Oct. 3, 1939. C. F. BALL 2,175,074

VALVE FOR CONCRETE AND THE LIKE

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Fig. 1.

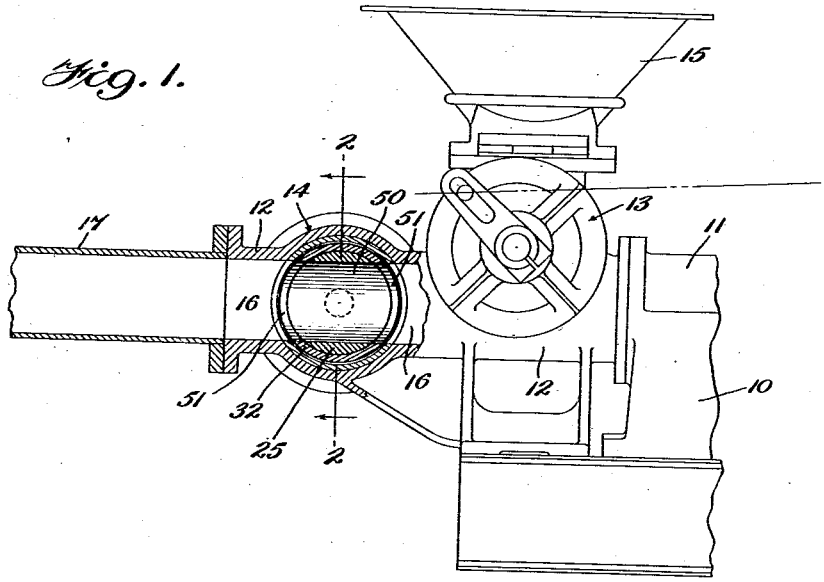

Fig. 2.

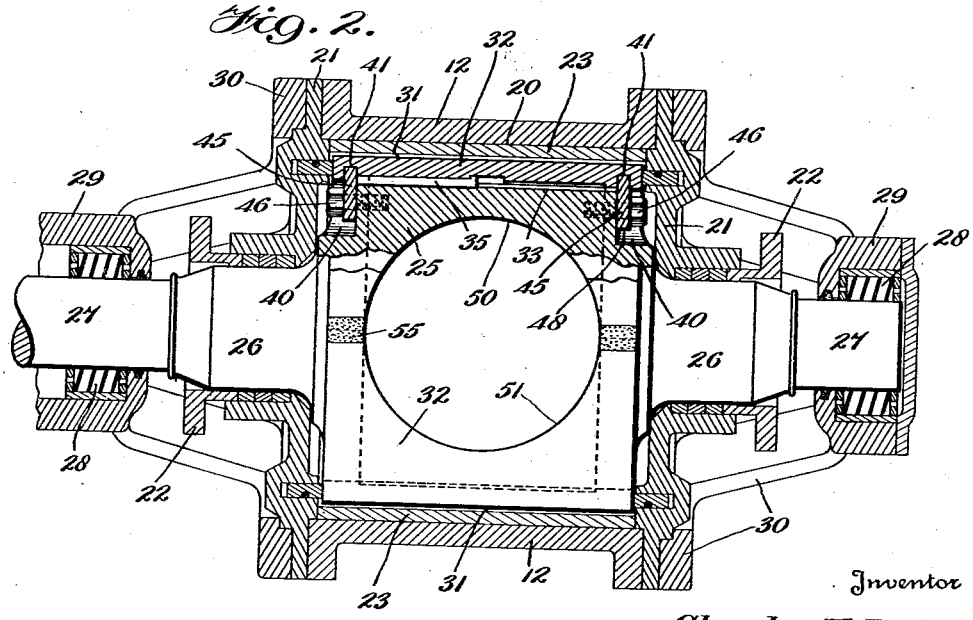

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Fig. 3.

