(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 154 103 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**17.02.2010 Bulletin 2010/07**

(51) Int Cl.:
***B67D 1/04*** *(2006.01)*

(21) Application number: **08425553.8**

(22) Date of filing: **07.08.2008**

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

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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

# (54) Modular beverage dispensing assembly

(57) A modular beverage dispensing assembly (1) having a number of beverage storage units (2), each for supplying a pressurized beverage and in turn having an airtight pressure container (3) housing a collapsible removable cartridge (4) containing the beverage; and an electric compressor (5) for feeding pressurized gas into the pressure container (3) of each beverage storage unit (2), to crush the removable cartridge (4) inside the pressure container; each beverage storage unit (2) also having a valve assembly (12) for regulating pressurized-gas flow from the pressurized-gas source (5) into the airtight pressure container (3), and which has a non-return valve (25) and a three-way valve (26) arranged in cascade formation one after the other; the non-return valve (25) being interposed between the inside of the pressure container (3) and the three-way valve (26), and being so oriented as to allow pressurized-gas flow from the pressure container (3) to the three-way valve (26), and to normally prevent pressurized-gas flow into the pressure container (3); the three-way valve (26), on the other hand, being designed to connect the non-return valve (25) directly to the pressurized-gas source (5) when the pressure container (3) is in a predetermined work position, and to connect the non-return valve (25) directly to the outside when the pressure container (3) is not in the work position; the valve assembly (12) also having valve-locking means (28) for keeping the non-return valve (25) open when the collapsible removable cartridge (4) is inserted properly inside the pressure container (3).

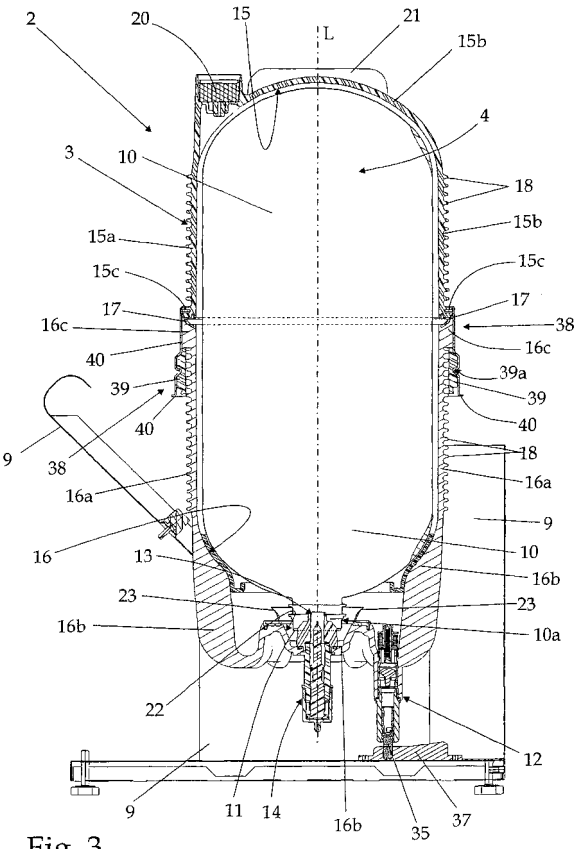


Fig. 3

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## Description

**[0001]** The present invention relates to a modular beverage dispensing assembly.

**[0002]** More specifically, the present invention relates to a modular beer dispensing assembly, to which the following description refers purely by way of example.

**[0003]** PCT Patent Application WO007019848 discloses an easy-carry cooled-beer dispensing assembly substantially comprising an undeformable, substantially cylindrical outer pressure container made of plastic and fitted with a removable airtight bottom cap for access to the inside; an electric reciprocating compressor for maintaining the air inside the pressure container at higher than atmospheric pressure; and a removable cartridge inserted inside the pressure container and in turn comprising a substantially bottle-shaped collapsible container designed to fit inside the pressure container, with its neck facing the removable bottom cap of the pressure container, and which is originally filled completely with beer or other beverage.

**[0004]** More specifically, the pressure container bottom , cap is fitted with a central cylindrical sleeve, which projects towards the centre of the pressure container, coaxially with the longitudinal axis of the pressure container, and communicates with the outside through a central hole formed through the wall of the bottom cap; and the neck of the collapsible container is designed to fit inside the cylindrical sleeve, so the base of the neck rests on the distal end of the sleeve, compressing annular seals on the sleeve. The annular seals are designed to prevent compressed-air leakage from the pressure container when the neck of the collapsible container is inserted fully inside the cylindrical sleeve of the bottom cap.

**[0005]** In addition to the collapsible container, the removable inner cartridge also comprises a sealing cap for airtight sealing the opening in the neck of the collapsible container; and an outflow hose connected at one end to the sealing cap of the cartridge, and extending outwards of the pressure container through the cylindrical sleeve in the pressure container bottom cap.

**[0006]** The easy-carry cooled-beer dispensing assembly also comprises a refrigeration compartment designed to house the outer pressure container vertically and in rocking manner; and a manually operated metering valve fitted externally to the top of the refrigeration compartment, and connected by the outflow hose to the collapsible container of the removable cartridge.

**[0007]** Finally, the easy-carry cooled-beer dispensing assembly comprises a valve assembly for regulating compressed-air flow from the reciprocating compressor into the pressure container. More specifically, the valve assembly is designed to connect the pressure container directly to the delivery side of the electric compressor when the pressure container is positioned vertically inside the refrigeration compartment, and to connect the pressure container directly to the outside when the pressure container is not positioned vertically inside the refrigeration compartment.

**[0008]** When the compressor pressurizes the air inside the pressure container, the difference in pressure deforms the collapsible container, so the liquid inside (beer or other beverage) is forced to flow under pressure along the outflow hose to the metering valve, from which it is tapped by the user.

**[0009]** The Applicant has realized that the above-described easy-carry beer dispensing assembly, though ensuring a much higher standard of hygiene than conventional beer tap systems (the removable cartridge is disposable), is not suitable for systems requiring a higher operating pressure, for example those systems where the pressure containers are remote from the place where the beverage is actually dispensed (and possibly cooled).

**[0010]** Moreover, the valve assembly of the easy-carry cooled-beer dispensing assembly described in PCT Patent Application WO007019848 can connect the pressure container to the delivery side of the electric compressor even with no removable cartridge inside the pressure container, thus operating the electric compressor and consuming current to no purpose. The pressure gauge turning the electric compressor on and off, in fact, is only designed to turn the electric compressor off when the pressure in the pressure container reaches a predetermined value, which never occurs when the removable bottom cap sleeve is not engaged by the neck of the collapsible container of the removable cartridge.

**[0011]** It is an object of the present invention to provide a cooled-beer dispensing assembly designed to eliminate the aforementioned drawbacks, and in particular to improve the way in which the pressure container is pressurized and depressurized.

**[0012]** According to the present invention, there is provided a modular beverage dispensing assembly as claimed in Claim 1 and preferably, though not necessarily, in any one of the Claims depending directly or indirectly on Claim 1.

**[0013]** In particular, the Applicant has found that a very efficient system for pressurizing and depressurizing a cooled-beer dispensing assembly of a type like the one previously described provides for using a valve assembly comprising a non-return valve, a three-way valve arranged in cascade with the non-return valve, and a valve-locking means, which are arranged and configured to operate as follows:

- when no removable cartridge is properly inserted in the pressure container, the non-return valve allows pressurized-gas flow from the pressure container to the three-way valve but prevents pressurized-gas flow into the pressure container;
- when a removable cartridge is properly inserted in the pressure container, the valve-locking means cooperate with the non-return valve to '" keep it open, so that gas flow is allowed in both directions;
- when the pressure container is in a predetermined work position (beverage dispensing condition), the

three-way valve connects the non-return valve to the pressurized-gas source;

- when the pressure container is in a different position (rest condition), the three-way valve connects the non-return valve to the outside.

**[0014]** According to a first aspect thereof, the present invention thus relates to a modular beverage dispensing assembly comprising:

- at least one beverage storage unit for supplying a pressurized beverage, and in turn comprising an airtight pressure container for housing a collapsible removable cartridge containing the beverage; and
- a pressurized-gas source for feeding pressurized gas into the pressure container of the beverage storage unit, to compress the removable cartridge inside the pressure container;

the beverage storage unit also comprising a valve assembly for regulating pressurized-gas flow from the pressurized-gas source into the airtight pressure container; and the valve assembly comprising a non-return valve which is oriented so as to allow pressurized-gas flow from the pressure container to the outside, and to normally prevent pressurized-gas flow into the pressure container, and also valve-locking means for keeping the non-return valve open when the removable cartridge is inserted properly inside said pressure container.

