 77. This facilitates positioning of the dividing members 51 and 53 upon assembling the dividing members 51 and 53, thereby enhancing workability upon assembling.

[0040] The lower dividing member 51 is provided with a plurality of accommodation portions 83 that accommodate a fixing tool 81 such as a screw at a portion corresponding to the peripheral wall portion 49 as illustrated in Fig. 8. The spacer 69 of the lower dividing member 51 is also provided with an accommodation portion 83 that accommodates a fixing tool 81. Each of the accommodation portions 83 is formed with an insertion hole 85 to be inserted with the fixing tool 81. The upper dividing member 53 is provided

with a screw hole as an attached portion 87 at a position corresponding to the insertion hole 85. A tip portion 81a of the fixing tool 81 is fastened to the attached portion 87 by screwing thereto. The dividing members 51 and 53 are detachably coupled by these fixing tools 81.

[0041] The accommodation portion 83 of the lower dividing member 51 includes those provided coaxially to the positioning recessed portion 75 as illustrated in Fig. 9(a). The attached portion 87 of the upper dividing member 53 corresponding to the insertion hole 85 of the accommodation portion 83 is provided to the positioning protruding portion 77.

[0042] The lower dividing member 51 and the upper dividing member 53 have a first seal member 89 interposed between the multiple butting surfaces 55 as illustrated in Fig. 8. The butting surface 55 of the lower dividing member 51 is formed with a groove portion 91 to which the first seal member 89 can be fitted. The first seal member 89 is disposed inside the groove portion 91. The first seal member 89 is disposed in the groove portion 91 in a freely detachable manner without bonded thereto.

[0043] The first seal member 89 is formed in such a manner as to extend along the inner peripheral wall surface 33b of the peripheral wall portion 49 of the discharge passage 33. The inner peripheral wall surface 33b extends from one opening edge 13a of the water discharge port 13 in the lateral width direction to the other opening edge 13a as illustrated in Fig. 5(a). The first seal member 89 is disposed to surround the discharge passage 33 from the three directions of the both sides in the lateral width direction and the depth side.

[0044] Referring back to Fig. 8, the butting surface 55 of the upper dividing member 53 is formed with a convex portion 93 at a position opposite to the first seal member 89 in the up-and-down direction Z. The convex portion 93 is formed as a convex strip along the direction in which the first seal member 89 extends. The convex portion 93 presses the first seal member 89 and the plurality of butting surfaces 55 is sealed by the first seal member 89. This allows the first seal member 89 to regulate leakage of water in the discharge passage 33 from between the butting surfaces 55 to the outside. More specifically, leakage from an outer peripheral surface 19c of the water discharge member 19 from between the butting surfaces 55 or leakage from the insertion hole 85 or other parts of the accommodation portion 83 is regulated.

[0045] Note that a second seal member 95 of a ring shape is interposed between a tip end surface 69d of the spacer 69 and an upper wall surface 73 of the upper dividing member 53 opposite thereto. The second seal member 95 is disposed in an annular groove portion 97 formed on the tip end surface 69d also in a freely detachable manner without bonded thereto similarly to the first seal member 89. The upper wall surface 73 is formed with a convex portion 99 of a ring shape at a position opposite to the second seal member 95 in the up-and-down direction Z. The convex portion 99 presses the second seal member 95 and the tip end surface 69d and the upper wall surface 73 are sealed by the second seal member 95.

[0046] The plurality of insertion holes 85 is disposed with intervals along the inner peripheral wall surface 33b of the

peripheral wall portion 49 of the water discharge member 19 as illustrated in Fig. 5(a). That is, the plurality of fixing tools 81 is also disposed with similar positional relation although not illustrated in the drawing. These fixing tools 81 next to each other in the lateral width direction X are disposed such that an interval L2 in the both end portions 19a in the lateral width direction X of the water discharge member 19 is narrower than an interval L1 in an intermediate portion 19b in the lateral width direction X of the water discharge member 19.

[0047] Operations of the water discharge device 10 according to the above embodiment will be described.

In the water discharge member 19, water of a predetermined flow rate is pressure-fed from the water supply pump 221 (see Fig. 2) as illustrated in Fig. 4 and this water flows into the reservoir chamber 37 from the inlet 35 through the water introducing passage 17 and is then temporary stored in the reservoir chamber 37 as reserve water. Feeding water from the inlet 35 while reserve water is stored in the reservoir chamber 37 pressures the reserve water in the reservoir chamber 37. This water pressure causes the reserve water to be fed to the water discharge port 13 through the constricting flow path 39 and the water flow W is discharged from the water discharge port 13.

[0048] Here, water flowing from the inlet 35, which serves as an upstream side flows, in a spreading manner from the inlet 35 toward the entrance 39a of the constricting flow path 39. The flow velocity of this water flow is radically decreased when passing the reservoir chamber 37 than in the case where the discharge passage 33 has a constant passage height. The water

flow is effectively straightened such that the flow velocity becomes uniform in the lateral width direction X of the discharge passage 33 during the time the water flow reaches the entrance 39a of the constricting flow path 39 from the inlet 35.

[0049] Operational effects of the water discharge device 10 according to the above embodiment will be described.

In the water discharge member 19, each of the water discharge port 13, the reservoir chamber 37, and the constricting flow path 39 is defined by both of the upper dividing member 53 and the lower dividing member 51. Therefore, the inner wall surfaces 71, 73, and 33b of the discharge passage 33 can be exposed to the external space 235 over an area ranging from the water discharge port 13 to the reservoir chamber 37 when the respective dividing members 51 and 53 are exploded. Upon forming a portion having a hollow cross section, a degree of difficulty in molding is generally lower in the case of a plurality of components separately molded for exposing inner wall surfaces thereof to the external space than in the case of a single component integrally molded. This also facilitates ensuring accuracy in dimensions of the inner wall surfaces thereof. Therefore, the water discharge member 19 according to the present embodiment facilitates suppression of roughness of the inner wall surfaces 71, 73, and 33b of the discharge passage 33, thereby facilitating suppression of disturbance in the shape of the discharged water flow W caused by the surface roughness. Especially, the dividing members 51 and 53 are resin-molded products and thus a casting surface such as in a metal casting product is not generated on the inner wall surfaces 71, 73, and

33b of the discharge passage 33 and surface roughness can be greatly suppressed.

[0050] A water flow supplied to the discharge passage 33 is prone to be disturbed due to a radical change in a flow passage cross section when the water flow flows therein from the inlet 35. The discharge passage 33 has a cross-sectional shape with a wide passage width and a low passage height for vigorously discharging the laterally long water flow W. Therefore a water flow flowing inside the discharge passage 33 also has a laterally long and thin shape and thus is prone to influence of a disturbed flow, a clogged foreign matter, or others in the discharge passage 33. And a distance from the inlet 35 to the water discharge port 13 varies depending on a position in the lateral width direction of the water discharge port 13. The larger the lateral width dimension of the water discharge port 13, that is, the lateral width dimension of the discharged water flow W is, the larger a difference between the minimum distance and the maximum distance tends to be. From the above reasons, if the reservoir chamber 37 is not included in the discharge passage 33, the water flow W discharged from the water discharge port 13 tends to have dispersion in the flow velocity in the lateral width direction X of the water discharge port 13 and to have a disturbed shape.

