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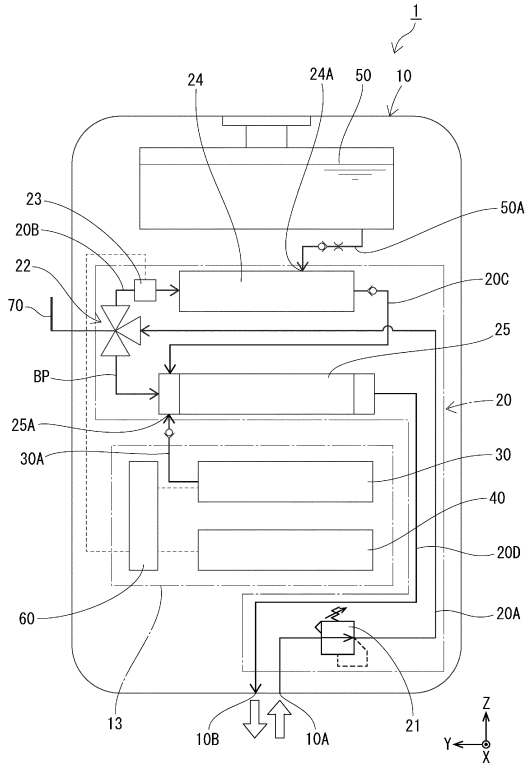
(54) **BUBBLE SUPPLYING DEVICE FOR BATHROOM**

(57) A foam supplying device for a bathroom (1) includes a case (10), a flow channel (20), a compressor (30), and a battery (40). In the case (10), a water inflow port (10A) and a foam outflow port (10B) are formed. The flow channel (20) connects the water inflow port (10A) and the foam outflow port (10B). The compressor (30) is built in the case (10) and sends compressed air to the flow channel (20). The battery (40) is built in the case (10) and supplies electric power to the compressor (30).

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a foam supplying device for a bathroom.

BACKGROUND ART

[0002] Patent Literature 1 discloses a conventional foam supplying device. The foam supplying device includes a housing in which a water supply port and a foam discharge port are formed, and a flow channel connecting the water supply port and the foam discharge port. Compressed gas supplied from a compressed gas supply unit is fed into the flow channel.

CITATIONS LIST

PATENT LITERATURE

[0003] Patent Literature 1: JP 2018-198641 A

SUMMARY OF INVENTION

TECHNICAL PROBLEMS

[0004] In a case of Patent Literature 1, the compressed gas supply unit is disposed outside the housing, and is connected to the housing by a hose or the like. In this case, since work such as installation of the housing, installation of the compressed gas supply unit, and arrangement of the hose or the like is required, installation work and the like are complicated.

[0005] The present disclosure has been made in view of the above conventional circumstances, and an object of the present disclosure is to provide a foam supplying device for a bathroom that can be easily installed.

SOLUTIONS TO PROBLEMS

[0006] A foam supplying device for a bathroom according to one embodiment of the present disclosure includes: a case in which a water inflow port and a foam outflow port are formed; a flow channel that connects the water inflow port and the foam outflow port; a compressor that is built in the case and sends compressed air to the flow channel; and a battery that is built in the case and supplies electric power to the compressor.

BRIEF DESCRIPTION OF DRAWINGS

[0007]

Fig. 1 is a view schematically illustrating a foam supplying device for a bathroom according to an embodiment.
Fig. 2 is a front view illustrating the foam supplying device for a bathroom according to the embodiment.
Fig. 3 is a right-side view illustrating the foam supplying device for a bathroom according to the embodiment.
Fig. 4 is a plan view illustrating the foam supplying device for a bathroom according to the embodiment.
Fig. 5 is a bottom view illustrating the foam supplying device for a bathroom according to the embodiment.
Fig. 6 is a rear view illustrating the foam supplying device for a bathroom according to the embodiment.
Fig. 7 is a cross-sectional view taken along a VII-VII line in Fig. 2.
Fig. 8 is a perspective view illustrating a flow channel and a base plate according to the embodiment.
Fig. 9 is a perspective view illustrating a battery unit and a second lid member according to the embodiment.
Fig. 10 is an enlarged view of a region X in Fig. 7.
Fig. 11 is a left-side cross-sectional view illustrating a tank according to the embodiment.
Fig. 12 is a perspective view illustrating an operation unit and the base plate according to the embodiment.

DESCRIPTION OF EMBODIMENTS

[0008] A foam supplying device for a bathroom 1 (hereinafter, also simply referred to as a foam supplying device 1) shown in Figs. 1 to 7 is a device that turns inflowing water into foam and causes the foam to flow out. The foam supplying

device for a bathroom 1 is installed in a bathroom. Foam supplying device 1 is detachably attached to a wall surface W of the bathroom.

[0009] In the following description, in a state where the foam supplying device 1 is attached to the wall surface W, a front-back direction is defined with a front direction of the wall surface W as a front side, and an opposite direction as a back side. For a vertical direction and a horizontal direction, a direction of the foam supplying device 1 in a state of being attached to the wall surface W as viewed from the front of the wall surface W is directly defined as a vertical direction and a horizontal direction. An X axis, a Y axis, and a Z axis shown in each drawing represent the front-back direction, the horizontal direction, and the vertical direction, respectively. In the X axis, the Y axis, and the Z axis, a positive direction of each axis is the front side, the left side, and the upper side, respectively.

[0010] As shown in Fig. 1, the foam supplying device 1 includes a case 10, a flow channel 20, a compressor 30, a battery unit 40, a tank 50, a control unit 60, and an operation unit 70. The foam supplying device 1 houses the flow channel 20, the compressor 30, the battery unit 40, the tank 50, and the control unit 60 in an inner space of the case 10. The operation unit 70 is pivotally supported by the case 10. The operation unit 70 performs a switching operation of a three-way valve 22 to be described later by being rotated by a user.

[0011] In the case 10, a water inflow port 10A and a foam outflow port 10B are formed. The flow channel 20 connects the water inflow port 10A and the foam outflow port 10B. The compressor 30 is built in the case 10 and sends compressed air to the flow channel 20. The battery unit 40 is an example of a battery according to the present disclosure. The battery unit 40 is built in the case 10 and supplies electric power to the compressor 30. The tank 50 is built in the case 10 and stores a liquid cleaning agent. The control unit 60 is built in the case 10, and performs operation control of the compressor 30.

[0012] As shown in Figs. 2 to 7, the case 10 is rounded and bulges outward as a whole, from an upper surface 10C to a lower surface 10E through a front surface 10D, and from the front surface 10D to left and right side surfaces 10F. A rear surface 10G of the case 10 is a flat surface. The case 10 has a rectangular shape in which the vertical direction is a longitudinal direction in a front view. The case 10 includes a front cover 11, a base plate 12, and an inner cover 13.

[0013] The front cover 11 forms a three-dimensional shape having surfaces in which upper and lower surfaces, left and right surfaces, and a front surface are continuous in a curved surface shape. The upper surface of the front cover 11 constitutes the upper surface 10C of the case 10. The lower surface of the front cover 11 constitutes the lower surface 10E of the case 10. The left and right side surfaces of the front cover 11 constitute the left and right side surfaces 10F of the case 10. The front surface of the front cover 11 constitutes the front surface 10D of the case 10. A rear surface of the front cover 11 is opened. The base plate 12 has a flat plate shape that closes a rear surface opening of the front cover 11. The case 10 is attached to the wall surface W with the rear surface of the base plate 12 facing the wall surface W.

[0014] A first opening 11A is formed in the front surface of the front cover 11, that is, the front surface 10D of the case 10 (see Figs. 2 and 3). The first opening 11A is an opening for taking the battery unit 40 in and out of the case 10. The first opening 11A opens forward below the center of the front cover 11 in the vertical direction. A first lid member 14 is detachably fitted in the first opening 11A.

[0015] The first opening 11A has a rectangular shape in which the horizontal direction is the longitudinal direction in a front view (see Fig. 2). In the first opening 11A, an outline portion corresponding to each side of the rectangle is rounded to bulge outward. An upper edge portion of the first opening 11A has a central portion in the horizontal direction located at the uppermost position, and is gradually inclined therefrom downward toward the outside in the horizontal direction.

[0016] A projection portion 11B is provided in a peripheral edge portion of the first opening 11A. The projection portion 11B protrudes outward, that is, forward, along the peripheral edge portion of the first opening 11A. A height from the surface of the front cover 11 to a front end of the projection portion 11B, that is, a protruding height of the projection portion 11B is equal over an entire circumference of the first opening 11A. Therefore, a surface shape of a protruding end surface of the projection portion 11B is annular and has a curved surface shape along the surface of the front cover 11 having a curved surface shape. The upper edge portion of the first opening 11A is located forward relative to the lower edge portion (see Fig. 6).

[0017] The front cover 11 is inclined downward to the front side (in a direction of the front) from an upper end thereof to a portion above the first opening 11A (see Fig. 3). The front cover 11 is inclined rearward (in a back direction opposite to the front) from a horizontally central portion toward the outside in the horizontal direction (see Fig. 4). Therefore, when water attached to the surface of the front cover 11 drops along the surface, the water is urged to flow down to the outside in the horizontal direction so as to avoid the first opening 11A formed at the horizontally central portion.

[0018] On the front cover 11, an upper opening 11C, a lower opening 11D, and a side opening 11E are formed. The upper opening 11C is formed on the upper surface of the front cover 11, that is, the upper surface 10C of the case 10 (see Fig. 4). The upper opening 11C has a trapezoidal shape in a plan view. A rear end of the upper opening 11C is opened rearward. An upper lid member 15 is detachably fitted in the upper opening 11C. The upper lid member 15 covers a cleaning agent replenishment portion 51 to be described later in the tank 50. The upper lid member 15 constitutes the upper surface 10C of the case 10 together with the upper surface of the front cover 11 in a state of being fitted into the front cover 11.

[0019] The lower opening 11D is formed on the lower surface of the front cover 11 (see Fig. 5). The lower opening 11D has a trapezoidal shape in a bottom view. The rear end of the lower opening 11D is opened rearward. A lower lid member 16 is detachably fitted in the lower opening 11D. The lower lid member 16 covers a periphery of the water inflow port 10A and the foam outflow port 10B. The lower lid member 16 is formed with a pair of through holes 16A and 16B. The pair of through holes 16A and 16B is formed in line in the front-back direction. Opening peripheral edge portions of the pair of through holes 16A and 16B protrude downward (see Figs. 2 and 3). Pipe joints F1 and F2 forming the water inflow port 10A and the foam outflow port 10B penetrate the pair of through holes 16A and 16B. Gaps are formed between inner peripheral surfaces of the through holes 16A and 16B and outer peripheral surfaces of the pipe joints F1 and F2.

[0020] The side openings 11E are formed on the left and right side surfaces of the front cover 11, respectively (see Figs. 2 and 3). Each side opening 11E has a U-shaped opening shape that is opened rearward. A side cover 17 is fitted in each side opening 11E. A rotation shaft of an arm portion 72 to be described later in the operation unit 70 penetrates the side cover 17. The side cover 17 remains on the base plate 12 side even when the front cover 11 is removed.

[0021] In the case 10, a remaining amount confirmation window 11F is formed at an upper portion of the front surface of the front cover 11 (see Fig. 2). The remaining amount confirmation window 11F is opened such that a remaining amount gauge 53, to be described later, of the tank 50 disposed in the case 10 can be visually recognized. The remaining amount confirmation window 11F is formed at the center in the horizontal direction of the front cover 11, in a long hole shape in which the vertical direction is the longitudinal direction.

[0022] The base plate 12 has a flat plate shape (see Figs. 6 and 7). A magnet sheet (not illustrated) is attached to the rear surface of the base plate 12. The rear surface of the base plate 12 constitutes the rear surface 10G of the case 10. When the foam supplying device 1 is attached to the wall surface W, the base plate 12 comes into contact with the wall surface W via the magnet sheet.

[0023] The base plate 12 has a recess 12A and a cutout portion 12B. The recess 12A is formed at the center of the base plate 12 in the horizontal direction and above the center in the vertical direction to be recessed forward. A fall prevention hook F attached to the wall surface W is accommodated in the recess 12A. The recess 12A is provided with a locking portion 12C to be locked to the fall prevention hook F. The cutout portion 12B is formed by cutting out an upper end portion of the base plate 12 downward. An opening 51B, to be described later, of the tank 50 is exposed in the cutout portion 12B.

[0024] As shown in Fig. 7, the inner cover 13 is disposed in a space formed by the front cover 11 and the base plate 12. The inner cover 13 is attached to the front surface of the base plate 12. Electric components such as the compressor 30, the battery unit 40, and the control unit 60 are disposed in a space inside the inner cover 13 (see Figs. 1 and 2).

[0025] The inner cover 13 has a box shape in which the rear surface is opened. Watertightness of the connection between the inner cover 13 and the base plate 12 is maintained by a seal member (not illustrated). An opening 13A is formed in the front surface of the inner cover 13. A storage unit 43 to be described later is fitted into the opening 13A from the back side. The battery unit 40 is detachably stored in the storage unit 43. The storage unit 43 is disposed behind the first opening 11A so as to correspond to the first opening 11A in the front cover 11.

