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(54) Flush device for a flush tank

(57) A flush device for a flush tank (1) has a supporting structure (8) fixable to the flush tank (1) and having a drain hole (12); a shutter (9) movable, in a given direction (D) with respect to the supporting structure (8), between a raised position and a lowered position opening and closing the drain hole (12) respectively; and a connecting member (19), firmly connected to the shutter (9) and suitable for connecting the shutter (9) either to a mechanical control assembly (3;3a) or a pneumatic control assembly (4;4a).

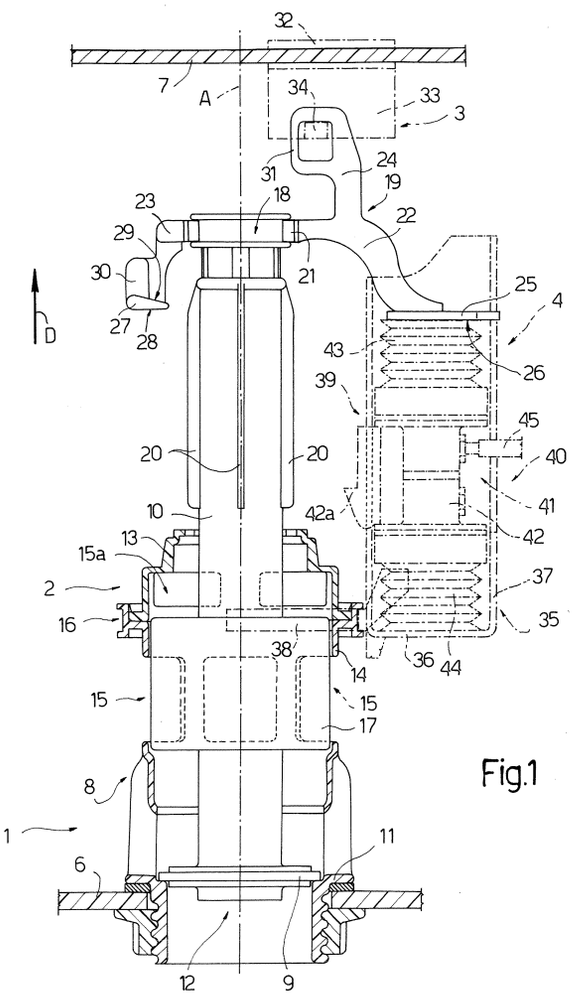

Fig.1

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Description

[0001] The present invention relates to a flush tank flush device.

[0002] A flush tank normally comprises a flush device for discharging the water on command by the user, and which comprises a supporting structure integral with the tank and having a drain hole; and a shutter located at the drain hole and movable between a closed position and an open position respectively closing and opening the hole. The shutter is moved vertically by a user-interfaced control assembly connected to the flush device. Of known flush tanks, a first type is equipped with a mechanical control assembly, i.e. a control assembly having a pushbutton and a number of levers for raising the shutter into the open position; and a second type is equipped with a pneumatic control assembly, i.e. a control assembly comprising a pneumatic pushbutton which blows air into a pneumatic actuator for raising the shutter into the open position.

[0003] The component parts of flush devices of flush tanks with a mechanical control assembly differ from those of flush tanks with a pneumatic control assembly, in particular, as regards connection of the flush device to the control assembly.

[0004] To meet market demand, flush tank manufacturers are forced to produce both types of tank, i.e. with mechanical and pneumatic control assemblies, and therefore to produce a large number of plastic component parts, which in turn call for respective molds. As a result, scale economy as regards component production is particularly difficult when dealing with flush tanks of different types.

[0005] It is an object of the present invention to provide a flush tank flush device designed to eliminate the drawbacks of the known state of the art.

[0006] According to the present invention, there is provided a flush device for a flush tank, comprising:

> a supporting structure fixable to the flush tank and having a drain hole; and
> a shutter movable, in a given direction with respect to the supporting structure, between a raised position and a lowered position opening and closing the drain hole respectively;
> the flush device being characterized by comprising a connecting member firmly connected to said shutter; said connecting member being suitable for connecting the shutter to either a mechanical control assembly or a pneumatic control assembly.

