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(54) **Carbonated beverage dispensing device with pressure control**

(57) Dispensing device 1 for dispensing carbonated beverage, comprising a beverage container 2 containing a gas and the carbonated beverage 4 having a fixed carbon dioxide content, an extractor tube 5, a dispense head 6 coupled with the extractor tube, a gas source 7 connected with the dispense head for delivering gas to the beverage container via the dispense head. A temperature sensor 8 directly or indirectly measures the temperature of the container content. The dispensing device comprises a pressure regulator 9 having a control unit 10, the pressure regulator being fluidly connected to the gas source and the dispense head, said temperature sensor being connected with the pressure regulator. The control unit, on the basis of said measured temperature, regulates the gas pressure delivered to the dispense head via control of the pressure regulator. Furthermore, the present invention relates to a dispensing system and a method for dispensing carbonised beverage.

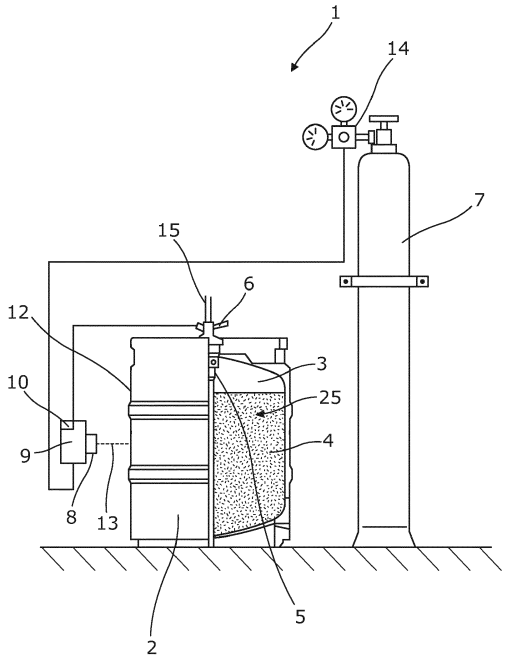

Fig. 1

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Description

Field of the invention

[0001] The present invention relates to a dispensing device for dispensing carbonised beverage. Furthermore, the present invention relates to a dispensing system and a method for dispensing carbonised beverage.

Background art

[0002] A large number of systems and devices are known within the field of beverage dispensing. Typically, the beverage is stored in a beverage container, such as a keg, which is connected to a dispensing system during use. The beverage flows from the container through a dispensing line which is typically connected to a dispensing tap from which the beverage is dispensed. The flow of beverage may for instance be achieved by a higher than atmospheric pressure inside the container, forcing the beverage into the dispensing line. During use of the dispensing system, pressure is usually continuously applied to the inside of the container by means of a pressure medium. It is common to use gas such as CO2 as pressure medium.

[0003] The pressure medium is usually supplied to the beverage container from a gas source via a dispense head. Also, it is common that the dispense head is connected to the beverage outlet of the container, whereby it serves to supply pressure medium, such as CO2, to the beverage container and beverage to the dispensing system.

[0004] Since the beverage itself comprises a content of gas, the continuous supply of gas to the beverage container may have a negative influence on the intended gas content of beverage, which again may influence the intended taste and texture of the dispensed beverage.

Summary of the invention

[0005] It is an object of the present invention to wholly or partly overcome the above disadvantages and drawbacks of the prior art. More specifically, it is an object to provide an improved dispensing device wherein the supply of gas is regulated in view of the beverage and gas present in the beverage container.

[0006] The above objects, together with numerous other objects, advantages and features, which will become evident from the below description, are accomplished by a solution in accordance with the present invention by a dispensing device for dispensing carbonised beverage, comprising a beverage container having a content of a gas and a beverage having a predetermined gas content, the beverage container comprising:

- an extractor tube,
- a dispense head adapted to be coupled with the extractor tube, and
- a gas source connected with the dispense head for delivering a gas to the beverage container via the dispense head,

wherein a temperature sensor is arranged for directly or indirectly measuring a temperature of the content in the beverage container, and wherein the dispensing device further comprises a pressure regulator having a control unit, the pressure regulator being fluidly connected to the gas source and the dispense head, said temperature sensor being connected with the pressure regulator, whereby the control unit, on the basis of the measured temperatures of the content, regulates the gas pressure delivered to the dispense head via control of the pressure regulator.

[0007] The temperature sensor may be arranged inside the beverage container.

[0008] Also, the temperature sensor may be arranged on an outer face of the beverage container or may be adapted to measure the temperature of the outer face of the beverage container.

[0009] Furthermore, the temperature sensor may be an infrared sensor adapted to measure the temperature of the outer face of the beverage container.

[0010] Said infrared sensor may be arranged a distance from the outer face of the beverage container and may emit an infrared beam, the infrared beam being adapted to be reflected on the outer face of the beverage container and return to the infrared sensor.

[0011] The infrared beam may be substantially perpendicular to the outer face of the beverage container.

[0012] Further, the temperature sensor may be arranged as part of the pressure regulator.

[0013] Additionally, the beverage container may be made of metal.

[0014] The metal may be stainless steel.

[0015] Moreover, the temperature sensor may measure the temperature of the content via the temperature of the beverage container.

[0016] Also, the temperature sensor may be directly connected to the pressure regulator via a wire or may be comprised in the pressure regulator.

[0017] Furthermore, the temperature sensor may be wirelessly connected with the pressure regulator.

[0018] In addition, the gas source may comprise a source pressure regulator.

[0019] Moreover, the predetermined gas content in the beverage may be carbon dioxide (CO2) or other suitable gases.