[0026] As shown in Fig. 7, in the case 10, the water inflow port 10A and the foam outflow port 10B are formed. In the case of the present embodiment, the water inflow port 10A and the foam outflow port 10B are opened downward at the lower surface 10E of the case 10. The water inflow port 10A and the foam outflow port 10B are disposed in line in the front-back direction. The water inflow port 10A and the foam outflow port 10B are formed by the pipe joints F1 and F2, respectively. The pipe joints F1 and F2 are integrated and fixed to a lower end of the front surface of the base plate 12. A flow channel forming member (not illustrated) communicating with a water supply source, such as a water supply hose, is connected to the pipe joint F1. A shower hose or the like with a shower head attached to the end thereof is attached to the pipe joint F2.

[0027] As shown in Fig. 1, the flow channel 20 is formed in the case 10, and connects the water inflow port 10A and the foam outflow port 10B. In the case of the present embodiment, the flow channel 20 is formed by hoses, pipe joints, and the like, as shown in Fig. 8. The flow channel 20 allows water flowing in from the water inflow port 10A to flow therethrough, and in the flowing process, the liquid cleaning agent and the compressed air are mixed to generate foam which is discharged from the foam outflow port 10B. The liquid cleaning agent and the compressed air are respectively supplied from a first connection channel 50A and a second connection channel 30A which merge in the middle of the flow channel 20. One end of the first connection channel 50A is connected to the tank 50. One end of the second connection channel 30A is connected to the compressor 30.

[0028] The flow channel 20 is provided with a pressure reducing valve 21, a three-way valve 22, a flow rate sensor 23, an aspirator 24, and a foam maker 25. It can be said that the pressure reducing valve 21, the three-way valve 22, the flow rate sensor 23, the aspirator 24, and the foam maker 25 form a part of the flow channel 20 thereinside. The pressure reducing valve 21, the three-way valve 22, the flow rate sensor 23, the aspirator 24, and the foam maker 25 are disposed in this order from the water inflow port 10A on an upstream side of the flow channel 20 to the foam outflow port 10B which is a downstream end.

[0029] As shown in Fig. 8, the flow channel 20 is roughly divided into four sections of a flow channel 20A from the

water inflow port 10A to the three-way valve 22, a flow channel 20B from the three-way valve 22 to the aspirator 24, a flow channel 20C from the aspirator 24 to the foam maker 25, and a flow channel 20D from the foam maker 25 to the foam outflow port 10B.

[0030] The pressure reducing valve 21 is provided in the flow channel 20A. In the case of the present embodiment, the pressure reducing valve 21 is provided integrally with the pipe joint F1 which forms the water inflow port 10A (see Fig. 7). The pressure reducing valve 21 is disposed at the center of the case 10 in the horizontal direction and in a lower end portion of the space in the case 10. The pressure reducing valve 21 is fixed to the front surface of the base plate 12. The pressure reducing valve 21 reduces pressure of water introduced from the water supply source to a predetermined size. As a result, water pressure in the aspirator 24 is kept constant, and suction quantity of the liquid cleaning agent is kept constant.

[0031] As shown in Fig. 8, the flow channel 20A extends to a right side from the pressure reducing valve 21. The flow channel 20A is bent upward in a right side portion of the case 10 and extends upward between the front cover 11 and the inner cover 13. The flow channel 20A is bent to a left side at a position slightly above the central portion of the case 10 in the vertical direction, extends to the left side at the central portion of the case 10 in the front-back direction, and is connected to the three-way valve 22.

[0032] The three-way valve 22 is an example of a switching unit according to the present disclosure. The three-way valve 22 switches a mode of flowing out from the foam outflow port 10B to either water or foam. Three outflow and inflow ports of the three-way valve 22 are connected to the flow channel 20A connected from the pressure reducing valve 21 on the upstream side, the flow channel 20B leading to the flow rate sensor 23 on the downstream side, and a bypass flow channel BP leading directly to the foam maker 25, respectively (see Fig. 1). The three-way valve 22 is switchable between a state where the flow channel 20A and the flow channel 20B communicate with each other and a state where the flow channel 20A and the bypass flow channel BP communicate with each other. The three-way valve 22 is disposed above the center of the case 10 in the vertical direction and on the left side relative to the center of the case 10 in the horizontal direction.

[0033] In the case of the present embodiment, in the three-way valve 22, three outflow and inflow ports and an operation shaft are arranged in a cross shape. The three-way valve 22 has a cross shape extending in the front, back, left, and right directions in a plan view seen from above. Specifically, the flow channel 20A is connected to the three-way valve 22 from the right side, the flow channel 20B is connected from the back side, and the bypass flow channel BP is connected from the front side. The operation shaft of the three-way valve 22 extends to the left side. By operation of the operation shaft, the three-way valve 22 is switched between two states: a state where the flow channel 20A and the flow channel 20B communicate with each other; and a state where the flow channel 20A and the bypass flow channel BP communicate with each other. In a state where the flow channel 20A and the flow channel 20B communicate with each other, the foam flows out from the foam outflow port 10B. In a state where the flow channel 20A and the bypass flow channel BP communicate with each other, water flows out from the foam outflow port 10B.

[0034] The three-way valve 22 is fixed to a bearing portion 73 to be described later in the operation unit 70. The bearing portion 73 is fixed to the front surface of the base plate 12. Therefore, it can be said that the three-way valve 22 is indirectly fixed to the base plate 12 via the bearing portion 73. The operation unit 70 is connected to the operation shaft of the three-way valve 22. The three-way valve 22 is a so-called ball valve using a ball-shaped valve body. By rotating the operation shaft, the ball-shaped valve body is rotated so that three-way valve 22 switches the flow channel.

[0035] By using the ball-shaped valve body, the three-way valve 22 can bring the flow channel 20A into a state of being communicating with both the flow channel 20B and the bypass flow channel BP in a flow channel switching process. The three-way valve 22 gradually switches the flow channel without completely blocking the flow channel. Therefore, flow of water flowing through the flow channel 20 does not stop even during switching. For example, in a case where hot water from a water heater is used as water flowing in from the water inflow port 10A, if the flow of water stops when the flow channel is switched, the water heater also stops, so that unheated water may flow after the switching is completed. On the other hand, in the case of the three-way valve 22 using the ball-shaped valve body, the switching can be performed without stopping the water heater, and thus heated hot water can stably flow through the flow channel 20.

[0036] The flow channel 20B extends rearward from the three-way valve 22. The flow channel 20B is bent to the right side in front of the base plate 12 and extends to the right side along the front surface of the base plate 12. The flow channel 20B is bent upward in the right side portion of the case 10 and connected to a right side end portion of the aspirator 24.

[0037] The flow rate sensor 23 is provided in the flow channel 20B. The flow rate sensor 23 is fixed to the front surface of the base plate 12 at a position rightward relative to the central portion of the case 10 in the horizontal direction. The flow rate sensor 23 detects a flow rate of water flowing through the flow channel 20B. A detection result of the flow rate sensor 23 is transmitted to the control unit 60, and used for operation control of the compressor 30.

[0038] The aspirator 24 aspirates the liquid cleaning agent in the tank 50 by negative pressure. The aspirator 24 utilizes the Venturi effect to generate negative pressure. The aspirator 24 is disposed at a position above the three-way valve 22 and close to the rear in the front-back direction (see Fig. 7). The aspirator 24 is formed in a cylindrical shape. The

aspirator 24 is disposed with its central axis along the horizontal direction. The aspirator 24 forms a flow channel flowing from the right side end portion toward a left side end portion. The aspirator 24 is fixed to the front surface of the base plate 12.

[0039] As shown in Fig. 8, the aspirator 24 is provided with a first merging portion 24A. The first connection channel 50A is connected to the first merging portion 24A. The first connection channel 50A is connected to the tank 50 and allows the liquid cleaning agent stored in the tank 50 to flow therethrough. The aspirator 24 mixes the liquid cleaning agent sucked from the first merging portion 24A by negative pressure with the water flowing in from the flow channel 20B on the upstream side. The water mixed with the liquid cleaning agent in the aspirator 24 flows out to the flow channel 20C on the downstream side. A backflow prevention valve is provided at a downstream side end portion of the aspirator 24. An orifice and a backflow prevention valve (not illustrated) are provided at the downstream side end portion of the first connection channel 50A.

[0040] As shown in Fig. 8, the flow channel 20C extends from the left side end portion of the aspirator 24 to the left side and is bent forward. The flow channel 20C extends forward while being bent in a crank shape, and is connected to the outer peripheral surface of the foam maker 25.

[0041] The foam maker 25 further mixes the compressed air with a mixed fluid of water and the liquid cleaning agent to generate a mixed fluid of water, the liquid cleaning agent, and the compressed air, that is, foam. The foam maker 25 is formed in a cylindrical shape, and is disposed with its central axis along the horizontal direction. The foam maker 25 is disposed at the same height position as the three-way valve 22 and in front of the three-way valve 22 and the aspirator 24. In the foam maker 25, the flow channel 20C is connected to the outer peripheral surface of the left side end portion, and the flow channel 20D is connected to the right end surface. The bypass flow channel BP is connected to a left end surface of the foam maker 25. The bypass flow channel BP is formed by a L-shaped pipe joint made of resin. The foam maker 25 is fixed to the three-way valve 22 by the pipe joint. In other words, the foam maker 25 is fixed to the base plate 12 via the L-shaped pipe joint, the three-way valve 22, and the bearing portion 73.

[0042] The foam maker 25 is provided with a second merging portion 25A. The second connection channel 30A is connected to the second merging portion 25A. The second connection channel 30A is connected to the compressor 30 at an upstream end. The compressed air generated by the compressor 30 flows through the second connection channel 30A. In the foam maker 25, the compressed air flowing through the second connection channel 30A is sent from the second merging portion 25A. The foam maker 25 mixes the compressed air sent from the second merging portion 25A with a mixed fluid of water and the liquid cleaning agent flowing in from the flow channel 20C. The foam maker 25 stirs a mixed fluid of water, the liquid cleaning agent, and the compressed air in the process of flowing through the inside. The mixed fluid of water, the liquid cleaning agent, and the compressed air well mixed in the foam maker 25 flows out to the flow channel 20D on the downstream side and flows out from the foam outflow port 10B. The backflow prevention valve (not illustrated) is provided in the middle of the second connection channel 30A.

[0043] As shown in Fig. 8, the flow channel 20D is connected to a right end portion of the foam maker 25. The flow channel 20D is bent downward from the right end portion of the foam maker 25, extends downward between the front cover 11 and the inner cover 13 in front of the flow channel 20A, and is connected to the foam outflow port 10B.

[0044] The compressor 30 is built in the case 10 (see Figs. 1 and 2). The compressor 30 is disposed in the central portion of the case 10 in the horizontal direction. The compressor 30 is also disposed in the central portion in the vertical direction of the case 10. The compressor 30 is disposed in a space inside the inner cover 13 of the case 10. The compressor 30 is disposed below the foam maker 25 with an upper surface wall of the inner cover 13 interposed therebetween. The compressor 30 is disposed in the upper portion in the inner cover 13.

[0045] The compressor 30 is electrically driven. Electric power for driving the compressor 30 is supplied from the battery unit 40 disposed in the inner cover 13 as the compressor 30. The compressor 30 is controlled by the control unit 60 disposed in the inner cover 13. Electric wires connecting the compressor 30, the battery unit 40, and the control unit 60 are arranged only in the inner cover 13.

[0046] As described above, the second connection channel 30A is connected to the compressor 30. The second connection channel 30A extends from the compressor 30 inside the inner cover 13 to the second merging portion 25A outside the inner cover 13 through a through hole into which a waterproofing grommet (not illustrated) is fitted.

[0047] The battery unit 40 is disposed below the compressor 30 (see Figs. 1 and 2). As shown in Figs. 9 and 10, the battery unit 40 includes a battery body 41 and a battery case 42 in which the battery body 41 is stored. In the case of the present embodiment, the battery body 41 uses a secondary battery such as a lithium ion battery. The battery case 42 can be divided into upper and lower parts, and the battery body 41 stored inside can be replaced.

[0048] The battery unit 40 is stored in the storage unit 43. The storage unit 43 is disposed inside the inner cover 13 (see Fig. 7). The storage unit 43 has a bottomed rectangular cylindrical shape in which a second opening 43A is formed at a front end portion. The battery unit 40 is taken in and out of the storage unit 43 in the front-back direction from the second opening 43A. As shown in Fig. 10, the front end portion of the storage unit 43 is fitted into the inner periphery of the opening 13A in the inner cover 13, and is attached in a watertight manner to a peripheral rear surface of the opening 13A via the seal member. A seal groove 43B is formed on an innermost surface of the second opening 43A. A

seal member P is stored in the seal groove 43B.

[0049] A second lid member 44 is fitted into the second opening 43A. The second lid member 44 closes the second opening 43A in a watertight manner. As shown in Figs. 9 and 10, the second lid member 44 includes a cylindrical portion 44A and a flange portion 44B. The cylindrical portion 44A is fitted into the inner periphery of the second opening 43A when the second lid member 44 closes the second opening 43A. The cylindrical portion 44A has a rectangular cylindrical shape in which the horizontal direction is the longitudinal direction. An end surface 44C of the cylindrical portion 44A comes into contact with the seal member P. The flange portion 44B extends outward from a front end of the cylindrical portion 44A in a flange shape. When the second lid member 44 closes the second opening 43A, the flange portion 44B abuts against a peripheral front surface of the second opening 43A.

[0050] As shown in Figs. 9 and 10, the second lid member 44 includes a holding member 45. The holding member 45 holds the position of the second lid member 44 in a state of closing the second opening 43A in a watertight manner. The holding member 45 is attached on the front surface of the flange portion 44B of the second lid member 44 to be slidable in a direction intersecting the direction in which the battery unit 40 is taken in and out.

