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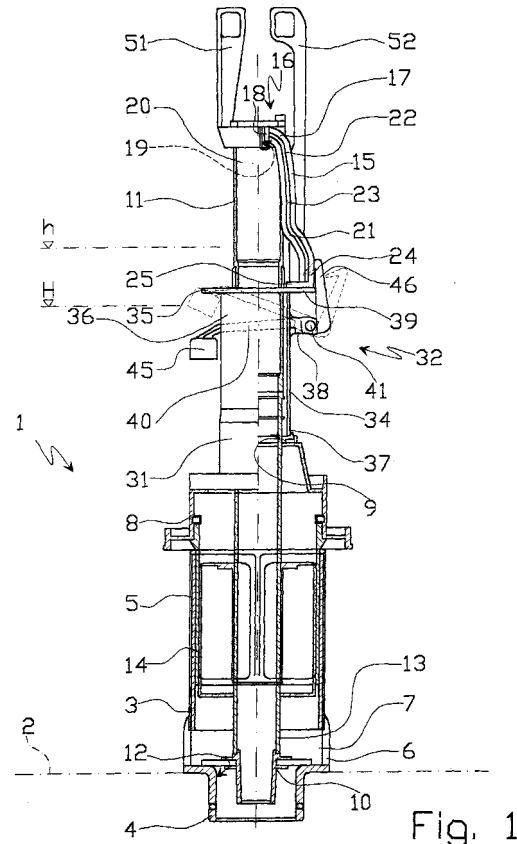
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(54) **Flush device for a lavatory flush tank**

(57) The device (1), which provides for both full and partial discharge, is of the type in which a movable member (11), fitted with a valve (10), has a float (14) for delaying return of the valve to the closed position, and an additional member (31) is selectively connectable to the movable member (11) to accelerate closure of the valve. According to the invention, the additional member (31) is connected to the movable member (11) by a rocking body (40) hinged to a support (38) carried by the additional member (31); and the rocking body (40) has, at respective ends, a buoyancy member (45) and a hook (46) which engages a respective seat (28) on the movable member (11), so that the additional member (31) is connected automatically to the movable member (11) alongside a variation in the level of the water in the tank.



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## Description

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

**[0002]** Various types of flush devices are known, and in particular : single-flush devices for simply discharging all the water from the tank; dual-flush devices for selectively discharging all or only part of the water from the tank; and single- or dual-flush devices designed to cut off discharge as required.

**[0003]** Known dual-flush devices normally feature a valve fitted to the bottom end of a movable member (which normally also functions as an overflow pipe) and associated with a float for delaying closure of the valve to discharge all the water. Conversely, to discharge only part of the water, an additional weight is connected reversibly to the valve to close the valve faster.

**[0004]** A major drawback of known devices of this type lies in the reversible connection of the additional weight to the valve involving relatively complex, delicate mechanisms, which are subject to frequent malfunctioning or damage. Moreover, such mechanisms are normally located at the free surface of the water in the tank, where, as is known, a film of lime tends to deposit on the mechanisms, thus damaging them or impairing performance. In the event the mechanism is damaged, the additional weight normally remains connected unreleasably to the valve, thus enabling only partial-discharge operating mode (whereas, in the event of breakage, full-discharge mode would be preferable).

**[0005]** Moreover, known single- and dual-flush devices are not interchangeable, in the sense that a single-flush device cannot be converted quickly and easily to a dual-flush device. At present, in fact, both types are produced separately on substantially different production lines.

**[0006]** It is therefore an object of the present invention to provide a flush device for a lavatory flush tank, designed to eliminate the aforementioned drawbacks of known devices, and which, in particular, is cheap and easy to produce, easy to operate, and highly reliable.

**[0007]** It is a further object of the invention to provide a modular system of flush devices for lavatory flush tanks, whereby flush devices with different operating modes can be obtained using only a small number of different components, thus affording considerable advantages in terms of production, storage and transport.

**[0008]** According to the present invention, there is provided a flush device for a lavatory flush tank, comprising a valve carried by a movable member to selectively assume a closed position and an open position inside a relative sealing seat; a float carried by the movable member to delay return of the valve to the closed position; an additional member connectable to the movable member to alter the speed at which the valve returns to the closed position; and reversible connecting means for selectively connecting/disconnecting said additional member and said movable member; the device

being characterized in that said reversible connecting means comprise auxiliary buoyancy means carried by the additional member and for moving corresponding retaining means to selectively connect/disconnect said additional member and said movable member alongside a variation in the level of the water in the tank.