**[0015]** Preferably, the valve assembly also comprises a three-way valve arranged in cascade formation to said non-return valve; the non-return valve being interposed between the inside of the pressure container and the three-way valve, and being so oriented as to allow pressurized-gas flow from the pressure container to the three-way valve; the three-way valve being designed to connect the non-return valve to the pressurized-gas source when the pressure container is in a predetermined work position, and to connect the non-return valve to the outside when the pressure container is not in said work position.

**[0016]** Preferably, the valve assembly also comprises a valve body having a through conduit communicating directly with the inside of the pressure container; the non-return valve is located along the through conduit, and comprises a movable shutter suitable to move inside the through conduit to and from a closed position closing the through conduit hermetically, and a first elastic member for keeping the movable shutter in the closed position; the movable shutter and the first elastic member are located inside the through conduit of the valve body, so that pressurized-gas flow into the pressure container assists the first elastic member in keeping the movable shutter in the closed position; the valve-locking means are designed to keep the movable shutter away from the closed position when the removable cartridge is inserted properly inside said pressure container.

**[0017]** Preferably, the pressure container is in the work position when its longitudinal axis is substantially vertical.

**[0018]** In a preferred embodiment, the removable cartridge comprises a substantially bottle-shaped collapsible container designed to fit, upside down, inside the pressure container, with the neck of the collapsible container facing the end wall of the pressure container, and a cap in the form of a pierceable membrane or similar, sealing the opening at the end of the neck. Advantageously, the removable cartridge is inserted properly inside said pressure container when the neck of the collapsible container engages a dead seat formed in the end wall of the pressure container.

**[0019]** The valve body is preferably located on the end wall of the pressure container, alongside the dead seat. The valve-locking means preferably comprise a movable pin inserted in axially-sliding manner inside the top end of the valve body, so that the bottom end of the movable pin extends inside the through conduit to a point close to the movable shutter in the closed position, and a second elastic member for preventing the movable pin from penetrating further inside the valve body and reaching and so pushing the movable shutter out of the closed position. The top end of the movable pin preferably supports a part of said collapsible container. The second elastic member is preferably designed to yield under the weight of the collapsible container to allow the movable pin to push the movable shutter out of the closed position.

**[0020]** The pressure container may also comprise an annular lip seal completely surrounding the opening of the dead seat formed in the end wall of the pressure container; the through conduit of the valve body is connected to the inside of the pressure container, outside the annular seal.

**[0021]** The three-way valve may be located at the end of the valve body, outside the pressure container, and comprises an outer casing fixed directly to the valve body, a movable stem inserted telescopically inside the outer casing, and a third elastic member for opposing penetration of the movable stem inside the outer casing. The variable-volume cavity formed by the movable stem inside the outer casing may communicate directly with the through conduit of the valve body, and the outer casing may comprise a number of exhaust openings respectively connecting said variable-volume cavity to the outside and to the pressurized-gas source. Depending on the position assumed with respect to the outer casing, the movable stem may be able to close the exhaust openings connecting the variable-volume cavity to the outside, or the exhaust openings connecting the variable-volume cavity to the pressurized-gas source.

**[0022]** The movable stem is preferably movable between an extracted position, in which the movable stem projects almost entirely from the outer casing and closes the exhaust openings connecting the variable-volume cavity to the outside, so the pressurized gas from the pressurized-gas source flows to the through conduit of the valve body, and a withdrawn position, in which the movable stem is almost entirely inserted inside the outer

casing and closes the exhaust openings connecting the variable-volume cavity to the pressurized-gas source, thus connecting the pressure container to the outside.

**[0023]** Preferably, the third elastic member of the three-way valve tends to keep the movable stem in the extracted position. The valve assembly may also comprise a cam guide designed to push the movable stem into the withdrawn position when the pressure container is set to the work position.

**[0024]** The pressure container may comprise two bell-shaped monolithic shells made of plastic material, aligned along the same longitudinal axis with their concavities facing, and which rest one on the other to form a closed shell. Each bell-shaped monolithic shell may have a substantially cylindrical lateral wall, and a projecting peripheral flange completely surrounding the opening at the end of the lateral wall. The peripheral flanges may rest one on the other when the two bell-shaped monolithic shells are joined to form the closed shell. One of the two bell-shaped monolithic shells may also have an annular lip seal which is fixed firmly to the peripheral flange and projects towards the other bell-shaped monolithic shell to seal the join between the two peripheral flanges.

**[0025]** The pressure container may also comprises a fastener for selectively tightening the peripheral flanges of the two bell-shaped monolithic shells to one another, so as to fix said bell-shaped monolithic shells rigidly to one another and force the annular seal to seal the join between said peripheral flanges.

**[0026]** The fastener may comprise a bush fitted to the lateral wall of a first bell-shaped monolithic shell, with one end of the bush resting on the peripheral flange of said first bell-shaped monolithic shell. The fastener may also comprise a substantially cup-shaped outer ring nut fitted to the lateral wall of a second bell-shaped monolithic shell, so as to project beyond the peripheral flange of the second bell-shaped monolithic shell, coaxially with the longitudinal axis of the two bell-shaped monolithic shells, to extend completely over the peripheral flange of the first bell-shaped monolithic shell, and to fit directly onto said bush. The outer ring nut may have at least one helical thread, which extends coaxially with said longitudinal axis and engages a corresponding helical groove formed in the outer surface of said bush.

**[0027]** In a preferred embodiment, the lateral wall of each bell-shaped monolithic shell is corrugated externally.

**[0028]** In particular, the outer surface of the lateral wall of each bell-shaped monolithic shell may have a number of projecting annular ribs equally spaced along substantially the full height of the lateral wall, and designed to locally increase the nominal thickness of the lateral wall by at least 50%.

**[0029]** The projecting annular ribs may be arranged on the outer surface of the lateral wall so that the distance between each two adjacent projecting annular ribs substantially equals the maximum thickness of the lateral wall at said projecting annular ribs.

**[0030]** The beverage storage unit may also comprise a piercing head which is housed inside the dead seat formed in the end wall of the pressure container, directly faces the cap of the removable cartridge, and is designed to pierce through the cap into the collapsible container; and an outflow pipe for feeding the beverage contained in the collapsible container out of the pressure container through the piercing head.

**[0031]** The beverage storage unit may also comprise a supporting frame, and the pressure container may be fixed to said frame to oscillate freely about a horizontal axis of rotation.

**[0032]** The assembly may comprise a number of independent beverage storage units, and the pressurized-gas source may feed pressurized gas into the pressure container of each beverage storage unit to compress the removable cartridge inside the pressure container.

**[0033]** The pressurized-gas source may be an electric compressor.

**[0034]** The assembly may also comprise at least one hand-operated metering valve, and a corresponding connecting pipe connecting the outflow pipe of said at least one beverage storage unit to the metering valve.

**[0035]** The assembly may also comprise at least one refrigeration unit located along the connecting pipe to cool the beverage flowing along said connecting pipe.

**[0036]** A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic view, with parts removed for clarity, of a modular beverage dispensing assembly in accordance with the teachings of the present invention;

Figure 2 shows a view in perspective, with parts removed for clarity, of a component part of the Figure 1 modular beverage dispensing assembly;

Figure 3 shows a section of the Figure 2 component part;

Figure 4 shows a larger-scale view, with parts removed for clarity, of a first detail of the Figure 2 and 3 component part;

Figure 5 shows a larger-scale view, with parts removed for clarity, of a second detail of the Figure 2 and 3 component part;

Figure 6 shows a larger-scale view, with parts removed for clarity, of a variation of the Figure 5 second detail.

**[0037]** With reference to Figures 1, 2 and 3, number 1 indicates as a whole a modular beverage dispensing assembly, particularly suitable for dispensing cooled beer or other beverage, possibly containing dissolved carbon dioxide.

**[0038]** The modular beverage dispensing assembly comprises: a number of (in the example shown, four) fully independent beverage storage units 2, each for supplying a stream of pressurized beer at ambient temperature,

and each substantially defined by an airtight, substantially undeformable outer pressure container (or chamber) 3 housing a removable cartridge 4 containing pressurized beer; an electric reciprocating compressor 5 for feeding compressed air, on command, into pressure container 3 of each beverage storage unit 2 connected to it, so as to compress, i.e. to crush, the removable cartridge 4 inside the pressure container; an external, preferably, though not necessarily, manually operated metering valve 6; and a connecting pipe 7 for feeding beer from individual beverage storage units 2 to metering valve 6.

