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(54) DISHWASHER COMPRISING A THREE-WAY VALVE

GESCHIRRSPÜLMASCHINE MIT DREIWEGEVENTIL

LAVE-VAISSELLE COMPRENANT UN ROBINET À TROIS VOIES

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Description

[0001] The present invention relates to a dishwasher comprising a three-way valve suitable for use in the dishwasher which has a water softening unit for softening tap water and a salt container for regenerating an ion exchange material, in particular a resin of the softening unit.

[0002] Tap water for use in the washers, for instance the dishwashers, the laundry washing machines, etc. is usually relatively hard. Hard water adversely affects the washing process. For instance if the dishes are washed with hard water, white precipitates are formed on the dishes so that they appear cloudy in a dishwasher. In addition, hard water causes scale formation and damages the dishwasher. Therefore, it is generally important to use soft water in dishwashers.

[0003] Several methods have been developed for softening tap water. In a commonly known technique, an ion exchange material, in particular a resin is utilized to absorb calcium and magnesium ions in the tap water. It is customary to provide dishwashers with built-in water softening units which use resin for softening tap water. However, the softening capacity of a resin is limited. Therefore, the resin must be replaced from time to time. Alternatively, the softening capacity of the resin can be restored by treating the resin with brine. This treatment is also referred to as "regeneration". Dishwashers in which the resin can be regenerated have a refillable salt container for supplying brine to the softening unit. Such dishwasher are controlled to intermittently perform a regeneration process. After the resin has been regenerated, the regeneration water inside the softening unit becomes highly corrosive. Thus, the regeneration water must be prevented from contacting an inner surface of the washing tub of the dishwasher. Therefore, the regeneration water which has been output by the softening unit at the end of a regeneration process into a sump of the washing tub must be immediately drained to an outside of the dishwasher by a pump without being circulated within the washing tub. EP 0 741 991 A1 discloses a dishwasher which has a resin container for storing resin to reduce the degree of water hardness. The dishwasher also includes a salt container for storing salt which is required for the regeneration of the resin. The resin container is fluidly connected with the washing tub by a pipe which opens into a sump that is located on the bottom of the washing tub. The sump is fluidly connected to a discharge line for drainage and two sprayer arms.

[0004] GB1462952 A discloses a dishwasher comprising a valve.

[0005] An objective of the present invention is to provide a cost-effective and operationally reliable valve for use in a dishwasher for the purpose of selectively feeding the regeneration water and the softened water which are output by a water softening unit to separate lines. Another objective of the present invention is to provide a dishwasher in which the valve of the present invention is specifically used for protecting the washing tub from the corrosive effect of the regeneration water which is output by a softening unit.

[0006] These objectives have been achieved by the dishwasher according to the present invention as defined in claim 1. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.

[0007] The three-way valve of the present invention comprises a valve chamber which includes an inlet port, a first outlet port and a second outlet port. The inlet port is suitable for receiving softened water or regeneration water delivered from a water softening unit of a dishwasher. The first outlet port and the second outlet port are both in fluid communication with the inlet port. The first outlet port is arranged at a first position. The second outlet port is arranged at a second position which is higher than the first position. The three-way valve of the present invention further comprises a valve member which is provided in form of a float. The valve member is movably arranged within the valve chamber between the first position and the second position. At the first position, the first outlet port is entirely obstructed by the valve member and the second outlet port is open. At the second position, the first outlet port is open and the second outlet port is entirely obstructed by the valve member. The mass and the volume of the valve member are configured such that when the valve chamber is filled with softened water, the gravity force which acts on the valve member exceeds the buoyancy force which acts on the valve member so that the valve member is held at the first position. The mass and the volume of the valve member are also configured such when the valve chamber is filled with the regeneration water, the buoyancy force which acts on the valve member exceeds the gravity force which acts on the valve member so that the valve member is held at the second position. Thereby, the regeneration water which has been output by the softening unit can be conducted to the first outlet port. Also, the softened water which has been output by the softening unit can be conducted to the second outlet port.

[0008] In an embodiment, the valve member is movably supported by a guide means which is arranged inside the valve chamber. In this embodiment, the valve member is guided upwards through the resultant action of gravity and buoyancy when the valve chamber is filled with the regeneration water. The valve member is guided downwards through the resultant action of gravity and buoyancy when the valve chamber is filled with softened water.

[0009] In an alternative embodiment, the walls of the valve chamber configure a guide which guides the valve member upwards or downwards. In this embodiment the valve member has a shape which fits between the walls of chamber. A small clearance is provided between the walls of the valve chamber and the valve member. Thereby, the valve member can smoothly move upwards or downwards like a shuttle between the outlet ports.

[0010] In another embodiment, the valve chamber has

two subchamber which are maintained in fluid communication. In this embodiment, the inlet port opens into a first subchamber. The outlet ports branch off from the second subchamber into which the valve member is movably arranged. In this embodiment, the first subchamber and the second subchamber function like a floodgate. Thereby, a response of the valve member to the incoming water is improved.

[0011] In another embodiment, each of the outlet ports has a seat. In this embodiment, the valve member has a sealing means which is configured to abut against a respective seat so as to inhibit the flow through the respective outlet port. The seats and the sealing member have a matching form. Thereby, a leak-tight engagement between the valve member and the respective outlet ports is attained.

[0012] In another embodiment, the valve member is provided in form of a block-shaped float. The sealing means is configured by two seal members which are respectively arranged on an upper surface and a lower surface of the block-shaped float.

[0013] In another alternative embodiment, the valve member is provided in form of a ball-shaped float. The sealing means is configured by an outer surface of the ball-shaped float. In this embodiment, the ball-shaped float easily abuts against the outlet ports which are respectively formed at the deepest and the highest locations of the valve chamber.

[0014] The dishwasher of the present invention includes a softening unit for softening tap water, and a salt container for regenerating an ion exchange material, in particular a resin within the softening unit. The dishwasher of the present invention further includes the three-way valve of the present invention. The three-way valve is arranged on a downstream side of the water softening unit to selectively conduct the regeneration water and the softened water which are output by the softening unit to different lines. The three-way valve specifically conducts the regeneration water directly into a sump of the dishwasher to be drained off outside the dishwasher by a pump without being circulated within a washing tub. Thereby, the washing tub is protected from the corrosive effects of the regeneration water. The dishwasher of the present invention further includes a water inlet for delivering the softened water into the washing tub. The water inlet is arranged on a wall of the washing tab at a location above the sump. The three-way valve specifically conducts the softened water to the water inlet. Thereby, softened water can be directly delivered into the washing tub without being mixed with any residual water in the sump.

[0015] In an embodiment, the water inlet has a nozzle which sprays the softened water towards a detergent dispenser. Thereby, a content of the detergent dispenser can be completely flushed into the washing tub. Consequently, a decrease in the cleaning performance is avoided. Moreover, a risk that any residual detergent in the detergent dispenser mixes later on with the rinsing water is also avoided. Consequently, the rinsing performance is improved.

[0016] The three-way valve of the present invention operates through the action of gravity and buoyancy. Therefore, the three-way valve is trouble-free and easy-to-install in comparison to a conventional valve system which is electrically driven by additional control equipment. The three-way valve of the present invention enables feeding the regeneration water and the softened water output by the softening unit to different lines. Thereby, the dishwasher can be protected from the corrosive effects of the regeneration water. In addition the softened water can be separately utilized at other stations in the dishwasher without being initially passed through the sump. Thereby, the dishes are treated hygienically.

[0017] The three-way valve of the present invention is also intended for use in a clothes washer.

[0018] Additional advantages of the three-way valve and the dishwasher according to the present invention will become apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

Figure 1 - is a schematic perspective view of a three-way valve as the valve member is held in the presence of softened water inside the valve chamber at a first position according to an embodiment of the present invention.

Figure 2 - is a schematic perspective view of the three-way valve as the valve member is moving upwards according to an embodiment of the present invention.

Figure 3 - is a schematic perspective view of the three-way valve as the valve member is held in the presence of regeneration water inside the valve chamber at a second position according to an embodiment of the present invention.

Figure 4 - is a schematic front view of the three-way valve shown in Fig. 1.

Figure 5 - is a schematic front view of the three-way valve shown in Fig. 3.

Figure 6 - is a schematic side view of a dishwasher which has the three-way valve according to an embodiment of the present invention.

Figure 7 - is a schematic perspective view of the dishwasher which has the three-way valve according to an embodiment of the present invention.

Figure 8 - is a schematic perspective view of a nozzle, a retainer and a hose of the dishwasher shown in Figs. 6 and 7.

Figure 9 - is a schematic rear view of the nozzle shown in Fig. 8.

Figure 10 - is a schematic perspective rear view of the nozzle shown in Fig. 9.

Figure 11 - is a schematic rear view of the retainer and the hose shown in Fig. 8.

Figure 12 - is a schematic front view of the retainer and the hose shown in Fig. 11.

Figure 13 - is a schematic perspective rear view of the retainer and the hose shown in Fig. 12.
Figure 14 - is a schematic partial bottom view of the dishwasher shown in Figs. 6 and 7.

[0019] The reference signs appearing on the drawings relate to the following technical features.

1. Valve
2. Dishwasher
3. Valve chamber
4. Inlet port
5. Softening unit
6. First outlet port
7. Second outlet port
8. Valve member
9. Partition wall
10. First subchamber
11. Second subchamber
12. Aperture
13. Lateral wall
14. Guide
15. First seat
16. Second seat
17. Block
18. Upper surface
19. Lower surface
20. Upper seal
21. Lower seal
22. Hollow portion
23. Tub
24. Door
25. Dispenser
26. Sump
27. Outlet
28. Water inlet
29. Nozzle
30. Side wall

31a. Upper rack
31b. Lower rack

32. Hub
33. First opening
34. Second opening
35. Channel
36. Retainer
37. Metering unit
38. Receptacle
39. Hose
40. Control unit

[0020] The three-way valve (1) is suitable for use in a washer, in particular a dishwasher (2) (Figs. 1 to 5 and Fig. 14).