**[0009]** The invention also relates to a modular system of flush devices for lavatory flush tanks, the system comprising a single-flush device, and a conversion kit for converting the single-flush device to a dual-flush device; and the system being characterized in that:

- the single-flush device comprises a first preassembled unit comprising a valve carried by a movable member to selectively assume a closed position and an open position inside a relative sealing seat, and a float carried by the movable member to delay return of the valve to the closed position;
- the conversion kit comprises a second preassembled unit and a connecting member; said second preassembled unit comprising an additional member having reversible connecting means for selectively connecting/disconnecting said additional member and said movable member; said reversible connecting means comprising auxiliary buoyancy means carried by the additional member and for moving corresponding retaining means to selectively connect/disconnect said additional member and said movable member alongside a variation in the level of the water in the tank; and said connecting member being defined by a one-piece body made of plastic material and having click-on fastening means for removable connection to said movable member, and a seat for cooperating with said retaining means.

**[0010]** A preferred, non-limiting embodiment of the invention will be described, purely by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a front view, partly sectioned along a central vertical plane, of a flush device for a lavatory flush tank in accordance with the invention;

Figure 2 shows a larger-scale, partial rear view of the Figure 1 device;

Figure 3 shows a larger-scale view in perspective of a detached component part of the Figure 1 device;

Figure 4 shows a view in perspective of a variation of the Figure 3 component;

Figure 5 shows, schematically, a modular system of flush devices for lavatory flush tanks in accordance with a further aspect of the invention.

**[0011]** With reference to Figures 1 to 3, number 1 indicates as a whole a flush device for a known flush tank 2 (not shown in detail for the sake of simplicity), and of the type for selectively discharging all or only part of the

water in tank 2.

**[0012]** Device 1 comprises a supporting structure 3 having an externally threaded, tubular bottom portion 4 insertable in fluidtight manner, according to a known solution, inside a drain hole in tank 2. Supporting structure 3 also comprises a cylindrical top portion 5 connected to the bottom portion by four radial segments 6 defining four ample openings 7 through which water flows out of tank 2 into bottom portion 4. Top portion 5 is closed at the top by a lid 8 having a central through hole 9.

**[0013]** Device 1 also comprises a valve 10 carried by a movable member 11 to selectively assume a closed position and an open position inside a relative sealing seat 12 defined, in the example shown, inside bottom portion 4 of supporting structure 3. Movable member 11 is housed and slides inside supporting structure 3, is fitted through hole 9, may comprise a number of connected parts, and also functions as an overflow pipe. Valve 10 is located at the bottom axial end 13 of movable member 11; and movable member 11 is fitted integrally with a toroidal float 14 housed in top portion 5 of supporting structure 3.

**[0014]** Device 1 also comprises a connecting member 15 - shown in detail in Figure 3 - fitted integrally to movable member 11 and preferably defined by a one-piece body made of plastic material and having fast-fit fastening means 16 (of any known type) for removable connection to movable member 11. In the example shown, connecting member 15 comprises a head 17 having a tooth 18 which is insertable inside a seat 19 formed at the top axial end 20, opposite end 13, of movable member 11; an anchor 21 projects from head 17 and comprises a root portion 22 connected radially to and projecting from head 17, and a contoured arm 23 substantially parallel to movable member 11 and terminating with a free end 24; and free end 24 has a radial projection 25 crosswise to arm 23 and having a bottom face 26 facing supporting structure 3, and a top face 27 facing head 17 and in which is formed a seat 28.

**[0015]** Device 1 also comprises an additional member 31 connectable to movable member 11; and reversible connecting means 32 for selectively connecting and disconnecting additional member 31 and movable member 11 as explained later on.

**[0016]** In the example shown, additional member 31 comprises a tubular body 34 fitted coaxially and sliding freely about movable member 11; and a radial collar 35 carried by the top axial end 36 of tubular body 34. The bottom axial end 37 of tubular body 34 rests on lid 8 of supporting structure 3; a support 38 projects radially from an outer lateral wall of tubular body 34, just below collar 35; collar 35 extends radially so as to interfere axially with projection 25 of connecting member 15; and projection 25 is located just over collar 35, at a contact portion 39 of collar 35 designed to exert axial thrust on face 26 of projection 25.

