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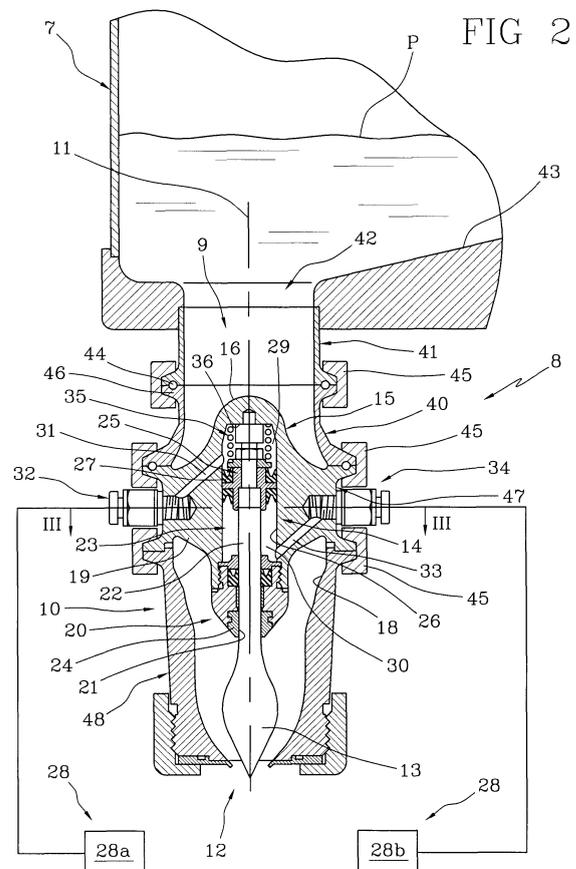
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(54) Machine for filling containers with liquid or powder products

(57) Containers are filled with liquid or powder products by a machine equipped with a carousel rotatable about a vertical axis and carrying a set of pedestals on which single containers are positioned and weighed while being filled with a product (P). Also carried by the carousel is a feed tank (7) equipped with a set of nozzles (8) spaced around the axis (5) of rotation, from which the product (P) is dispensed into the containers placed on the pedestals. Each nozzle (8) appears as a cylindrical barrel (10) delimiting a feed duct (9) and terminating at bottom in an outlet (12) opened and closed by a reciprocating valve element (13); motion is induced in the valve element by a mechanism (14) enclosed within a fluidly streamlined housing (15) installed internally of the feed duct (9).



Description

[0001] The present invention relates to a machine for filling containers with liquid or powder products.

[0002] The invention has application to advantage in the art field of carousel type machines used to fill containers with a variety of substances, including liquid food products such as milk or fruit juices, also mineral lubricating oils, detergents, etc.

[0003] A filling machine of the type in question appears as a tank carried by a main carousel and holding a supply of the liquid substance; the carousel is rotatable about a vertical axis through a first transfer station by way of which it receives a succession of containers, each presenting a filler mouth.

[0004] The tank is rigidly associated with the carousel and affords a plurality of filler valves at the bottom, each of which can be associated with the mouth of a respective container; thus, when the carousel is set in rotation, the tank turns on the vertical axis and its contents are released via the filler valves into the containers, whereupon the filled containers are directed by way of a second transfer station onto an outfeed conveyor.

[0005] Filler valves of conventional type comprise a feed duct terminating at the bottom end in a dispensing outlet such as can be opened or closed by a valve element sliding axially within the duct. The valve element is attached to the end of a rod operated by suitable devices installed above the filler valve. The feed duct is vertically disposed, extending downward from a bottom wall of the tank so that the tank can be emptied entirely of its contents. Accordingly, each rod passes through the tank and connects with the relative operating device, which is located internally of the tank and above the free surface of the product contained therein; the operating devices, preferably, will be separated from the product by a suitable partition baffle.

[0006] The presence of the rods in the space occupied by the product being dispensed from the tank can lead to contamination of the selfsame product, whilst the operation of cleaning the tank, which must be undertaken before changing over to a new product, can be rendered more difficult and less thorough. In effect, the structure of the rods is such as to create interstitial spaces in which the product will stagnate and collect. Moreover, servicing of the rods is complicated by the fact that any repair or replacement operation necessitates their removal from the tank.

[0007] These drawbacks have been overcome to an extent by adopting filler valves connected to rods and actuators located externally of the tank, with the relative valve elements operated via levers, although the structure of the machine is rendered notably more complex. A filler valve of the type in question is disclosed, for example, in EP 1129949.

