(19) Europäisches Patentamt
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(11) **EP 3 147 416 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**29.03.2017 Bulletin 2017/13**

(51) Int Cl.:
***E03D 1/32*** *(2006.01)*

(21) Application number: **16190183.0**

(22) Date of filing: **22.09.2016**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**MA MD**

(30) Priority: **22.09.2015 IT UB20153781**

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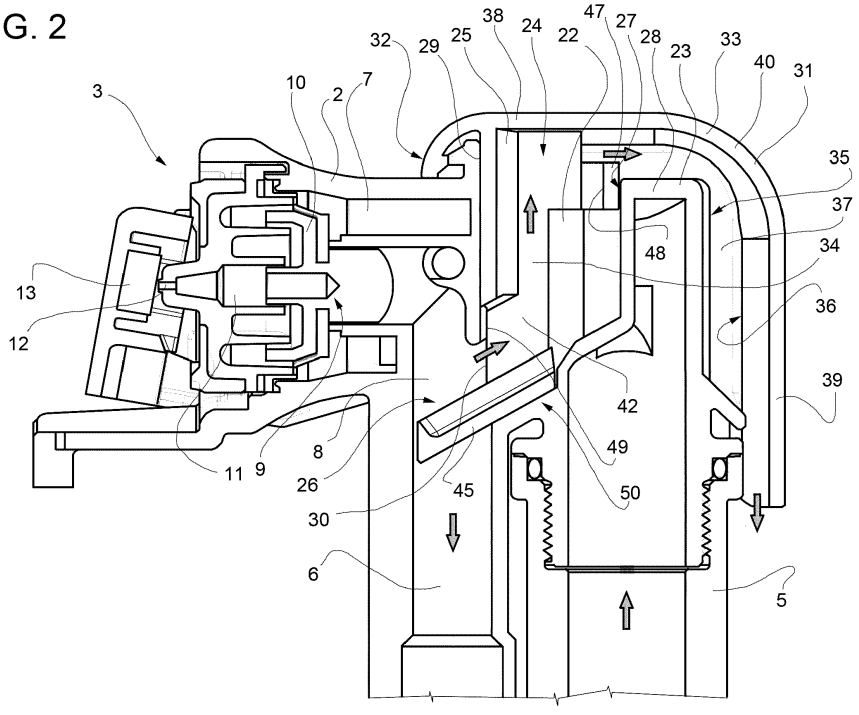
# (54) INLET VALVE FOR A FLUSH TANK

(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) for selectively opening/closing a passage (9) between the inlet conduit (7) and the outlet conduit (8); 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); a flooding chamber (22), positioned in the body (2) and communicating with the air vent (24) and with the outlet conduit (8); and a conveyor element (25) which projects inside the outlet conduit (8) and forms a narrowing (26) in the outlet conduit (8) for intercepting a water flow circulating in the outlet conduit (8) and causing the filling of the chamber (22) with water and thus preventing the entrance of air into the outlet conduit (8).

FIG. 2

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## Description

**[0001]** The present invention relates to a feeding device for a flush tank of a sanitary appliance.

**[0002]** As is known, a flush tank of a sanitary appliance, as well as being provided with a flush valve, is generally also provided with a feeding device connected to the water supply to fill the tank after flushing of the water in the sanitary appliance occurs.

**[0003]** A commonly used feeding device comprises, in general terms, an inlet pipe having a fitting for connection to the water supply, a valve assembly housed in a casing and controlled by a float, and an outlet pipe that admits the water that has flowed through the valve assembly into the tank.

**[0004]** The valve assembly may be, in particular, of the so-called counter-pressure closure or diaphragm type, in which the float operates a shutter acting on a vent nozzle of a counter-pressure chamber delimited by a diaphragm or membrane; the diaphragm separates two conduits from each other, which are connected, respectively, to the inlet pipe and the outlet pipe. When the float drops, following the flushing of water from the tank, the vent nozzle opens and the diaphragm deforms elastically under the pressure of the water and connects together the conduits, thus allowing the passage of water and the filling of the tank. When the float rises, the vent nozzle closes and the pressure in the counter-pressure chamber balances that of the incoming water and the diaphragm once again disconnects the conduits, stopping water entering into the tank.

