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(54) **Lavatory flush tank feed valve**

(57) A lavatory flush tank feed valve (1) of the type having a valve assembly (4) housed in a body (2) and controlled by a main float (11) movable with respect to the body; an auxiliary float (31), carried by the main float (11), moves a corresponding retaining member (32), which engages and disengages a seat integral with the body to connect and disconnect the main float (11) and the body (2) alongside a variation in the level of the water in the flush tank. The feed valve thus withstands relatively high operating pressures (even over 20 bars) of the water mains to which it is connected, despite employing standard valve assemblies, and adapts automatically to different operating pressures with no major adjustment required in the level of the main float.

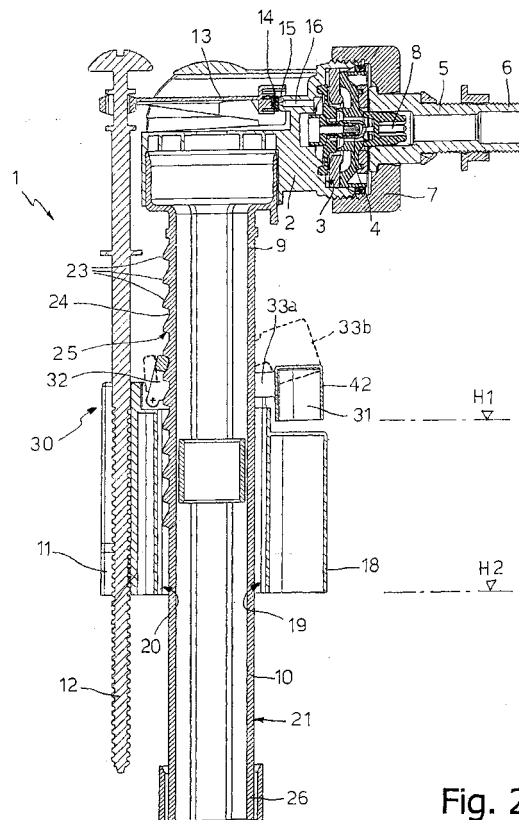


Fig. 2

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Description

[0001] The present invention relates to a lavatory flush tank feed valve.

[0002] As is known, lavatory flush tanks are fitted with feed valves connected to the water mains. Commonly used feed valves substantially comprise a metal fitting for connection to the water mains; a valve assembly housed in a casing; and a movable float controlling a shutter on the valve assembly. The valve assembly may be of the type closed directly by a piston (in which the float-controlled shutter acts directly on the mains connection nozzle), or of the type closed by counterpressure (in which the shutter acts on an auxiliary nozzle which closes a counterpressure chamber). In either case, the feed valve must be adjusted during installation according to the water mains operating pressure by adjusting the level of the float, i.e. the distance between the float and the valve body. Since the mains pressure may differ widely, however, from one situation to another, the level of the float may have to be adjusted considerably, thus affecting the overall size of the feed valve; whereas a feed valve capable of at least partly compensating for differences in operating pressure with no major adjustment required in the level of the float would be more desirable.

[0003] Moreover, piston feed valves are suitable for use with relatively low operating pressures (maximum 15-16 bars), and even known counterpressure valves cannot be relied on over 20-bar pressure, so that a demand exists for a feed valve enabling the use of ordinary valve assemblies at higher mains pressures, even of over 20 bars.

[0004] It is an object of the present invention to provide a lavatory flush tank feed valve designed to eliminate the aforementioned drawbacks of known solutions. More specifically, it is an object of the invention to provide a feed valve capable of at least partly compensating for differences in the operating pressure of the water mains to which it is connected with no major adjustment required in the level of the float, and which is compact in size by requiring, at most, a minimum amount of adjustment. It is a further object of the invention to provide a feed valve which, despite employing substantially known valve assemblies, can also be used at relatively high pressures (even over 20 bars), and which at the same time is reliable, and cheap and easy to produce and install.

[0005] According to the present invention, there is provided a feed valve for a lavatory flush tank, comprising a body housing a valve assembly; and first float means movable with respect to said body and connected to a shutter of said valve assembly to control opening-closing of the valve assembly; the feed valve being characterized by also comprising reversible connecting means for selectively connecting-disconnecting said first float means and said body.

