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1,968,200

PUMP VALVE

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Fig. 1.

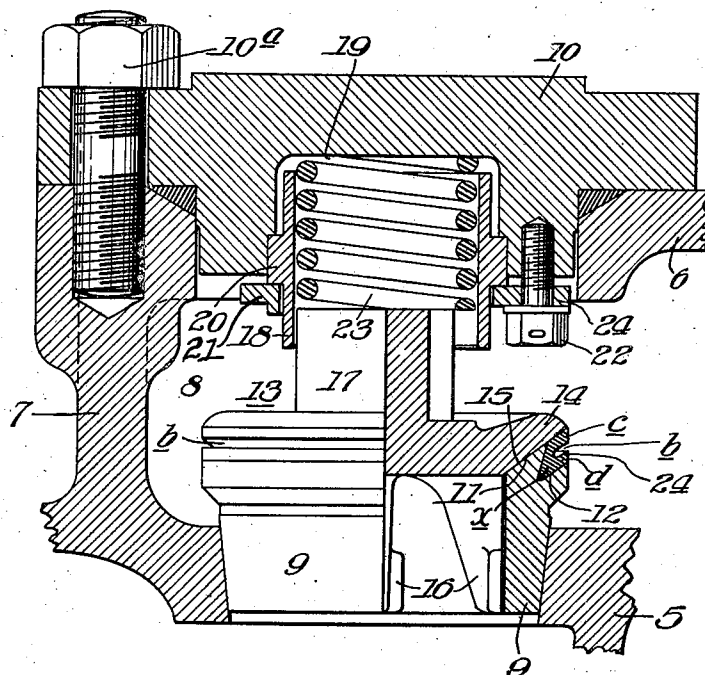


Fig. 2.

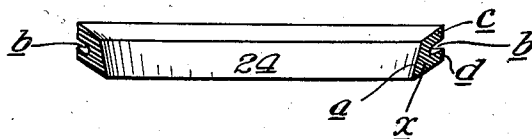
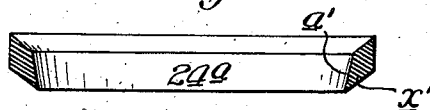


Fig. 3.



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UNITED STATES PATENT OFFICE

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PUMP VALVE

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assignments, to Oil Well Supply Company,
Pittsburgh, Pa., a corporation of New Jersey

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8 Claims. (Cl. 251-144)

My invention relates to improvements in pump valves of the type employed in connection with the water cylinders of pumps, particularly designed for use in oil and gas fields and employed for pumping fluids carrying a considerable quantity of sand, grit and/or other abrasive substances.

In attempting to provide an efficient valve structure of the character stated, it has heretofore been the practice to provide a metal to metal contact and a resilient material and metal contact between the valve proper and the valve seat, and the present invention contemplates such a construction.

In practice, however, such devices as heretofore built have not proven satisfactory for effecting an efficient seal for the high pressure fluid to which the valves are subjected, due to faulty construction and to the fact that the fluid pressure is utilized for bodily moving the resilient material insert in one direction only, i. e., either toward the valve or toward the seat.

Among the objects of the present invention are, to provide a new and improved valve of the class stated, or in a valve assembly of the character to which my invention relates, a valve structure having a metal to metal contact and a flexible or resilient material and metal contact when the valve is closed, embodying a flexible or resilient insert fixedly positioned adjacent the contact surface of the valve seat with the valve proper and of such construction as to effect an efficient seal; to provide a construction having a groove or recess for holding a flexible or resilient insert constructed and arranged to have portions thereof flexed in opposite directions by the fluid pressure to effect a seal between the valve and its seat; and to provide a new and improved flexible or resilient insert.

In the accompanying drawing, which illustrates an application of my invention:

Fig. 1 is a vertical sectional view of a valve assembly embodying my invention;

Fig. 2, a detail sectional view, showing a portion of an insert employed; and

Fig. 3, a view similar to Fig. 2, showing a modified form of insert.

In the drawing, I have shown the valve assembly embodying my invention in connection with wall portions 5, 6 and 7 of a water cylinder structure having a valve chamber 8 therein. As illustrated, each of the walls 5 and 6 is formed with an opening, the opening of the lower wall 5 being adapted to receive a valve seat 9, and the opening of wall 6 being adapted to receive a depending portion of a

closure cap 10, the latter being removably attached to the cylinder casing by bolts and nuts, as at 10a.

The valve seat 9, which is entered in the opening of the lower wall 5, is of circular form and has an inclined or inwardly tapering valve contacting face or surface 11 to provide metal to metal contact between the valve proper or the contacting or seating face thereof and the seat. In addition to the face 11, the valve seat is formed with an annular groove or recess 12 of substantially V-shape in cross section, adapted to receive an insert of flexible material, as fully hereinafter described.

The valve proper, designated generally by the numeral 13, comprises an annular portion 14 having an enlarged inclined contacting face 15 for co-operation with the relatively wide and inclined face 11 of the seat. The portion 14 is provided with depending guide members 16 and with an upwardly extending portion 17, the latter being entered in a guide sleeve 18 carried by the cap 10 in a chamber 19 thereof. Sleeve 18 is flanged at 20, and is retained in the cap by a ring 21 and headed bolts 22. 23 designates a spring disposed in the cap chamber and bears upon the upper end of portion or member 17 of the valve, tending to force the valve to closed position.