**[0005]** In order to avoid the phenomena of backflow into the water supply in the event of malfunctions, the valve assembly must (as also set out in specific standards and regulations) be provided with an air vent, communicating with the outside of the feeding device to allow the exit of air from the feeding device and therefore to prevent potential suction of water from the tank.

**[0006]** However, the presence of the air vent causes, during the normal operation of the feeding device, the formation of a water/air mixture in the feeding device. The admission of air into the water flow circulating in the feeding device can cause turbulent flow phenomena with a consequent increase in noise during filling of the tank.

**[0007]** It is a purpose of the present invention to provide a solution to the above problem. In particular, it is a purpose of the invention to provide a feeding device that ensures compliance with anti-backflow standards, at the same time resulting in a simple, effective and reliable device and allowing a reduction of noise.

**[0008]** The present invention relates therefore to a feeding device for a flush tank as defined in essential terms in the appended claim 1 and, in its additional characteristics, in the dependent claims.

**[0009]** The feeding device according to the invention meets the criteria set out in anti-backflow standards, being effectively able to prevent backflow of water into the water supply, but at the same time avoids problems related to the admission of air into the water flow circulating in the feeding device and in particular reduces noise while the tank is filling.

**[0010]** Further characteristics and advantages of the present invention will become apparent from the following description of a non-limiting example of an embodiment with reference to the figures of the accompanying drawings, wherein:

- figure 1 is a schematic view in longitudinal section of a feeding device according to the invention;
- figure 2 is a view in enlarged scale of a detail of the feeding device of figure 1;
- figure 3 is a perspective view with parts in section and parts removed for clarity, of the detail of figure 2;
- figures 4 and 5 are a top front perspective view and a top rear perspective view of a component of the feeding device of the invention.

**[0011]** A feeding device, in particular a bottom-fed device, for a flush tank (known and, for simplicity, not shown) of a sanitary appliance, is indicated as a whole with 1 in figure 1.

**[0012]** The feeding device 1 comprises an internally hollow body 2, a valve assembly 3 housed in the body 2 and controlled by a float 4, an inlet pipe 5 arranged upstream of the valve assembly 3 and connectable to a water supply to carry a water flow to the valve assembly 3, and an outlet pipe 6 arranged downstream of the valve assembly 3 and through which the water flowing through the valve assembly 3 is admitted into the tank.

**[0013]** The valve assembly 3 is a counter-pressure valve assembly that is substantially known per se.

**[0014]** In summary, and with reference also to figure 2, the valve assembly 3 comprises an inlet conduit 7 connected to the inlet pipe 5; an outlet conduit 8 connected to the outlet pipe 6; an internal connecting passage 9 connecting the inlet conduit 7 and the outlet conduit 8; an elastically deformable or movable disc-shaped diaphragm 10 which selectively closes off the passage 9; and a counter-pressure chamber 11 delimited by the diaphragm 10 and provided with a vent nozzle 12 which connects the counter-pressure chamber 11 with the outside of the body 2 and which is closed by a movable shutter 13 operated by the float 4.

**[0015]** When the nozzle 12 is closed by the shutter 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 counter-pressure chamber 11 and the water present in the inlet conduit 7 is unable to deform or move the diaphragm 10.

**[0016]** When the nozzle 12 opens, as a result of a downward movement of the float 4 resulting from a lowering of the water level in the tank (i.e. when the water is flushed from the tank), the water pressure in the inlet conduit 7 exceeds the pressure in the counter-pressure chamber 11 and the diaphragm 10 elastically deforms or

moves, opening the passage 9 and allowing the water to pass from the inlet conduit 7 to the outlet conduit 8 and from here, through the outlet pipe 6, to the tank.