[0006] More specifically, said reversible connecting

means comprise second float means for moving corresponding retaining means to selectively connect-disconnect said first float means and said body alongside a variation in the level of the water in the flush tank.

[0007] The feed valve according to the invention thus adapts automatically to different operating pressures of the water mains to which it is connected, with no major adjustment required in the level of the float, and is therefore highly compact by requiring, at most, a minimum amount of adjustment.

[0008] Moreover, the feed valve according to the invention operates reliably even at relatively high pressures (over 20 bars), despite employing substantially known - in particular, counterpressure-type - valve assemblies, and at the same time is cheap and easy to produce and install.

[0009] 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 an overall view in perspective of a feed valve in accordance with the invention;

Figure 2 shows a longitudinal section of the Figure 1 feed valve.

[0010] Number 1 in the accompanying drawings indicates as a whole a feed valve for a lavatory flush tank (not shown). Feed valve 1 comprises a body 2 having an inner cavity 3 housing a known, e.g. counterpressure-type, valve assembly 4 not described in detail for the sake of simplicity. A tubular fitting 5 is connected to body 2 by a ring nut 7, has an externally threaded end 6 for connection to an external feed pipe (not shown), and may be fitted inside with a noise-damping member 8, e.g. of the type described in the Applicant's pending Italian Patent Application n. MI200A002272.

[0011] Body 2 is also connected to a pipe 9 perpendicular to fitting 5, and along which water flows in known manner from fitting 5 and valve assembly 4 into the flush tank. The same pipe 9 also acts as a guide member 10 for a main float 11 fitted coaxially to and sliding axially on the outside of guide member 10, and connected mechanically by an adjustable rod 12 to a lever 13 controlling valve assembly 4. More specifically, lever 13 has a shutter 14 cooperating with a valve seat 15 of a nozzle 16 of valve assembly 4 to control opening-closing of valve assembly 4.

[0012] In the non-limiting example shown, main float 11 comprises a substantially prismatic buoyancy tank 18 having a central through seat 19 defined by a cylindrical inner lateral surface 20. Guide member 10 is inserted to slide axially inside seat 19, and comprises, on its outer lateral surface 21, two diametrically opposite rails 22 cooperating in known manner with respective longitudinal ribs (not shown) projecting from inner lateral surface 20.

[0013] Outer lateral surface 21 also comprises, between rails 22, a succession of longitudinally spaced

teeth 23 projecting radially from outer lateral surface 21 to define a number of respective seats 24 having respective mating surfaces 25 facing downwards, i.e. facing a free end 26 of guide member 10.

[0014] Feed valve 1 also comprises reversible connecting means 30 for selectively connecting-disconnecting main float 11 and guide member 10 (i.e. main float 11 and body 2). More specifically, reversible connecting means 30 comprise an auxiliary float 31 for moving a retaining member 32 for selectively connecting-disconnecting main float 11 and guide member 10 alongside a variation in the level of the water in the flush tank.

[0015] In the non-limiting example shown, auxiliary float 31 and retaining member 32 are carried by a rocking member 33 hinged to a top face 34, facing body 2, of buoyancy tank 18 of main float 11. Rocking member 33 comprises a fork 35 having two parallel arms 36 hinged at respective ends 37 and by respective pins 38 to buoyancy tank 18. At ends 37, arms 36 have respective projections 39 projecting on the opposite side to face 34 and connected rigidly by a crossbar 40. Crossbar 40 defines retaining member 32, which engages a selected seat 24 by resting substantially axially against mating surface 25 of seat 24.

[0016] Auxiliary float 31 is carried by and projects from respective ends 41, opposite ends 37, of arms 36, and comprises a buoyancy tank 42 (preferably, though not necessarily, much smaller than buoyancy tank 18) parallel to crossbar 40 and rigidly connecting ends 41 transversely. Arms 36, crossbar 40 and buoyancy tank 42 define a gap 43 through which guide member 10 extends; and retaining member 32 and auxiliary float 31 are located diametrically opposite with respect to guide member 10.