[0020] Furthermore, the temperature sensor may measure continuously or may be adapted to measure the temperature at predetermined intervals.

[0021] In addition, the pressure regulator may be adapted to regulate the gas pressure continuously or at predetermined intervals.

[0022] The present invention also relates to a dispensing system for dispensing carbonised beverage, comprising:

- a dispensing device according to any of the preceding claims,
- a cooling device for cooling the beverage,
- a dispensing line fluidly connected with the beverage container during dispensing, and
- a tapping head from which the beverage is tapped.

[0023] Finally, the present invention also relates to a method for dispensing a carbonised beverage from a dispensing device as described above, comprising the steps of:

- coupling a dispense head to a beverage container so that a gas flow from the gas source to the beverage container is provided,
- measuring the temperature of the content of the beverage container by measuring the temperature of the content itself or measuring the temperature of an outer face of the beverage container, and
- regulating the gas pressure of the gas flow to the beverage container on the basis of the measured temperatures of the content.

Brief description of the drawings

[0024] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawings, which for the purpose of illustration show some non-limiting embodiments and in which

Fig. 1 shows a dispensing device according to the invention,

Figs. 2-4 are cross-sectional views of different embodiments of the dispensing device,

Fig. 5 shows a dispensing system according to the invention, and

Fig. 6 shows another dispensing system according to the invention.

[0025] All the figures are highly schematic and not necessarily to scale, and they show only those parts which are necessary in order to elucidate the invention, other parts being omitted or merely suggested.

Detailed description of the invention

[0026] Fig. 1 shows a dispensing device 1 according to the invention. The dispensing device 1 is adapted for dispensing carbonised beverage, such as for instance beer, ciders, soft drinks etc.

[0027] The dispensing device 1 comprises a beverage container 2 having a content 25 of a gas 3 and a beverage 4, the beverage 4 having a predetermined gas content, for instance a CO2 content. The gas content is set by the brewery for the specific beverage so that beverage, when being dispensed, has the intended taste, feel, texture and foam generation. The predetermined gas content set by the brewery is the pressure of equilibrium for the specific beverage.

[0028] Furthermore, the beverage container 2 comprises an extractor tube 5 and a dispense head 6 adapted to be coupled with the extractor tube 5. A gas source 7 is connected with the dispense head 6 for delivering a gas to the beverage container 2 via the dispense head 6. The beverage container 2 may be made of metal, such as stainless steel.

[0029] During operation of the dispensing device 1, the gas source 7 supplies pressurised gas, such as CO2 or other suitable gasses, via the dispense head 6 to the top of the beverage container 2 in order to displace the beverage. When the dispensing tap (not shown) is opened, the CO2 will start displacing the beverage from the top of the beverage container 2, causing the beverage at the bottom of the beverage container 2 to flow via the extractor tube 5 into a flow channel in the dispense head 6 and further into the dispensing line 15.

[0030] The extractor tubes and dispense heads are *inter alia* referred to as A-Systems, G-Systems, M-Systems, S-Systems, D-Systems, U-Systems and L-Systems, and their design and function are well-known and will not be described in detail here.

[0031] These extractor tubes and dispense heads may be divided into two types, the well types and the flat types. The well types are characterised in that the dispense head is adapted to be inserted into a collar of the extractor tube, and the flat types are characterised in that the dispense head is adapted to be slid onto a flange of the extractor tube.

[0032] All the dispense head systems mentioned above are adapted to open a double valve (i.e. a concentric gas valve and beverage valve) of the extractor tube by a piston of the dispense head being displaced downwards after being connected with the extractor tubes for opening the valves. The piston may displace the valves directly or may displace an intermediate piston arranged between the valves of the extractor tube and the dispense head.

[0033] According to the invention, a temperature sensor 8 is arranged for directly or indirectly measuring a temperature of the content 25 in the beverage container 2. Furthermore, the dispensing device 1 comprises a pressure regulator 9 having a control unit 10, the pressure regulator 9 being fluidly connected to the gas source 7 and the dispense head 6, said temperature sensor 8 being connected with the pressure regulator 9, whereby the control unit 10, on the basis of the measured temperatures of the content 25, regulates the gas pressure delivered to the dispense head and thereby to the beverage container 2 via control of the pressure regulator 9.

[0034] By measuring the temperature of the content in the beverage container, the pressure of gas in the beverage container may be calculated and established.

Hereby it is possible to regulate the gas pressure of the gas to be delivered to the beverage container during dispensing, so that the gas pressure substantially corresponds to the predetermined gas content of the beverage, i.e. the pressure of equilibrium for the specific beverage. The pressure regulator hereby ensures that the beverage will not be over-carbonated due to an excessive gas pressure being delivered to the beverage container. Also, the pressure regulator ensures that the beverage will not lose its gas content due to an insufficient gas pressure being delivered to the beverage container. Accordingly, the dispensing device according to the invention ensures that the beverage being dispensed substantially has the intended taste, feel, texture and foam generation.

[0035] In Fig. 1, the temperature sensor 8 is arranged a distance from the beverage container 2 and is adapted to measure the temperature of beverage container 2 via the beam 13. Hereby, the temperature sensor measures the temperature of the content 25 via the temperature of the beverage container 2. In addition, the gas source 7 has a source pressure regulator 14 adapted to regulate the gas source to a predetermined gas feed pressure. This gas feed pressure is normally around 4 bar, which again is the pressure which is delivered to the pressure regulator 9.