**[0039]** Preferably, though not necessarily, the modular beverage dispensing assembly also comprises a preferably, though not necessarily, heat-pump-type external refrigeration unit 8 located along pipe 7 to cool the beer flowing along pipe 7 to metering valve 6, so that beer comes out of metering valve 6 at lower than ambient temperature, and preferably, though not necessarily, at a temperature ranging between +5°C and +18°C.

**[0040]** More specifically, with reference to Figures 2, 3 and 4, in the example shown, pressure container 3 of each beverage storage unit 2 is substantially cylindrical, rests on a supporting frame 9 with the longitudinal axis L of the pressure container preferably, though not necessarily, positioned substantially vertically, and can oscillate freely, on supporting frame 9, about a horizontal axis of rotation A.

**[0041]** Removable cartridge 4 substantially comprises a collapsible, substantially bottle-shaped container 10, which is originally filled completely with beer or other beverage, and is designed to fit, upside down, completely inside pressure container 3, with its neck 10a facing downwards and resting on the substantially semispherical bottom of pressure container 3; and a cap 11, in the form of a pierceable membrane or similar, sealing the opening at the end of neck 10a.

**[0042]** In the example shown, collapsible container 10 has a capacity of a few tens of litres, and is made of polyethylene terephthalate (PET); whereas pressure container 3 is preferably, though not necessarily, approximately 610 millimeters high, and the internal diameter of pressure container 3 is preferably, though not necessarily, equal to approximately 250 millimeters.

**[0043]** In addition to pressure container 3 and frame 9, each beverage storage unit 2 also comprises: a first valve assembly 12 for regulating compressed-air flow from compressor 5 into pressure container 3; a piercing head 13 housed inside the bottom of pressure container 3, directly facing cap 11 of removable cartridge 4, and designed to pierce through cap 11 into collapsible container 10; an outflow pipe (not shown) connecting piercing head 13 to connecting pipe 7 to feed beer from collapsible container 10 to pipe 7; and a second valve assembly 14 for regulating beer outflow along the outflow pipe (not shown) to pipe 7.

**[0044]** In the example shown, the outflow pipe of each beverage storage unit 2 is preferably, though not necessarily, connected to connecting pipe 7 with the interposition of an electrically or manually controlled on/off valve (not shown) for isolating the corresponding beverage storage unit 2 from pipe 7 to metering valve 6.

**[0045]** Obviously, the on/off valves as a whole may be replaced by a hydraulic distributor, to which all the outflow pipes are connected, and from which connecting pipe 7 extends.

**[0046]** With reference to Figure 3, in the example shown, valve assembly 14 is preferably, though not necessarily, inserted through the bottom of pressure container 3, directly below piercing head 13, and is interposed between piercing head 13 and the outflow pipe (not shown).

**[0047]** With reference to Figures 2, 3 and 4, unlike the pressure container described in PCT Patent Application WO2007019848, pressure container 3 substantially comprises two hollow bodies, in particular two bell-shaped monolithic shells 15, 16 made of plastic - preferably, though not necessarily, a thermoplastic material - and each having an externally corrugated, substantially cylindrical lateral wall 15a, 16a, and a substantially semispherical end wall 15b, 16b. Bell-shaped monolithic shells 15, 16 are aligned one over the other, with their concavities facing, along the longitudinal axis L of pressure container 3, and rest one on the other to form a closed shell. The bottom bell-shaped monolithic shell 16 is hinged to frame 9 at lateral wall 16a to oscillate freely about axis A, and the end wall 16b of bottom monolithic shell 16 therefore defines the bottom of pressure container 3 fitted with valve assemblies 12, 14 and piercing head 13.

**[0048]** Each bell-shaped monolithic shell 15, 16 has a flange or peripheral projection 15c, 16c surrounding the whole opening at the end of lateral wall 15a, 16a. The two peripheral flanges 15c, 16c rest one on top of the other when bell-shaped monolithic shells 15, 16 are joined to form the closed shell, and the top bell-shaped monolithic shell 15 also comprises an annular lip seal 17 fixed firmly to peripheral flange 15c and projecting towards bell-shaped monolithic shell 16 underneath to engage a corresponding annular groove formed in peripheral flange 16c of shell 16, and adhere to the inner surface of shell 16 to seal the join between the two peripheral flanges 15c, 16c.

**[0049]** As for the corrugated profile of substantially cylindrical lateral walls 15a, 16a, as shown particularly in Figures 3 and 4, the outer surface of lateral wall 15a, 16a of bell-shaped monolithic shell 15, 16 comprises a number of projecting annular ribs 18 equally spaced along substantially the full height of lateral wall 15a, 16a, and shaped to form, in between, a succession of rounded-bottomed annular grooves 19. In the example shown, each projecting annular rib 18 is preferably, though not necessarily, also rounded at the top.

**[0050]** More specifically, projecting annular ribs 18 are shaped to locally increase the thickness of lateral wall 15a, 16a by at least 50%, and are equally spaced along the outer surface of lateral wall 15a, 16a, so that the dis-

tance d between each two adjacent projecting annular ribs 18 substantially equals the maximum thickness $S_{max}$ of lateral wall 15a, 16a at the annular ribs.

**[0051]** More specifically, in the example shown, projecting annular ribs 18 are preferably, though not necessarily, shaped to at least locally double the thickness of lateral wall 15a, 16a, and to form annular grooves 19 with a substantially constant bottom radius of curvature $r_1$ greater than the radius of curvature $r_2$ of the rounded top of each projecting annular rib 18.

**[0052]** In other words, lateral wall 15a, 16a of bell-shaped monolithic shell 15, 16 has a predetermined minimum thickness $S_{min}$, and projecting annular ribs 18 project from the main body of the wall to a maximum height h equal to or greater than the minimum thickness $S_{min}$ of lateral wall 15a, 16a. At projecting annular ribs 18, lateral wall 15a, 16a therefore reaches a maximum thickness $S_{max}$ equal to at least twice the minimum thickness $S_{min}$ of the wall.

**[0053]** More specifically, in the example shown, lateral wall 15a, 16a of bell-shaped monolithic shell 15, 16 has a minimum thickness $S_{min}$ of 3 to 5 millimetres and preferably, though not necessarily, of about 4 millimetres; and projecting annular ribs 18 project from the main body of lateral wall 15a, 16a to a maximum height h of 4 to 6 millimetres and preferably, though not necessarily, of about 5 millimetres, so that the maximum thickness $S_{max}$ of lateral wall 15a, 16a at projecting annular ribs 18 is 7 to 11 millimetres and preferably, though not necessarily, about 9 millimetres.

**[0054]** Projecting annular ribs 18 are also shaped so that the radius of curvature $r_1$ at the bottom of annular grooves 19 is 2 to 4 millimeters and preferably, though not necessarily, about 3 millimeters; whereas radius of curvature $r_2$ of the top of projecting annular ribs 18 is 0,5 to 3 millimeters.

**[0055]** In the example shown, the minimum thickness $S_{min}$ of lateral wall 15a, 16a of bell-shaped monolithic shell 15, 16 preferably, though not necessarily, equals the nominal thickness of the corresponding end wall 15b, 16b.

**[0056]** With reference to Figures 3 and 4, the top bell-shaped monolithic shell 15 is preferably, though not necessarily, also fitted with a gauge 20 for measuring the pressure inside pressure container 3. In the example shown, gauge 20 is housed in a seat formed in end wall 15b of shell 15, between two handles 21 projecting upwards on opposite sides of shell 15 for easy, firm grip by the user.

**[0057]** With reference to Figures 3 and 5, end wall 16b of bell-shaped monolithic shell 16 comprises a substantially funnel-shaped dead seat 22 tapering downwards, extending coaxially with the longitudinal axis L of shell 16 and pressure container 3, and facing inwards of shell 16 to receive neck 10a of collapsible container 10; and an annular lip seal 23 fixed firmly to end wall 16b to surround the whole of the mouth of dead seat 22. Dead seat 22 houses piercing head 13 for piercing the membrane cap 11 sealing neck 10a. The annular lip seal 23 projects towards the top opening of bell-shaped monolithic shell 16 to adhere to collapsible container 10, at the base of neck 10a, and airtight seal the inside of dead seat 22, so that, when neck 10a of collapsible container 10 fully engages dead seat 22, the compressed air pumped into pressure container 3 by compressor 5 is prevented from leaking into collapsible container 10.