**[0017]** The float 4 is fitted so that it is axially slidable on a guide element 15 located on the outside of the body 2 and is mechanically connected, for example by means of a linkage 16, to the shutter 13 cooperating with the nozzle 12 so as to control operation of the valve assembly 3.

**[0018]** In the non-limiting example illustrated, the inlet pipe 5 and the outlet pipe 6 are substantially straight and parallel and substantially vertical in use, both extending downwards from the body 2 parallel to a longitudinal axis A, vertical in use, of the feeding device 1.

**[0019]** It is understood that there are other possible configurations: in particular, the inlet pipe 5 can extend laterally from the body 2, rather than downwards.

**[0020]** In the example shown, the inlet pipe 5 is provided with an end connector 17 which serves to connect it to an external pipe, and fastening means 18 for mechanically securing the feeding device 1 to the tank.

**[0021]** The outlet pipe 6 is placed beside the inlet pipe 5 and carries the guide element 15 for the float 4.

**[0022]** Also with reference to figure 3, the feeding device 1 comprises an internal flooding chamber 22, arranged in the body 2 at a top end 23 of the feeding device 1, i.e. of the body 2; an air vent 24 formed in the body 2 and communicating with the outside of the body 2 and the outlet conduit 8; and a conveyor element 25 housed at least partly in the chamber 22 and extending inside the outlet conduit 8, where it intercepts a water flow circulating in the outlet conduit 8 and forms a narrowing 26 suitable to cause the chamber 22 to be filled with water and thus prevent the admission of air into the outlet conduit 8 through the air vent 24, in effect closing the air vent 24 with a water zone.

**[0023]** The chamber 22 communicates with the outside of the body 2 through the air vent 24. In the non-limiting example illustrated, the air vent 24 is formed inside an external opening 27 which passes through a top wall 28 of the body 2 and is delimited by a peripheral edge 29. Inside the body 2, the chamber 22 communicates with the outlet conduit 8 through a lateral branch passage 30, formed in a lateral wall of the outlet conduit 8.

**[0024]** The chamber 22 defines a critical zone in which, in the known feeding devices similar to that described here, the formation of air/water mixtures may occur.

**[0025]** Precisely in order to avoid the formation of air/water mixtures and consequent noise problems, the feeding device 1 comprises the conveyor element 25, shaped in such a way as to intercept the water flow circulating in the feeding device 1 and in particular in the outlet conduit 8 and to restrict the passage section (cross-section) of the outlet conduit 8 so as to convey water into the chamber 22 and completely flood (fill with water), the chamber 22, thus creating a water zone that closes the air vent 24.

**[0026]** Advantageously, as also shown in figures 4 and 5, the conveyor element 25 consists of a piece 31, preferably monolithic and made of a substantially rigid polymeric material, fitted by means of a coupling 32, in particular a snap-on coupling, on the body 2 at the end 23.

**[0027]** The conveyor element 25 comprises an outer part 33, positioned outside the body 2 and attached to the body 2 by the coupling 32; and an inner part 34, which protrudes from the part 33 and is housed inside the body 2 and more precisely in the chamber 22.

**[0028]** The outer part 33 is substantially elbow-shaped and extends along an outer surface 35 of the body 2; the part 33 has an inner lateral surface 36, facing the outer surface 35 of the body 2 and having a concave cross-section. The outer surface 35 of the body 2 and the lateral surface 36 of the conveyor element 25 delimit an outer channel 37.

**[0029]** In particular, the part 33 has a first portion 38 positioned above the opening 27 and the air vent 24, and substantially horizontal; and a second portion 39 substantially vertical and orthogonal to the first portion 38, connected to the first portion 38 by a curved connecting portion 40.