[0017] Auxiliary float 31 is so sized that rocking member 33 selectively assumes a first operating position 33a (shown by the continuous line in Figure 2) in which retaining member 32 engages seat 24 when the water in the flush tank is below a predetermined level H1, and a second operating position 33b (shown by the dash line in Figure 2) in which retaining member 32 does not engage seat 24 when the water in the flush tank reaches or exceeds level H1. Auxiliary float 31 therefore moves retaining member 32 (by rotating rocking member 33) to selectively connect-disconnect main float 11 and guide member 10 (i.e. main float 11 and body 2) alongside a variation in the level of the water in the flush tank.

[0018] Feed valve 1 operates as follows:

[0019] When the flush tank is empty (i.e. when the water in the flush tank has been discharged), main float 11, no longer buoyed up by the water, weighs on rod 12, which, by means of lever 13, keeps shutter 14 detached from valve seat 15 to open nozzle 16, so that water from the mains flows into the flush tank through valve assembly 4 (operation of which is known and therefore not described for the sake of simplicity). Similarly, auxiliary float 31, no longer buoyed up by the water, weighs on

rocking member 33 to keep it in the first operating position 33a, in which retaining member 32 engages seat 24 and rests axially upwards against mating surface 25, so that main float 11 is connected axially to guide member 10.

[0020] As the flush tank fills up, the water level first reaches main float 11 (level H2 in Figure 2), which, as opposed to sliding upwards along guide member 10, remains stationary by being connected axially to guide member 10, so that valve assembly 4 remains open and water continues flowing into the flush tank. When the water in the flush tank eventually reaches auxiliary float 31, i.e. the predetermined level H1 causing rotation of rocking member 33, the buoyancy of the water on auxiliary float 31 rotates rocking member 33 into the second operating position 33b, in which retaining member 32 does not engage seat 24, so that main float 11 is disconnected from and slides along guide member 10 to close valve assembly 4 and cut off the flow of water into the flush tank.

[0021] Clearly, changes may be made to the feed valve as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A feed valve (1) for a lavatory flush tank, comprising a body (2) housing a valve assembly (4); and first float means (11) movable with respect to said body and connected to a shutter (14) of said valve assembly to control opening-closing of the valve assembly; the feed valve being **characterized by** also comprising reversible connecting means (30) for selectively connecting-disconnecting said first float means (11) and said body (2).
2. A feed valve as claimed in Claim 1, **characterized in that** said reversible connecting means (30) comprise second float means (31) for moving corresponding retaining means (32) to selectively connect-disconnect said first float means (11) and said body (2) alongside a variation in the level of the water in the flush tank.
3. A feed valve as claimed in Claim 2, **characterized in that** said first and second float means comprise a main float (11) and an auxiliary float (31) respectively; said main float (11) sliding axially along a guide member (10) carried by said body (2); and said auxiliary float (31) and said retaining means (32) being carried by said main float (11).
4. A feed valve as claimed in Claim 3, **characterized by** comprising a rocking member (33) hinged to said main float (11); said rocking member (33) having, at respective ends, said auxiliary float (31), and a retaining member (32) which engages a respective

seat (24) on said guide member (10) to connect said main float (11) axially to said guide member (10).

5. A feed valve as claimed in Claim 4, **characterized** is that said auxiliary float (31) is so sized that said rocking member (33) selectively assumes a first operating position (33a) wherein said retaining member (32) engages said seat (24) when the water in the flush tank is below a predetermined level (H1), and a second operating position (33b) wherein said retaining member (32) does not engage said seat (24) when the water in the flush tank rises above said level (H1). 5 10
6. A feed valve as claimed in Claim 5, **characterized in that** said auxiliary float (31) is located at a top face (34) of said main float (11). 15
7. A feed valve as claimed in one of Claims 4 to 6, **characterized in that** said rocking member (33) comprises at least one arm (36) hinged at a first end (37) to said main float (11); said auxiliary float (31) being carried by and projecting from a second end (41), opposite said first end (37), of said at least one arm (36); and said at least one arm (36) also having, at said first end (37), a crossbar (40) defining said retaining member (32). 20 25
8. A feed valve as claimed in one of Claims 4 to 7, **characterized in that** said seat (24) is defined by a tooth (23) projecting from an outer lateral surface (21) of said guide member (10), and having a mating surface (25) to rest substantially axially on said retaining member (32). 30 35
9. A feed valve as claimed in Claim 9, **characterized in that** said guide member (10) comprises a succession of teeth (23) projecting from said outer lateral surface (21) of said guide member (10) to define a number of respective seats (24); said retaining member (32) being selectively insertable inside a predetermined one of said seats (24). 40 45 50 55

