

June 20, 1939.

J. M. SHIMER

2,163,472

VALVE

Filed July 7, 1936

2 Sheets-Sheet 1

Fig. 1.

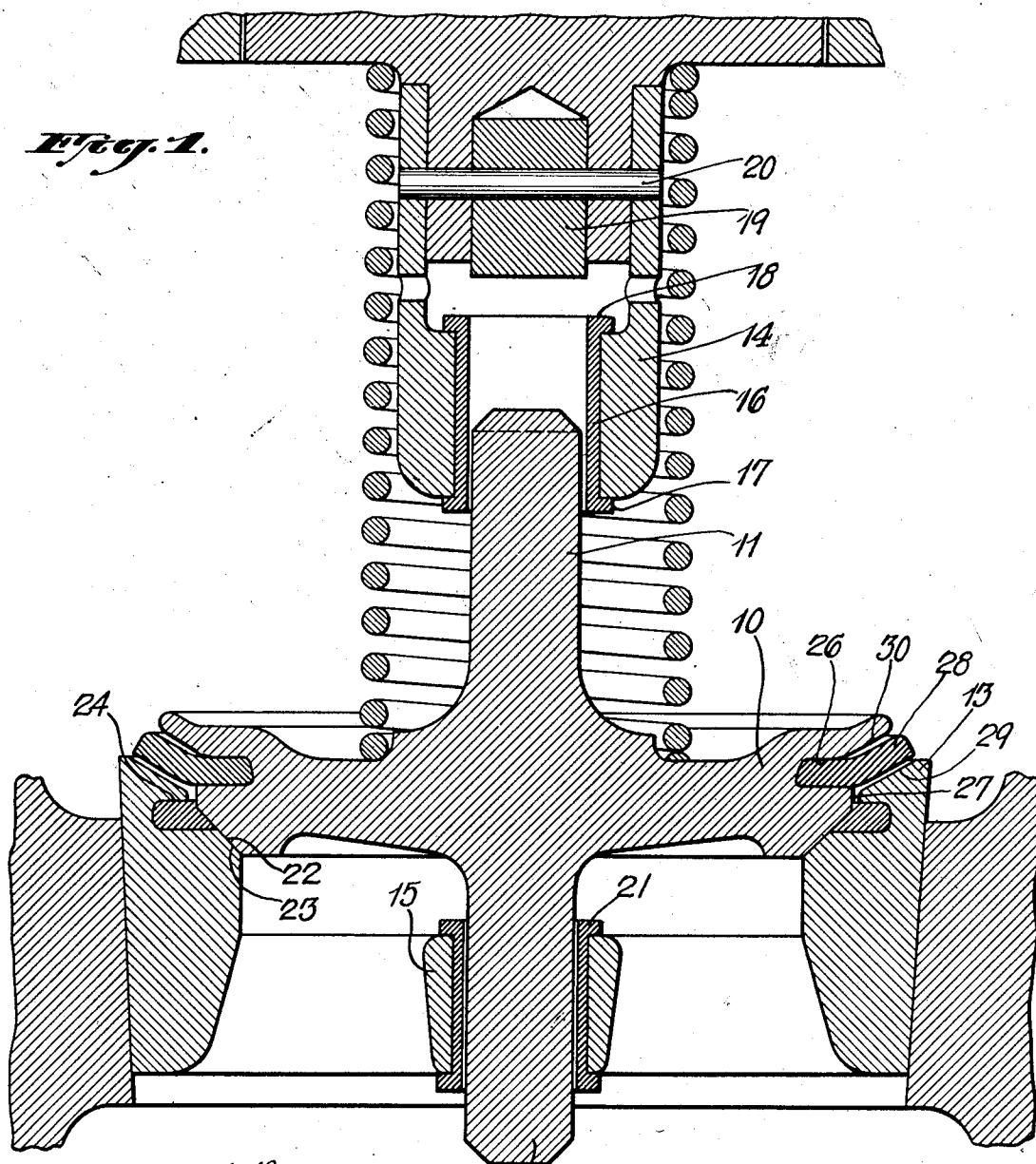


Fig. 2.