[0007] The connecting member is thus common to either flush tanks with a mechanical control assembly or flush tanks with a pneumatic control assembly.

[0008] Known tanks also comprise a conventional type of tank, which provides solely for full flush, and an "advanced" type of tank, which provides for both full and partial flush.

[0009] In this case, too, the component parts of the two tanks differ and at present prevent scale economy.

[0010] The above problem is solved by Claim 2, whereby said connecting member is suitable for connecting said shutter to an accelerating assembly for accelerating closure of the drain hole; said accelerating assembly being connectable to either a mechanical control assembly or a pneumatic control assembly.

[0011] 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 front view, with parts in section and parts removed for clarity, of a flush tank equipped with a flush device in accordance with the present invention;
> Figure 2 shows a front view, with parts in section and parts removed for clarity, of a flush tank equipped with the Figure 1 flush device and a partial-flush assembly;
> Figure 3 shows a view in perspective of a connecting member of the Figure 1 and 2 flush device;
> Figure 4 shows a view in perspective of a component part of a pneumatic control device;
> Figure 5 shows a view in perspective of the Figure 2 partial-flush assembly;
> Figure 6 shows a view in perspective of a component part of a mechanical control assembly in Figure 2.

[0012] Number 1 in Figure 1 indicates a flush tank equipped with a flush device 2 cooperating with a mechanical control assembly 3 or a pneumatic control assembly 4, both indicated by dot-and-dash lines. Both control assemblies 3 and 4 provide solely for full flush, though flush device 2, as shown in Figure 2, may cooperate with both a mechanical, full- and partial-flush control assembly 3a and a pneumatic, full- and partial-flush control assembly 4a, both indicated by dot-and-dash lines. Number 5 and the dash line in Figure 2 indicates an accelerating assembly for accelerating closure of the drain hole, and which is selectively activated by assembly 3a or 4a to partly drain tank 1.

[0013] With reference to Figure 1, tank 1 comprises a bottom wall 6 supporting device 2; and a lid 7 supporting assembly 3. Device 2 comprises a supporting structure 8; a shutter 9; and an overflow pipe 10, which is fitted on the bottom end with shutter 9, extends along a vertical axis A, and is movable in a direction D parallel to axis A.

[0014] Supporting structure 8 comprises a bottom portion 11 fixed to bottom wall 6 of tank 1 and having a drain hole 12; and a cover 13 fixed to the top end of portion 11. Portion 11 comprises a lateral wall 14 having windows 15 and a seat 16, which is engaged by pneumatic control assembly 4; and cover 13 comprises windows 15a. Shutter 9 is movable, integral with pipe 10 and in direction D, between a closed position, in which

shutter 9 rests on structure 8 to close hole 12, and an open position (not shown), in which shutter 9 is raised with respect to structure 8 to open hole 12.

[0015] Pipe 10 is connected to a float 17 housed inside structure 8, and comprises, at the top end, a seat 18 defined substantially by an annular groove and which is engaged by a connecting member 19. Pipe 10 also comprises a number of radial ribs 20 extending along part of the top portion of pipe 10, and which connect pipe 10 to accelerating assembly 5 for accelerating closure of shutter 9.

[0016] With reference to Figures 1 and 3, connecting member 19 comprises an elastic gripper 21 which clicks inside seat 18; two arms 22 and 23 projecting substantially radially in opposite directions from gripper 21; and an arm 24 projecting upwards and parallel to direction D from arm 22. Gripper 21 is in the form of an open ring, and is deformable elastically to click onto pipe 10. Arm 22 supports a plate 25 having a bottom face 26; arm 23 supports a hook 27 having a bottom face 28 substantially perpendicular to direction D, and a top face 29 having a rib 30 parallel to axis A; and arm 24 has an eye 31 at the top end.

