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(54) **FEEDING DEVICE FOR A FLUSH TANK**

(57) A feeding device (1) for a flush tank comprises an internally hollow body (2), a valve assembly (3) housed inside the body (2) and arranged between an inlet conduit (7) and an outlet conduit (8); an air vent (24) formed in the body (2) and communicating with the outside of the body (2) and with the outlet conduit (8); and a flooding chamber (22), positioned in the body (2) and communicating with the air vent (24) and with the outlet conduit (8); the outlet tube (6) has a narrowing (35), positioned at one lower free end (20) of the outlet tube (6) so as to cause the filling of the chamber (22) with water and close the air vent (24) with a water zone.

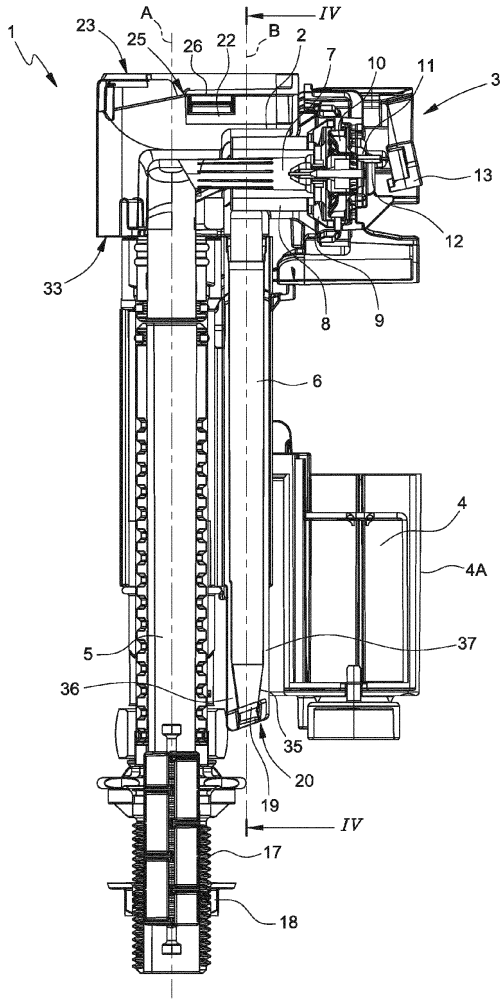

FIG. 2

EP 3 495 572 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This Patent application claims priority from Italian Patent Application No. 102017000141217 filed on 06/12/2017.

TECHNICAL FIELD

[0002] The present invention relates to a feeding device for a flush tank of a sanitary appliance.

BACKGROUND ART

[0003] As is known, a flush tank of a sanitary appliance, in addition to a discharge valve, is also generally provided with a feeding device connected to the water supply network for the filling of the tank after the water has been discharged into the sanitary appliance.

[0004] A commonly used feeding device comprises, in general terms, an inlet tube having a fitting for connection to the water supply network, a valve assembly housed in a casing and controlled by a float, an outlet tube that lets the water that has flowed through the valve assembly into the tank.

[0005] The valve assembly, in particular, may be of the so-called back pressure or diaphragm closing type, in which the float operates a cut-off acting on a vent nozzle of a back pressure chamber delimited by a diaphragm or membrane; the diaphragm separates two conduits from each other, connected to the inlet tube and the outlet tube, respectively. When the float, as a result of the discharge of water from the tank, falls, it opens the vent nozzle, and the diaphragm elastically deforms under the water pressure and puts the conduits into communication with each other, thus allowing the passage of water and the filling of the tank. When the float rises, it closes the vent nozzle, and the pressure in the back pressure chamber balances that of the incoming water and causes the diaphragm to separate the conduits again, stopping the water from entering the tank.

[0006] In order to avoid backflow into the water supply network in the event of malfunctions, the valve assembly must be provided (as also provided for by specific rules and regulations) with an air outlet opening, communicating with the outside of the feeding device to allow the exit of air from the feeding device and therefore avoid any suction of water from the tank.

[0007] However, the presence of the air outlet opening causes, during normal operation of the feeding device, the formation of a water/air mixture in the feeding device. Entry of air into the water flow circulating in the feeding device can cause turbulent motion phenomena with consequent increase in noise during the filling of the tank.