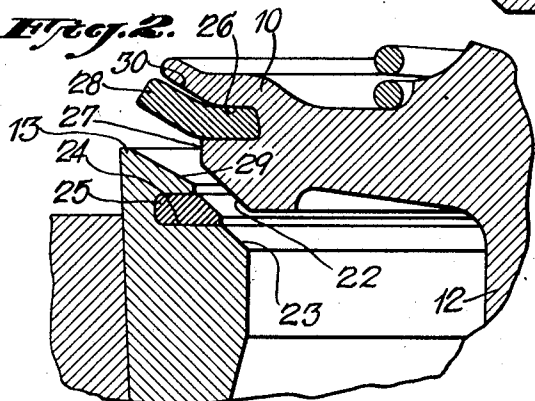
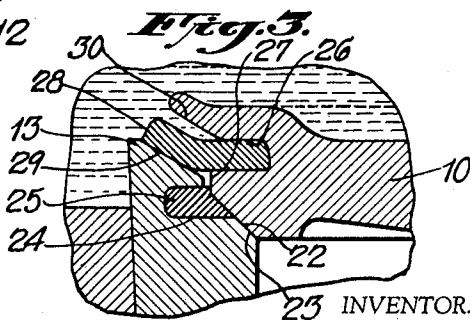


Fig. 3.



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Fig. 4.