[0051] With this regard, the water discharge member 19 according to the present embodiment is formed with the reservoir chamber 37 in the discharge passage 33 and thus the flow velocity of a water flow in the discharge passage 33 decreases when the water flow passes the reservoir chamber 37. This results in uniforming a flow velocity in the lateral width direction X in the reservoir

chamber 37, thereby allowing for effectively straightening the flow. The water flow W discharged from the water discharge port 13 is thus facilitated to uniform a flow velocity in the lateral width direction X. Suppressing disturbance in the shape allows for providing the discharged water flow W with excellent appearance. The discharged water flow W having excellent appearance further provides relaxing effects by falling onto a shoulder of a bather or more.

[0052] Moreover, the reservoir chamber 37 is formed such that a pair of the lower wall surface 71 and the upper wall surface 73 of the discharge passage 33, which are opposite to each other, extend in directions away from each other from the entrance 39a of the constricting flow path 39. Therefore, the volume of an interior portion of the reservoir chamber 37 can be easily increased as compared to a case where only one of the pair of wall surfaces 71 and 73 is formed to extend away from the other. As a result, the water pressure of reserve water in the reservoir chamber 37 is lowered and thus the flow velocity thereof can be easily lowered. This allows for effectively straightening a flow in the reservoir chamber 37 in such a manner as to uniform a flow velocity in the lateral width direction X.

[0053] The water discharge member 19 further has the following advantages due to the spacer 69 disposed in the discharge passage 33 as illustrated in Fig. 8. The water discharge device 10 may be used in a case where a pillow member is disposed on an upper surface of the device main body 11, and a bather places the head thereon. In this case, the water discharge member 19 is applied with a load to narrow the space in the discharge passage 33. When

the space in the discharge passage 33 is narrowed due to this load, the shape of the discharged water flow W may be disadvantageously disturbed. Especially a water flow flowing in the discharge passage 33 is prone to influence of a change in the space in the discharge passage 33 due to the laterally long and thin shape as described above. With this regard, the space in the discharge passage 33 can be maintained by the spacers 69 in the present embodiment and thus, even when the aforementioned load is applied to the water discharge member 19, disturbance in the shape of the discharged water flow W can be easily suppressed. There is especially a great advantage in that, even though the dividing members 51 and 53 are resin-molded products that are difficult to ensure strength, a change of the space in the discharge passage 33 due to the load can be suppressed even in this case.

[0054] Disposing the spacers 69 in the discharge passage 33 results in division of water flows by the spacers 69. With this regard, the spacers 69 according to the present embodiment are disposed in the reservoir chamber 37 where the flow velocity of a water flow is slow and a distance to the water discharge port 13 is farther than the constricting flow path 39. Therefore, even when a water flow is divided by the spacer 69, the divided water flows are facilitated to join at an early stage before reaching the water discharge port 13, thereby facilitating suppression of disturbance in the shape of a discharged water flow W caused by divided water flows.

[0055] If the first seal member 89 is attached to the upper dividing member 53 without bonded thereto, the first seal member 89 is easily detached upon assembling the dividing members 51 and

53. If attached by bonding, the assembling work becomes laborious. Especially, the first seal member 89 according to the present embodiment has such a complicated shape to surround the discharge passage 33 from the three directions and thus attaching to the upper dividing member 53 by bonding makes the assembling work further laborious. With this regard, the first seal member 89 according to the present embodiment is installed in the groove portion 91 of the lower dividing member 51 and thus the upper dividing member 53 can be assembled to the lower dividing member 51 with a state where the first seal member 89 is mounted in the groove portion 91 without bonded thereto, thereby enhancing workability upon assembling.

[0056] There are also cases where the water discharge member 19 is applied with bending force in a warping manner in the up-and-down direction caused by screwing of the fixing member 231 (see Fig. 4) or water pressure in the discharge passage 33 and so on. The water discharge member 19 has the depth dimension smaller than the lateral width dimension as illustrated in Fig. 5(a) for discharging the water flow W having a wide lateral width while reducing a space occupied thereby. Therefore, in the both end portions 19a in the lateral width direction X of the water discharge member 19, a distance from a point of load where the bending force is applied, that is, a distance from a point of load to a point of effort tends to be longer than in the intermediate portion 19b, and thus larger bending moment tends to act. With this regard, the plurality of fixing tools 81 (not illustrated in the drawing) is disposed such that the interval L2 in the both end portions 19a of the water discharge member 19 is narrower than the

interval L1 in the intermediate portion 19b in the present embodiment. Therefore, a degree of fixture of the both end portions 19a is higher than that of the intermediate portion 19b. Therefore, the interval L1 between the fixing tools 81 can be wide and the number of the fixing tools 81 can be reduced in the intermediate portion 19b of the water discharge member 19 while in the both end portions 19a thereof the interval L2 between the fixing tools 81 can be narrower to effectively resist the bending moment. This allows for stably maintaining the state where the dividing members 51 and 53 are coupled to each other.

[0057] The dividing members 51 and 53 are resin-molded products and thus mixing a coloring agent in the resin composition allows for providing the water discharge device 10 in a various color variations. Furthermore, the dividing members 51 and 53 are resin-molded products and thus post-processing such as anti-corrosion treatment is unnecessary, thereby enhancing productivity.

[0058] The present invention has been described based on the embodiments above; however, the embodiments merely illustrate the principles and applications of the present invention. Moreover, the embodiments may include various variations or modifications to arrangement within a scope not departing from the ideas of the present invention defined in the claims.

[0059] The example where a base body to which the water discharge device 10 is installed is the bathtub 210 has been described; however, a specific structure of the base body is not limited thereto. The water discharge device 10 may be installed to a washbasin in a lavatory, a sink in a kitchen, or other items

serving as the base body. In either case, an installment surface 217 may be provided to the base body and the water discharge device 10 may be installed on the installment surface 217.

[0060] The water discharge port 13 is formed into a laterally long slit shape. The discharge passage 33 is formed to be laterally long in a direction in which the water discharge port 13 extends. The shapes are not limited thereto and may be formed into a round shape for example or other shapes.

[0061] The example where the upper dividing member 53 and the lower dividing member 51 are resin-molded products has been described; however, the upper dividing member 53 and the lower dividing member 51 may be other metal casting products. The passage portion 23 having a hollow cross section is formed by assembling the plurality of components and thus, even in this case, disassembled components allows for easily reducing surface roughness by post-processing such as cutting or polishing of the inner wall surface of the discharge passage 33.