[0036] In Fig. 2, the beverage container 2 and the dispense head 6 are shown in a cross-sectional view. The beverage container 2 is shown without the middle section, so that only the bottom and the top of the beverage container 2 are shown. As mentioned above, the beverage container 2 contains a content 25 containing a beverage 4 and a gas 3. Via the gas inlet 22 of the dispense head and the gas and beverage valve 23 of the extractor tube 5, gas is delivered to the head space of the beverage container 2, so that the beverage may be dispensed out of the beverage container 2 in this embodiment via the dispense head 6. The temperature sensor 8 is, in Fig. 2, arranged in the same manner as in Fig. 1 and is adapted to measure the temperature of the outer face 12 of the beverage container 2. The temperature sensor 8 is, in this embodiment, an infrared sensor 8 adapted to measure the temperature of the outer face 12 of the beverage container 2. The infrared sensor 8 is arranged a distance from the outer face 12 of the beverage container 2 and emits an infrared beam 13, the infrared beam 13 being adapted to be reflected on the outer face 12 of the beverage container 2 and return to the infrared sensor 8. The infrared beam 13 is substantially perpendicular to the outer face 12 of the beverage container 2. The infrared sensor 8 has a detector (not shown) which is adapted to convert the radiant power received from the reflected beam 13 to an electric signal which can be converted into a temperature reading. The temperature reading is then transmitted to the control unit 10 of the pressure regulator 9, which control unit 10 converts the temperature to a pressure level and subsequently regulates the pressure accordingly. In the present embodiment, the temperature sensor 8 is arranged as part of the pressure regulator 9.

[0037] The pressure regulator 9 may conveniently be incorporated into existing dispensing devices and systems, so that these devices and systems may comprise the same advantages as the present invention.

[0038] Fig. 3 shows another embodiment in which the temperature sensor 8 is arranged on the outer face 12 of the beverage container 2. The beverage container 2 is shown in the same way as in Fig. 2. As mentioned above, the beverage container 2 contains the content 25 containing the beverage 4 and the gas 3. Via the gas inlet 22 of the dispense head and the gas and beverage valve 23 of the extractor tube 5, gas is delivered to the head space of the beverage container 2, so that the beverage may be dispensed out of the beverage container 2 in this embodiment via the dispense head 6. The temperature sensor 8 is adapted to measure the temperature of the outer face 12 of the beverage container 2 and thereby the content 25 of the beverage container 2. The temperature is then transmitted wirelessly to the pressure regulator 9, whereby the control unit 10 may regulate the gas pressure accordingly. The temperature sensor 8 may also be directly connected to the pressure regulator 9 via a wire. In addition, the temperature sensor 8 may be arranged as part of the beverage container 2, or it may be designed so that it can be placed on the beverage container at the same time as the dispense head is coupled with the extractor tube.

[0039] Fig. 4 shows an additional embodiment in which the temperature sensor 8 is arranged inside 11 the beverage container 2. The beverage container 2 is shown in the same way as in Figs. 2 and 3. As mentioned above, the beverage container 2 contains the content 25 containing the beverage 4 and the gas 3. Via the gas inlet 22 of the dispense head and the gas and beverage valve 23 of the extractor tube 5, gas is delivered to the head space of the beverage container 2, so that the beverage may be dispensed out of the beverage container 2 in this embodiment via the dispense head 6. The temperature sensor 8 is arranged inside the beverage container 2. Inside the beverage container 2 may be on an inner face of the beverage container or another part, such as the down tube of the extractor tube as shown in Fig. 4. Hereby the temperature sensor 8 may measure the content 25 directly and transmit the measured temperatures wirelessly to the pressure regulator 9. On the basis of the measured temperatures of the content 25, the control unit 10 regulates the gas pressure accordingly.

[0040] In Fig. 5, a dispensing system 100 is shown in a cross-sectional side view. The dispensing system 100 comprises the housing 28 adapted to house the beverage container 2. The housing 28 is provided with a cooling device 20 for cooling the beverage to a predetermined temperature and is further provided with circulating means for circulating the cool air in the housing 28. The housing 28 also comprises the gas source 7. The gas source 7 is connected to the source pressure regulator

14 and is connected via a gas line 27 to the pressure regulator 9. The pressure regulator 9 is then connected to the dispense head 6, which is coupled to the extractor tube 5 of the beverage container 2. The dispensing line 15 extends from the beverage container 2 up through the font 26 to the tapping head 21. The tapping head 21 furthermore comprises the tapping handle 30. At the end of the dispensing line 15, a dispensing valve 29 is arranged which may be opened and closed by the tapping handle 30.

[0041] The dispensing line 15 may be made of a non-rigid material to facilitate handling and guiding. The dispensing line 15 may comprise a valve 29 at the outlet end, which valve 29 is adapted to be opened and closed by the tapping handle 30 when the dispensing line and valve are positioned in the tapping head. Instead of a valve, the dispensing valve may comprise a section made of a flexible material, such as rubber or silicone. The section is positioned opposite a pinch device arranged in the second part in connection with the tapping handle. The pinch device is adapted to pinch the section of the dispensing line and thereby close off the dispensing line.

[0042] In the same manner as described in relation to Fig. 2, the temperature sensor 8 is arranged a distance from the outer face 12 of the beverage container 2 and measures the temperature of the outer face 12 by means of an infrared beam 13. The reflected infrared beam 13 is converted into a temperature which is transmitted to the control unit 10, so that the gas pressure may be regulated according to the measured temperatures of the content 25.