[0017] With reference to Figure 1, mechanical control assembly 3 comprises a pushbutton 32 fitted to lid 7 of tank 1; a known mechanism 33 shown schematically in Figure 1; and a lever 34, which engages eye 31 and provides for raising pipe 10 and shutter 9 to permit flushing.

[0018] Pneumatic control assembly 4 may be fitted to tank 1 instead of mechanical control assembly 3, and comprises a pocket 35 having a bottom wall 36 and a cylindrical lateral wall 37; and an elastic gripper 38 integral with pocket 35 and which clicks inside seat 16. Cylindrical wall 37 is parallel to axis A, and has a window 39 facing pipe 10, and a window 40 on the opposite side, as shown more clearly in Figure 4. With reference to Figure 1, assembly 4 comprises a pneumatic actuator 41 housed inside pocket 35 and in turn comprising a central manifold 42, and two expandable bellows 43, 44 located above and below manifold 42 respectively. A pipe 45 connects manifold 42 to a pneumatic pushbutton (not shown) which, when pressed, expands bellows 43, which, on contacting face 26, pushes plate 25 upwards to raise pipe 10 and shutter 9. Manifold 42 comprises a lateral projection 42a, which projects through window 39 from wall 37, and the function of which is described later on.

[0019] With reference to Figures 2 and 5, assembly 5 comprises an annular body 46 extending about axis A and in direction D, and fitted to pipe 10 so as to slide about pipe 10; and a rocker arm 47 hinged to body 46 about an axis 48 perpendicular to axis A. Body 46 comprises grooves 49, which are engaged by ribs 20 to form a coupling preventing rotation of body 46 with respect to pipe 10; a bottom annular disk 50 by which assembly 5 rests on structure 8; and a top annular disk 51 which pushes hook 27 of connecting member 19.

[0020] Rocker arm 47 has a hook 52 at one end and, at the opposite end, a float 53, which, depending on the water level in tank 1 with respect to the position of float 53, connects assembly 5 to hook 27 of member 19 to connect assembly 5 integrally to pipe 10 and shutter 9. That is, when the water level is considerably below axis 48, hook 52 engages hook 27 to connect assembly integrally to pipe 10. In other words, assembly 5 acts as ballast which, when connected to pipe 10, accelerates closure of the drain hole to permit partial flushing.

[0021] Assembly 5 also comprises a radial projection 54 cooperating with pneumatic control assembly 4a; and a seat 55 for receiving an arm 56 having an eye 57, so as to enable assembly 5 to cooperate with mechanical control assembly 3a.

[0022] In addition to the component parts described with reference to assembly 3, mechanical control assembly 3a also comprises a partial-flush pushbutton 58; a mechanism 59; a lever 60 engaging eye 57; and arm 56 with eye 57, as shown in Figure 6. When pushbutton 58 is pressed, lever 60 is raised together with assembly 5, which raises connecting member 19, pipe 10, and shutter 9 to discharge the water. A fall in water level rotates rocker arm 47, so that hook 52 engages connecting member 19, and assembly 5 ballasts pipe 10 to accelerate closure of the drain hole.

[0023] Pneumatic control assembly 4a can be fitted to tank 1 instead of mechanical control assembly 3a, and, in addition to the component parts described with reference to assembly 4, also comprises a further pipe 61 connecting a partial-flush pushbutton (not shown) to bellows 44. Expansion of bellows 44 raises manifold 42 and projection 42a, which, on engaging projection 54, raises assembly 5, engages hook 52 on hook 27, and accelerates downward movement of shutter 9.

[0024] Flush device 2 is designed to cooperate with four different control assemblies 3, 4, 3a, 4a, and with an accelerating assembly 5 common to both control assemblies 3a and 4a, thus substantially reducing the total number of component parts of four types of flush tank.

Claims

1. A flush device for a flush tank (1), comprising:

a supporting structure (8) fixable to the flush tank (1) and having a drain hole (12); and

a shutter (9) movable, in a given direction (D) with respect to the supporting structure (8), between a raised position and a lowered position opening and closing the drain hole (12) respectively;

the flush device (2) being **characterized by** comprising a connecting member (19) firmly connected to said shutter (9); said connecting member (19) being suitable for connecting the shutter (9) to either a mechanical control assembly (3; 3a) or a pneumatic control assembly

(4; 4a).