[0062] The upper dividing member 53 and the lower dividing member 51 have been described as being the first dividing member and the second dividing member, respectively, having shapes of the water discharge member 19 divided into an upper part and a lower part, respectively. These members may have shapes divided in the lateral width direction X. In either case, the dividing members are only required to have shapes divided in a direction intersecting with the direction from the reservoir chamber 37 toward the water discharge port 13.

[0063] The lower dividing member 51 and the upper dividing member 53 are detachably assembled to each other by the fixing tools 81;

however, the lower dividing member 51 and the upper dividing member 53 may be assembled by snap fitting or other means without limited thereto. The inlet 35 is formed on the lower wall surface 71 of the discharge passage 33; however, the inlet 35 is only required to be formed on the wall surface of the discharge passage 33 and may be formed on the upper wall surface 73, a rear wall surface, or the side wall surface.

[0064] The example where the spacer 69 is integrally formed in a rising manner from the lower dividing member 51 has been described; however, the spacer 69 may be integrally formed with the upper dividing member 53 or may be provided separately from the dividing members 51 and 53.

[0065] The example where the positioning structure 79 is formed by a combination of the positioning protruding portion 77 and the positioning recessed portion 75 has been described; however, the positioning structure 79 is not limited thereto. The positioning structure 79 may be provided to one of the lower dividing member 51 and the upper dividing member 53 for example or may be formed by a guiding protruding portion protruding toward the other. In this case, the other one of the dividing members 51 and 53 is guided by the guiding protruding portion upon assembling the dividing members 51 and 53, thereby performing positioning thereof. Moreover, the example where the positioning protruding portion 77 is provided to the upper dividing member 53 while the positioning recessed portion 75 is provided to the lower dividing member 51 in the positioning structure 79 has been described; however, the positioning recessed portion 75 may be provided to the upper dividing member 53 while the positioning protruding

portion 77 may be provided to the lower dividing member 51.

[0066] The example where the fixing tool 81 is accommodated in the accommodation portion 83 provided on the lower dividing member 51 has been described; however, the fixing tool 81 may be accommodated in an accommodation portion 83 provided on the upper dividing member 53. In either case, the accommodation portion 83 is provided on one of the lower dividing member 51 and the upper dividing member 53 at a portion corresponding the peripheral wall portion 49 surrounding the discharge passage 33 while the attached portion 87 is provided on the other.

[DESCRIPTION OF THE REFERENCE NUMERALS]

[0067] 10 water discharge device, 13 water discharge port, 19 water discharge member, 19a both end portions, 19b intermediate portion, 33 discharge passage, 33b inner wall surface, 37 reservoir chamber, 39 constricting flow path, 39a entrance, 49 peripheral wall portion, 51 lower dividing member, 53 upper dividing member, 55 butting surface, 69 spacer, 79 structure, 81 fixing tool, 91 groove portion, 200 bathtub device, 210 bathtub.

[INDUSTRIAL APPLICABILITY]

[0068] The present invention relates to a water discharge device that discharges water.

[CLAIMS]

1. A water discharge device, comprising:

a water discharge member formed with a discharge passage at an inner portion thereof,

wherein the discharge passage comprises: a water discharge port for discharging water; a reservoir chamber for storing water flowing therein from an upstream side; and a constricting flow path for feeding water in the reservoir chamber to the water discharge port,

the water discharge member is formed by a first dividing member and a second dividing member assembled to each other, and

each of the water discharge port, the reservoir chamber, and the constricting flow path is defined by both of the first dividing member and the second dividing member.

2. The water discharge device according to claim 1,

wherein the reservoir chamber is formed such that a pair of wall surfaces of the discharge passage, which are opposite to each other, spread in directions away from each other from an entrance of the constricting flow path.

3. The water discharge device according to claim 1 or 2,

wherein the water discharge member further comprises a spacer that is disposed inside the discharge passage and maintains a space between the pair of wall surfaces of the discharge passage opposite to each other.

4. The water discharge device according to claim 3,

wherein the spacer is disposed inside the reservoir chamber.

5. The water discharge device according to any one of claims 1 to 4,

wherein the first dividing member and the second dividing member comprise a plurality of butting surfaces butted to each other and a seal member that is interposed between the plurality of butting surfaces and seals between the plurality of butting surfaces.

6. The water discharge device according to claim 5,

wherein the first dividing member and the second dividing member are an upper dividing member and a lower dividing member, respectively, having shapes of the water discharge member divided into an upper part and a lower part, respectively,

the plurality of butting surfaces is provided opposite to each other in an up-and-down direction, and

the seal member is disposed in a groove portion formed on the butting surface of the lower dividing member.

7. The water discharge device according to any one of claims 1 to 6,

wherein the water discharge member has a positioning structure that positions the first dividing member and the second dividing member upon assembling the first dividing member and the second dividing member.

8. The water discharge device according to any one of claims

1 to 7,

wherein the water discharge member has a peripheral wall portion surrounding the discharge passage from three directions of both sides in a lateral width direction of the discharge passage and a depth side opposite to the water discharge port,

the first dividing member and the second dividing member are coupled by a plurality of fixing tools disposed with intervals along an inner peripheral wall surface of the peripheral wall portion, and

the plurality of fixing tools is disposed such that an interval in an intermediate portion in a lateral width direction of the water discharge member is narrower than an interval in both end portions thereof.

9. The water discharge device according to any one of claims 1 to 8,

wherein the first dividing member and the second dividing member are a resin-molded product.

10. The water discharge device according to any one of claims 1 to 9,

wherein the water discharge port is formed into a laterally long slit shape, and

the discharge passage is formed to be laterally long in a direction in which the water discharge port extends.

11. A bathtub device, comprising:

the water discharge device according to any one of claims 1

to 10; and

a bathtub installed with the water discharge device.