**[0030]** The inner part 34 extends through the opening 27 into the chamber 22 and comprises: an auxiliary pipe 42, which extends downwards from the part 33 and precisely from the portion 38 and is joined to the portion 38 by means of an upper stem end 43; and a baffle 45 which extends from a lower free end 46, opposite to the end 43 of the auxiliary pipe 42.

**[0031]** The auxiliary pipe 42 is preferably provided with a radially outer collar 47, placed inside the opening 27 in contact with the edge 29.

**[0032]** The auxiliary tube 42 is provided at the end 43 with a first opening 48 communicating with the outside of the body 2 and facing the channel 37; and at the end 46 with a second lateral opening 49 adjacent to the branch passage 30 and communicating with the branch passage 30.

**[0033]** In the non-limiting example illustrated, the opening 48 defines the air vent 24; in any case, the opening 48 communicates with the air vent 24; the air vent 24 communicates, via the auxiliary tube 42, with the outlet conduit 8.

**[0034]** The baffle 45 extends from the end 46 of the auxiliary tube 42 under the opening 49 and extends through the branch passage 30 and transversely inside the outlet conduit 8; the baffle 45 is preferably inclined with respect to the auxiliary tube 42 and the outlet conduit 8 and extends obliquely downwards from the end 46 of the auxiliary tube 42 in the outlet conduit 8.

**[0035]** The baffle 45 is shaped and dimensioned so as to form the narrowing 26 in the outlet conduit, i.e. to restrict the passage section (cross-section) of the outlet conduit 8 without fully occluding the outlet conduit 8, leaving a free passage space 50 in the outlet conduit 8.

**[0036]** In use, after a flushing of the water contained in the tank, the float 4 opens the nozzle 12 and the supply water pressure in the inlet conduit 7 deforms the dia-

phragm 10, opening the passage 9; the water thus flows from the inlet conduit 7 into the outlet conduit 8.

**[0037]** The water flow circulating in the outlet conduit 8 is intercepted by the baffle 45 which narrows the passage section of the outlet conduit 8 forming the narrowing 26.

**[0038]** Accordingly, while part of the water passes through the free passage space 50 and flows into the outlet conduit 8 and then into the outlet pipe 6, other water accumulates over the baffle 45, filling the area of the outlet conduit 8 above the baffle 45 and flooding the chamber 22, i.e. the area of possible air mixing. In this way, air is prevented from mixing with the water flowing into the outlet conduit 8 and the outlet pipe 6.

**[0039]** The water that accumulates on the baffle 45 enters through the branch passage 30 and the opening 49 in the auxiliary pipe 42, flooding (completely filling) the chamber 22 and closing the air vent 24 with a water zone.

**[0040]** Once the chamber 22 is flooded (filled), the water flows out of the opening 48, i.e. via the air vent 24, and flows into the outer channel 37, always ending up in the tank.

**[0041]** When the tank 2 has completed filling, the float 4 closes the nozzle 12, stopping the inflow of water.

**[0042]** It is clear then that the feeding device described and illustrated may be subject to many 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); 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); the feeding device (1) being **characterised by** comprising a flooding chamber (22), positioned in the body (2) and communicating with the air vent (24) and with the outlet conduit (8); and a conveyor element (25) which projects inside the outlet conduit (8) and forms a narrowing (26) in the outlet conduit (8) for intercepting a water flow circulating in the outlet conduit (8) and causing the filling of the chamber (22) with water and thus preventing the entrance of air into the outlet conduit (8).

2. A feeding device according to claim 1, wherein the conveyor element (25) is shaped so as to cause the filling of the chamber (22) with water up to the air vent (24), closing the air vent (24) with a water zone.

3. A feeding device according to claim 1 or 2, wherein the chamber (22) is positioned in the body (2) at a top end (23) of the feeding device (1) and the air vent (24) is formed in the body (2) through a top wall (28) of the body (2).