[0021] The three-way valve (1) of the present invention includes a valve chamber (3) which has an inlet port (4), a first outlet port (6) and a second outlet port (7) (Figs.1 to 5 and Fig. 14). The inlet port (4) is suitable for receiving softened water or regeneration water which is delivered from a water softening unit (5) of the dishwasher (2) (Fig. 14). The first outlet port (6) and a second outlet port (7) are in fluid communication with the inlet port (4) (Figs. 1 to 5). The first outlet port (6) is arranged at a first position. The second outlet port (7) is arrange at a second position which is higher than the first position (Figs. 1 to 5). The three-way valve (1) of the present invention further includes a valve member (8) which is provided inform of a float. The valve member (8) is movably arranged within the valve chamber (3) between the first position and the second position (Figs. 1 to 5). At the first position, the first outlet port (6) is closed by the valve member (8) and the second outlet port (7) is open (Figs. 1 and 4). At the second position, the first outlet port (6) is open and the second outlet port (7) is closed by the valve member (8) (Figs. 3 and 5).

[0022] The mass and the volume of the valve member (8), i.e., the float are configured such that when the valve chamber (3) is filled with softened water, the gravity force (G) that acts on the valve member (8) exceeds the buoyancy force (B) that acts on the valve member (8) so that the valve member (8) is held at the first position (Figs. 1 and 4). The mass and the volume of the valve member (8), i.e., the float are further configured such that when the valve chamber (3) is filled with regeneration water, the buoyancy force (B) that acts on the valve member (8) exceeds the gravity force (G) that acts on the valve member (8) so that the valve member (8) is held at the second position (Figs. 3 and 5).

[0023] According to the present invention the average density of the valve member (8) has a value which is between the density of soft water and the density of the regeneration water. The regeneration water has a relatively high salt concentration in comparison to the softened water. The mass and volume of the valve member (8) can be adjusted such that the above conditions are satisfied. Thereby, the regeneration water and the soft water are respectively conducted to the first outlet port (6) and the second outlet port (7).

[0024] In an embodiment, the valve member (8) is movably supported by a guide means (not shown) which is arranged inside the valve chamber (3). In this embodiment, the valve member (8) is guided by the guide means upwards or downwards under the action of gravity and buoyancy.

[0025] In another embodiment, the three-way valve (1) further includes a partition wall (9) which partitions the valve chamber (3) into two subchambers, namely a first subchamber (10) and a second subchamber (11) (Figs. 1 to 5). The first subchamber (10) and the second subchamber (11) are maintained in fluid communication through one or more than one aperture (12) which is formed into the partition wall (9) (Figs. 1 to 5). In this embodiment, the inlet port (4) opens into the first subchamber (10) (Figs. 1 to 5). In addition, the first outlet port (6) and the second outlet port (7) branch off from the second subchamber (11) (Figs. 1 to 5). In this embodiment, the valve member (8) is movably arranged within

the second subchamber (11) (Figs. 1 to 15). The partition wall (9) prevents the water which streams into the valve chamber (8) from disturbing the valve member (8). The first and second subchambers (10, 11) function like a floodgate. Thereby, a response of the valve member (8) to the water flowing into the valve chamber (3) is improved. In addition, a smooth operation of the valve member (8) is attained.

[0026] In another embodiment, the aforementioned guide means (not shown) is arranged inside the second subchamber (11). In this embodiment, the valve member (8) is guided by the guide means upwards or downwards within the second subchamber (11) under the action of gravity and buoyancy.

[0027] In an alternative embodiment, the partition wall (9) opposes a lateral wall (13) of the second subchamber (11) (Figs. 1 to 5). In this embodiment, the valve member (8) is placed between the partition wall (9) and said lateral wall (13) with a little clearance (Figs.1 to 5). In this embodiment, the partition wall (9) and the lateral wall (13) of the second subchamber (11) together configure a guide (14) in which the valve member (8) moves upwards or downwards under the action of gravity and buoyancy (Figs. 1 to 5).

[0028] In another embodiment, the volume of the first subchamber (10) is greater than the volume of the second subchamber (11) (Figs. 1 to 5). Thereby, an operation of the valve member (8) is further regulated.

[0029] In another embodiment, the first outlet port (6) is formed on a bottom of the second subchamber (11) (Figs. 1 to 5). In addition, the second outlet port (7) is formed on a ceiling of the second subchamber (11) (Figs. 1 to5). In this embodiment, the first outlet port (6) and the second outlet port (7) are arranged to oppose each other. The valve member (8) rectilinearly moves up or down like a shuttle between the first position and the second position in accordance with a density of the water inside the valve chamber (3).

[0030] In another embodiment, the aperture (12) is closer to a bottom of the valve chamber (8) than a ceiling of valve chamber (8) (Fig. 1 to 5). Thereby, a fraction of the water which flows into the first subchamber (10) immediately streams into the second subchamber (11). Thereby, a response of the valve member (8) to the water flowing into the valve chamber (3) is further improved.

[0031] In another embodiment, the cross section of the aperture (12) has a surface area which is substantially as large as each of the inner cross sections of the first outlet port (6) and the second outlet port (7) (Figs. 1 to 5). Thereby, a flow from the first subchamber (10) into the second subchamber (11) is further regulated.

[0032] In another embodiment, the inlet port (4) is formed on a bottom of the first subchamber (10) (Figs. 1 to 5).

[0033] In another embodiment, the first subchamber (10) and the second subchamber (11) have rectangular cross-sections within a plane which is perpendicular to a direction along which the valve member (8) moves upwards or downwards (Figs. 1 to 5).

[0034] In another embodiment, the first outlet port (6) and the second outlet port (6) respectively have a first seat (15) and a second seat (16) (Figs. 1 to 5). In this embodiment, the valve member (8) has a sealing means which is configured to abut against the first seat (15) when the valve member (8) is held at the first position. The sealing means abuts against the second seat (16) when the valve member (8) is held at the second position. Thereby a leak-tight engagement between the valve member (8) and the respective one of the first outlet port (6) and the second outlet port (7) is attained.

[0035] In another embodiment, the valve member (8) is a block (17) which has an upper surface (18) and a lower surface (19) (Figs. 1 to 5). The block (17) has the shape of a rectangular prism, in particular a cubic shape. In this embodiment, the sealing means is configured by an upper seal member (20) and a lower seal member (21) which are respectively arranged on the upper surface (19) and the lower surface (20) of the block (17) (Figs. 1 to 5).

[0036] In another embodiment, each of the upper seal member (20) and the lower seal member (21) has the form of a truncated cone (Figs. 1 to 5).

[0037] In another embodiment, the inner surfaces of the first seat (15) and the second seat (16) each has the form of a truncated cone (Figs. 1 to 5).

[0038] In another embodiment, the three-way valve (1) has a sensing unit (not shown) which is configured to detect whether the valve member (8) is at the first position or the second position. The sensing unit outputs a respective signal which is indicative of the position of the valve member (8). In this embodiment, the signal is utilized to trigger an analysis unit (not shown) to respectively analyze the saltiness and the softness of the regeneration water and the softened water output by the three-way valve (1), and to judge whether the regeneration process/softening process has been successful.

[0039] In another embodiment, the signal which is output by the sensing unit is utilized to monitor whether the three-way valve (1) functions properly.

[0040] In another embodiment, the sensing unit is configured by one or more than one reed relay.

[0041] In another embodiment, the block (17) has a water permeable hollow portion (22) (Figs. 1 to 5). Thereby, the incoming water also flow through the valve member (8) as it fills the valve chamber (3).

[0042] In an another alternative embodiment, the valve member (8) is a ball (not shown). In this embodiment, the sealing means is configured by the outer surface of the ball-shaped valve member (8).

[0043] In another embodiment, the valve chamber (3) and valve member (8) are made from a plastic material. The average density of the valve member (3) has been adjusted by using counter weights attached to or built into the float. The three-way valve (1) is due to its constitution and working principle practically maintenance-free.

[0044] The dishwasher (2) includes a washing tub (23) for receiving dishes to be cleaned, a door (24) for opening/closing the washing tub (23), a detergent dispenser (25) for dispensing chemical substances such as detergent softener and the like (Figs. 6 and 7). The detergent dispenser (25) is arranged on an inner side of the door (24). The dishwasher (2) further includes a sump (26) which is arranged on a bottom of the washing tub (23) for collecting water delivered into the washing tub (23), a softening unit (5) for softening tap water and a salt container (not shown) for supplying brine to the softening unit (5) for regenerating an ion exchange material, in particular a resin within the softening unit (5) (Fig. 14). The softening unit (5) has an inlet (not shown) and an outlet (27). The inlet of the softening unit (5) is configured to receive tap water or brine. The outlet (27) is configured to output softened water or regeneration water to an inlet port (4) of the three-way valve (1) (Fig. 14).

[0045] The dishwasher (2) of the present invention, further includes a three-way valve (1) as defined in any one of the above embodiments. In the dishwasher (2) of the present invention, the inlet port (4) is fluidly connected to the outlet (27) of the softening unit (5). The first outlet port (6) opens directly into the sump (26). The second outlet port (7) is fluidly connected to a water inlet (28) via a hose (39). The water inlet (28) is for delivering the softened water which is output by the softening unit (5) into the washing tub (23) (Figs. 6 and 7). The water inlet (28) is arranged on a wall of the washing tab (23) at a location above the sump (26) (Fig. 6). Thereby, soft water can be delivered into the washing tub (3) without being mixed with any residual water in the sump (26). By virtue of the three-way valve (1), the corrosive regeneration water is directly delivered into the sump (2) and subsequently drained off outside the dishwasher (2) by a pump (not shown) without being circulated within the washing tub (3). Consequently, the washing tub (3) is protected from the corrosive effects of the regeneration water.