**[0058]** More specifically, with reference to Figure 5, valve assembly 14 is fixed to end wall 16b of bell-shaped monolithic shell 16, directly beneath dead seat 22, projects downwards, outside shell 16 and pressure container 3, and is locally substantially coaxial with longitudinal axis L of the container; whereas valve assembly 12 is located alongside valve assembly 14, but outside the perimeter of dead seat 22, so as to communicate directly with the inside of bell-shaped monolithic shell 16, outside annular seal 23.

**[0059]** Like valve assembly 14, valve assembly 12 is fixed to end wall 16b of bell-shaped monolithic shell 16, projects downwards, outside shell 16 and pressure container 3, and is locally substantially parallel to the longitudinal axis L of the container.

**[0060]** More specifically, valve assembly 12 comprises a non-return valve 25 and a three-way valve 26 arranged in cascade formation one after the other, preferably, though not necessarily, inside a single valve body 27 projecting downwards from end wall 16b of bell-shaped monolithic shell 16 and locally substantially coaxial with an axis B parallel to longitudinal axis L of the container.

**[0061]** Non-return valve 25 is interposed between the inside of pressure container 3 and three-way valve 26, and is oriented to allow compressed-air flow from pressure container 3 to three-way valve 26, and to normally prevent compressed-air flow into pressure container 3; whereas three-way valve 26 is designed to connect non-return valve 25 directly to the delivery side of compressor 5 when pressure container 3 is in a given work position in which longitudinal axis L of the container is preferably, though not necessarily, substantially vertical, and to connect non-return valve 25 directly to the outside when pressure container 3 is not in said work position.

**[0062]** Seeing as non-return valve 25 is oriented to normally prevent compressed-air flow into pressure container 3, regardless of the position of three-way valve 26, each beverage storage unit 2 also comprises a valve-lock device 28 for keeping non-return valve 25 open when neck 10a of collapsible container 10 fully engages dead seat 22 in end wall 16b of bell-shaped monolithic shell 16 and compresses annular seal 23, so as to allow the compressed air from compressor 5 to flow through non-return valve 25 into pressure container 3 when dead seat 22 is sealed off by annular seal 23 from the rest of the cavity inside pressure container 3.

**[0063]** More specifically, with reference to Figure 5, non-return valve 25 is inserted inside a through conduit 27a formed in valve body 27, and substantially comprises a movable shutter 29, in turn comprising a head and a

stem, inserted inside through conduit 27a to slide axially to and from a closed position, in which the end of movable shutter 29 rests against a constriction along through conduit 27a, thus cutting off compressed-air flow; and a coil spring 30, or similar elastic member, arranged around the stem of movable shutter 29 and interposed between the head of movable shutter 29 and a transversal wall of valve body 27, to keep movable shutter 29 in the closed position. Movable shutter 29 and coil spring 30 are so arranged inside through conduit 27a of valve body 27 that compressed-air flow into pressure container 3 aids coil spring 30 in pushing and retaining movable shutter 29 in the closed position in which the end of movable shutter 29 closes through conduit 27a in fluidtight manner; whereas valve-lock device 28 is designed to keep movable shutter 29 away from the closed position (i.e. to keep the valve 25 in an open position) when neck 10a of collapsible container 10 fully engages dead seat 22 in end wall 16b of bell-shaped monolithic shell 16, and compresses annular seal 23.

**[0064]** With reference to Figure 5, in the example shown, through conduit 27a is a straight conduit extending coaxially with axis B, and valve-lock device 28 comprises a movable pin 31 extending coaxially with axis B and inserted in axially-sliding manner inside the top end of valve body 27, i.e. above non-return valve 25, so that the bottom end of the pin extends inside through conduit 27a down to a point close to movable shutter 29 in the closed position.

**[0065]** Movable pin 31 comprises a top head 31a provided with a radial flange, and a coil spring 31b which extends coaxially with axis B, and has one end arranged into head 31a, and an opposite free end resting on movable shutter 29. Coil spring 31b forms the stem of movable pin 31.

**[0066]** Valve-lock device 28 also comprises a coil spring 32, or similar elastic member, which extends coaxially with axis B and externally to coil spring 31b. In particular, the coil spring 32 is interposed between an internal annular edge on top of the valve body 27 and the radial flange of the head 31a of movable pin 31, to prevent movable pin 31 from penetrating further inside valve body 27 and reaching and so pushing movable shutter 29 out of the closed position.

**[0067]** The top end or head of movable pin 31 is designed to support a preferably, though not necessarily, flared, substantially cup-shaped outer collar 10b projecting from the base of, and coaxially with, neck 10a of collapsible container 10. In particular, the collar 10b is supported by the above-mentioned radial flange of the head 31a of the pin 31. Coil spring 32 is designed to yield under the weight of collapsible container 10, and only allow movable pin 31 to penetrate further inside valve body 27 and push movable shutter 29 out of the closed position when removable cartridge 4 is inserted properly inside pressure container 3.

**[0068]** More specifically, movable pin 31 and coil spring 32 are designed to only push movable shutter 29 of non-return valve 25 from the closed position when neck 10a of collapsible container 10 is fully inserted inside dead seat 22, and annular lip seal 23 rests on collapsible container 10, at the base of neck 10a, from which outer collar 10b projects.

**[0069]** Three-way valve 26 is fixed to the bottom end of valve body 27, outside pressure container 3, and substantially comprises an outer casing 34 fixed directly to valve body 27; a movable stem 35 with one end inserted telescopically inside casing 34; and a coil spring 36 inserted inside casing 34 to oppose penetration of movable stem 35 inside casing 34.

**[0070]** The variable-volume cavity formed by movable stem 35 inside casing 34 communicates directly with through conduit 27a, and casing 34 has a number of exhaust openings respectively connecting the variable-volume cavity to the outside and to the pipe (not shown) connecting valve assembly 12 to the delivery side of compressor 5.

**[0071]** Depending on the position of movable stem 35 inside casing 34, the body of movable stem 35 closes the exhaust openings connecting the variable-volume cavity to the outside, or closes the exhaust openings connecting the variable-volume cavity to the pipe (not shown) connecting valve assembly 12 to the delivery side of compressor 5.

**[0072]** More specifically, in the example shown, movable stem 35 is movable between an extracted position, in which movable stem 35 projects almost entirely from casing 34 and closes the exhaust openings connecting the variable-volume cavity to the outside, so the compressed air from compressor 5 flows to through conduit 27a of valve body 27; and a withdrawn position, in which movable stem 35 is almost entirely inserted inside casing 34 and closes the exhaust openings connecting the variable-volume cavity to the pipe (not shown) connecting valve assembly 12 to the delivery side of compressor 5, thus connecting pressure container 3 to the outside.

**[0073]** With reference to Figures 2 and 3, coil spring 36 of three-way valve 26 tends to keep movable stem 35 in the extracted position, and valve assembly 12 also comprises a cam guide 37 located preferably, though not necessarily, on frame 9, and designed to push movable stem 35 into the withdrawn position when pressure container 3 is in the work position, so as to allow compressor 5 to feed compressed air into pressure container 3.

**[0074]** With reference to Figures 2 and 3, pressure container 3 comprises a fastener 38 for selectively tightening peripheral flanges 15c, 16c of bell-shaped monolithic shells 15, 16 to each other, so as to fix bell-shaped monolithic shells 15, 16 rigidly to each other and force annular seal 17 to seal the join between peripheral flanges 15c and 16c.

**[0075]** In the example shown, fastener 38 substantially comprises a bush 39 made of preferably, though not necessarily, self-lubricating plastic (such as Teflon), and which is fitted to lateral wall 16a of bottom bell-shaped monolithic shell 16, over projecting annular ribs 18, with

its top end resting on peripheral flange 16c; and a substantially cup-shaped metal outer coupling belt or ring nut 40 fitted to lateral wall 15a of top bell-shaped monolithic shell 15, and projecting beyond peripheral flange 15c, coaxially with the longitudinal axis L of shell 15 and pressure container 3.

