Oct. 4, 1938. W. A. ABEGG 2,131,928

SLUSH PUMP VALVE AND THE LIKE

Filed Sept. 30, 1935

Fig 1

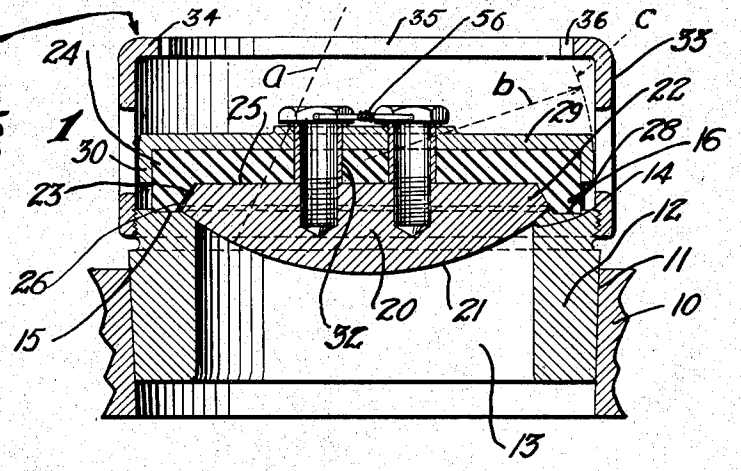


Fig 2

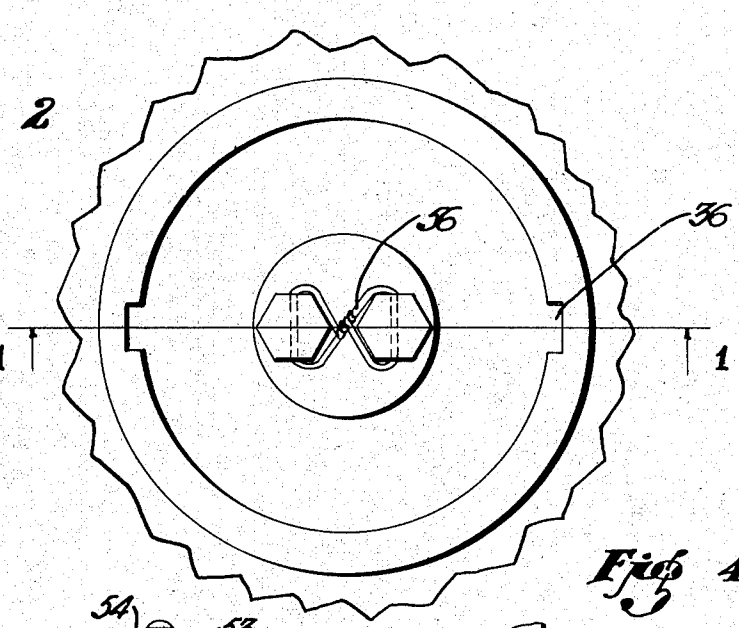


Fig 5

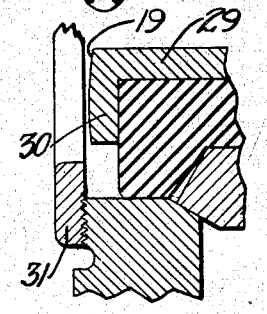


Fig 3

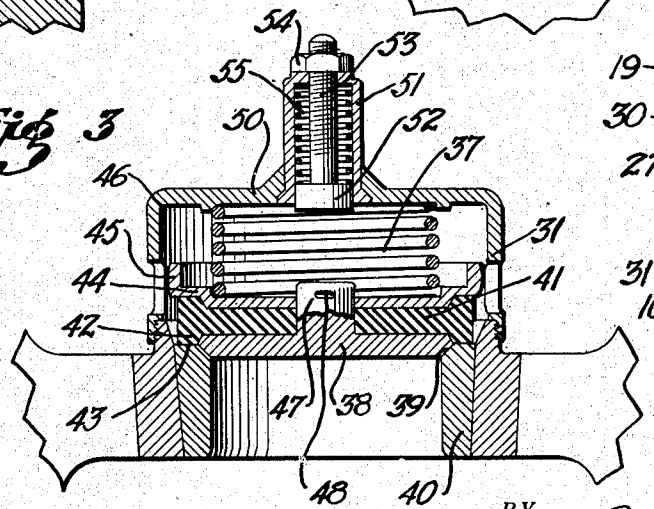
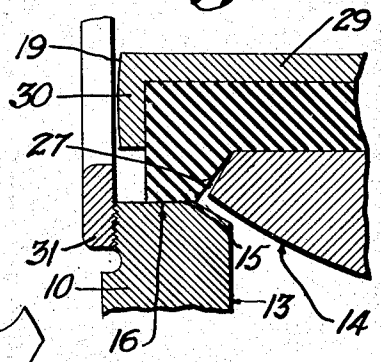


Fig 4



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2,131,928

SLUSH PUMP VALVE AND THE LIKE

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Application September 30, 1935, Serial No. 42,857

1 Claim. (Cl. 251—127)

This invention relates to valves for slush pumps and the like and is a continuation in part of my patent entitled "Valve for slush pumps and the like", No. 2,079,647, granted May 11, 1937.

In the operation of slush pumps and other structures of like character it is desirable that a valve be provided which will handle heavy fluids often of abrasive character and which will withstand pressure of these fluids and their abrasive action. It is also desirable to provide these valves of a structure insuring that the valve will always come to its seat after having been raised to thus form an effective seal and that the valve will operate in a simple manner without the use of complicated parts. It is the principal object of the present invention, therefore, to provide a slush pump valve which is simple in character, decidedly rugged in construction and will insure that a maximum sealing action will be obtained and that the valve will readily aline itself and assume a proper sealing position upon its seat when pressure is relieved from beneath it.

The present invention contemplates the provision of a valve seat upon which a valve element of desired character and structure is freely mounted so that it may be lifted from its seat easily, may thereafter aline itself properly and assume a sealing position upon its seat.

The invention is illustrated by way of example in the accompanying drawing in which:

Fig. 1 is a view in transverse section on the line 1—1 through the valve structure as shown in Fig. 2.

Fig. 2 is a view in plan showing the valve structure in position upon a portion of the valve, or cylinder housing, indicated in the fragmentary manner.

Fig. 3 is a view in transverse section through another form of the valve structure with which the present invention is concerned.