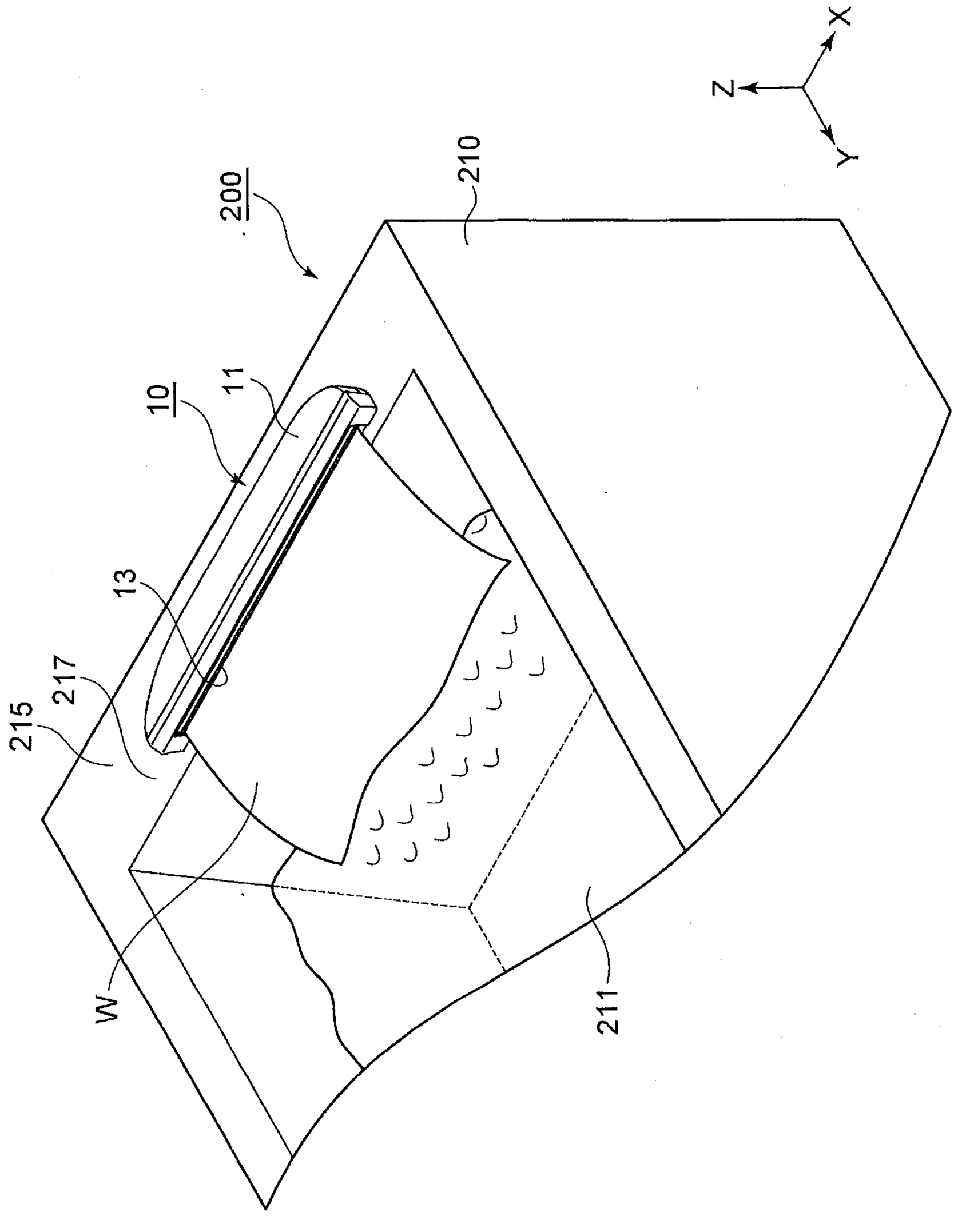


FIG. 1

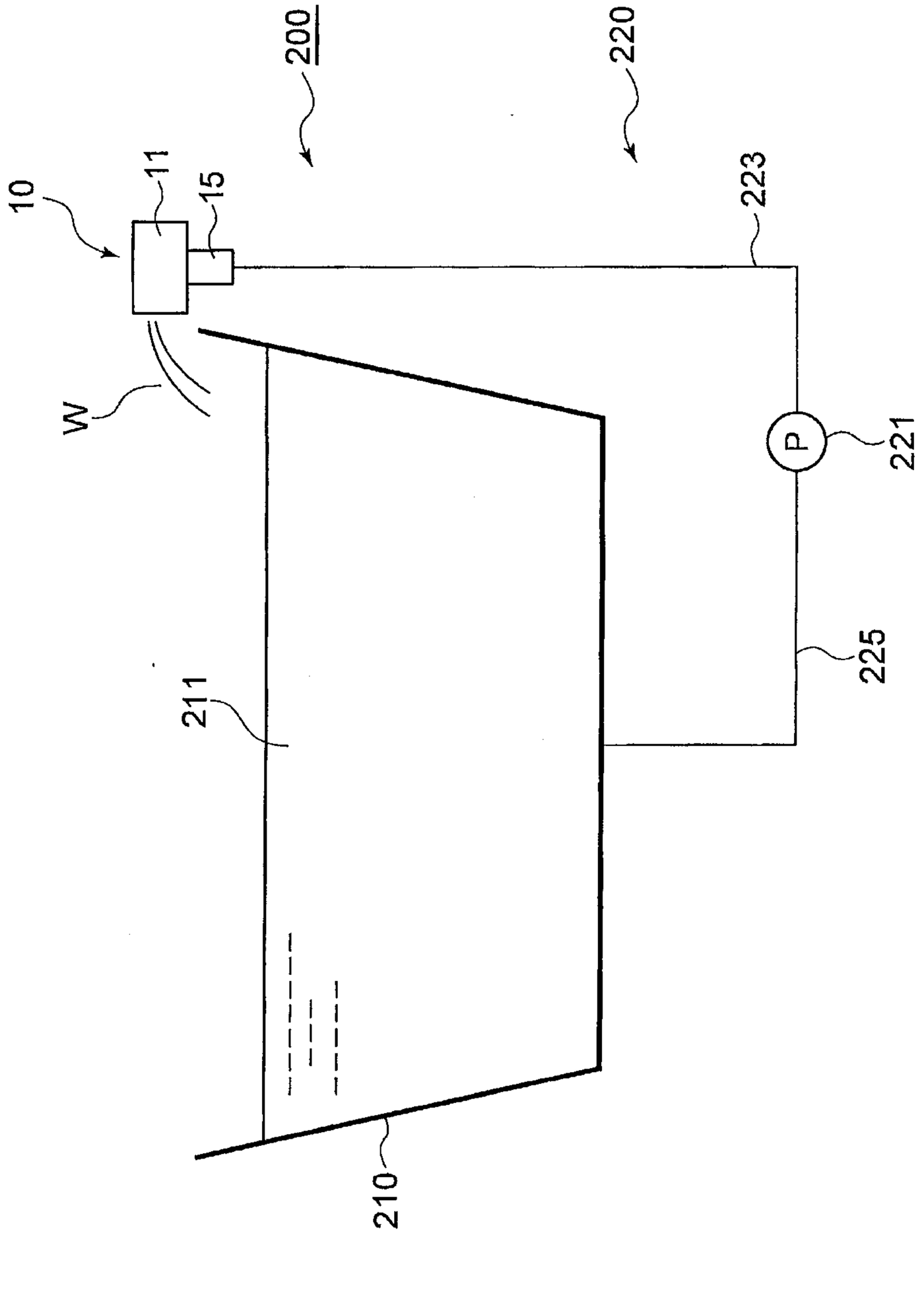


FIG. 2