**[0076]** Outer ring nut 40 is preferably, though not necessarily, fixed rigidly to peripheral flange 15c of bell-shaped monolithic shell 15; has a radially inward flanged edge resting on peripheral flange 15c, on the opposite side to annular seal 17 and on the opposite side to that on which peripheral flange 15c rests on peripheral flange 16c; and is of such a height as to extend completely over peripheral flange 16c of bell-shaped monolithic shell 16, when peripheral flange 15c of bell-shaped monolithic shell 15 rests on peripheral flange 16c of bell-shaped monolithic shell 16, and to fit directly onto bush 39. Outer ring nut 40 has two opposite helical drawings or ridges 40a extending along the wall, coaxially with the longitudinal axis of the bush/ring nut, i.e. with longitudinal axis L of the pressure container, and which engage respective helical grooves 39a formed on the outer surface of bush 39. The pitch of helical ridges 40a and helical grooves 39a is such that top bell-shaped monolithic shell 15 can be locked firmly to and released quickly from bottom bell-shaped monolithic shell 16 by rotating bell-shaped monolithic shell 15 by less than 360° about longitudinal axis L.

**[0077]** Operation of modular beverage dispensing assembly 1 is clear from the above description, with no further explanation required.

**[0078]** The present invention renders it possible to realize a simple and low-cost modular beverage dispensing assembly.

**[0079]** The advantages of the design of modular beverage dispensing assembly 1 are evident: given the possibility of varying the number of beverage storage units 2, modular beverage dispensing assembly 1 can be adapted quickly and easily to the demands of any, even the largest, bar.

**[0080]** The design of valve assembly 12 of beverage storage units 2 has major advantages. Non-return valve 25 downstream from three-way valve 26, and valve-lock device 28 prevent compressed air being fed into pressure container 3 when removable cartridge 4 is not positioned properly inside pressure container 3. As a result, beverage storage units 2 can all be connected to one compressor 5, with no danger of an improperly positioned removable cartridge 4 compromising operation of modular beverage dispensing assembly 1 as a whole.

**[0081]** The design of valve assembly 12 also enables the user to replace an empty removable cartridge 4 without compromising operation of the other beverage storage units 2.

**[0082]** In addition to the above, the corrugated profile formed by projecting annular ribs 18 on lateral walls 15a, 16a of bell-shaped monolithic shells 15, 16 provides for evenly distributing mechanical stress caused by the difference in pressure, thus imparting to pressure container 3 sufficient structural rigidity to enable it to withstand pressures of even over 4-5 bars with no appreciable deformation.

**[0083]** Moreover, providing peripheral flanges 15c, 16c, bush 39, and outer ring nut 40 on the part of pressure container 3 subjected to the greatest mechanical stress aids in locally reinforcing, and further improving the high-pressure resistance of, pressure container 3.

**[0084]** Dividing pressure container 3 into two bell-shaped monolithic shells also makes it easier for the user to insert and remove removable cartridges 4.

**[0085]** Clearly, changes may be made to modular beverage dispensing assembly 1 as described herein without, however, departing from the scope of the present invention.

**[0086]** For example, with reference to Figure 6 variation, non-return valve 25 and valve-lock device 28 may be integral one to the other, so as to reduce the number of coil springs.

**[0087]** More specifically, with reference to Figure 6, coil spring 30 of non-return valve 25 is missing; valve-lock device 28 comprises a substantially nail-shaped movable pin 31' extending coaxially with axis B and inserted in axially-sliding manner inside the top end of valve body 27; and movable shutter 29 is integral with the lower end of nail-shaped movable pin 31'. In which case, coil spring 32 of valve-lock device 28 is dimensioned for both preventing movable pin 31' from penetrating further inside valve body 27 for moving away shutter 29 from its closed position, and for keeping movable shutter 29 in said closed position.

**[0088]** Moreover, in a further different embodiment, modular beverage dispensing assembly 1 may also comprise a number of connecting pipes 7, each to a respective hand-operated metering valve 6. In which case, the various beverage storage units 2 (or, rather, removable cartridges 4) may contain different types of beer, and each connecting pipe 7 may be connected solely to the beverage storage units 2 containing the same type of beer.

**[0089]** The modular beverage dispensing assembly may also comprise a number of independent refrigeration units 8, each located along a respective connecting pipe 7.

**[0090]** Finally, in a still further different embodiment, modular beverage dispensing assembly 1 may comprise only one beverage storage unit 2.

## Claims

1. A modular beverage dispensing assembly (1) comprising:

   - at least one beverage storage unit (2) for supplying a pressurized beverage, and in turn comprising an airtight pressure container (3) for housing a collapsible removable cartridge (4)

containing the beverage; and
- a pressurized-gas source (5) for feeding pressurized gas into the pressure container (3) of said at least one beverage storage unit (2), to compress the removable cartridge (4) inside the pressure container;

said at least one beverage storage unit (2) also comprising a valve assembly (12) for regulating pressurized-gas flow from the pressurized-gas source (5) into the airtight pressure container (3);
the modular beverage dispensing assembly (1) being **characterized in that** said valve assembly (12) comprises a non-return valve (25) which is oriented so as to allow pressurized-gas flow from the pressure container (3) to the outside, and to normally prevent pressurized-gas flow into the pressure container (3), and valve-locking means (28) for keeping the non-return valve (25) open when the removable cartridge (4) is inserted properly inside said pressure container (3).

**2.** A modular beverage dispensing assembly as claimed in Claim 1, **characterized in that** said valve assembly (12) also comprises a three-way valve (26) arranged in cascade formation to said non-return valve (25); the non-return valve (25) being interposed between the inside of the pressure container (3) and the three-way valve (26), and being so oriented as to allow pressurized-gas flow from the pressure container (3) to the three-way valve (26); the three-way valve (26) being designed to connect the non-return valve (25) to the pressurized-gas source (5) when the pressure container (3) is in a predetermined work position, and to connect the non-return valve (25) to the outside when the pressure container (3) is not in said work position.

**3.** A modular beverage dispensing assembly as claimed in Claim 1 or 2, **characterized in that** said valve assembly (12) comprises a valve body (27) having a through conduit (27a) communicating directly with the inside of the pressure container (3), the non-return valve (25) being located along said through conduit (27a).

**4.** A modular beverage dispensing assembly as claimed in Claim 3, **characterized in that** the non-return valve (25) comprises a movable shutter (29) movable inside the through conduit (27a) to and from a closed position closing the through conduit (27a) hermetically, and a first elastic member (30) for keeping the movable shutter (29) in said closed position.

**5.** A modular beverage dispensing assembly as claimed in Claim 4, **characterized in that** the movable shutter (29) and the first elastic member (30) are so located inside the through conduit (27a) that a pressurized-gas flow towards the pressure container (3) assists the first elastic member (30) in keeping the movable shutter (29) in the closed position.

**6.** A modular beverage dispensing assembly as claimed in any one of the preceding claims, **characterized in that** the pressure container (3) is in said work position when its longitudinal axis (L) is substantially vertical.

**7.** A modular beverage dispensing assembly as claimed in any of the preceding claims, **characterized in that** said removable cartridge (4) is inserted properly inside said pressure container (3) when the collapsible container (10) engages a dead seat (22) formed in the end wall (16b) of the pressure container (3).

**8.** A modular beverage dispensing assembly as claimed in Claim 7 when depending on claim 3, **characterized in that** the valve body (27) is located on the end wall (16b) of the pressure container (3), alongside the dead seat (22).

**9.** A modular beverage dispensing assembly as claimed in Claim 4, **characterized in that** the valve-locking means (28) comprise a movable pin (31) inserted in axially-sliding manner inside the top end of the valve body (27), so that the bottom end of the movable pin (31) extends inside the through conduit (27a) to a point close to the movable shutter (29) in the closed position, and a second elastic member (32) for preventing the movable pin (31) from penetrating further inside the valve body (27) and reaching and so pushing the movable shutter (29) out of the closed position.

**10.** A modular beverage dispensing assembly as claimed in Claim 9, **characterized in that** the top end (31a) of the movable pin (31) supports a part (10b) of said removable cartridge (4), and the second elastic member (32) is designed to yield under the weight of the removable cartridge (4) to allow the movable pin (31) to push the movable shutter (29) out of the closed position.

**11.** A modular beverage dispensing assembly as claimed in Claim 8 when depending on claim 3, **characterized in that** the pressure container (3) also comprises an annular lip seal (23) completely surrounding the opening of the dead seat (22) formed in the end wall (16b) of the pressure container (3); the through conduit (27a) of the valve body (27) being connected to the inside of the pressure container (3), outside said annular seal (23).