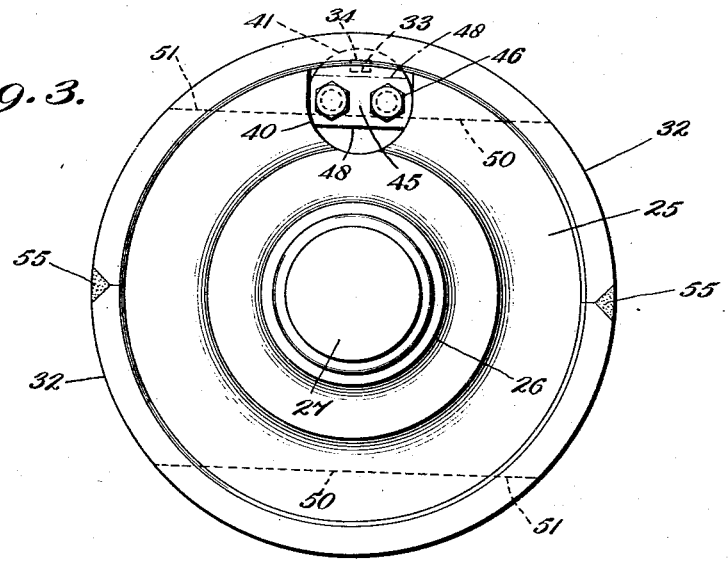


Fig. 4.

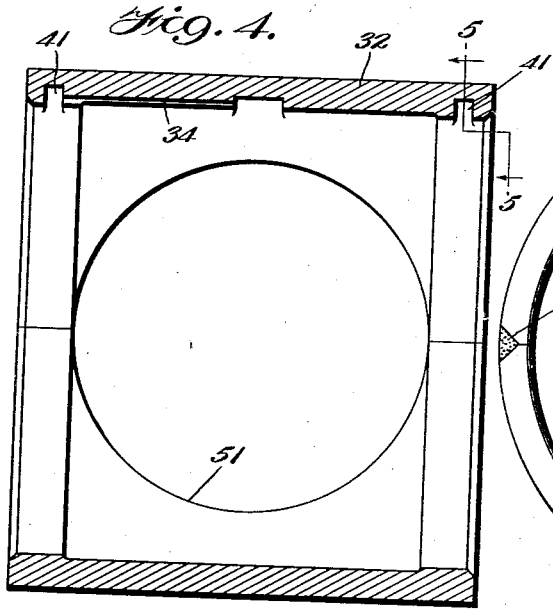
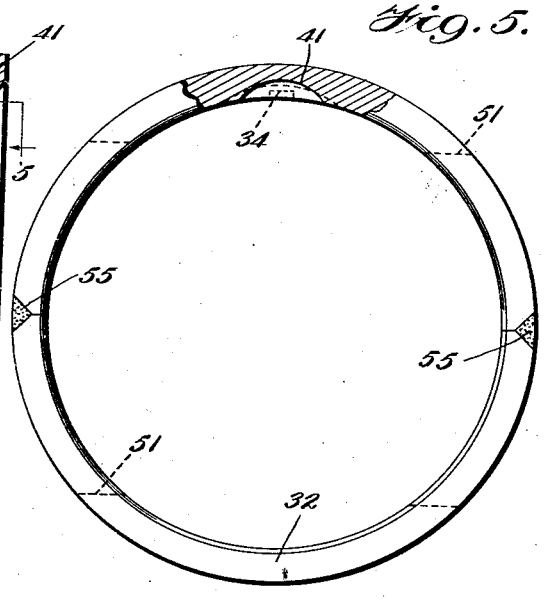


Fig. 5.



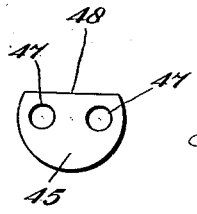


Fig. 6.

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Patented Oct. 3, 1939 2,175,074

UNITED STATES PATENT OFFICE

2,175,074

VALVE FOR CONCRETE AND THE LIKE

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Application May 8, 1936, Serial No. 78,709

1 Claim. (Cl. 287—52)

This invention relates to valves, and more particularly to the construction of the oscillating or rotary plugs of valves specially adapted for the handling of plastic concrete mixtures and analogous materials. A typical example of the use of such valves may be found in the concrete handling pump generically disclosed in the United States Patent No. 2,017,975, granted October 22, 1935, to Jacobus C. Kooyman; and while, as will appear more fully from the following description, the invention is not limited solely to use as a pump valve, for purposes of this disclosure it has been illustrated and will be set forth in connection with a somewhat modified form of such concrete pump.

