Oct. 27, 1936. H. V. HANSEN 2,058,868

VALVE

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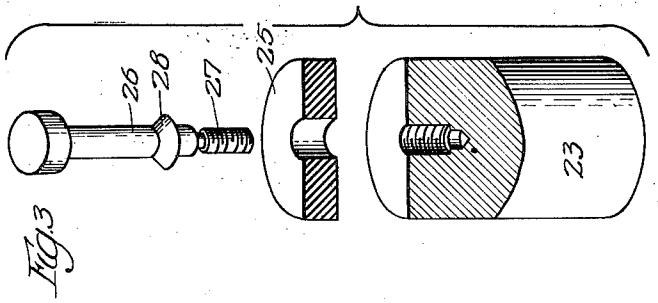


Fig. 3

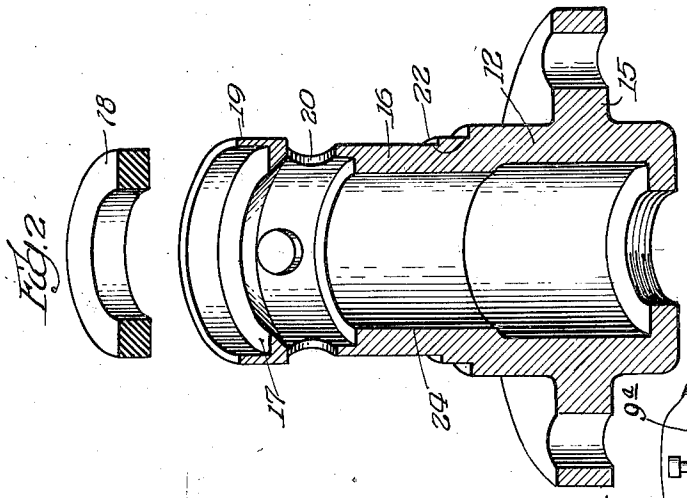


Fig. 2

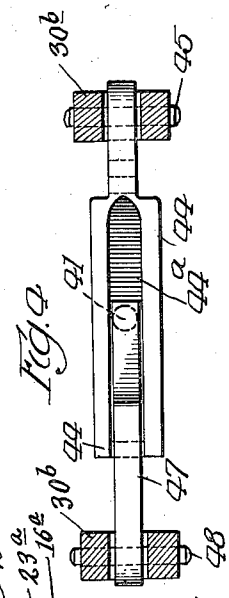


Fig. 4a

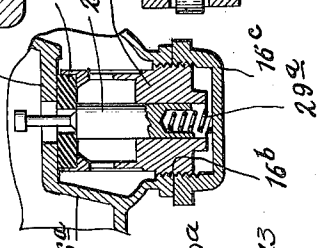


Fig. 5

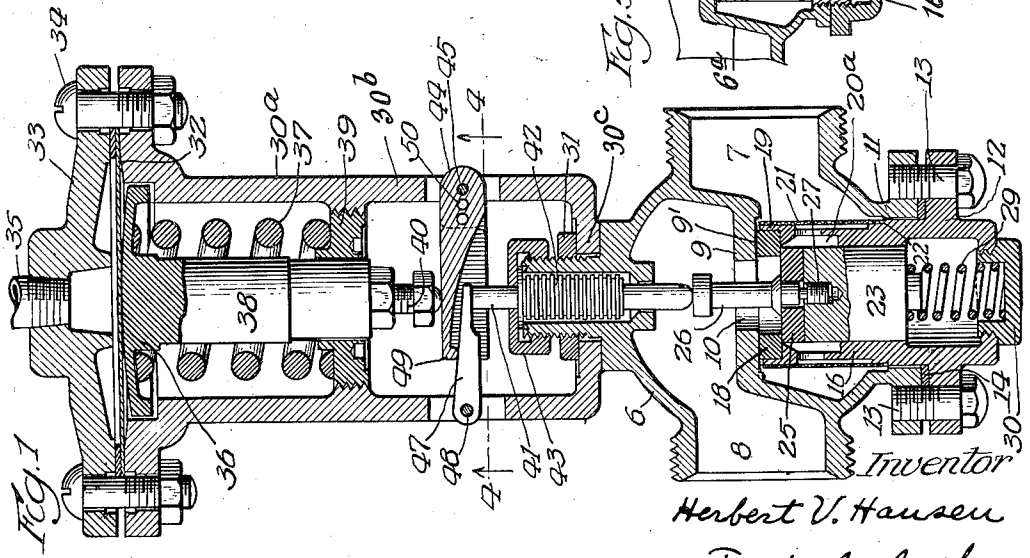


Fig. 1

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VALVE

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1 Claim. (Cl. 251—156)

The invention relates to valves and its primary object is to provide an improved valve of the type in which the casing is provided with a bottom opening therein, and such opening is closed by means of a cap which has a cylindrical upstanding sleeve for slidably supporting a valve plunger and clamping a ring-shaped valve seat against the bottom face of a substantially horizontally extending passage equipped cross-wall in the casing.