[0051] In the case of the present embodiment, a pair of upper and lower holding members 45 is provided. The pair of holding members 45 is slidable in the vertical direction with respect to the second lid member 44. The pair of holding members 45 includes holding portions 45A and release operation portions 45B. The holding portions 45A are locked to holding claws 13B provided on the peripheral front surface of the opening 13A of the inner cover 13. The release operation portions 45B are operated when the holding portions 45A are to be released from the state held by the holding claws 13B. The release operation portions 45B each have a plate shape protruding forward from the front surface of the holding member 45. In the pair of holding members 45, the release operation portions 45B face each other in the vertical direction.

[0052] In the pair of holding members 45, for the upper holding member 45, the position where the upper holding member 45 has moved to an upper side is a holding position, and the position where the upper holding member 45 has moved to a lower side is a holding release position. For the lower holding member 45, the position where the lower holding member 45 has moved to the lower side is the holding position, and the position where the lower holding member 45 has moved to the upper side is the holding release position. The pair of holding members 45 is biased to the holding position side by an elastic member. When the pair of holding members 45 is to be moved to the holding release position, the release operation portions 45B are operated against an elastic force of the elastic member. Specifically, the pair of holding members 45 is operated such that the release operation portions 45B disposed opposite to each other are pinched in the vertical direction. As a result, the state where each holding portion 45A of the pair of holding members 45 is locked to each holding claw 13B on the inner cover 13 side is released. By pulling out the release operation portions 45B forward while they are pinched in the vertical direction, the second lid member 44 can be removed from the second opening 43A.

[0053] As shown in Fig. 10, in a state where each of the pair of holding members 45 is at the holding position, movement of the pair of holding members 45 to the holding release position is restricted by a pair of restriction pieces 14A of the first lid member 14. The pair of restriction pieces 14A has a plate shape protruding rearward from the rear surface of the first lid member 14. The pair of restriction pieces 14A faces each other in the vertical direction. A spacing between the pair of restriction pieces 14A is narrower than the spacing between the release operation portions 45B in a state where the pair of holding members 45 is at the holding position. When the first lid member 14 is fitted into the first opening 11A in a state where the second lid member 44 closes the second opening 43A and the pair of holding members 45 is at the holding position, the pair of restriction pieces 14A is disposed between the release operation portions 45B opposed to each other in the pair of holding members 45. Therefore, by fitting the first lid member 14 into the first opening 11A, the pair of holding members 45 is prevented from unexpectedly moving to the holding release position, and the position of the second lid member 44 closing the second opening 43A in a watertight manner is reliably held.

[0054] In the case of the present embodiment, the second lid member 44 is attached to the battery case 42. Therefore, the second lid member 44 is attached and detached integrally with the battery unit 40 when the battery unit 40 is taken in and out of the storage unit 43. As shown in Figs. 9 and 10, the second lid member 44 has a plurality of engaging portions 44D. Each engaging portion 44D protrudes rearward from the rear surface of the flange portion 44B in the second lid member 44. Each engaging portion 44D is locked to an engaging claw 42A provided on the battery case 42 side by snap-fit.

[0055] The tank 50 is disposed in an uppermost portion in the case 10 (see Figs. 1 and 2). As shown in Fig. 11, the tank 50 is formed by combining upper and lower two divided members. In a bottom surface of the tank 50, a front portion thereof is formed deeper than the rear portion.

[0056] The tank 50 includes the cleaning agent replenishment portion 51, a cleaning agent outflow portion 52, and the remaining amount gauge 53. The cleaning agent replenishment portion 51 is formed in a cylindrical shape extending upward at the rear portion of the horizontally central portion of the tank 50. A strainer (not illustrated) is attached to the cleaning agent replenishment portion 51, and foreign matters and the like are prevented from entering when the liquid cleaning agent is replenished. A receiving surface 51A is formed around the cleaning agent replenishment portion 51. The receiving surface 51A is inclined downward toward the back side. The receiving surface 51A is opened rearward

at the rear end from the opening 51B. In the tank 50 stored in the case 10, the opening 51B is opened rearward from the cutout portion 12B of the base plate 12 (see Fig. 2).

[0057] The cleaning agent outflow portion 52 has a cylindrical shape extending downward from the lower surface of the front portion of the tank 50. The upper end of the cleaning agent outflow portion 52 is opened to the bottom surface of the front portion of the tank 50. In the cleaning agent outflow portion 52, the first connection channel 50A is connected to the cleaning agent outflow portion 52. The remaining amount gauge 53 is provided so as to protrude forward from the front end of the horizontally central portions of the tank 50. In the tank 50 stored in the case 10, a front end surface 53A of the remaining amount gauge 53 is a portion exposed from the remaining amount confirmation window 11F. The remaining amount gauge 53 is made of a resin having translucency so that the inside of the tank 50 can be visually recognized. The front end surface 53A of the remaining amount gauge 53 is inclined at the same inclination as that of the portion of the front cover 11 where the remaining amount confirmation window 11F is formed. The entire tank 50 may be made of a material having translucency, or only a portion including the front end portion of the remaining amount gauge 53 may be partially made of a material having translucency.

[0058] The control unit 60 executes operation control of the compressor 30 connected to the control unit 60. The control unit 60 is configured mainly by a computer, for example, and is in a form of being mounted on an electric substrate including an arithmetic device such as a central processing unit (CPU), a memory such as a read only memory (ROM) or a random access memory (RAM), and the like. The control unit 60 is disposed on the left side relative to the horizontally central portion of the case 10 (see Figs. 1 and 2). Specifically, the control unit 60 is disposed in the inner cover 13 on the left side of the compressor 30 and the battery unit 40. As described above, the flow channel 20 vertically passes on the right side relative to the horizontally central portion in the case 10. Thus, the control unit 60 is disposed away from the flow channel 20.

[0059] The operation unit 70 operates the three-way valve 22 as a switching unit according to the present disclosure. As shown in Fig. 12, the operation unit 70 includes a grip portion 71, the arm portion 72, and the bearing portion 73. The grip portion 71 and the arm portion 72 are disposed outside the case 10. The bearing portion 73 is disposed in the case 10.

[0060] The grip portion 71 is a portion assumed to be gripped by an operator during operation of the operation unit 70. The grip portion 71 is provided so as to extend in the horizontal direction. The grip portion 71 extends in the horizontal direction by a length equivalent to a horizontal width of the case 10. The grip portion 71 can move between a position above the upper surface 10C of the case 10 indicated by a solid line in Fig. 12 and a position in front of the front surface 10D of the case 10 indicated by a two-dot chain line in Fig. 12. Hereinafter, a state where the grip portion 71 is above the case 10 will be described as a first position of the operation unit 70, and a state where the grip portion 71 is in front of the case 10 will be described as a second position of the operation unit 70. The operation unit 70 can move between the first position and the second position.

[0061] In the case of the present embodiment, the grip portion 71 moves on an arc-shaped trajectory around a rotation axis A passing through the case 10 in the horizontal direction. The grip portion 71 maintains an orientation extending in the horizontal direction even when the operation unit 70 is at any position between the first position and the second position. In a state where the operation unit 70 is at the first position, the grip portion 71 is curved so as to protrude upward. In a state where the operation unit 70 is at the second position, the grip portion 71 is curved so as to protrude forward. In a state where the operation unit 70 is at the first position, the grip portion 71 is located above the upper surface 10C of the case 10 and behind the front surface 10D of the case 10. In a state where the operation unit 70 is at the second position, the grip portion 71 is located in front of the front surface 10D of the case 10 and below the upper surface 10C of the case 10.

[0062] A pair of arm portions 72 is provided. The arm portions 72 extend in a direction intersecting with the rotation axis A while the grip portion 71 extends along the horizontal direction in which the rotation axis A extends. Specifically, the arm portions 72 are connected to the grip portion 71 and extend from both ends of the grip portion 71 in a direction intersecting the rotation axis A. The pair of arm portions 72 is curved so as to protrude outward. The pair of arm portions 72 is pivotally supported by a pair of bearing portions 73 on the rotation axis A. Specifically, the arm portions 72 each have a rotation shaft (not illustrated) penetrating the side cover 17 and extending into the case 10. The bearing portion 73 pivotally support the rotation shaft extending from the arm portion 72.

[0063] A connection portion that is a boundary portion between the grip portion 71 and the arm portion 72 is curved. Specifically, the boundary portion between the grip portion 71 and the arm portion 72 is curved with a curvature larger than the curvatures of the grip portion 71 and the arm portion 72 both of which are formed to be curved. As a result, the grip portion 71 and the arm portion 72 are continuously formed in a continuous arch shape (see Fig. 2). When operating the operation unit 70, not only the grip portion 71 can be gripped, but also the arm portion 72 connected from the grip portion 71 or the boundary portion between the grip portion 71 and the arm portion 72 can be gripped and operated.

[0064] The grip portion 71 and the arm portion 72 are disposed to be spaced apart from the outer peripheral surface of the case 10. The space is set to such an extent that a gap is secured between a gripping hand and the outer peripheral surface of the case 10 when an average adult grips the grip portion 71 and the arm portion 72. The grip portion 71 and the arm portion 72 are kept in a state of being spaced apart from the outer peripheral surface of the case 10 at any

position while the operation unit 70 moves between the first position and the second position. Thus, since the grip portion 71 and the arm portion are disposed to be spaced apart from the outer peripheral surface of the case 10, they can be firmly gripped, and rotation operation of the operation unit 70 is easy.

[0065] The pair of bearing portions 73 is attached to the front surface of the base plate 12. The pair of bearing portions 73 is disposed separately on the left and right in the case 10. Each bearing portion 73 supports, inside the case 10, a rotation shaft of the arm portion 72 extending from the outside of the case 10. The three-way valve 22 is fixed to one of the pair of bearing portions 73 (in Fig. 12, the bearing portion 73 on the left side). The operation shaft of the three-way valve 22 is connected to the rotation shaft of the arm portion 72. The three-way valve 22 switches the flow channel by the operation of the operation unit 70.

[0066] In the case of the present embodiment, when the operation unit 70 is at the first position, the three-way valve 22 brings the flow channel 20A in the flow channel 20 and the bypass flow channel BP into communication with each other. As a result, the foam supplying device 1 causes water to flow out from the foam outflow port 10B. On the other hand, when the operation unit 70 is at the second position, the three-way valve 22 brings the flow channel 20A and the flow channel 20B into communication with each other. As a result, the foam supplying device 1 causes foam to flow out from the foam outflow port 10B.

[0067] An installation example of the foam supplying device 1 for a bathroom having the above configuration will be described. The foam supplying device 1 is attached to the wall surface W of the bathroom by magnetic force of the magnet sheet. During installation, the foam supplying device 1 is temporarily attached by a magnet to determine the position of the foam supplying device 1 on the wall surface W. By doing this, it is checked whether there is no problem with a height position during use of the foam supplying device 1, arrangement of the water supply hose connected to the water inflow port 10A, the shower hose connected to the foam outflow port 10B, and the like.

[0068] When the attaching position of the foam supplying device 1 is determined, the foam supplying device 1 is temporarily detached, and the fall prevention hook F is attached to the wall surface W in accordance with the position. The fall prevention hook F is attached to the wall surface W using a double-sided tape or the like. The locking portion 12C is locked to the fall prevention hook F, and the foam supplying device 1 is fixed to the wall surface W by the magnet. In this way, the foam supplying device 1 does not require work as in the conventional case such as separately installing a device body and the compressor or arranging a hose for supplying compressed air from the compressor to the device body. Since the compressor 30 is built in the case 10, the foam supplying device 1 can be installed extremely easily as compared with the conventional case.

[0069] An action of the foam supplying device 1 for a bathroom having the above configuration will be described. In the foam supplying device 1, when water is to be discharged from the foam outflow port 10B, the operation unit 70 is set to be located at the first position. As described above, the first position of the operation unit 70 is a state where the grip portion 71 is located above the upper surface 10C of the case 10. In this state, water from the water supply source is supplied. Then, water flows into the flow channel 20A from the water inflow port 10A. The water flowing into the flow channel 20A passes through the pressure reducing valve 21 and reaches the three-way valve 22. At this time, since the operation unit 70 is at the first position, the three-way valve 22 is in a state of making the flow channel 20A and the bypass flow channel BP communicate with each other. Therefore, the water flowing into the three-way valve 22 from the flow channel 20A passes through the bypass flow channel BP, flows through the foam maker 25 and the flow channel 20D in this order, and directly flows out from the foam outflow port 10B. As a result, a shower bathing with only water can be performed.

[0070] In a case where foam is to be discharged from the foam supplying device 1, the operation unit 70 is moved from the first position to the second position. In the operation of the operation unit 70, the grip portion 71 may be preferably gripped and operated. For example, in a case where the operation unit 70 is operated and moved from the first position to the second position, the grip portion 71 located above the upper surface 10C of the case 10 is gripped and then pulled down forward and diagonally downward. As a result, the grip portion 71 is moved to a position in front of the front surface 10D of the case 10 while maintaining the orientation extending in the horizontal direction. In the operation unit 70, the boundary portion between the grip portion 71 and the arm portion 72 is curved, and the grip portion 71 and the arm portion 72 are continuously connected. Therefore, even when the operation unit 70 is operated by gripping the arm portion 72 or the boundary portion between the arm portion 72 and the grip portion 71, the operation unit 70 can be preferably operated.