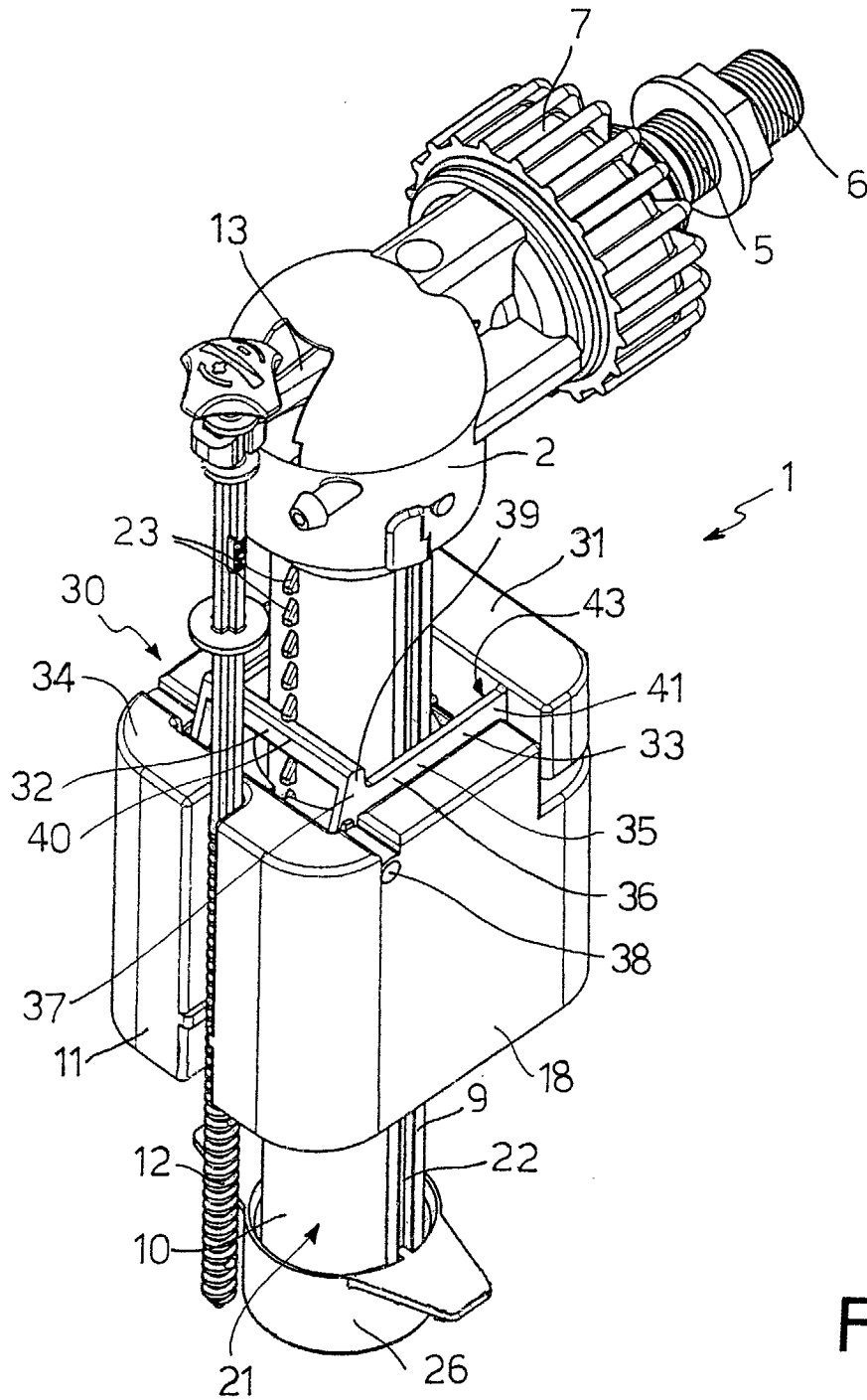


Fig. 1

