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(54) **Isobaric machine for filling containers with liquids**

(57) Isobaric machine for filling containers with liquids, which comprises a rotary turntable (2), on which a first tank (6) for the pressurised containment of a liquid gassed to be bottled in containers (4); and a plurality of valve units (3) hydraulically connected to the first tank (6) are mounted. Each valve unit (3) comprises: a supply conduit (11), for the inflow of the liquid from the first tank (6) to the containers (4) to be bottled, interception means (18, 19) associated to the supply conduit (11) and adapted to regulate the inflow of the liquid in the containers (4); a compensation cannula (26) coaxially mounted within the supply conduit (11), susceptible of transporting a gaseous fluid or a fraction of the bottled liquid, coming from the containers (4), during a step for filling and/or self-levelling the containers (4). The compensation cannula (26) traverses the first tank (6) though remaining hydraulically insulated from the latter, and it is connected - at the upper part - to a second tank (60). The latter is in communication with the first tank (6) through means for balancing the pressures advantageously obtained by means of a balancing conduit (61) of the pressures arranged between the two tanks (6, 60) to connect them. The second tank (60) is also in communication with the external environment by means of a vent valve (62) of the gaseous fluid. [B67C].

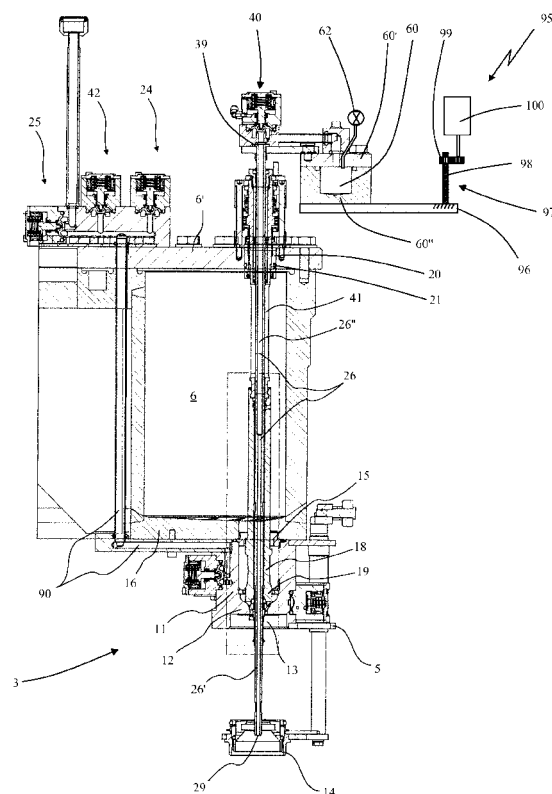


Fig. 5

Description

[0001] The present invention refers to an isobaric machine for filling containers with liquids, according to the preamble of the main claim.

[0002] The machine in question falls within the field of industrial bottling plants and it is intended to be used for filling containers, such as bottles, with pressurized liquids, in particular of the food type, such as for example gasified wines, sparkling wines, mineral water, etcetera.

[0003] More in detail, isobaric machines are conventionally provided with a fixed support structure on which a rotary turntable (usually referred to in the sector as "turret") is rotatably mounted, which supports a tank for containing the liquid to be bottled. Beneath the latter a plurality of filling valve units is peripherally fixed. Operatively, the containers, during the travel thereof around the turntable, are moved in association to the single valve units to be filled up to the desired level. For such purpose, each valve unit is provided with a supply conduit, which is intercepted by a valve (shutter), which regulates the inflow of liquid, for example wine, from the tank to the underlying container, generally consisting of a bottle, arranged coaxially beneath the valve unit.

[0004] Functionally, the inflow of liquid in the container occurs during a provided filling step with the shutter open and in conditions of pressure equilibrium, i.e. after the pressure of the container reaches the same pressure of the tank having been sent in the container a gas preferably inert, usually nitrogen, to move it to the pressure of the tank, generally in the order of 5-8 bars.

[0005] Within the supply conduit a compensation cannula is coaxially mounted, through which the gas or air present in the container during the step for filling return.

[0006] Usually, during the filling step the air present in the container is replaced by the liquid and rises back in the compensation cannula until it flows out in the tank from an opening directly communicating with the tank.

[0007] Once the container filling step is completed, for example through the control of closing the liquid passage valve, a self-levelling step is usually provided for, in which the liquid contained in the bottle, arranged above the desired level, is urged to rise through the compensation cannula due to an overpressure in the container obtained by means of a controlled flow of inert gas introduced into the same container through special control valves.

[0008] The container is thus returned to the ambient pressure through at least one degassing conduit and a relative control valve.

[0009] Some isobaric machines of the known type also provide for one or more preliminary steps for evacuating the air present in the bottle for reducing the presence of oxygen and thus the risk of oxidation of the beverage. Furthermore some isobaric machines of the known type provide for the cyclic movement of the compensation cannula before the degassing step to avoid the evacuation of the gas contained in the cannula passing through the liquid.

[0010] The isobaric machines of the known type, of the above generally described type, in practice revealed drawbacks.

5 **[0011]** A first important drawback lies in the fact that the gas and/or the air contained in the container before the filling are transported from the compensation cannula into the tank.

10 **[0012]** Though the filling step can be preceded by an air pre-evacuation step and by a subsequent inert gas introducing step, a residual volume of air containing oxygen is however conveyed, through the compensation cannula, and thus from the latter up to inside the tank through a provided opening, thus modifying the atmosphere of gas in direct contact with the free surface of the liquid to be bottled and thus resulting in an unwanted oxidation of such liquid.

15 **[0013]** A second drawback lies in the fact that the quota part of the liquid that is discharged from the container during the aforementioned self-levelling step of the machine is also reintroduced into the tank through the same opening of the compensation cannula mentioned above. Thus, any impurity or contamination, for example by microorganisms, present in each specific container may contaminate the liquid in the tank conveyed by the aforementioned quota part of liquid discharged from the container during the self-levelling step.

20 **[0014]** Patent DE 4005000 discloses a filling machine comprising a rotary bearing turntable mounted on a plurality of valve units, each of which is provided with a supply conduit connected to a tank of the liquid to be bottled, and intercepted by a shutter which can be actuated by a pneumatic cylinder arranged within the tank for regulating the inflow of liquid into a container to be filled. Furthermore, each valve unit is provided with a compensation cannula mounted within the supply conduit and connected at the upper end thereof to the interior of the pneumatic cylinder of the shutter.

25 **[0015]** In particular, during the container filling step, the interior of the pneumatic cylinder is connected, by means of the actuation of a control valve, with the interior of the tank for conveying in the latter the air coming from the container through the compensation cannula.

30 **[0016]** The latter machine of the known type does not resolve the aforementioned problem of contamination of the atmosphere within the tank of the liquid to be bottled with oxygen in any manner whatsoever, given that in the filling step all the air present in the container is conveyed into the tank itself.

35 **[0017]** With the aim of resolving the aforementioned problems of the filling machines of the known type briefly described above, patent EP 1995208 discloses a filling machine in which, during the container filling step, the compensation cannula of each valve unit is connected, by means of a special control valve, with an evacuation circuit for conveying the air coming from the container outside the tank. The main drawback of the filling machine described in patent EP 1995208 is due to the fact that the compensation cannula should be connected to

the evacuation circuit by means of flexible rubber ducts, with the aim of allowing the movement of the cannula for regulating the maximum level of liquid in the container. The use of such flexible ducts, the latter requiring to be pressurized, implies the risk of gas leakage with an ensuing low reliability of the filling machine, and therefore it does not allow to operate with the high pressures of the isobaric machines in the order of 5-8 bars. In addition, the use of flexible ducts does not allow repeatedly moving the compensation cannula because such ducts are easily subjected to wear.