[0043] In Fig. 6, another dispensing system 100 is shown. The dispensing system 100 is arranged below a bar counter which is adapted to house the beverage container 2. Beneath the bar, a cooling device 20 is arranged for cooling the content 25 (i.e. gas 3 and beverage 4) to a predetermined temperature. The gas source 7 is positioned in another room from the beverage container 2. The gas source 7 is connected to the source pressure regulator 14 and is connected via a gas line to the pressure regulator 9. The pressure regulator 9 is then connected to the dispense head 6, which is coupled to the extractor tube 5 of the beverage container 2. The dispensing line 15 extends from the beverage container 2 up through the font 26 to the tapping head 21. In the same manner as described in relation to Fig. 2, the temperature sensor 8 is arranged a distance from the outer face 12 of the beverage container 2 and measures the temperature of the outer face by means of an infrared beam 13. The reflected infrared beam 13 is converted into a temperature which is transmitted to the control unit 10, so that the gas pressure may be regulated according to the measured temperatures of the content 25.

[0044] Although the invention has been described in the above in connection with preferred embodiments of the invention, it will be evident for a person skilled in the art that several modifications are conceivable without departing from the invention as defined by the following claims.

Claims

1. A dispensing device (1) for dispensing carbonised beverage, comprising:

   - a beverage container (2) having a content (25) of a gas (3) and a beverage (4) having a predetermined gas content, the beverage container comprising an extractor tube (5),
   - a dispense head (6) adapted to be coupled with the extractor tube (5), and
   - a gas source (7) connected with the dispense head for delivering a gas to the beverage container via the dispense head,

   wherein a temperature sensor (8) is arranged for directly or indirectly measuring a temperature of the content (25) in the beverage container, and wherein the dispensing device (1) further comprises a pressure regulator (9) having a control unit (10), the pressure regulator being fluidly connected to the gas source and the dispense head, said temperature sensor (8) being connected with the pressure regulator, whereby the control unit (10), on the basis of the measured temperatures of the content (25), regulates the gas pressure delivered to the dispense head (6) via control of the pressure regulator.

2. A dispensing device (1) according to claim 1, wherein the temperature sensor (8) is arranged inside (11) the beverage container (2).

3. A dispensing device (1) according to claim 1, wherein the temperature sensor (8) is arranged on an outer face (12) of the beverage container (2) or is adapted to measure the temperature of the outer face (12) of the beverage container.

4. A dispensing device (1) according to claim 3, wherein the temperature sensor is an infrared sensor (8) adapted to measure the temperature of the outer face (12) of the beverage container (2).

5. A dispensing device (1) according to claim 4, wherein the infrared sensor (8) is arranged a distance from the outer face (12) of the beverage container (2) and emits an infrared beam (13), the infrared beam (13) being adapted to be reflected on the outer face (12) of the beverage container and return to the infrared sensor (8).

6. A dispensing device (1) according to claim 5, wherein the infrared beam (13) is substantially perpendicular to the outer face (12) of the beverage container.

7. A dispensing device (1) according to claim 1, or any of the claims 3-6, wherein the temperature sensor (8) is arranged as part of the pressure regulator (9).

8. A dispensing device (1) according to claim 1, or any of the claim 3-7, wherein the temperature sensor (8) measures the temperature of the content (25) via the temperature of the beverage container (2).

9. A dispensing device (1) according to any of the preceding claims, wherein the temperature sensor (8) is directly connected to the pressure regulator (9) via a wire or is comprised in the pressure regulator.

10. A dispensing device (1) according to any of the claims 1-8, wherein the temperature sensor (8) is wirelessly connected with the pressure regulator.

11. A dispensing device (1) according to any of the preceding claims, wherein the gas source (7) comprises a source pressure regulator (14).

12. A dispensing system (100) for dispensing carbonised beverage, comprising:

- a dispensing device (1) according to any of the preceding claims,
- a cooling device (20) for cooling the beverage,
- a dispensing line (15) fluidly connected with the beverage container (2) during dispensing, and
- a tapping head (21) from which the beverage (4) is tapped.

13. A method for dispensing a carbonised beverage from a dispensing device according to any of the claims 1-11, comprising the steps of:

- coupling a dispense head (6) to a beverage container (2) so that a gas flow from the gas source (7) to the beverage container is provided,
- measuring the temperature of the content (25) of the beverage container by measuring the temperature of the content itself or measuring the temperature of an outer face (12) of the beverage container, and
- regulating the gas pressure of the gas flow to the beverage container (2) on the basis of the measured temperatures of the content (25).