**12.** A modular beverage dispensing assembly as

claimed in Claim 3, **characterized in that** the three-way valve (26) is located at the end of the valve body (27), outside the pressure container (3), and comprises an outer casing (34) fixed directly to the valve body (27); a movable stem (35) inserted telescopically inside the outer casing (34); and a third elastic member (36) for opposing penetration of the movable stem (35) inside the outer casing (34); the variable-volume cavity formed by the movable stem (35) inside the outer casing (34) communicating directly with the through conduit (27a) of the valve body (27), and the outer casing (34) comprising a number of exhaust openings respectively connecting said variable-volume cavity to the outside and to the pressurized-gas source (5); depending on the position assumed with respect to the outer casing (34), the movable stem (35) being able to close the exhaust openings connecting the variable-volume cavity to the outside, or the exhaust openings connecting the variable-volume cavity to the pressurized-gas source (5).

**13.** A modular beverage dispensing assembly as claimed in Claim 12, **characterized in that** the movable stem (35) is movable between an extracted position, in which the movable stem (35) projects almost entirely from the outer casing (34) and closes the exhaust openings connecting the variable-volume cavity to the outside, so the pressurized gas from the pressurized-gas source (5) flows to the through conduit (27a) of the valve body (27), and a withdrawn position, in which the movable stem (35) is almost entirely inserted inside the outer casing (34) and closes the exhaust openings connecting the variable-volume cavity to the pressurized-gas source (5), thus connecting the pressure container (3) to the outside.

**14.** A modular beverage dispensing assembly as claimed in Claim 12 or 13, **characterized in that** the third elastic member (36) of the three-way valve (26) tends to keep the movable stem (35) in the extracted position; and the valve assembly (12) also comprises a cam guide (37) designed to push the movable stem (35) into the withdrawn position when the pressure container (3) is set to the work position.

**15.** A modular beverage dispensing assembly as claimed in any one of the foregoing Claims, **characterized in that** said beverage storage unit (2) also comprises a piercing head (13) positioned in an end wall (16b) of the pressure container (3), and is designed to pierce through a cap (11) of the collapsible container (10); and an outflow pipe for feeding the beverage contained in the collapsible container (10) out of the pressure container (3) through the piercing head (13).

**Amended claims in accordance with Rule 137(2) EPC.**

**6.** A modular beverage dispensing assembly as claimed in claim 2, **characterized in that** the pressure container (3) is in said work position when its longitudinal axis (L) is substantially vertical.