4. A feeding device according to one of the preceding claims, wherein the conveyor element (25) comprises a baffle (45) which extends transversally inside the outlet conduit (8) through a lateral branch passage (30) formed in a lateral wall of the outlet conduit (8).

5. A feeding device according to claim 4, wherein the baffle (45) is shaped so as to form the narrowing (26) in the outlet conduit (8), i.e. to narrow the passage section of the outlet conduit (8).

6. A feeding device according to claim 4 or 5, wherein the baffle (45) delimits a free passage space (50) in the outlet conduit (8).

7. A feeding device according to one of claims 4 to 6, wherein the baffle (45) is inclined with respect to the outlet conduit (8) and extends obliquely downwards in the outlet conduit (8).

8. A feeding device according to one of the preceding claims, wherein the conveyor element (25) comprises an auxiliary tube (42), which projects inside the body (2) in the chamber (22) and connects the air vent (24) with the outlet conduit (8).

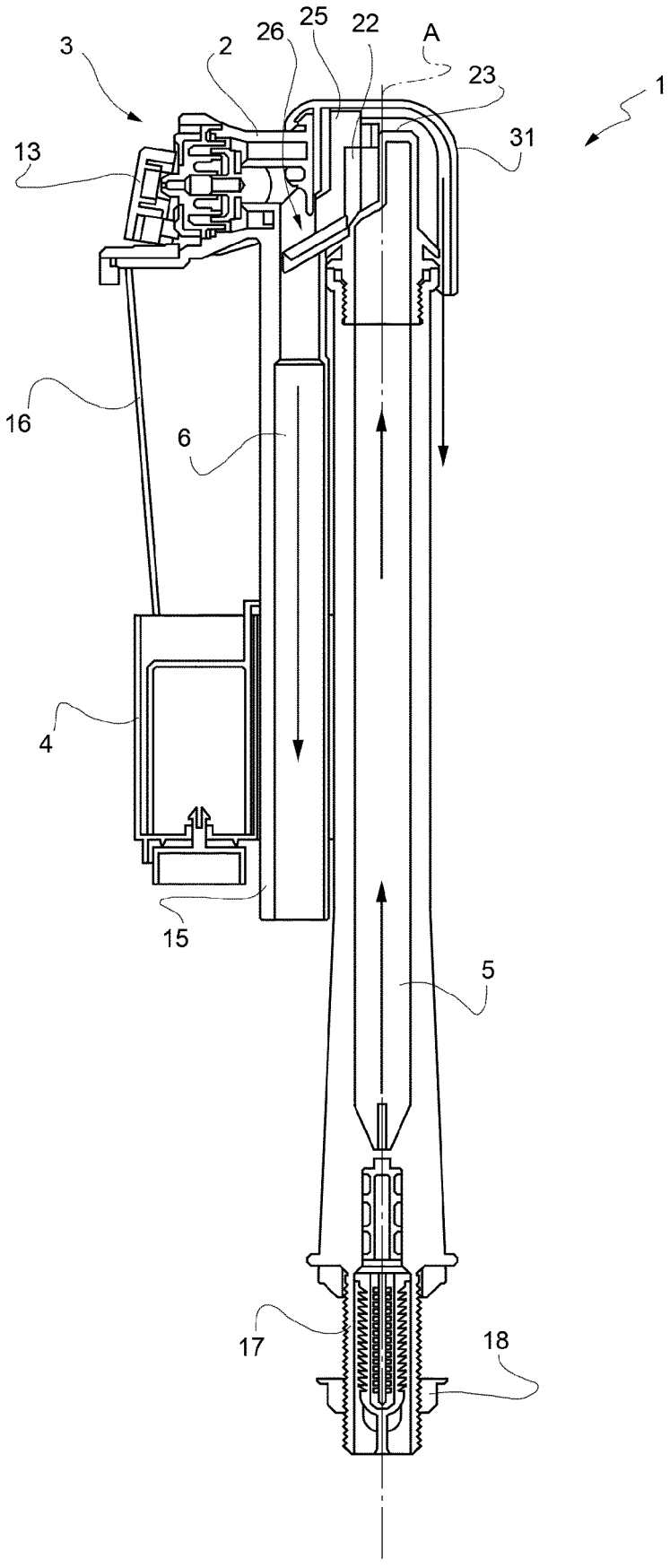
9. A feeding device according to one of the preceding claims, wherein the conveyor element (25) comprises an outer part (33), positioned outside the body (2) and having an inner lateral surface (36) facing an outer surface (35) of the body (2) and defining, together with the outer surface (35) of the body (2), an outer channel (37) communicating with the air vent (24).