[0018] A filling machine comprising a turntable carrying mounted an annular-shaped tank for containing a liquid to be bottled, and a plurality of valve units each provided with a supply conduit hydraulically connected to the tank for the inflow of the liquid to containers to be filled, and with a compensation cannula adapted to transport the air and a liquid fraction coming from the container during the container filling step, is also known from the patent DE 3033678.

[0019] In particular, on the cover of the tank an annular chamber is obtained connected to the upper end of the compensation cannula of the valve units for receiving the air and the liquid fraction coming from the containers, and connected to the exterior by means of a vent valve. In addition, the annular chamber is connected with the interior of the tank by means of a return conduit for returning the aforementioned liquid fraction in the tank.

[0020] The main drawback of the filling machine described in DE 3033678 lies in the fact that the compensation cannula is rigidly fixed to the cover of the tank, and thus it is not possible to vary the height of the compensation cannula for regulating the maximum level of the liquid in the container. This fixed position of the compensation cannula implies a consequent limited field of use of the filling machine, which may not operate with all the container sizes.

[0021] Machines for the containment of containers with liquids of an entirely different type i.e. not of the isobaric type, and in particular of the gravity type or slight vacuum type, which provide for discharging outside the tank both the gas coming from the containers during the filling step and the liquid in excess extracted from the containers during the self-levelling step, are known.

[0022] The technical solutions provided for in these different types of machines do not adapt to the isobaric machines which require pressurizing the containers during the filling steps and which preferably provide for that the pressurized conduits are not made using flexible conduits but using rigid conduits in particular made of metal. More in detail, for example gravity machines are known which suction through vacuum the gas and the excess liquid, the machines obviously cannot be adapted in any manner to the isobaric machines that provide for pressurizing the containers. In this situation, the problem on which the present invention is based is that of overcoming the drawbacks revealed by the prior art, by providing an isobaric machine for filling containers with liquids, which

allows to perform a very large regulation of the maximum level of the liquid in the containers.

[0023] A further object of the present finding is that of providing an isobaric machine for filling containers with liquids, capable of allowing to evacuate the gas from the containers during the filling and self-levelling steps without contaminating the liquid contained in the tank of the machine.

[0024] Yet another object of the present invention is that of providing an isobaric machine for filling containers with liquids, capable of subjecting the tank and the conduits of the machine to relatively high pressures without any risk of gas leakage, upon the variation of the level quota of the liquid in the containers.

[0025] A further object of the present finding is that of providing an isobaric machine for filling containers with liquids, capable of allowing evacuating the quota part of liquid contained in the containers beyond the predefined level quota without contaminating the liquid contained in the machine tank.

[0026] A further object of the present finding is that of providing an isobaric machine for filling containers with liquids, which is easy to construct and operatively entirely reliable.

[0027] These and other objects are attained by an isobaric machine for filling containers with liquids, which comprises a support structure; a rotary turntable rotatably mounted on said support structure; a first tank for the pressurised containment of a liquid, in particular gassed liquid, to be bottled in containers, supported by the rotary turntable; a plurality of valve units mounted peripherally on the rotary turntable, hydraulically connected to the first tank and each comprising: a supply conduit, for the inflow of the liquid from the first tank to the containers to be bottled, interception means associated to the supply conduit and adapted to regulate the inflow of liquid in the containers; a compensation cannula which is coaxially mounted within the supply conduit, is provided with an open lower end intended to be inserted into the containers for hydraulically regulating the maximum level of the liquid in the containers, and is susceptible to transport a gaseous fluid or a fraction of the bottled liquid, coming from the containers, during a container filling and/or self-levelling step; said compensation cannula being hydraulically insulated from the first tank and connected - at the upper part - to a second tank, which is connected to the exterior by means of a vent valve; balancing means being provided for substantially balancing the pressures between the first and the second tank. Such isobaric filling machine is particularly characterized in that the second tank is mounted on the first tank spaced therefrom, with the compensation cannula being fixed to the second tank and arranged traversing the first tank; said isobaric filling machine further comprising regulation means mechanically connected to the second tank, actuatable to move the latter with respect to the first tank, transporting the compensation cannula through said first tank with the open lower end between different level heights.

[0028] The technical characteristics of the finding, according to the aforementioned objects, are clearly observable from the content of the following claims and the advantages thereof are clearer in the following detailed description, provided with reference to the attached drawings, which represent an embodiment merely provided by way of non-limiting example, wherein:

- figure 1 shows a first plan schematic view of an isobaric filling machine subject of the invention with some parts removed for showing the others better;
- figure 2 shows a perspective view of the isobaric filling machine of figure 1, with some parts removed for showing the others better;
- figure 3 shows a portion of the isobaric filling machine of the preceding figures, in a side and sectional view schematically representing a plant for the treatment of the liquid extracted from the containers during a self-levelling step;
- figure 4 shows a view of an enlarged detail of an isobaric filling machine regarding a valve unit with some parts being sectional and others removed for showing the others even better;
- figure 5 shows a view of an enlarged detail of an isobaric filling machine, which slightly differs from that of figure 4 for example due to the absence of first actuator means for moving the compensation cannula, regarding a valve unit with some parts being sectional and others removed for showing the others even better.

[0029] According to the figures of the attached drawings, an isobaric machine for filling containers with liquids was indicated in its entirety with 1.

[0030] It comprises in a per se entirely conventional manner, a support structure on which a rotary turntable or turret 2 is rotatably mounted, peripherally carrying mounted a plurality of valve units 3 for filling containers 4 with a liquid, in particular gassed liquid.

[0031] The isobaric filling machine 1 can be inserted within a bottling plant, which comprises in a per se entirely conventional manner usually a rinsing machine and at least one capping machine respectively mounted upstream and downstream of the isobaric filling machine 1 to which the latter is operatively connected by means of augers 101, starwheels and pockets 102 or conveyor belts for transporting the containers 4.

[0032] Each valve unit 3 is provided with a support structure 5 intended to be sealingly peripherally fixed beneath a first tank 6 of the isobaric filling machine 1.

[0033] The first tank 6 contains a liquid, advantageously gassed, at a pressure higher than the atmospheric one and generally of about 5-8 bar for maintaining the gas dissolved in the liquid. For such purpose, the first tank 6 is connected with a source 80 for supplying pressurized gas, generally constituted by an inert gas such as nitrogen.

[0034] A first rotary distributor 70 allows to connect the

first tank 6, which rotates together with the rotary turntable 2, with the source 80 for the fixed supply of pressurized gas.

[0035] Within the support structure 5 of each valve unit 3 a supply conduit 11 is provided for placing the first tank 6 hydraulically in communication with the underlying container 4.

[0036] As outlined more in detail hereinafter, the aforementioned supply conduit 11 conveys, during a step for filling of the container 4, the liquid contained in the first tank 6 to the container 4 upon reaching the pressure equilibrium.

[0037] More in detail, according to an embodiment illustrated in the attached figure, the supply conduit 11 terminates - at the lower part - after a narrowing 12 with a spout 13, in which around the supply conduit 11, in a per se known manner, a plurality of passage holes is peripherally obtained which put the interior of the container 4 in communication with an enabling valve 7 i.e. with degassing valves 8, 9 provided mounted on the support structure 5.