[0046] In another embodiment, the water inlet (28) has a nozzle (29) (Figs. 6 and 7). In this embodiment, the water inlet (28) is arranged on a side wall (30) of the washing tub (23). The nozzle (29) is configured to spray the water received by the water inlet (28) towards the detergent dispenser (25). Thereby, a content of the detergent dispenser (25) can be completely flushed into the washing tub (3). Consequently, a decrease in the washing performance is avoided. Moreover, a risk that any residual detergent in the detergent dispenser (25) mixes with the rinsing water is avoided. Consequently, the rinsing performance is improved.

[0047] In another embodiment, the nozzle (29) is arranged on a front side wall (30) of the washing tub (23) (Figs. 6 and 7). In this embodiment, the nozzle (29) is located in the proximity of the detergent dispenser (25). Thereby, the risk of being obstructed by any items in the washing tub (3) is substantially avoided. In addition, the detergent can be entirely flushed into the washing tub (3) with less amount of water.

[0048] In another embodiment, the dishwasher (2) includes at least two racks (31). In this embodiment, the water inlet (28) is arranged on side wall of the washing tub (31) at a height which is between the upper rack (31a) and the lower rack (31b). Thereby the nozzle is prevented from being obstructed by any dishes placed in the racks (31a, 31b) (Figs. 6 and 7).

[0049] In another embodiment, the nozzle (29) comprises a hub (32) for receiving the softened water from the three-way valve (1) (Figs. 8 and 9). The hub (32) has a first opening (33) which is arranged on an inner side thereof and a second opening (34) which is arranged on an outer side thereof (Figs. 8 and 9). The first opening (33) and the second opening (34) are fluidly connected by a channel (35) which is configured to eject the softened water towards detergent dispenser (25) (Figs. 6 and 9). In this embodiment, the hub (32) has a substantially convex shape (Fig. 8) that projects into the washing tub (3). In addition, the cross sectional area of the second opening (34) is smaller than the cross sectional area of the first opening (33). Thereby, the water can be jetted towards the detergent dispenser (25).

[0050] In another embodiment, the dishwasher (2) includes a retainer (36) for mounting the nozzle to the water inlet (28) on the side wall (30). In this embodiment, The nozzle (29) is fixed by a bayonet connection to the retainer (36). A sealing member (not shown) is provided between the nozzle (29) and the retainer (36) to attain a leak-tight connection.

[0051] In another embodiment, the dishwasher (2) includes a water receptacle (38). The dishwasher (2) further includes a metering unit (37) for measuring the amount of water taken into the water receptacle (38). The water receptacle (38) is fluidly connected with the inlet of the water softening unit (5) and the salt container. The water receptacle (38) has an air break to prevent water from flowing back into the mains water supply in case of a vacuum.

[0052] In another alternative embodiment, the air-break in the water receptacle (38) has been dispensed with as the three-way valve (1) provides an air gap between the sump (26) and the mains water supply. Thereby, a size of the water receptacle (38) has been reduced and further cost-saving has been achieved.

[0053] The dishwasher (2) further includes a control unit (40) which controls an overall operation of the dishwasher (2), including an initiation/termination of the regeneration process of the resin and the water softening process (Fig. 6).

[0054] The three-way valve (1) of the present invention enables feeding the regeneration water and the softened water output by the softening unit (5) to different lines. Thereby, the dishwasher (2) can be protected from corroding. In addition the softened water can be utilized without being contaminated by the residual water in the sump (26). Thereby, a lifetime of the dishwasher (2) is increased and a washing/rinsing performance of the dishes is further enhanced.

Claims

1. A dishwasher (2) comprising a three way valve (1), the three way valve (1) comprising a valve chamber (3) including an inlet port (4) for receiving softened water or regeneration water delivered from a water softening unit (5) of the dishwasher (2), a first outlet port (6) and a second outlet port (7) which are in fluid communication with the inlet port (4), the first outlet port (6) is arranged at a first position and the second outlet port (7) is arranged at a second position which is higher than the first position, a valve member (8) provided in form of a float which is movably arranged within the valve chamber (3) between the first position and the second position, wherein at the first position, the first outlet port (6) is closed by the valve member (8) and the second outlet port (7) is open, wherein at the second position, the first outlet port (6) is open and the second outlet port (7) is closed by the valve member (8), wherein the mass and the volume of the valve member (8) is configured such that when the valve chamber (3) is filled with softened water, the gravity force (G) acting on the valve member (8) exceeds the buoyancy force (B) acting on the valve member (8) so that the valve member (8) is held at the first position, and when the valve chamber (3) is filled with regeneration water, the buoyancy force (B) acting on the valve member (8) exceeds the gravity force (G) acting on the valve member (8) so that the valve member (8) is held at the second position.

2. The dishwasher according to claim 1, **characterized in that** a partition wall (9) which partitions the valve chamber (3) into a first subchamber (10) and a second subchamber (11), wherein the first subchamber (10) and the second subchamber (11) are maintained in fluid communication through one or more than one aperture (12) formed in the partition wall (9), wherein the inlet port (4) opens into the first subchamber (10), wherein the first outlet port (6) and the second outlet port (7) branch off from the second subchamber (11), and wherein the valve member (8) is movably arranged within the second subchamber (11).

3. The dishwasher according to claim 2, **characterized in that** the partition wall (9) opposes a lateral wall (13) of the second subchamber (11), wherein the partition wall (9) and the lateral wall (13) of the second subchamber (11) configure a guide (14) in which the valve member (8) moves upwards or downwards.

4. The dishwasher according to claim 2 or 3, **characterized in that** the volume of the first subchamber (10) is greater than the volume of the second subchamber (11).

5. The dishwasher according to any one of claims 2 to 4, **characterized in that** the first outlet port (6) is formed on a bottom of the second subchamber (11) and the second outlet port (7) is formed on a ceiling of the second subchamber (11), wherein the first outlet port (6) and the second outlet port (7) are arranged to oppose each other.

6. The dishwasher according to any one of claims 2 to 5, **characterized in that** the aperture (12) is closer to a bottom of the valve chamber (8) than a ceiling of valve chamber (8).

7. The dishwasher according to any one of claims 2 to 6, **characterized in that** the inlet port (4) is formed on a bottom of the first subchamber (10).

8. The dishwasher according to any one of claims 2 to 7, **characterized in that** the first subchamber (10) and the second subchamber (11) have rectangular cross-sections within a plane which is perpendicular to a direction along which the valve member (8) moves upwards or downwards.

9. The dishwasher according to any one of claims 1 to 8, **characterized in that** the first outlet port (6) and the second outlet port (6) respectively have a first seat (15) and a second seat (16) and the valve member (8) has a sealing means which is configured to abut against the first seat (15) when the valve member (8) is held at the first position, and to abut against the second seat (16) when the valve member (8) is held at the second position.

10. The dishwasher according to claim 9, **characterized in that** the inner surfaces of the first seat (15) and the second seat (16) each has the form of a truncated cone.

11. The dishwasher according to claim 9 or 10, **characterized in that** the valve member (8) is a block (17) which has an upper surface (18) and a lower surface (19) and the sealing means is configured by an upper seal member (20) and a lower seal member (21) which are respectively arranged on the upper surface (18) and the lower surface (19).

12. The dishwasher according to any one of claims 1 to 11, **characterized in that** a sensing unit which is configured to detect whether the valve member (8) is at the first position or the second position, and to output a respective signal which is indicative of the position of the valve member (8).

13. The dishwasher according to any one of claim 9 or 10, **characterized in that** the valve member (8) is a ball, and the sealing means is configured by the outer surface of the valve member (8).

14. The dishwasher (2) according to any one of claims 1 to 13, comprising a washing tub (23) for receiving dishes to be cleaned, a door (24) for opening/closing the washing tub (23), a detergent dispenser (25) for dispensing chemical substances such as detergent softener and the like, wherein the detergent dispenser (25) is arranged on an inner side of the door (24) and a sump (26) which is arranged on a bottom of the washing tub (23) for collecting water delivered into the washing tub (23), a softening unit (5) for softening tap water, wherein the softening unit (5) includes an inlet for receiving tap water or brine and an outlet (27) for outputting softened water or regeneration water, a salt container for supplying brine to the softening unit (5) for regenerating an ion exchange material such as a resin within the softening unit (5) and the three-way valve (1), one or more than one water inlet (28) for delivering the softened water which is output by the softening unit (5) into the washing tub (23), wherein the water inlet (28) is arranged on a wall of the washing tab (23) at a location above the sump (26) and the three-way valve (1), wherein the inlet port (4) is fluidly connected to the outlet (27) of the softening unit (5), wherein the first outlet port (6) opens directly into the sump (26), and wherein the second outlet port (7) is fluidly connected to the water inlet (28).

15. The dishwasher (2) according to claim 14, **characterized in that** the water inlet (28) has a nozzle (29) and the water inlet (28) is arranged on a side wall (30) of the washing tub (23), wherein the nozzle (29) is configured to spray the water received by the water inlet (28) towards the detergent dispenser (25).