[0008] Accordingly, the object of the present invention is to provide a machine for filling containers with liquid products or powder products, such as will be unaffected

by the drawbacks mentioned above.

[0009] One object of the invention, in particular, is to make available a machine for filling containers with liquid or powder products, of which the filler nozzles can be serviced easily without having to dismantle any part of the tank.

[0010] A further object of the invention is to provide a machine such as will ensure products are handled in conformity with pertinent hygiene standards.

[0011] The stated objects are realized in a machine according to the present invention for filling containers with liquid or powder products, of which the characterizing features are recited in one or more of the appended claims.

[0012] The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 shows a preferred embodiment of a machine according to the present invention for filling containers with liquid or powder products, viewed in elevation;
- figure 2 shows a detail of the machine illustrated in figure 1, viewed partly in section;
- figure 3 is a section on the plane denoted III-III in figure 2;
- figure 4 shows the detail of figure 2 in an alternative embodiment.

[0013] With reference to figure 1, numeral 1 denotes a filling machine, in its entirety, designed to batch liquid or powder products into containers 2, each affording a respective filler mouth 3.

[0014] In the embodiment of figure 1, illustrated purely by way of example, the filling machine 1 comprises a carousel 4 rotatable about a vertical axis 5. The carousel 4 carries supporting and weighing means 6 on which a plurality of containers 2 can be placed, filled with a product P and weight-checked while caused to advance along a circular filling path extending about the vertical axis 5 of the carousel from an infeed station to an outfeed station, both conventional in embodiment and therefore not illustrated.

[0015] Containers 2 are received in succession by the carousel 4 at the infeed station, and transferred ultimately from the outfeed station to a take-up unit, not shown in the drawings.

[0016] The machine 1 comprises feed means supplying a product P, which in the embodiment illustrated are shown as a tank 7 holding the selfsame product P.

[0017] The tank 7 is mounted to the carousel 4 and carries a plurality of nozzles 8 distributed about the axis 5 of rotation, from which the containers 2 positioned on the supporting and weighing means 6 are filled with the product.

[0018] Referring to figure 2, in particular, each of the filler nozzles 8 comprises a barrel 10 preferably of cylindrical shape, delimiting a feed duct 9 aligned on an axis

11 disposed parallel to the vertical axis 5 of the carousel 4.

[0019] The duct 9 terminates at bottom in a dispensing outlet 12 directed toward a relative container 2 positioned for filling, and is equipped internally with a valve element 13 capable of movement between a position in which the outlet 12 is closed and a position in which the outlet 12 is open.

[0020] The valve element 13 and the inside surface of the duct 9 adjacent to the dispensing outlet 12 are shaped in such a way that the outflowing stream of the product P will assume selected characteristics of geometry, velocity and pressure.

[0021] Motion is induced in the valve element 13 by operating means 14 mounted advantageously inside a housing 15 incorporated into the feed duct 9. The housing 15, which appears tapered and preferably of ogival geometry, with a domed portion 16 directed toward the tank 7, is aligned on the longitudinal axis 11 of the duct 9 and presents a cross-section smaller than that of the duct, as discernible in figure 3, with the result that a flow passage of predetermined cross-sectional area 17 is offered to the product P.

[0022] The housing 15 thus occupies a position distanced from an inner side wall 18 of the duct 9 and is joined to the wall by way of at least one arm 19, of which the function is to support the housing 15. In the preferred solution illustrated, the nozzle 8 presents a pair of arms 19 fashioned integrally with and extending radially in opposite directions from the housing 15.

[0023] The contours of the housing 15 are optimized in order to create fluidynamic characteristics such as will minimize turbulence in the flowing product P, whilst the cross-sectional area 17 is preferably constant along the length of the duct, or tapered toward the dispensing outlet 12.

[0024] The housing 15 presents a bottom portion 20 with an opening 21, located at the end opposite from the domed portion 16 and directed toward the dispensing outlet 12. The opening 21 is occupied slidably by a rod 22 extending partly into a chamber 23 afforded by the housing 15 and carrying the valve element 13 at one end, externally of the housing. Axial motion induced in the rod 22 causes the valve element 13 to shift between the open and closed positions.

[0025] To prevent the product P from entering the chamber 23, the housing 15 is equipped with sealing means 24, provided for example by a wiper ring offered in sliding contact to the rod 13 and fitted to the bottom portion 20, at the opening 21.