[0038] On the lower face of the spout 13 a centring cone 14 is intended to end up sealingly within which the port of the container 4, raised by special plates (not represented), is engaged for coupling with a respective valve unit 3 and thus receiving the liquid to be bottled during the operative travel thereof around the rotary turntable 2.

[0039] The supply conduit 11 extends upwards to the internal of the first tank 6 through a first opening 15 obtained on the bottom 16 thereof, with a conveyance section fixed to the bottom 16 and provided with large side openings for the inflow of the liquid from the first tank 6. Preferably, in the conveying conduit a mechanical filter is positioned for avoiding the introduction of possible foreign bodies into the valve units 3.

[0040] Within the supply conduit 11, interception means are arranged advantageously obtained with a shutter 18 concentrically mounted in the supply conduit 11 and susceptible to provide sealing, by means of a widened portion 19 thereof, on the interior surface of the narrowing 12 of the supply conduit 11.

[0041] Functionally, the shutter 18 is moved by means of special means described hereinafter, between an opening position, in which it allows the passage of the liquid towards the container 4, and a closing position, in which it obstructs the passage of the liquid towards the container 4.

[0042] As previously mentioned, the isobaric filling machine 1 requires, for filling the containers 4, providing a condition of pressure equilibrium between the first tank 6 and the containers 4 in advance.

[0043] For such purpose, each container 4 is put in communication by means of a first control valve 24 with an isobaric circuit for pressurised gas, in particular inert gas such as nitrogen, adapted to bring the container 4 to the same pressure of the first tank 6. The gas is made to directly flow from the first tank 6 i.e. from a special conduit connected to the source 80 for supplying pres-

surized gas.

[0044] Once the pressures have been balanced, the shutter 18 is moved in opening position, and starts the step for filling with the liquid which flows from the first tank 6 to the container 4, the two now being in pressure equilibrium.

[0045] A compensation cannula 26 is provided for allowing the return of the air, i.e. of the gas, contained in the container 4 and which is replaced by the liquid which flows to the internal thereof during the aforementioned filling step.

[0046] More in detail, each valve unit 3, is actually provided with a compensation cannula 26, which is mounted coaxially within the supply conduit 11, advantageously traversing the shutter 18 obtaining sealing on the latter, and it is provided with an open lower end 29 intended to be inserted within the container 4 for hydraulically regulating the maximum level of the liquid in the container 4.

[0047] The compensation cannula 26 allows, during the step for filling of the container 4, to evacuate the air contained within the latter so as to avoid the forming of a counterpressure which opposes the descent of the liquid, as well as the, as indicated hereinafter, to evacuate a liquid fraction in excess during a subsequent step of self-levelling of the liquid in the container 4.

[0048] Before the filling it is possible, as known, to provide a step for evacuating the air contained in the containers 4 by creating a degree of vacuum. For the purpose, each valve unit 3 of the isobaric filling machine 1 preferably comprises a second valve 25 for controlling a vacuum circuit intended to suction all the air from the container 4, as soon as the latter is carried by the support plate with the centring cone 14 sealed on the spout 13 of the supply conduit 11. Advantageously, in order to quicken the various operations of the filling cycle, the enabling valve 7, is arranged in proximity of the container 4, and it is always subjected in advance to the action of the various operative fluids so as to avoid having to wait for the time required to bring a long section of the conduit of the selected operative circuit to pressurization, before obtaining the desired result in the container 4.

[0049] Once the air from the container 4 is suctioned, this operation being preferable but not strictly necessary, the filling step is performed as described.

[0050] Once the filling step is concluded, the self-levelling step is performed, during which a flow of inert gas, controlled by a third control valve 42 of a self-levelling circuit, is insufflated within the container 4 for determining the rising in the compensation cannula 26 of the liquid fraction (and foam) arranged over the desired level i.e. over the open lower end 29 of the same compensation cannula 26.

[0051] The third valve 42 for controlling the self-levelling circuit is connected to the source 80 for supplying pressurized gas and to the container 4 through the passage holes obtained in the spout 13 around the supply conduit 11. The aforementioned passage holes put the interior of the container 4 in communication with the en-

abling valve 7 which, in turn, is in communication with the third valve 42 for controlling the self-levelling circuit. More in detail, the enabling valve 7 is in communication with the three control valves 24, 25 and 42 of the isobaric circuit, for the vacuum and self-levelling by means of a common conduit 90 indicated in figure 5 in two orthogonal sections that slide parallel to the walls of the first tank 6.

[0052] Upon completing filling and levelling, before the container 4 is disconnected from the respective valve unit 3 it is necessary to return the container 4 to the atmospheric pressure by means of a, per se known, degassing step. For such purpose the aforementioned passage holes of the spout 13 are in communication with one or more of the degassing valves 8, 9 for controllably reducing the pressure in the container 4 up to the atmospheric pressure.

[0053] The compensation cannula 26 is preferably obtained in two sections, one of which is lower 26' intended to be inserted with the open lower end 29 thereof in the containers 4, and an upper 26" one carrying slidably externally associated a control rod 41 of the shutter 18.

[0054] The compensation cannula 26 is hydraulically insulated from the first tank 6, and it is connected - at the upper part - to a second tank 60, preferably toroidally or cylindrically-shaped, and separate from the first tank 6. The second tank 60 is in turn connected to the exterior by means of a vent valve 62 for the evacuation of the gaseous fluid coming from the containers 4.

[0055] Advantageously, the vent valve 62 is adapted to evacuate the gaseous fluid transported from the compensation cannula 26 in the second tank 60, in particular during the self-levelling step described above.

[0056] Balancing means for balancing the pressures between the two tanks 6, 60 are also provided.

[0057] According to a preferred embodiment of the present invention, the balancing means comprise a conduit 61, for balancing the pressures, mounted astride between the two tanks 6, 60 for physically joining them to each other and thus instantaneously bringing the pressures in equilibrium therewithin.

[0058] According to this embodiment, the conduit 61 for balancing the pressures between the two tanks 6, 60, is interposed between a first hole obtained on the cover 6' of the first tank 6 and a second hole obtained on the cover 60' of the second tank 60 to connect them.

[0059] Alternatively, upon physical connection between the two tanks 6, 60 by means of the balancing conduit 61 indicated above, the balancing means may differently provide for at least one first pressure transducer, associated to the first tank 6, and at least one second pressure transducer, associated to the second tank 60, the transducers detecting the pressure on the whole of the respective tanks 6, 60 and controlling the achievement of an equal pressure value therewithin. For the purpose they can control the supply of gas (usually inert) in the two tanks 6, 60 i.e., alternatively or additionally, they can control the release of the gas from the respective tanks 6, 60 in the air. Obviously, the number of

pressure transducers and the positioning thereof in the tanks 6, 60 (or in conduits connected to the tanks 6, 60) may vary depending on the dimensions of the machine or the specific project choice adopted for controlling the pressures, without departing from the scope of protection of the present invention.

[0060] In accordance with the idea on which the present invention is based, the second tank 60 is mounted on the first tank 6 spaced therefrom, with the compensation cannula 26 fixed to the second tank 60 and arranged traversing the first tank 6.