2. A device as claimed in Claim 1, **characterized in that** said connecting member (19) being suitable for connecting said shutter (9) to an accelerating assembly (5) for accelerating closure of the drain hole (12); said accelerating assembly (5) being connectable to either a mechanical control assembly (3a) or a pneumatic control assembly (4a).

3. A device as claimed in Claim 1 or 2, **characterized in that** said supporting structure (8) comprises a seat (16) for housing a fastening member (38) of said pneumatic control assembly (4; 4a).

4. A device as claimed in any one of the foregoing Claims, **characterized by** comprising an elongated member (10) having a first end fitted with said shutter (9), and a second end fitted with said connecting member (19).

5. A device as claimed in Claim 4, **characterized in that** said elongated member defines an overflow pipe (10), and extends along an axis (A) parallel to said direction (D).

6. A device as claimed in Claim 5, **characterized in that** said overflow pipe (10) is designed to form a prismatic coupling with an accelerating assembly (5), and to enable the accelerating assembly (5) to slide along the overflow pipe (10) in said direction (D).

7. A device as claimed in Claim 6, **characterized in that** said overflow pipe (10) comprises ribs parallel to said axis (A) and which engage grooves on said accelerating assembly (5).

8. A device as claimed in any one of the foregoing Claims, **characterized in that** said connecting member (19) comprises a first member (31) connectable to the mechanical control assembly (3; 3a), and a second member (25) connectable to the pneumatic control assembly (4; 4a).

9. A device as claimed in Claim 8, **characterized in that** said first member is an eye (31) engageable by a lever (34) of the mechanical control assembly (3; 3a).

10. A device as claimed in Claim 8 or 9, **characterized in that** said second member is a plate (25) which cooperates with a pneumatic actuator (41) of the pneumatic control assembly (4; 4a).

11. A device as claimed in any one of the foregoing Claims, **characterized in that** said connecting member (19) comprises a third member (27) connectable to the accelerating assembly (5).

12. A device as claimed in Claim 11, **characterized in that** said third member comprises a hook (27).

13. A device as claimed in any one of the foregoing Claims, **characterized in that** said connecting member (19) comprises an elastic gripper (21) which clicks onto said elongated member (10).