Fig. 4 is an enlarged fragmentary section showing the detailed construction of the valve seat, the valve member in a partially sealed position thereon, and the formation of the meeting faces of the valve and its seat.

Fig. 5 is a fragmentary view in vertical section showing the valve structure of Fig. 1 with a tapered valve seat.

Referring more particularly to the drawing, 10 indicates a wall of the pump structure having a bore 11 therein to receive a tubular valve seat bushing 12. The bore may be tapered to form a suitable fit with the valve seat bushing more readily, or the valve seat bushing may be secured by other conventional means. A relatively large center passageway 13 is formed through the valve seat bushing 12. This passageway is represented by a straight bore, the upper opened end of which terminates in a spheroidal seating surface 14 struck from a center generally indicated by the dotted radius line a in Fig. 1. The upper face of the valve seat 12 is in a plane at right angles to the longitudinal axis of the bore 13 and preferably is formed with a flat face 15. A valve disk 20 is provided to assume a seated position upon the spheroidal seating face 14. This disk has an over-all diameter agreeing with the diameter of the upper terminating edge of the seating face 14. Its under face 21 is spheroidal and represents a segment of a sphere, the radius of which is indicated by the dotted line a in Fig. 1 so that a downwardly protruding convex surface will be provided to conform to and seat upon the seating face 14. It will thus be evident that the faces 14 and 21 when properly ground together will form a tight seat and seal irrespective of the fact that the valve disk might rotate laterally with relation to its seat. Above the plane of largest diameter of the valve disk an upwardly protruding portion 22 occurs. The circumferential edge of this portion tapers upwardly and inwardly as indicated at 23, the top face of the disk being flat. The valve disk is preferably made of a suitable, high-grade steel and is ground to fit the seating face 14. Mounted upon the upwardly protruding portion 22 of the disk 20 is a non-metallic packing disk 24, preferably constructed of rubber, or other suitable material.

