Aug. 14, 1951 J. H. MILLER 2,564,023

RECIPROCABLE CHECK VALVE

Filed April 14, 1947

Fig. 1.

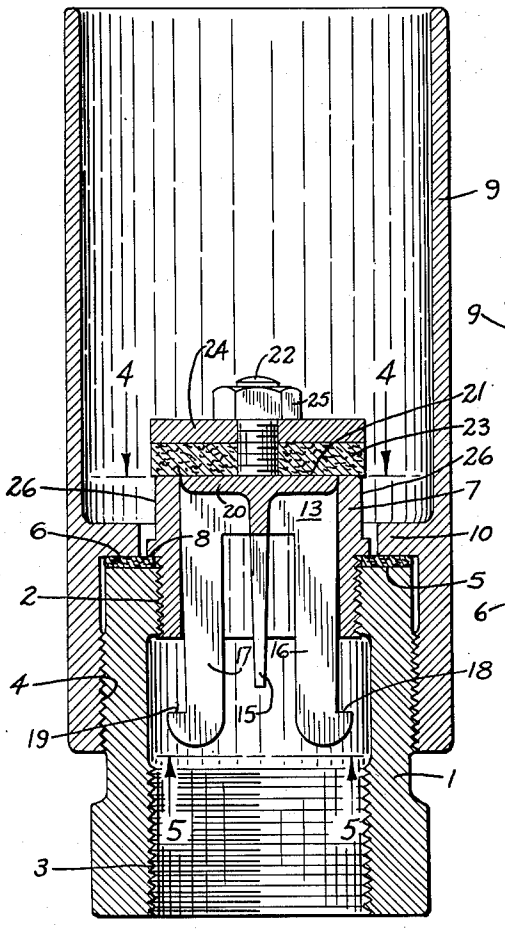


Fig. 4.

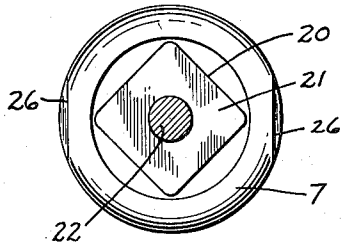


Fig. 2.

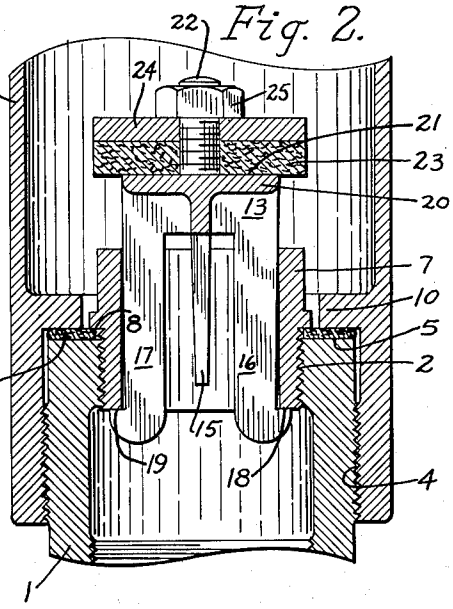


Fig. 3.

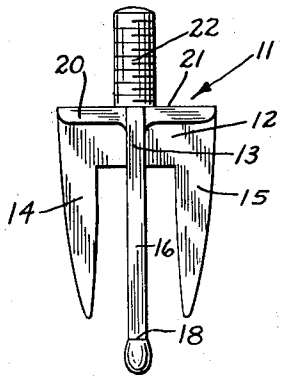
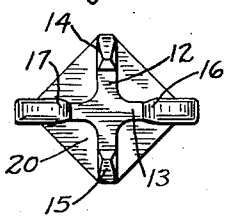


Fig. 5.



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RECIPROCABLE CHECK VALVE

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1 Claim. (Cl. 251—127)

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This invention relates to improvements in valves having valve guides in the flow-stream with stops for limiting the opening stroke of the valve, the valve assembly forming a part of an assemblage of the type disclosed in the patent granted to me April 26, 1904, No. 758,377, the present invention being designed as an improvement thereon.

As indicated in the earlier patent, above identified, the valve structure forms a part of a pump assemblage designed for the purpose of raising liquids by transferring the liquid from a lower cylindrical member to an upper cylinder as by a pumping action, the pumping mechanism generally being active with the upper cylinder; hence, the valve movements in the upward direction are generally due to differentials in pressure between the upper and lower cylinders, the valve being moved to closed position by the weight of the valve and the liquid thereabove, the valve assembly thus being responsive to pressure conditions rather than directly by mechanical power; the valve movements thus are automatically developed and are practically of impulse type, the valve opening when the pumping structure reduces the pressure in the upper cylinder and becoming seated when the mechanism moves in the direction to raise the pressure in the upper cylinder. The pumping assemblage is broadly of a well known type.