[0026] The movement of the rod 22 is produced preferably by pneumatic or electromagnetic means.

[0027] As illustrated in figures 2 and 3, the operating means 14 comprise a piston 25 rigidly associated with the rod 22, accommodated slidably in the chamber 23 of the housing 15 and engaging with a side wall 26 of the selfsame chamber by way of seals 27.

[0028] The chamber 23 is connected to at least one source 28 of pressurized gas, so that the piston 25 can

be driven by admitting and exhausting the gas.

[0029] More exactly, the chamber 23 is separated by the piston 25 into a top cavity denoted 29 and a bottom cavity denoted 30, both of variable volume.

5 **[0030]** A first duct 31 formed in the housing 15 connects the top cavity 29 with a first valve 32 installed on the housing 15, and a second duct 33 connects the bottom cavity 30 with a second valve 34. Each valve 32 and 34 allows gas to be admitted from a relative connected pressure source 28a and 28b, as well as allowing the gas to be exhausted from the respective cavity 29 and 30.

10 **[0031]** The entry of gas by way of the first valve 32 into the top cavity 29 causes the piston 25 and the valve element 13 to shift toward the outlet 12, in other words toward the closed position. At the same time, the gas contained in the bottom cavity 30 is compressed to a degree by the piston 25 and forced out via the second valve 34.

15 **[0032]** Conversely, the entry of gas by way of the second valve 34 into the bottom cavity 30 causes the piston 25 and the valve element 13 to shift away from the outlet 12, in other words toward the open position. At the same time, the gas contained in the top cavity 29 is compressed to a degree by the piston 25 and forced out via the first valve 32.

20 **[0033]** To assist the action of the gas in closing the outlet 12 and/or keep the outlet closed when there is no gas supply to the machine 1, the nozzle 8 further comprises a spring 35, preferably a coil spring, seated between the piston 25 and an end wall 36 of the top chamber cavity 29 in such a way as to bias the valve element 13 toward the dispensing outlet 12.

25 **[0034]** In an alternative embodiment of the machine, not illustrated, the operating means might include only the first duct 31 connecting with the top cavity 29 of the chamber, and the outlet 12 could be closed by the action of the spring 35 alone.

30 **[0035]** Where motion is induced electromagnetically (see figure 4), the operating means 14 will be composed, for example, of a fixed field winding 37 installed in the chamber 23 and powered by a suitable control circuit 38, and a moving part 39 of ferromagnetic material rigidly associated with the rod 22. The moving part 38 is paired with the field winding 37 and functions as a solenoid plunger.

35 **[0036]** In operation, when the field winding 37 is fed with a current of sufficient strength generated in a direction determined by the control circuit 38, an electromagnetic field is induced in the plunger 39 which, depending on the direction of the current through the field winding 37, will set up an electromotive force tending to direct the selfsame plunger 39 along the axis 11 of the duct 9 toward the position that opens or closes the outlet 12. This electromagnetically induced type of movement could be assisted likewise by the action of the aforementioned spring 35 (not shown in figure 4).

40 **[0037]** To facilitate access to the operating means 14 and simplify maintenance of the nozzle 8, as illustrated

in the example of figures 2 and 3, the cylindrical barrel 10 is embodied as a plurality of tubular sections assembled coaxially with and separable one from another.

[0038] A flared first section 40 is connected to a tubular coupling 41, for example a straight piece extending from an opening 42 presented by a bottom wall 43 of the tank 7. The first section 40 is butt-joined to the coupling 41 together with an interposed annular seal 44 and secured thus by means of a "C" profile clamp collar 45, removable with ease using normal workshop tools. To guarantee a secure assembly, the first section 40 and the coupling 41 are fashioned with respective annular projections 46 around the mating edges, which when joined one with another will fit into the groove of the "C" profile collar 45.

[0039] A second tubular section 47 is butt-joined to the first section 40 and secured with a further clamp collar 45 of the type described above. The second section 47 carries the housing 15, which is axially longer and embodied preferably in one piece with the selfsame section 47.

[0040] The dispensing outlet 12 is located in the bottom end of a tapered third section 48 joined to the second section 47, secured by means of a relative clamp collar 45 and encasing the bottom portion 20 of the housing 15 together with the rod 22.

[0041] Finally, the bottom portion 20 of the housing 15 is mounted removably, for example screw-coupled to a top portion 49 integral with the arms 19 and with the second tubular section 47, so as to allow the removal of the rod 22 and the operating means 14 from the chamber 23.