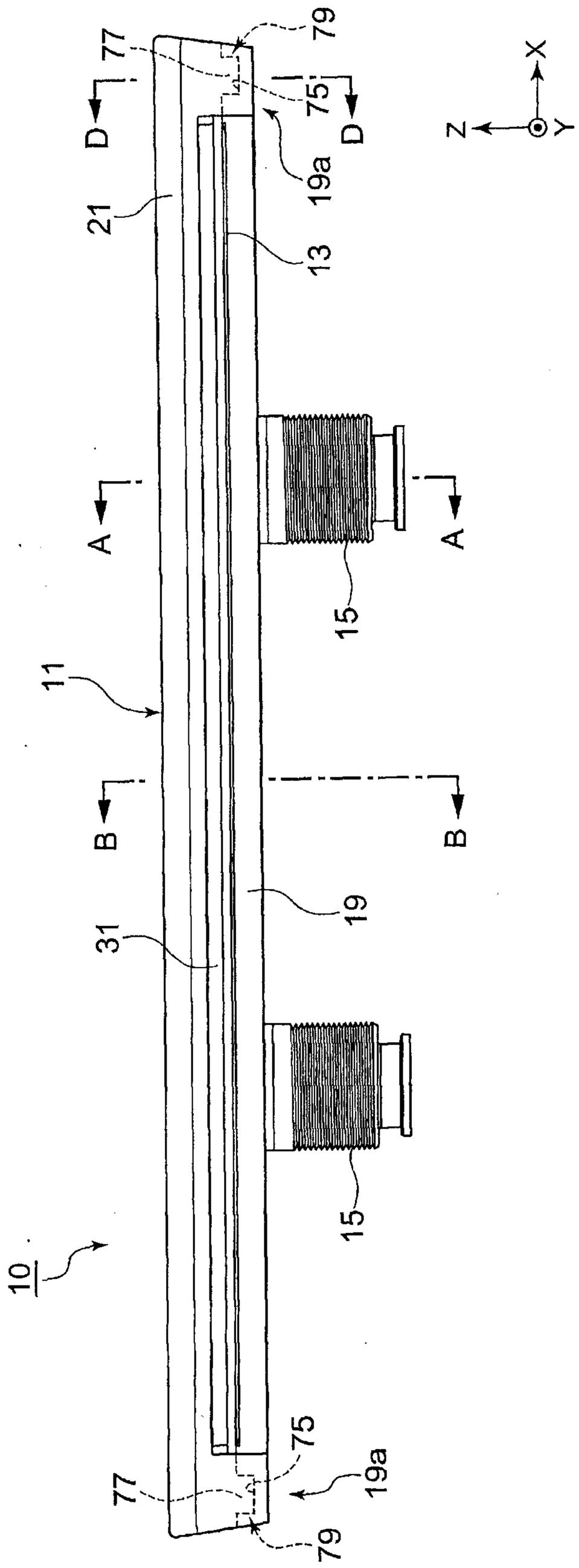


FIG. 3

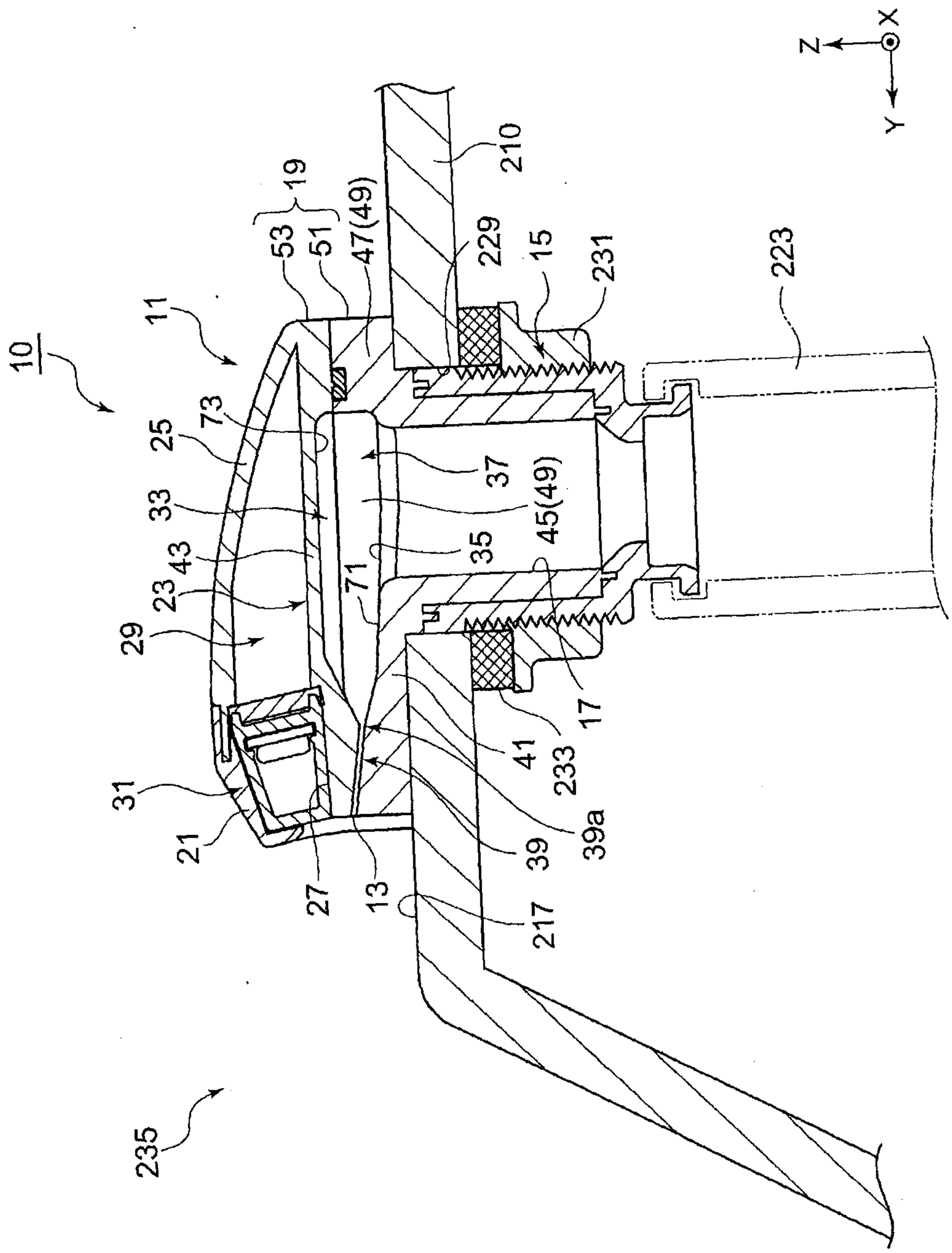
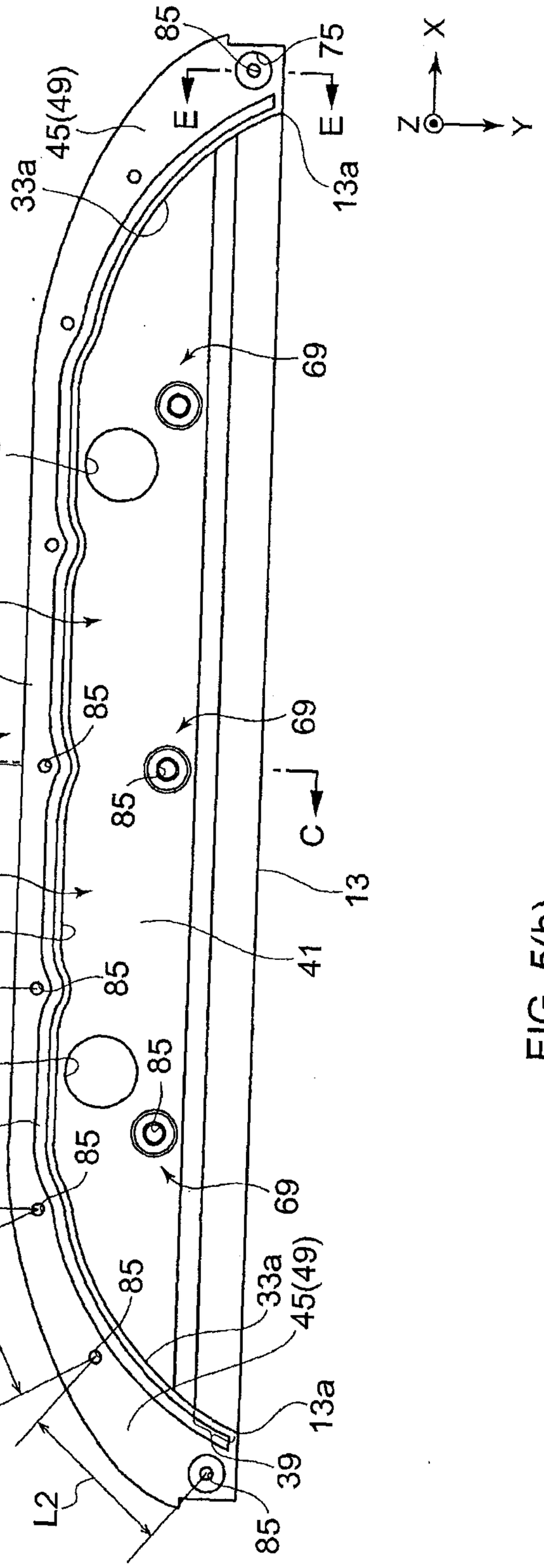

