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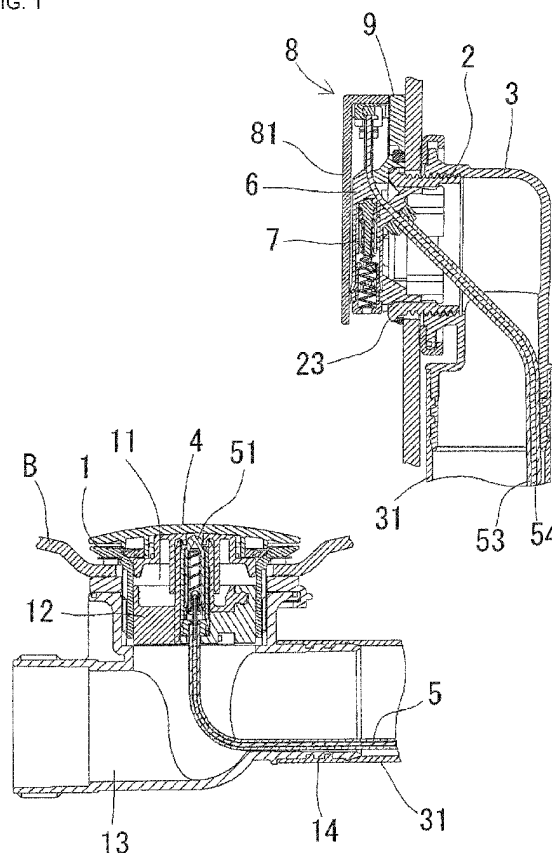
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(54) **DRAIN PLUG DEVICE**

(57) A drain plug device comprising a tank body (B) including a drain port (11) formed in a bottom surface of the tank body and an overflow port (21) formed in a side wall of the tank body; a valve member (4) that opens and closes the drain port (11); an operation unit (8) that is attached to the overflow port (21) to perform a raising operation of the valve member (4); and a transmission member (5) that transmits operation applied to the operation unit to the valve member (4), wherein the operation unit (8) includes an activation unit (81) displaceable with respect to the tank body (B), and a positioning member (9) that can be fixed in any direction to determine a position and a direction of the activation unit (81).

FIG. 1



## Description

### BACKGROUND OF THE INVENTION

#### (1) Field of the Invention

**[0001]** The present invention relates to a drain plug device that activates a valve member disposed in a tank body.

#### (2) Description of Related Art

**[0002]** As a conventional drain plug device, a drain plug device, which is attached to a tank body that includes a drain port in a bottom surface and an overflow port in a side surface, is known. In the drain plug device, operation applied to an operation unit is transmitted to the valve member through a transmission member, and the drain port is opened and closed by raising and lowering the valve member.

**[0003]** In the drain plug device described in JP 2014-167251 A, the operation unit is attached to the overflow port, and the overflow port is closed by the operation unit when the valve member is raised. Consequently, a user cannot visually recognize dirt or the like of an inside of the overflow port, thereby improving design. Although the overflow port is open when the valve member is lowered, a knob protruding toward the inside of the tank body covers the overflow port, and the user can hardly visually recognize the overflow port. The operation unit includes an activation unit that is vertically displaced, and the user can raise and lower the valve member by applying a pressing operation to the activation unit.

**[0004]** In the case where the displacement direction of the activation unit is determined as in JP 2014-167251 A, it is necessary to fix the operation unit in a predetermined direction. Similarly, for reasons such as design of the operation unit, it is necessary to fix the operation unit in a predetermined direction. However, in the case where the operation unit is attached by screwing, even if a thickness of the tank body changes only within a range of about 0.1 mm, a rotation amount of the operation unit changes greatly, and the direction of the operation unit completely changes by the change of the rotation amount.

**[0005]** Thus, it is difficult to fix the operation unit in any direction. Additionally, installation using adhesion and screw fastening is very complicated.

### SUMMARY OF THE INVENTION

**[0006]** An object of the present invention is to improve workability of the drain plug device.

**[0007]** According to a first aspect of the present invention, a drain plug device is characterized by including:

a tank body including a drain port formed in a bottom surface of the tank body; a valve member that opens

and closes the drain port;

an operation unit that is attached to an opening formed in the tank body or a vicinity of the tank body to perform a raising operation of the valve member; and

a transmission member that transmits operation applied to the operation unit to the valve member,

wherein the operation unit includes an activation unit displaceable with respect to the tank body, and a positioning member that can be fixed in any direction to determine a position and a direction of the activation unit.

**[0008]** According to a second aspect of the present invention, in the drain plug device of the first aspect, a flange member is attached to the opening formed in the tank body or the vicinity of the tank body, the flange member including a flange at an upstream end, a drain path being formed in the flange member, and the positioning member is sandwiched between an opening circumferential edge and the flange.

**[0009]** According to a third aspect of the present invention, in the drain plug device of the first or second aspect, the tank body includes an overflow port in a side wall of the tank body, and the operation unit is attached to the overflow port.

**[0010]** According to a fourth aspect of the present invention, in the drain plug device of any one of the first to third aspects, an end of the transmission member on an operation unit side is fixed to an inside of the flange member by a wire receiver, the wire receiver is rotatable relative to the flange member, and the positioning member and the wire receiver are engaged with each other so as not to rotate relative to each other.

**[0011]** According to the present invention, the positioning member can be fixed in any direction, so that the position and the direction of the activation unit can freely be set. Consequently, construction can be performed without any problems in the case of a structure in which the activation unit is displaced in a predetermined direction or in the case of a design having upper, lower, left and right. Additionally, because the positioning member can be fixed in any direction, unlike JP 2014-167251 A, it is unnecessary to form a rectangular opening for attachment in the tank body or the vicinity of the tank body. Thus, the opening is easily formed, and screwing can be used when the positioning member is fixed.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### **[0012]**

Fig. 1 is a sectional view illustrating a construction state of the present invention;

Fig. 2 is a sectional view illustrating an operation unit; Fig. 3 is an exploded perspective view illustrating each member constituting the operation unit;

Fig. 4 is a perspective view illustrating a wire receiver-

er;

Fig. 5 is a perspective view illustrating the wire receiver in a direction different from that in Fig. 4;

Fig. 6 is a perspective view illustrating the operation unit when the operation unit is viewed from below;

Fig. 7A is a front view illustrating the operation unit when the valve member is in a lowered state, and

Fig. 7B is a front view illustrating the operation unit when the valve member is in a raised state;

Fig. 8 is a perspective view illustrating a positioning member;

Fig. 9 is a sectional view illustrating the operation unit under construction; and

Fig. 10 is a reference view illustrating a flow of waste water during overflow.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

**[0013]** Hereinafter, a drain plug device of the present invention will be described with reference to the drawings. It is to be noted that the following description facilitates the understanding of the embodiment, and the present invention is not limited to this description. In the following embodiment, upper and lower and right and left and a positional relationship between members will be described with reference to a construction state in Fig. 1 unless otherwise specified.

**[0014]** A drain plug device according to an embodiment raises and lowers a valve member 4 by operating an operation unit 8 to remotely open and close a drain port 11 formed in a bottom surface of a tank body B. As illustrated in Figs. 1 to 3, the drain plug device of the embodiment includes a drain plug 1, a flange member 2, a connection unit 3, the valve member 4, a transmission member 5, a wire receiver 6, a lock mechanism 7, the operation unit 8, and a positioning member 9.

**[0015]** The tank body B is a box-shaped bathtub in which a top is open, and circular openings are formed in the bottom surface and an inside wall. The drain plug 1 is attached to the opening of the bottom surface, and the flange member 2 is attached to the opening of the inside wall. The opening formed in the bottom surface serves as the drain port 11, and the opening formed in the inside wall serves as an overflow port 21. The drain port 11 is sandwiched between the drain plug 1 and a drain device 13, and the overflow port 21 is sandwiched between the flange member 2 and the connection unit 3.

**[0016]** The drain plug 1 is a tubular body having a flange at an upper end, and a drain path serving as the drain port 11 through which hot water or the like in the tank body B is discharged as waste water is formed in the drain plug 1. A male screw is threaded on an outer periphery of the tubular portion. A wire fixing unit 12 is attached to a protrusion formed in the drain plug 1, and a valve shaft 51 that is one end of the transmission member 5 is fixed to the wire fixing unit 12. The drain plug 1 is screwed to the drain device 13 disposed on a rear

surface of the tank body B while the tubular portion is inserted in the opening formed in the bottom surface of the tank body B.