**[0017]** Reversible connecting means 32 comprise a rocking body 40 hinged to support 38, e.g. by a pin de-

fining a hinge 41. Rocking body 40 comprises a central portion 42 hinged to support 38; and two arms 43, 44 diverging from central portion 42, and the respective free ends of which support a buoyancy member 45 and, respectively, a hook 46 for engaging seat 28 on connecting member 15. Hook 46 engages seat 28 in the opposite axial direction to that in which contact portion 39 of collar 35 exerts axial thrust on projection 25, and has a rounded or beveled head 47 also defining the free end of arm 44.

**[0018]** Arm 43 is a curved arm extending in a semicircle about movable member 11; arm 44 is substantially straight and perpendicular to arm 43; and buoyancy member 45 and hook 46 are located diametrically opposite each other about movable member 11.

**[0019]** Buoyancy member 45 is sized so that rocking body 40 selectively assumes a rest position - shown by the dash line in Figure 1 - in which hook 46 does not engage seat 28 when the water in tank 2 is above a predetermined level H, and a work position - shown by the continuous line in Figure 1 - in which hook 46 engages seat 28 when the water in tank 2 falls below level H.

**[0020]** Device 1 also comprises a tie 51 connected integrally to end 20 of movable member 11; and a tie 52 connected integrally to collar 35 of additional member 31. Ties 51, 52 are connectable, in known manner not shown, to respective user control members for implementing full or partial discharge. Tie 51 may be formed integrally in one piece with movable member 11, or, as shown in Figure 3, be formed as a separate component and connected removably to movable member 11, e.g. by means of an elastic collar 53 which clicks on to end 20 of movable member 11. Connecting member 15 in turn may be formed in one piece with tie 51 and collar 53, or be connected removably to collar 53 as described previously.

**[0021]** Device 1 operates as follows:

**[0022]** At rest, tank 2 is full of water up to a predetermined level  $h$  (determined, as known, by a float for closing a feed tap) equal to or higher than the level H at which rocking body 40 is rotated about hinge 41, so that rocking body 40 is in the rest position in which hook 46 does not engage seat 28, and valve 10 closes sealing seat 12.

**[0023]** When full discharge is activated, tie 51 is raised to pull up movable member 11 together with float 14, so that valve 10 opens and the water flows out of tank 2. Tie 52, additional member 31 and rocking body 40, on the other hand, remain stationary, additional member 31 resting on lid 8 of supporting structure 3. The hydrostatic thrust of the water on float 14 prevents movable member 11 from moving back down, thus delaying the return of valve 10 to the closed position until discharge is completed. When the water in tank 2 falls below level H, rocking body 40, no longer being buoyed up by buoyancy member 45, rotates about hinge 41 into the work position. In this condition, however, projection 25 of connecting member 15 is still located above hook

46, so that movable member 11 continues moving down without being connected to additional member 31. As movable member 11 continues downwards, projection 25, on contacting head 47 of hook 46, exerts thrust on head 47 to rotate rocking body 40, so that arm 44 moves down, arm 43 moves up, valve 10 returns to the closed position, and tank 2 is filled again.

**[0024]** Conversely, when partial discharge is activated, tie 52 is raised to pull up additional member 31 and rocking body 40; contact portion 39 of collar 35 exerts axial thrust on face 26 of projection 25, so as to also raise movable member 11 and valve 10, which moves into the open position; and, when the water in tank 2 falls below level H, rocking body 40 rotates about hinge 41 into the work position, so that hook 46 engages seat 28. In this condition, in fact, projection 25 of connecting member 15 is located below hook 46, so that movable member 11 is connected to and moved down faster by additional member 31 to close valve 10 sooner.

**[0025]** In the Figure 4 variation, in which any details similar to or identical with those already described are indicated using the same reference numbers, connecting member 15 is defined by a one-piece body of plastic material in the form of a gripper which clicks on to movable member 11. Connecting member 15 comprises two side by side arms 60 projecting obliquely from a cross-piece 61; respective free ends 62 of arms 60, opposite respective ends 63 connected to crosspiece 61, support respective arc-shaped portions 64 which click inside a groove 65 (Figure 2) formed on movable member 11 and defined axially by two opposite shoulders 66; crosspiece 61 comprises two radial projections 25 having respective top faces 27, and respective bottom faces 26 for cooperating, in use, with the contact portion of collar 35; and seat 28 for hook 46 is formed between arms 60.