10
11
19
53
51
47(49)
210
229
15
231
223
25
73
37
33
45(49)
43
35
23
71
29
31
21
27
13
39
39a
41
233
17
217
235
Z
Y

FIG. 4


85
75
X
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Y
E
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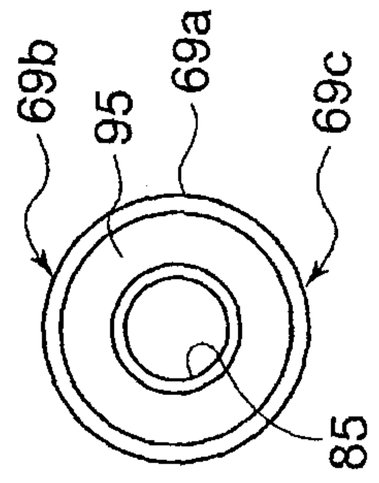
45(49)
33a
13a
69
35
33
47(49)
19b
85
C
C
L1
37
33b
41
13
89
L2
39

FIG. 5(a)


69b
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69a
69c
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69

FIG. 5(b)

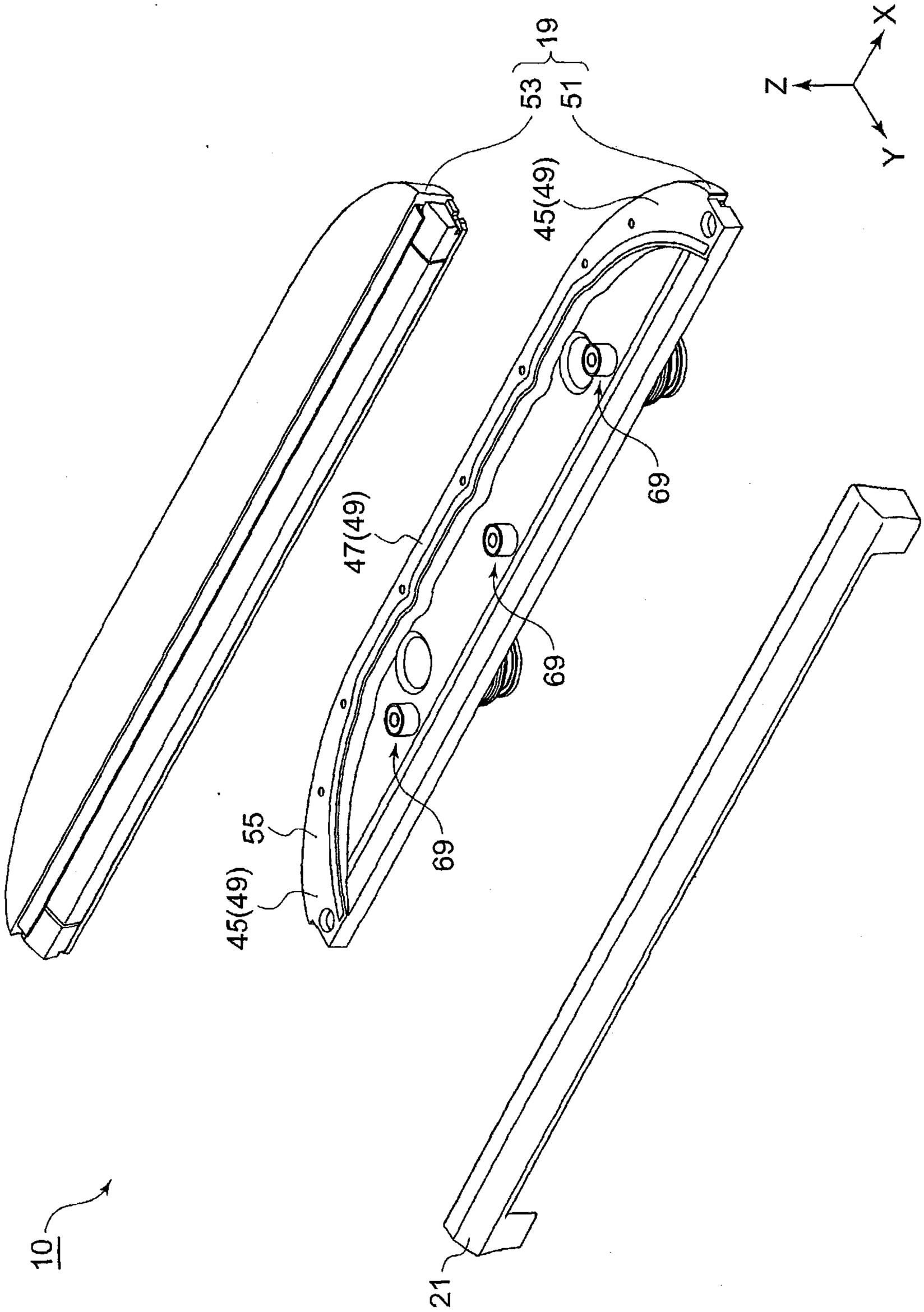
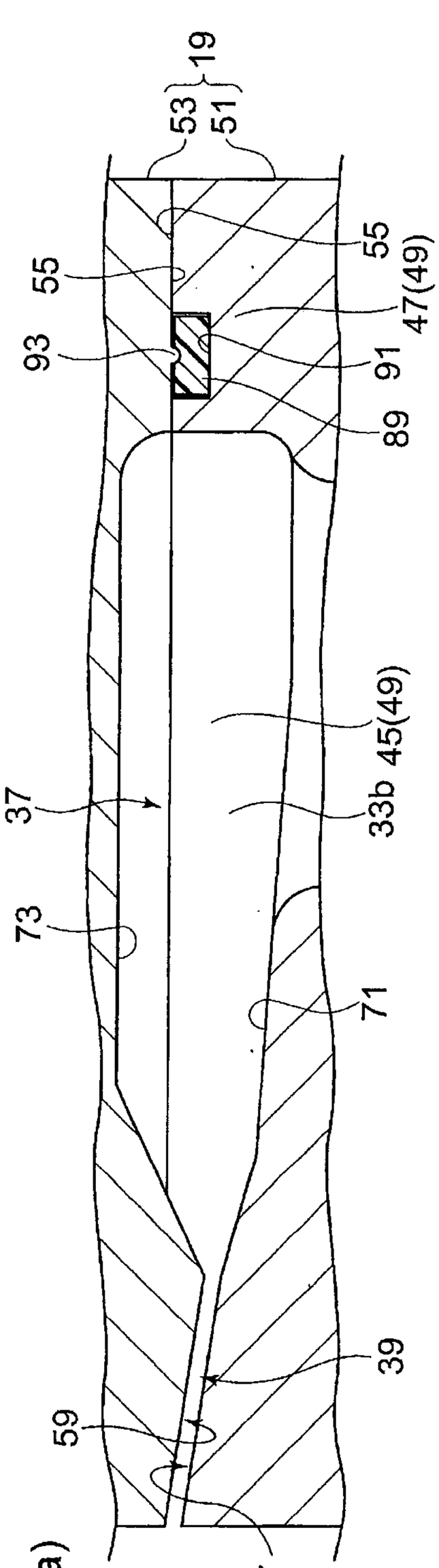