[0008] The problem highlighted here is solved by EP3147416A1, by means of a feeding device having an air vent communicating with a flooding chamber, which in use, during the filling of the tank, fills with water thereby closing the air vent. This feeding device is effectively capable of preventing phenomena of water backflow into the water supply network, while avoiding the problems related to entry of air into the water flow circulating in the feeding device, in particular reducing the noise during the filling of the tank.

[0009] However, the device referred to herein, like other known ones such as EP1371787A2, which also includes an upper air vent, although efficient still have room for improvement, in particular in terms of simplicity of construction and operation, noise reduction capability and ability to operate at different pressures of the water supply network (in particular, even at a relatively low pressure).

DISCLOSURE OF INVENTION

[0010] It is an object of the present invention to provide a feeding device, which ensures compliance with the non-return rules, while being simple, effective and reliable, allowing reduction in noise, and guaranteeing operation even at low pressure of the supply network.

[0011] Therefore, the present invention relates to a feeding device for a flush tank, as defined essentially in the appended claim 1 and, in its additional features, in the dependent claims.

[0012] In accordance with the invention, the air vent is located at a higher level (i.e. higher) than the prior art solutions, resulting in a more advantageous operation.

[0013] The feeding device in accordance with the invention not only meets the criteria laid down by the non-return rules, by being effectively capable of preventing phenomena of water backflow into the water supply network, but at the same time avoids the problems related to entry of air into the water flow circulating in the feeding device, and particularly reduces the noise during the filling of the tank, being extremely simple to manufacture and simple and reliable in its operation, always operating effectively even at different pressure levels of the supply network (and in particular even at relatively low pressure).

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Further features and advantages of the present invention will be apparent from the following description of a non-limiting embodiment thereof, with reference to the figures of the accompanying drawings, wherein:

- Figure 1 is a side elevation view of a feeding device according to the invention;
- Figure 2 is a view in longitudinal section of the feeding device in Figure 1;
- Figure 3 is a view in enlarged scale and with parts removed for clarity of a detail of the section in Figure 2;
- Figure 4 is a sectional view along the plane IV-IV in

figure 2, with parts removed for clarity;

- Figure 5 is a perspective view with parts removed for clarity of a further detail of the feeding device in Figure 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] In Figures 1 and 2, the numeral 1 indicates, as a whole, a feeding device, in particular with bottom feed, for a flush tank (known and not shown for simplicity) of a sanitary appliance.

[0016] The feeding device 1 comprises an internally hollow body 2, a valve assembly 3 housed inside the body 2 and controlled by a float 4 (for example movably housed in a service container 4A), an inlet tube 5 arranged upstream of the valve assembly 3 and connectable to a water supply network to carry a flow of water to the valve assembly 3, and an outlet tube 6 arranged downstream of the valve assembly 3 and through which the water flowing through the valve assembly 3 is fed into the tank.

[0017] The valve assembly 3 is a back pressure valve assembly substantially known per se.

[0018] In brief, the valve assembly 3 comprises an inlet conduit 7 connected to the inlet tube 5; an outlet conduit 8 connected to the outlet tube 6; an internal connecting passage 9 connecting the inlet conduit 7 to the outlet conduit 8; an elastically deformable or movable, discoidal diaphragm 10 selectively closing the passage 9; and a back pressure chamber 11 delimited by the diaphragm 10 and provided with a vent nozzle 12, which connects the back pressure chamber 11 to the outside of the body 2 and is closed by a movable cut-off 13 actuated by the float 4.

[0019] When the nozzle 12 is closed by the cut-off 13, the diaphragm 10 keeps the passage 9 closed because the water pressure in the inlet conduit 7 is counterbalanced by the pressure inside the back pressure chamber 11, and the water in the inlet conduit 7 is unable to deform or move the diaphragm 10.

[0020] When the nozzle 12 opens, following a downward movement of the float 4 as a result of a lowering of the water level in the tank (i.e. when the water is discharged from the tank), the water pressure in the inlet conduit 7 exceeds the pressure in the back pressure chamber 11 and the diaphragm 10 elastically deforms or moves, thus opening the passage 9 and allowing the water to flow from the inlet conduit 7 to the outlet conduit 8 and from here, through the outlet tube 6, into the tank.

[0021] The float 4 is axially slidably mounted on a guide element 15 located outside the inlet tube 5 and is mechanically connected, for example by means of a linkage 16, to the cut-off 13 cooperating with the nozzle 12 for controlling the operation of the valve assembly 3.