**[0017]** The drain device 13 is disposed on the rear surface of the bottom surface of the tank body B and screwed to the lower end of the drain plug 1 by a female screw formed above the drain device 13, and an outlet that further discharges the waste water flowing into the drain device 13 to piping (not illustrated) on a downstream side is formed on the downstream side of the drain device 13. A tubular branch pipe 14 extends outward from the side surface of the drain device 13, and is connected to the connection unit 3 through an overflow pipe 31 having flexibility.

**[0018]** The flange member 2 is a tubular body including a flange 23 at an upstream end (left side in Fig. 1), and a drain path, which serves as an overflow path that discharges hot water stored up to a position higher than a predetermined level, is formed in the flange member 2. A male screw is threaded on an outer periphery of the tubular portion. The wire receiver 6 is attached to a step 22 formed in the flange member 2, and an attached unit 52 that is the other end of the transmission member 5 is fixed to the wire receiver 6. The flange member 2 is screwed to the connection unit 3 disposed on the rear surface of the tank body B while inserted in the opening formed in the inside wall of the tank body B, so that the flange member 2 sandwiches an opening circumferential edge formed in the inside wall of the tank body B.

**[0019]** The connection unit 3 is a substantially L-shaped drain piping that is disposed on the rear surface of the inside wall of the tank body B, and the drain path of the substantially L-shaped drain piping is bent by about 90 degrees such that the waste water flowing horizontally from the overflow port 21 is discharged in a vertical direction. The connection unit 3 is screwed to the flange member 2 by a female screw formed at the upstream end. The overflow pipe 31 having the flexibility is attached to the downstream end, and the hot water flowing into the inside is discharged to the branch pipe 14 through the overflow pipe 31.

**[0020]** The transmission member 5, to be described later, is disposed in the overflow path communicated with the overflow port 21.

**[0021]** The valve member 4 is a lid member in which packing is fitted on the outer circumferential surface of the valve member 4. The packing comes into contact with the circumferential edge of the drain port 11 while the valve member 4 is lowered, whereby the drain port 11 is watertightly closed. The leading end of a valve shaft 51 formed at one end of the transmission member 5 is detachably fitted in the rear surface of the valve member 4, and the valve member 4 is pushed up and raised by the valve shaft 51 protruding upward by the operation of the operation unit 8, whereby the drain port 11 can be opened.

**[0022]** The transmission member 5 is a member that is configured by an outer tube 53 and an inner wire 54

to transmit displacement of the operation unit 8 to the valve member 4, and the transmission member 5 includes the valve shaft 51 provided at the end on the drain port 11 side and an attached unit 52 provided at the end on the operation unit 8 side. The valve shaft 51 is fixed to the inside of the drain plug 1 by the wire fixing unit 12, and the attached unit 52 is fixed to the inside of the flange member 2 by the wire receiver 6. Most of the transmission member 5 is disposed in the overflow path communicated with the overflow port 21.

**[0023]** The outer tube 53 is a tube body made of a hollow synthetic resin, and the inner wire 54 is slidably disposed in the outer tube 53.

**[0024]** The inner wire 54 is a metal wire having flexibility in the side surface direction. One end of the inner wire 54 is connected to the valve shaft 51, and the other end is connected to a lock shaft 72. The inner wire 54 is exposed from the outer tube 53 on the operation unit 8 side and extended from the overflow port 21 toward the operation unit 8 side. The inner wire 54 relating to the exposed portion is accommodated in a groove 64 formed in an induction unit upper portion 92 and an induction unit lower portion 63, and the end of the inner wire 54 is bent so as to be oriented toward a displacement direction of the operation unit 8. When the operation is applied to the operation unit 8, the inner wire 54 can transmit the displacement of the operation unit 8 by sliding the inside of the outer tube 53.

**[0025]** The valve shaft 51 is a tubular body formed at the end of the transmission member 5 on the drain port 11 side, and the valve shaft 51 includes an outer cylinder and an inner cylinder. The outer cylinder is a hollow tubular body to which the outer tube 53 is connected, and the inner cylinder is slidably accommodated in the outer tube 53, and an outer circumferential surface of the outer cylinder is fixed to the wire fixing unit 12. The inner cylinder is a hollow tubular body to which the inner wire 54 is connected, the upper end of the inner cylinder is closed, and a shock absorber spring is accommodated in the inner cylinder while the valve member 4 is fitted in the upper end of the inner cylinder.

**[0026]** In the valve shaft 51, when the operation is applied to the operation unit 8, the inner wire 54 slides toward the drain port 11 side, whereby the inner cylinder protrudes from the outer cylinder to push up the valve member 4.

**[0027]** A protrusion is formed on the outer circumferential surface of the attached unit 52 and is fitted in a notch formed in an attachment unit 62 of the wire receiver 6, thereby the attached unit 52 is fixed.

**[0028]** As illustrated in Figs. 4 and 5, the wire receiver 6 is a member that fixes the other end of the transmission member 5 to the inside of the flange member 2, and the wire receiver 6 includes a ring portion having approximately the same outer diameter as the inner circumferential surface of the flange member 2, and is engaged with the step 22 of the flange member 2 by a claw 61 extending from the end of the ring portion. The claw 61

is positioned on the rear surface (right side in Fig. 1) of the step 22 while engaged with the step 22, and the wire receiver 6 is rotatably attached by the claw 61 without being removed from the flange member 2. The wire receiver 6 includes the attachment unit 62, the induction unit lower portion 63, and a casing 65.

**[0029]** The attachment unit 62 has a substantially tubular shape, a center axis of the attachment unit 62 is inclined with respect to a center axis of the wire receiver 6, and the attachment unit 62 is formed at a position different from the center of the wire receiver 6. The attached unit 52 of the transmission member 5 is inserted through the attachment unit 62, the protrusion of the attached unit 52 is fitted in the notch, and the attached unit 52 is fixed to the operation unit 8 side. Thus, the end of the transmission member 5 on the operation unit 8 side is inclined with respect to the center axis of the wire receiver 6.

**[0030]** The induction unit lower portion 63 is extended into an arc shape from the upper end of the attachment unit 62, and the groove 64 is formed along the longitudinal direction in the upper surface of the arcuate portion and the center of the arcuate portion. The induction unit lower portion 63 is bent at an angle corresponding to the lower surface of the induction unit upper portion 92 formed on the positioning member 9, to be described later.

**[0031]** The casing 65 is a tubular member, which is disposed below the induction unit lower portion 63 and inside the tank body B and formed such that an axial direction of the casing 65 is set to the vertical direction, and a fixed gear is formed in the inner circumferential surface, and each member constituting the lock mechanism 7 is accommodated in the casing 65. The casing 65 includes a collection unit 66 located at the lower end of the casing 65. As illustrated in Fig. 6, the collection unit 66 is disposed at an inlet 82 at the time of completion of construction, and prevents dust and a toy in the hot water from being discharged from the overflow port 21.

**[0032]** The lock mechanism 7 is called a thrust lock mechanism that holds the state of the valve member 4 that is raised according to the operation of the operation unit 8. The lock mechanism 7 is configured by the casing 65, a rotating gear 71 disposed in the casing 65, a lock shaft 72, and a spring.

**[0033]** As illustrated in Fig. 2, the lock shaft 72 is disposed in the center of the casing 65, penetrates the upper surface of the casing 65, and is branched in two from the middle to the upper end. The induction unit lower portion 63 is disposed between the branched portions of the lock shaft 72. Thus, the end of the transmission member 5 is disposed between the branched portions along the lock shaft 72. A cap-shaped wire hold 73 is attached to the upper end of the lock shaft 72, so that the inner wire 54 is configured to be interlocked with the lock shaft 72 while the end of the exposed inner wire 54 is fixed. The lock shaft 72 is disposed so as to be able to move up and down in the casing 65, and the rotation gear 71 is turnably attached so as not to be able to move up and down with respect to the lock shaft 72. When the lock shaft 72 is

lowered, the lock mechanism 7 can hold the lowered state of a lock shaft 72 by engagement between the rotational gear 71 and the fixed gear. When the lock shaft 72 is lowered again, the engagement between the rotation gear 71 and the fixed gear is released, and the lock shaft 72 can be raised by elasticity of the spring.

**[0034]** The lock mechanism 7 is disposed below an activation unit 81, and the upper end of the lock shaft 72 is in contact with the rear surface of the activation unit 81 with the wire hold 73 interposed therebetween. Thus, the lock shaft 72 also moves up and down according to the vertical movement of the activation unit 81. The axial direction of the lock shaft 72 is disposed so as to be set to the vertical direction, so that the axial direction of the lock shaft 72 is substantially parallel to the displacement direction of the activation unit 81 and the axial direction of the end of the inner wire 54 fixed to the lock shaft 72.