FIG. 6


19
53
51
55
55
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91
89
45(49)
33b
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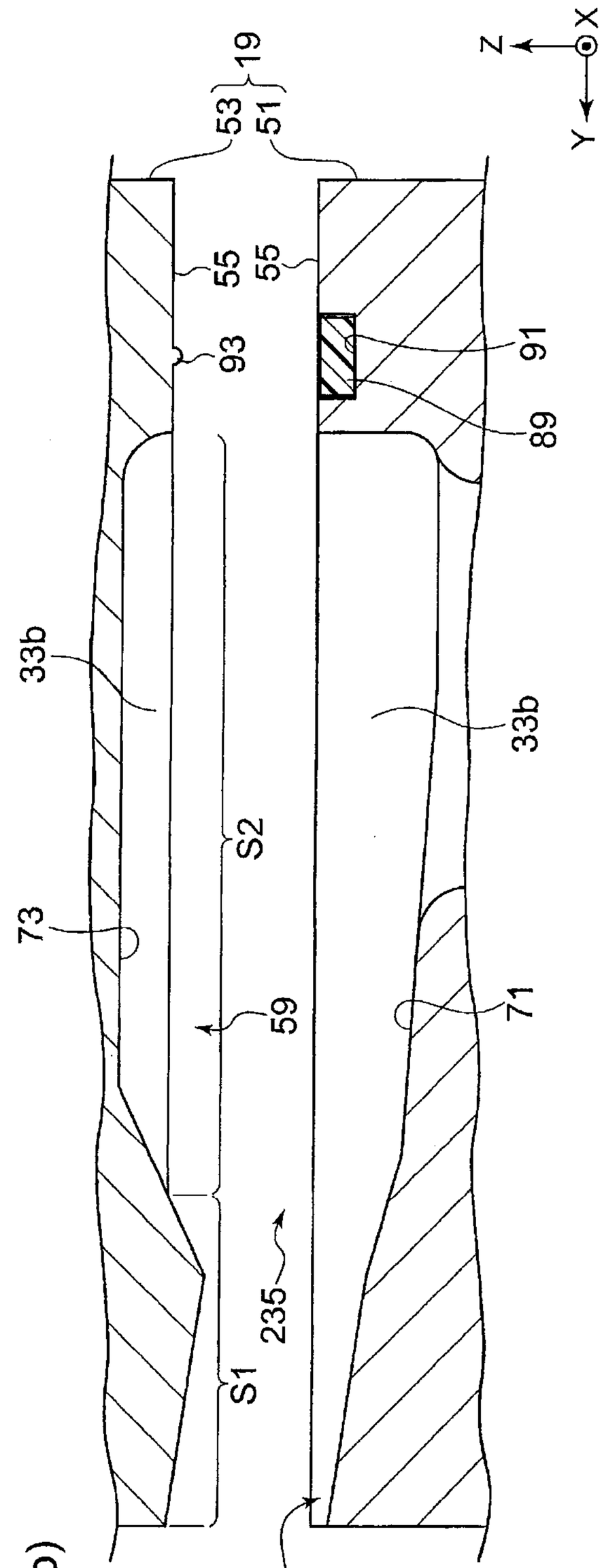
73
71
39
59
57