Claims

1. A machine for filling containers with liquid or powder products, comprising
 - a carousel (4) rotatable about a relative axis (5); supporting and weighing means (6) on which to stand and weigh a plurality of containers (2);
 - feed means supplying the liquid or powder products; a plurality of dispensing nozzles (8) positioned to fill the containers (2) standing on the supporting means (6), each nozzle (8) presenting a cylindrical barrel (10) delimiting a feed duct (9) and terminating at bottom in a dispensing outlet (12), also a valve element (13) serving to open and close the outlet (12), and means (14) by which to operate the valve element (13),
 - characterized**
 - in that** the single nozzle (8) further comprises a housing (15) installed in the feed duct (9) and containing the operating means (14).
2. A machine as in claim 1, wherein the housing (15) is distanced from an internal side wall (18) of the feed duct (9) and connected to the same internal wall (18) by at least one supporting arm (19).
3. A machine as in claim 1, wherein the housing (15) is aligned on a longitudinal axis (11) of the feed duct (9).
4. A machine as in claim 1, wherein the housing (15) presents a tapered and preferably ogival profile.
5. A machine as in claim 1, further comprising a rod (22) carrying the valve element (13), accommodated slidably within the housing (15) and connected to the operating means (14).
6. A machine as in claim 5, wherein the housing (15) presents a bottom portion (20) fitted with sealing means (24) positioned to engage the rod (22), by which the liquid or powder product (P) is prevented from entering the housing (15).
7. A machine as in claim 6, wherein sealing means (24) consist in a seal offered in sliding contact to the rod (22).
8. A machine as in claim 1, wherein the operating means (14) are installed, for ease of access, in a cylindrical barrel (10) comprising a first tubular section (40) connected to a bottom wall (43) of the tank (7), a second tubular section (47) carrying the housing (15) and joined detachably to the first section (40), also a third tubular section (48) joined detachably to the second section (47) and incorporating the dispensing outlet (12).
9. A machine as in claim 2, wherein the housing (15) combines with the internal side wall (18) of the feed duct (9) to delimit a passage for the liquid or powder product, of which the cross-sectional area (17) remains constant along the longitudinal axis (11) of the duct (9).
10. A machine as in claim 2, wherein the housing (15) combines with the internal side wall (18) of the feed duct (9) to delimit a passage for the liquid or powder product, of which the cross-sectional area (17) decreases progressively toward the dispensing outlet (12).
11. A machine as in claim 1, wherein the operating means (14) are of pneumatic type.
12. A machine as in claim 5, wherein the operating means (14) comprise a piston (25) associated rigidly with the rod (22) and accommodated slidably in a chamber (23) of the housing (15), also a source (28) of pressurized gas connected to the chamber (23), in such a way that motion can be induced in the piston (25) by directing gas into the chamber (23).
13. A machine as in claim 12, wherein the chamber (23)

of the housing (15) is divided by the piston (25) into a top cavity (29) and a bottom cavity (30), and the source (28) of pressurized gas connects with the bottom cavity (30) so that the outlet (12) can be opened by directing gas into the bottom cavity (30).

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14. A machine as in claim 13, wherein the source (28) of pressurized gas also connects with the top cavity (29) so that the outlet (12) can be closed by directing gas into the top cavity (29).

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15. A machine as in claim 13, wherein the operating means (14) further comprise a spring (35) seated between the piston (25) and an end wall (36) of the top cavity (29), by which the valve element (13) is biased toward the dispensing outlet (12).

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16. A machine as in claim 1, wherein the operating means (14) are of electromagnetic type.

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17. A machine as in claim 5, wherein the operating means (14) comprise a fixed field winding (37) associated rigidly with the housing (15), and a moving plunger (39) mounted to the rod (22) and paired with the field winding (37).