Other objects of the invention and the various advantages and characteristics of the present valve construction will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by the claim at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views, Figure 1 is a section of a valve embodying the invention. Fig. 2 is a fragmentary perspective of the removable cap and valve seat. Fig. 3 is a fragmentary perspective of the various parts of the valve plunger. Fig. 4 is a section on line 4—4 of Fig. 1. Fig. 5 is a section illustrating a modified form of the invention.

The invention is exemplified in a valve which comprises a casing 6 and has particular utility in connection with the control or regulation of the flow of fluid to a compressor in a refrigerating system. The casing 6 is provided at one side with an inlet passage 7 and has an outlet passage 8 at the outer side thereof. A wall or partition 9 extends across the interior of the casing 6 and is formed with a passage 10 through which fluid is adapted to pass when the valve is open. The bottom of the casing is provided with an opening 11 to provide access to the interior of the valve casing. This opening is closed by a cap 12 which is removably secured by any suitable means, such as screws 13, to the valve casing. A packing ring 14 is interposed between the valve casing and a flange 15 on the cap. The cap is provided with a cylindrical sleeve 16, the upper end of which terminates adjacent to the wall 9 in the casing. An inwardly extending and upwardly facing annular shoulder 17 is formed near the upper end of the sleeve 16 to engage a ring 18 which forms a removable valve seat. This ring is preferably formed of suitable elastic material and fits between the shoulder 17 and the lower face of the wall 9 around the passage 10 in said wall. The sleeve 16 is provided with a flange 19 which fits around the ring 18. When the cap 12 is secured in place with respect to the casing by the screws 13, the ring 18 is firmly clamped between the shoulder 17 on the sleeve 16 and the wall 9. When the cap is removed from the casing the seat forming ring 18 comes with it. The lower face of the wall 9 is machined as at 9' so that when the ring 18 is jammed against it a fluid-proof joint is formed by the ring between the sleeve 16 of the cap and said wall. An annular groove 20a is formed in the inner periphery of the upper end of the sleeve 16. Openings 20 are formed in the sleeve 16 to permit fluid to pass from the inlet 7 into the groove and through the ring 18 and passage 10 in wall 9. A cylindrical screen 21 is fitted around the outside of the sleeve 16 and seated on a shoulder 22. The upper ends of the flange 19 and screen 21 terminate slightly below the top face of the seat-forming ring 18 so there will be no interference with the jamming of the ring 18 into its operative position between the shoulder 22 and wall 9. A cylindrical plunger 23 slides in a cylinder 24 in the sleeve 16 of the cap, and a valve-member 25 of any suitable material is secured on the top of the plunger by a stem 26 the lower end of which is screw threaded, as at 27, into the plunger and is provided with a shoulder 28 for removably securing the valve member 25 on the plunger. The plunger 23 is held normally closed by a spring 29 which engages the lower end of the plunger and has its lower end confined in a recess in a screw plug 30 in the central portion of the lower end of the cap 12. The upper face of the valve member 25 is adapted to seat on the under face of the seat-forming ring 18 to cut off communication between the inlet and outlet passages in the casing. The margin of the valve member 25 is adapted to lap the bottom face of the ring 18 inwardly of the annular shoulder 17 in the sleeve 16.

Whenever it becomes necessary to examine or replace the ring 18, it is only necessary to remove the screws 13 so the cap and all of the parts carried thereby including the ring 18, the plunger 23 and the stem 26 can be withdrawn through the opening 11 from the casing. By virtue of the fact that the ring 18 is unattached to the wall 9 and removable from the cap it is possible readily to replace the ring whenever it becomes worn. The valve member 25 can also be readily replaced after the cap has been removed from the casing by disconnecting the stem 26 from the plunger 23.

Normally the plunger is held closed by the

spring 29. The fluid under pressure in the passage 7 flows through the screen and the openings 20 in the sleeve 16 of the cap 12 into the annular groove 20a in said sleeve and around the valve member 25. The pressure of the cap against the seat-forming ring 18 effectively seals the joint between the ring and the wall 9 and the pressure of the fluid and the plunger 23 against the underside of said ring tends to keep the seal tight, in order to direct the fluid upwardly from the groove 20a and thence through the seat-forming ring 18. The sleeve is provided on the inner periphery thereof and directly above the groove with an upwardly tapered face. This face is approximately of the same diameter as the valve member 25 and in addition to directing the fluid upwards through the seat-forming ring it serves to guide the valve member 25 into seated relation with the ring 18 when the valve plunger is shifted upwards in the sleeve.