**[0035]** As illustrated in Figs. 6 and 7, the operation unit 8 has a substantially circular shape in front view, is attached to the flange member 2, and protrudes toward the inside of the tank body B. The operation unit 8 includes the activation unit 81 and the positioning member 9.

**[0036]** As illustrated in Figs. 2 and 10, the activation unit 81 is a box body in which the bottom and rear surfaces (right side in Fig. 1) are open. Guide units 91 of the positioning member 9 are disposed on both sides in front view. As illustrated in Fig. 7, the activation unit 81 is displaceable only in the vertical direction with respect to the tank body B, the operation unit 8 has a substantially circular shape in front view when the valve member 4 is in the raised state, and the activation unit 81 protrudes downward from the positioning member 9 when the valve member 4 is in the lowered state. The activation unit 81 is in contact with the lock shaft 72 and the inner wire 54 with the wire hold 73 interposed therebetween. The lock mechanism 7 is accommodated and disposed in the activation unit 81.

**[0037]** As described above, the activation unit 81 is the box body in which the bottom and rear surfaces are open. However, when the construction of the activation unit 81 is completed, the positioning member 9 is disposed on the rear and side surfaces of the activation unit 81, so that only the bottom surface is open. At this point, the opened bottom surface serves as the inlet 82, and the drain path communicated with the overflow port 21 is formed. The drain path communicated with the inlet 82 serves as the overflow path through which the hot water stored above the predetermined height in the tank body B is discharged, but the hot water discharged from the tank body B also flows from the gap between the activation unit 81 and the positioning member 9 in addition to the inlet 82. Thus, the inlet 82 is a main inflow path only when the waste water flows in the overflow port 21, and the overflowed waste water does not necessarily flow from the inlet 82.

**[0038]** As illustrated in Figs. 7 and 8, the positioning member 9 has a substantially circular shape in front view, and guide units 91 are formed on both the sides of the

activation unit 81 while the activation unit 81 is attached. The positioning member 9 includes the induction unit upper portion 92 that is matched with the induction unit lower portion 63 of the wire receiver 6 in the vicinity of the center, and an opening through which the flange member 2 is inserted below the induction unit upper portion 92, and a latch unit 93 is attached to the opening.

**[0039]** The induction unit upper portion 92 is formed in an arc shape that is matched with the induction unit lower portion 63, and the groove 64 is formed along the longitudinal direction in the center of the arc portion. The induction unit upper portion 92 is engaged with the induction unit lower portion 63.

**[0040]** The guide unit 91 protrudes toward the inside of the tank body B while having the substantially same interval as the width in the horizontal direction of the activation unit 81.

**[0041]** The latch unit 93 is an annular member, is inserted through the tubular portion of the flange member 2, and is attached to the positioning member 9 from the rear surface, and the flange 23 of the flange member 2 is latched during the construction. Consequently, the positioning member 9 is sandwiched between the flange 23 of the flange member 2 and the side wall of the tank body B.

**[0042]** At this point, the positioning member 9 prevents the wire receiver 6 from rotating relative to the positioning member 9 by the engagement between the induction unit upper portion 92 and the induction unit lower portion 63, and also prevents the activation unit 81 from rotating relative to the positioning member 9 by the disposition of the guide units 91 on both the sides of the activation unit 81. That is, the positioning member 9 determines the orientation of the wire receiver 6, and the guide units 91 are disposed on both the sides of the activation unit 81, whereby the positioning member 9 determines the position and direction of the activation unit 81.

**[0043]** The drain plug device configured by the above members is constructed as follows. Unless particularly described, the members requiring watertightness are watertightly connected to each other with a watertight member such as an adhesive and packing interposed therebetween as needed.

**[0044]** The drain device 13 and the connection unit 3 are connected to each other by the overflow pipe 31. The drain plug 1 is inserted through the opening in the bottom surface of the tank body B, and screwed to the drain device 13. The latch unit 93 is inserted through the cylindrical portion of the flange member 2, and attached to the positioning member 9. The flange member 2 is inserted in the opening formed in the side wall of the tank body B, and screwed to the connection unit 3. At this point, as illustrated in Fig. 9, the positioning member 9 is disposed between the flange 23 of the flange member 2 and the inside wall of the tank body B, and the flange 23 is latched to the latch unit 93, whereby the positioning member 9 is sandwiched between the opening circumferential edge formed on the inside wall of the tank body

B and the flange member 2. On the other hand, during the screwing, the positioning member 9 is rotatable with respect to the flange member 2, and the direction of the positioning member 9 can freely be changed. Thus, the positioning member 9 can be fixed in any direction with respect to the tank body B. A worker grasps the positioning member 9, adjusts the orientation of the positioning member 9 such that the operation unit 8 can be displaced in the vertical direction, tightens the flange member 2 and the connection unit 3, and the screwing is performed until the positioning member 9 cannot be turned. Consequently, the orientation of the positioning member 9 is fixed.

**[0045]** Subsequently, the transmission member 5 is inserted in the flange member 2 from the end on the valve shaft 51 side. At this point, the transmission member 5 is induced by the overflow pipe 31, and the valve shaft 51 easily reaches the inside of the drain device 13 by the branch pipe 14. The worker draws the valve shaft 51 from the inside of the drain plug 1, fixes the valve shaft 51 to the wire fixing unit 12, and attaches the wire fixing unit 12 to the drain plug 1. The construction on the drain plug 1 side is completed by fitting the valve shaft 51 and the valve member 4.

**[0046]** Subsequently, the attached unit 52 of the transmission member 5 is fixed to the attachment unit 62 of the wire receiver 6, the wire hold 73 is attached to the end of the inner wire 54, and the wire receiver 6 is attached to the flange member 2. At this point, the induction unit upper portion 92 and the induction unit lower portion 63 are engaged with each other, and the inner wire 54 exposed from the outer tube 53 is disposed in the groove 64. At this point, the wire receiver 6 and the positioning member 9 are fixed together so as not to be turned in association with the engagement between the induction unit upper portion 92 and the induction unit lower portion 63.

**[0047]** Finally, the activation unit 81 is disposed between the guide units 91 of the positioning member 9 to complete the construction of the drain plug device.

**[0048]** In the above construction procedure, the direction of the wire receiver 6 that determines the attachment position and direction of the activation unit 81 is fixed by the engagement with the positioning member 9. When the activation unit 81 is displaced, the activation of the activation unit 81 is guided by the guide units 91 disposed on both the sides of the activation unit 81. That is, in the present invention, the position and direction of the activation unit 81 are determined by the positioning member 9.

**[0049]** The drain path through which the waste water is discharged from the drain port 11 and the overflow path through which the waste water is discharged from the overflow port 21 are formed in the drain plug device in which the construction is completed as described above.

**[0050]** In the drain plug device, the drain port 11 is closed by the watertight contact of the packing fitted around the valve member 4 with the upper surface of the

drain plug 1 while the valve member 4 is lowered. When the pushing operation is applied to the activation unit 81 from the lowered state of the valve member 4, the inner wire 54 slides toward the drain plug 1 side as the activation unit 81 is lowered, the inner cylinder of the valve shaft 51 protrudes from the outer cylinder, and the valve member 4 is pushed up and raised. At this point, the lock mechanism 7 is activated, and the raised state of the valve member 4 is maintained. When the valve member 4 is raised, the drain port 11 is open, and the hot water in the tank body B can be discharged from the drain port 11.

**[0051]** When the pushing operation is applied to the activation unit 81 again, the lock mechanism 7 is activated to release the raised state of the valve member 4, whereby the valve member 4 is lowered. Consequently, the valve member 4 closes the drain port 11, and the hot water can be stored in the tank body B.

**[0052]** On the other hand, when the water level in the tank body B becomes higher than or equal to a predetermined level while the drain port 11 is closed, the hot water in the tank body B is discharged from the overflow port 21 as illustrated in Fig. 10. In Fig. 10, in order to facilitate understanding of the invention, the description of the wire receiver 6 and the transmission member 5 is omitted from the state in Fig. 2, and the flow of the waste water during the overflow is indicated by an arrow. Although the overflow port 21 is covered by the operation unit 8, the bottom surface of the activation unit 81 is opened to form the inlet 82. Thus, the overflowing water in the tank body B can be discharged from the inlet 82 to the overflow port 21 through the rear side of the activation unit 81. The hot water discharged from the overflow port 21 flows into the drain device 13 from the branch pipe 14 through the connection unit 3 and the overflow pipe 31.

**[0053]** As illustrated in Fig. 6, because the collection unit 66 is disposed at the inlet 82, large dust, a toy, and the like are not discharged through the inlet 82. The user can be prevented from inserting a finger or the like in the device from the inlet 82 by the collection unit 66.