FIG. 7(a)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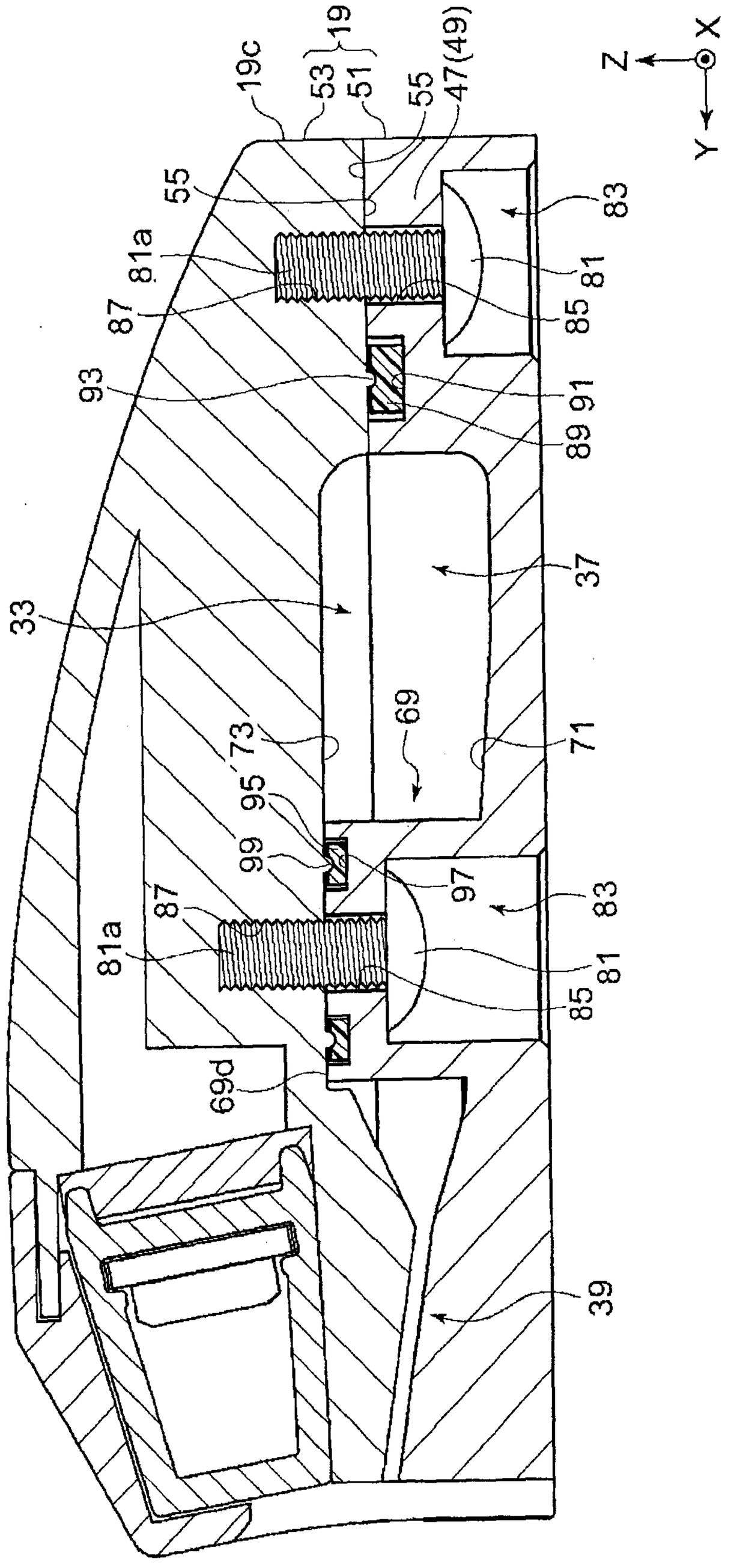
33b
33b
S2
73
59
71
S1
235
57

FIG. 7(b)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83
81a
81
85
69d
39

FIG. 8

FIG. 9(a)

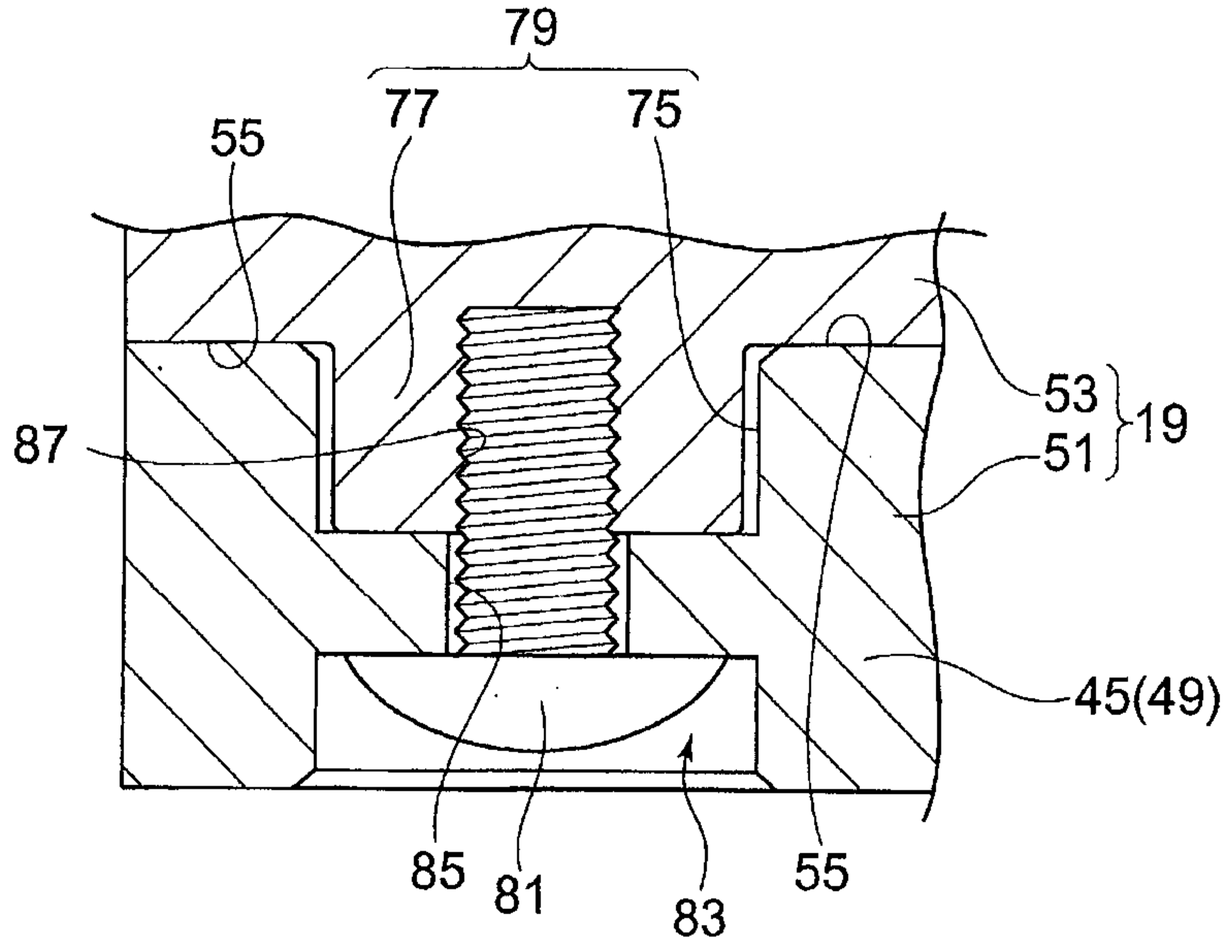

FIG. 9(b)