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(54) **Flush device for a flush tank, in particular a multifunction tank, permitting adjustment of the amount of water discharged**

(57) A flush device (1) for a flush tank, in particular a multifunction tank, permitting adjustment of the amount of water discharged, and of the type in which a discharge valve (6) is carried by an actuating member (7) movable to selectively assume a closed position, in which the valve engages a respective sealing seat (5), and an open position, in which the valve is raised a predetermined distance from the sealing seat (5); the return speed of the valve (6) from the open position to the closed position is determined by additional weights (23) connectable mechanically to the actuating member (7); and adjusting means (22) are provided for adjusting the position of the additional weights (23) with respect to the valve (6) in the closed position, so as to set the additional weights (23) to a predetermined operating position selectively chosen from a number of predetermined operating positions permitted by the adjusting means (22).

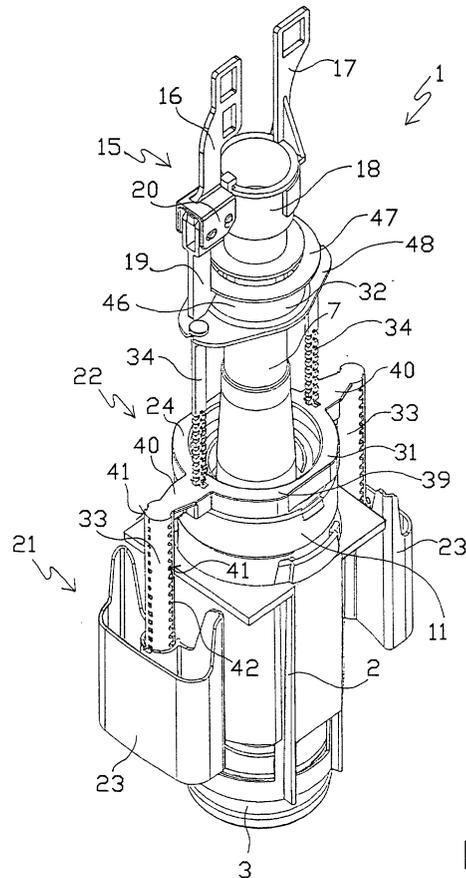


Fig. 1

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## Description

**[0001]** The present invention relates to a flush device for a flush tank, in particular a multifunction tank, which, both at and after installation, permits easy, effective adjustment of the amount of water discharged.

**[0002]** Numerous flush devices for flush tanks, in particular so-called "multifunction" tanks, are known which provide for selectively draining all or only part of the water from the tank. In general, the discharge valve of multifunction flush devices is lifted out of its seat by an appropriate control mechanism, returns to the closed position by force of gravity, in opposition to a float, and is only acted on by an additional weight to speed up closure of the valve when partial flush mode is selected. In devices of this sort, the amount of water discharged in partial flush mode depends on the position of the additional weight with respect to the closed position of the valve, so that the additional weight should obviously be settable to a desired height depending on the depth of the tank and the desired amount of water to be discharged. In known devices, however, the height of the additional weight with respect to the closed valve is not adjustable.

**[0003]** It is therefore an object of the present invention to provide a flush device for a flush tank, in particular a multifunction tank, designed to eliminate the aforementioned problems by, in particular, enabling fast, easy adjustment, both at and after installation, of the amount of water discharged.

**[0004]** According to the present invention, there is provided a flush device for a flush tank, in particular a multifunction tank, permitting adjustment of the amount of water discharged, and comprising a discharge valve carried by an actuating member which is movable to selectively assume a closed position, in which the valve engages a respective sealing seat, and an open position, in which the valve is raised a predetermined distance from the sealing seat; control means for controlling said actuating member; and speed control means connectable mechanically to said actuating member and for controlling the return speed of said valve from the open position to the closed position; the device being characterized by also comprising adjusting means for adjusting the position of said speed control means with respect to said valve in the closed position, so as to set said speed control means to a predetermined operating position selectively chosen from a number of predetermined operating positions permitted by said adjusting means.