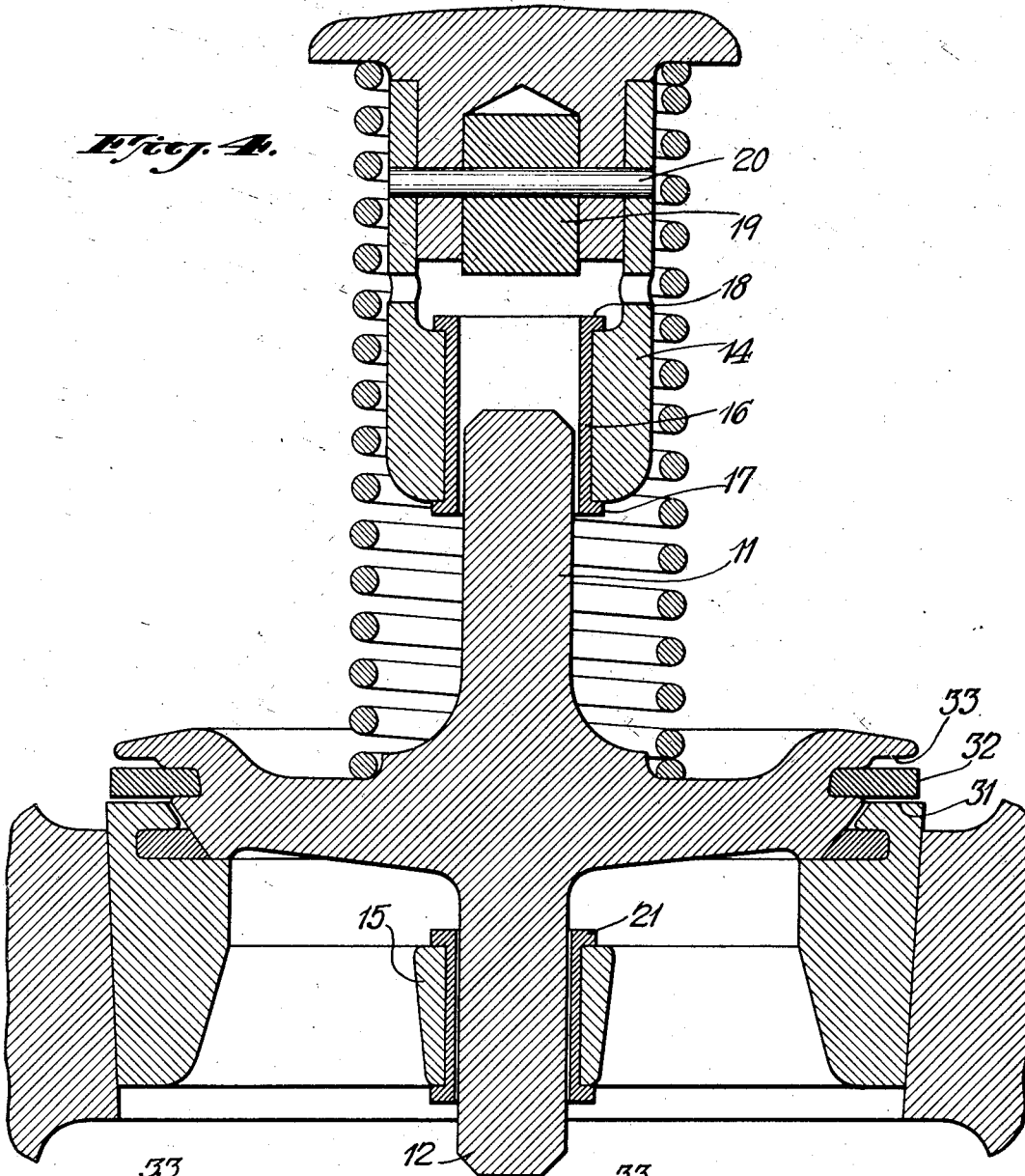


Fig. 5.

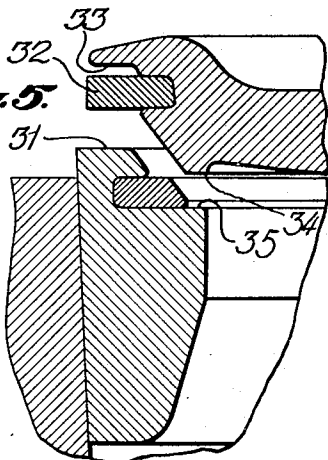
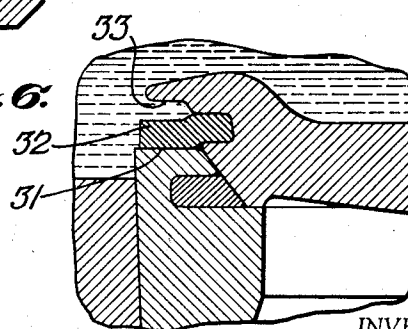


Fig. 6.



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UNITED STATES PATENT OFFICE

2,163,472

VALVE

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Application July 7, 1936, Serial No. 89,378

6 Claims. (Cl. 251-144)

My invention relates to a valve construction, and more particularly to a valve for pumps for pumping mud and similar abrasive materials.

In pumps for pumping mud and liquids generally carrying suspended particles of minerals or other gritty substances, there is a rapid wear on valves and valve seats, guides, etc., which come in contact with the liquid being pumped. The suspended particles in their passage over the metallic surfaces tend to cut grooves and thus cause wear, and wherever there are relatively moving surfaces, the suspended particles that lodge between such surfaces act as abrasives and cause rapid wear.

In my present invention the wearing away of surfaces exposed to mud or other grit carrying liquids, and the effects due to such wear are greatly minimized so that the life of the valve elements and their tightness against leakage of liquid are increased.

In my invention the valve element is provided with guide pins, or a pair of aligned guide pins, projecting respectively from one or both sides of the valve and axially arranged thereto, and these pins are received or guided in the cylindrical bores of guide elements provided with a surface or lining of resilient material. This material has the effect of greatly reducing or eliminating the abrasive effect of the suspended particles. Apparently, such particles lodging between the valve stem and the resiliently lined guide bores, cut into the relatively soft resilient lining rather than into the metallic valve stem, so that the abrasive effect on the latter is removed. Inasmuch as the resilient material yields, the cutting effect of the abrasive particles on the lining is absorbed without cutting or wearing away the lining material. Any suitable resilient or elastic material may be employed, such as rubber, either of natural or artificial origin, or synthetic resins, or compositions of these materials with rubber or other natural resins. As the invention is not directed to the composition of the resilient material, but only to its mechanical action, it will be apparent that any suitable resilient material of the general nature of rubber may be employed.