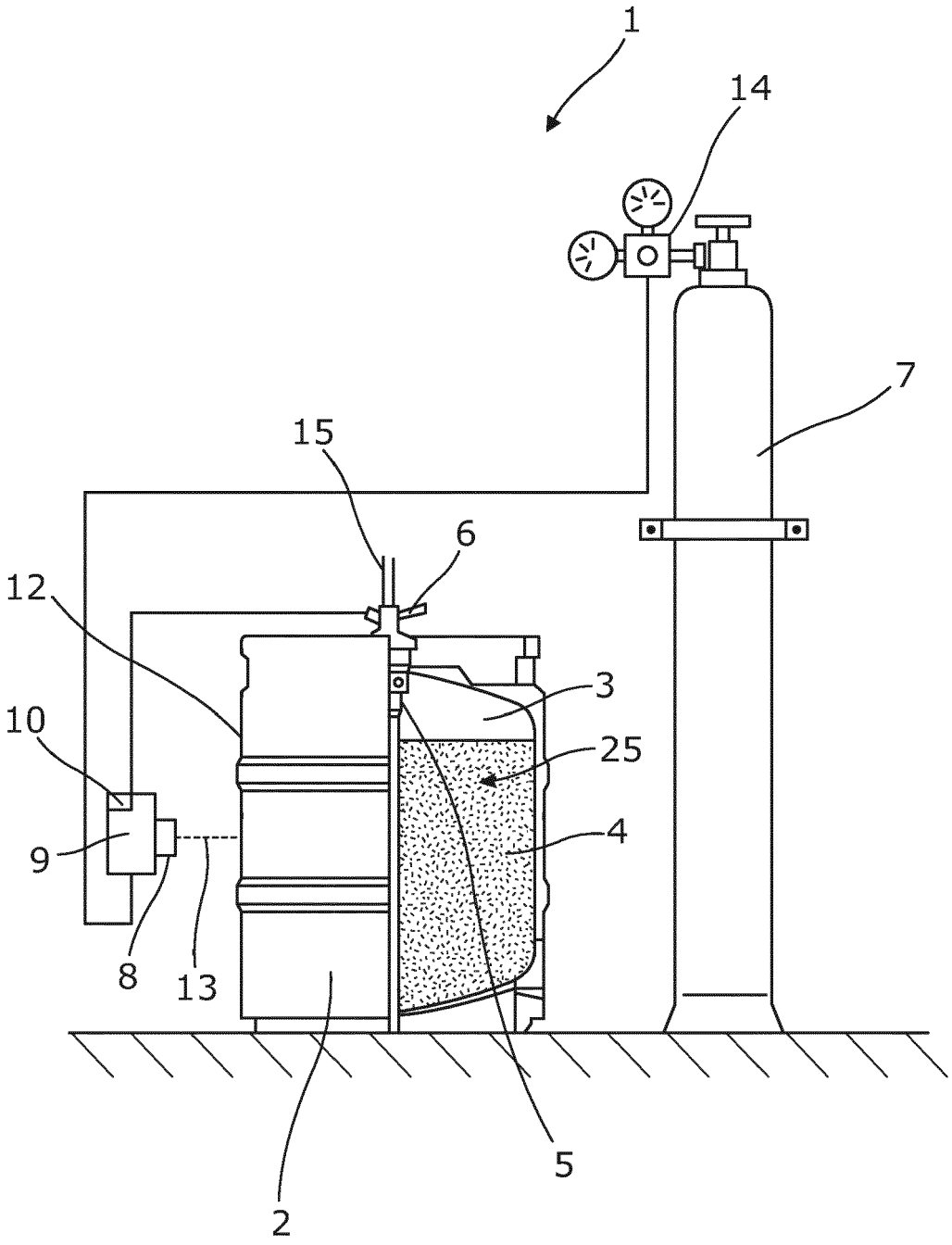

Fig. 1

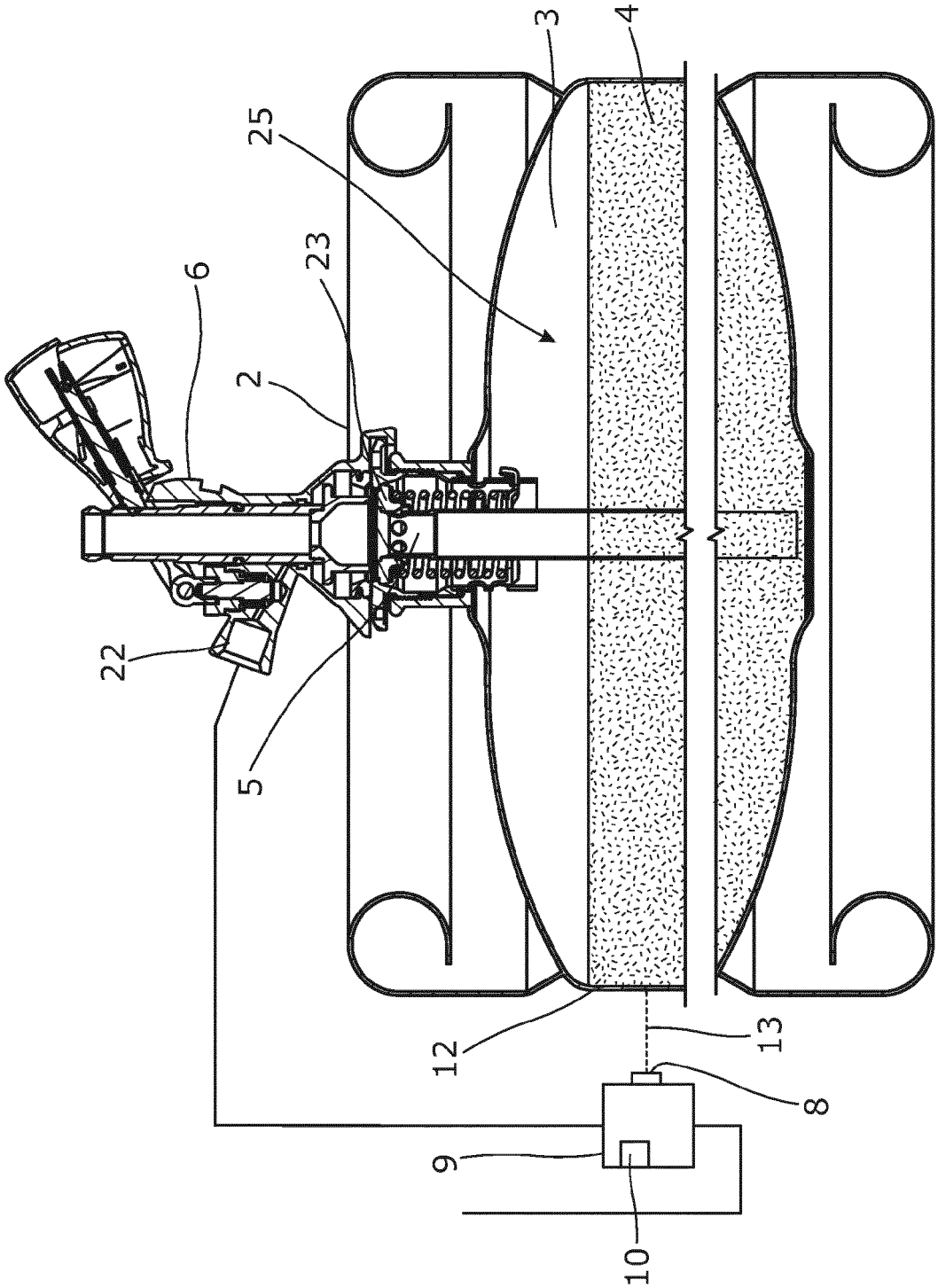

Fig. 2

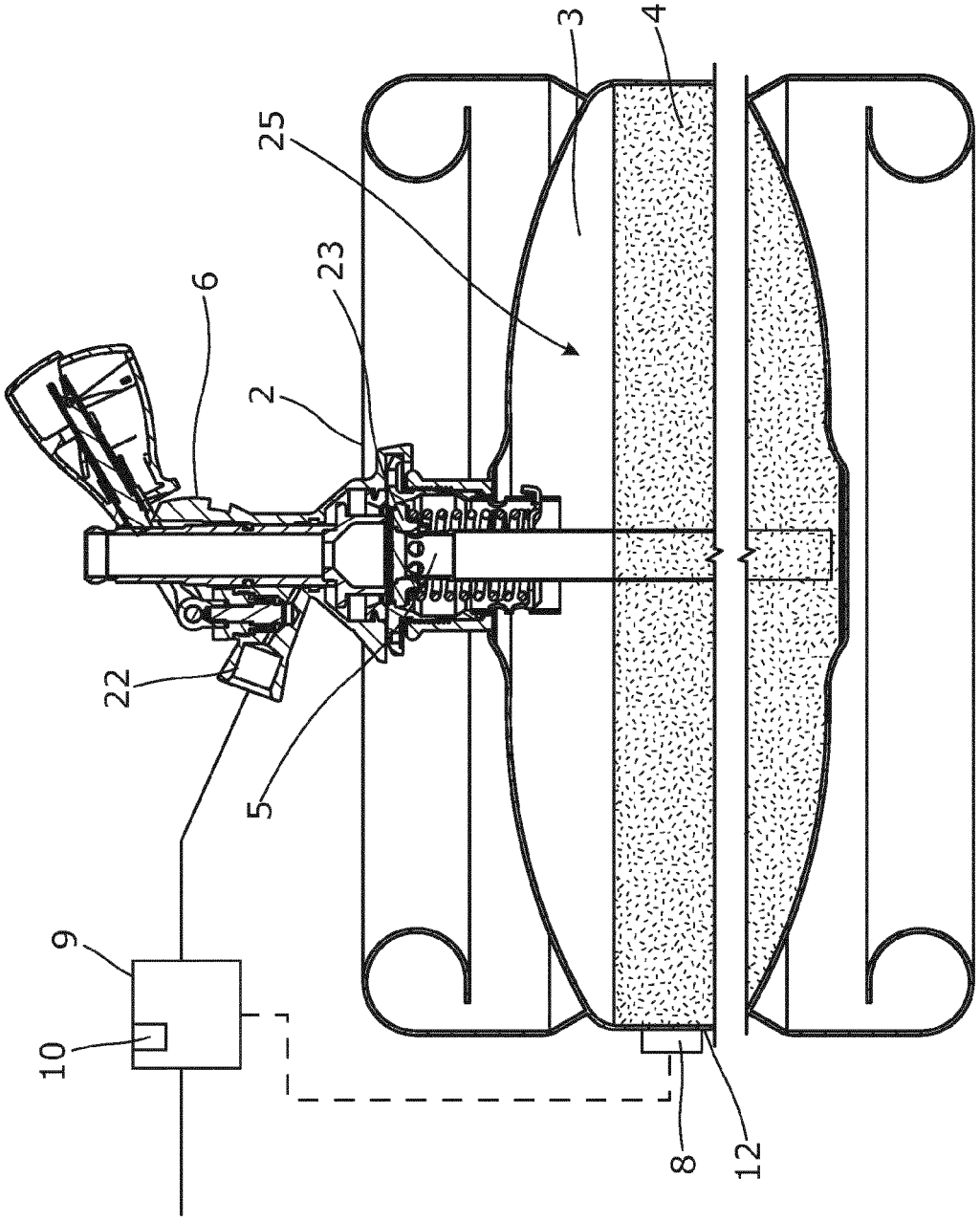