[0071] In a state where the operation unit 70 is at the second position, the three-way valve 22 is in a state of making the flow channel 20A and the flow channel 20B communicate with each other. Therefore, the water flowing into the three-way valve 22 from the flow channel 20A flows into the flow channel 20B. Then, the flow of water is detected by the flow rate sensor 23 disposed in the flow channel 20B. The flow rate sensor 23 transmits a signal indicating that water is flowing through the flow channel 20B to the control unit 60. The control unit 60 receives the signal from the flow rate sensor 23 and execute drive control of the compressor 30. As a result, the compressor 30 generates compressed air and sends the compressed air from the second merging portion 25A to the flow channel 20.

[0072] The water flowing through the flow channel 20B flows into the aspirator 24. In the aspirator 24, the liquid cleaning

agent is mixed from the first merging portion 24A by negative pressure utilizing the Venturi effect due to the flow of water. The liquid cleaning agent is supplied from the tank 50 through the first connection channel 50A. The mixed fluid of the water and the liquid cleaning agent that has passed through the aspirator 24 and flowed through the flow channel 20C flows into the foam maker 25. In the foam maker 25, the compressed air is mixed from the second merging portion 25A. The compressed air is supplied from the compressor 30 through the second connection channel 30A. The foam maker 25 stirs a mixed fluid of the water, the liquid cleaning agent, and the compressed air, and then discharge it to the flow channel 20D. Then, the mixed fluid of the water, the liquid cleaning agent, and the compressed air that has flowed through the flow channel 20D flows out as foam from the foam outflow port 10B. After a desired amount of foam has been discharged, the operation unit 70 is returned to the first position to stop a supply of foam, and the supply of water from the water supply source is stopped.

[0073] In the foam supplying device 1, the compressor 30 is built in the case 10, so that the case 10 and the compressor 30 do not need to be separately installed, unlike a case where the compressor is provided outside the case, for example. In the foam supplying device 1, since the compressor 30 is built in the case 10, it is not necessary to arrange a hose or the like for introducing compressed air outside the case 10. Therefore, the foam supplying device 1 is easy to install.

[0074] Since the compressor 30 is built in the horizontally central portion of the case 10, it is preferable for suppressing transmission of vibration during driving to the outside, and leakage of driving sound to the outside also can be suppressed. The compressor 30 is also built in the central portion in the vertical direction of the case 10, so that transmission of vibration to the outside is further suppressed.

[0075] The foam supplying device 1 includes the tank 50, the first connection channel 50A, the second connection channel 30A, and the foam maker 25, and have them built in the case 10. Therefore, the foam supplying device 1 does not need to arrange piping or other flow channels for supplying the liquid cleaning agent outside the case 10, and thus can be more easily installed.

[0076] The compressor 30 is driven by electric power supplied from the battery unit 40. Since the battery unit 40 is built in the case 10 as the compressor 30 is, it is not necessary to arrange an electric power supply wiring to the compressor 30 outside the case 10. Therefore, the foam supplying device 1 is easy to install.

[0077] The battery unit 40 uses a secondary battery, and can be charged and used repeatedly. In a case where the battery unit 40 is taken out from the storage unit 43 in the case 10 for charging, first, the first lid member 14 is removed from the first opening 11A on the front surface of the front cover 11. By removing the first lid member 14, the second lid member 44 is exposed. The release operation portions 45B in the pair of holding members 45 on the front surface of the second lid member 44 are pinched, and the second lid member 44 is removed from the second opening 43A. Since the second lid member 44 is integrated with the battery case 42 in the battery unit 40, the battery unit 40 can be taken out together by removing the second lid member 44.

[0078] After completion of charging of the battery unit 40, the battery unit 40 is inserted to the storage unit 43 from the second opening 43A, in the opposite manner to the above procedure. By inserting the battery unit 40 deep into the storage unit 43, the end surface 44C of the cylindrical portion 44A in the second lid member 44 integrated with the battery unit 40 comes into contact with the seal member P. As a result, the second opening 43A is closed in a watertight manner. At this time, the second lid member 44 is held by the pair of holding members 45 at the position where the second lid member 44 closes the second opening 43A in a watertight manner. Finally, the first lid member 14 is fitted into the first opening 11A.

[0079] As described above, the battery unit 40 is stored in the storage unit 43 built in the case 10. The battery unit 40 is taken in and out from the second opening 43A in the storage unit 43, opened on the front surface. The second opening 43A is closed in a watertight manner by the second lid member 44. Therefore, a waterproof property for the battery unit 40 is enhanced.

[0080] The second lid member 44 is held at the position by the pair of holding members 45 where the second lid member 44 closes the second opening 43A in a watertight manner. Therefore, the watertightness of the second opening 43A in the storage unit 43 can be favorably maintained, and the waterproof property for the battery unit 40 stored in the storage unit 43 can be further improved.

[0081] The projection portion 11B is formed on the peripheral edge portion of the first opening 11A, and the projection portion 11B protrudes forward. Therefore, water flowing along the surface of the case 10 is prevented from entering the case 10 through the first opening 11A. Since the upper edge portion of the first opening 11A has a central portion in the horizontal direction located at the uppermost position, and is gradually inclined therefrom downward toward the outside in the horizontal direction, entry of water into the first opening 11A is further prevented. Since the upper edge portion of the first opening 11A is located in front of the lower edge portion, water is particularly prevented from entering the case 10 from the first opening 11A.

[0082] The first opening 11A is formed at the horizontally central portion in the front surface 10D of the case 10. The front surface 10D of the case 10 is inclined downward to the front side from the upper end thereof to the upper side of the first opening 11A, and is inclined rearward from the horizontally central portion toward the outside in the horizontal direction. Therefore, the water flowing down along the surface of the case 10 is less likely to gather at the horizontally

central portion, and is urged to flow down to the outside in the horizontal direction. Thus, water is further prevented from entering the case 10 through the first opening 11A.

[0083] As described above, the compressor 30 is built in the central portion in the vertical direction in the case 10. In the case 10, the tank 50 is disposed above the compressor 30, and the battery unit 40 is disposed below the compressor 30. Therefore, when the compressor 30 is driven, transmission of vibration to the outside can be further suppressed. In addition, leakage of the drive sound to the outside can be further suppressed. The compressor 30 is disposed in the inner cover 13 in the case 10. Therefore, leakage of the drive sound to the outside is further suppressed. In the foam supplying device 1, the battery unit 40 and the control unit 60 are also disposed in the inner cover 13 together with the compressor 30. Therefore, it is possible to realize a configuration in which an electric wiring related to driving of the compressor 30 is completed in the inner cover 13. The inner cover 13 holds an internal space in a watertight manner. By being disposed in such an inner cover 13, the waterproof property of the compressor 30, the battery unit 40, and the control unit 60 is improved.

[0084] As described above, the compressor 30 is built in the central portion in the vertical direction in the case 10. In the case 10, the tank 50 is disposed above the compressor 30. Therefore, the vibration of the compressor 30 is prevented from propagating to the upper side of the case 10. The battery unit 40 is disposed below the compressor 30. Therefore, the vibration of the compressor 30 is prevented from propagating to the lower side of the case 10.

[0085] As described above, the foam supplying device 1 for a bathroom according to the first embodiment includes the case 10, the flow channel 20, the compressor 30, and the battery unit 40 as a battery according to the present disclosure. In the case 10, the water inflow port 10A and the foam outflow port 10B are formed. The flow channel 20 connects the water inflow port 10A and the foam outflow port 10B. The compressor 30 is built in the case 10 and sends compressed air to the flow channel 20. The battery unit 40 is built in the case 10 and supplies electric power to the compressor 30.

[0086] According to this configuration, the foam supplying device 1 can generate compressed air by supplying electric power from the battery unit 40 built in the case 10 to the compressor 30 built in the case 10. Therefore, in the foam supplying device 1, it is not necessary to separately install the device body and a compressed air supply means such as the compressor like in the conventional case, and it is also not necessary to arrange a hose and an electric power supply wiring for introducing the compressed air outside the case 10. Accordingly, the foam supplying device 1 can be easily installed.

[0087] The foam supplying device 1 includes the tank 50, the first connection channel 50A, the second connection channel 30A, and the foam maker 25. The tank 50 is built in the case 10 and stores a liquid cleaning agent. The first connection channel 50A has one end connected to the tank 50 and the other end connected to the first merging portion 24A of the flow channel 20. The second connection channel 30A has one end connected to the compressor 30 and the other end connected to the second merging portion 25A on the downstream side of the first merging portion 24A in the flow channel 20. The foam maker 25 is built in the case 10 and is provided in the flow channel 20 on the downstream side of the second merging portion 25A. According to this configuration, a liquid cleaning agent for generating foam can be sent into the flow channel from the tank 50 in the case 10. Therefore, unlike a case where a tank for storing the liquid cleaning agent or a foam maker is disposed outside the case, it is not necessary to arrange piping or other flow channels for supplying the liquid cleaning agent outside the case 10. As a result, the foam supplying device 1 can be installed more easily.

[0088] The foam supplying device 1 includes the three-way valve 22 as a switching unit according to the present disclosure, and the operation unit 70 which operates the three-way valve 22. The three-way valve 22 is built in the case 10, and switches a mode of flowing out from the foam outflow port 10B to either water or foam. The operation unit 70 includes the grip portion 71 which can move between the position above the upper surface 10C of the case 10 and the position in front of the front surface 10D of the case 10. According to this configuration, the mode of flowing out from the foam outflow port 10B can be easily switched by operating the grip portion 71.

[0089] In the foam supplying device 1, the operation unit 70 includes a pair of arm portions 72. The pair of arm portions 72 extends from both ends of the grip portion 71. The pair of arm portions 72 is pivotally supported at both left and right ends of the case 10 so as to be rotatable about the rotation axis A extending in the horizontal direction of the case 10. According to this configuration, the operation unit 70 is supported at left and right two end portions of the case 10 by the pair of arm portions 72. Therefore, in the rotational operation of the operation unit 70, stable operation by gripping the grip portion 71 can be realized.

[0090] In the operation unit 70, the boundary portion between the grip portion 71 and the arm portion 72 is curved and connected. Therefore, it is possible to improve a degree of freedom of a gripping position when operating the operation unit 70. For example, not only the grip portion 71 can be gripped, but also the arm portion 72 or the boundary portion between the arm portion 72 and the grip portion 71 can be gripped.

[0091] The foam supplying device 1 includes the storage unit 43. The storage unit 43 is built in the case 10 and stores the battery unit 40. In the case 10, the first opening 11A is formed through which the battery unit 40 passes when the battery unit 40 is taken in and out of the storage unit 43, and the case has the first lid member 14 which closes the first

opening 11A. In the storage unit 43, the second opening 43A through which the battery unit 40 is taken in and out is formed, and the storage unit 43 has the second lid member 44 which closes the second opening 43A in a watertight manner. According to this configuration, it is possible to improve the waterproof property for the battery unit 40 stored in the storage unit 43.

[0092] In the foam supplying device 1, the battery unit 40 includes the battery body 41 and the battery case 42 having the battery body 41 built therein. The second lid member 44 is attached to the battery case 42. According to this configuration, when the battery unit 40 is to be attached or detached, the battery unit 40 can be attached or detached together with the second lid member 44. As a result, the work related to attaching and detaching the battery unit 40 can be simplified.

[0093] In the foam supplying device 1, the second lid member 44 includes the holding member 45 which holds the position where the second lid member 44 closes the second opening 43A in a watertight manner. According to this configuration, the watertightness of the second opening 43A in the storage unit 43 can be favorably maintained, and the waterproof property for the battery unit 40 stored in the storage unit 43 can be further improved.

[0094] In the foam supplying device 1, the case 10 has the projection portion 11B protruding outward along the peripheral edge portion of first opening 11A. Therefore, it is possible to prevent water flowing along the surface of the case 10 from entering the inside of the case 10 through the first opening 11A.

[0095] In the foam supplying device 1, the first opening 11A is formed at the horizontally central portion in the case 10. In the case 10, the portion from an upper end thereof to an upper side of the first opening 11A is inclined downward to the front side, and is inclined rearward from the horizontally central portion toward the left and right directions. According to this configuration, it is possible to prevent water flowing along the surface of the case 10 from entering the inside of the case 10 through the first opening 11A.

[0096] In the foam supplying device 1, the compressor 30 is built in the central portion of the case 10 in the horizontal direction. According to this configuration, the compressor 30 can be disposed away from both left and right wall surfaces of the case 10, so that it is possible to suppress transmission of vibration during driving of the compressor 30 to the outside of the case 10 in the horizontal direction.

[0097] In the foam supplying device 1, the compressor 30 is built in the central portion of the case 10 in the vertical direction. According to this configuration, the compressor 30 can be disposed away from both the upper and lower wall surfaces of the case 10, so that it is possible to suppress transmission of vibration during driving of the compressor 30 to the vertical direction of the case 10.

[0098] In the foam supplying device 1, the tank 50 is built in an upper portion of the case 10 above the compressor 30. According to this configuration, since the tank 50 can absorb vibration during driving of the compressor 30, vibration of the compressor 30 can be prevented from propagating to the upper side of the case 10.

<Other Embodiments>

[0099] The present disclosure is not limited to the embodiments described with reference to the above description and drawings, and for example, the following embodiments are also included in the technical scope of the present disclosure.

[0100] The "bathroom" according to the present disclosure may be not only one equipped with a bathtub but also one that does not include a bathtub, such as a shower booth or the like.