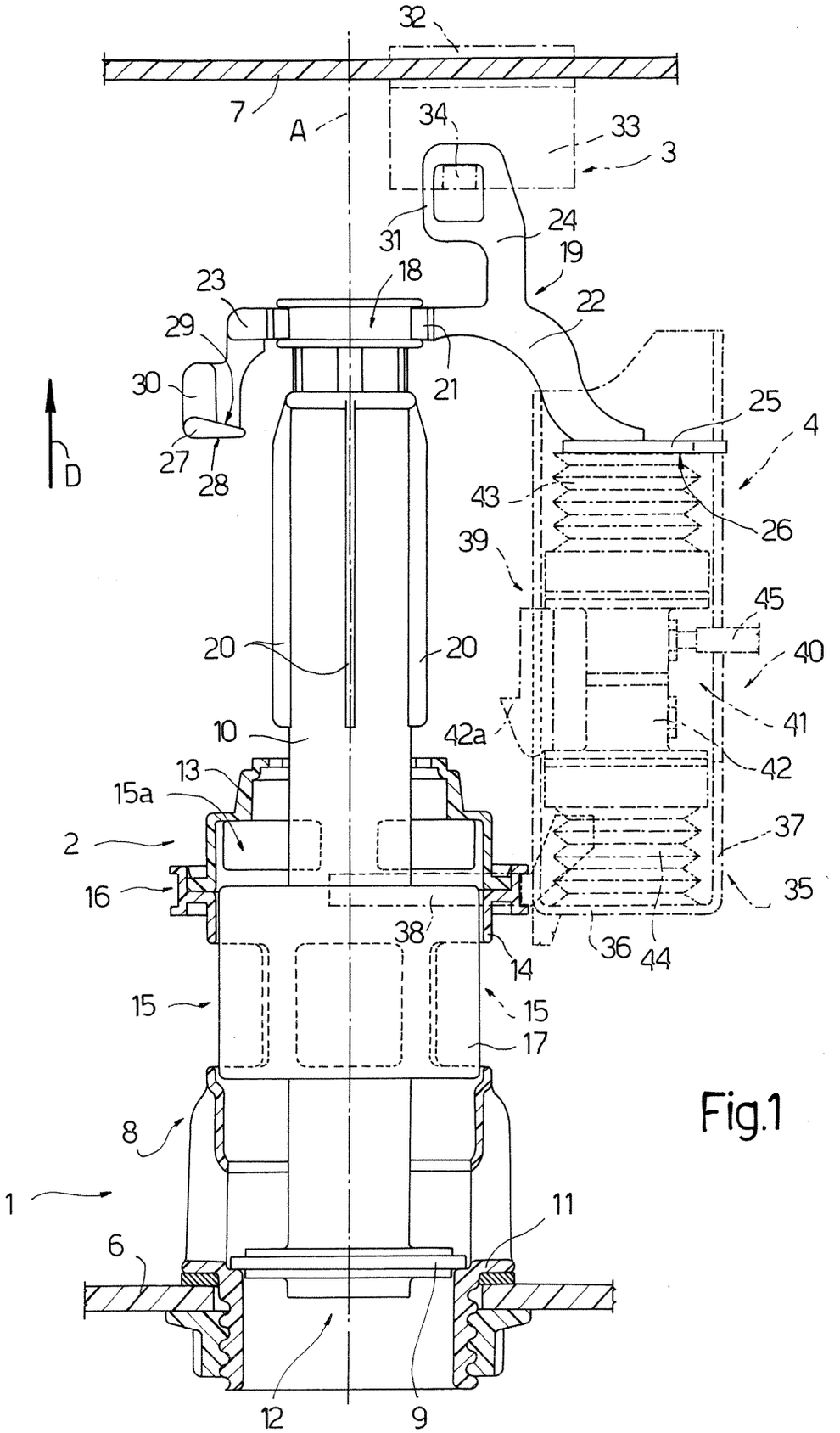
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Fig.1