**[0005]** The flush device according to the invention provides for accurately adjusting the position of the control means governing the return speed of the valve to the closed position and, therefore, the amount of water discharged. Adjustment can be made quickly and easily, with no tools required, both at and after installation, when servicing or modifying the tank, so that one flush device according to the invention can be used on tanks

of different sizes and/or for discharging different amounts of water.

**[0006]** A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a view in perspective of a flush device for a flush tank, in accordance with the invention;

Figure 2 shows a longitudinal section of the Figure 1 device;

Figures 3, 4, 5 show respective larger-scale details of the Figure 1 device.

**[0007]** Number 1 in Figures 1 and 2 indicates as a whole a flush device for a known flush tank (not shown). In the non-limiting example shown, device 1 is a multifunction type for selectively discharging all or only part of the water from the tank.

**[0008]** Device 1 comprises a supporting structure 2 having an end portion 3 insertable in known and fluidtight manner inside a drain hole on the tank. Portion 3 has a drain opening 4 defined by a peripheral edge in turn defining a sealing seat 5 for a discharge valve 6; and further openings are provided in supporting structure 2 to allow water to flow from the tank to drain opening 4. Valve 6 is carried integrally by a movable actuating member 7 housed in sliding manner in supporting structure 2 and for selectively moving valve 6 from a closed position (Figure 2), in which valve 6 engages sealing seat 5, and an open position (not shown), in which valve 6 is raised a predetermined distance from sealing seat 5. In the example shown, actuating member 7 is defined by a tubular member, possibly defined by a number of connected parts, which also functions as an overflow pipe; and the valve is fixed to an axial end 8 of the tubular member.

**[0009]** Supporting structure 2 comprises a cylindrical vessel 9 closed at the bottom by a bottom wall 10 and at the top by a lid 11. Actuating member 7 is fitted through respective openings in bottom wall 10 and lid 11, and slides axially inside vessel 9 in a direction coincident with a longitudinal axis 12 of symmetry of actuating member 7. Vessel 9 also houses a known substantially toroidal float 13 carried integrally by actuating member 7.

**[0010]** Device 1 also comprises substantially known control means 15 for controlling actuating member 7, and comprising a first tie 16 for activating total flush mode, and a second tie 17 for activating partial flush mode. Both ties 16, 17 are connected to an axial end 18, opposite axial end 8, of actuating member 7; and tie 16 also controls in known manner a hook 19 hinged to a support 20 fixed to axial end 18, so that the upward movement of tie 16 not only raises actuating member 7 but also simultaneously rotates hook 19.

**[0011]** Device 1 also comprises control means 21 for controlling the return speed of valve 6 from the open to

the closed position; and adjusting means 22 for adjusting the position of control means 21 with respect to valve 6 in the closed position, so as to set control means 21 to a predetermined operating position selectively chosen from a number of predetermined operating positions permitted by adjusting means 22.

**[0012]** More specifically, control means 21 comprise two additional weights 23; and a connecting structure 24 for connecting additional weights 23 to actuating member 7, and by which additional weights 23 act on valve 6.

**[0013]** Connecting structure 24 in turn comprises a first and a second connecting member 31, 32. Adjusting means 22 comprise a first pair of adjusting members 33 located between first connecting member 31 and additional weights 23 to adjust the position of additional weights 23 with respect to first connecting member 31; and a second pair of adjusting members 34 located between first and second connecting members 31, 32 to adjust the position of connecting members 31, 32 with respect to each other. More specifically, adjusting members 33 are carried integrally by first connecting member 31, and are inserted in sliding manner inside respective seats 35 formed in additional weights 23; and adjusting members 34 are carried integrally by second connecting member 32, and are inserted in sliding manner inside respective seats 36 formed in first connecting member 31. Adjusting members 33, 34 and respective seats 35, 36 have respective connecting parts, described below, which may be positively connected by circumferentially rotating adjusting members 33, 34 with respect to respective seats 35, 36, so as to secure adjusting members 33, 34 axially to respective seats 35, 36.