The bottom face of the packing disk 24 is formed with a center circular recess 25 of a depth of slightly greater depth than that of the portion 22 of the valve disk 20. The recess is bounded by an outwardly and downwardly tapered circumferential wall 26 which circumscribes the beveled face 23 of the valve disk portion 22 and terminates in a flat face 16 which abuts against face 15 of the valve seat. Attention, however, is directed to the fact that the angle of the face 26 is wider than the angle of the face 23 to provide a clearance space which will permit some flexibility of the lip 28 which projects downwardly from the packing disk 24 as formed by the recess 25. The bottom face 16 of the lip 28, as particularly indicated at Fig. 4 of the drawing, will when compressed against the end surface 15 of the valve seat bushing 12 prior to the seating of the surfaces 14 and 21 increase the sealing efficiency of the valve. Mounted above the packing disk 24, as shown in Fig. 1 of the drawing, is a guide cap 29. This cap is formed with an

annular flange 30. The outer face of the annular flange 30, as indicated at 19 in Fig. 4, is spheroidal and is described by an arc representing the radius of the extreme diameter of the disk, the radius being indicated at *b* in Fig. 1 of the drawing, and the arc being indicated at *c*. The radius of the arc described also represents the radius of the inside diameter of a cylindrical cage 31 within which the valve structure is housed. The valve disk 20, the packing disk 24, and the guide cap 29 are secured in assembled relation to each other by cap screws which pass through openings in the guide cap 29 and the packing disk 24 and are threaded into the valve member 20. Spacing bushings 32 extend through the guide cap and the packing disk and receive the cap screws. By this arrangement it is possible to securely fasten the spacing disk 20 and the guide cap together without unduly compressing the body of the packing disk 24, and while preventing any resilient action of the packing disk 24 from tending to aid the cap screws in working loose. The cage 31 is formed with a cylindrical wall 33, and is threaded at its lower end to engage complementary threads around the upper edge of the valve bushing 12. The upper end of the cage is substantially open save for an inturned marginal flange 34 which forms the top opening 35. At suitable points on this flange recesses 36 are cut to receive a wrench by which the cage may be screwed into position or removed therefrom. The inturned flange 34 limits the upward movement of the assembled valve unit while permitting it to be raised from its seat a sufficient distance to uncover ports formed through the side wall 33 of the cage. Attention is also directed to the fact that this flange provides a peripheral stop which will tend to bring the valve unit to a normally alined position when the pressure beneath the valve forces the guide cap 29 upwardly against the flange 34, it being understood that the spheroidal face 19 of the guide cap 29 makes it possible for this cap to become tilted in any manner as brought about by the pressure of the fluid beneath the valve unit, but that after this tilting motion the circumferential flange 34 will aline the valve so that it will fall directly upon its seat.

In the form of the device shown in Fig. 1 the valve returns to its seat by gravity. In the form of the device shown in Fig. 3 the valve unit is returned to its seat by a spring 37. Referring particularly to Fig. 3 of the drawing it will be seen that a valve disk 38 is provided to seat upon the beveled seat 39 of the valve bushing 40. Within the valve disk 38 is a packing element 41 having a down turned flange portion 42 which rests against a face 43 at the end of the valve bushing and supplements the sealing action of the disk. A guide cap 44 is here shown differing from the guide cap 29 previously generally described in that while the down turned flange 30 of guide cap 29 circumscribes and conforms to the circumference of the packing disk 24, in this particular case a guide flange 45 extends upwardly. This flange is formed with the spheroidal face 19 previously described tending to guide the valve element within the cage 46 while allowing it to have free tilting motion as it moves.