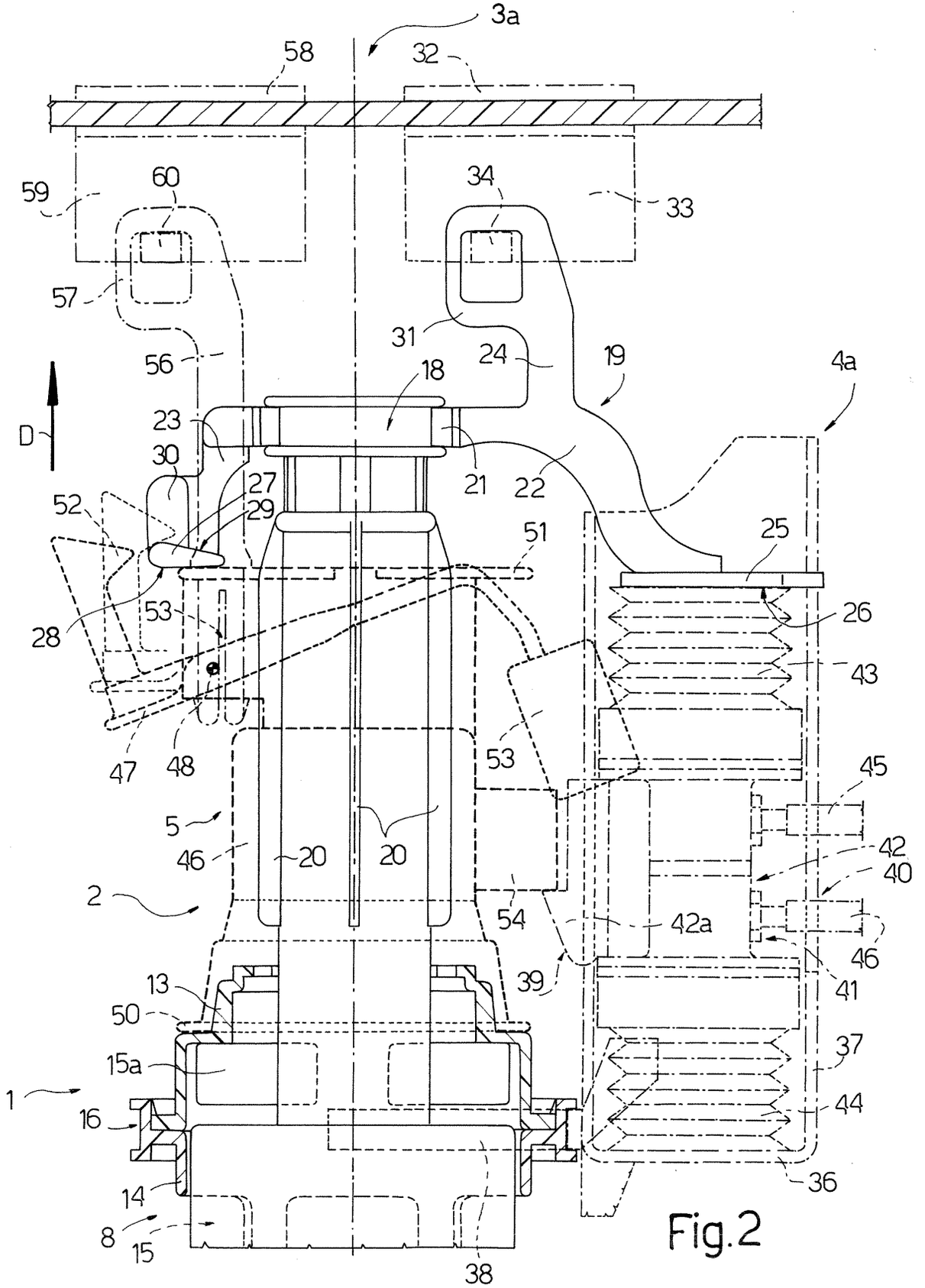
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Fig.2