**[0014]** In the non-limiting example shown in Figures 1 and 2, additional weights 23 are defined by respective one-piece bodies made of polymer material and cup-shaped with respective floodable inner cavities closed at the bottom by respective bottom walls, possibly with outflow holes (not shown). Additional weights 23 are located symmetrically and diametrically opposite with respect to axis 12, and, as stated, comprise seats 35, which are substantially cylindrical with respective axes parallel to axis 12, and are formed, for example, in respective lateral walls of additional weights 23 facing actuating member 7 in use. As shown in detail in Figure 3, at a top end edge 37 defining a corresponding access opening, each seat 35 has two diametrically opposite pins 38 (only one shown schematically in Figure 3) projecting radially towards each other from an inner lateral surface of seat 35.

**[0015]** First connecting member 31 is defined by a ring 39 of polymer material fitted coaxially and with ample radial clearance about actuating member 7 and resting on top of lid 11 of vessel 9. Ring 39 has two diametrically opposite, radially outer arms 40, from which respective substantially cylindrical rods project downwards, have respective free ends inserted in sliding manner inside seats 35 in additional weights 23, and de-

fine said adjusting members 33. On an outer lateral surface, each adjusting member or rod 33 has two diametrically opposite axial grooves 41, from which respective numbers of dead circumferential grooves 42 extend transversely, are arranged axially in succession a predetermined distance apart, and have respective narrow inlets 43. Axial grooves 41 and dead circumferential grooves 42 are deep enough to permit insertion and slide of pins 38: axial grooves 41 define respective tracks permitting axial slide of pins 38; and dead circumferential grooves 42 and respective narrow inlets 43 define respective seats into which pins 38 click.

**[0016]** Second connecting member 32 is defined by a collar 46 made of polymer material, fitted coaxially with radial clearance about actuating member 7, and having two flanges 47, 48 at respective opposite axial ends. The top flange 47 has a peripheral edge engageable by hook 19; and the bottom flange 48 has two diametrically opposite fastening seats 49 (Figure 4 detail) defined by respective axially through slots open towards a radially outer edge of flange 48 and having respective narrow inlets 50.

**[0017]** With reference also to Figures 4 and 5, adjusting members 34 are defined by respective flexible rods made of polymer material; and corresponding seats 36 are defined by respective rectangular, axially through slots formed in ring 39 in diametrically opposite positions at the attachment of arms 40. At respective opposite longitudinal ends 51, 52, each adjusting member or rod 34 has a fastening head 53 by which to click inside a fastening seat 49; and a succession of transverse teeth 54, separated by respective gaps 55, by which to engage a peripheral edge 56 of a slot 36. More specifically, teeth 54 of each rod 34 are arranged in two series extending on opposite faces of rod 34; ends 52 of rods 34 can be inserted and slid axially inside respective slots 36 when teeth 54 are positioned parallel to the long sides of slots 36; and teeth 54 are caused to engage peripheral edges 56 of respective slots 36 by rotating rods 34 circumferentially about their respective axes.

**[0018]** In use, the position of first connecting member 31 with respect to second connecting member 32 can therefore be adjusted quickly and easily from a number of predetermined operating positions permitted by teeth 54: ends 52 of rods 34 are inserted inside slots 36 with teeth 54 aligned lengthwise with the slots; once the desired position is reached (possibly shown by a mark on each rod 34), rods 34 are rotated so that teeth 54 engage peripheral edges 56 of respective slots 36; at which point, rods 34, being flexible, are fixed to collar 46 by clicking heads 53 inside respective fastening seats 49.

**[0019]** Similarly, the position of additional weights 23 can be adjusted quickly and easily with respect to first connecting member 31: by means of respective seats 35, additional weights 23 are slid along rods 33 by sliding pins 38 along axial grooves 41; once the desired position is reached (possibly shown by a mark on each rod

33), additional weights 23 are rotated circumferentially to click pins 38 positively inside a chosen pair of dead circumferential seats 42 and so set and lock additional weights 23 into any one of a number of predetermined operating positions defined by dead circumferential seats 42.