Patentansprüche

1. Geschirrspüler (2) mit einem Dreiwegeventil (1) das Dreiwegeventil (1) eine Ventilkammer (3) umfasst mit einer Einlassöffnung (4) zum Aufnehmen von enthärtetem Wasser oder Regenerationswasser, das von einer Wasserenthärtungseinheit (5) der Geschirrspüler (2) abgegeben wird, eine erste Auslassöffnung (6) und eine zweite Auslassöffnung (7) umfasst, die in Fluidverbindung mit der Einlassöffnung (4) stehen, die erste Auslassöffnung (6) an einer ersten Position angeordnet ist und die zweite Auslassöffnung (7) an einer zweiten Position angeordnet ist, die höher als die erste Position ist, ein Ventilelement (8) in Form eines Schwimmers, das innerhalb der Ventilkammer (3) zwischen der ersten Position und der zweiten Position beweglich angeordnet ist, wobei an der ersten Position die erste Auslassöffnung (6) durch das Ventilelement (8) geschlossen und die zweite Auslassöffnung (7) geöffnet ist, wobei an der zweiten Position die erste Auslassöffnung (6) offen ist und die zweite Auslassöffnung (7) durch das Ventilelement (8) geschlossen ist, wobei die Masse und das Volumen des Ventilelements (8) so gestaltet ist, dass wenn die Ventilkammer (3) mit enthärtetem Wasser gefüllt ist, die auf das Ventilelement (8) wirkende Schwerkraft (G) die auf das Ventilelement (8) wirkende Auftriebskraft (B) übersteigt, so dass das Ventilelement (8) in der ersten Position gehalten wird, und wenn die Ventilkammer (3) mit Regenerationswasser gefüllt ist, die auf das Ventilelement (8) wirkende Auftriebskraft (B) die auf das Ventilelement (8) wirkende Schwerkraft (G) übersteigt, so dass das Ventilelement (8) in der zweiten Position gehalten wird.

2. Geschirrspüler nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Trennwand (9), die die Ventilkammer (3) in eine erste Unterkammer (10) und eine zweite Unterkammer (11) trennt, wobei die erste Unterkammer (10) und die zweite Unterkammer (11) in Fluidverbindung gehalten werden durch eine oder mehrere Öffnungen (12), die in der Trennwand (9) gebildet sind, wobei die Einlassöffnung (4) in die erste Unterkammer (10) mündet, wobei die erste Auslassöffnung (6) und die zweite Auslassöffnung (7) von der zweiten Unterkammer (11) abzweigen, und wobei das Ventilelement (8) innerhalb der zweiten Unterkammer (11) beweglich angeordnet ist.

3. Geschirrspüler nach Anspruch 2, **dadurch gekennzeichnet, dass** die Trennwand (9) einer Seitenwand (13) der zweiten Unterrkammer (11) gegenüberliegt, wobei die Trennwand (9) und die Seitenwand (13) der zweiten Unterkammer (11) eine Führung (14) gestalten, in der sich das Ventilelement (8) nach oben oder unten bewegt.

4. Geschirrspüler nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** das Volumen der ersten Unterkammer (10) größer ist als das Volumen der zweiten Unterkammer (11).

5. Geschirrspüler nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** die erste Auslassöffnung (6) auf einem Boden der zweiten Unterkammer (11) und die zweite Auslassöffnung (7) auf einer Decke der zweiten Unterkammer (11) gebildet ist, wobei die erste Auslassöffnung (6) und die zweite Auslassöffnung (7) gegeneinander angeordnet sind.

6. Geschirrspüler nach einem der Ansprüche 2 bis 5, **dadurch gekennzeichnet, dass** die Öffnung (12) näher an einem Boden der Ventilkammer (8) liegt als eine Decke der Ventilkammer (8).

7. Geschirrspüler nach einem der Ansprüche 2 bis 6, **dadurch gekennzeichnet, dass** die Einlassöffnung (4) auf einem Boden der ersten Unterkammer (10) gebildet ist.

8. Geschirrspüler nach einem der Ansprüche 2 bis 7, **dadurch gekennzeichnet, dass** die erste Unterkammer (10) und die zweite Unterkammer (11) rechteckige Querschnitte innerhalb einer Ebene aufweisen, die senkrecht zu einer Richtung steht, entlang der sich das Ventilelement (8) nach oben oder unten bewegt.

9. Geschirrspüler nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** die erste Auslassöffnung (6) und die zweite Auslassöffnung (6) jeweils einen ersten Sitz (15) und einen zweiten Sitz (16) aufweisen and das Ventilelement (8) ein Dichtungsmittel aufweist, das so ausgestaltet ist, dass es an dem ersten Sitz (15) anliegt, wenn das Ventilelement (8) in der ersten Position gehalten wird, und an dem zweiten Sitz (16) anliegt, wenn das Ventilelement (8) in der zweiten Position gehalten wird.

10. Geschirrspüler nach Anspruch 9, **dadurch gekennzeichnet, dass** die Innenflächen des ersten Sitzes (15) und des zweiten Sitzes (16) jeder die Form eines Kegelstumpfes aufweisen.

11. Geschirrspüler nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** das Ventilelement (8) ein Block (17) ist, der eine Oberseite (18) und eine Unterseite (19) aufweist und das Dichtungsmittel durch ein oberes Dichtungselement (20) und ein unteres Dichtungselement (21) gestaltet ist, die jeweils an der Oberseite (18) und der Unterseite (19) angeordnet sind.

12. Geschirrspüler nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** eine Abtasteinheit, die so ausgestaltet ist, dass sie erfasst, ob sich das Ventilelement (8) in der ersten Position oder der zweiten Position befindet, und ein entsprechendes Signal ausgibt, das die Position des Ventilelements (8) anzeigt.

13. Geschirrspüler nach einem der Ansprüche 9 oder 10, **dadurch gekennzeichnet, dass** das Ventilelement (8) eine Kugel ist und das Dichtungsmittel durch die Außenfläche des Ventilelements (8) ausgestaltet ist.

14. Geschirrspüler (2) nach einem der Ansprüche 1 bis 13, umfassend eine Waschwanne (23) zur Aufnahme von zu reinigendem Geschirr, eine Tür (24) zum Öffnen/Schließen der Waschwanne (23), einen Waschmittelspender (25) zur Abgabe von chemischen Substanzen wie Waschmittel-Weichmacher und dergleichen, wobei der Waschmittelspender (25) auf einer Innenseite der Tür (24) und einem Sumpf (26) angeordnet ist, der auf einem Boden des Waschwanne (23) zum Sammeln von in den Waschwanne (23) abgegebenem Wasser angeordnet ist, einer Enthärtungseinheit (5) zum Enthärten von Leitungswasser, wobei die Enthärtungseinheit (5) einen Einlass zum Aufnehmen von Leitungswasser oder Salzsole und einen Auslass (27) zum Ausgeben von enthärtetem Wasser oder Regenerationswasser, einen Salzbehälter zum Zuführen von Salzsole zur Enthärtungseinheit (5) zum Regenerieren eines Ionenaustauschmaterials wie beispielsweise eines Harzes innerhalb der Enthärtungseinheit (5) und des Dreiwegeventils (1),
einen oder mehrere Wassereinlässe (28) zum Zuführen des enthärteten Wassers, das von der Enthärtungseinheit (5) ausgegeben wird, in die Waschwanne (23) beinhaltet, wobei der Wassereinlass (28) an einer Wand der Waschlappen (23) an einer Stelle oberhalb des Sumpfes (26) und des Dreiwegeventils (1) angeordnet ist, wobei die Einlassöffnung (4) mit dem Auslass (27) der Enthärtungseinheit (5) fluidisch verbunden ist, wobei die erste Auslassöffnung (6) direkt in den Sumpf (26) mündet, und wobei die zweite Auslassöffnung (7) fluidisch mit dem Wassereinlass (28) verbunden ist.

15. Geschirrspüler (2) nach Anspruch 14, **dadurch gekennzeichnet, dass** der Wassereinlass (28) eine Düse (29) und der Wassereinlass (28) an einer Seitenwand (30) der Waschwanne (23) angeordnet ist, wobei die Düse (29) so ausgestaltet ist, dass sie das vom Wassereinlass (28) aufgenommene Wasser in Richtung des Waschmittelspenders (25) spritzt.

Revendications

1. Lave-vaisselle (2) comprenant une vanne à trois voies (1), la vanne à trois voies (1) comprenant une chambre de vanne (3) comprenant un orifice d'entrée (4) pour recevoir de l'eau adoucie ou de l'eau de régénération délivrée par une unité d'adoucissement de l'eau (5) du lave-vaisselle (2), un premier orifice de sortie (6) et un deuxième orifice de sortie (7) qui sont en communication fluidique avec l'orifice d'entrée (4), le premier orifice de sortie (6) est disposé dans une première position et le deuxième orifice de sortie (7) est disposé dans une deuxième position qui est supérieure à la première position, un organe de vanne (8) prévu sous la forme d'un flotteur qui est disposé de manière mobile dans la chambre de vanne (3) entre la première position et la deuxième position, dans laquelle à la première position, le premier orifice de sortie (6) est fermé par l'organe de vanne (8) et le deuxième orifice de sortie (7) est ouvert, dans laquelle à la deuxième position, le premier orifice de sortie (6) est ouvert et le deuxième orifice de sortie (7) est fermé par l'organe de vanne (8), dans laquelle la masse et le volume de l'organe de vanne (8) sont configurés de telle sorte que lorsque la chambre de vanne (3) est remplie d'eau adou-

cie, la force de gravité (G) agissant sur l'organe de vanne (8) dépasse la force de flottabilité (B) agissant sur l'organe de vanne (8) de sorte que l'organe de vanne (8) est maintenu à la première position, et lorsque la chambre de vanne (3) est remplie d'eau de régénération, la force de flottabilité (B) agissant sur l'organe de vanne (8) dépasse la force de gravité (G) agissant sur l'organe de vanne (8) de sorte que l'organe de vanne (8) est maintenu dans la deuxième position.