[0061] The isobaric filling machine 1 subject of the invention also comprises regulation means 95 mechanically connected to the second tank 60, actuatable to move the latter with respect to the first tank 6, transporting the compensation cannula 26 through the first tank 6 with the open lower end 29 between different level heights. Advantageously, the regulation means 95 are adapted to controllably regulate the second tank 60 between different heights, corresponding to different level heights of the open lower end 29 of the compensation cannula 26, the heights defining corresponding different maximum levels of liquid in the container 4.

[0062] According to the embodiment illustrated in figures 4 and 5, the compensation cannula 26 slides through the first opening 15 obtained on the bottom 16 of the first tank 6 and through a second opening 20 obtained on the cover 6' of the first tank 6 and preferably aligned to the first opening 15.

[0063] More in detail, advantageously, the compensation cannula 26 is slidably inserted in the shutter 18, which is in turn slidably inserted in the first opening 15 of the bottom 16 of the first tank 6 to allow the movement of the shutter 18 between the open and closed position previously described.

[0064] In addition, advantageously, the compensation cannula 26 is slidably inserted in the control rod 41 of the shutter 18, the rod 41 is in turn slidably inserted in the second opening 20 of the cover 6' of the first tank 6, preferably having interposed a first sealing gasket 21 between the control rod 41 and the edge of the second opening 20 to prevent any leakage of the pressurised gas contained in the first tank 6.

[0065] According to an embodiment illustrated in figure 4, the compensation cannula 26 of each valve unit 3 is provided with an open upper end 39 hydraulically connected to the second tank 60 by means of a fitting conduit 64, connected to a third hole obtained on the cover 60' of the second tank 60.

[0066] Advantageously, an extraction conduit 63 is provided, which is derived from the bottom 60" of the second tank 60 and it is connected to the first tank 6 by means of a conveyance section 63', for pouring the liquid fraction contained in the second tank 60 within the first tank 6, as described in detail hereinafter.

[0067] Preferably, the conveyance section 63' of the extraction conduit 63 is vertically positioned and it is arranged traversing the cover 6' of the first tank 6.

[0068] Such extraction conduit 63 optionally allows to pour the liquid fraction contained in the second tank 60 within the first tank 6.

[0069] Advantageously, the extraction conduit 63 is intercepted by at least one first interception valve 65, adapted to selectively close or open the communication of the second tank 60 towards the first tank 6.

[0070] Once the liquid phase is separated from the gaseous phase in the second tank 60, given that during the self-levelling step the compensation cannula 26 also usually conveys part of the foam of the liquid to be bottled i.e. simultaneously gas and liquid contained in the containers 4, it is possible to discharge the gaseous phase through the vent valve 62 and instead reintroduce the liquid phase in the first tank 6 thus recycling the liquid fraction that had been extracted from containers 4 to take them to the desired filling level.

[0071] Alternatively, should one prefer that the fraction does not return into the first tank 6, in that potentially susceptible of contaminating the entire content thereof (for example should a container 4 be contaminated by a microbial load), it is possible to convey such liquid fraction contained in the second tank 60 no longer in the first tank 6 but externally to the rotary turntable 2.

[0072] For the purpose, the extraction conduit 63 is connected to a system 66 for the treatment of the aforementioned liquid fraction, and it is intercepted by at least one second interception valve 67 adapted to selectively close or open the communication of the second tank 60 towards the system 66. The same system 66 is maintained in pressure equilibrium with the first tank 6 and with the second tank 60. Preferably, the system 66 comprises a second rotary distributor 68 connected to the extraction conduit 63 and to an accumulation tank 69. The liquid may be advantageously treated by the latter, for example through filtration means (not illustrated), before being reintroduced into the first tank 6.

[0073] Advantageously, the aforementioned compensation cannula 26 is cyclically moved to slide within the shutter 18 between a raised position, in which it allows to correctly obtain the degassing step, and a lowered position in which it is inserted with the lower section 26' thereof within the container 4 with the open lower end 29 arranged at the aforementioned predefined height level for defining the level of the liquid within of the container 4.

[0074] For such purpose, first actuator means 30 operate on the compensation cannula 26, and more precisely on the upper section 26" thereof, moving it at each cycle for filling a container 4, between the aforementioned raised position, adapted to allow to correctly perform the degassing, and lowered position, adapted to determine the predefined liquid level in the container 4.

[0075] More in detail, when the compensation cannula 26 is in lowered position with the open lower end 29 having reached the predefined height level, a levelling of the liquid at such height (self-levelling step or compensation) occurs by insufflating inert gas within the container 4 through the third control valve 42 of the self-levelling cir-

cuit, and the ensuing passage of liquid through the compensation cannula 26 up to reaching the interior of the second tank 60.

[0076] The compensation cannula 26 is usually in raised position and it is moved down, in the lowered position, for the aforementioned compensation step aimed at defining the predefined level of liquid in the container 4.

[0077] During degassing it is instead preferable that the compensation cannula 26 be raised, for example preferably by 15 mm, on the surface of the liquid. Actually, were the compensation cannula 26 to touch the surface of the liquid, the pressurized gas would remain therein hence causing, during the degassing step, strong perturbations of the liquid with pressure surge which should instead be avoided.

[0078] As previously mentioned, the regulation of the predefined level of liquid in the containers 4 is obtained by actuating the aforementioned regulation means 95 to move the second tank 60 with respect to the first tank 6 to move the compensation cannula 26 between different heights.

[0079] In particular, the regulation means 95 raise the compensation cannula 26 of all the valve units 3 alongside the respective first actuator means 30 and an opening/closure valve 40, to be described hereinafter and which serve for opening and closing the open upper end 39 of the cannula 26.

[0080] The regulation means 95 operate preferably on a regulation ring 96 in particular fixed to the bottom 60" of the second tank 60, vertically moving the latter controllably between different heights corresponding to the different level heights of the open lower end 29 of the compensation cannula 26 of the valve units 3.

[0081] For example, the regulation means 95 for moving the regulation ring 96 and thus for the regulation of the height of the compensation cannulae 26 of all the valve units 3, comprise one or more linear actuators 97 with trapezoidal screw operating on the regulation ring 96. In particular, each linear actuator 97 is provided with a trapezoidal screw 98 which is engaged within the internally threaded through cavity of a toothed wheel 99 rotated by an actuation motor 100.

[0082] The two tanks 6, 60 can thus be moved one relative to the other following the actuation of the regulation means 95 for regulating the height of the compensation cannula 26. For this purpose, the conveyance section 63' of the extraction conduit 63 is slidably sealingly inserted into a through hole 94 obtained on the cover 6' of the first tank 6.

[0083] Preferably, the sealing between the cover 6' of the first tank 6 and the conveyance section 63' is obtained by means of a second sealing gasket 22 interposed between the conveyance section 63' and the edge of the through hole 94, to prevent any leakage of the pressurized gas contained in the first tank 6.

[0084] Advantageously, the conveyance section 63' of the extraction conduit 63 is made of rigid material, preferably metal.

[0085] The provision of the conveyance section 63' of the extraction conduit 63 according to the invention allows to avoid hydraulic connection with flexible conduits, which having to be pressurised, would lead to the risk of leakages in the isobaric machines. Advantageously, it is possible to bring the gas into the first tank 6 and the second tank 60 with high pressures, in particular in the order of 5-8 bars, without any risk of pressure drop.

[0086] The shutter 18 is preferably moved independently between the raised position and the lowered position by second actuator means 33 which operate on the control rod 41 mentioned previously.