**[0020]** Once the position of additional weights 23 is adjusted, flush device 1 operates in exactly the same way as similar dual-flush devices. Very briefly : to drain all the water from the flush tank, tie 16 is raised by appropriate known actuating means not shown; tie 16 raises actuating member 7, which moves valve 6 into the open position to discharge the water from the flush tank; at the same time, the upward movement of tie 16 rotates and detaches hook 19 from flange 47 of collar 46; connecting structure 24 and additional weights 23 are therefore not raised, and remain stationary, resting on supporting structure 2; and actuating member 7 and valve 6 are kept raised by the buoyancy of float 13 until all the water is discharged from the flush tank.

**[0021]** Conversely, when partial flush mode is activated, the actuating means raise tie 17. In addition to actuating member 7 and valve 6, tie 17 also raises support 20 and, therefore, the whole of connecting structure 24, by hook 19 engaging flange 47 of collar 46. When closing, therefore, valve 6 is also subjected to additional weights 23, which speed up closure of valve 6 to allow only a predetermined amount of water to be discharged from the flush tank.

**[0022]** Clearly, changes may be made to the flush device as described and illustrated herein without, however, departing from the scope of the present invention.

## Claims

1. A flush device (1) for a flush tank, in particular a multifunction tank, permitting adjustment of the amount of water discharged, and comprising a discharge valve (6) carried by an actuating member (7) which is movable to selectively assume a closed position, in which the valve engages a respective sealing seat (5), and an open position, in which the valve is raised a predetermined distance from the sealing seat (5); control means (15) for controlling said actuating member (7); and speed control means (21) connectable mechanically to said actuating member (7) and for controlling the return speed of said valve (6) from the open position to the closed position; the device being **characterized by** also comprising adjusting means (22) for adjusting the position of said speed control means (21) with respect to said valve (6) in the closed position, so as to set said speed control means (21) to a predetermined operating position selectively chosen from a number of predetermined operating positions permitted by said adjusting means (22).
2. A device as claimed in Claim 1, **characterized in that** said adjusting means (22) comprise at least one first adjusting member (33; 34) inserted in sliding manner inside a respective seat (35; 36); said at least one first adjusting member and the respective seat having respective connecting parts (38, 41, 42; 54, 55, 56) which are positively engageable by circumferentially rotating said at least one first adjusting member (33; 34) with respect to the respective seat (35; 36) to secure said at least one first adjusting member axially to the respective seat.
3. A device as claimed in Claim 2, **characterized in that** said speed control means (21) comprise at least one additional weight (23) acting on said valve (6) by means of said actuating member (7), and a connecting structure (24) connecting said at least one additional weight to said actuating member; said at least one first adjusting member (33; 34) being located between said connecting structure (24) and said at least one additional weight (23) to adjust the position of said at least one additional weight with respect to said connecting structure.
4. A device as claimed in Claim 3, **characterized in that** said at least one first adjusting member is defined by a rod (33) carried by said connecting structure (24) and inserted in sliding manner inside a respective seat (35) formed in a body of said at least one additional weight (23); said connecting parts comprising two diametrically opposite pins (38) projecting radially towards each other from an inner lateral surface of said seat (35), and two corresponding diametrically opposite, axial grooves (41) formed in an outer lateral surface of said rod (33), and from which extend respective numbers of dead circumferential grooves (42); said axial grooves defining respective tracks for axial slide of said pins; and said dead circumferential grooves defining respective recesses into which said pins click.
5. A device as claimed in Claim 3 or 4, **characterized in that** said connecting structure (24) comprises a first and a second connecting member (31, 32); said adjusting means (22) comprising at least one first (33) adjusting member located between said first connecting member (31) and said at least one additional weight (23) to adjust the position of said at least one additional weight (23) with respect to said first connecting member (31), and at least one second adjusting member (34) located between said first and said second connecting member (31, 32) to adjust the position of said first and said second connecting member (31, 32) with respect to each other.
6. A device as claimed in Claim 5, **characterized in that** said at least one second adjusting member

(34) is defined by a flexible rod having, at respective opposite longitudinal ends (51, 52), a fastening head (53) which clicks into a respective fastening seat (49) formed in said second connecting member (32), and a succession of transverse teeth (54) insertable inside a slot (36), formed in said first connecting member (31), to engage a peripheral edge (56) of said slot (36). 5