10. A feeding device according to one of the preceding claims, wherein the conveyor element (25) consists of a piece (31), preferably monolithic, fitted to the body (2) by means of a snap-on coupling (32).

11. A feeding device according to one of the preceding claims, wherein the valve assembly (3) is a counter-pressure valve assembly.

12. A feeding device according to one of the preceding claims, wherein the valve assembly (3) is operated by a float (4).

FIG. 1



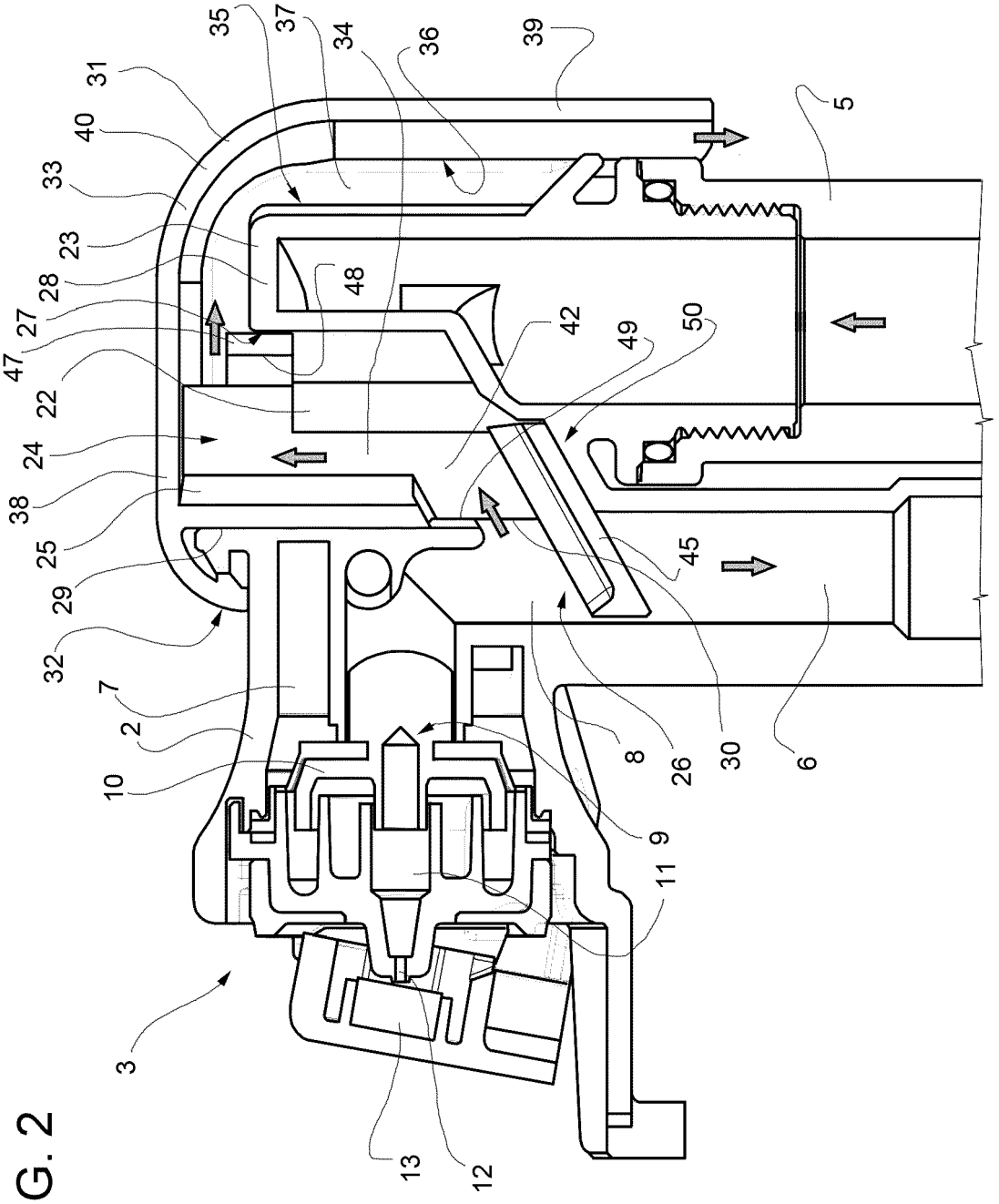

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FIG. 2

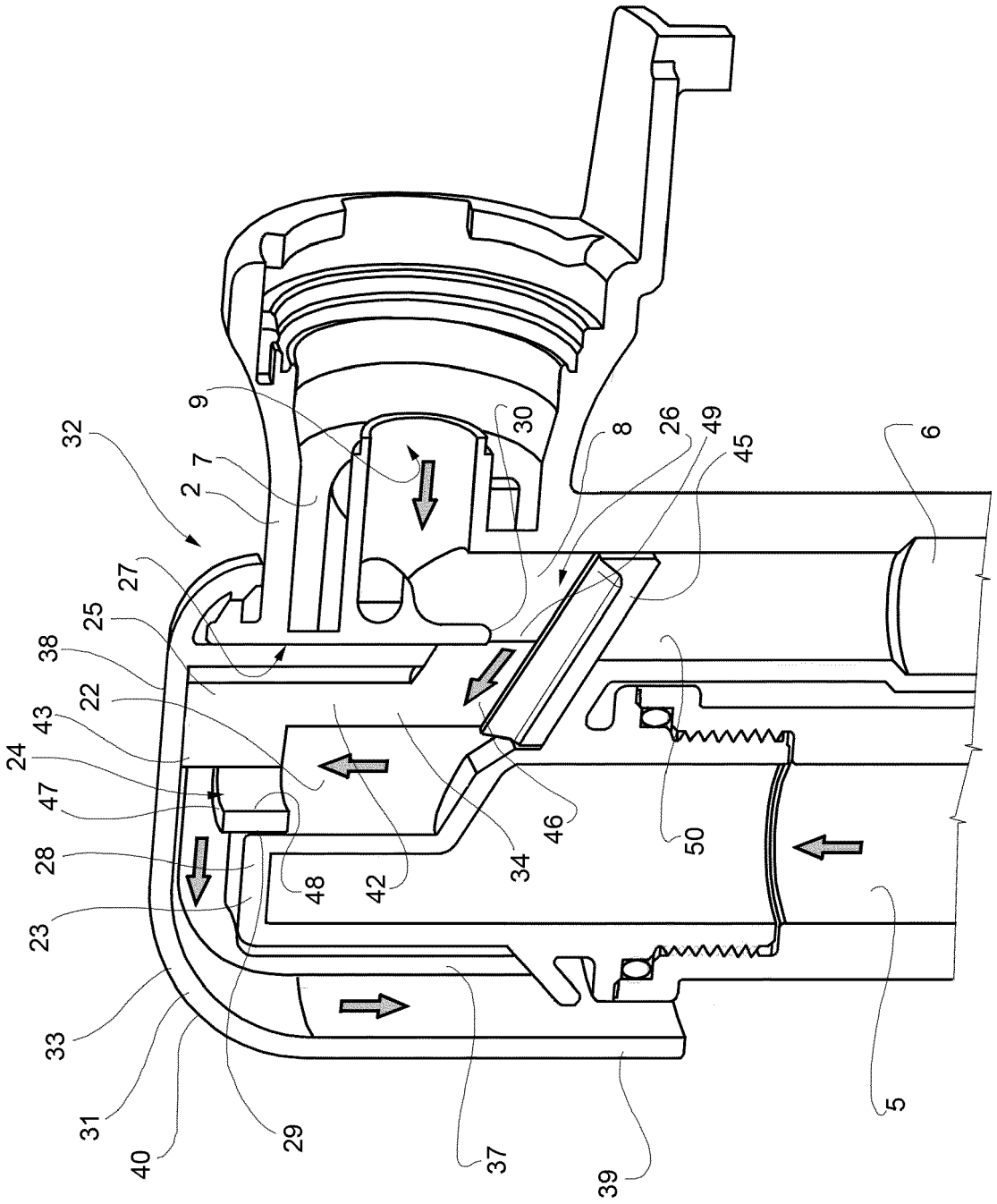
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FIG. 3