[0087] According to a preferable embodiment illustrated in the attached figures, the second actuator means 33 consist of a pneumatic cylinder, which is coaxially traversed by the upper section 26" of the compensation cannula 26 and determines - by actuating the control rods 41, according to preset operating steps controlled by a logic control unit - the ascent and the descent of the shutter 18. Advantageously, each valve unit 3 also comprises an opening/closure valve 40, which is mounted on the open upper end 39 of the upper section 26" of the compensation cannula 26, and it is adapted to open and close such open upper end 39 according to preset operating steps.

[0088] According to the embodiment illustrated in the attached figures, the fitting conduit 64, which connects the second tank 60 to the compensation cannula 26, is laterally derived from the compensation cannula 26 preferably developing orthogonally to the latter, and it is intercepted by the opening/closure valve 40 at the open upper opening 39 of the compensation cannula 26.

[0089] The upper closure of the compensation cannula 26, actuated by the opening/closure valve 40, occurs in absence of the container 4, during degassing and during the pressurisation for avoiding removing pressure on the first tank 6.

[0090] Functionally, with reference to what has been described above, upon completing the step for filling of the container 4, the logic control unit of the isobaric filling machine 1, controls the closure of the supply conduit 11 by means of the shutter 18 which is made to descend by means of the second actuator means 33 and the descent of the compensation cannula 26 by means of the first actuator means 30 up to bringing the open lower end 29 thereof to the predefined height for defining the level of the liquid within the container 4.

[0091] At this point, in a per se conventional manner, the third control valve 42 of the self-levelling circuit is opened, which controls, through the enabling valve 7, the inflow of inert gas within the container 4 thus raising the liquid in the second tank 60 through the compensation cannula 26 up to the achievement of the predefined height level.

[0092] Once the step for self-levelling the liquid in the container 4 is completed, the logic control unit controls, through the opening/closure valve 40, the closure of the open upper end 39 of the compensation cannula 26, and

through the first actuator means 30 the rising of the compensation cannula 26 in the raised position.

[0093] Hence, the logic control unit controls the sequential opening of the two degassing valves 8, 9 adapted to bring the pressure of the container 4 first to an intermediate pressure and then to the ambient pressure (i.e. directly to the ambient pressure without passing through an intermediate pressure).

[0094] Thus the finding thus conceived attains the pre-set objects.

Claims

1. Isobaric machine (1) for filling containers with liquids, comprising:

- a support structure;
- a rotary turntable (2) rotatably mounted on said support structure;
- a first tank (6) for the pressurised containment of a liquid, in particular gassed, to be bottled in containers (4), supported by said rotary turntable (2);
- a plurality of valve units (3) peripherally mounted on said rotary turntable (2), hydraulically connected to said first tank (6) and each comprising:

- o a supply conduit (11), for the inflow of said liquid from said first tank (6) to said containers (4) to be bottled,
- o interception means (18, 19) associated to said supply conduit (11) and adapted to regulate the inflow of said liquid in said containers (4);
- o a compensation cannula (26) coaxially mounted within said supply conduit (11), provided with an open lower end (29) intended to be inserted within said containers (4) for hydraulically regulating the maximum level of said liquid in said containers (4), and susceptible of transporting a gaseous fluid or a fraction of said bottled liquid, coming from said containers (4), during a step for filling and/or self-levelling said containers (4);

said compensation cannula (26) being hydraulically insulated from said first tank (6) and connected - at the upper part - to a second tank (60), which is connected to the external environment by means of a vent valve (62); balancing means being provided for substantially balancing the pressures between said first and second tank (6, 60);
said isobaric filling machine (1) being **characterised in that** said second tank (60) is mounted on said first tank (6) spaced therefrom, with said compensation cannula (26) fixed to said second tank (60) and ar-

ranged traversing said first tank (6); said isobaric filling machine (1) further comprising regulation means (95) mechanically connected to said second tank (60), actuatable to move the latter with respect to said first tank (6), transporting said compensation cannula (26) through said first tank (6) with the open lower end (29) between different level heights.

2. Isobaric filling machine (1) according to claim 1, **characterised in that** it comprises at least one extraction conduit (63), which is derived from the bottom (60") of said second tank (60) and it is connected to said first tank (6) by means of a conveyance section (63') arranged traversing the cover (6') of said first tank (6), for pouring the liquid fraction contained in said second tank (60) within said first tank (6).
3. Isobaric filling machine (1) according to claim 2, **characterised in that** the conveyance section (63') of said extraction conduit (63) is substantially vertical and it is slidably sealingly inserted in a through hole (94) obtained on the cover (6') of said first tank (6).
4. Isobaric filling machine (1) according to claim 1, **characterised in that** said vent valve (62) is susceptible to evacuate the gaseous fluid transported from said compensation cannula (26) in said second tank (60), in particular during said self-levelling step.
5. Isobaric filling machine (1) according to claim 1, **characterised in that** said balancing means comprise a balancing conduit (61) of the pressures connected astride between said first and second tank (6, 60).
6. Isobaric filling machine (1) according to claim 5, **characterised in that** said balancing conduit (61) of the pressures is interposed between a first hole obtained on the cover (6') of said first tank (6) and a second hole obtained on the cover (60') of said second tank (60) to connect them.
7. Isobaric filling machine (1) according to claim 1, **characterised in that** said second tank (60) is hydraulically connected to an open upper end (39) of said compensation cannula (26) of each valve unit (3) by means of a fitting conduit (64) connected to a third hole obtained on the cover (60') of said second tank (60).
8. Isobaric filling machine (1) according to claim 7, **characterised in that** each said valve unit (3) comprises at least one opening/closure valve (40), which is mounted on the upper end (39) of said compensation cannula (26) and it is adapted to open and close said open upper end (39) according to preset operating steps.

9. Isobaric filling machine (1) according to claim 8,
characterised in that said fitting conduit (64) is de-
 rived laterally by said compensation cannula (26),
 and it is intercepted by said opening/closure valve
 (40) at the open upper opening (39) of said compen- 5
 sation cannula (26).

10. Isobaric filling machine (1) according to claim 2,
characterised in that said extraction conduit (63)
 is intercepted by at least one first interception valve 10
 (65) adapted to selectively close or open the com-
 munication of said second tank (60) towards said
 first tank (6).

11. Isobaric filling machine (1) according to claim 1, 15
characterised in that it comprises at least one ex-
 traction conduit (63), which is derived from the bot-
 tom (60") of said second tank (60) and it is connected
 to a system (66) for treating said liquid fraction,
 whose system (66) is substantially in pressure equi- 20
 librium with said first and second tank (6, 60).

12. Isobaric filling machine (1) according to claim 11,
characterised in that said extraction conduit (63)
 is intercepted by at least one second interception 25
 valve (67) adapted to selectively close or open the
 communication of said second tank (60) towards
 said system (66) for treating said liquid fraction.