**[0026]** The advantages, as compared with the known state of the art, of device 1 according to the invention will be clear from the foregoing description. In particular, as compared with known devices, device 1 is extremely cheap and easy to produce, is extremely easy to use, and is highly reliable. Moreover, the component parts reversibly connecting movable member 11 and additional member 31 - in particular, rocking body 40 and hook 46 - are located beneath the free surface of the water in the tank, thus safeguarding the components against lime deposits. Device 1 also ensures full-discharge mode even in the event of damage to rocking body 40, which, in fact, would remain in the rest position disconnecting movable member 11 and additional member 31.

**[0027]** Device 1 as described also provides for forming a modular system of flush devices for lavatory flush tanks, as shown schematically in Figure 5 (in which any details similar to or identical with those already described are indicated using the same reference numbers). The modular system according to the invention comprises a single-flush device 100; and a conversion kit 101 for converting single-flush device 100 to a dual-flush device 102. The single-flush device 100 is sub-

stantially defined by a first preassembled unit 103 comprising supporting structure 3, movable member 11 with tie 51 (here shown in the form of an appendix integral with movable member 11), valve 10 and float 14 as described previously. Kit 101 comprises a second preassembled unit 104 and connecting member 15. Second preassembled unit 104 in turn comprises additional member 31, rocking body 40, and tie 52 as described previously; and connecting member 15 may be any one of the embodiments already described, or other variations such as the one shown in Figure 5, in which fast-fit fastening means 16 are defined by an elastic collar which clicks on to movable member 11.

**[0028]** Single-flush device 100 can be fitted, as it is, to tanks 2 designed to operate in full-discharge mode (possibly also with a flow cut-off function), and can be converted to a dual-flush device 102 by simply fitting second preassembled unit 104 and connecting member 15 to first preassembled unit 103.

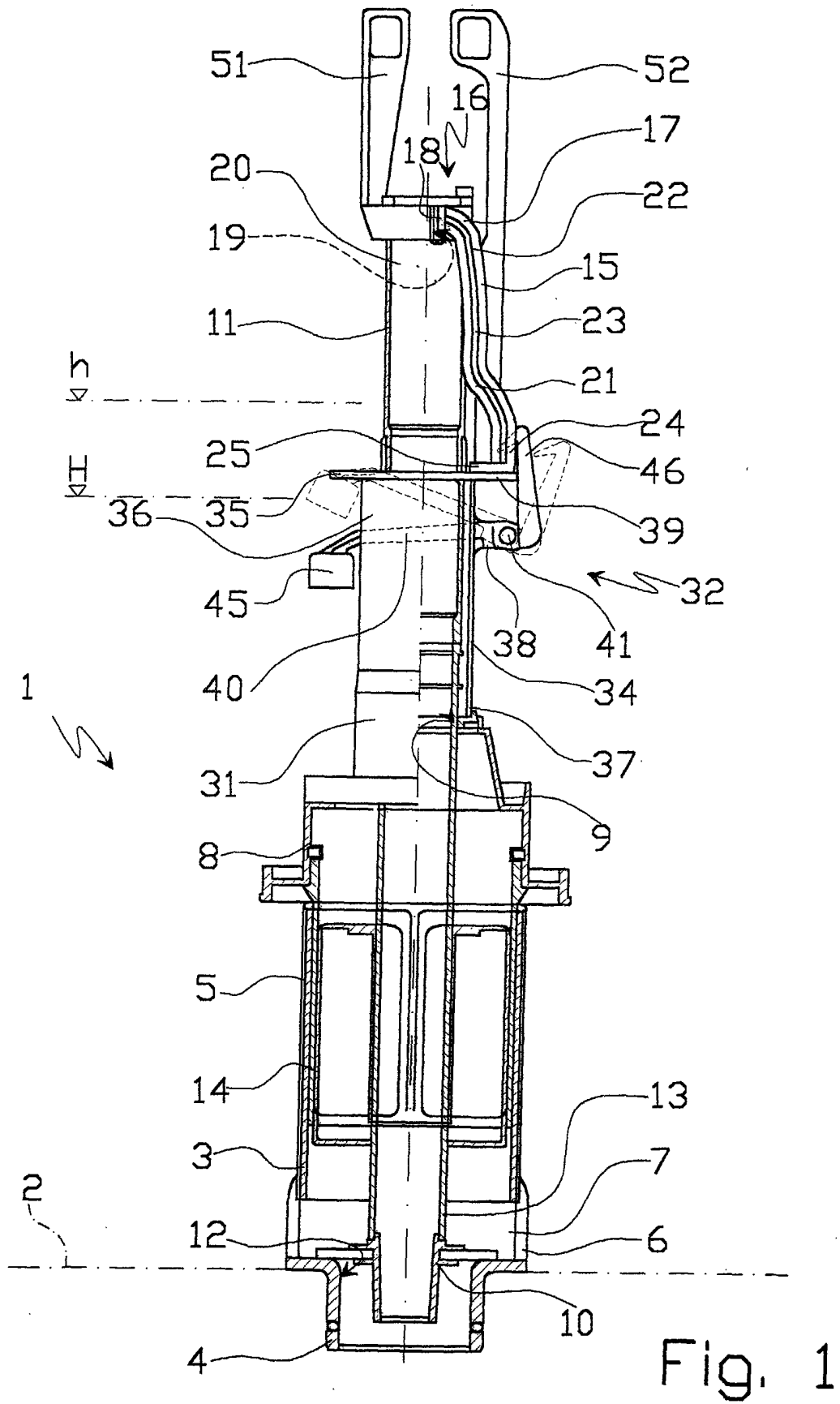
**[0029]** The modular system according to the invention therefore provides for obtaining both single- and dual-flush devices by producing and assembling only a very small number of different components, thus affording considerable advantages in terms of production, installation and storage/transport.