2. Lave-vaisselle selon la revendication 1, **caractérisé en ce qu'**une paroi de séparation (9) qui sépare la chambre de vanne (3) en une première sous-chambre (10) et une deuxième sous-chambre (11), dans laquelle la première sous-chambre (10) et la deuxième sous-chambre (11) sont maintenues en communication fluidique à travers une ou plusieurs ouvertures (12) formées dans la paroi de séparation (9), dans lequel l'orifice d'entrée (4) s'ouvre dans la première sous-chambre (10), dans lequel le premier orifice de sortie (6) et le deuxième orifice de sortie (7) dérivent de la deuxième sous-chambre (11), et dans lequel l'organe de vanne (8) est disposé de manière mobile à l'intérieur de la deuxième sous-chambre (11).

3. Lave-vaisselle selon la revendication 2, **caractérisé en ce que** la paroi de séparation (9) est opposée à une paroi latérale (13) de la deuxième sous-chambre (11), dans laquelle la paroi de séparation (9) et la paroi latérale (13) de la deuxième sous-chambre (11) configurent un guidage (14) dans lequel l'organe de vanne (8) se déplace vers le haut ou vers le bas.

4. Lave-vaisselle selon la revendication 2 ou 3, **caractérisé en ce que** le volume de la première sous-chambre (10) est supérieur au volume de la deuxième sous-chambre (11).

5. Lave-vaisselle selon l'une quelconque des revendications 2 à 4, **caractérisé en ce que** le premier orifice de sortie (6) est formé sur un fond de la deuxième sous-chambre (11) et le deuxième orifice de sortie (7) est formé sur un plafond de la deuxième sous-chambre (11), dans lequel le premier orifice de sortie (6) et le deuxième orifice de sortie (7) sont agencés pour s'opposer l'un à l'autre.

6. Lave-vaisselle selon l'une quelconque des revendications 2 à 5, **caractérisé en ce que** l'ouverture (12) est plus proche d'un fond de la chambre de vanne (8) qu'un plafond de la chambre de vanne (8).

7. Lave-vaisselle selon l'une quelconque des revendications 2 à 6, **caractérisé en ce que** l'orifice d'entrée (4) est formé sur un fond de la première sous-chambre (10).

8. Lave-vaisselle selon l'une quelconque des revendications 2 à 7, **caractérisé en ce que** la première sous-chambre (10) et la deuxième sous-chambre (11) ont des sections transversales rectangulaires dans un plan qui est perpendiculaire à une direction le long de laquelle l'organe de vanne (8) se déplace vers le haut ou vers le bas.

9. Lave-vaisselle selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** le premier orifice de sortie (6) et le deuxième orifice de sortie (6) ont respectivement un premier siège (15) et un deuxième siège (16) et l'organe de vanne (8) a un moyen d'étanchéité qui est configuré pour venir en butée contre le premier siège (15) lorsque l'organe de vanne (8) est maintenu à la première position, et pour venir en butée contre le deuxième siège (16) lorsque l'organe de vanne (8) est maintenu dans la deuxième position.

10. Lave-vaisselle selon la revendication 9, **caractérisé en ce que** les surfaces intérieures du premier siège (15) et du deuxième siège (16) ont chacune la forme d'un cône tronqué.

11. Lave-vaisselle selon la revendication 9 ou 10, **caractérisé en ce que** l'organe de vanne (8) est un bloc (17) qui a une surface supérieure (18) et une surface inférieure (19) et le moyen d'étanchéité est configuré par un organe d'étanchéité supérieur (20) et un organe d'étanchéité inférieur (21) qui sont respectivement disposés sur la surface supérieure (18) et la surface inférieure (19).

12. Lave-vaisselle selon l'une quelconque des revendications 1 à 11, **caractérisé en ce qu'**une unité de détection qui est configurée pour détecter si l'organe de vanne (8) est à la première position ou à la deuxième position, et pour délivrer un signal respectif qui est indicatif de la position de l'organe de vanne (8).

13. Lave-vaisselle selon l'une quelconque des revendications 9 ou 10, **caractérisé en ce que** l'organe de vanne (8) est une bille, et le moyen d'étanchéité est configuré par la surface extérieure de l'organe de vanne (8).

14. Lave-vaisselle (2) selon l'une quelconque des revendications 1 à 13, comprenant une cuve de lavage (23) pour recevoir la vaisselle à nettoyer, une porte (24) pour ouvrir/fermer la cuve de lavage (23), un distributeur de détergent (25) pour distribuer des substances chimiques telles qu'un adoucisseur de détergent et analogues, dans laquelle le distributeur de détergent (25) est disposé sur un côté intérieur de la porte (24) et un puisard (26) qui est disposé sur un fond de cuve de lavage (23) pour recueillir l'eau fournie dans la cuve de lavage (23), une unité

d'adoucissement (5) pour adoucir l'eau du robinet, dans laquelle l'unité d'adoucissement (5) comprend une entrée pour recevoir de l'eau du robinet ou de la saumure et une sortie (27) pour fournir de l'eau adoucie ou de l'eau de régénération, un réservoir de sel pour fournir de la saumure à l'unité d'adoucissement (5) pour régénérer un matériau échangeur d'ions tel qu'une résine dans l'unité d'adoucissement (5) et la vanne trois voies (1), une ou plusieurs entrées d'eau (28) pour délivrer l'eau adoucie qui est sortie par l'unité d'adoucissement (5) dans la cuve de lavage (23), dans laquelle l'entrée d'eau (28) est disposée sur une paroi de la patte de lavage (23) à un emplacement au-dessus du puisard (26) et de la vanne trois voies (1), dans lequel l'orifice d'entrée (4) est relié fluidiquement à la sortie (27) de l'unité d'adoucissement (5), dans lequel le premier orifice de sortie (6) s'ouvre directement dans le puisard (26), et dans lequel le deuxième orifice de sortie (7) est relié par fluide à l'entrée d'eau (28).

15. Lave-vaisselle (2) selon la revendication 14, **caractérisé en ce que** l'entrée d'eau (28) comporte une buse (29) et l'entrée d'eau (28) est disposée sur une paroi latérale (30) de cuve de lavage (23), dans laquelle la buse (29) est configurée pour pulvériser l'eau reçue par l'entrée d'eau (28) vers le distributeur de détergent (25).