13. Isobaric filling machine (1) according to claim 11, 30
characterised in that said system (66) comprises
 a second rotary distributor (68) connected to said
 extraction conduit (63) and to a tank (69) for accu-
 mulating said liquid. 35

14. Isobaric filling machine (1) according to claim 1,
characterised in that said balancing means com-
 prise at least one first pressure transducer associat-
 ed to said first tank (6) and at least one second pres-
 sure transducer associated to said second tank (60), 40
 which detect the pressure within the respective tanks
 (6, 60) and control the achievement of an equal pres-
 sure value controlling the inlet and/or the outlet of
 gas in the respective tanks (6, 60). 45

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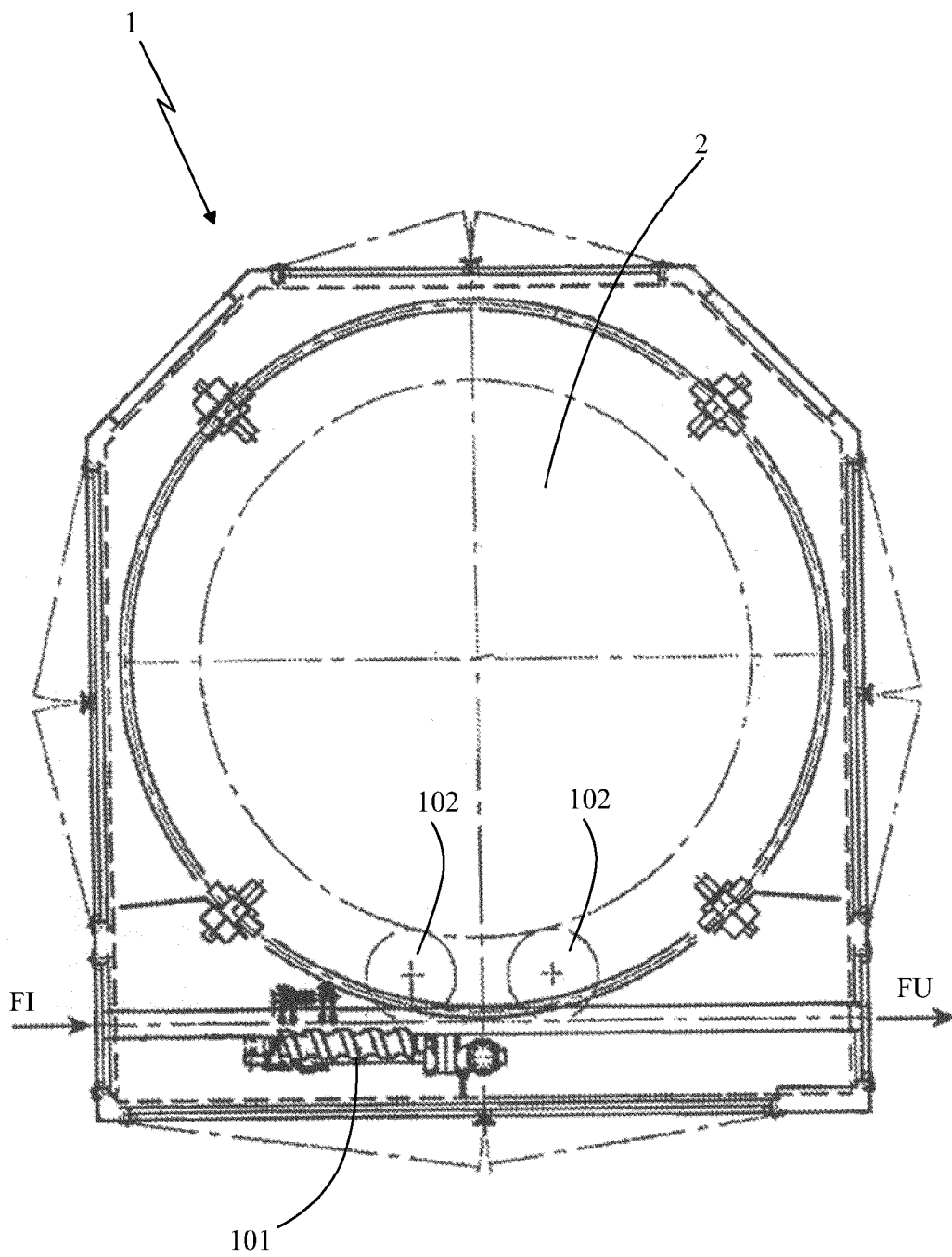