[0101] The "water" according to the present disclosure includes not only so-called water but also hot water obtained by heating water, and the temperature thereof is not particularly limited.

[0102] In a case where foam is generated using a liquid cleaning agent, components and the like of the liquid cleaning agent are not particularly limited. As a liquid cleaning agent, for example, not only one having a cleaning effect such as a liquid soap, but also one having a skin care effect such as a treatment agent may be used.

[0103] The configuration, shape, size, and the like of the case according to the present disclosure are not limited to the embodiments described above. Arrangement of each component in the case is not particularly limited.

[0104] The configuration of the flow channel, a mode of generating foam in the process of flowing through the flow channel, and the like according to the present disclosure are not limited to the embodiments described above.

[0105] A type of the compressor, the mode of generating compressed air by the compressor, and the like according to the present disclosure are not limited to the embodiments described above.

[0106] The type, number, size, and the like of the battery according to the present disclosure are not particularly limited. The battery is not limited to the lithium ion battery exemplified in the embodiment, and may be, for example, another type of the secondary battery such as a nickel-metal hydride battery or a nickel-cadmium battery, or may be a primary battery such as an alkaline dry battery. The battery may supply electric power to an electric device other than the compressor. Examples of the electric device in this case include an electrically driven valve, various sensors, and the like.

[0107] In a case where a storage unit is provided, the configuration, shape, size, arrangement in the case, and the like of the storage unit are not limited to the embodiments. The shape, the size, a formation position, and the like of the

second opening are also not particularly limited. The configuration and the like of the second lid member are not particularly limited.

[0108] In a case where a first opening is formed in the case, the shape, size, formation position in the case, and the like of the first opening are not limited to the embodiments described above. The configuration and the like of the first lid member are not particularly limited.

[0109] The battery may be taken in and out, for example, by detachably attaching the front cover to the base plate, without forming a first opening in the case. In other words, it is not essential to form a first opening in the case.

[0110] In a case where a tank is provided, the configuration, shape, size, and the like of the tank are not limited to the embodiments described above. The tank may be disposed outside the case.

[0111] The switching unit is not limited to the three-way valve having the ball-shaped valve body exemplified in the embodiment. In a case where a switching unit is provided, the configuration, type, mode of switching the type of the fluid flowing out from the foam outflow port, and the like of the switching unit are not particularly limited.

[0112] The switching unit may be driven by an actuator such as a motor. In this case, the operation unit may be a switch for simply transmitting an electric signal, such as a push button switch or a touch switch.

[0113] The configuration, shape, size, mode of operation, and the like of the operation unit are not limited to those exemplified in the embodiment. In a case where an operation unit is provided, any form may be used, for example, an operation unit including only the grip portion without including the arm portion, an operation unit in which the arm portion is provided only at one end portion of the grip portion and is pivotally supported in a cantilever manner, an operation unit in which one arm portion is connected to a central portion of the grip portion, and an operation unit including only the arm portion without including the grip portion. The operation unit may be one that moves on a linear trajectory. The operation unit may be one that simply performs an electric signal transmission operation.

[0114] In a case where the operation unit is rotationally operated, the rotation axis is not limited to that of the embodiment described above. The rotation axis may be along a direction other than the horizontal direction, for example, the vertical direction, the front-back direction, or the like. In this case, an extending direction of the grip portion may be not only the direction along the rotation axis but also a direction intersecting the rotation axis or a direction at a twisted position relative to the rotation axis.

REFERENCE SIGNS LIST

[0115]

1	foam supplying device for bathroom
10	case
10A	water inflow port
10B	foam outflow port
10C	upper surface of case
10D	front surface of case
11A	first opening
11B	projection portion
14	first lid member
20, 20A, 20B, 20C, 20D	flow channel
24A	first merging portion
25	foam maker
25A	second merging portion
30	compressor
30A	second connection channel
40	battery unit (battery)
41	battery body
42	battery case
43	storage unit
43A	second opening
44	second lid member
45	holding member
50	tank
50A	first connection channel
70	operation unit
71	grip portion
72	arm portion

A rotation axis

Claims

1. A foam supplying device for a bathroom comprising:

   a case in which a water inflow port and a foam outflow port are formed;
   a flow channel connecting the water inflow port and the foam outflow port;
   a compressor that is built in the case and sends compressed air to the flow channel; and
   a battery that is built in the case and supplies electric power to the compressor.

2. The foam supplying device for a bathroom according to claim 1, further comprising:

   a tank that is built in the case and stores a liquid cleaning agent;
   a first connection channel connected to the tank and connected to a first merging portion of the flow channel;
   a second connection channel connected to the compressor and connected to a second merging portion on a downstream side of the first merging portion of the flow channel; and
   a foam maker that is built in the case and provided in the flow channel on a downstream side of the second merging portion.

3. The foam supplying device for a bathroom according to any one of claims 1 and 2, further comprising:

   a switching unit that is built in the case and switches a mode of flowing out from the foam outflow port to either water or foam; and
   an operation unit that operates the switching unit, wherein
   the operation unit includes a grip portion that can move between a position above an upper surface of the case and a position in front of a front surface of the case.

4. The foam supplying device for a bathroom according to claim 3, wherein

   the operation unit includes a pair of arm portions extending from both ends of the grip portion, and
   the pair of arm portions is pivotally supported at left and right ends of the case so as to be rotatable about a rotation axis extending in a horizontal direction of the case.

5. The foam supplying device for a bathroom according to claim 4, wherein
   a boundary portion between the grip portion and the arm portion is curved and connected.

6. The foam supplying device for a bathroom according to any one of claims 1 to 5, further comprising:

   a storage unit that is built in the case and stores the battery, wherein
   in the case, a first opening is formed through which the battery passes when the battery is taken in and out of the storage unit, and the case has a first lid member that closes the first opening, and
   in the storage unit, a second opening through which the battery is taken in and out is formed, and the storage unit has a second lid member that closes the second opening in a watertight manner.

7. The foam supplying device for a bathroom according to claim 6, wherein

   the battery includes a battery body and a battery case having the battery body built therin, and
   the second lid member is attached to the battery case.

8. The foam supplying device for a bathroom according to any one of claims 6 and 7, wherein
   the second lid member includes a holding member that holds a position where the second lid member closes the second opening in a watertight manner.

9. The foam supplying device for a bathroom according to any one of claims 1 to 5, further comprising:

   a storage unit that is built in the case and stores the battery, wherein

in the case, a first opening is formed through which the battery passes when the battery is taken in and out of the storage unit, and the case has a projection portion protruding outward along a peripheral edge portion of the first opening.

10. The foam supplying device for a bathroom according to claim 9, wherein

in a front view of a surface of the case where the first opening is formed as viewed from a front,
the first opening is formed at a horizontally central portion of the case, and
in the case, a portion from an upper end thereof to an upper side of the first opening is inclined downward in a direction of the front, and is inclined in a back direction opposite to the front from a horizontally central portion toward left and right directions.

11. The foam supplying device for a bathroom according to any one of claims 1 to 10, wherein
the compressor is built in a central portion of the case in the horizontal direction.

12. The foam supplying device for a bathroom according to claim 11, wherein
the compressor is built in a central portion of the case in a vertical direction.

13. The foam supplying device for a bathroom according to any one of claims 11 and 12, further comprising a tank that is provided above the compressor, is built in an upper portion of the case, and supplies a stored liquid cleaning agent to the flow channel.

Fig. 1

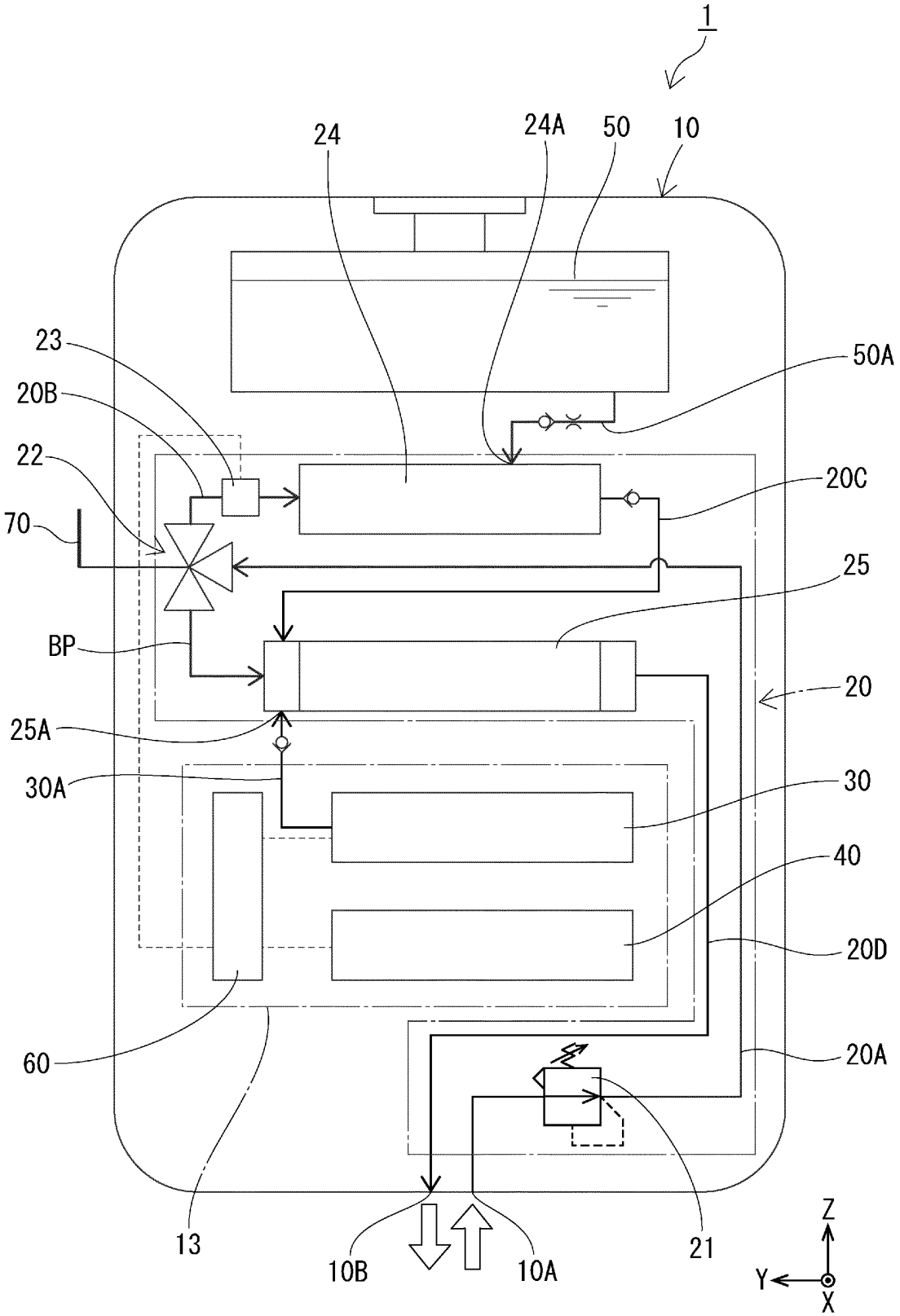
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Fig. 2

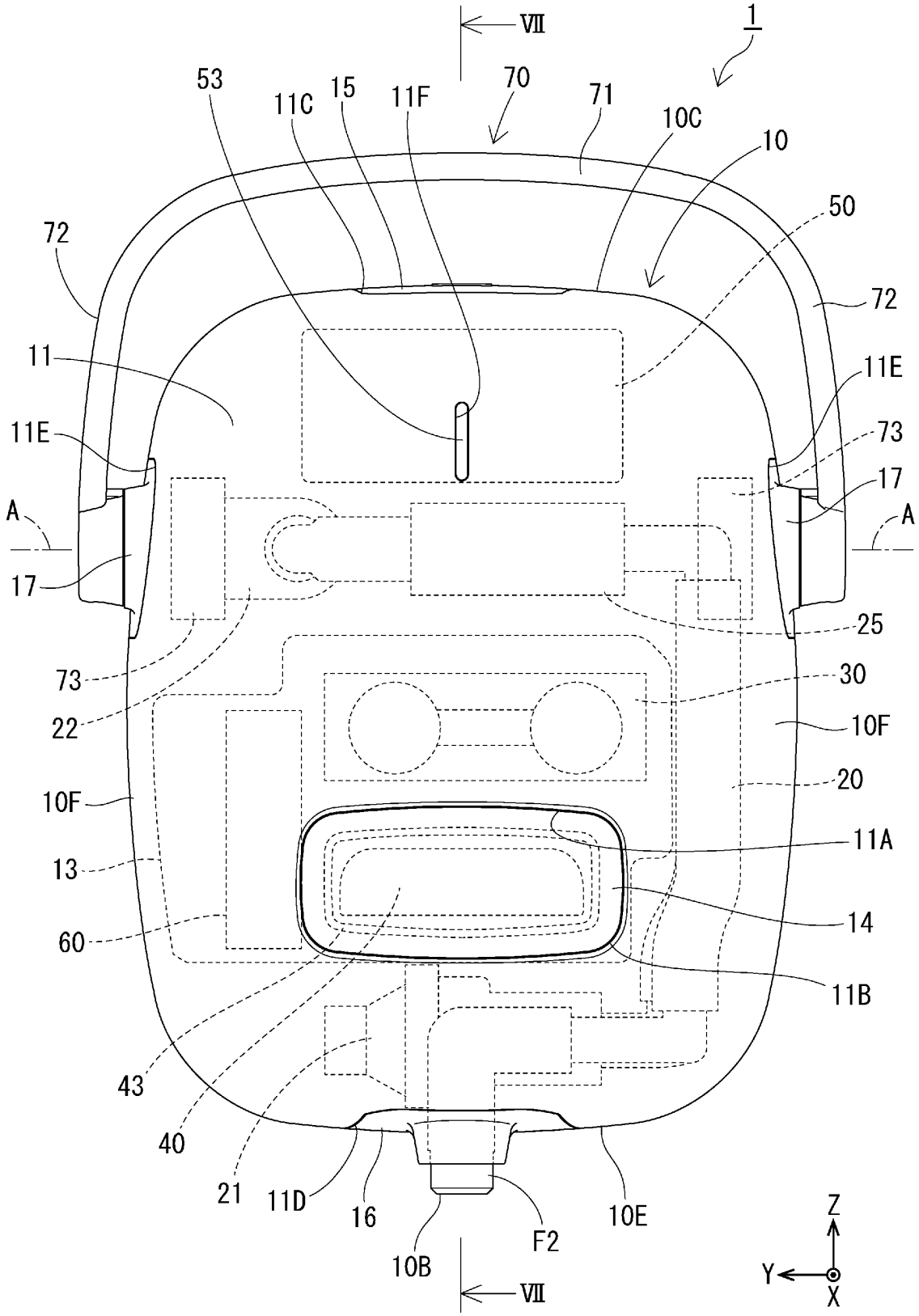
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Fig. 3