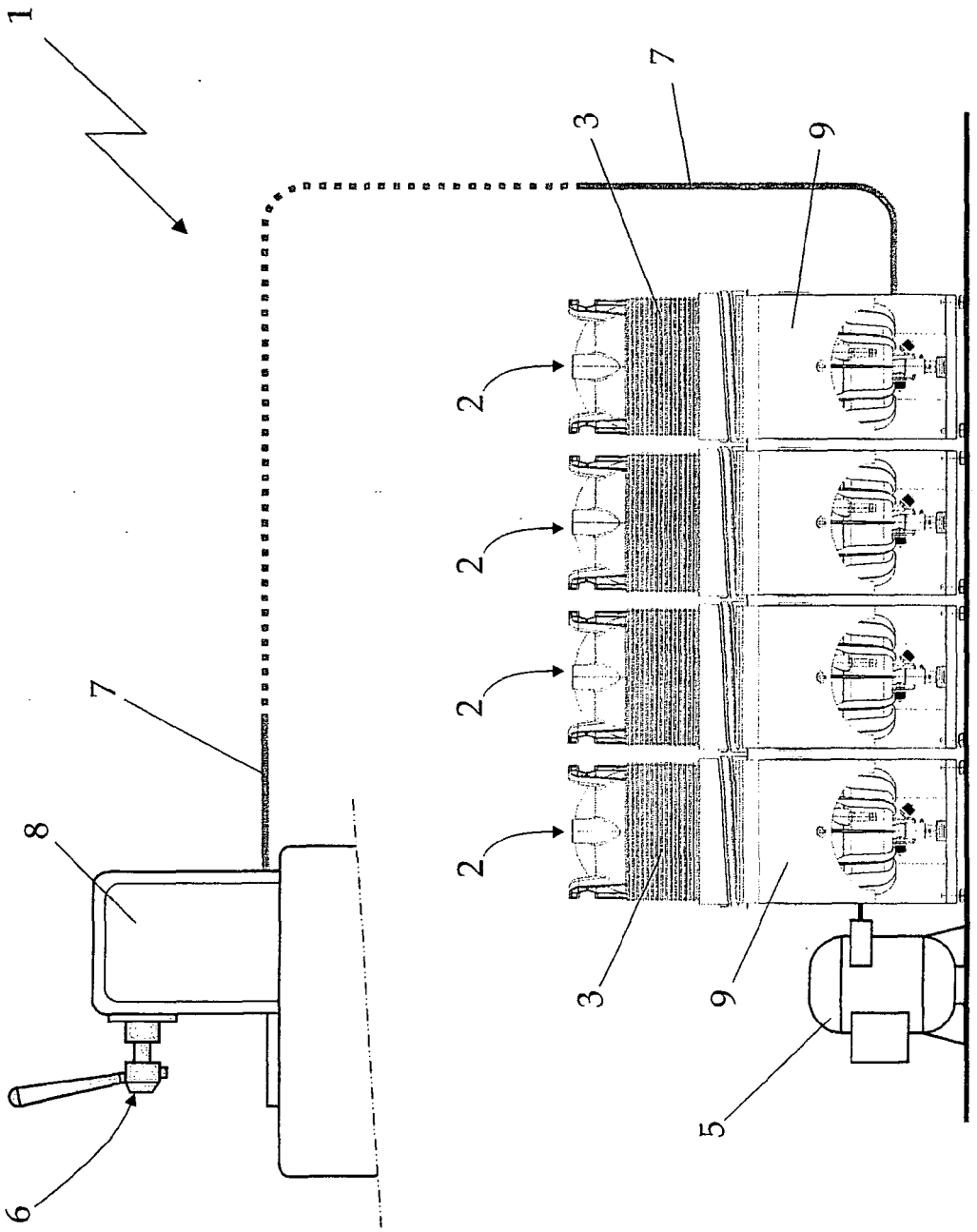


Fig. 1

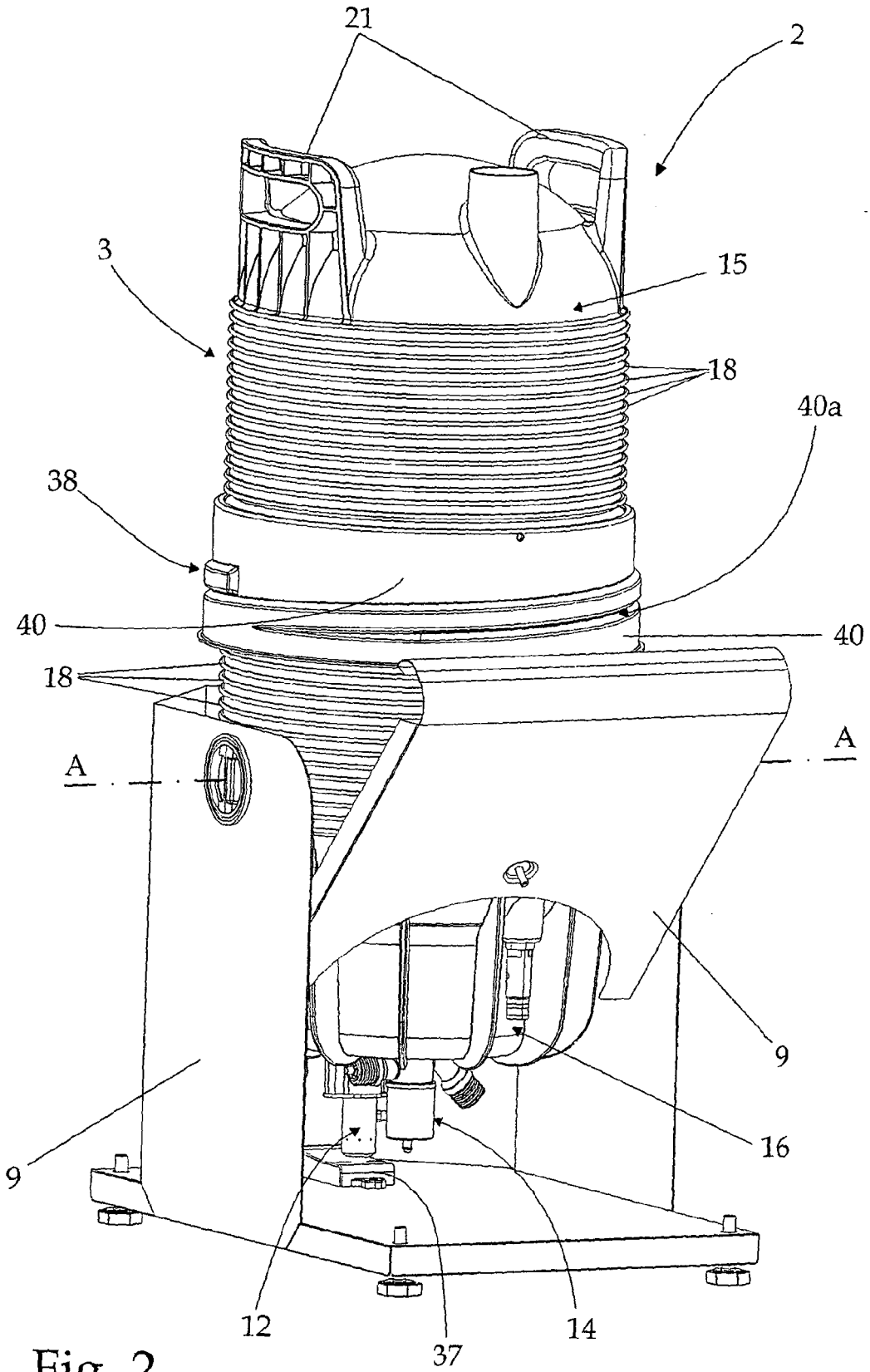


Fig. 2

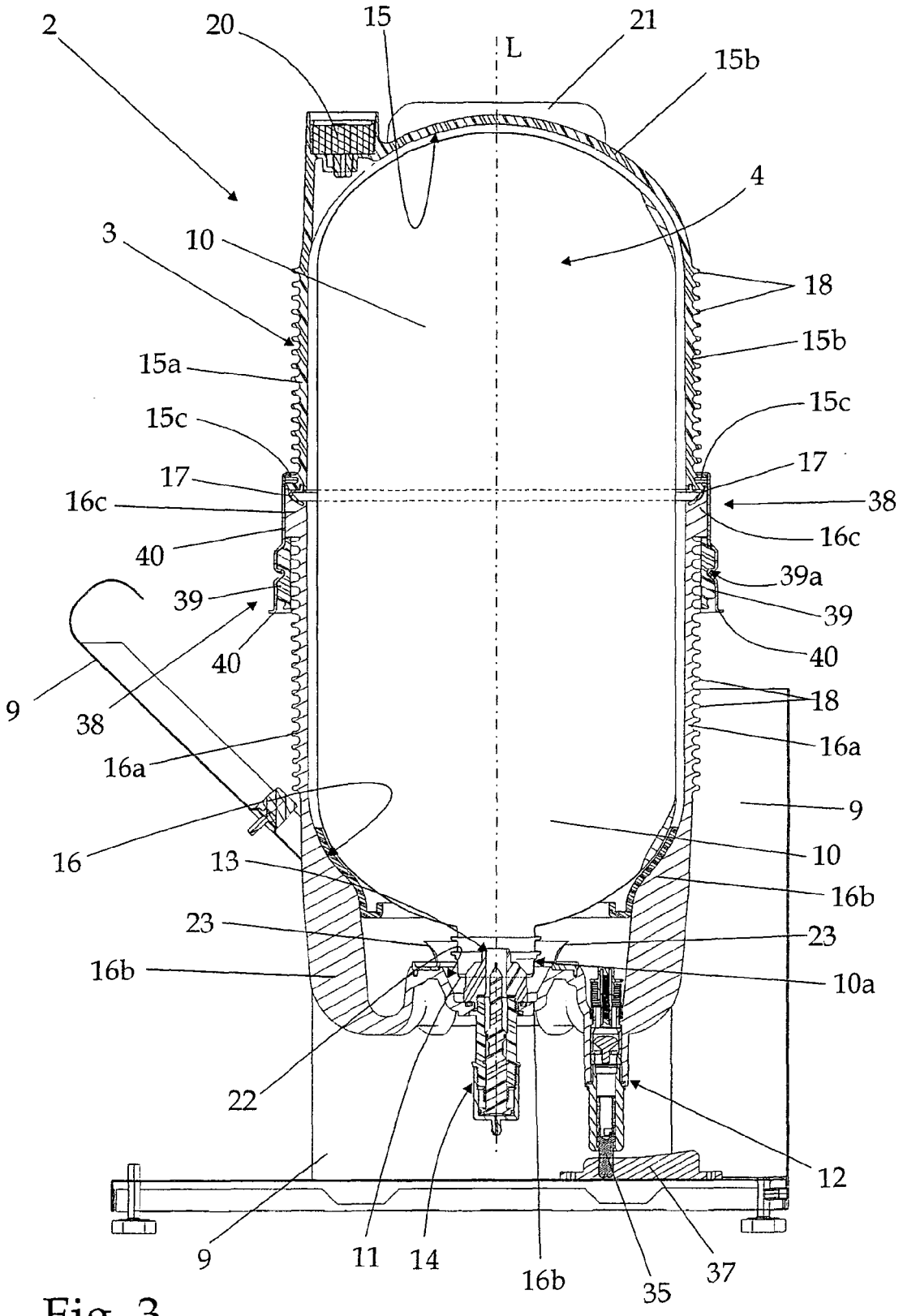
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Fig. 3

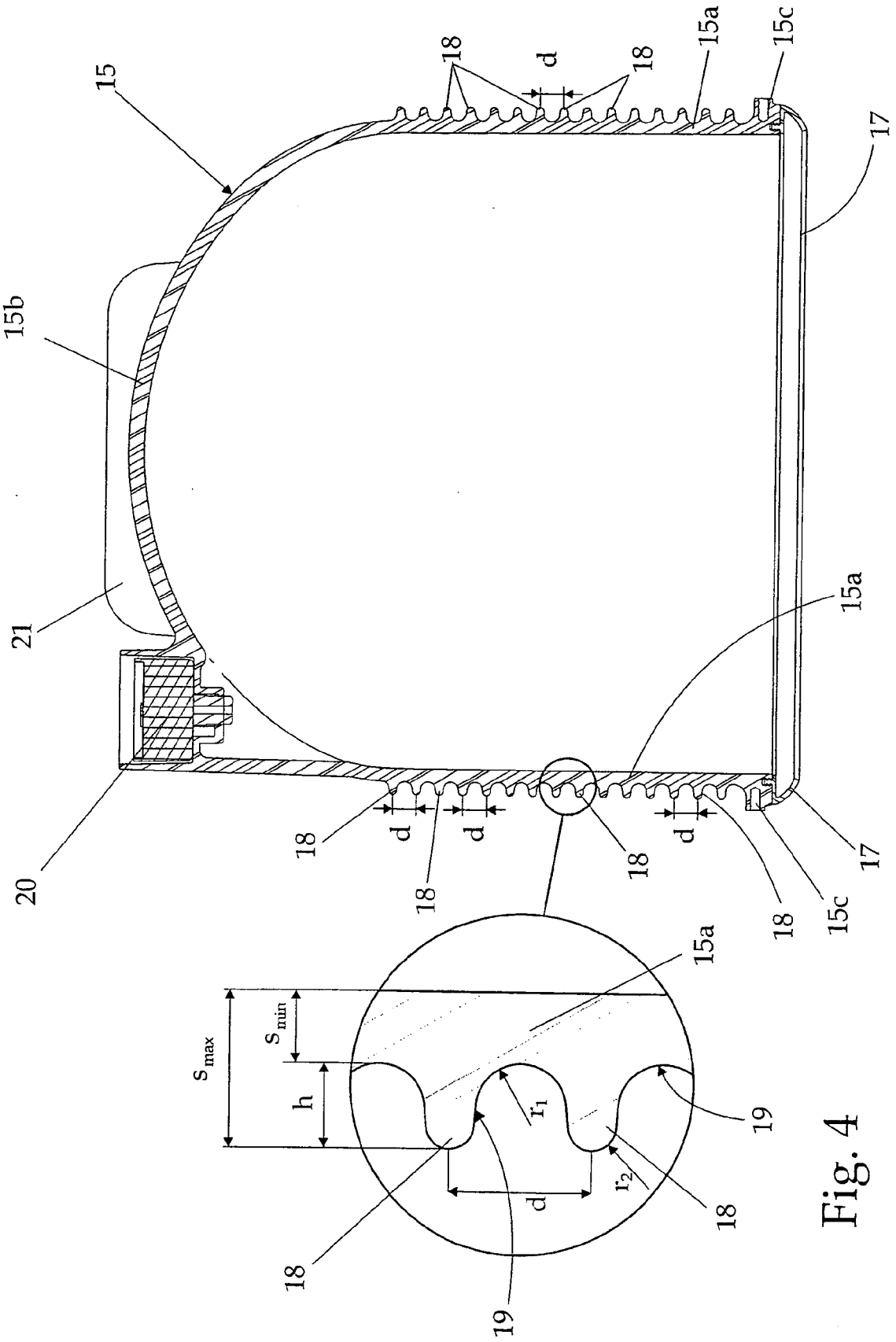
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Fig. 4