**[0030]** Clearly, changes may be made to the device described and illustrated herein without, however, departing from the scope of the present invention.

## Claims

1. A flush device (1) for a lavatory flush tank, comprising a valve (10) carried by a movable member (11) to selectively assume a closed position and an open position inside a relative sealing seat (12); a float (14) carried by the movable member to delay return of the valve to the closed position; an additional member (31) connectable to the movable member (11) to alter the speed at which the valve returns to the closed position; and reversible connecting means (32) for selectively connecting/disconnecting said additional member (31) and said movable member (11); the device being **characterized in that** said reversible connecting means (32) comprise auxiliary buoyancy means (45) carried by the additional member and for moving corresponding retaining means (46) to selectively connect/disconnect said additional member (31) and said movable member (11) alongside a variation in the level of the water in the tank.
2. A device as claimed in Claim 1, **characterized in that** said reversible connecting means (32) comprise a rocking body (40) hinged to a support (38) carried by said additional member (31); said rocking body (40) having, at respective ends, a buoyancy member (45), and a hook (46) which engages a re-

- spective seat (28) on said movable member (11).
3. A device as claimed in Claim 2, **characterized in that** said buoyancy member (45) is sized so that said rocking body (40) selectively assumes a rest position in which said hook (46) does not engage said seat (28), when the water in the tank is above a predetermined level, and a work position in which said hook (46) engages said seat (28), when the water in the tank falls below said level.
  4. A device as claimed in Claim 3, **characterized in that** said hook (46) engages said seat (28) axially, so that, when the hook (46) engages the seat (28), said additional member (31) pulls down said movable member (11).
  5. A device as claimed in Claim 4, **characterized in that** said rocking body (40) comprises a central portion (42) hinged to said support (38); and a first and a second arm (43, 44) diverging from said central portion (42) and supporting, at their respective free ends, said buoyancy member (45) and said hook (46) respectively.
  6. A device as claimed in Claim 5, **characterized in that** said first arm (43) is a curved arm extending in a semicircle about said movable member (11), and said second arm (44) is substantially perpendicular to said first arm; said buoyancy member (45) and said hook (46) being located diametrically opposite each other about said movable member (11).
  7. A device as claimed in one of Claims 4 to 6, **characterized in that** said additional member (31) comprises contact means (39) for exerting axial thrust on said movable member (11) in the opposite direction to that in which said hook (46) engages said seat (28).
  8. A device as claimed in Claim 7, **characterized in that** said contact means comprise a contact portion (39) carried by said additional member (31) and which axially contacts a projection (25) projecting radially from said movable member (11).
  9. A device as claimed in Claim 8, **characterized in that** said projection (25) cooperating with said additional member (31), and said seat (28) for receiving said hook (46) are carried by a connecting member (15) connected integrally to said movable member (11).
  10. A device as claimed in Claim 9, **characterized in that** said connecting member (15) is defined by a one-piece body made of plastic material and having fast-fit fastening means (16) for removable connection to said movable member (11).
  11. A modular system of flush devices for lavatory flush tanks, the system comprising a single-flush device (100), and a conversion kit (101) for converting the single-flush device (100) to a dual-flush device (102); and the system being **characterized in that:**
    - said single-flush device (100) comprises a first preassembled unit (103) comprising a valve (10) carried by a movable member (11) to selectively assume a closed position and an open position inside a relative sealing seat, and a float (14) carried by the movable member to delay return of the valve to the closed position;
    - said kit (101) comprises a second preassembled unit (104) and a connecting member (15); said second preassembled unit (104) comprising an additional member (31) having reversible connecting means (32) for selectively connecting/disconnecting said additional member (31) and said movable member (11); said reversible connecting means comprising auxiliary buoyancy means (45) carried by the additional member (31) and for moving corresponding retaining means (46) to selectively connect/disconnect said additional member (31) and said movable member (11) alongside a variation in the level of the water in the tank; and said connecting member (15) being defined by a one-piece body made of plastic material and having fast-fit fastening means (16) for removable connection to said movable member (11), and a seat (28) for cooperating with said retaining means (46).