[0022] In the non-limiting example shown, the inlet tube 5 and the outlet tube 6 are substantially rectilinear and parallel, and substantially vertical in use, both extending from the body 2 downwards along respective axes A, B, which are longitudinal, parallel, and vertical in use.

[0023] It is understood that other configurations are possible: in particular, the inlet tube 5 can extend laterally from the body 2, rather than downwards. The outlet tube 6 is preferably vertical, as shown.

[0024] In the example shown, the inlet tube 5 is provided with an end fitting 17 for connection to an external tubing, and fastening members 18 for mechanically fastening the feeding device 1 to the tank.

[0025] The outlet tube 6 is flanked by the inlet tube 5 and carries the guide element 15 for the float 4 and ends with a water outlet 19 located at a lower free end 20 of the outlet tube 6.

[0026] Also with reference to figures 3-5, the feeding device 1 comprises an internal flooding chamber 22 arranged in the body 2 at an upper end 23 of the feeding device 1, i.e. of the body 2; and an air vent 24 formed in the body 2 and communicating with the outside of the body 2 and with the outlet conduit 8, and therefore also with the outlet tube 6.

[0027] The chamber 22 communicates with the outside of the body 2 through the air vent 24, which is formed at the upper end 23 of the body 2 and is substantially transverse to the axes A, B, and facing upwards.

[0028] In particular, the air vent 24 is defined by an opening 25 formed through an upper wall 26 of the body 2.

[0029] In the non-limiting example shown (but not necessarily), the wall 26 is substantially transverse (for example, substantially perpendicular) to the axes A, B, and is provided with a peripheral edge 28, which also encloses the opening 25 defining the air vent 24.

[0030] The edge 28 extends vertically from the wall 26 and delimits an upper secondary chamber 29 located above the chamber 22 and shaped like a tank open at the top.

[0031] Above the opening 25 defining the air vent 24, the edge 28 is partially closed by a wall portion 30 located higher than the wall 26 and optionally provided with a drain 31 defined by a recess.

[0032] The wall 26 separates the chamber 22, delimited at the top by the wall 26, from the secondary chamber 29 located above the chamber 22.

[0033] Inside the body 2, the chamber 22 communicates with the outlet conduit 8 and/or the outlet tube 6, optionally via a bypass channel 32 connected to the outlet conduit 8 or directly to the outlet tube 6.

[0034] Moreover, the chamber 22 has an auxiliary outlet 33, opposite the air vent 24 and substantially transverse to the axes A, B, and facing downwards.

[0035] In particular, the auxiliary outlet 33 is formed in a lower wall 34 of the body 2 at an axial height (along an axis A, B), between the air vent 24 and the water outlet 19. In the example shown, the auxiliary outlet 33 is located in a position adjacent to the inlet tube 5.

[0036] The outlet tube 6 has a narrowing 35, defined, for example, by a reduction in the section of the outlet tube 6.

[0037] Preferably, the narrowing 35 is located inside

the outlet tube 6 at the lower free end 20 of the outlet tube 6, before the water outlet 19 (i.e. upstream of the water outlet 19 in the direction of flow of the water that, in use, runs through the outlet tube 6 to fill the tank) and advantageously in the proximity of the water outlet 19.

[0038] In the example shown, the narrowing 35 is defined by a tapered portion 36 of the outlet tube 6, converging toward the end 20 and the water outlet 19.

[0039] Preferably, the water outlet 19 is positioned radially with respect to the outlet tube 6 (and therefore to the axis B of the outlet tube 6), being formed through a lateral wall 37 of the outlet tube 6.

[0040] In the example shown, the outlet tube 6 has a bottom baffle 38, located at the end 20 and axially closing the end 20; the baffle 38 is substantially transverse to the axis B and preferably slanted with respect to the axis B; the water outlet 19 is defined by one or more radial slits 39 (in the example shown, by two symmetrical slits 39 diametrically opposite with respect to the axis B) formed through the lateral wall 37 above the baffle 38.

[0041] In use, after the water contained in the tank is discharged, the float 4 opens the nozzle 12 and the mains water pressure in the inlet conduit 7 deforms the diaphragm 10, opening the passage 9; the water then flows from the inlet conduit 7 into the outlet conduit 8, flowing into the outlet tube 6 and filling the tank.

[0042] Because of the narrowing 35, the water fills the outlet tube 6 and also rises into the chamber 22.

[0043] In particular, the narrowing 35 is shaped so as to cause the filling of the outlet tube 6 and the chamber 22 with water until the air vent 24 is closed with a water zone.