To minimize wear and leakage at the valve seat the seat is provided with an annular groove or recess into which a rubber ring is mounted so as to project to and slightly beyond the valve seat surface. Upon the seating of the valve, therefore the face first contacts with this rubber ring, and only upon further pressure will it rest on the valve seat itself. Preferably, this part of the valve seat and valve is of inverted conical curva-

ture. Somewhat above the level of this ring the edge of the valve element is recessed, and into this recess an annular disc is fitted so as to project outwardly to contact with the valve seat surface. As the valve, therefore, is seated the exposed surface of this disc also contacts with the valve seat, taking up the wear and resiliently fitting and accommodating itself to the contour of the valve seat. Preferably, the groove in which this disc is mounted is enlarged toward its open end, or recessed upwardly, so as to provide a space above the disc to admit the fluid under pressure above the valve. This tends to force this resilient disc downwardly by fluid pressure against the surface of the valve seat. The valve seat may be of plane or conical curvature at this place. Preferably, the inner edge of the valve recess is of inverted conical shape so as to compress the upper part of the disc more than the lower and cause it to curl downwardly into contact with the valve seat. In this construction there are two spaced areas or zones of rubber to metal contact to provide a double seal against leakage inasmuch as the resilient rubber material will shape itself to the contour of the seat even though the latter be unevenly worn or grooved. It will be understood that other equivalent materials may be employed instead of the natural rubber.

The various features of the invention are illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical sectional view of a valve seat and valve embodying a preferred form of the invention.

Figs. 2 and 3 are detail sections of a section of the valve and ring and seat, showing the valve in partly opened and fully closed positions, respectively.

Fig. 4 is a vertical sectional view of a modification of the valve embodying another form of the invention, and

Figs. 5 and 6 are detail sections of a portion of the valve seat and valve showing the same in partly opened and fully closed positions, respectively.

Referring more particularly to the embodiment shown in Fig. 1, a valve 10 having an upper valve stem 11 and a lower valve stem 12 is mounted on a valve seat 13, the upper stem being received in an upper guide 14, and the lower stem 12 being guided in a cross bar 15. The upper guide 14 has a vertically bored opening into which the stem 11 projects and is lined with a rubber bushing 16 having flanged ends 17 and 18. It may, therefore be inserted by collapsing it, pushing it into

the opening in the guide 14 and letting it expand after its flanges 17 and 18 just clear the edges of the passage. A suitable stop 19 is mounted in position in the guide 14 by means of a cross pin 20. The lower pin 12 projects similarly through a rubber bushing 21 mounted in the cross piece 15.

The outer edge of the valve disc is bevelled to an inverted conical curvature as at 22 to fit a similar conical surface 23 on the valve seat 13. Near the upper part of the bevelled or conical surface 23 an annular groove 24 is formed in the valve seat on approximately a horizontal plane. A rubber ring 25 is mounted in the groove 24 to project outwardly a short distance beyond the surface 23 so as to contact with the inclined or bevelled surface 22 of the valve disc 10. The inner surface of the ring 25 is preferably bevelled so as to fit the surface of the disc 10 and to receive the principal part of the wear as the valve seats on its seat. A short distance above the level of the annular groove 24 a groove 26 is formed in the valve disc 10 projecting radially inwardly from the edge of the valve. The surface of the valve may be inclined upwardly to a substantially vertical position as at 27 between the levels of the grooves 24 and 26. An annular disc 28 of rubber or other resilient material is mounted in the groove 26 and projects outwardly from the groove a considerable distance over the upper part of the valve seat surface 29. The projecting part of the rubber disc 28 may be forced downwardly by the pressure of the fluid above the valve into a tight fit against the surface 29, thus sealing the valve on its seat at this surface or zone. To prevent the disc 28 being held upwardly against the valve surface through suction or sticking, the valve surface is recessed upwardly at 30 immediately above the outer portion of the disc 28 so that fluid in the recess 30 will force the disc 28 downwardly.

The valve and valve seat shown in Figs. 4, 5 and 6 are similar in all respects to that shown in Figs. 1, 2 and 3, except that the upper inclined valve seat surface, corresponding to the surface 29, is made horizontal as at 31, and the outer edge of the valve disc 32 in this embodiment projects horizontally, or substantially horizontally, over the surface 31. The valve disc is recessed as at 33 above the projecting part of the disc 32 so as to provide a space into which fluid pressure will flow and force the valve disc 32 downwardly to seal against the surface 31. The metal to metal contact surfaces 34 and 35 are perpendicular to the axis of the valve pins instead of conical as are the surfaces 22 and 23. Preferably, the valve and its stem are made of a single integral piece as shown in the drawings.

