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DISPENSER FOR SELECTIVELY RELEASING VAPOR OR LIQUID FROM PRESSURE VESSEL

Filed Aug. 20, 1964

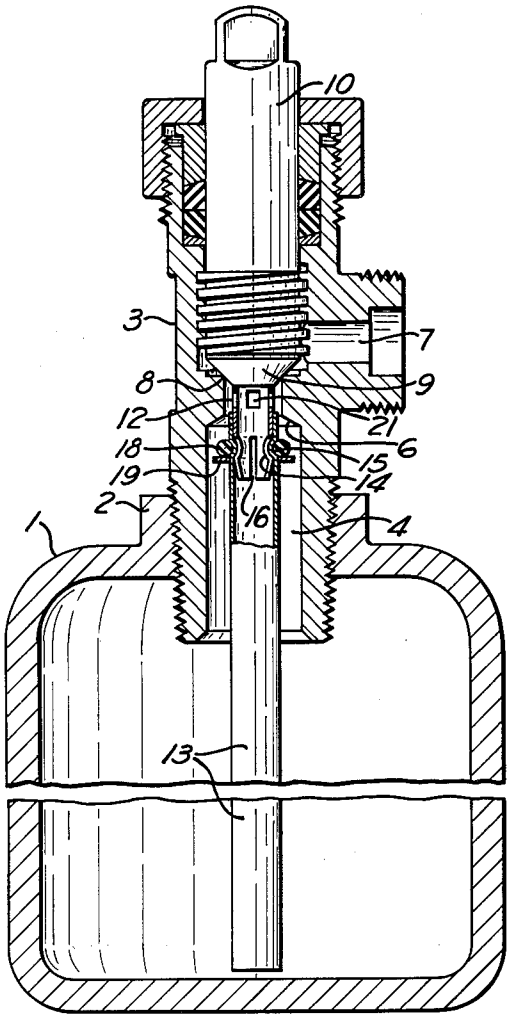


Fig. 1

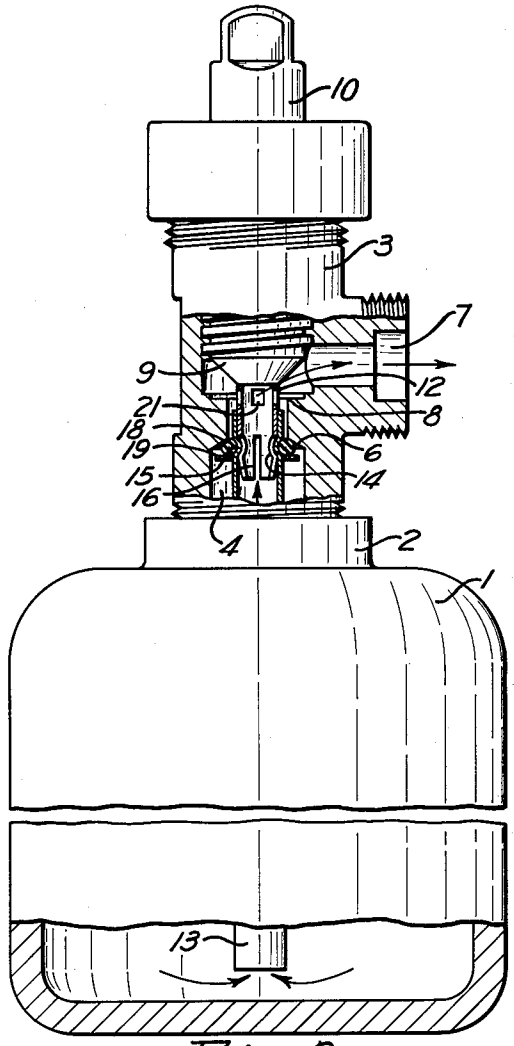


Fig. 3

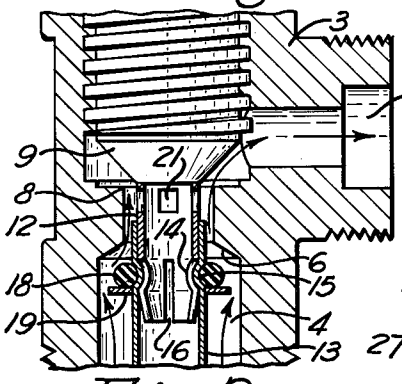


Fig. 2

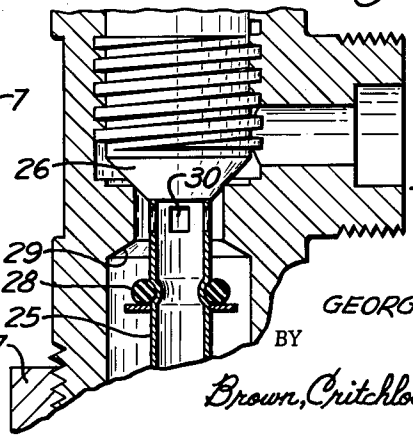


Fig. 4

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This invention relates to valves for the upper ends of pressure vessels containing liquefied gas and vapor under pressure, and more particularly to an improvement upon the valve shown in my Patent 2,991,918.