Fig. 3

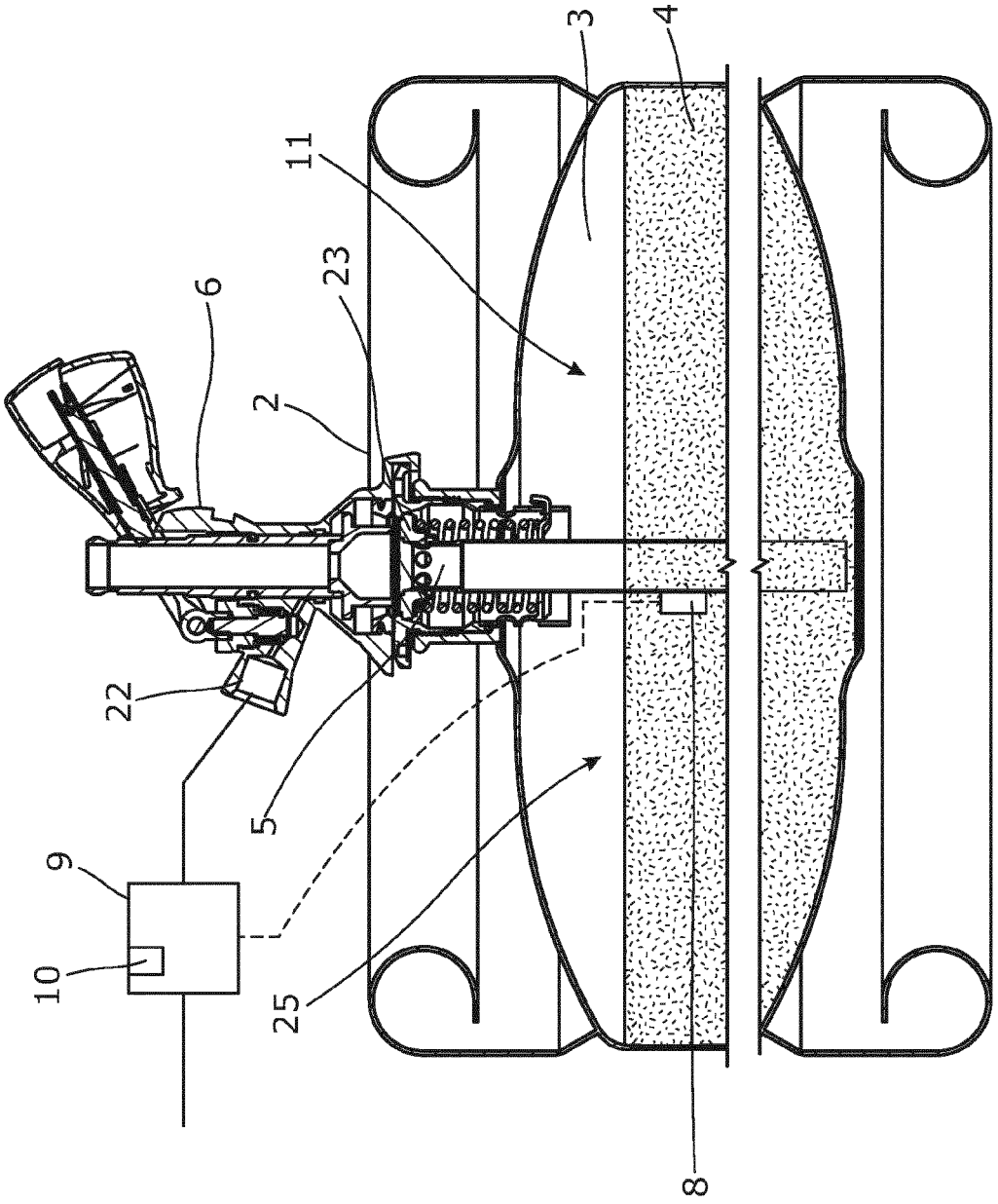

Fig. 4

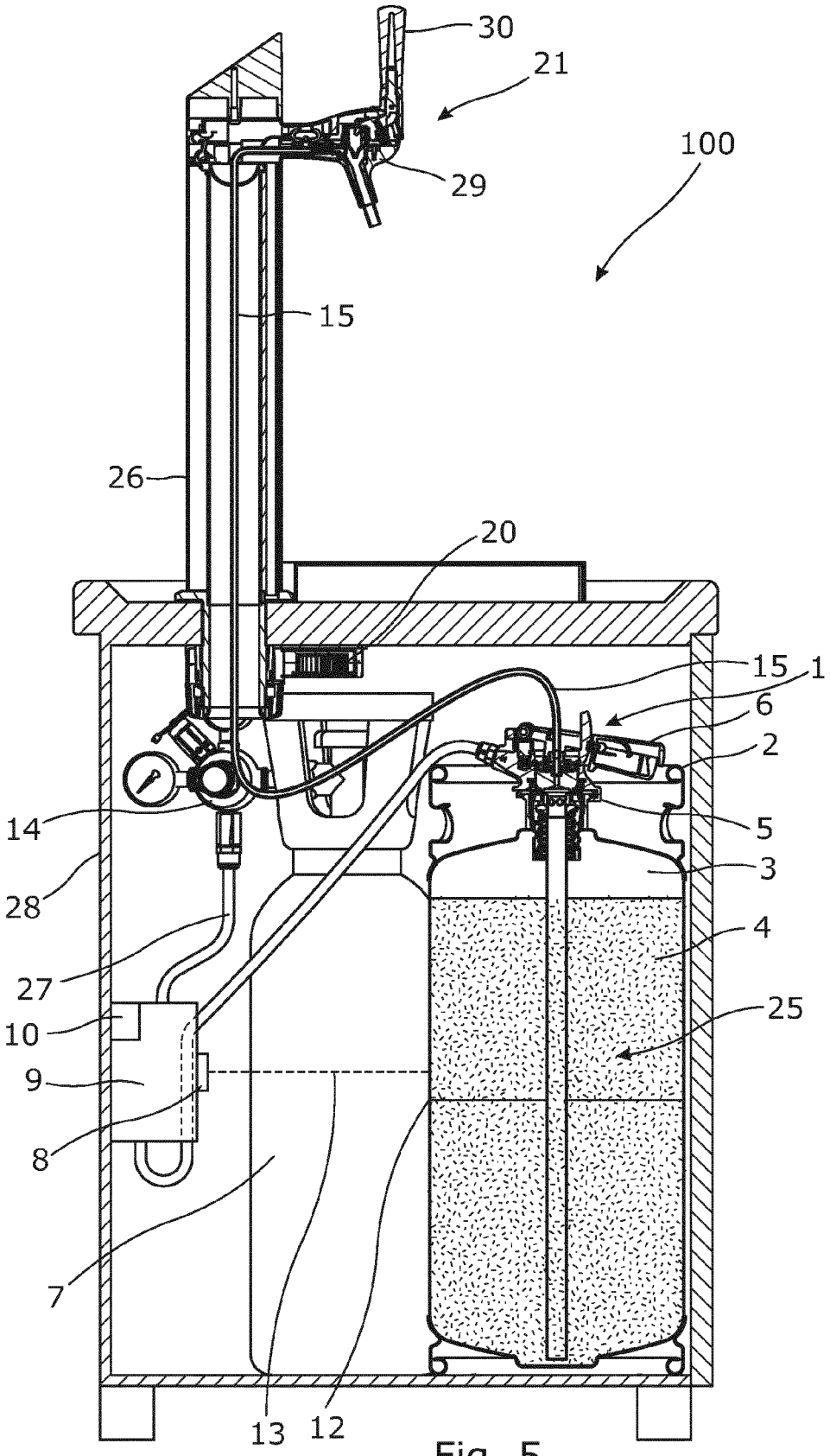

Fig. 5