As is fully disclosed in said patent, these valves are of a seatless type, being constructed with complete circumferential clearances between the plug and the housing, which may amount to say 3/64 of an inch when the valve is new. The water-and-cement paste constituting the binder of the concrete mixture, together with the smaller particles of the fine aggregate, find their way into these clearances, and while the said paste acts to some extent as a lubricant, at the same time it does not wholly overcome the abrasive action of the aggregate particles, with the result that wear of the complementary surfaces of the plug and housing unavoidably takes place. Although because of the peculiar stowing property of a concrete mixture, imparted thereto by the coarse aggregate, such wear is not particularly objectionable until the clearances go beyond say 1/4 of an inch, it is of course desirable to minimize it as much as possible in order that the life of the valve may be prolonged; and with this in view it has been previously proposed to provide the chambers of the valve housings with hardened metal bushings or sleeves, as shown in the said Kooyman patent.

The present invention has for its primary object the provision of a similar hardened or wear-resisting sleeve or mantle secured to and circumferentially surrounding the plug of the valve; and while it may be beneficially employed with both inlet and outlet valves of the said Kooyman Patent No. 2,017,975, it is of particular benefit when applied to such outlet valves, since the circumferential surfaces on the line side of these plugs are more subject to wear than any other, due to tremendous back-pressures—when the concrete is being pumped vertically upward—exerted on them by both the fine and coarse aggregates in the mixture when the valve is "closed" on the suction stroke of the piston.

Extensive field experience with valves constructed as disclosed in the said Kooyman patent has shown that due to the high resistance encountered by the valve plug in cutting through the densely packed concrete mixture in opening and closing, which movements are usually performed from 40 to 60 times a minute each, wear upon the ports of the valve plug passage is quite rapid, and these ports soon become ovate instead of circular as when the valve is new. Such plug port wear is also materially reduced by the present mantle.

In the actual use of the Kooyman type pumps, it is customary to inject grease under high pressure into the clearances between the ends of the valve plug and its housing, for lubricating and packing purposes, and the pressures of such grease, which may total several thousand pounds, may be unbalanced on the two ends of the plug. Since for ease in replacement the mantles are preferably only a light drive or tapping fit on the plugs, it is desirable that means be provided for positively retaining the mantles in position against both longitudinal and circumferential movements relative to the plugs.

More specifically therefore, the invention contemplates the application of such wear-resisting sleeves or mantles to the valve plugs in such manner as to insure against movement thereof relative to the plugs during operations in either circumferential or axial directions, while at the same time providing for the ready removal of the mantles for repair or replacement if such becomes necessary.

With the above and other objects in view, which will appear as the description proceeds, the invention consists in the novel details of construction, and combinations and arrangements of parts, more fully hereinafter disclosed, and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification, in which like reference characters designate like parts in all the views:

Figure 1 is a fragmentary diagrammatic side elevational view of a modified form of Kooyman concrete pump, the outlet valve being shown in section, and the plug thereof being provided with a wear-resisting sleeve or mantle in accordance with the present invention;

Fig. 2 is an enlarged vertical sectional view through the said valve along the axis of the plug, taken approximately on the plane indicated by the line 2—2 of Fig. 1;

Fig. 3 is an end elevational view of the plug and mantle;

Fig. 4 is a central longitudinal sectional view through the mantle;

Fig. 5 is an end elevational view of the mantle, partly broken away; and

Fig. 6 is a face view of one of the locking keys employed for preventing relative longitudinal movements between the mantle and plug.

Referring more particularly to Fig. 1 of said drawings, the pump comprises a base 10 upon which is mounted the working cylinder 11, having secured to its open end valve housing 12, which in this form of the pump incorporates both the inlet valve 13 and the outlet valve 14. The inlet valve is surmounted by a feed hopper 15 and the discharge passage 16 of the outlet portion of the valve housing communicates with the pipe line 17 which conveys the plastic mixture to the point of discharge.