In that patent a valve is shown which can be closed completely, opened part way to permit only vapor to escape from the pressure vessel to which the valve is attached, or opened completely to permit only liquid to escape from the vessel. That valve operates very satisfactorily, but it is an object of this invention to improve upon the valve construction in order to reduce its cost and to permit the long dip tube to be quickly removed from or attached to the rest of the valve.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a vertical section of my new valve mounted on a pressure vessel;

FIG. 2 is a fragmentary vertical section of the valve, showing it open for escape of vapor;

FIG. 3 is a view similar to FIG. 1, but partly in elevation and showing the valve open for escape of liquid; and

FIG. 4 is a vertical section of a modified valve, shown closed.

Referring to FIG. 1 of the drawings, a pressure tank or cylinder 1 of well-known construction is provided at its upper end with an internally threaded neck 2, into which the lower portion of a valve is screwed. The casing or body 3 of the valve has a passage 4 extending upwardly from its lower end to form an inlet for the valve. The upper portion of the passage is reduced in diameter, and where its lower end joins the larger diameter portion of the passage a downwardly facing control seat 6 is formed. The valve body above the passage is hollow and has an outlet opening 7, to which a pipe or hose can be connected. The upper end of inlet passage 4 is encircled by an upwardly facing main seat 8 that normally is engaged by a downwardly tapered main valve closure 9, which has a stem 10 extending up through the upper end of the valve body. The stem may be raised and lowered in any conventional manner. For example it may be a threaded stem, in which case its projecting upper end is formed for receiving a knob or handle (not shown) for rotating the stem in order to seat or unseat the valve closure.

Rigidly connected to the lower end of main closure 9 is a short vertical tube 12 that extends down through the restricted upper portion of the inlet passage and preferably past control seat 6. The outer diameter of the tube is materially smaller than the diameter of the surrounding passage, so that there can be a free flow of vapor up through the passage around the tube when the valve is open. Detachably and sealingly connected to the lower portion of this tube is the upper end of a long tube 13, which forms part of the valve and extends down to a point near the bottom of the cylinder. The connection between the two tubes preferably is made by telescoping their adjoining ends together. Although the upper end of the long tube could be inserted in the short tube, it is preferred to do the reverse and insert the short tube into the long tube. Even though this occurs in the reduced upper portion of passage 4, the tubes are small enough to leave space between the outer tube and the wall of the

passage for flow of vapor up through that passage around the tubes.

To lock the tubes together, they may be deformed to provide a pair of inwardly projecting nesting annular beads 14, whereby a groove 15 is formed around the outer tube. The telescoping portion of one of the tubes, preferably the short tube, is provided with a plurality of circumferentially spaced slots 16 extending vertically from its end. These slots render the areas of the tubes between them resilient so that they can flex inwardly when the long tube is pulled downwardly, thus permitting the beads 14 to be disconnected. When the long tube is pushed upwardly around the short tube, the latter will be contracted by the bead on the long tube until it can snap into the groove formed by the bead on the short tube.

The tubes support an encircling control valve closure that most suitably is composed essentially of a sealing ring or O-ring 18 which is large enough to engage control seat 6 but small enough in diameter to permit vapor to flow up around it when it is down away from the seat. The sealing ring may be supported by the tubes in various ways. Preferably, groove 15 is located in such a position that the sealing ring 18 can fit in it snugly and yet be spaced from seat 6 when the valve closure 9 is only partly raised. The sealing ring also may be supported from below by a collar 19 encircling the long tube directly below the groove and tightly secured to the tube.

The short tube above the upper end of the long tube is provided with one or more outlets 21.

In the operation of this valve, it of course is closed by merely screwing the main valve closure 9 down onto its seat 8 as shown in FIG. 1. When it is desired to withdraw vaporized liquid from the cylinder, the main valve closure is rotated by its stem 10 to raise it from its seat far enough to obtain the desired flow. Vapor flow is established when the main valve seat and the control valve seat are both open, as shown in FIG. 2 so that the vapor can flow up around control valve closure 18. Since the pressure on top of the liquid around the long tube 13 is no greater than on the liquid in the tube, there will be no flow of liquid out of the cylinder at this time. Of course, the control closure valve must not be raised as far as it will go, because that would prevent vapor from flowing up past the sealing ring and the main closure and out through the valve outlet 7.