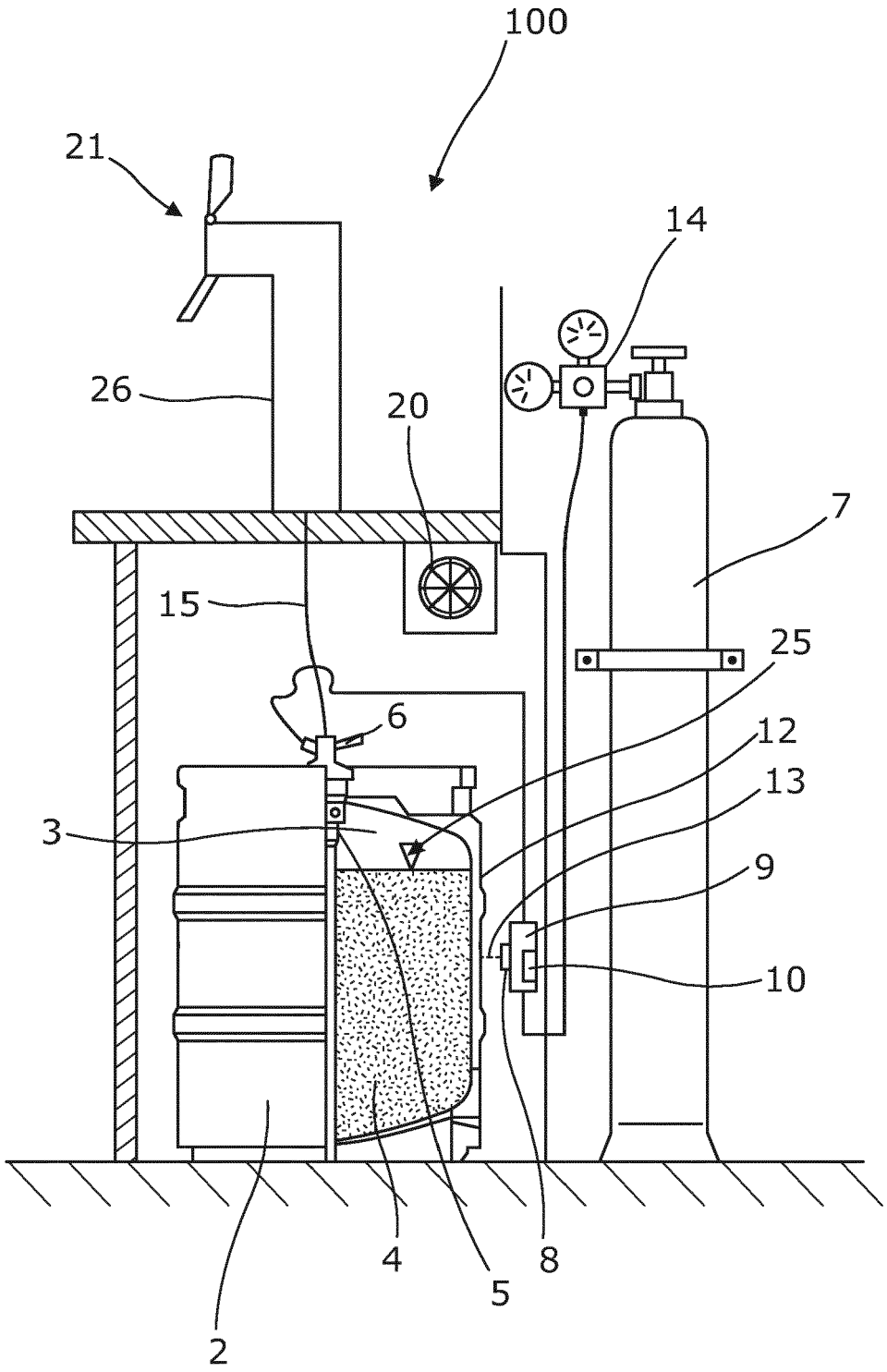

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 7919

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 February 2015	Desittere, Michiel

CATEGORY OF CITED DOCUMENTS

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