FIG. 5

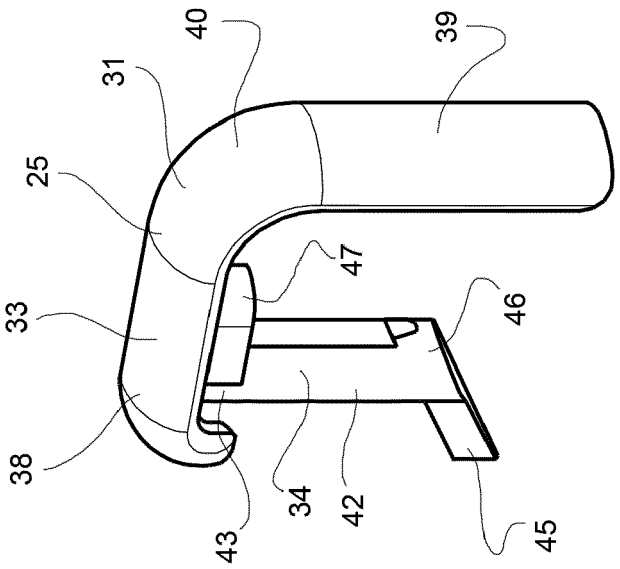
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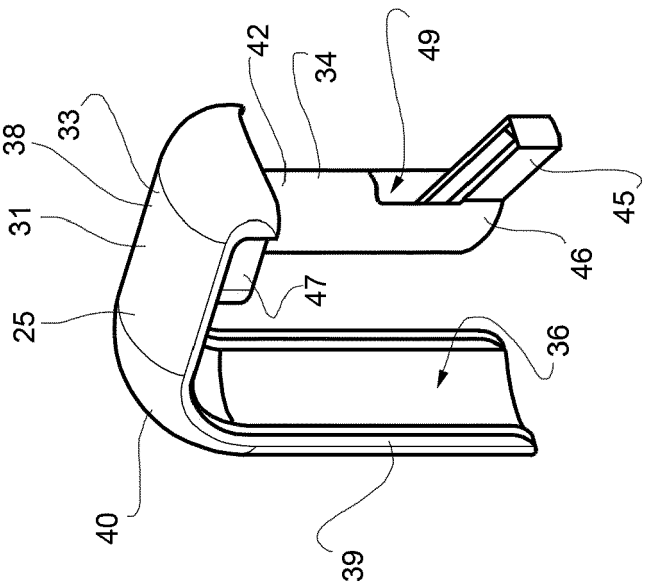
FIG. 4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# EUROPEAN SEARCH REPORT

Application Number
EP 16 19 0183

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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 | 2 February 2017 | Geisenhofer, Michael |

CATEGORY OF CITED DOCUMENTS

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