In case one wishes to withdraw liquid, instead of vapor, from the cylinder, the main valve closure 9 is raised still higher until the control valve closure firmly engages control seat 6, as shown in FIG. 3. This will shut off flow of vapor from the valve, so the pressure of the vapor in the cylinder above the liquid will force the liquid down and then up through the tubes and out through outlet 21, from which the liquid will flow out through the valve outlet 7.

It will be seen that with this valve the operator may withdraw either vapor or liquid from the cylinder at his option and without changing the position of the cylinder, as has been necessary heretofore. All operations of the valve are controlled from above, by merely turning the valve stem to raise or lower the two connected valve closures. A conventional valve does not need to be altered in any way, except to attach to the lower end of its tapered closure member the short upper tube 12, to which the long tube then can be connected.

With the construction disclosed herein, when this valve is being stored or shipped, the long tube can be quickly disconnected from the rest of the valve by merely giving it a quick downward jerk to pull it away from the short tube. The long tube then can be placed along side of the rest of the valve, where it is less likely to

be damaged than projecting from the valve body. To prepare the valve for use, all that has to be done is to push the upper end of the long tube up over the lower end of the short tube until the beads **14** snap together.

In case it is not desired to have a removable long tube, the cost of the valve can be reduced still more by making in one piece the tubular means that has just been described as formed from two connected tubes. This modified construction is shown in FIG. 4, where it will be seen that the upper end of a single long tube **25** is connected to the lower end of the main valve closure **26**. The tube extends down through the vertical valve passage to substantially the bottom of the pressure cylinder **27**. The tube carries a control valve closure **28** for engaging the control valve seat **29** when the main valve closure has been raised as far as possible. At that time liquid will be forced up through the tube and out of a lateral opening **30** in its upper end.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A dispenser for a pressure vessel containing liquefied gas and vapor under pressure, comprising a valve body provided with an inlet passage extending upward from its lower end and having a restricted upper portion forming a downwardly facing control valve seat, the upper end of the passage forming an upwardly facing main seat, a main valve closure normally engaging said main seat, said body having an outlet above said passage, means for raising the main closure to connect the passage with said outlet, tubular means having a smaller diameter than the restricted portion of said inlet passage and connected to the bottom of the main closure, said tubular means extending down through said inlet passage and past the control valve seat and adapted to extend down to a point near the bottom of said vessel, and a control valve closure encircling said tubular means and supported thereby normally spaced from said control valve seat to permit vapor in the vessel to flow up past both seats when said main closure is raised to less than its maximum distance from the main valve seat, said tubular means being provided above the control valve closure with an outlet, whereby upon raising the control valve closure into engagement with the control valve seat expanding vapor in the vessel can force liquid up through said tubular means and out of said outlets.

2. A dispenser as recited in claim **1**, in which said tubular means is a single tube.

3. A dispenser as recited in claim **1**, including a rigid member encircling said tubular means and secured thereto, said control valve closure being a sealing ring resting on said member.

4. A dispenser as recited in claim **3**, in which said tubular means is provided with an external annular groove snugly receiving said sealing ring.

5. A dispenser as recited in claim **1**, in which said tubular means is formed from a short tube connected to the main valve closure and a long tube detachably, sealingly connected to the short tube.

6. A dispenser as recited in claim **5**, in which the upper end of the long tube is telescoped over the lower end of the short tube, and said control valve closure is supported by the long tube.

7. A dispenser for a pressure vessel containing liquefied gas and vapor under pressure, comprising a valve body provided with an inlet passage extending upward from its lower end and having a restricted upper portion forming a downwardly facing control valve seat, the upper end of the passage forming an upwardly facing main seat, a main valve closure normally engaging said main seat, said body having an outlet above said passage, means for raising the main closure to connect the passage with said outlet, a short tube having a smaller diameter than the restricted portion of said inlet passage connected to the bottom of the main closure and projecting down through said passage, a long tube having an upper end disposed in tight telescoping relation with the lower portion of said short tube, the long tube being adapted to extend down to a point near the bottom of said vessel, the telescoping portions of the tubes below said control valve seat being provided with inwardly projecting nesting annular beads forming a groove around the outer tube, one of said telescoping portions being split lengthwise to permit the long tube to be disconnected from the short tube, and a control valve sealing ring mounted in said groove, said beads normally being spaced below said control valve seat far enough to permit vapor in the vessel to flow up around said ring and past both valve seats when said main valve closure is raised to less than its maximum distance from the main valve seat, and said short tube being provided above the sealing ring with an outlet, whereby upon raising said ring into engagement with the control valve seat expanding vapor in the vessel can force liquid up through said tubes and out of said outlets.

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