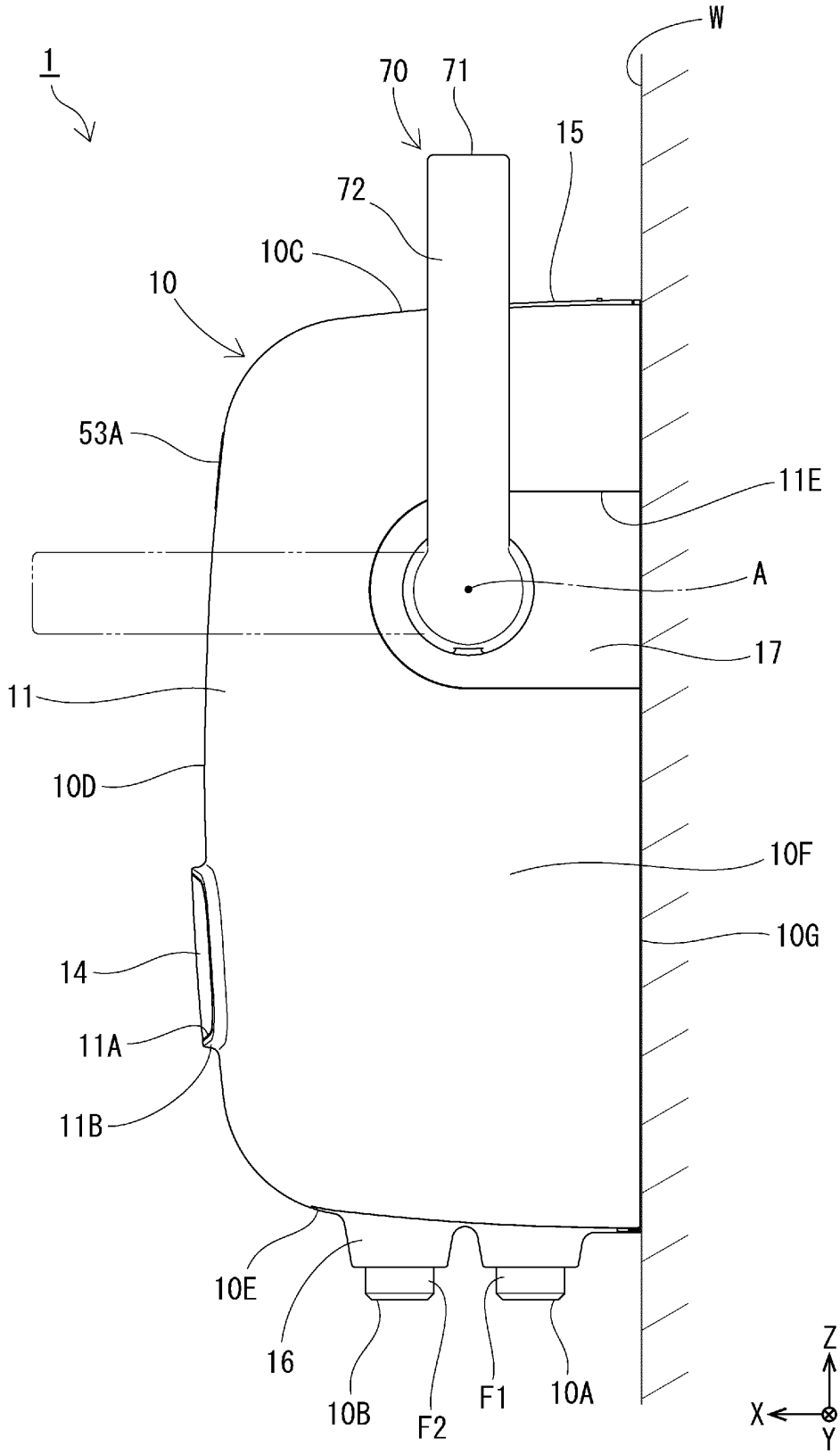
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Fig. 4

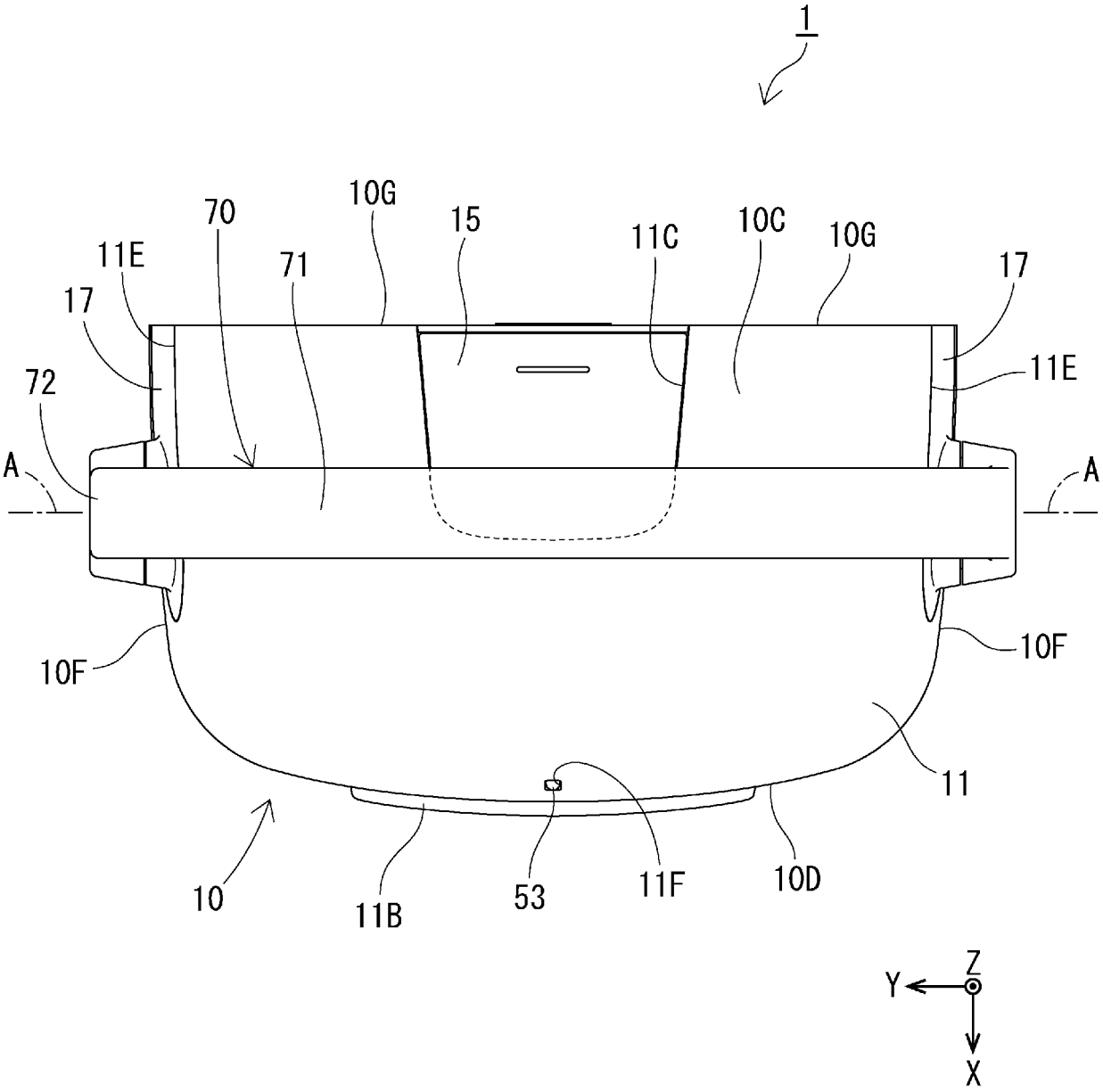
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Fig. 5

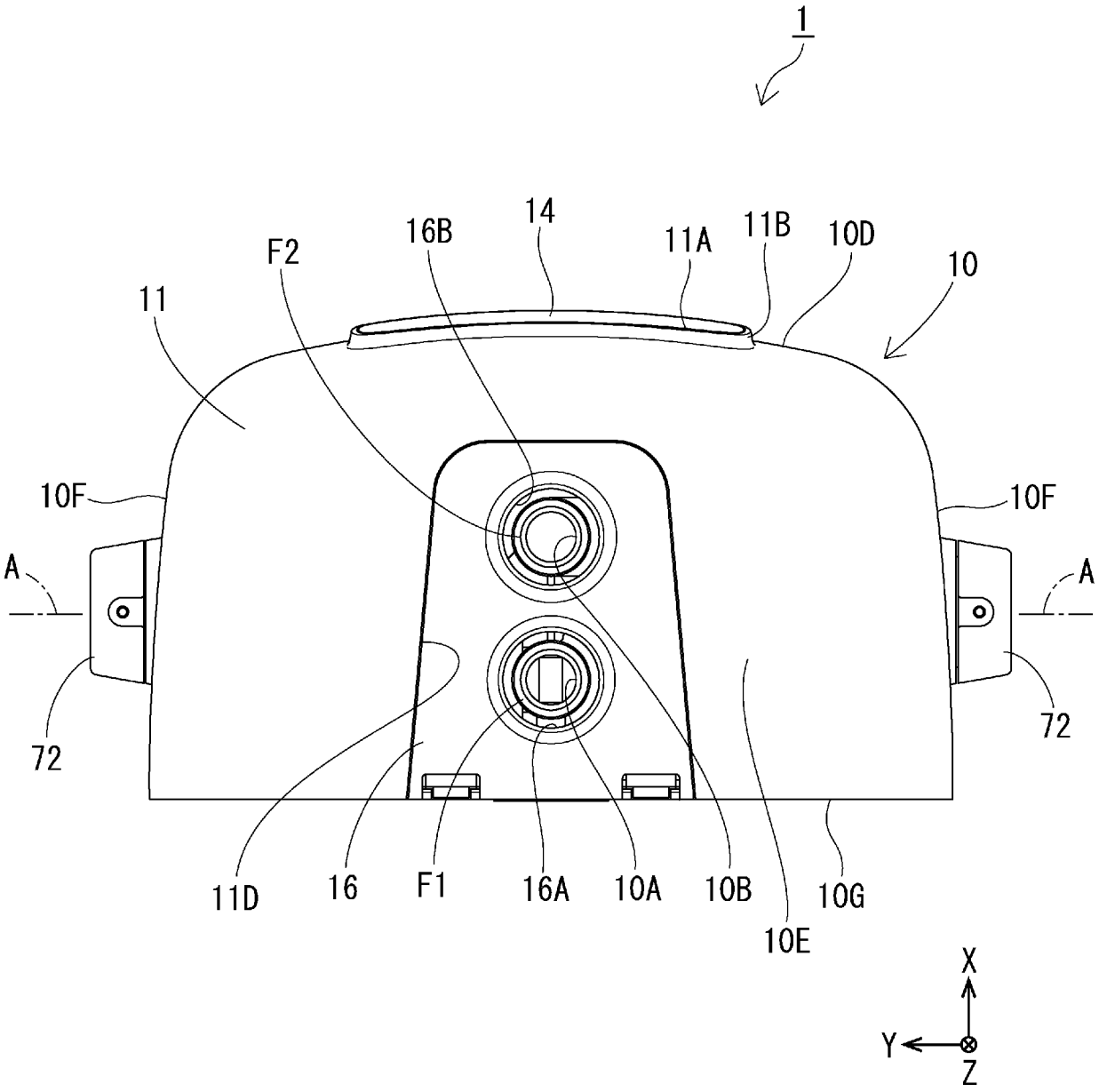
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Fig. 6