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FIG 1

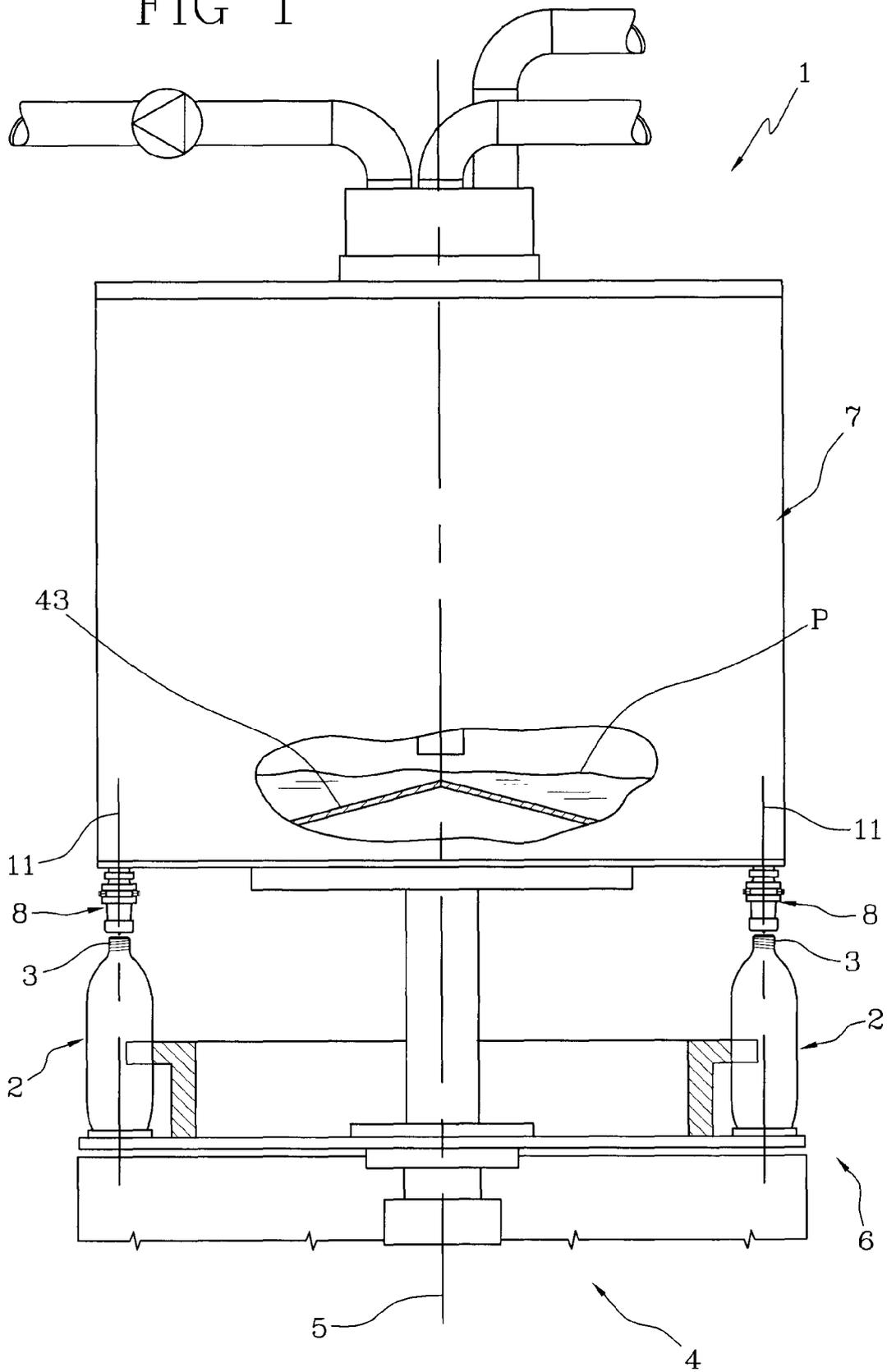