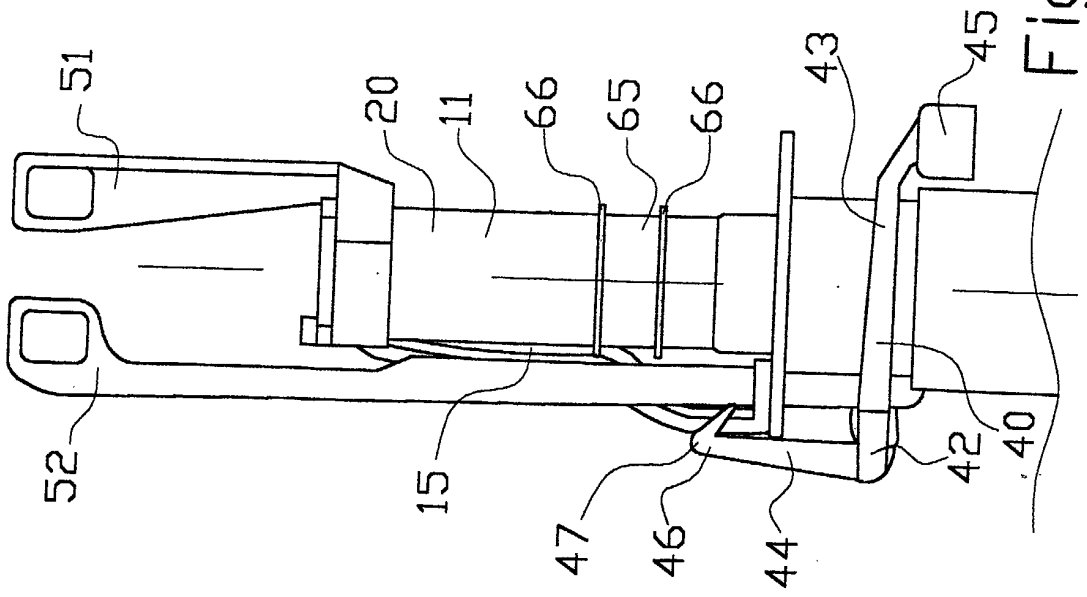


Fig. 2

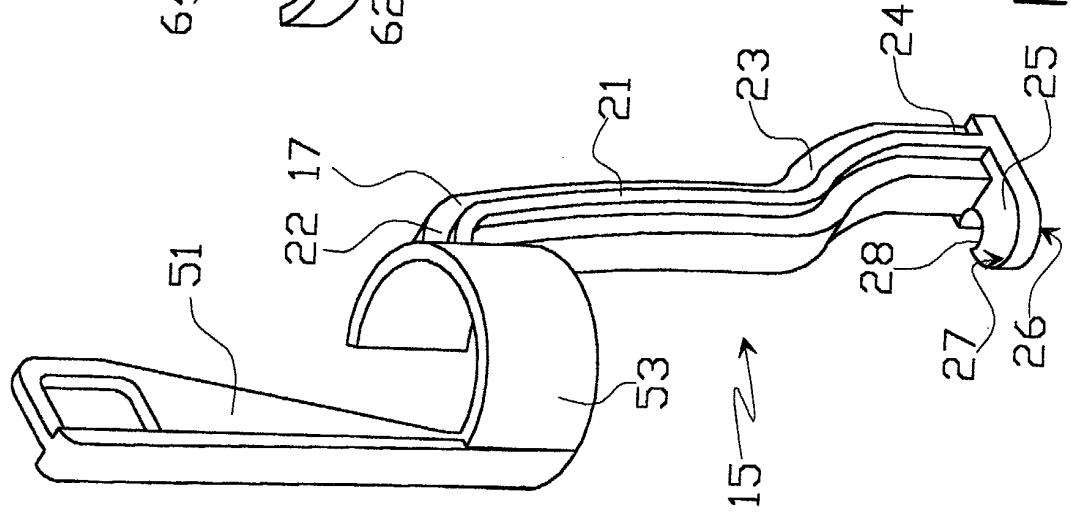


Fig. 3

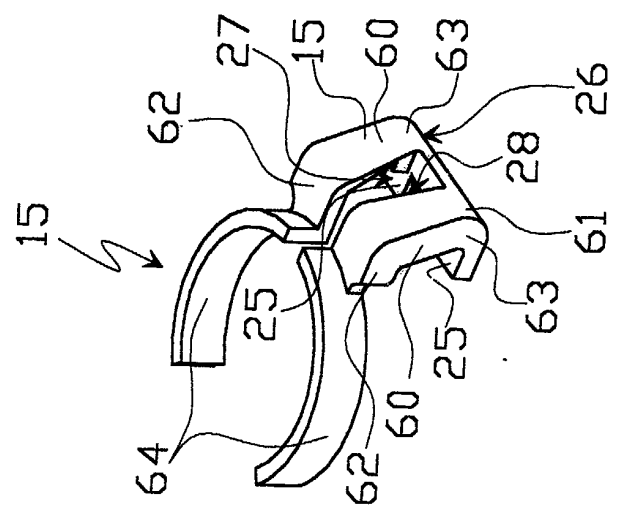


Fig. 4

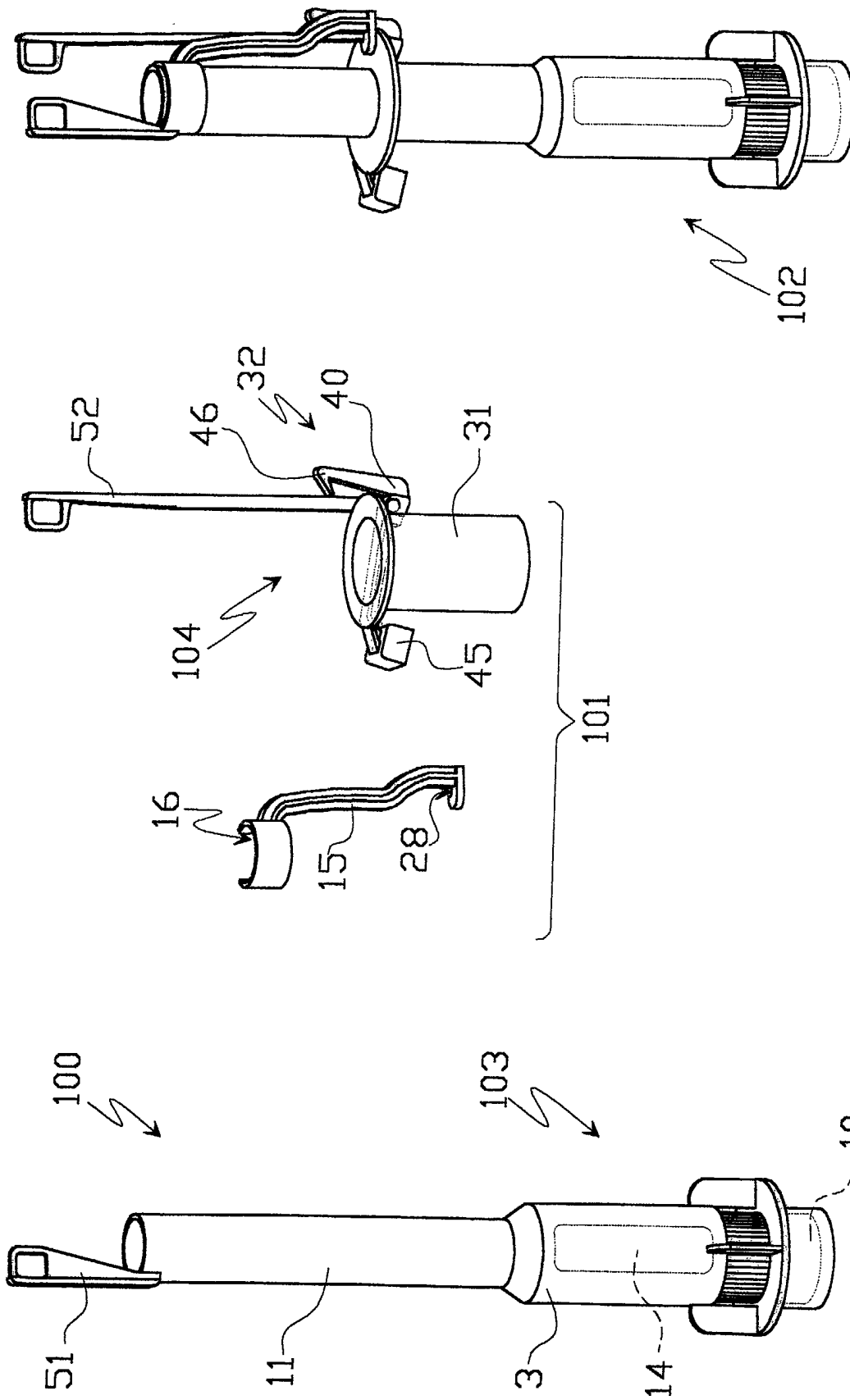


Fig. 5





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EUROPEAN SEARCH REPORT

Application Number  
EP 02 00 7091

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 305 163 A (RAZ ZEEV) 15 December 1981 (1981-12-15) * column 5, line 15 - line 36; figures 1,3 *	1-6	E03D1/14
Y	* figure 5 *	7-9	
X	EP 0 723 050 A (FRIATEC KERAMIK KUNSTSTOFF) 24 July 1996 (1996-07-24) * column 6, line 28 - column 8, line 16; figure 4 *	1	