**[0054]** In the present invention, the overflow port 21 is covered by the operation unit 8 such that the user cannot visually recognize the overflow port 21, the design can be improved. On the other hand, the overflow port 21 is always in the open state regardless of the state of the valve member 4, so that the flow rate of the drain piping communicated with the overflow port 21 is not decreased.

**[0055]** During the construction, the positioning member 9 can be fixed in any direction, and the position and direction of the activation unit 81 are determined by the positioning member 9. Thus, in the present invention, the worker can perform the adjustment such that the positioning member 9 is fixed in any direction, and improve workability. In the above embodiment, the activation unit 81 is configured to move up and down along the inside surface of the tank body B, and the inlet 82 is provided below the activation unit 81. Consequently, the inlet 82

is not visually recognized by the user during the use, and the good design is obtained regardless of the opening and closing states of the drain port 11.

[0056] Instead of the above embodiment, for example, in the operation unit 8, the drain port 11 is opened and closed by horizontally moving the activation unit 81 along the inner surface of the tank body B, and the inlet 82 is provided below the activation unit 81. Even in such a configuration, the user does not visually recognize the inlet 82 during the use, and it is possible to provide the drain plug device having the good design regardless of the opening and closing states of the drain port 11.

[0057] In the present invention, the positioning member 9 is sandwiched and fixed by the opening circumferential edge formed in the inside wall of the tank body B and the flange member 2, so that the opening used to attach the operation unit 8 can be formed in a circular shape. That is, it is not necessary to form the opening in a rectangular shape in order to determine the position and orientation of the positioning member 9, so that the opening is easily formed. Because the opening can be formed in a circular shape, the screw can be used for assembly of members, and it is not necessary to adopt a complicated assembly method using screw fastening or bonding.

[0058] Although the embodiment of the present invention is described above, the drain plug device of the present invention is not limited to the shape of the embodiment. For example, in the above embodiment, the activation unit 81 is configured to move up and down along the inner surface of the tank body B, and the inlet 82 is provided below the activation unit 81. Consequently, the inlet 82 is not visually recognized by the user during the use, and the good design is obtained regardless of the opening and closing states of the drain port 11.

[0059] Instead of the above embodiment, in the operation unit 8, the drain port 11 is opened and closed by horizontally moving the activation unit 81 along the inner surface of the tank body B, and the inlet 82 is provided below the activation unit 81. Even in such a configuration, the user does not visually recognize the inlet 82 during the use, and it is possible to provide the drain plug device having the good design regardless of the opening and closing states of the drain port 11.

[0060] The drain plug device of the present invention is not limited to the drain plug device for a bathtub, but may be used for a washstand or a kitchen.

[0061] In the above embodiment, the operation unit 8 or the transmission member 5 is also used as the overflow piping, but the present invention is not limited to the above embodiment. Alternatively, the tank body having no overflow piping may be used, or the operation unit 8 or the transmission member 5 which are independent of the overflow piping may be provided as the configuration in which the opening only for attaching the operation unit 8 or inserting the transmission member 5 is provided in the tank body B.

[0062] In the above embodiment, the opening to which

the operation unit 8 is attached is formed in the inside wall of the tank body B. Alternatively, the opening may be provided in the outside wall and the edge portion of the tank body B, or formed in the wall surface in the vicinity of the tank body B. Because the overflow piping is not necessarily provided in the construction of the operation unit 8 and the transmission member 5 as described above, no particular problem arises even if the operation unit 8 of the present invention is provided on the outside wall or the edge portion of the tank body B.

## DESCRIPTION OF REFERENCE NUMERALS

### [0063]

1	Drain plug
11	Drain port
12	Wire fixing unit
13	Drain device
14	Tubular branch pipe
2	Flange member
21	Overflow port
22	Step
23	Flange
3	Connection unit
31	Overflow pipe
4	Valve member
5	Transmission member
51	Valve shaft
52	Attached unit
53	Outer tube
54	Inner wire
6	Wire receiver
61	Claw
62	Attachment unit
63	Induction unit lower portion
64	Groove
65	Casing
66	Collection unit
7	Lock mechanism
71	Rotating gear
72	Lock shaft
73	Cap-shaped wire hold
8	Operation unit
81	Activation unit
82	Inlet
9	Positioning member
91	Guide units
92	Induction unit upper portion
93	Latch unit
B	Tank body

## Claims

1. A drain plug device **characterized by** including:  
a tank body including a drain port formed in a

bottom surface of the tank body; a valve member  
that opens and closes the drain port;  
an operation unit that is attached to an opening  
formed in the tank body or a vicinity of the tank  
body to perform a raising operation of the valve  
member; and  
a transmission member that transmits operation  
applied to the operation unit to the valve mem-  
ber,

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wherein the operation unit includes an activation unit  
displaceable with respect to the tank body, and  
a positioning member that can be fixed in any direc-  
tion to determine a position and a direction of the  
activation unit.

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2. The drain plug device according to claim 1, wherein  
a flange member is attached to the opening formed  
in the tank body or the vicinity of the tank body, the  
flange member including a flange at an upstream  
end, a drain path being formed in the flange member,  
and the positioning member is sandwiched between  
an opening circumferential edge and the flange. 20
3. The drain plug device according to claim 1 and 2, 25  
wherein the tank body includes an overflow port in  
a side wall of the tank body, and the operation unit  
is attached to the overflow port.
4. The drain plug device according to claim 1 to 3, 30  
wherein an end of the transmission member on an  
operation unit side is fixed to an inside of the flange  
member by a wire receiver,  
the wire receiver is rotatable relative to the flange  
member, and 35  
the positioning member and the wire receiver are  
engaged with each other so as not to rotate relative  
to each other.