In the operation of assemblages of this type, certain conditions are present. For instance, since passage of the liquid through the valve can only take place by raising the valve and the liquid content thereabove the weight of the valve and such content must be overcome by the pressure conditions within the lower cylinder which are generally constant in value; obviously, the efficiency of the assemblage is then dependent upon the ability to develop a differential in pressure of sufficient value to overcome the weight of valve assembly and such liquid content of the upper cylinder and to obtain this as speedily as possible; hence, it is important that the valve assembly have weight values as low as possible, and that the volume of liquid passing through the valve per unit of time be sufficiently large as to overcome the weight factor of the liquid content of the upper cylinder; the valve assemblage must have strength to withstand the service conditions and must be capable of movement between open and closed positions with freedom, and hence it is the practice to provide the valve assembly structure below the actual valve member with guiding members of thin material radiating from

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the axis of the valve, the guides being generally four in number, and having a length materially greater than the length of the valve seat member; the lower end of the guides are equipped with projecting lugs which serve to limit the upward travel of the valve. Such arrangement is shown in my earlier patent above identified.

In valves of this type it has been customary to make the valve guides of two solid cross pieces with stops provided at the ends of all four corners of these guides.

The object of this invention is to supplant these guides by two cross pieces which are cut away at the center to a point close to the valve seat, forming four fingers spaced 90° around the valve. Only two of these fingers spaced 180° apart have stop shoulders at their ends to form stops for the valve opening stroke, the other two being shorter and tapered, acting merely as guides, providing a much lighter and more efficient construction. The cut-away portions of the cross pieces at the center provide a free flow of the fluid passing through the valve. The fluid stream is not separated into four restricted streams in the guide portion until the free space above the valve is reached, preventing any restriction at the point where it crosses the roots of the fingers while the valve is open.

Other and more specific objects will become apparent in the following detailed description of one form of valve and guide means therefor, made in accordance with this invention, having reference to the accompanying drawing, wherein:

Figure 1 is a sectional view through the valve section of a fluid conduit, with the valve in closed position,

Figure 2 is a section of the valve in open position taken at right angles to that shown in Figure 1,

Figure 3 is an elevational view of the guide element per se,

Figure 4 is a section of the valve taken on the line 4—4 of Figure 1, and

Figure 5 is a bottom view of the guide element as viewed on the line 5—5 of Figure 1.

The valve section shown comprises a pipe fitting 1 having inner threads 2 and 3, and outer threads 4. The end face 5 is finished to receive a sealing member 6. Valve seat sleeve 7 is threaded into the thread 2 of pipe fitting 1 and has an outer shoulder 8 to engage the inner edge of the sealing member 6.

Another pipe fitting 9 is threaded over outer thread 4 of fitting 1 and has an internal flange

10 which engages the outer edge of the sealing member 6.

The valve is made up of the guide element 11 formed with two cross pieces 12 and 13 cut-away at the center to form the two guide fingers 14 and 15 from cross piece 12, and the two guide and stop fingers 16 and 17 from the cross piece 13. Fingers 16 and 17 are provided with stop shoulders 18 and 19 respectively. These cross pieces are integral with the end plate 20 having a finished face 21, and the stud 22. A valve seat 23 of suitably resilient material, such as leather, is held between the face 21 and a washer 24 by nut 25.

From the foregoing description, it is apparent that certain important changes have been made over the disclosure of the earlier patent, changes which serve to increase the efficiency of such earlier disclosure. For instance, the change made in the substructure of the valve which eliminates the central portion of such substructure to provide the central open zone which leads from the bottom to a point near the top of the substructure is of direct importance. The four guides are retained with respect to the upper zone, but are then continued as downwardly extending fingers, the central portion being removed. Hence the presence of the central space removes the individual quadrant-like shape of the individual passages of the earlier structure, permitting a greater volume of liquid to pass per unit of time, since the core-like central zone will exert a greater pressure in the direction of the outlet than is present with the small central angular zone of the quadrants of the earlier structure the quadrant effect is present immediately below the member 20, but, as indicated in Figure 2, the bottom plane of this quadrant zone is materially above the plane of the valve seat, in the position shown, the result being that the content of the zone has direct access to the upper cylinder through such space between the two planes placing additional pressure within the discharge zone, the only barrier effect being provided by the edges of the fingers.