The valve comprises improved mechanism for opening the plunger 23 by fluid under pressure to control or regulate the flow of fluid through the valve. This mechanism comprises a casing 30a, the lower end of which has a pair of legs 30b. The latter terminate in a ring 30c which is secured by a nut 31 on the top of the valve casing 6. A diaphragm 32 is clamped between the body of the casing 30a and a head 33 which is secured to said body by bolts 34. A pipe 35 is connected to the top of the head 33 to supply fluid under pressure into the chamber above the diaphragm to flex the diaphragm downwardly when the valve is to be opened. A plunger 36 engages the lower face of the diaphragm and is pressed thereagainst by a spring 37 which is held in the casing 30a. A stem 38 on the lower end of the plunger 36 is slidably mounted in a plug 39 which is screw-threaded into the casing 30a. A stud 40 is screw-threaded to the stem 38 so that it can be adjusted. A stem 41 is slidably mounted in the upper part of the valve casing 6 and its lower end is adapted to engage the upper end of the stem 26 of the plunger 23. A bellows 42 has a flange clamped to the casing 6 by a collar 43 to form a seal around the stem 41.

In order to impart to the plunger-valve a longer stroke than the range of movement of the diaphragm to control more accurately the movements of the valve responsively to variations in the pressure of the fluid acting on the diaphragm a device is interposed between the stud 40 and the stem 41. This device consists of a lever 44 which has its outer end fulcrumed on a pin 45 in one of the legs 30b of the casing 30a, and a lever 47 which has its outer end fulcrumed on a pin 48 in the other leg of the casing. The stud 40 engages the lever 44 at an intermediate point. The inner end of lever 47 engages the stem 41 and the inner end of the lever 44 has an abutment 49 which engages the lever 47 between its fulcrum and its inner end. As a result, the movement of the stud 40 is applied to the lever 44 so that the abutment 49 will have a greater movement than the stud 40 and the diaphragm and this abutment is applied to the lever 47 between its fulcrum and the point of its engagement with the stem 41 so that the movement of the inner end of the lever 47 and stem 41 will be greater than the movement of the abutment 49. This exemplifies a device between the diaphragm operated stud and the stem for shifting the plunger 23 for multiplying the movement imparted by the diaphragm to the plunger 23.

A series of holes 50 are formed in and adjacent the outer end of the lever 44 so the lever can be adjusted to vary the distance between the abutment 49 and the point of engagement of the stud 40 to vary the stroke imparted to the stem 41 relatively to the stroke of the diaphragm. The lever 44 is recessed as at 44a to receive the lever 47.

In the modification shown in Fig. 5 the plunger 23a is slidably mounted in an inner cap 16a which has a screw thread 16b for engaging a female thread in the casing 6a so that it can be turned to force the removable valve seat 18a against the wall 9a of the casing. An outer cap 16c is screw threaded to the portion of the thread 16b which projects beyond the casing. The outer cap 16c seats on a face on the casing to prevent leakage around the screw threads. A spring 29a for forcing the plunger against the seat 18a, is applied between the lower end of said plunger and the outer cap 16c.

The invention is not to be understood as restricted to the particular details set forth, since these may be modified within the scope of the appended claim, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

In a valve of the character described, the combination of an open ended, horizontally extending casing having an opening in its bottom and provided with a substantially horizontal, cross-wall serving to form a fluid inlet compartment in the lower portion of the casing and a fluid outlet compartment in the upper portion of said casing and embodying a central passage therein between the two compartments, a cap for closing the opening in the casing bottom secured removably to the casing, a sleeve formed integrally with, and extending upwardly from, the cap and having on its upper end and directly beneath the bottom face of the central portion of the cross-wall with a flat, annular face and a flange around the face, said sleeve being provided beneath the seat and in the inner periphery thereof with an annular groove and having side openings leading to the groove for permitting fluid in the lower compartment to pass into the groove and thence upwards through the passage into the upper compartment, and also having an upwardly tapered face directly above the groove and beneath said annular face for directing the fluid upwards from the groove and through the aforesaid passage, a ring-shaped valve seat confined within the flange and having the outer marginal part thereof clamped between the flat face of the sleeve and the bottom face of said central portion of the cross-wall, a valve plunger slidable vertically in the sleeve and having a separately formed member of elastic material secured to its upper end and adapted when the plunger is raised to be guided by said tapered face into engagement with the inner marginal part of the ring-shaped seat and to close the passage against flow of fluid from the lower compartment to the upper compartment, and means for shifting the plunger downwards with respect to the sleeve in order to open the passage for the flow of fluid therethrough.

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