FIG 2

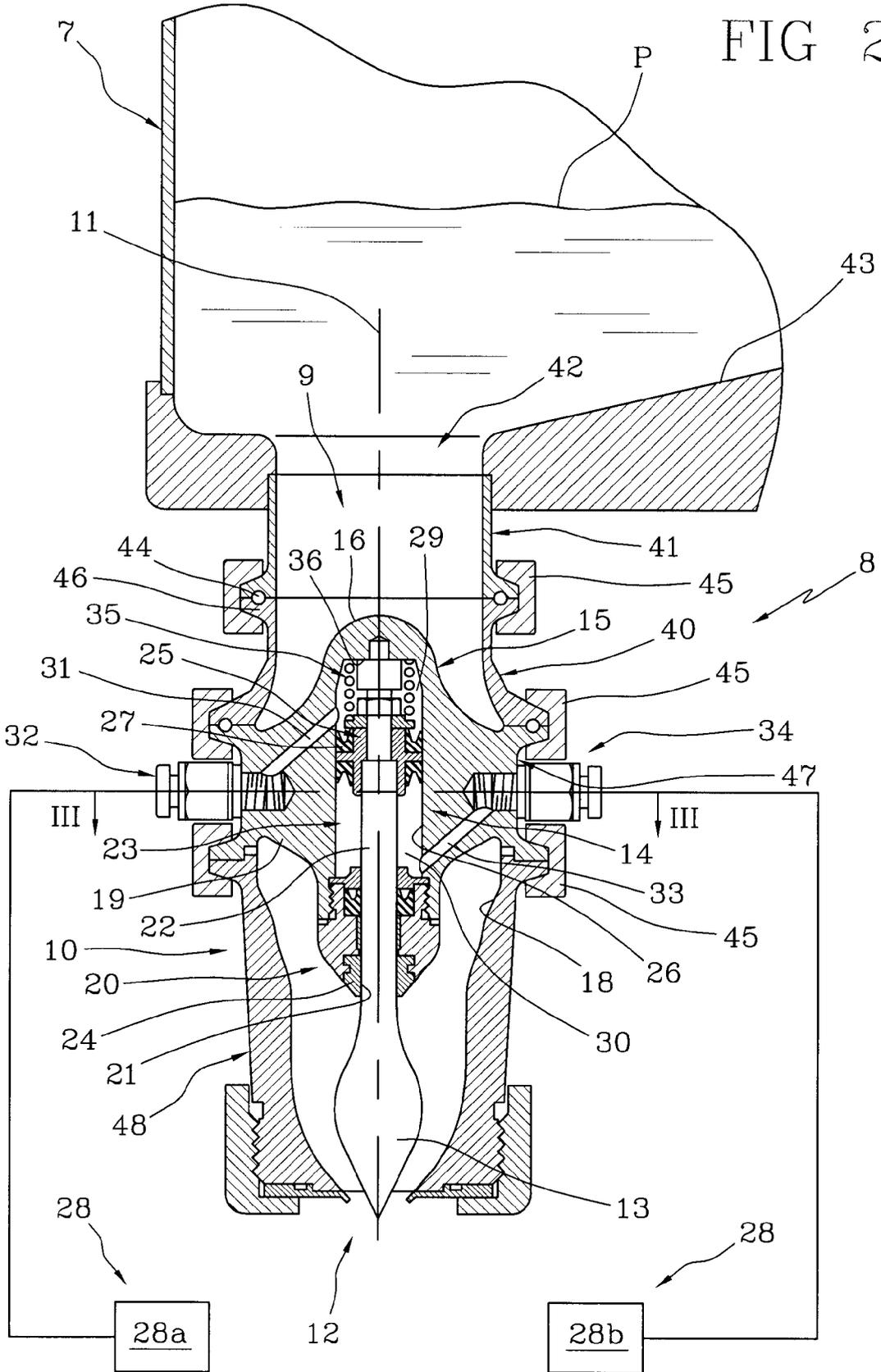


FIG 3

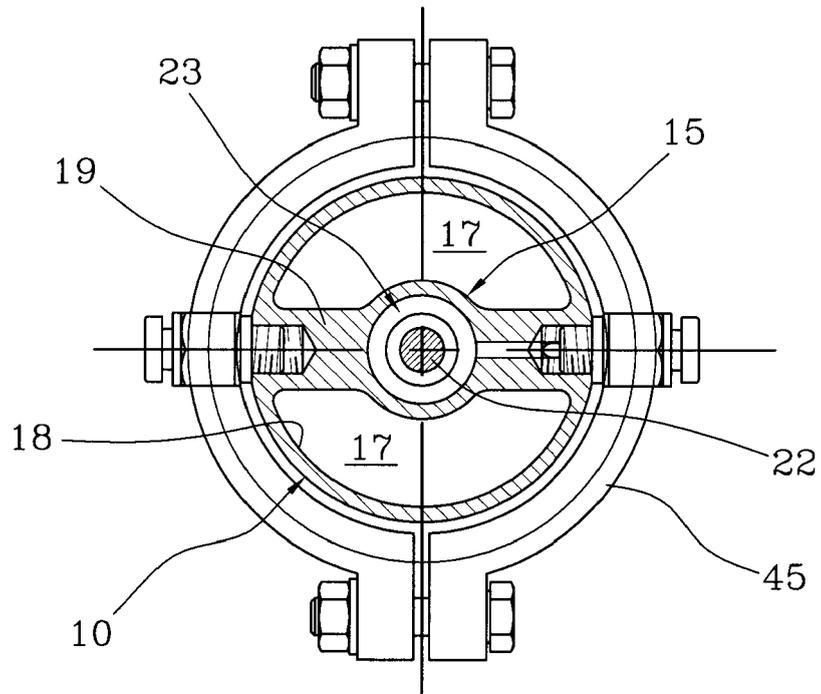