In Fig. 3 the valve disk 38 is shown as having an upwardly projecting center pin 47 which extends through the packing disk 41 and the guide cap 44. A cotter pin 48 passing through the pin 47 holds the valve element in its assembled position. Mounted in the upper wall 50 of the valve cage 46 shown in Fig. 3 is a thimble 51 receiving a snubber plunger 52 which is formed with a shank 53 carrying a nut 54 at its upper end. Around the plunger and within the thimble 51 is a spring 55 which resists extreme upward movement of the center pin 47 and cooperates with the spring 37 intending to resist hammering action of the valve and also to restore the valve to a normal alined position as it returns to its seat.

Fig. 5 shows a structure of the type shown in Fig. 1, but with the valve disk formed with a beveled face as in Fig. 3.

In operation of the form of the invention shown in Fig. 1 the valve structure is assembled as shown. The valve unit is also assembled and held in assembled position by the cap screws. These screws are preferably held by lock wires 56 to prevent them from loosening. When pressure of fluid is exerted against the under spheroid face of the valve disk 20, it will rise as guided by the cage 34. Due, however, to the spheroidal face 19 of the guide cap 29 the valve unit may freely tilt at various angles to the horizontal. The valve unit will then move upwardly and will first encounter the circumferential flange 34 of the cage at the highest edge of the disk, after which the pressure beneath the valve unit will force the guide cap 29 into alinement with the entire circumference of the flange 34 so that when the pressure is relieved from beneath the valve unit, it will drop freely on to its seat. In so doing the valve may become slightly displaced from its alined position; nevertheless, the spheroidal convex face 21 of the valve disk 20 will engage and seat upon the seating face 14 of the valve bushing 12. The end face 16 of flange 28 of the packing disk 24 will come to seat as it engages the end face 15 of the valve bushing 12, and prior to the time that the faces 21 and 14 finally seat. The packing member 24 will thus be compressed forcibly on to the seat 15. In the form of the invention shown in Fig. 3 the operation will be substantially the same. In this form of the structure, however, springs will tend to assist the gravity movement of the valve and the upward movement of the valve will be resisted by the springs and the force of impact will be yieldably snubbed.

It will thus be seen that this valve structure provides a freely moving valve element confined in movement by the cage only without the use of any conventional guide means which might bind and otherwise wear and render the device inoperative. It will also be evident that due to this arrangement the full area of the central bore through the valve bushings will be clear. It is not necessary to provide spiders for receiving guide pins and thus place obstructing means in the path of the abrasive fluid. It will also be evident that due to the fact that the valve unit is guided along a surface of large circumference there will not be tendency for binding of the parts and excessive wear of them, and it will, further, be apparent that the valve will automatically aline itself at the top of its stroke and will readily come to its seat conforming thereto so that its metallic valve surfaces and non-metallic valve surfaces may form an effective fluid seal.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction, and arrangement of parts by those skilled in the art, without departing from the spirit of my invention as claimed.

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

A valve structure comprising a valve seat having a flat annular face in a horizontal plane, a downwardly and inwardly spheroidal face circumscribed by said flat face, a valve element freely mounted for vertical movement with relation to said valve seat, said element comprising a disc having a spheroidal face on its under side, said spheroidal face being adapted to seat upon the spheroidal face of said valve seat, a non-metallic packing disc mounted upon the upper face of the valve member and having a circumferential flange extending around the periphery of the valve member, said flange being adapted to seat upon the flat face of said valve seat, a guide cap mounted above said non-metallic packing disc and being formed with an annular flange, the outer face of said annular flange being spheroidal, means securing said guide cap, packing disc and valve member in assembled relation, the two seat faces of the valve seat and the faces of the valve element bearing such relation to each other as to insure that the nonmetallic portion shall contact the annular valve seat and be compressed thereagainst prior to contact of the metallic inclined faces of the valve and its seat, and means cooperating with the spheroidal flange to guide the valve vertically.

WALTER A. ABEGG.