Y	* column 7, line 41 - line 58; figure 4 *	7-9	
A	EP 0 801 179 A (OLIVEIRA & IRMAO SA) 15 October 1997 (1997-10-15) * column 4, line 38 - column 5, line 45; figures 1,5 *	1-4,7-9	
A	US 5 073 995 A (BAKER ROBERT D ET AL) 24 December 1991 (1991-12-24) * abstract *	10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E03D
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 26 June 2002	Examiner Flygare, E
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ON EUROPEAN PATENT APPLICATION NO.**

EP 02 00 7091

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26-06-2002

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4305163	A	15-12-1981	AU 533945 B2	22-12-1983
			AU 5195379 A	15-05-1980
			DE 2966620 D1	08-03-1984
			EP 0010945 A1	14-05-1980
			MX 149724 A	14-12-1983
			ZA 7905612 A	29-10-1980
EP 0723050	A	24-07-1996	DE 19501355 A1	01-08-1996
			CZ 9600054 A3	14-08-1996
			EP 0723050 A1	24-07-1996
			FI 960248 A	19-07-1996
			IL 116612 A	06-12-1998
			NO 960206 A	19-07-1996
			PL 312351 A1	22-07-1996
			SK 5096 A3	07-08-1996
EP 0801179	A	15-10-1997	IT T0960276 A1	10-10-1997
			AU 723228 B2	24-08-2000
			AU 1777797 A	16-10-1997
			EP 0801179 A2	15-10-1997
			IL 120645 A	28-01-2001
US 5073995	A	24-12-1991	NONE	

EPO FORM P0468

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