Fig. 1

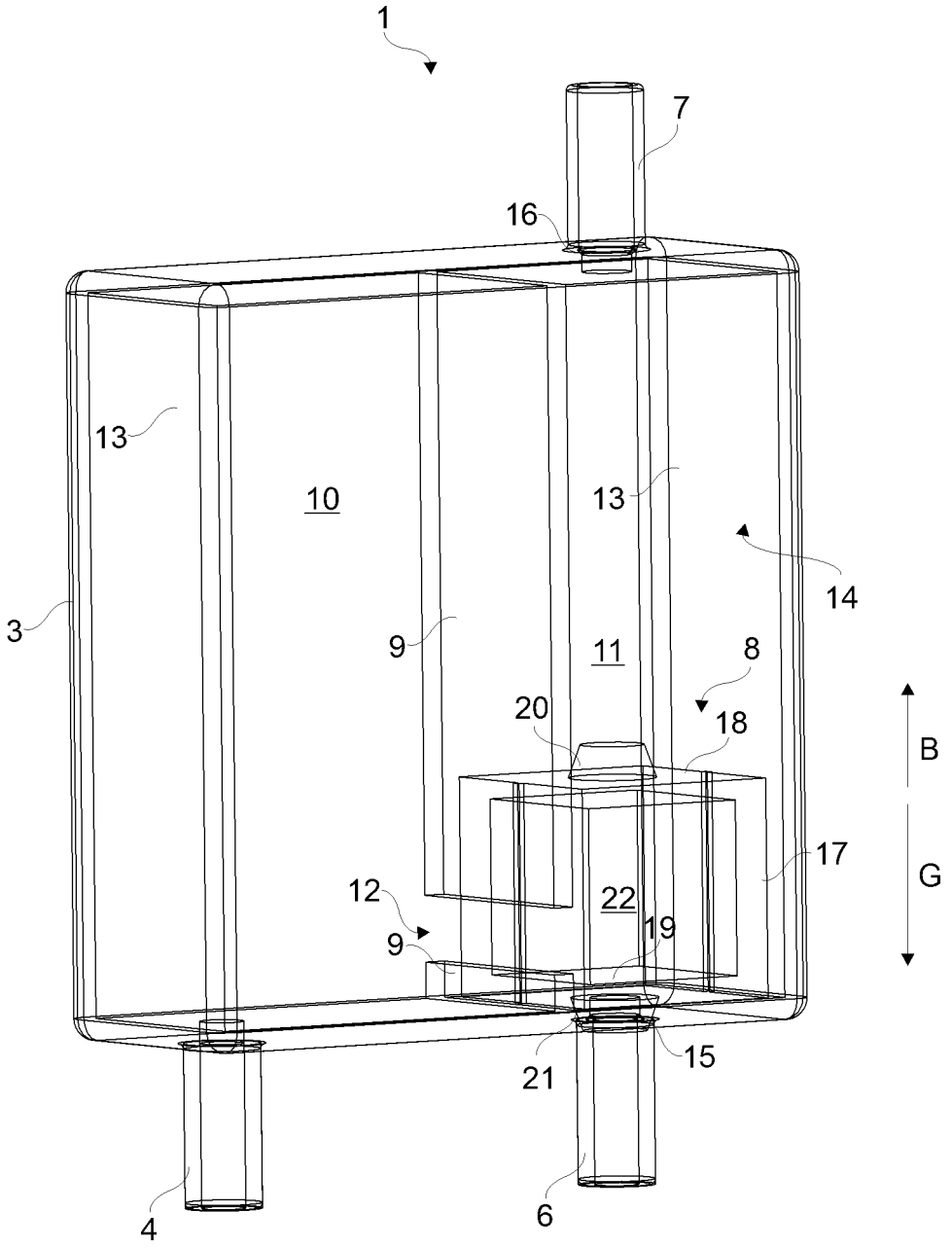


Fig. 2

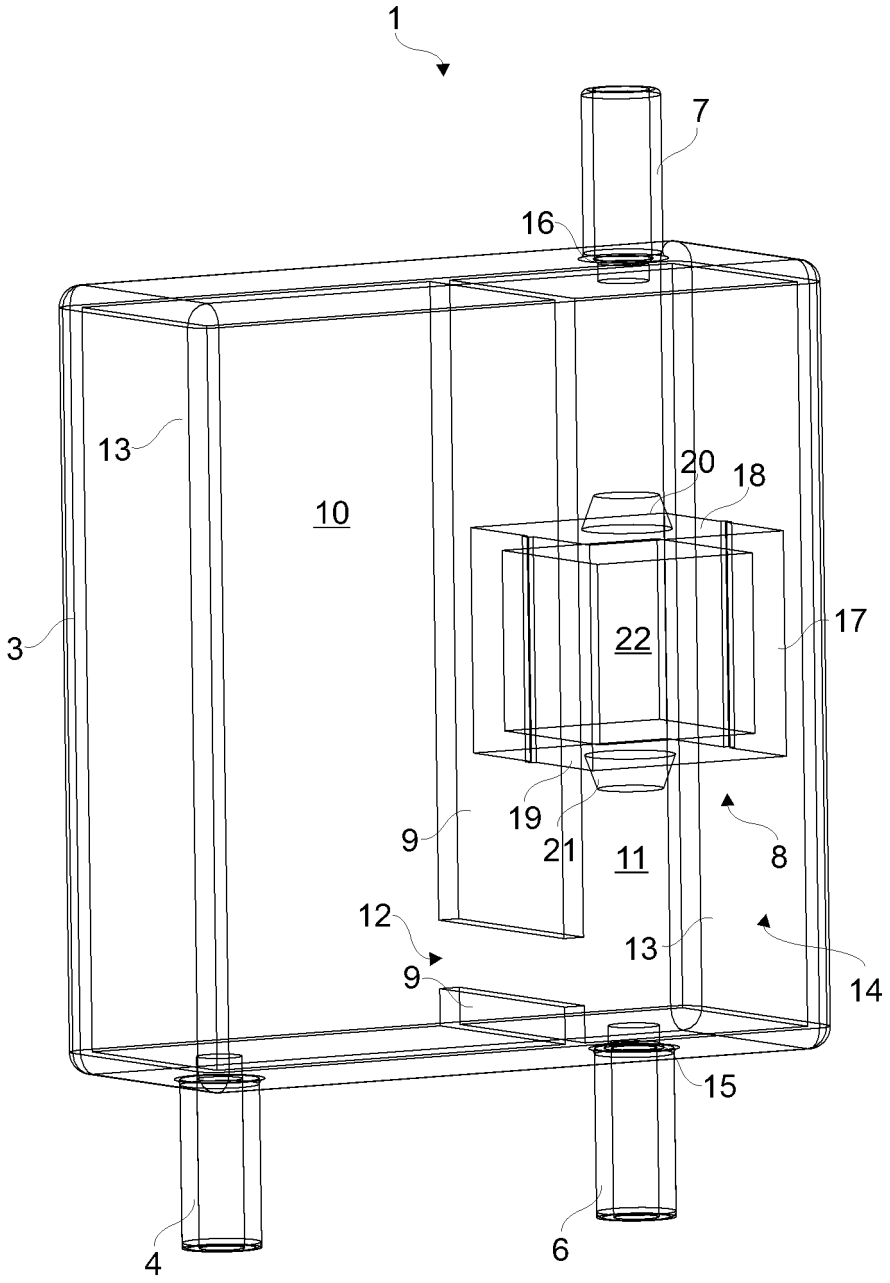


Fig. 3

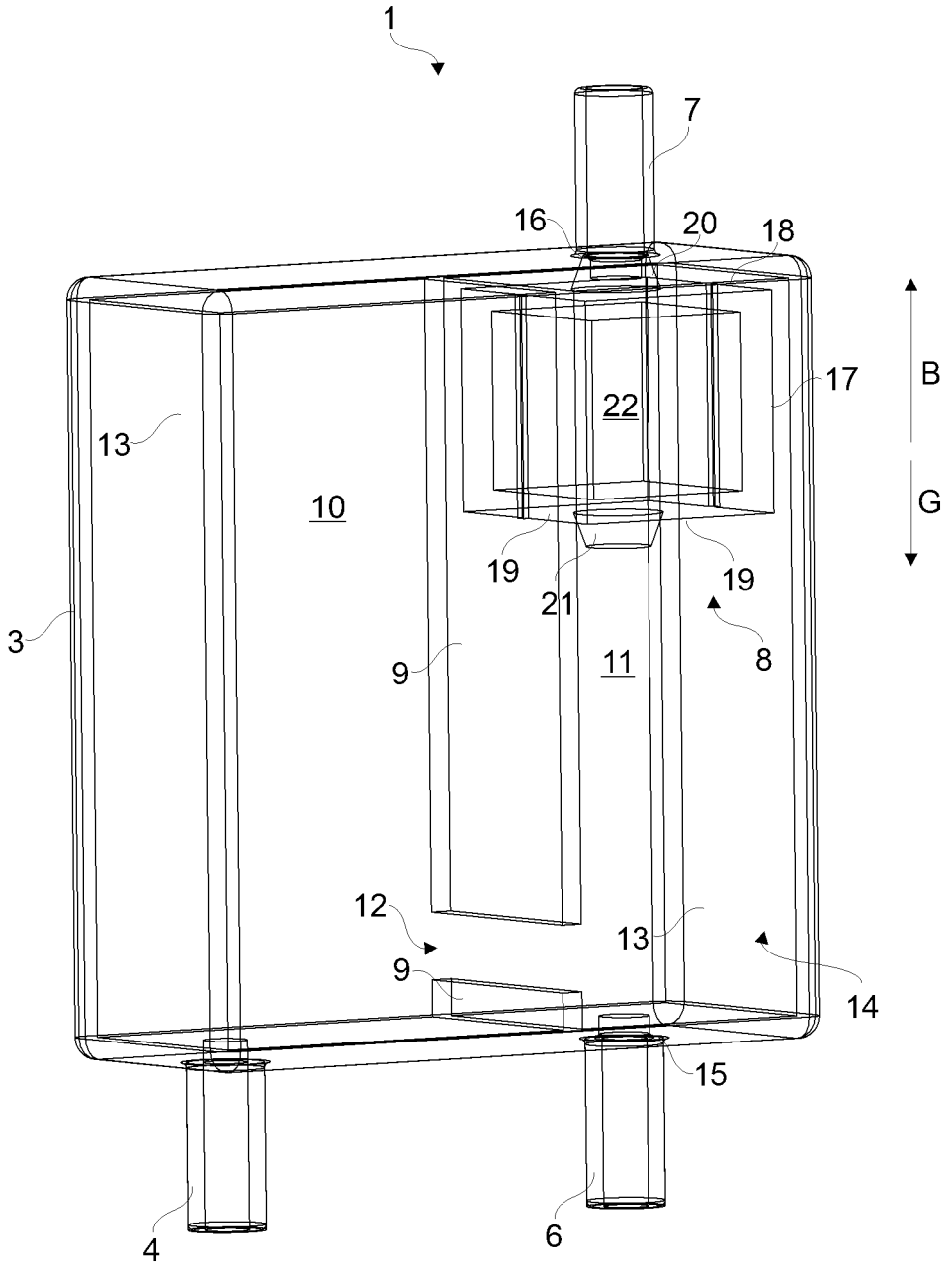


Fig. 4

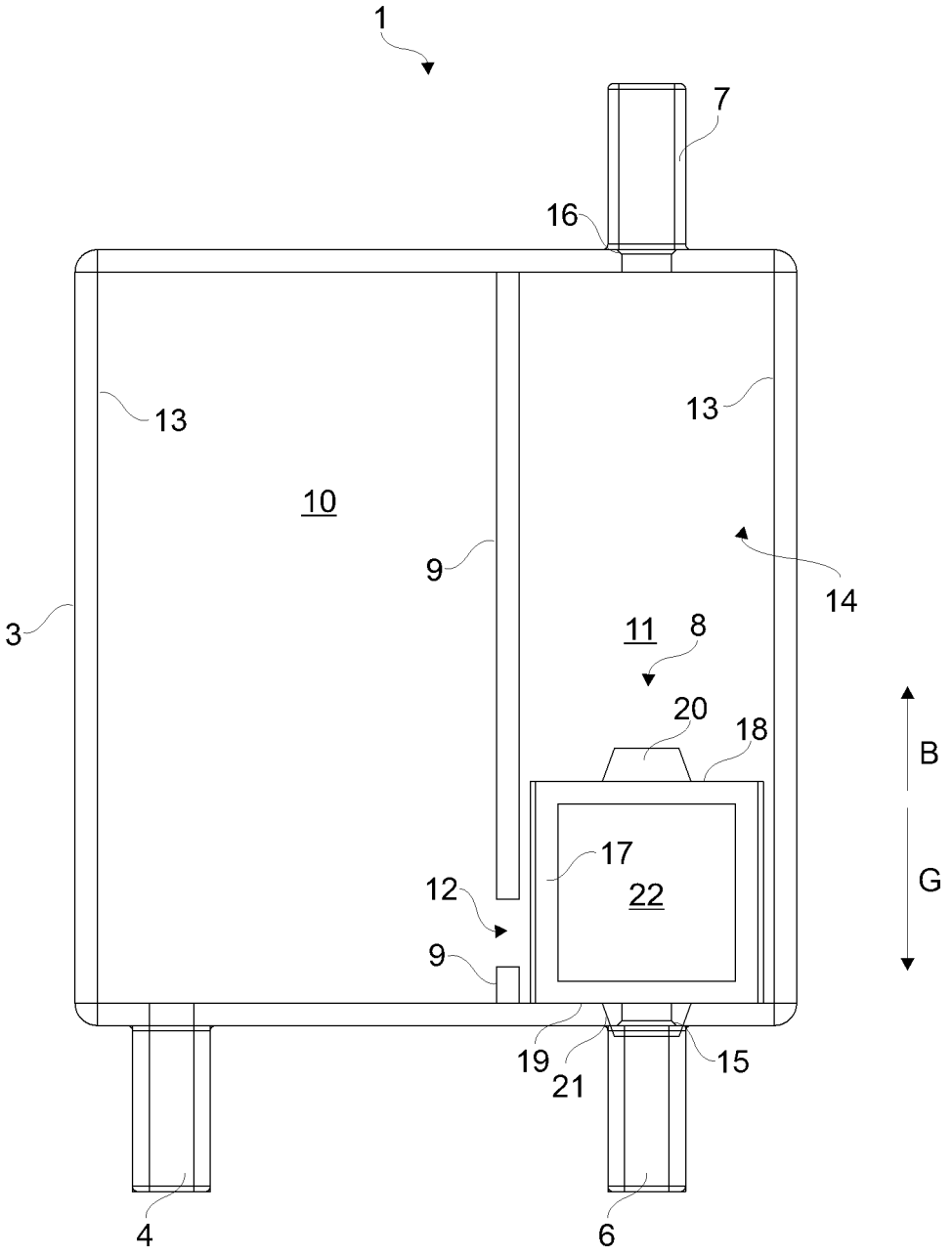


Fig. 5

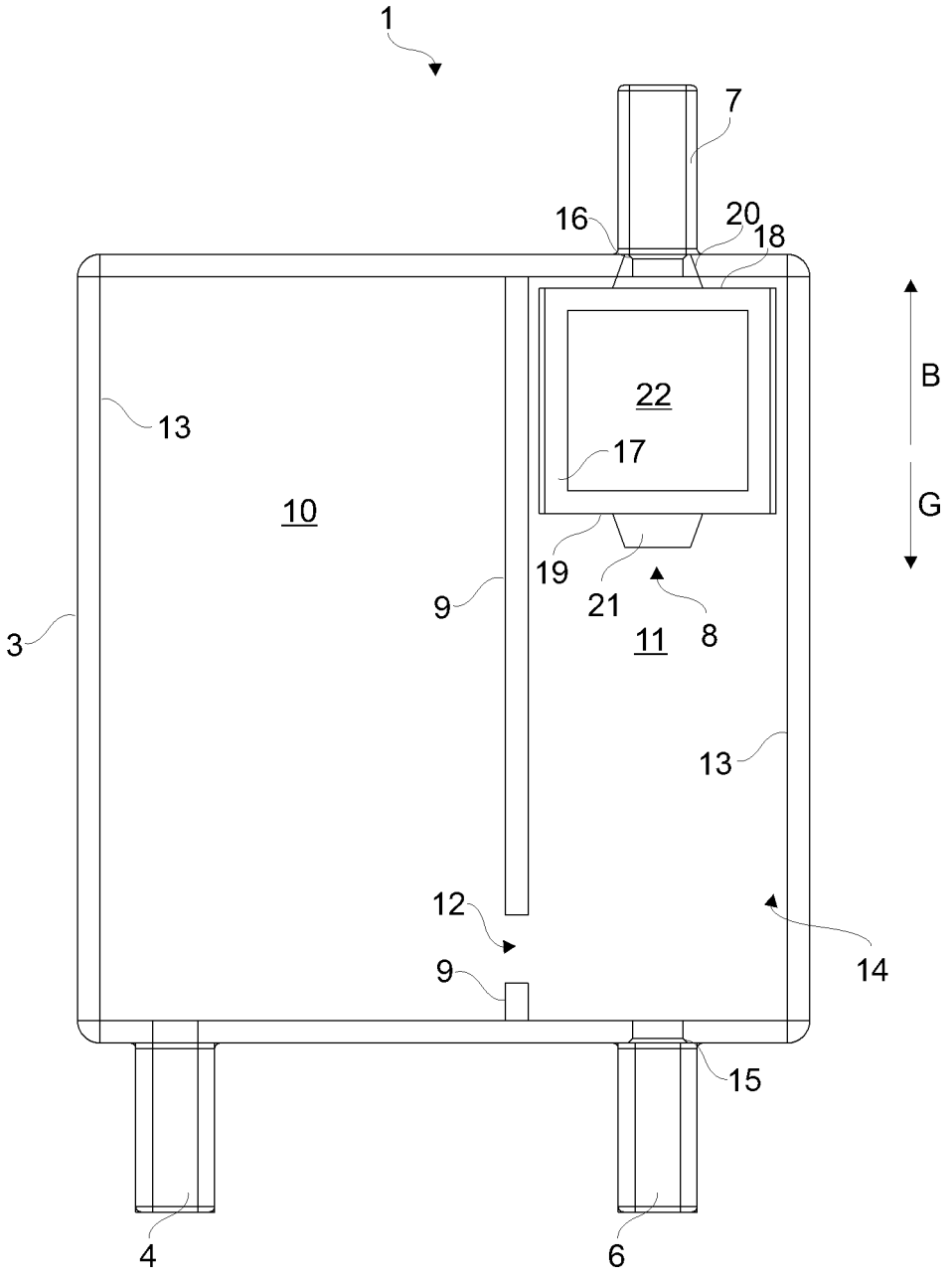


Fig. 6