As is best shown in Fig. 2, the valve housing 12 is provided with a bore 20 extending through it and which is closed by the end plates 21 having the axial glands or stuffing boxes 22. The bore 20 may be lined with a hardened wear-resisting sleeve 23, as in the Kooyman patent referred to above.

The valve plug 25 is mounted for oscillation within the sleeve or liner 23 and has the axial studs 26 extending from either end thereof through the glands or stuffing boxes 22. Beyond the studs 26 are the journal portions 27 mounted within the roller or other anti-friction bearings 28 housed within the hub portions 29 of the bearing spiders 30 which are secured to the housing 12 outside the end plates 21, as will be readily understood from the drawings.

Heretofore the valve plugs 25 have been made of a diameter appreciably less than the internal diameter of the wear-resisting sleeves 23 so as to provide complete circumferential clearance 31, which as above indicated may be as much as $\frac{3}{64}$ of an inch when the valve is new. In the present instance however the valve plugs 25 are made of considerably less diameter to receive the tubular hardened wear-resisting sleeve or mantle 32 which is a tapping fit upon the plug. The external circumference of the plug is provided with a longitudinally extending keyway 33 and the internal surface of the mantle 32 is provided with a companion keyway 34 for the reception of the longitudinal key 35 which serves as a guide to properly position the ports of the mantle relative to the plug passage during assembly.

The plug 25 is provided in each end thereof with the recesses 40, while the mantle 32 is provided with companion recesses or keyways 41, see Figs. 2 to 5, inclusive. As best shown in Fig. 3, the recesses 40 are substantially U-shaped, while the recesses 41 are arcuate, the curved portions of both recesses being struck with the same radii so that when the mantle and plug are assembled as in Fig. 3 the curved portions of the companion recesses will constitute parts of a complete circle.

Key members 45 of partly circular form are positioned in the recesses 40 of the plug 25 and secured therein by means of bolts 46 passing through apertures 47 formed in the said key members. In assembling the plug and mantle the key members 45 are placed in the recesses 40 with their cut away portions 48 uppermost, as shown in broken lines in Fig. 3, after which they are rotated through an arc of 180° to reverse the position and bring the cut away portion 48 downward, as shown in full lines in said figure. This motion, of course, introduces the curved portion of the key members into the keyways or recesses 41 of the mantle, after which the bolts 46 are screwed home thereby retaining the keys 45 in position, whereby they will positively prevent both longitudinal and circumferential movement of the mantle relative to the plug.

The plug 25 has the transverse bore or material passage 50 through which the mixture may pass when the bore is alined with the discharge passage 16 as indicated in Fig. 1, and the mantle 32 is provided with the opposed ports 51 which are adapted to aline with the passage 50 to provide an unobstructed passageway for the material.

The mantle 32 may be made of a seamless tube or other suitable stock, but because of its relatively large diameter it is preferred to form it from two flat plates which are bent into substantially semi-cylindrical form, after which their respective ends are dressed, scarfed, and welded, as at 55. The mantle may then be trued, heat-treated to impart to it the desired wear-resisting properties, and ground to size.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited to the above disclosure except as may be required by the claim.

What is claimed is:

In an interlocking construction for preventing relative movements between a valve plug and a mantle surrounding the same, a plug having an end face provided with an axially extending recess opening to the outer periphery of the plug; a tubular mantle encircling the plug having an arcuate recess in its inner face of less width than the axial depth of said plug recess, spaced from the mantle end and arranged to be complementarily alined axially and peripherally with said plug recess; a key member comprising a disk positioned in said complementarily disposed recesses, said disk having a peripheral portion thereof cut away whereby it may clear the end portion of the mantle when the disk is moved axially in said plug recess to alinement with said mantle recess, said disk thereafter being arcuately moved about its axis to enter an uncutaway portion of its periphery into said mantle recess; and means for securing the disk in said last named position.

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