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FIG. 1

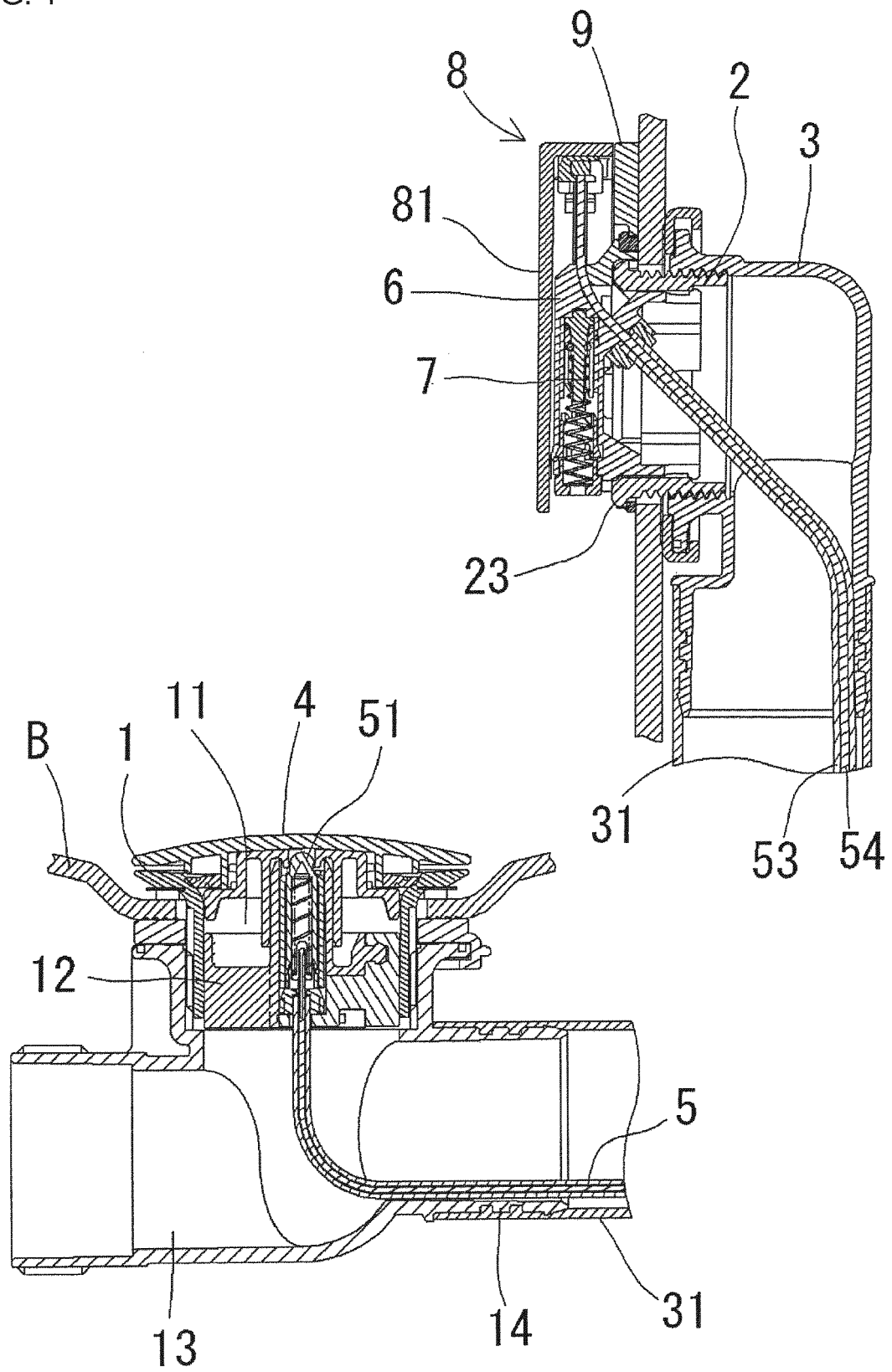


FIG. 2

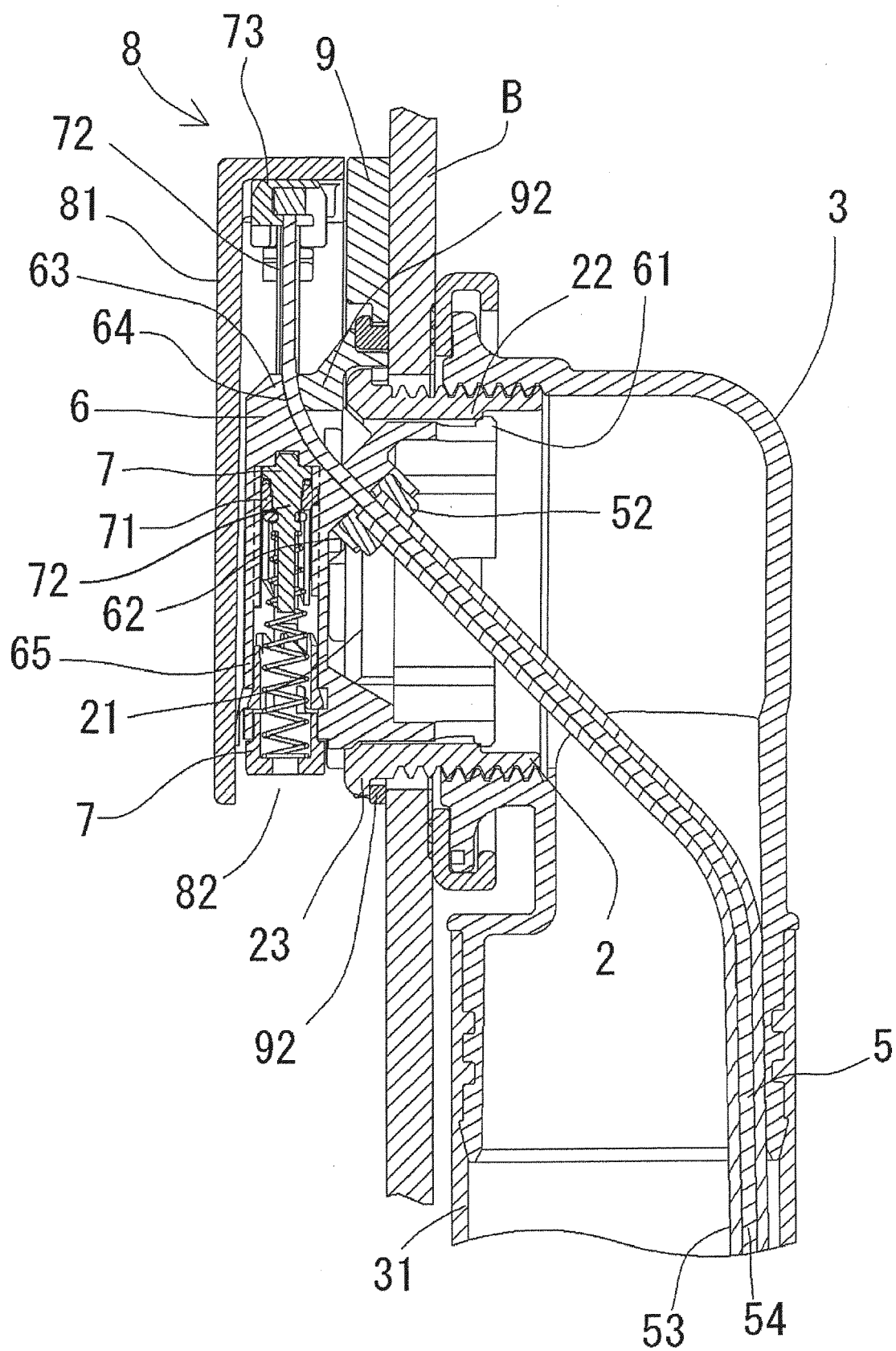