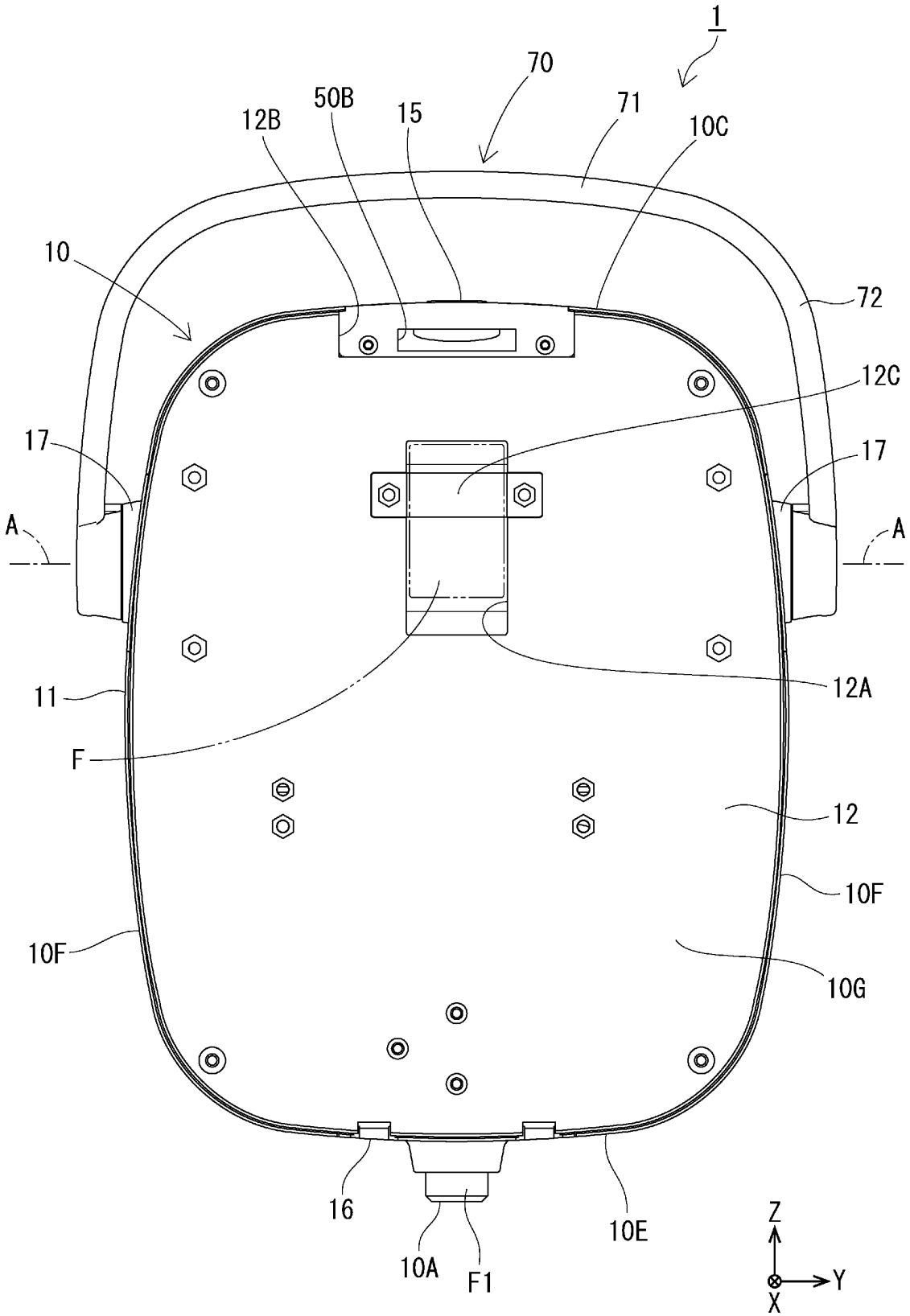
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Fig. 7

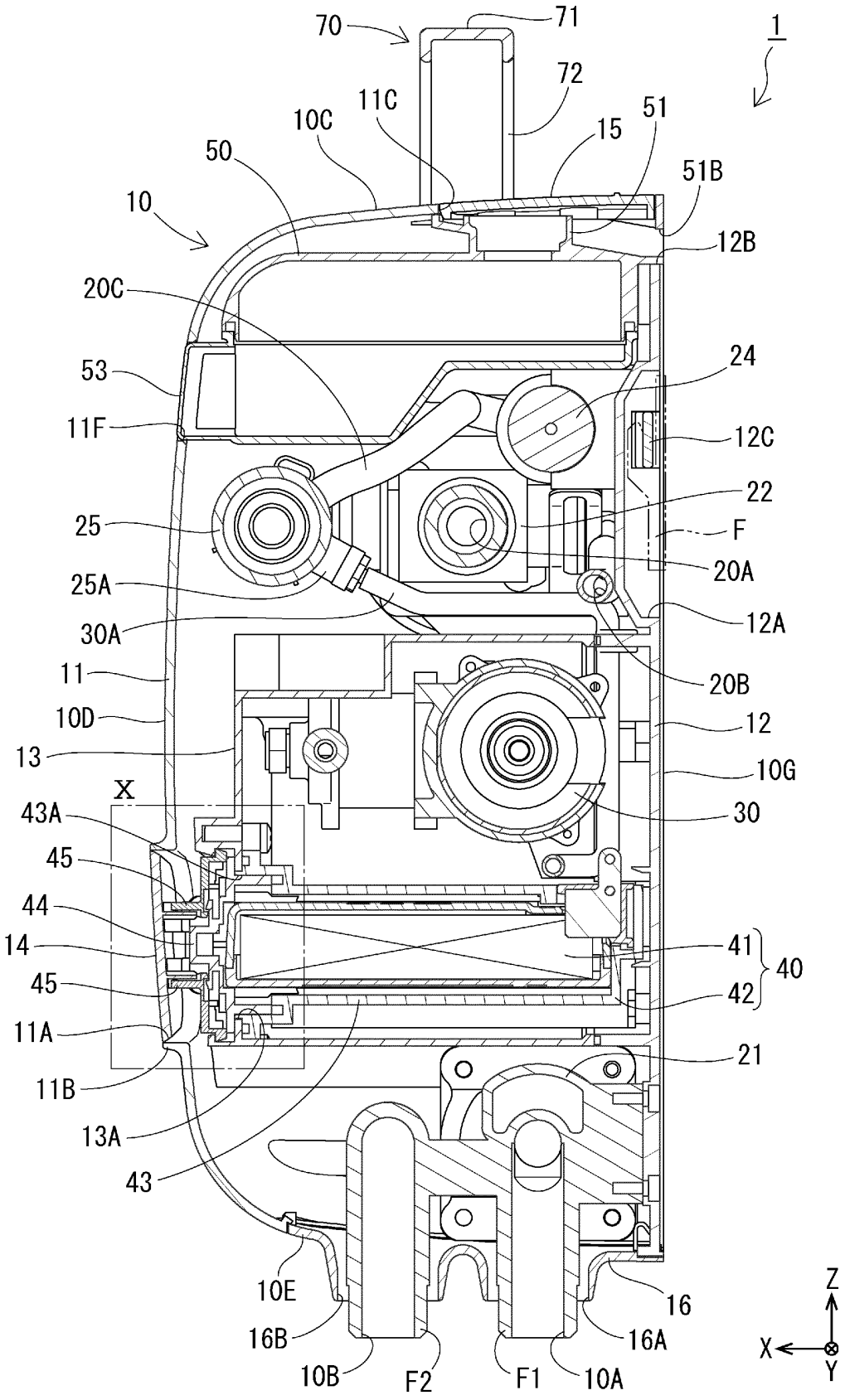
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Fig. 8

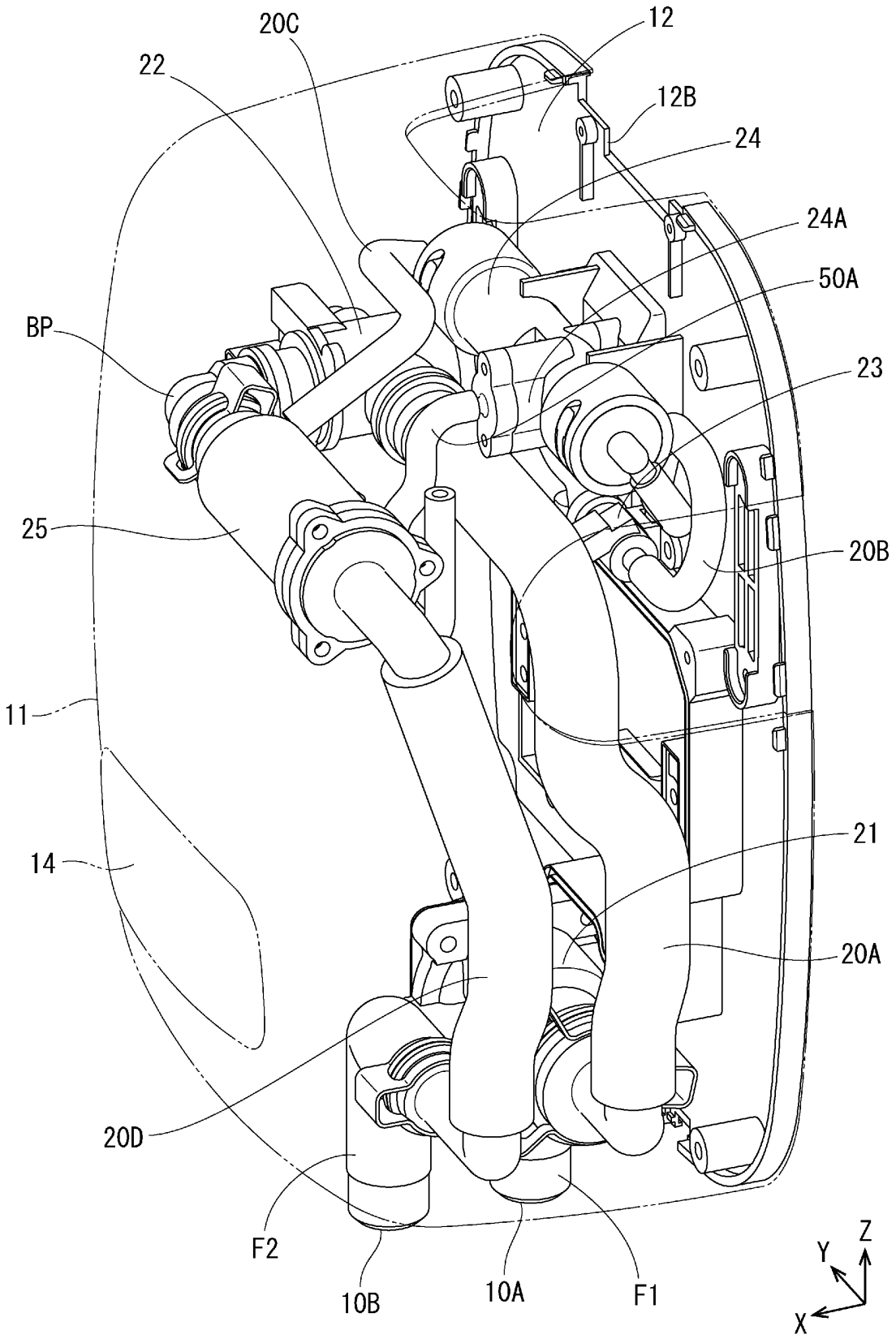
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Fig. 9