7. A device as claimed in Claim 5 or 6, **characterized in that** said speed control means (21) comprise two additional weights (23) located diametrically opposite with respect to a longitudinal axis (12) of symmetry of said actuating member (7); said adjusting means (22) comprising two first adjusting members (33) carried diametrically opposite by said first connecting member (31) to engage respective first seats (35) in said two additional weights (23), and two second adjusting members (34) carried diametrically opposite by said second connecting member (32) to engage respective second seats (36) formed in said first connecting member (31). 10 15 20

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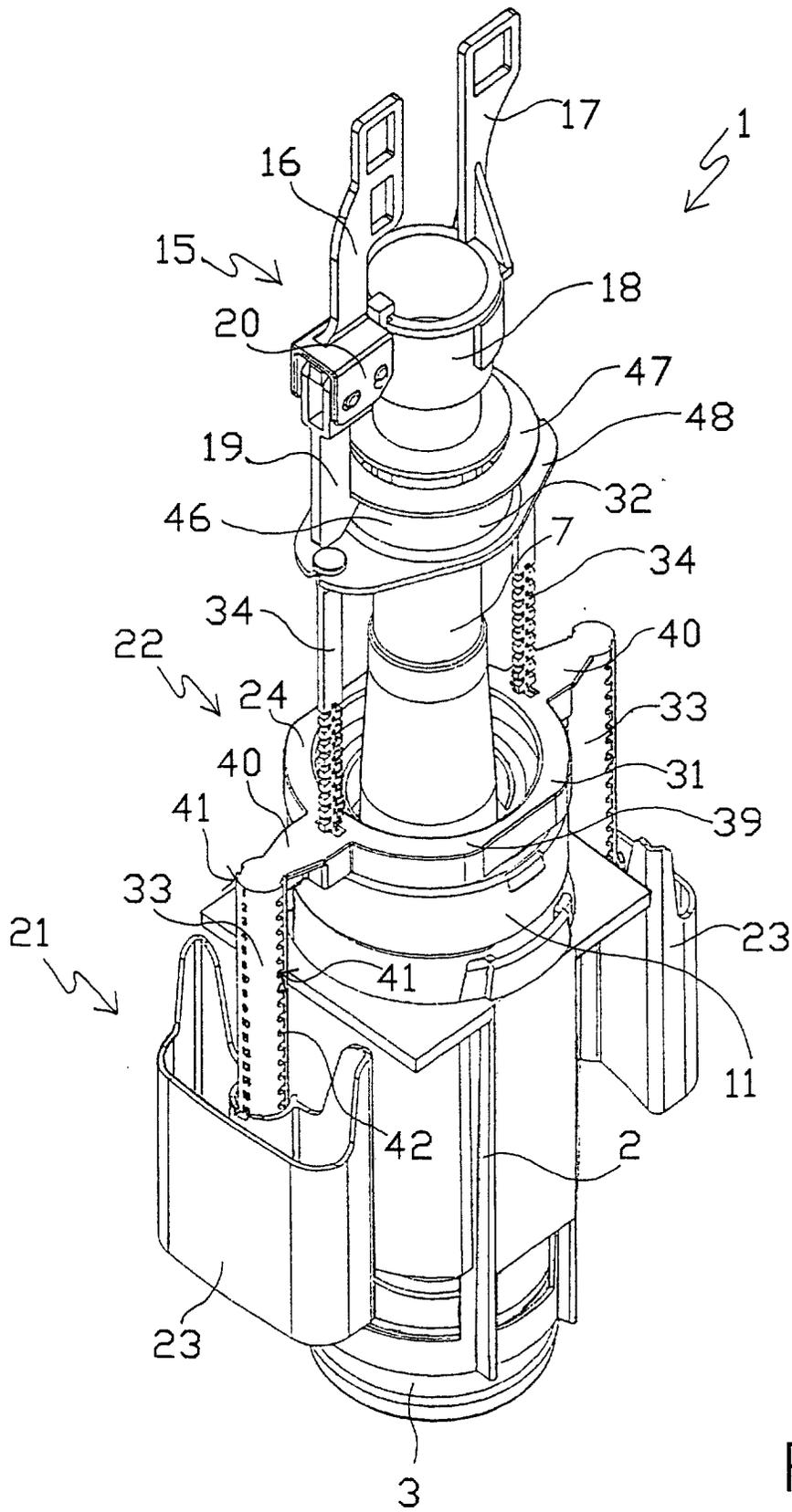
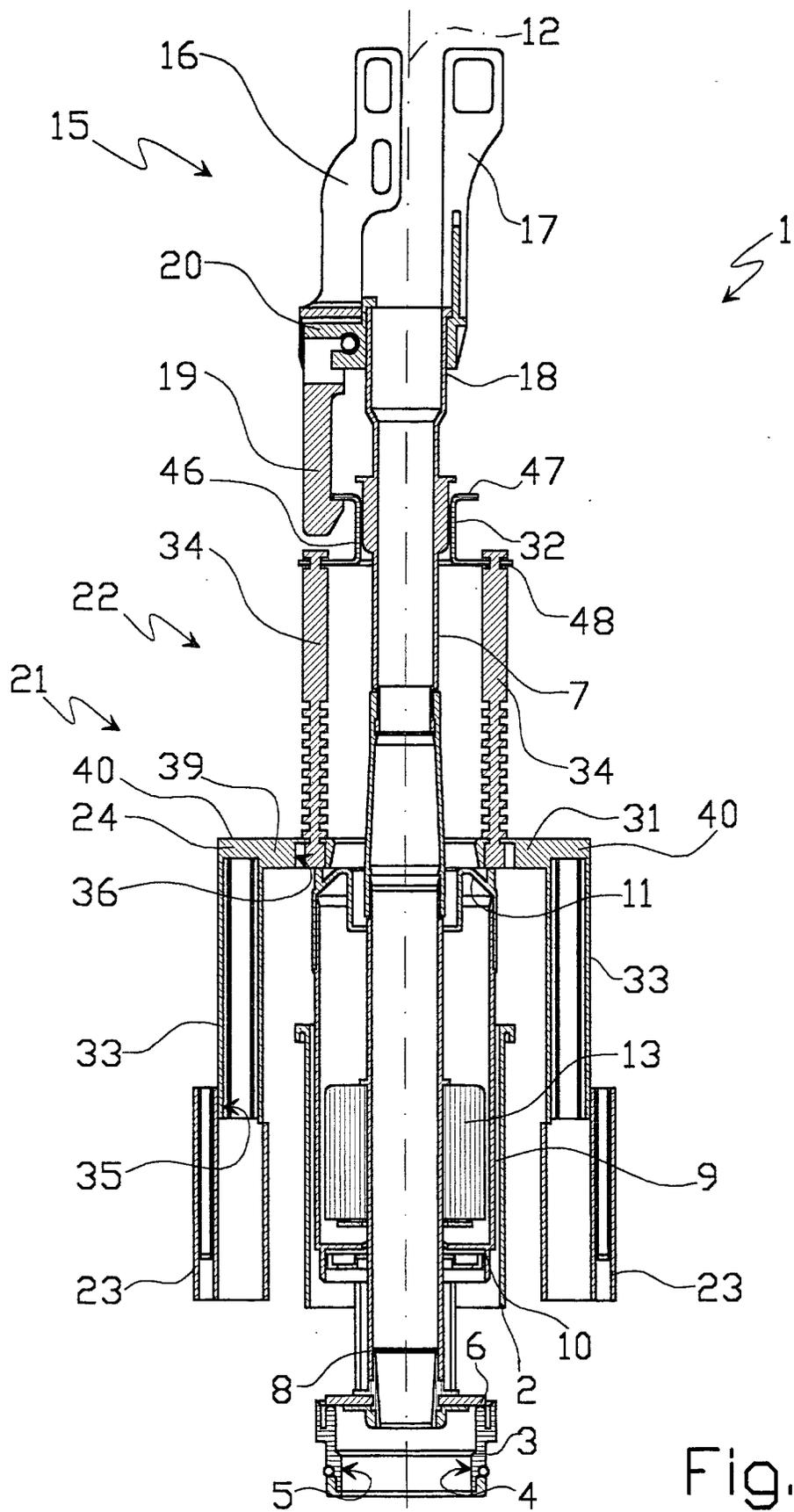