[0044] Therefore, the water floods (completely filling) the chamber 22 up to the wall 26 and closes the air vent 24 with a water zone.

[0045] The water partly exits through the auxiliary opening 33, but in any case keeps the air vent 24 closed.

[0046] When the water level in the chamber 22 passes the wall 26, the water floods the secondary chamber 29 above the wall 26 and thus ensures the filling of the tank.

[0047] Once the tank 2 is full, the float 4 closes the nozzle 12, thus stopping the flow of water.

[0048] The water flows out of the chamber 22 through the auxiliary opening 33.

[0049] It is understood that the feeding device as described and illustrated herein can be subject to numerous modifications and variations that do not depart from the scope of the appended claims.

Claims

1. A feeding device (1) for a flush tank, comprising an internally hollow body (2); a valve assembly (3) housed inside the body (2) and arranged between an inlet conduit (7) and an outlet conduit (8) for selectively opening/closing a passage (9) between the inlet conduit (7) and the outlet conduit (8); an air vent (24) formed in the body (2) and communicating with the outside of the body (2) and with the outlet conduit (8); and a flooding chamber (22), positioned in the body (2) and communicating with the air vent (24) and with the outlet conduit (8); the outlet conduit (8) being connected to an outlet tube (6) which extends along a longitudinal axis (B), substantially vertical in use, and is provided with a water outlet (19), positioned at a lower free end (20) of the outlet tube (6) for discharging, in use, water into the tank; the air vent (24) being defined by an opening (25) formed through an upper wall (26) of the body (2) at an upper end (23) of the body (2) and the feeding device (1), and facing upwards in use; the feeding device (1) being **characterised in that** the outlet tube (6) has a narrowing (35), positioned at the lower free end (20) of the outlet tube (6) and shaped so as to cause the filling of the outlet tube (6) and the chamber (22) with water until the air vent (24) is closed with a water zone.

2. The feeding device according to claim 1, wherein the narrowing (35) is positioned in the proximity of the water outlet (19).

3. The feeding device according to claim 1 or 2, wherein the narrowing (35) is defined by a tapered portion (36) of the outlet tube (6), converging toward the lower free end (20) of the outlet tube (6) and the water outlet (19) .

4. The feeding device according to one of the preceding claims, wherein the water outlet (19) is positioned radially with respect to the outlet tube (6) and the axis (B) of the outlet tube (6), being formed through a lateral wall (37) of the outlet tube (6).

5. The feeding device according to claim 4, wherein the outlet tube (6) has a bottom baffle (38), positioned at the lower free end (20) of the outlet tube (6) and substantially transverse to the axis (B) and axially closing the lower free end (20); and the water outlet (19) is defined by one or more radial slits (39) formed through the lateral wall (37) above the baffle (38).

6. The feeding device according to claim 5, wherein the baffle (38) is slanted with respect to the axis (B).

7. The feeding device according to one of the preceding claims, comprising a secondary chamber (29), positioned above the flooding chamber (22) and communicating with the flooding chamber (22) through the air vent (24) and shaped so as to receive water coming out of the flooding chamber (22) through the air vent (24).

8. The feeding device according to claim 7, wherein the upper wall (26) separates the flooding chamber (22),

delimited at the top by the upper wall (26), from the secondary chamber (29).

9. The feeding device according to claim 7 or 8, wherein the secondary chamber (29) is shaped like a tank open at the top, delimited by a peripheral edge (28).

10. The feeding device according to claim 9, wherein, above the air vent (24), the peripheral edge (28) is partially closed by a wall portion (30) located higher than the upper wall (26) and optionally provided with a drain (31) defined by a recess.

11. The feeding device according to one of the preceding claims, wherein the flooding chamber (22) has an auxiliary outlet (33), opposite the air vent (24) and substantially transverse to the axis (B) and facing downwards; the auxiliary outlet (33) being formed in a lower wall (34) of the body (2) at an axial height between the air vent (24) and the water outlet (19).