Fig. 1

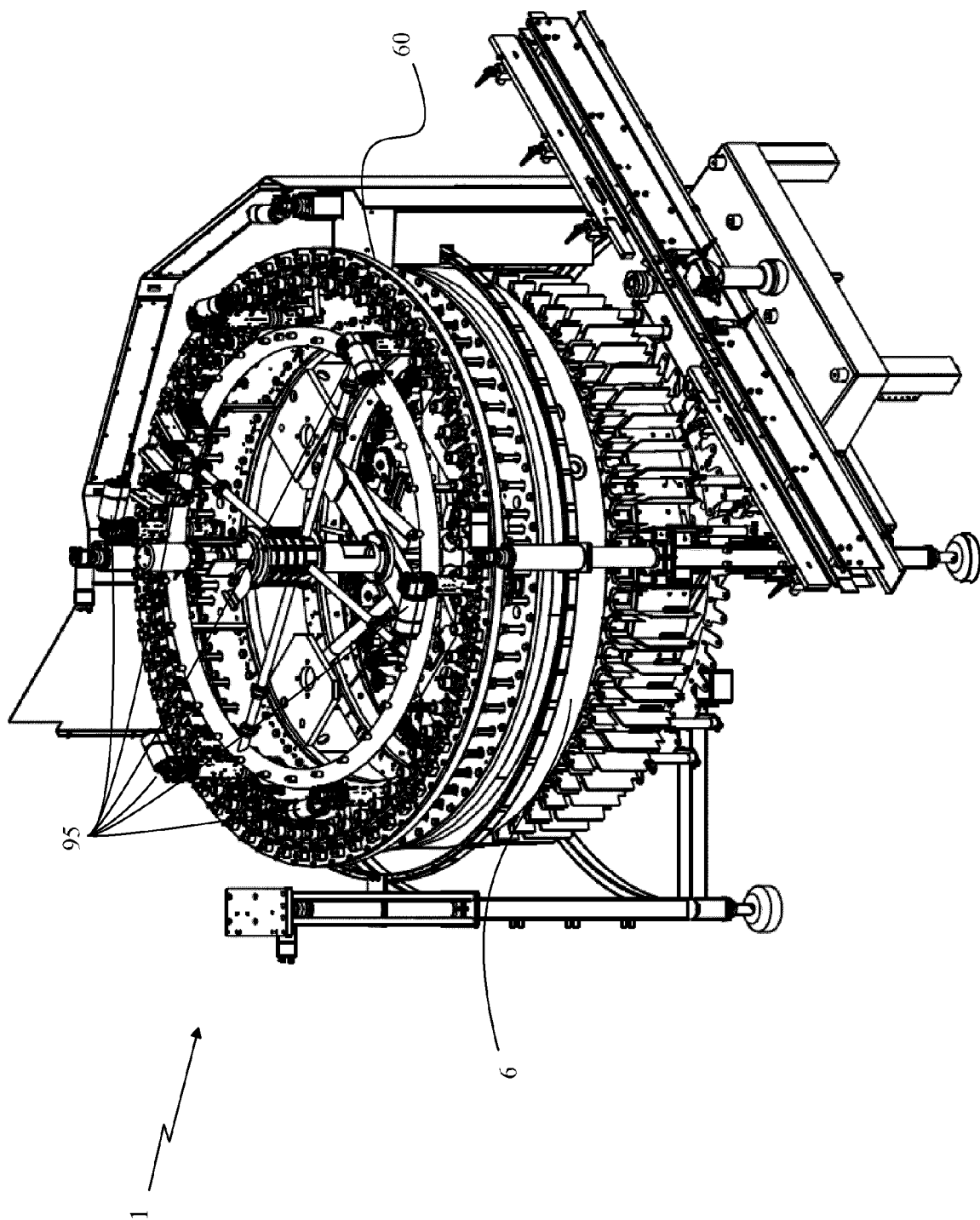


Fig. 2

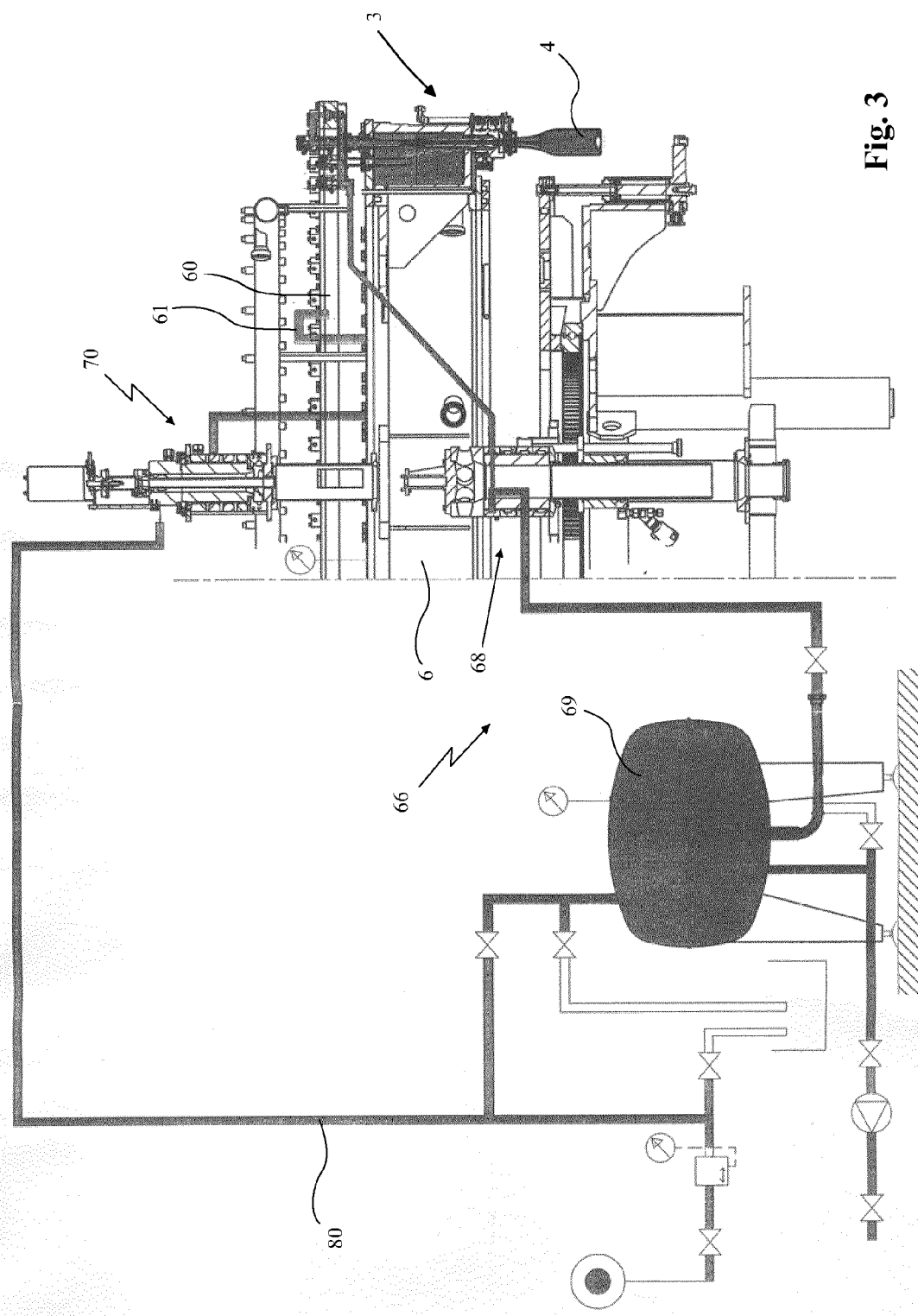


Fig. 3

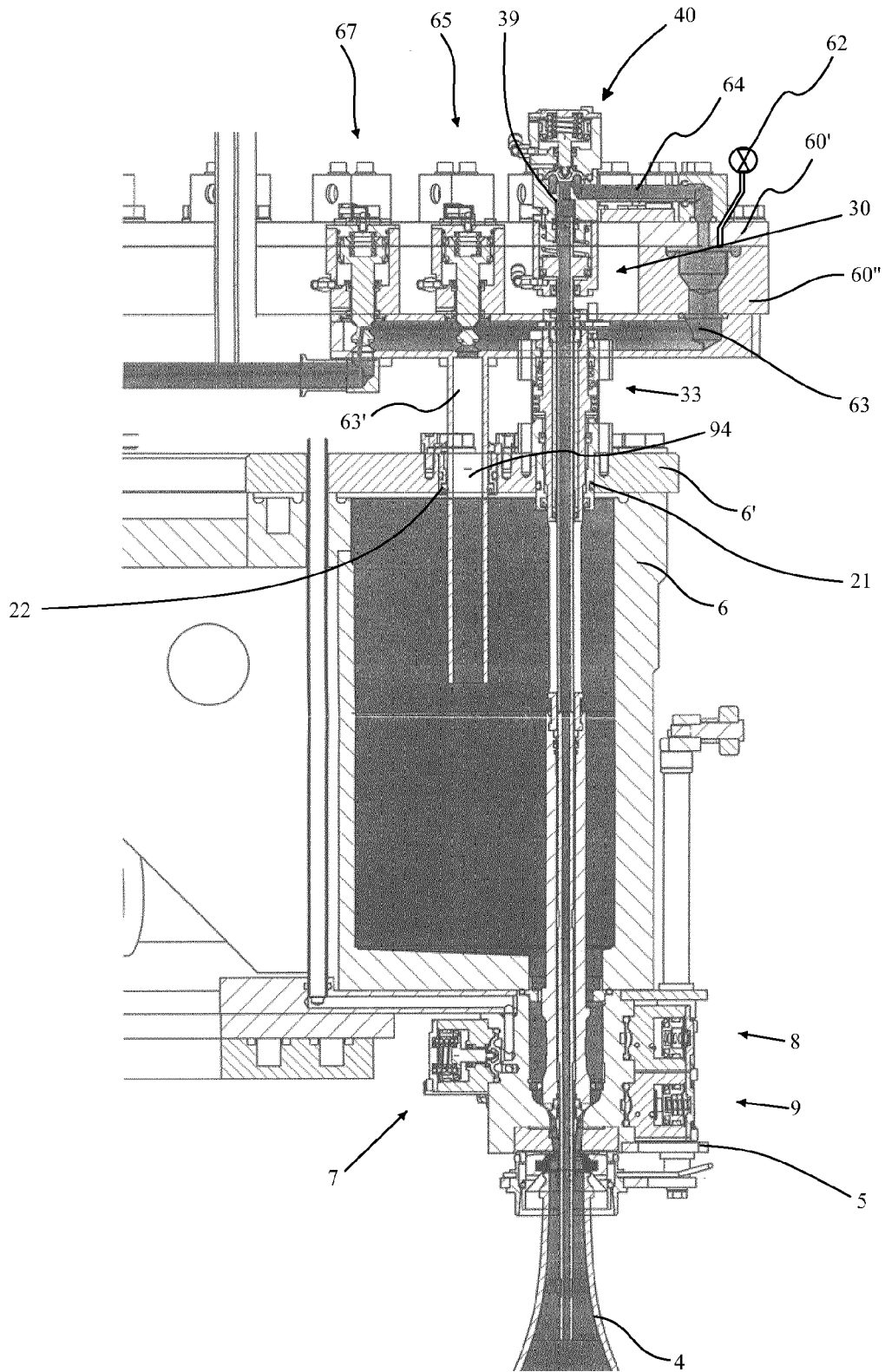


Fig. 4

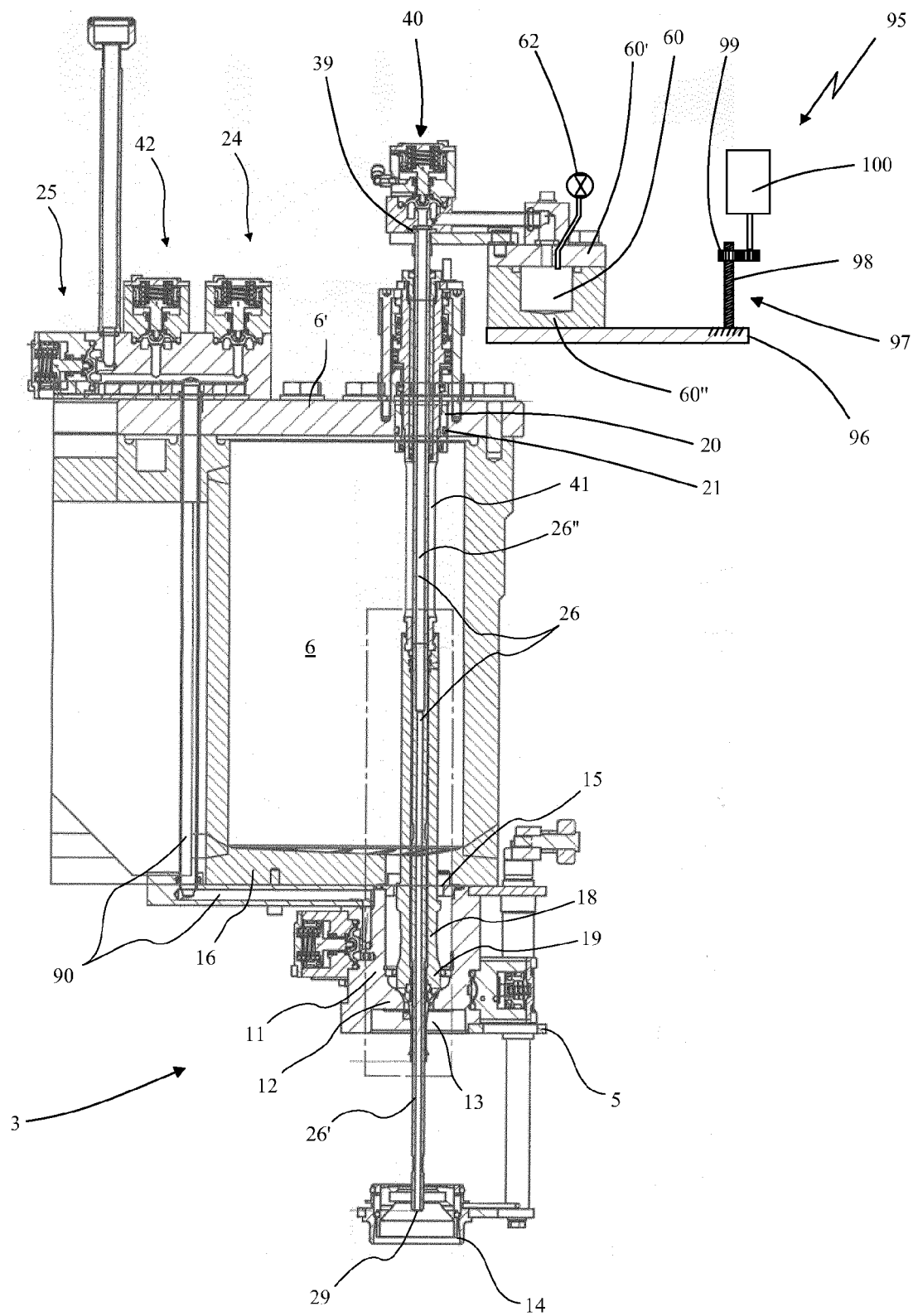


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 6593

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 30 33 678 A1 (VANDERGEETEN SA [BE]) 26 March 1981 (1981-03-26) * page 12, line 18 - page 21, line 12 * * figures 1,8 *	1-14	INV. B67C3/06 B67C3/26
A	EP 1 995 208 A1 (GRUPPO BERTOLASO SPA [IT]) 26 November 2008 (2008-11-26) * paragraphs [0040] - [0045], [0067] - [0074] * * figures 2,3 *	1-14	
A	DE 40 05 000 A1 (SEITZ ENZINGER NOLL MASCH [DE]) 22 August 1991 (1991-08-22) * column 2, line 56 - column 3, line 3 * * column 3, line 47 - column 4, line 35 * * page 6, line 48 - page 7, line 11 * * figure 1 *	1-14	
A	EP 2 236 454 A1 (GRUPPO BERTOLASO SPA [IT]) 6 October 2010 (2010-10-06) * paragraphs [0041] - [0044] * * figure 4 *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	DE 10 2009 009340 A1 (KHS AG [DE]) 26 August 2010 (2010-08-26) * paragraph [0013] * * figures 1,2 *	1	B67C
A	EP 0 554 690 A1 (SEITZ ENZINGER NOLL MASCH [DE]) 11 August 1993 (1993-08-11) * column 3, line 22 - column 5, line 39 * * column 6, lines 39-51 * * figure 1 *	1	