Fig. 1



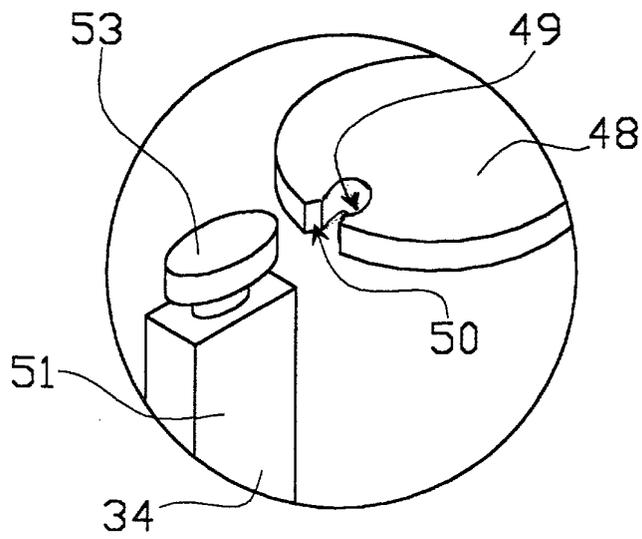


Fig. 4

Fig. 5

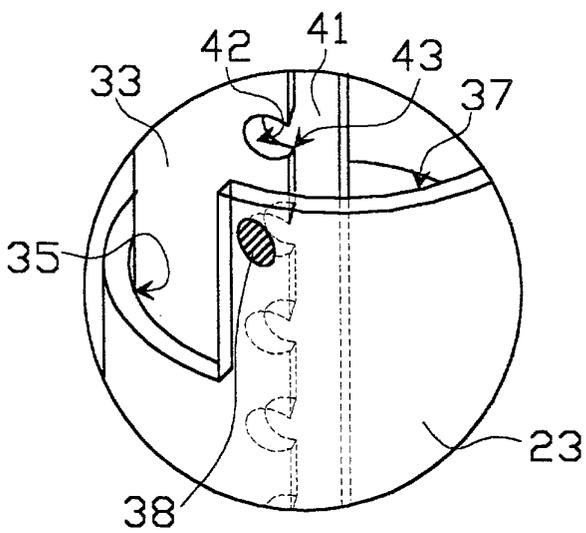
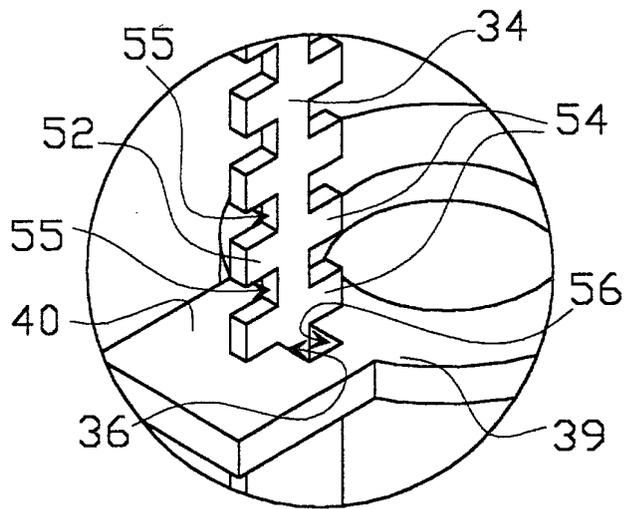


Fig. 3



| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |  |  |
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| Place of search   | Date of completion of the search  | Examiner   |  |
| MUNICH  | 28 January 2002   | Isailovski, M  |  |
| CATEGORY OF CITED DOCUMENTS   |   | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |  |
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EPO FORM 1503 03/02 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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