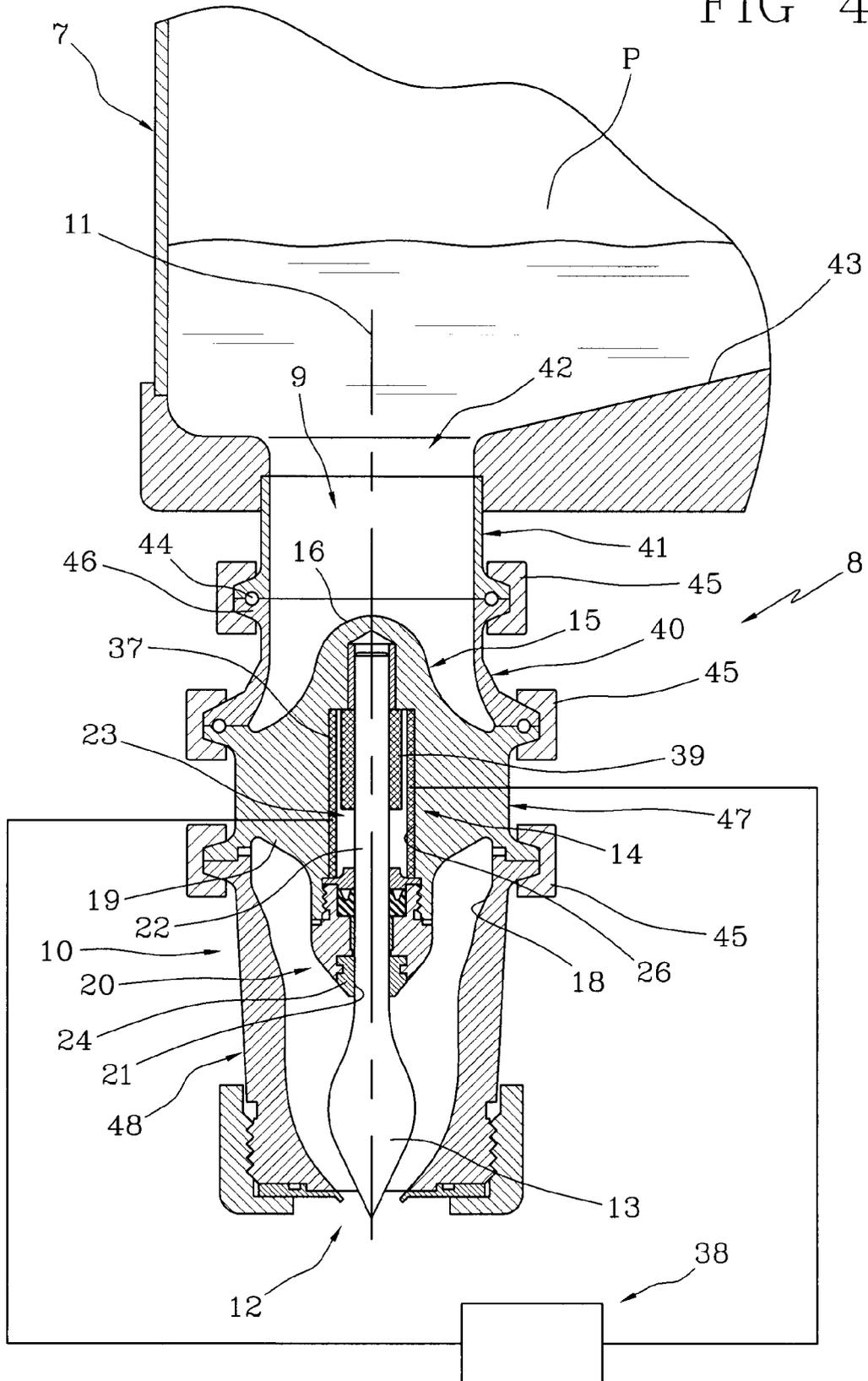


FIG 4





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