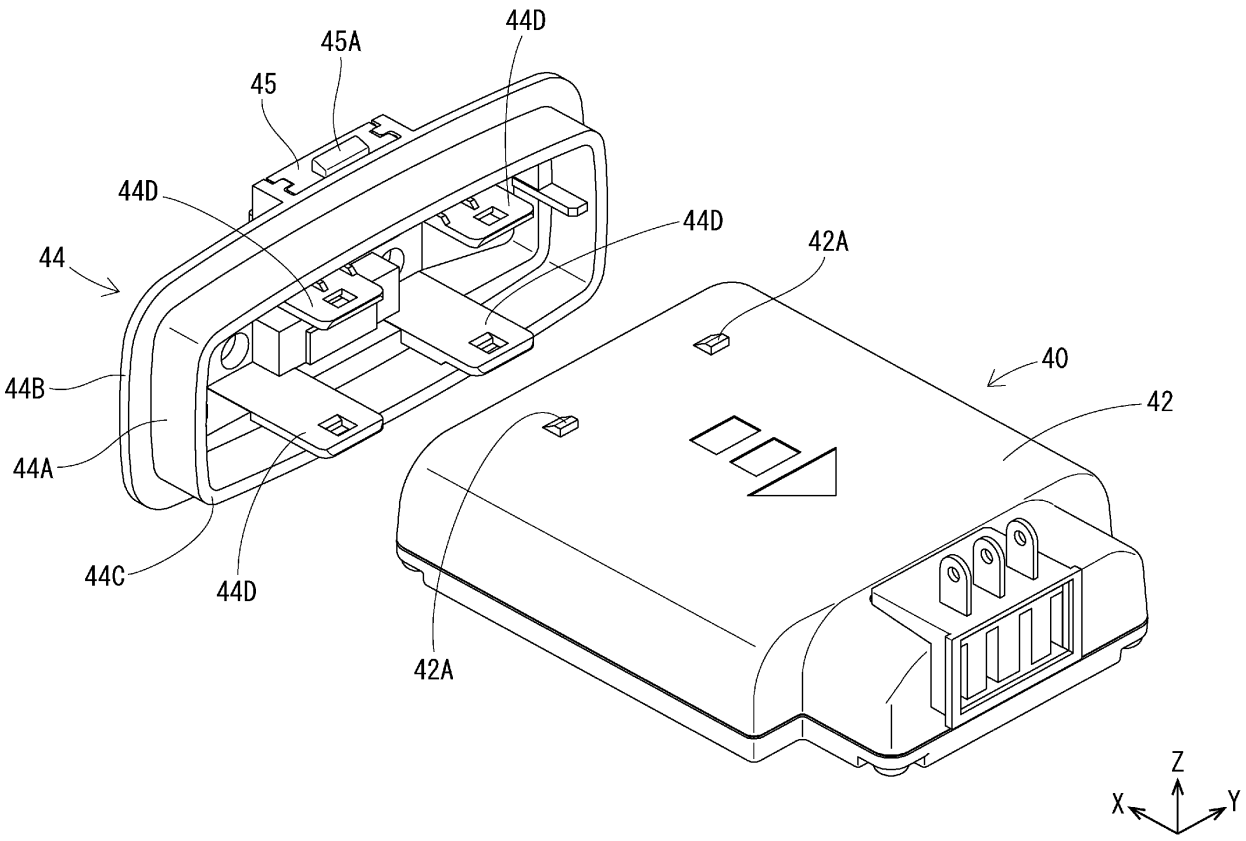

Fig. 10

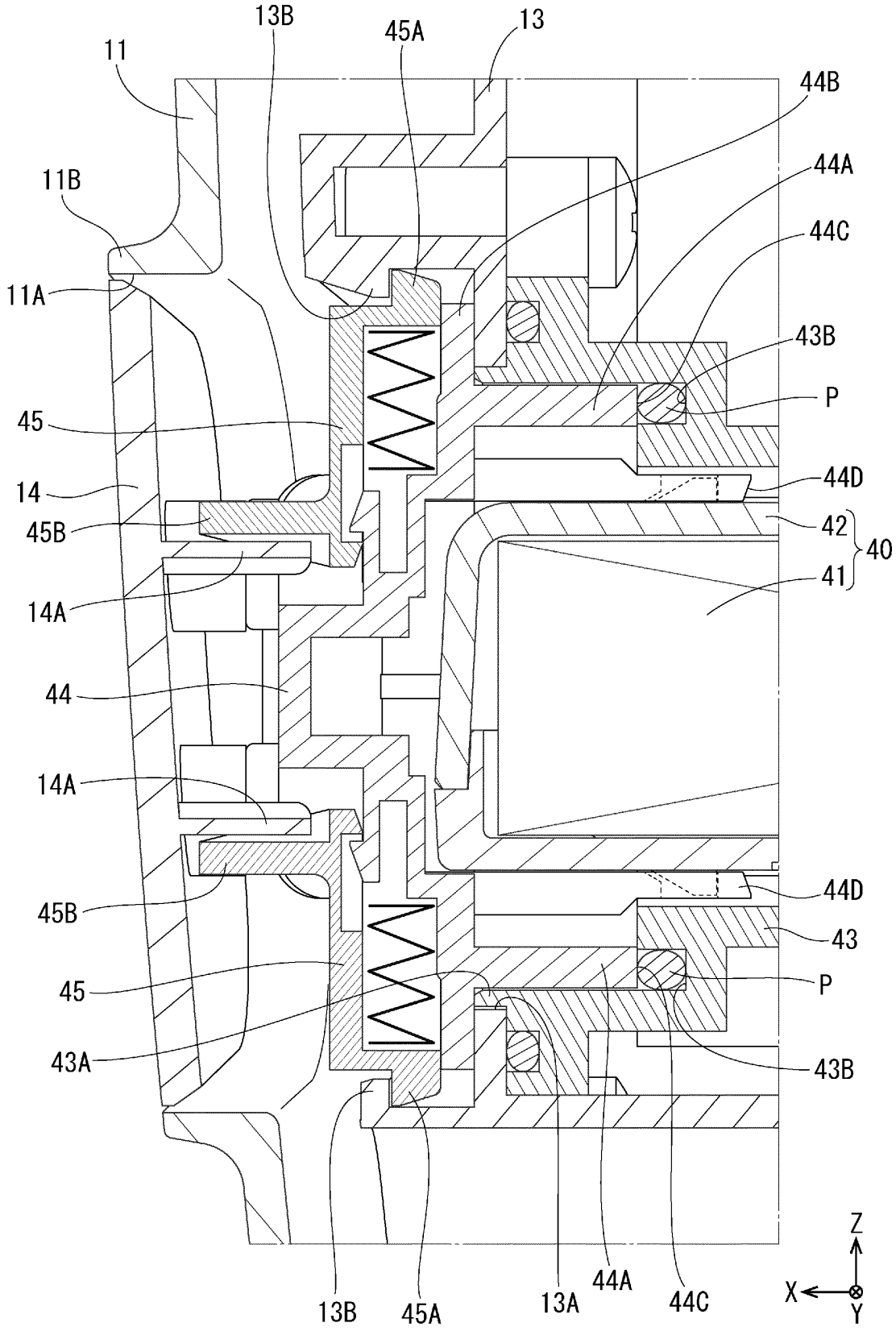
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Fig. 11

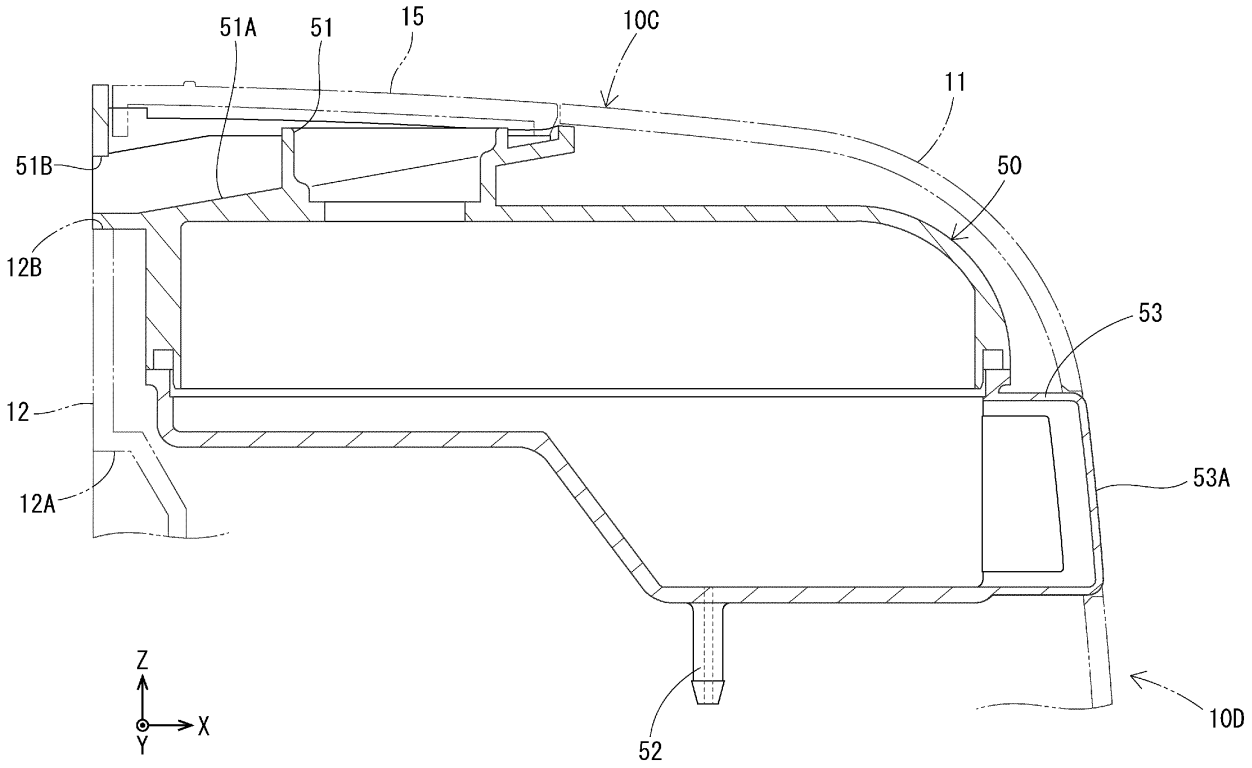
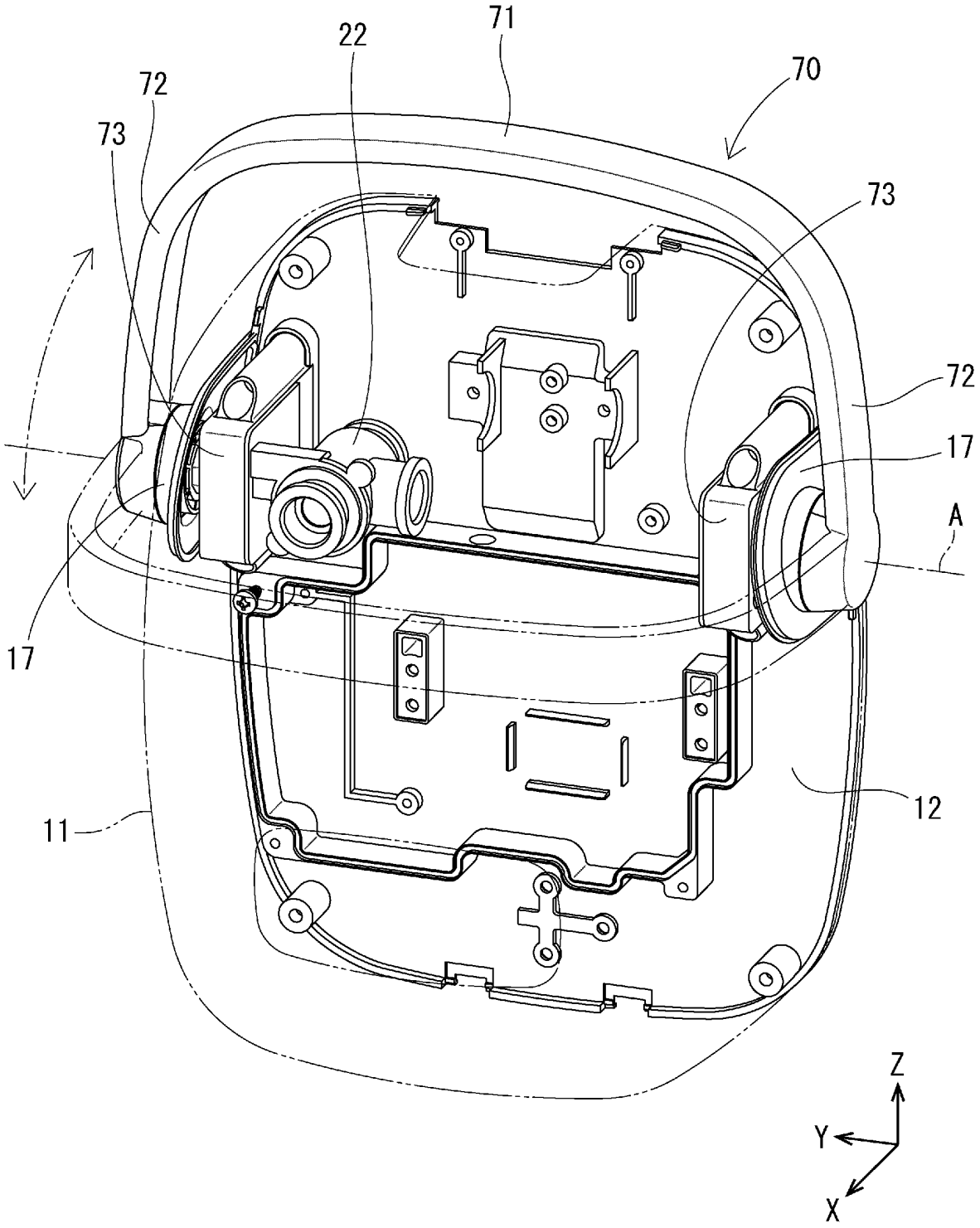


Fig. 12



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/010766

A. CLASSIFICATION OF SUBJECT MATTER
A47K 3/28(2006.01)i; E03C 1/046(2006.01)i
FI: A47K3/28; E03C1/046

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)
A47K3/20-3/40; E03C1/04-1/06; A61H33/00

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2018-198641 A (MORITA HOLDINGS CORP) 20 December 2018 (2018-12-20) paragraphs [0038], [0039], fig. 1, 2	1-5 6-13
Y A	CN 109046814 A (WANG, Tiezhong) 21 December 2018 (2018-12-21) paragraph [0016], fig. 2	1-5 6-13
Y A	WO 2010/016091 A1 (HAYAKAWA VALVE PRODUCTION CO., LTD) 11 February 2010 (2010-02-11) paragraphs [0047]-[0050], fig. 5, 6	3-5 6-13
Y A	JP 2007-90182 A (MATSUSHITA ELECTRIC WORKS LTD) 12 April 2007 (2007-04-12) paragraph [0012], fig. 8	3-5 6-13

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Date of the actual completion of the international search	Date of mailing of the international search report
14 May 2021 (14.05.2021)	25 May 2021 (25.05.2021)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/010766

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2018-198641 A	20 Dec. 2018	(Family: none)	
CN 109046814 A	21 Dec. 2018	(Family: none)	
WO 2010/016091 A1	11 Feb. 2010	(Family: none)	
JP 2007-90182 A	12 Apr. 2007	(Family: none)	

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

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Patent documents cited in the description

- JP 2018198641 A **[0003]**