FIG. 3

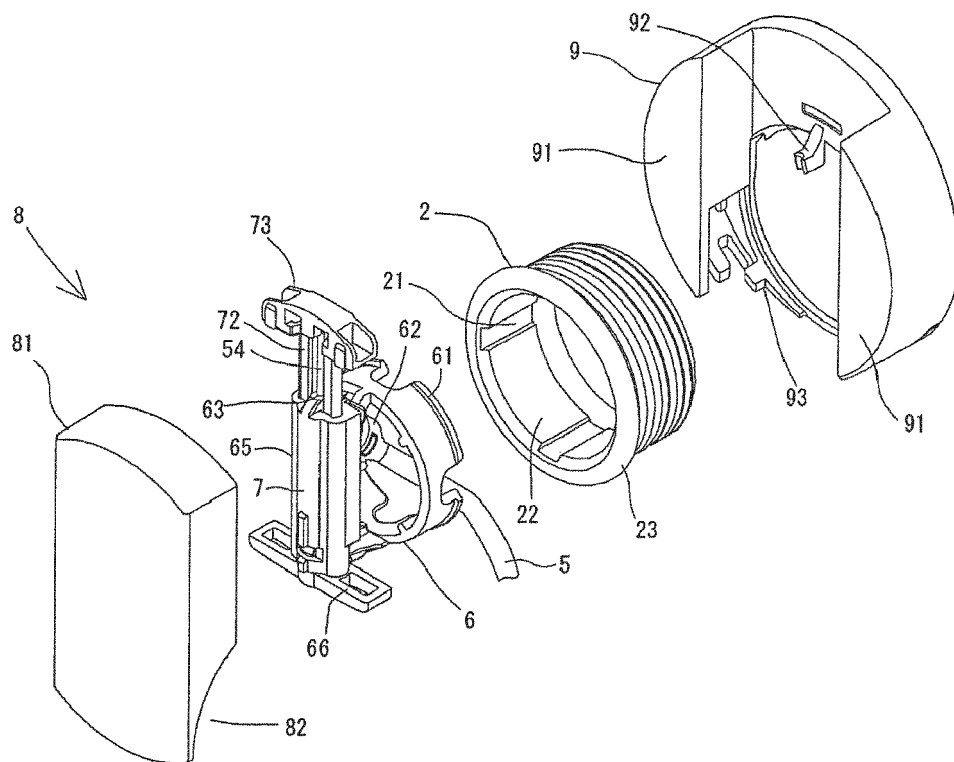


FIG. 4

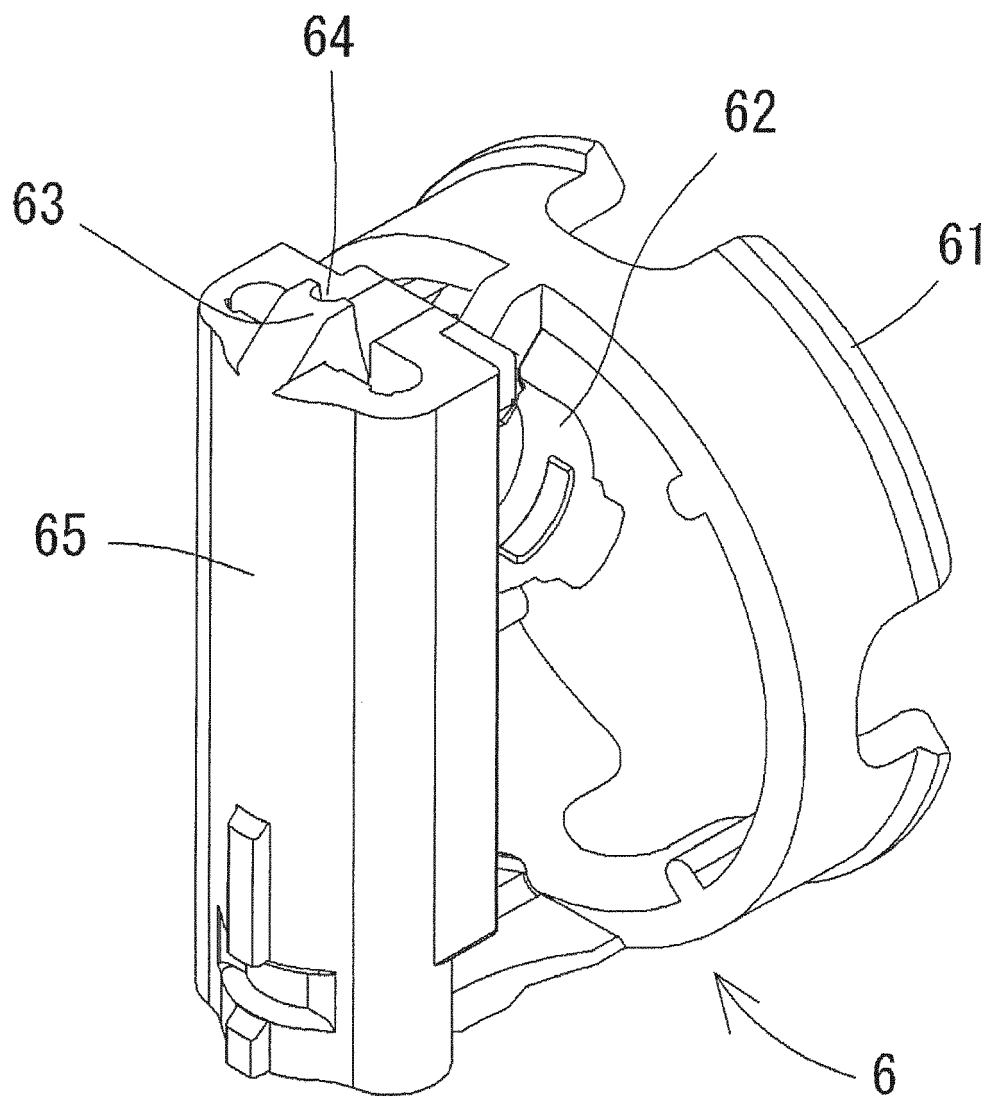


FIG. 5