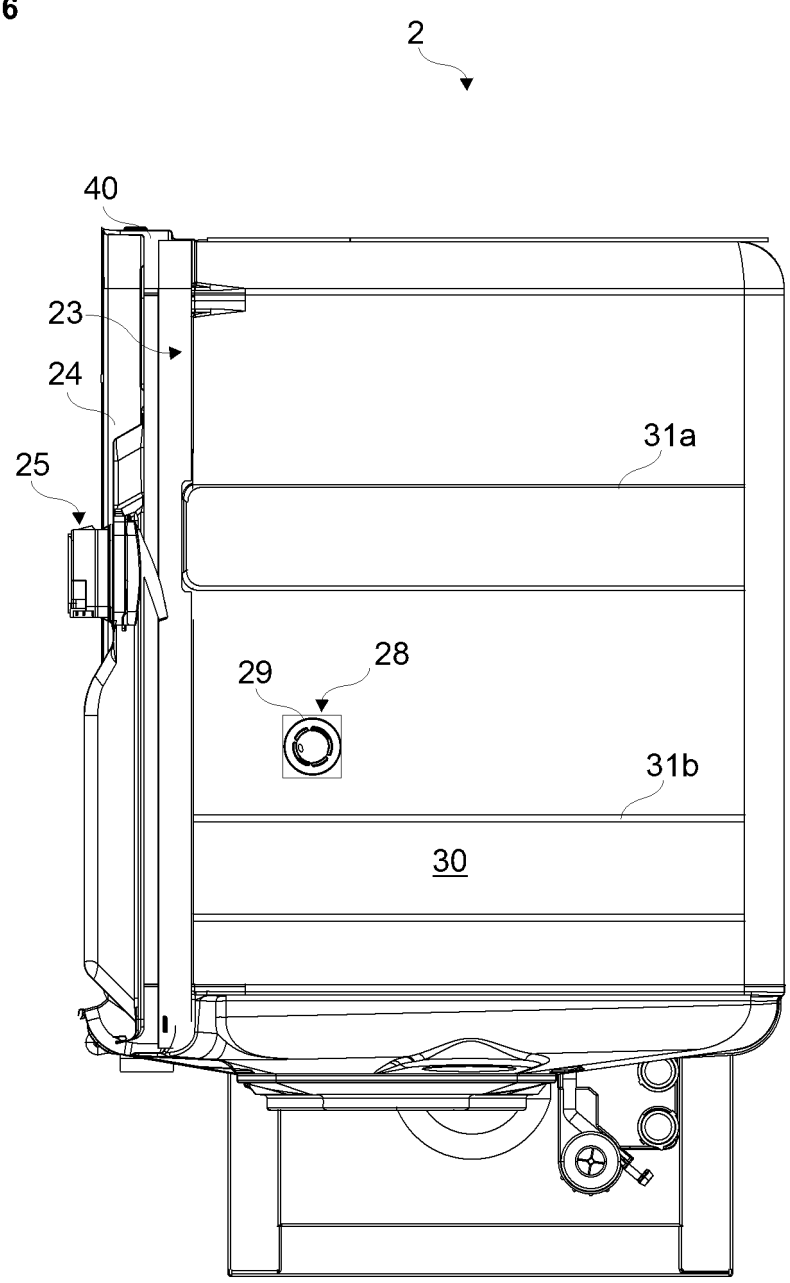


Fig. 7

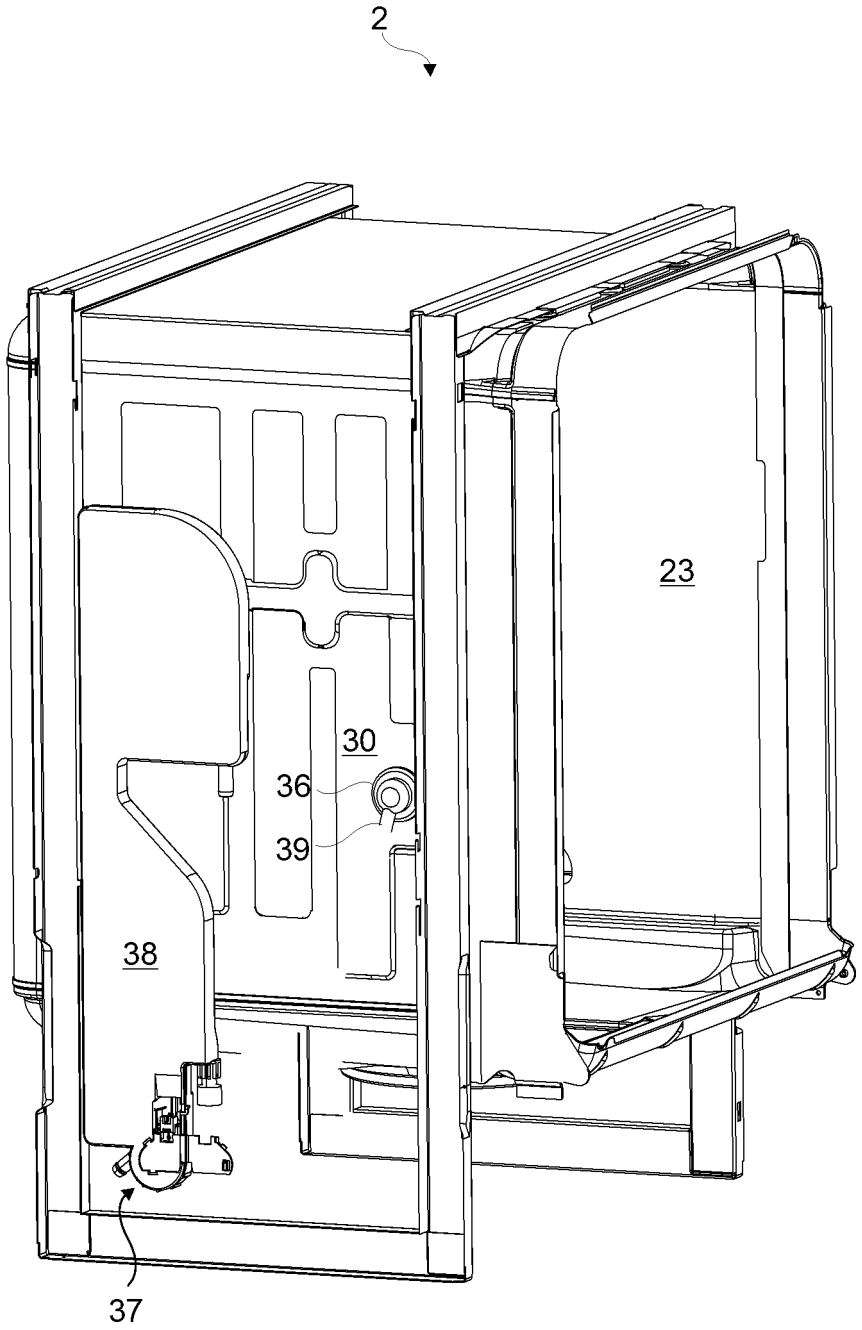


Fig. 8

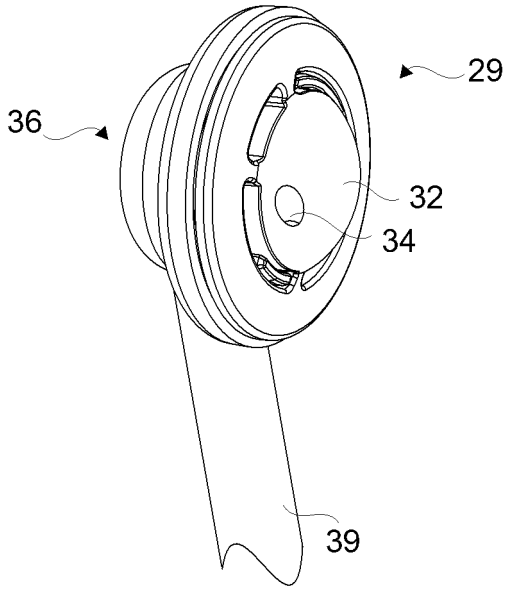


Fig. 9

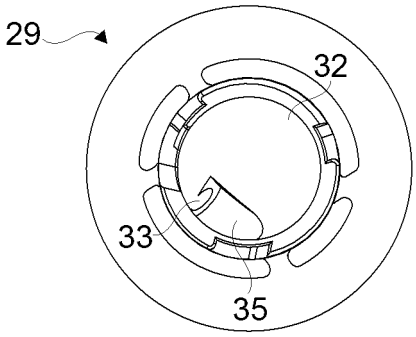


Fig. 10

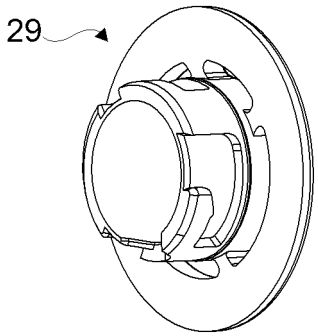


Fig. 11

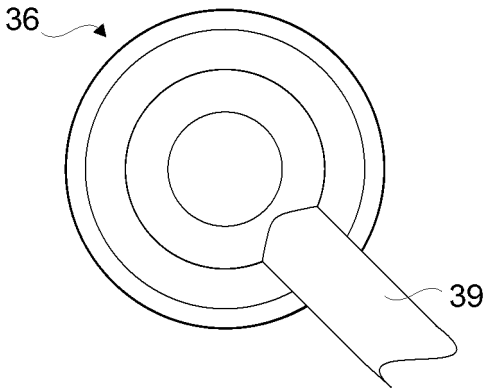