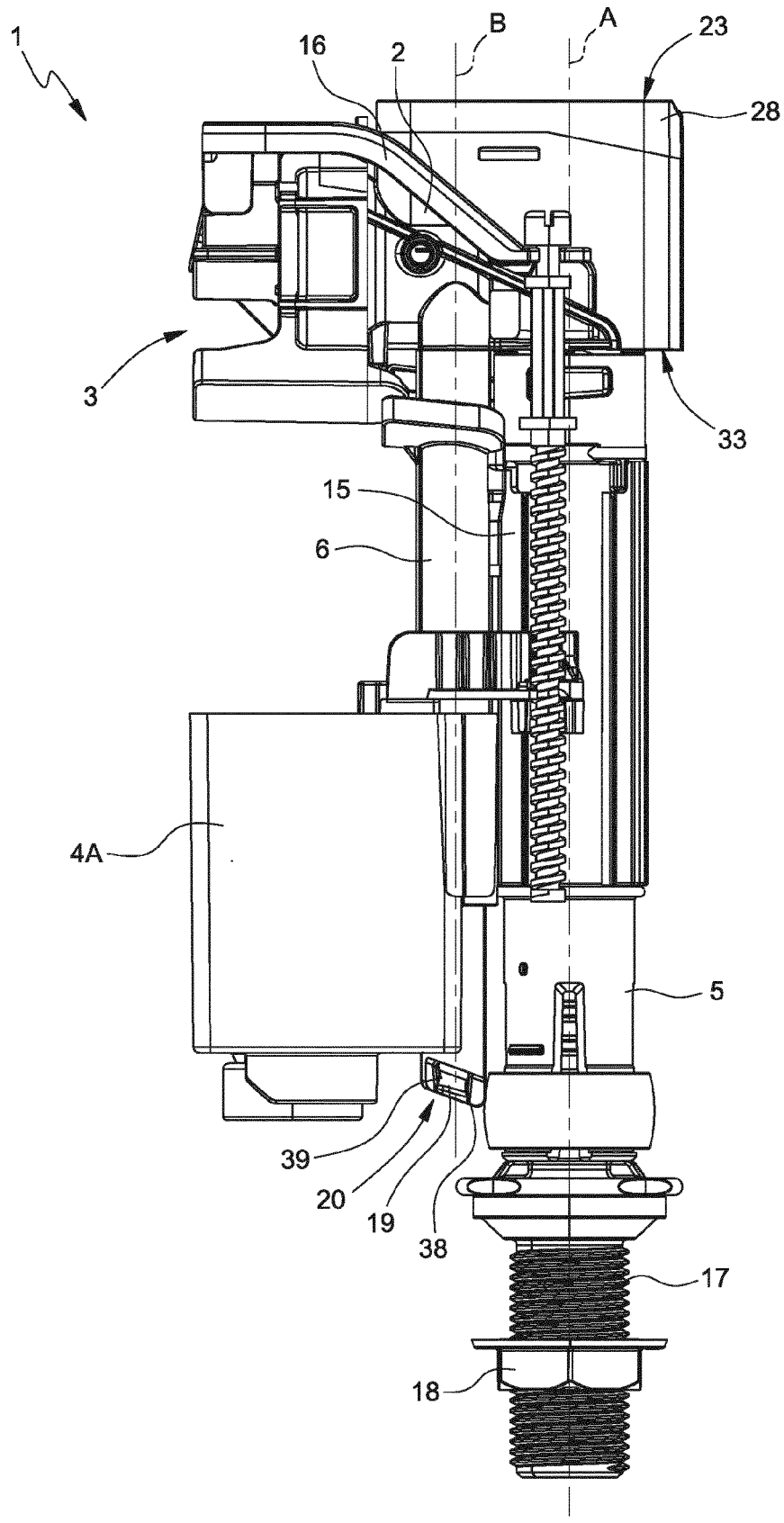

FIG. 1

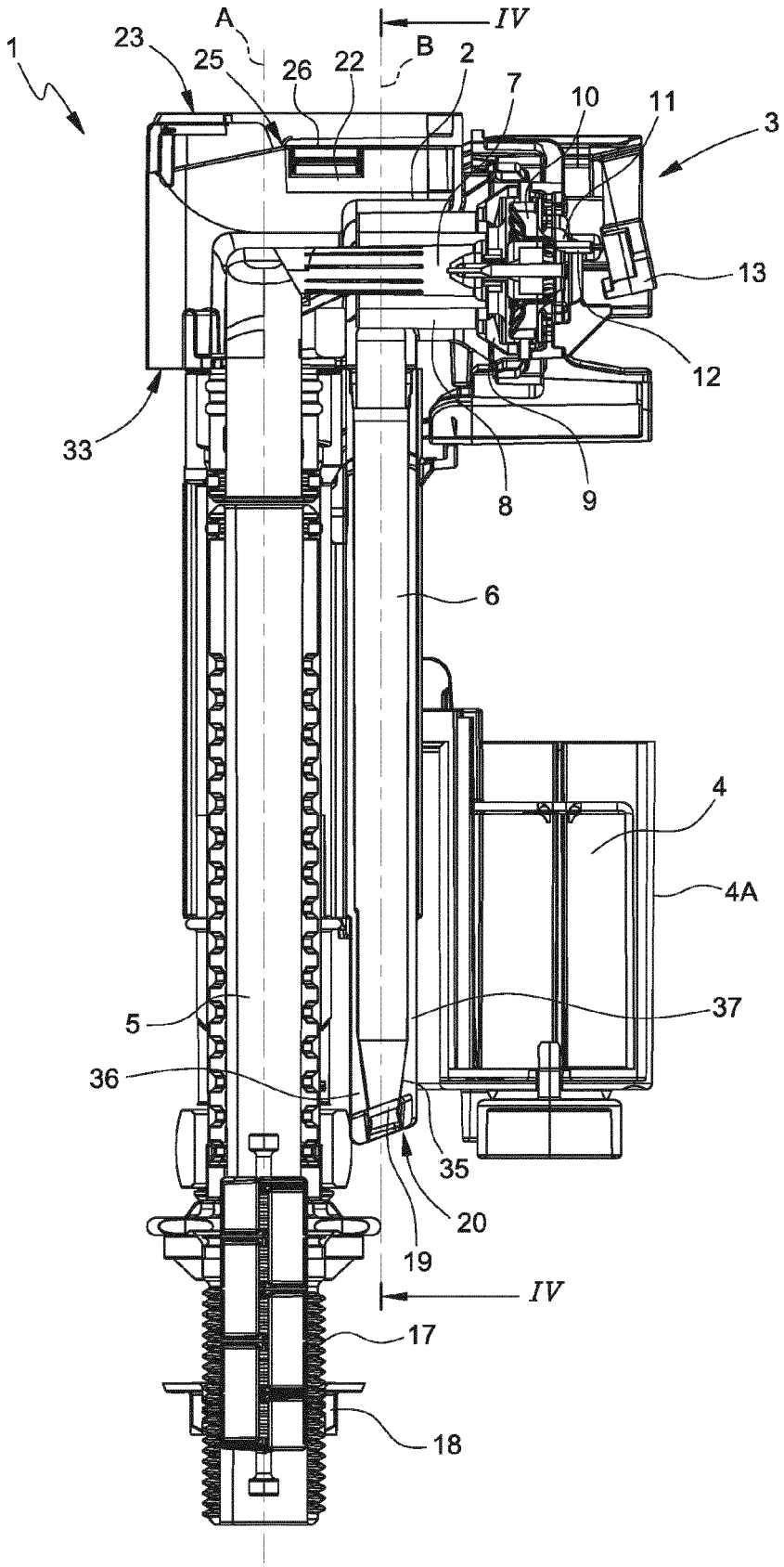

FIG. 2

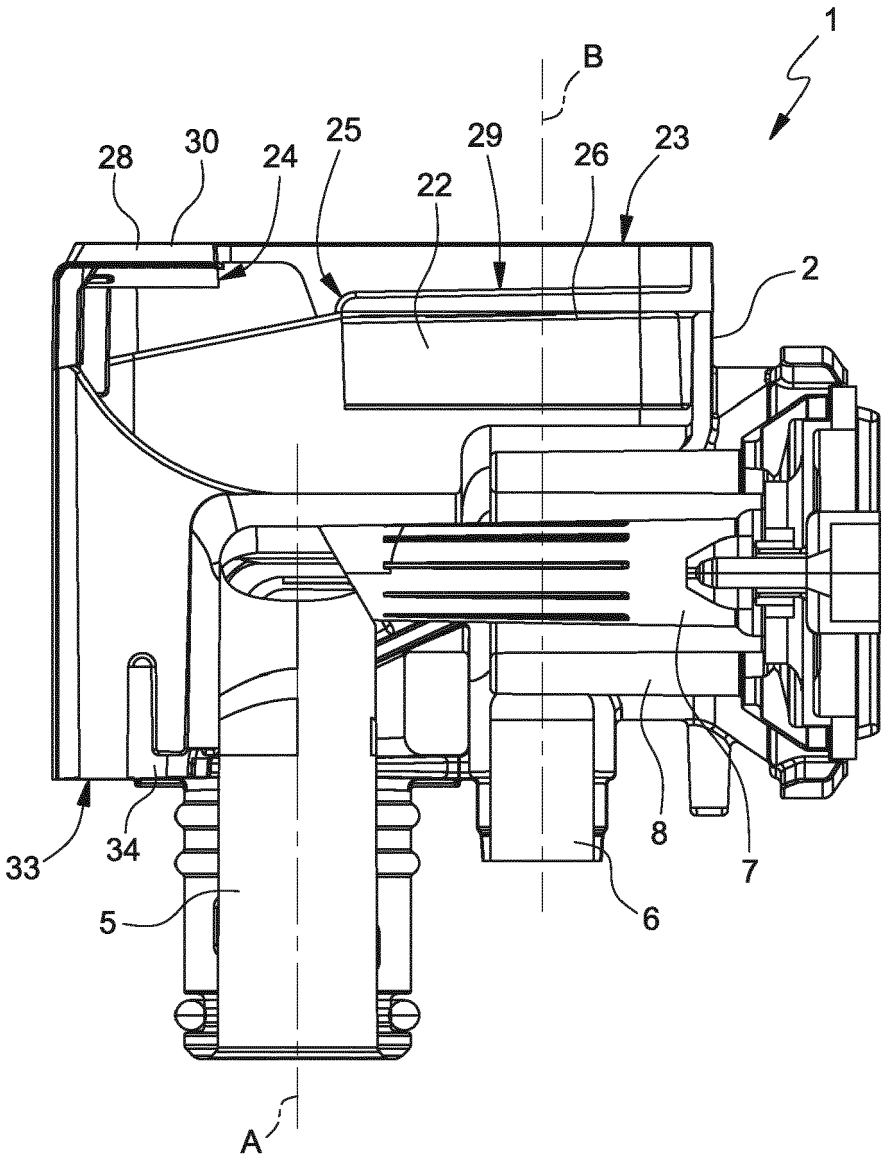

FIG. 3

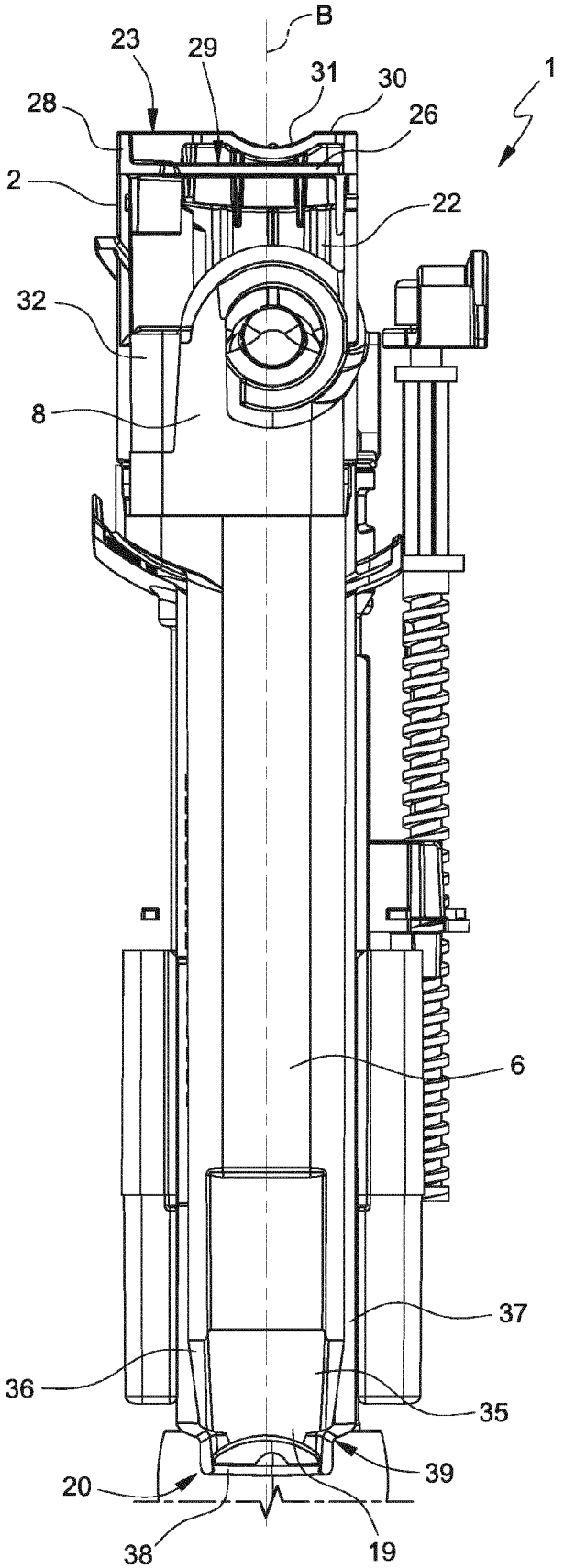

FIG. 4

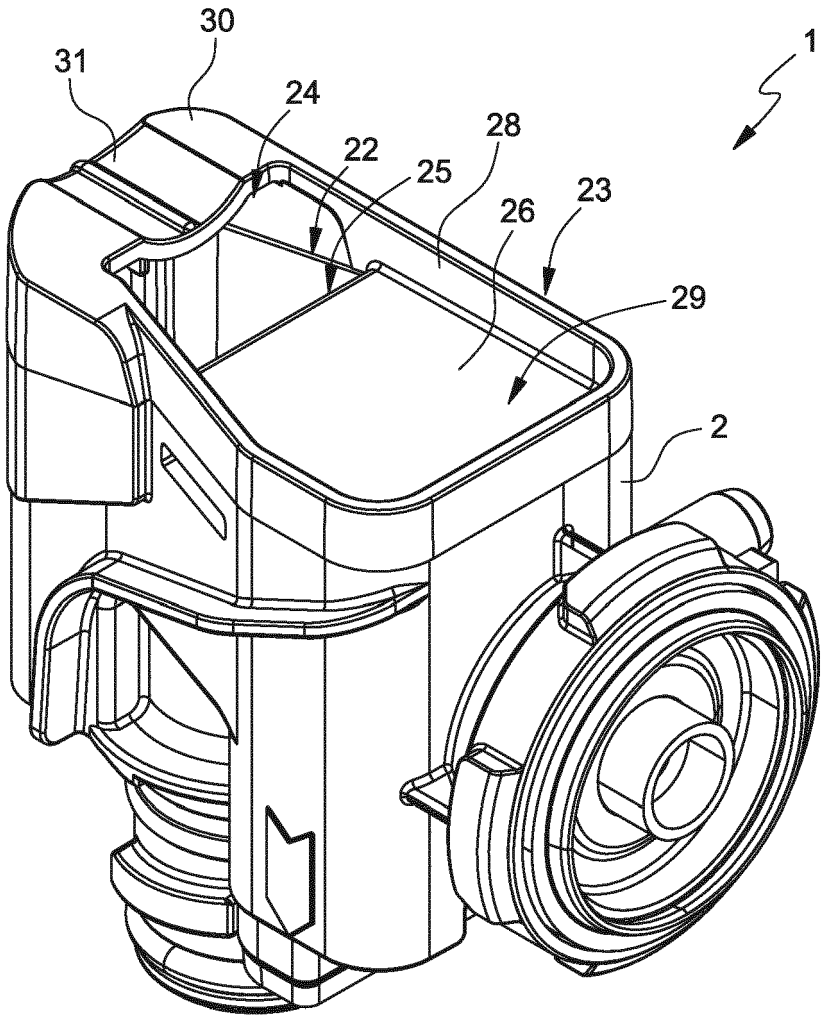

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 18 21 0169

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 3 147 416 A1 (OLIVEIRA & IRMAO SA [PT]) 29 March 2017 (2017-03-29) * figures *	1	INV. E03D1/32
A,D	EP 1 371 787 A2 (GEBERIT TECHNIK AG [CH]) 17 December 2003 (2003-12-17) * figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)

E03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 February 2019	Isailovski, Marko

CATEGORY OF CITED DOCUMENTS

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20-02-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3147416 A1	29-03-2017	NONE	
EP 1371787 A2	17-12-2003	AT 312980 T	15-12-2005
		DK 1371787 T3	24-04-2006
		EP 1371787 A2	17-12-2003
		ES 2254899 T3	16-06-2006
		US 2003230345 A1	18-12-2003

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Patent documents cited in the description

- IT 102017000141217 **[0001]**
- EP 3147416 A1 **[0008]**
- EP 1371787 A2 **[0009]**