The resilient discs 28 and 32 in each embodiment have inside diameters somewhat smaller than the inside diameter of their respective grooves so that when in place in these grooves they are under tension. The grooves are also bevelled in such a direction as, for example, on an inverted conical surface, as to stretch the upper part of the discs 28 and 32 greater than the lower part, and thus to cause these discs to curl downwardly toward their respective valve seats.

Through the above construction, therefore, I have provided a valve apparatus which is particularly resistant against wear of the valve, valve stems and guides, and which ensures double sealing against leakage at the valve seat. The ring 25 receives the full pressure of the valve and,

being compressed, tends to seal against any irregularities in the valve seat at this point. The upper disc 28 or 32 bends downwardly and, being flexible, will fit against its respective surface 29 or 31 and conform to the latter under the hydraulic or fluid pressure on the upper surface of the disc.

What I claim is:

1. Valve apparatus comprising a valve having in part an inverted conical periphery, a valve seat having a surface to contact said periphery, a recess in said surface, a rubber ring in said recess and projecting into contact with the conical periphery of said valve, a recess in said valve above the level of said ring, and a disc of rubber in said valve recess and projecting outwardly to contact with said valve seat, said valve recess being stepped upwardly above the projecting part of said rubber disc to form a space therebetween.

2. Valve apparatus comprising a valve having a periphery, a valve seat having a surface to contact said periphery, a recess in said valve seat surface, a rubber ring in said recess and projecting into contact with the periphery of said valve, a recess in said valve above the level of said ring, a rubber disc in said valve recess and protruding therefrom to contact said valve seat, the valve being offset above the protruding portion of the ring to form a recess above the projecting portion thereof.

3. Valve apparatus comprising a valve head, and a valve seat having a surface to contact the periphery of said valve head, a recess in said valve seat surface, a rubber ring in said recess and projecting into contact with the periphery of said valve head in a direction to receive a downward and outward thrust of said valve head, a recess in the valve above the level of said ring, and a rubber disc in said valve recess projecting outwardly to contact with said valve seat, there being a recess between the upper surface of said disc and said valve head.

4. In a valve having a spring pressed valve head provided with upper and lower pin members and guide members to receive said pin members, resilient collapsible bushings expansibly seated in said guide members between the reciprocating pin and guide surfaces, said bushings being comprised of a soft rubber composition, the upper and lower edges of said bushings being provided with flanges adapted to retain the bushings in position in said guide members, and a resilient stop spaced upwardly from said bushing for limiting the upward movement of said valve head.

5. In a double pin valve, a valve head and a valve seat each provided with complementary annularly tapered surfaces adapted to seat one within the other, an annular rubber insert in the tapered surface of said valve seat having an annular tapered surface protruding inwardly beyond the tapered surface on said valve seat, a rubber ring insert in the tapered surface of said valve head located in a position to and extending outwardly from said surface a distance adapted to overlie the upper edge of said valve seat when the said valve head is seated therein, an annular flange extension on the periphery of said valve head overlying the said ring insert but in spaced relation thereto, pin members extending upwardly and downwardly from the top and bottom of said valve head, guide members to receive said pin members, resilient rubber bushings in each guide member, resilient means limiting the upward movement of said valve head, and spring

means urging the valve head into seating engagement with said valve seat.

5 6. Valve apparatus comprising a valve head provided with an annular tapered surface for engaging a complementary tapered surface on a
10 valve seat and axially located aligned pin members extending above and below said tapered surface, a valve seat provided with an annular surface, complemently tapered, to receive said valve
15 head, an annular recess in said valve seat adjacent the bottom of said tapered surface thereon, an annular rubber insert in said recess having a correspondingly tapered surface extending beyond the tapered surface of said seat, an annular
15 recess in the tapered surface of said valve head

adjacent the top of said surface, a rubber ring insert in said recess extending beyond the said surface a distance adapted to make overlapping engagement with the upper edge of said valve seat, a flange extension on said valve head above
5 said rubber ring insert overlying the said ring insert and in spaced overlying relation thereto, guide members for said pin members, resilient rubber bushings in said guide members, resilient
10 stop means limiting the upward movement of said valve head, and spring means urging said valve head into seating engagement with said valve seat.

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