This effect is increased somewhat by the fact that member 20 is made square instead of circular. While valve 23 is mounted on the top of member 20, it will be understood that the exposed portion of the under face of the valve—in the Figure 3 position—is actually a part of the interior of the upper cylinder; hence, the change in shape of member 20 will serve to permit more rapid escape of liquid from the quadrant zone at the top of the valve substructure: as will be understood, where operation is based on the superiority of pressure on the lower side of the valve under the conditions of Figure 3 disclosure, the more rapid the discharge of the liquid from the confines of the valve, the greater becomes the volume of liquid passed per unit of time, with the response to the differential in pressure conditions made more rapid, thus increasing the efficiency of the assemblage.

Another advantageous change in structure is found in the change in the valve substructure which restricts the presence of the movement-limiting shoulders to but two of the four fingers, these being diametrically opposite. While this change could increase the possibility of slight wobbling when the valve is in the Figure 3 position, any effect in this direction would be limited by the fact that the shape of the intermediate fingers includes an outer upper zone which closely approaches that of the other fingers, so that any material rocking is prevented. The advantage of

the form of the intermediate fingers is the fact that the spear shape and shorter length shown reduces the weight of the valve assembly correspondingly. This reduction, plus the reduction of the elimination of the weight of the core-zone in producing the central open zone, provides a very material decrease in the weight of the assembly, thereby reducing the weight which must be raised by the differential in pressure activity. In the Figure 1 position, the upper zones of each of the four guides will be effective to prevent material rocking. The spear shape also assures that if there should be any tendency to rock when the valve is returning to closed position, the outer wall of the intermediate fingers will tend to move the structure to its proper position within the seat element 7. Intermediate fingers are needed to provide proper seating and to prevent any material tendency to valve rotation, but the particular configuration of the valve structure provides for minimum weight conditions.

The mounting of the valve has been changed from the earlier form, simplifying the positioning of the valve washer 24 protecting the valve from deformation during upward travel of the valve and forming a backing support for the valve during downward movement. The change also includes an actual clamping of the valve 23 in the valve assembly, with the valve perforation relatively smaller; hence, the valve is locked in position in the assemblage.

Another change made is in the assembly of the two cylinders and the seat element. As before, the lower cylinder has threaded connection with both the upper cylinder and the seat element, but the parts are so formed that the packing element is now mounted between flanges of both the upper cylinder and the seat element above the packing with the latter mounted on the upper end of the lower cylinder; as a result, the packing not only protects against air or liquid leakage through the thread connection of lower cylinder and seat element, as before, but additionally similarly protects against leakage through the thread connection between the two cylinders, the latter being formerly absent. As a result, there is no possibility of leakage of air into the upper cylinder to disturb the lowered pressure therein, so that the latter develops more rapidly and thus tends to increase the liquid volume delivery per unit of time.

In order words, through the changes made, the present invention makes the assemblage more efficient by increasing the volume delivery per unit of time through the more favorable movement of the liquid through the valve zone; and through reduction in the weight of the valve, and by making the valve responsive to pressure changes in the upper cylinder in a more rapid manner. Hence the particular type of assemblage is rendered more efficient in action.

The valve seat sleeve 7 may be provided with plates 26 for engagement by a wrench.

Obviously, many modifications in form and dimensions of the several parts of the present device may be made without departing from the spirit and scope of this invention, as defined in the appended claim.

What is claimed is:

A valved pipe section of the character described including a cylindrical sleeve having a gasket ring on one end face thereof, an annular check valve seat member positioned within the gasket bearing end of said sleeve and having a valve member reciprocating therein, said valve member

having a guide element formed of two cross-pieces cut out at the center to provide a free flow of fluid through said member when said valve is open, said cut-out cross pieces forming two pairs of opposed guide fingers, said fingers having their outer side edges tapered gradually inwardly toward their free ends, and one of said pairs being longer than the other pair and having outwardly directed stop shoulders at their ends for cooperation with the end of said seat member, said check valve seat member having an outwardly directed annular flange extending partially over and engaging said gasket in sealing relationship, and a second cylindrical sleeve of slightly greater diameter than said first cylindrical sleeve and securely overlapping the valve seat bearing end of said first sleeve, said second sleeve having an inwardly directed annular flange adjacent its overlapping end also extending partially over and engaging said gasket in sealing

relationship, whereby a single gasket provides a fluid tight seal between said tubular sleeves and also between said first sleeve and annular check valve seat member.

JACOB H. MILLER.

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