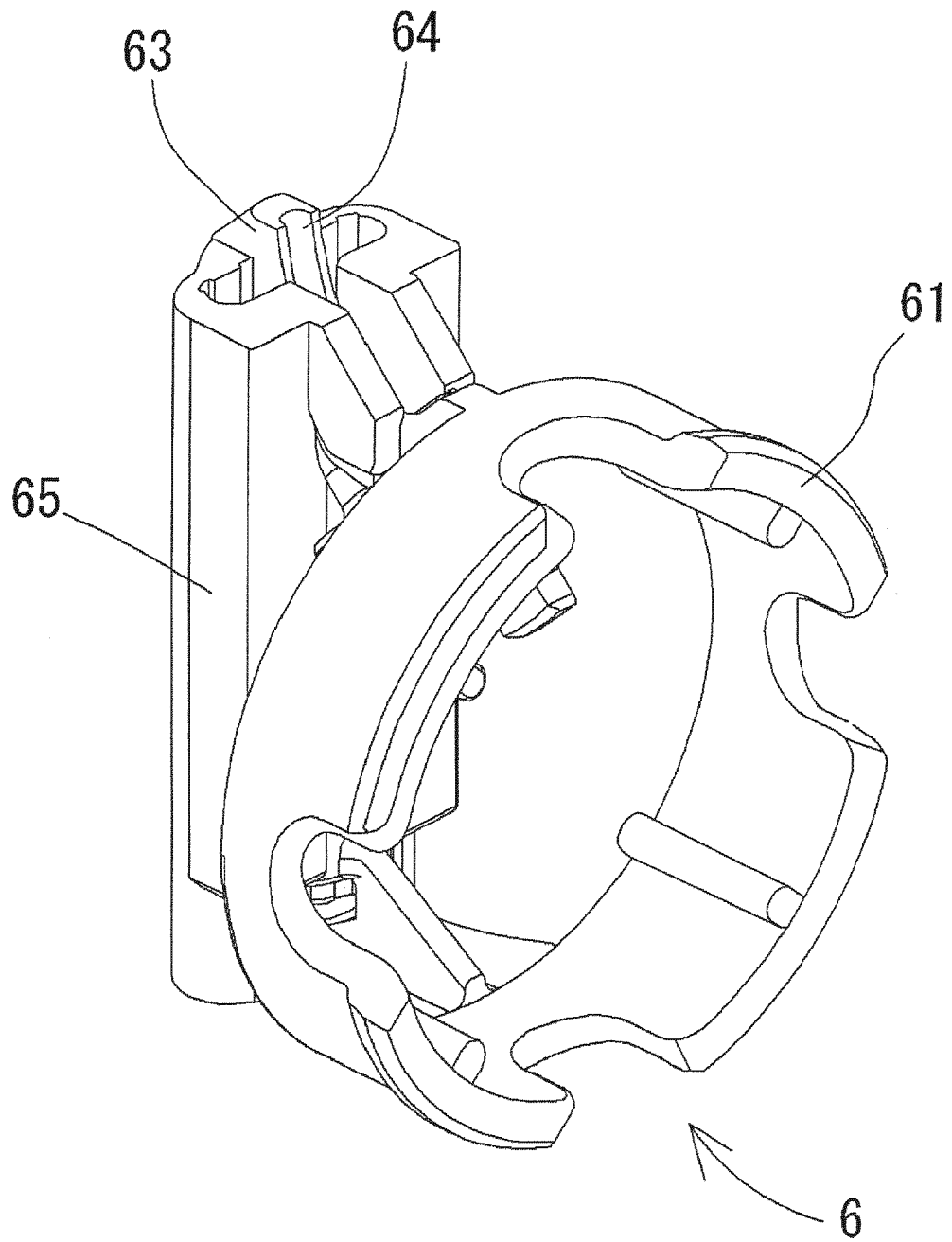


FIG. 6

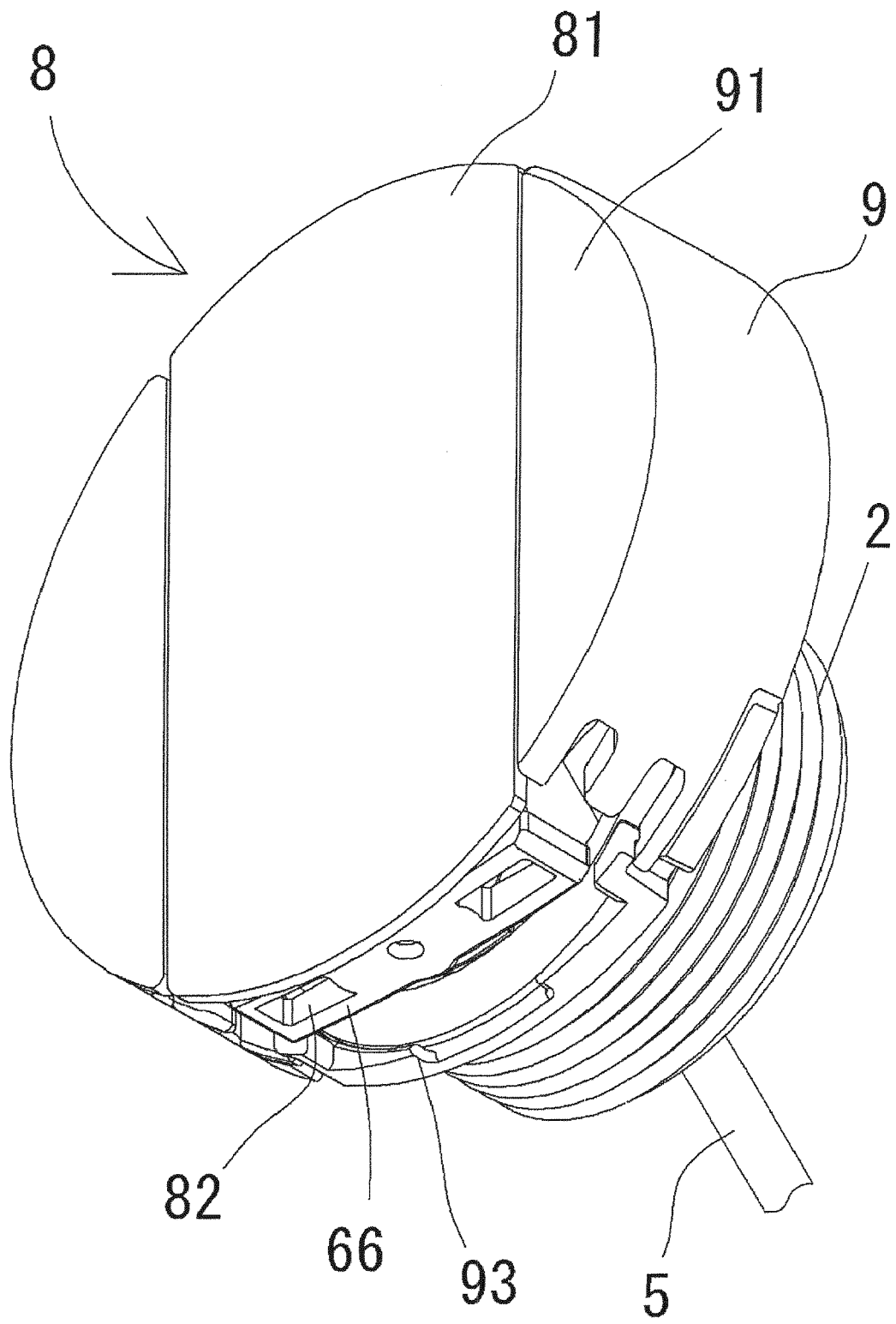
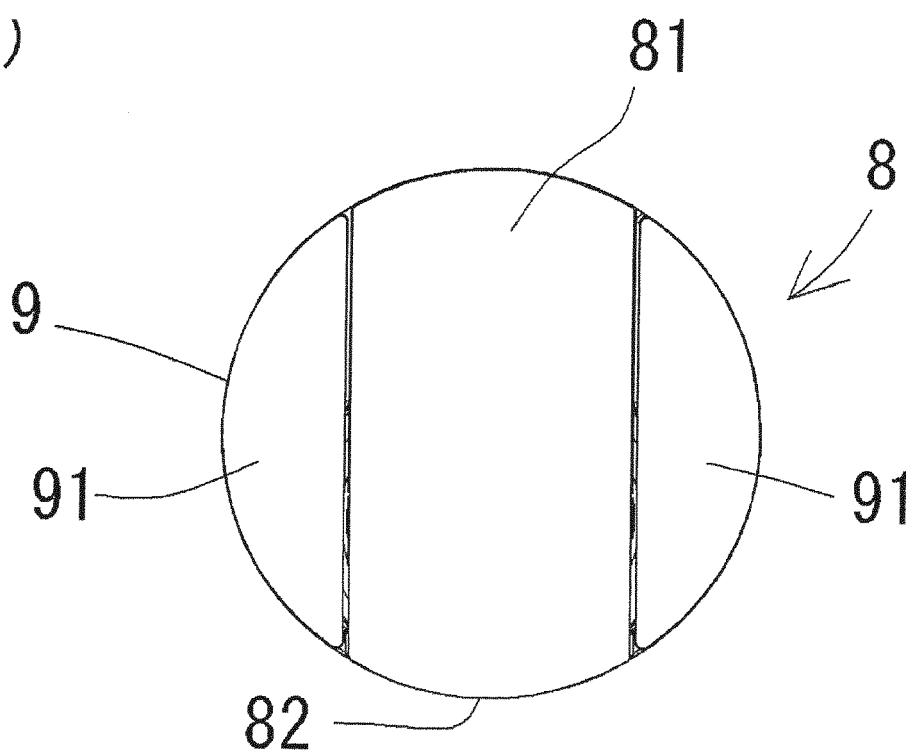


FIG. 7

(a)



(b)