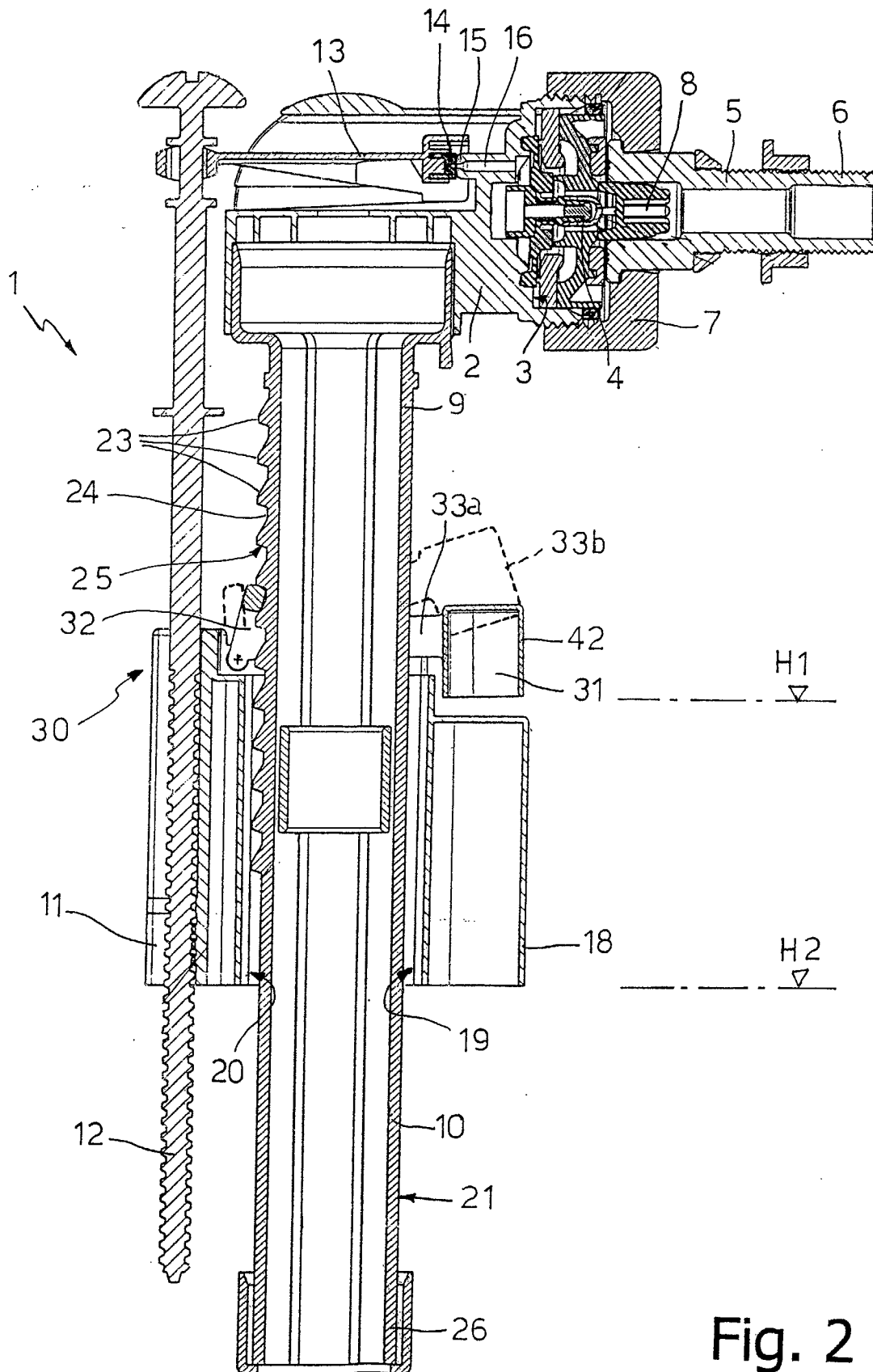


Fig. 2