A	DE 10 2007 009435 A1 (KHS AG [DE]) 28 August 2008 (2008-08-28)	1	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 January 2012	Examiner Pardo, Ignacio
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 6593

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-01-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3033678 A1	26-03-1981	DE 3033678 A1 PT 71778 A	26-03-1981 01-10-1980
EP 1995208 A1	26-11-2008	AR 065926 A1 AT 444936 T AU 2008201408 A1 EP 1995208 A1 ES 2333174 T3 US 2008271812 A1	08-07-2009 15-10-2009 23-10-2008 26-11-2008 17-02-2010 06-11-2008
DE 4005000 A1	22-08-1991	NONE	
EP 2236454 A1	06-10-2010	NONE	
DE 102009009340 A1	26-08-2010	DE 102009009340 A1 EP 2398731 A2 US 2011272057 A1 WO 2010094409 A2	26-08-2010 28-12-2011 10-11-2011 26-08-2010
EP 0554690 A1	11-08-1993	DE 4201698 A1 EP 0554690 A1	29-07-1993 11-08-1993
DE 102007009435 A1	28-08-2008	BR PI0806082 A2 CN 101626972 A DE 102007009435 A1 EP 2125600 A1 JP 2010519141 A US 2010212773 A1 WO 2008101572 A1	30-08-2011 13-01-2010 28-08-2008 02-12-2009 03-06-2010 26-08-2010 28-08-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 4005000 [0014]
- EP 1995208 A [0017]
- DE 3033678 [0018] [0020]