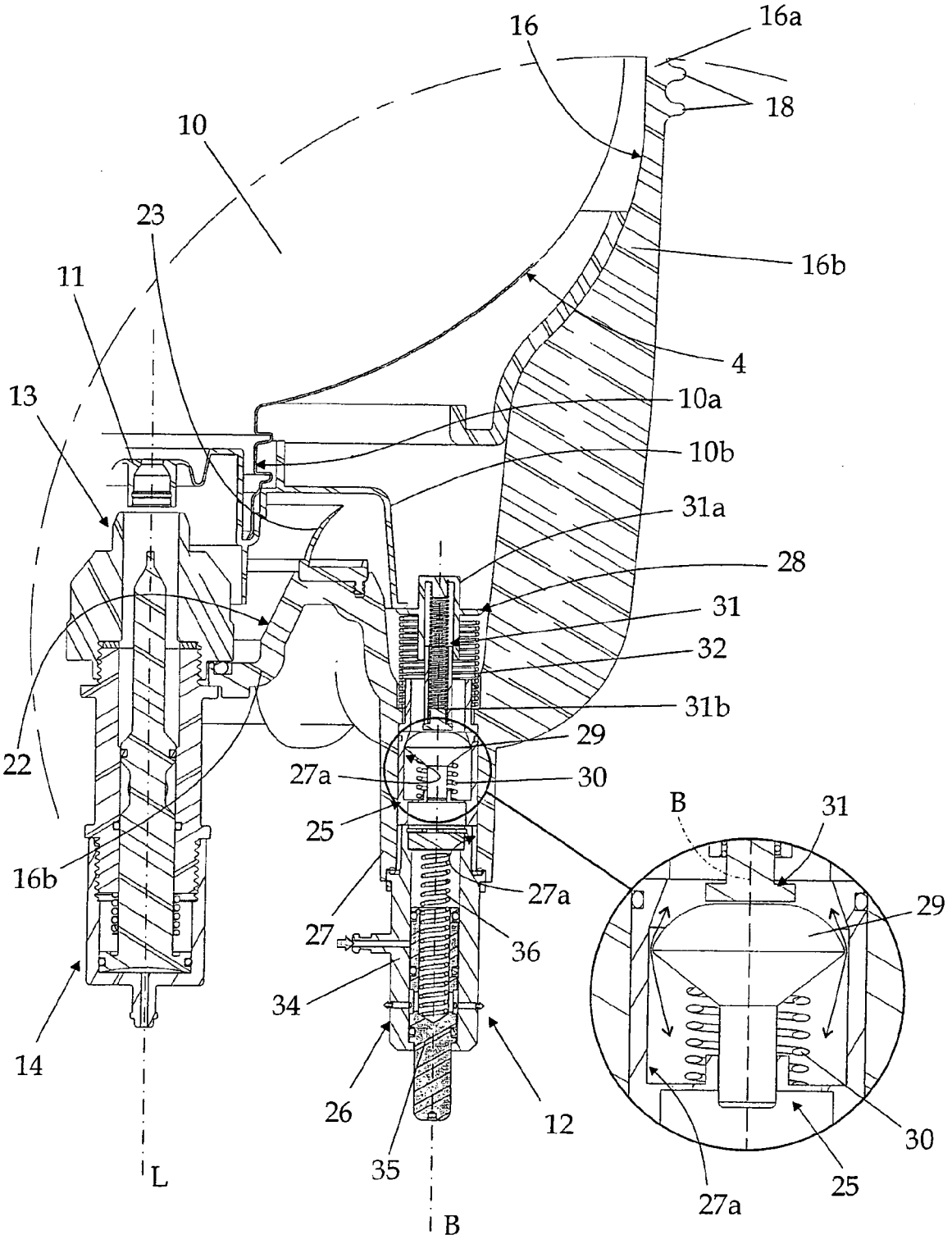
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Fig. 5

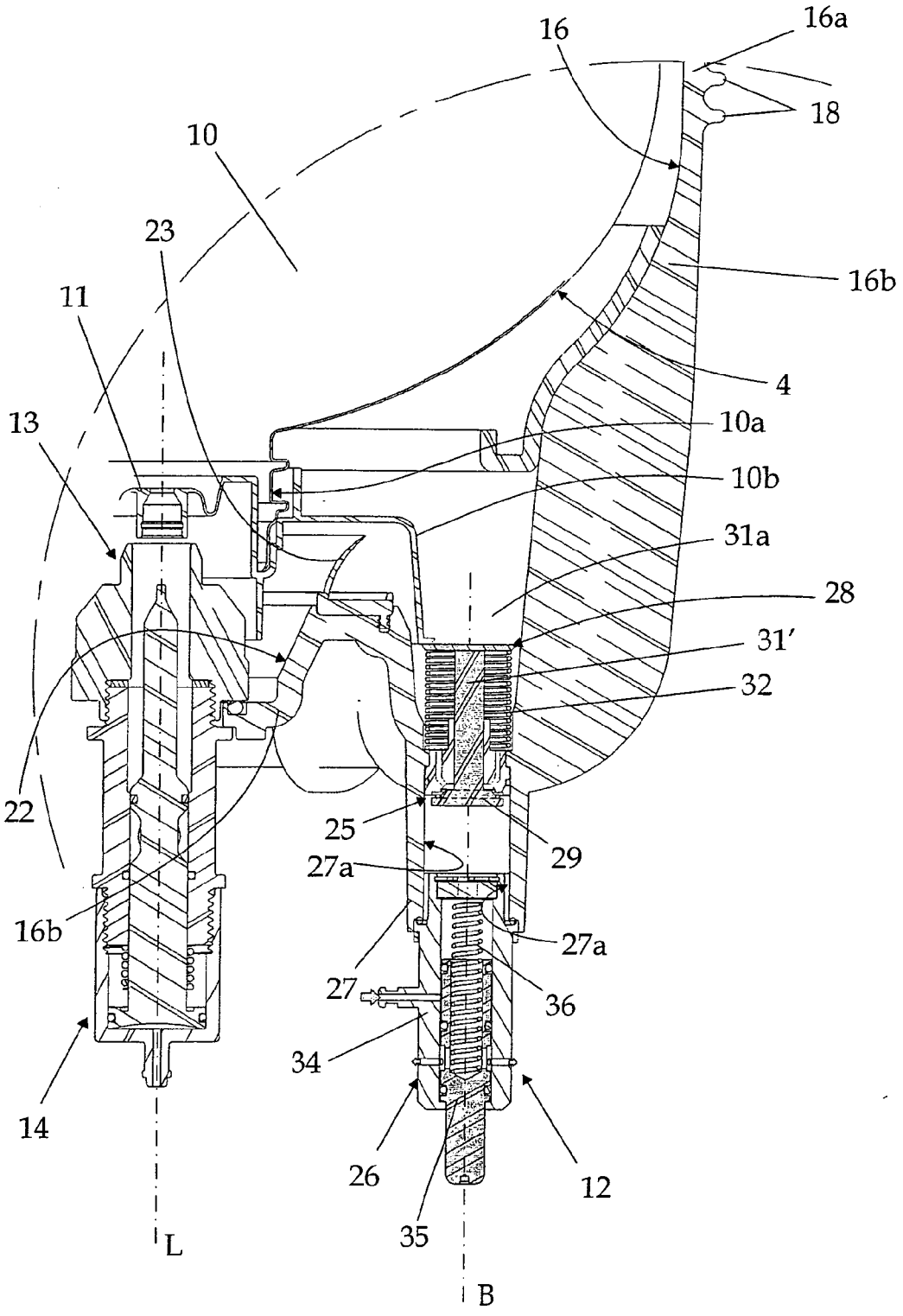
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Fig. 6

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# EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5553

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B67D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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| Munich | 26 May 2009 | Desittere, Michiel |

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