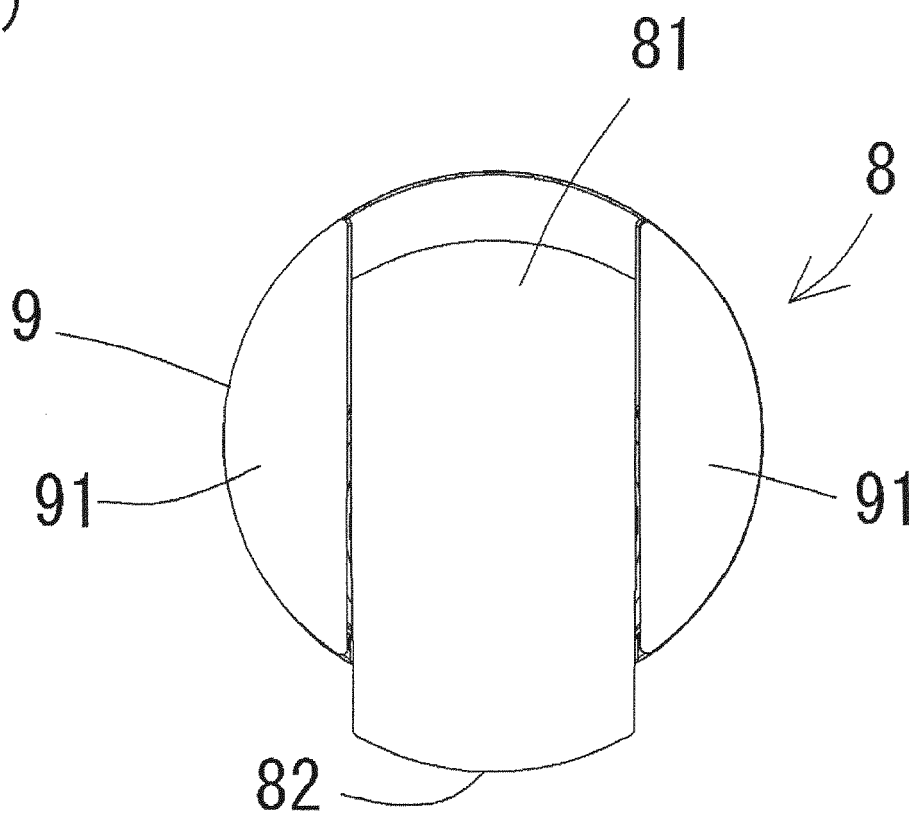


FIG. 8

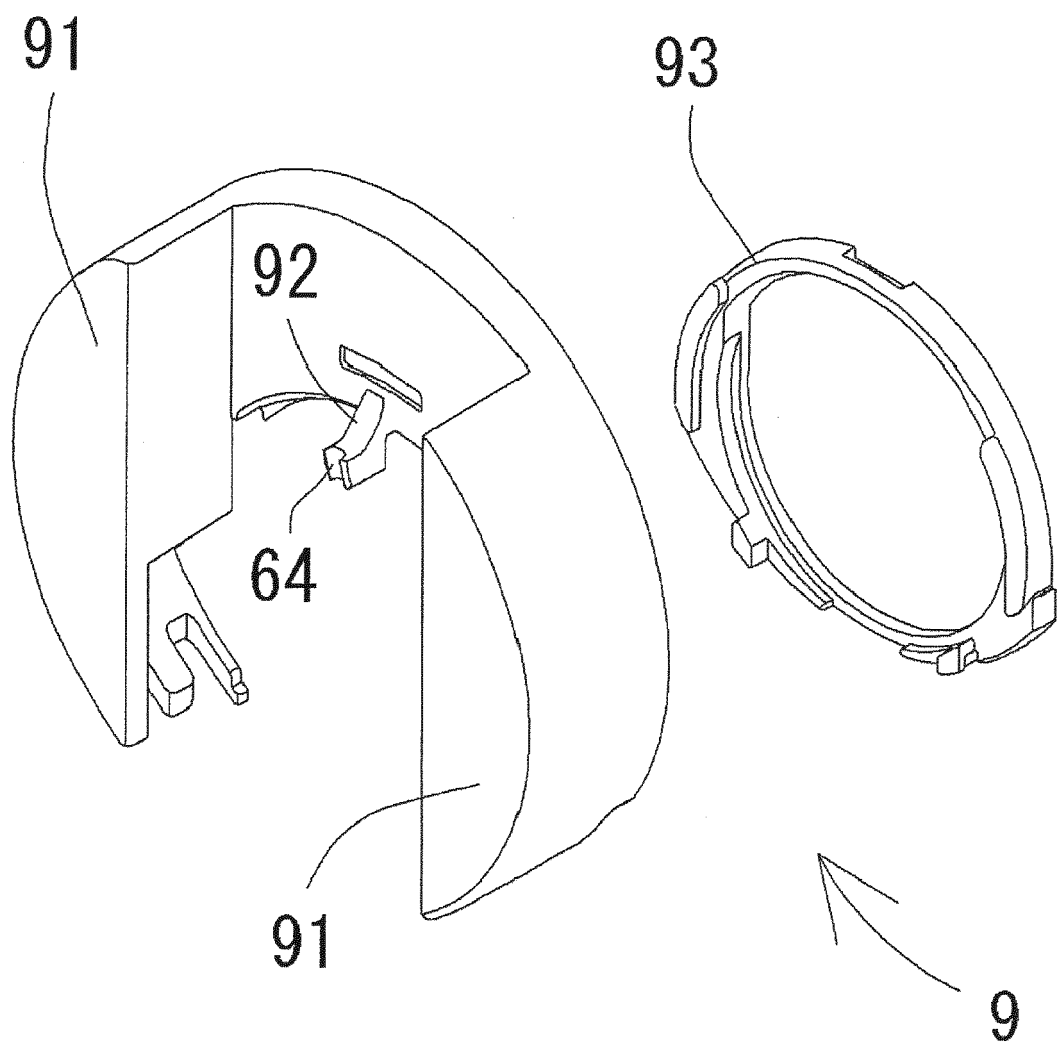




FIG. 9

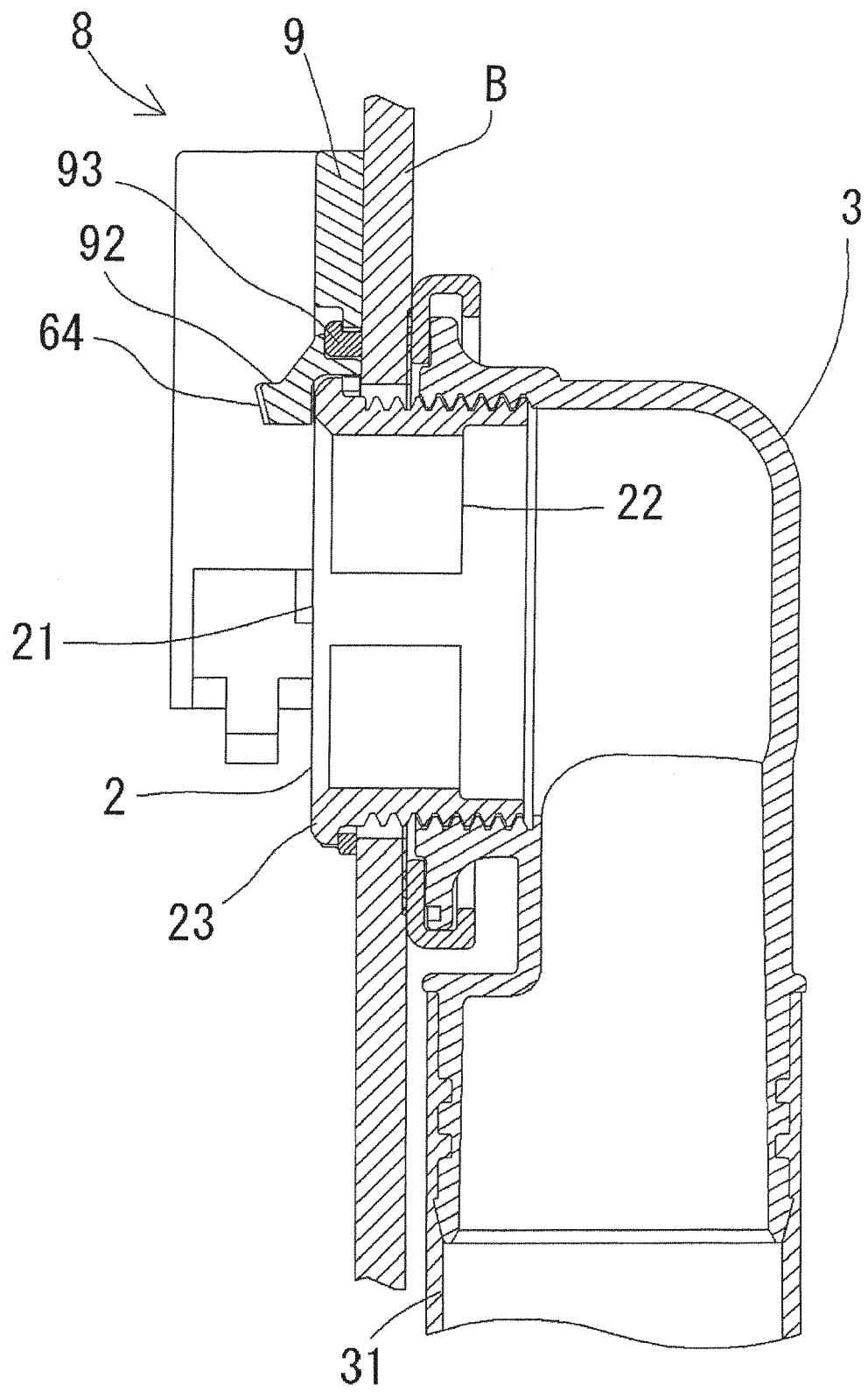
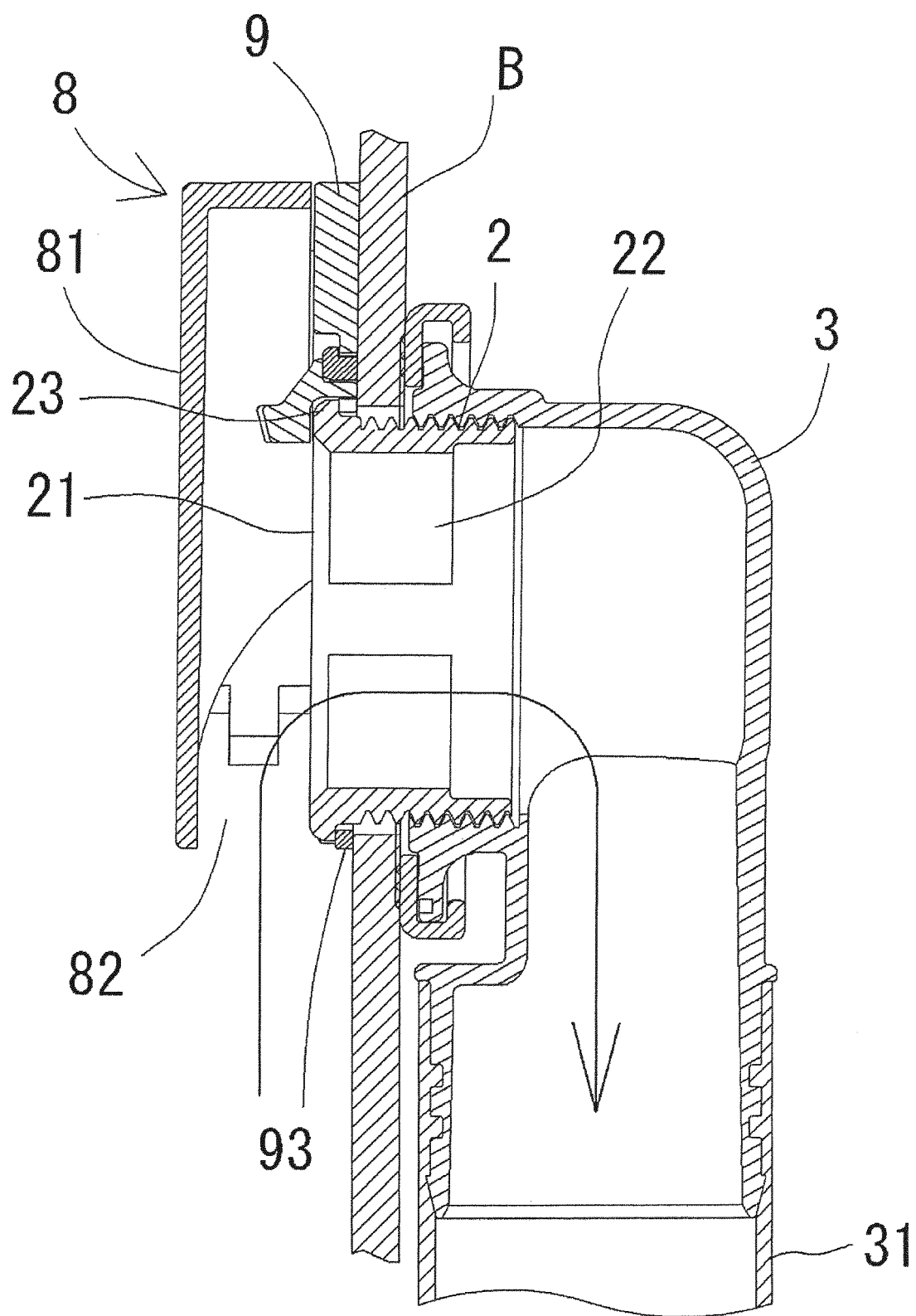


FIG. 10





## EUROPEAN SEARCH REPORT

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Place of search	Date of completion of the search		
Munich	7 May 2019	Fajárnés Jessen, A	
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07-05-2019

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US 4085469	A	25-04-1978	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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