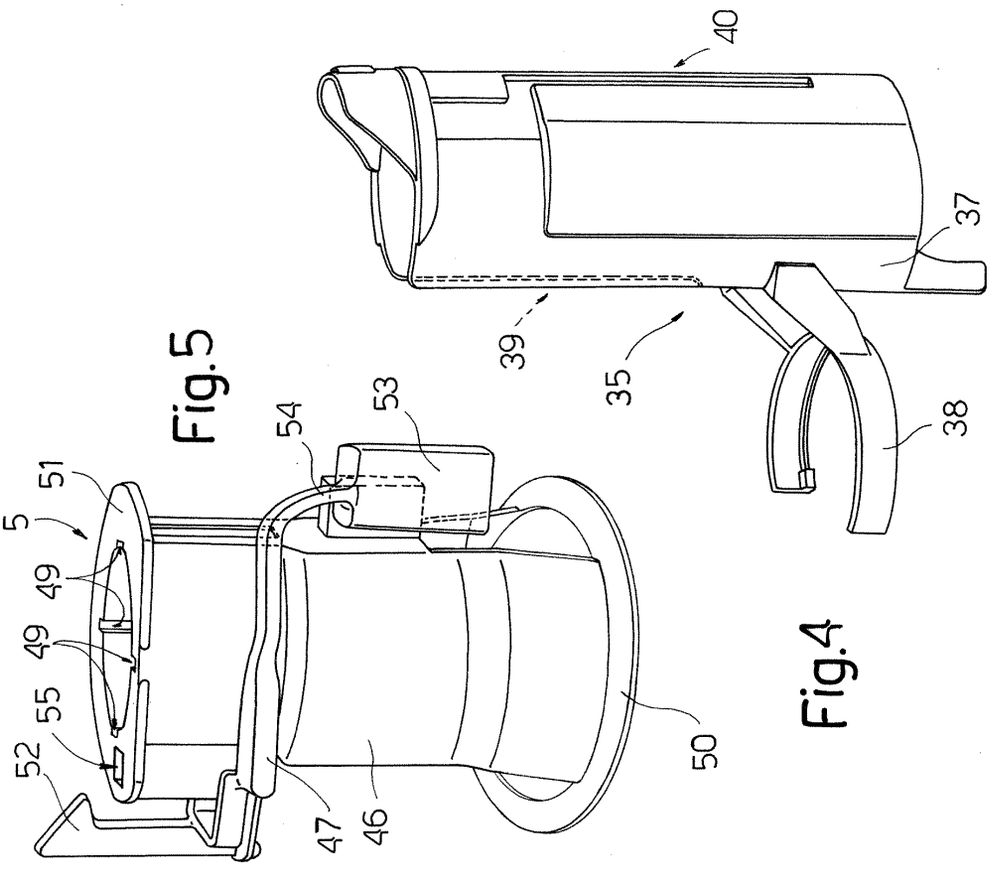

Fig.4

Fig.5

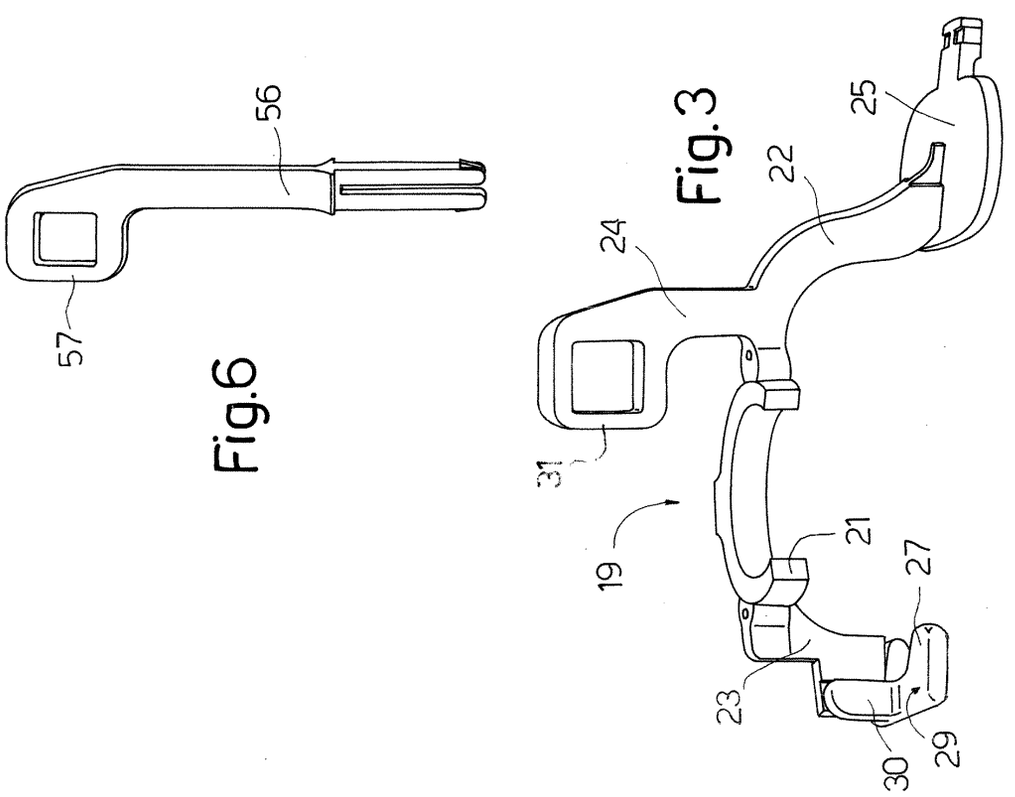

Fig.6

Fig.3

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 April 2005	Geisenhofer, M

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