A characteristic and important feature of the present invention is the insert or packing means 24. This insert 24 is adapted to be fixedly mounted in a groove or recess formed in the valve or the valve seat. As illustrated, I have shown it positioned in the groove 12 of the valve seat. This insert 24 in the form shown in Fig. 2 comprises a ring having a substantially V-shaped body portion *x* and is made from some suitable flexible or resilient material. It is formed with an inwardly tapering bore produced by the inclined or tapered face *a* and with an annular groove *b* in its perimeter.

Groove *b* extends inwardly from the outer surface or face towards the inclined face *a*, thereby providing flexible spaced-apart portions *c* and *d* projecting from the said body portion. These portions are adapted to be flexed in opposite directions by the fluid pressure within the chamber 8, when the valve is in closed position. It will be noted that the said fluid pressure, when the valve is closed, will force the portion *c* into close sealing engagement with the inclined face of the valve and the portion *d* against a wall of the recess 12 of the seat; and, further, that the pressure will prevent any relative movement of the body of the insert in the recess 12 except the

spaced-apart portions *c* and *d*, which will be flexed and form an efficient seal.

This construction also provides a flexible material and metal contact, and hence there is provided a metal to metal contact and a flexible material and metal contact between the seating faces of the valve and seat. The parts are arranged so that the fluid pressure may be utilized to simultaneously flex or move portions of the insert against the valve and against the seat to provide a highly efficient sealing means while retaining the body of the insert fixed.

Other important features of my construction are, that it provides metal to metal contact from the bore of the valve opening to a point near the outer diameter of the valve seat, and allows the positioning of the insert at a point where it is most effectively acted on by the fluid pressure and, in effect, enters into the construction of the outer periphery of the valve seat.

In the form of insert shown by Fig. 3, the annular groove *b* is omitted, otherwise the insert 24a is similar to the form of Fig. 2 and functions to form efficient sealing means when placed in the groove 12, which groove as above stated, is preferably positioned in the outer periphery of the valve seat in order to have the insert located to be acted on by the fluid pressure within the valve chamber. This latter form has an inclined or tapering face *a'* and a body portion *x'*, and it will be apparent that the pressure will act on the insert in substantially the same manner as in the form of Fig. 2, i. e., forcing the outer portion of the insert inwardly and against the valve and against the seat.

I claim:

1. A slush pump valve comprising a valve seat member having a valve seating face, said face forming the surface of a frustum of a cone with the apex directed downwardly, said valve seat member having an insert-receiving groove bounding the outer edge of said face, said groove being substantially V-shape in cross-section, a packing ring disposed in said groove, said ring having two faces engaging the two faces of the groove in the valve seat member, a third face forming a continuation of the valve seating face of said member and a fourth face cleft by a circumferential groove, and a valve proper cooperating with said seat member and packing ring, said fourth face of the ring being exposed when the valve proper is seated.

2. A packing ring for a valve formed of flexible material and having a lower face inclined downwardly and inwardly, an upper face substantially parallel thereto, and an outer face extending substantially vertically and having a groove therein separating upper and lower flexing portions.

3. A packing ring for a valve formed of flexible material and having a lower face inclined downwardly and inwardly, an upper face substantially

parallel thereto, an inner face inclined inwardly and downwardly, and an outer face having a groove therein separating upper and lower flexing portions.

4. A valve seat having an upwardly and outwardly flaring valve seating surface and having a groove in the outer edge of said surface, said groove having a downwardly tapering inner face and a lower face flaring outwardly and upwardly from said inner face and terminating below the upper edge of said inner face, and a gasket having an upper face continuing said seating surface, and inner and lower faces fitting the inner and lower faces of said groove and having an outer face exposed for a distance below the inner edge of its upper face.

5. A valve seat having an upwardly and outwardly flaring valve seating surface and having a groove in the outer edge of said surface, said groove having a downwardly tapering inner face and a lower face flaring outwardly and upwardly from said inner face, a gasket having an upper face continuing said seating surface, and inner and lower faces fitting the inner and lower faces of said groove and having an outer face exposed for a distance below the inner edge of its upper face and having a radially inwardly extending annular groove in its outer face.

6. A valve seat having an upwardly and outwardly flaring valve seating surface and having a groove in the outer edge of said surface, said groove having a downwardly tapering inner face and a lower face flaring outwardly and upwardly from said inner face, a gasket having an upper face continuing said seating surface, and inner and lower faces fitting the inner and lower faces of said groove and having an outer face exposed for a distance below the inner edge of its upper face, and a valve seating on said seating surface and said gasket.

7. A gasket for pump valves having an inner surface of inverted conical curvature, and upper and lower surfaces of co-axial inverted conical curvature intersecting said inner surface, the angle between the axis of said upper and lower surfaces and the inner surface being less than that between said axis and said upper and lower surfaces.

8. A gasket for pump valves having an inner surface of inverted conical curvature, and upper and lower surfaces of co-axial inverted conical curvature intersecting said inner surface, the angle between the axis of said upper and lower surfaces and the inner surface being less than that between said axis and said upper and lower surfaces and having an outer surface, and a peripheral angular recess extending inwardly from said outer surface between the upper and lower surfaces.

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