Fig. 12

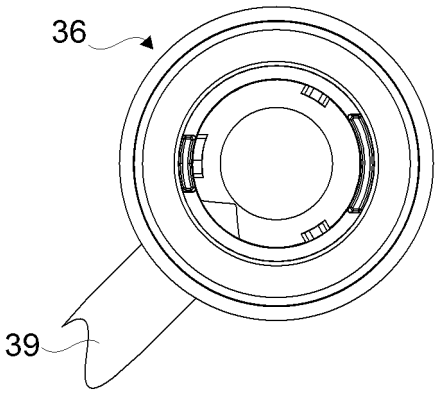


Fig. 13

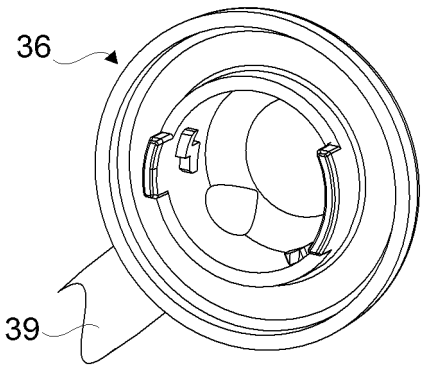
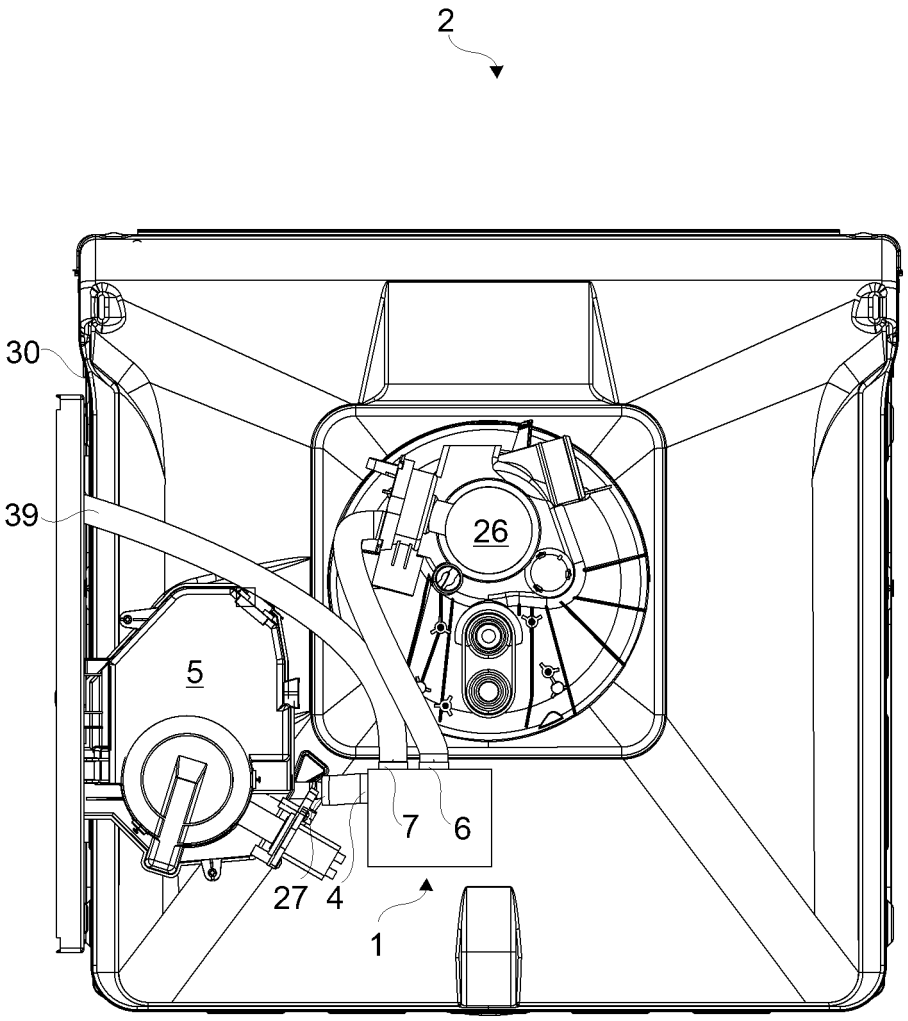


Fig. 14



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0741991 A1 **[0003]**
- GB 1462952 A **[0004]**