April 19, 1932. W. S. WHITE 1,854,434

CUP WASHER

Filed July 27, 1928

Fig. 1.

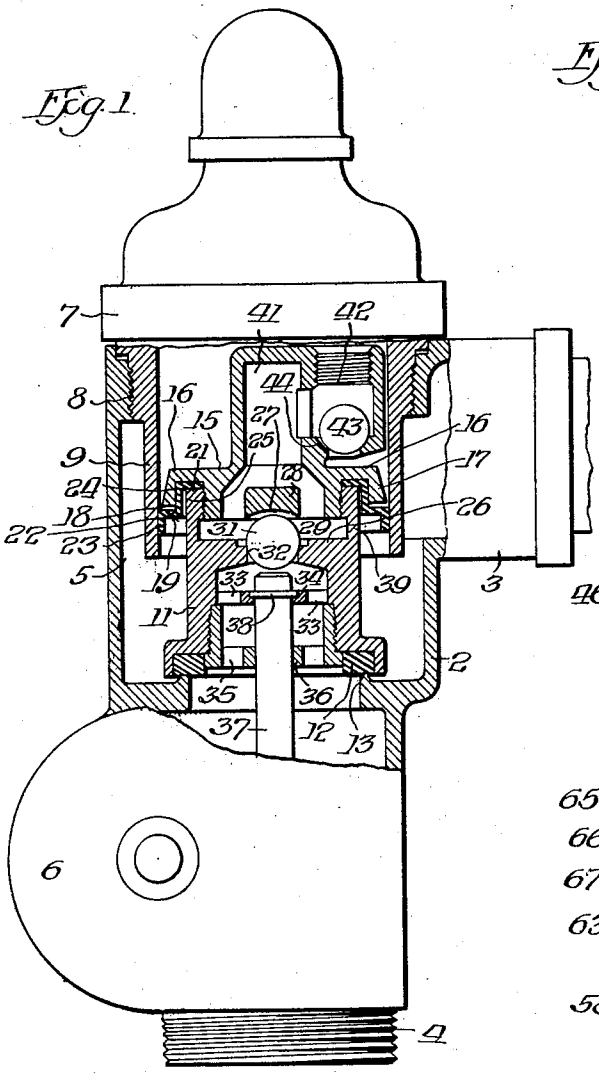


Fig. 2.

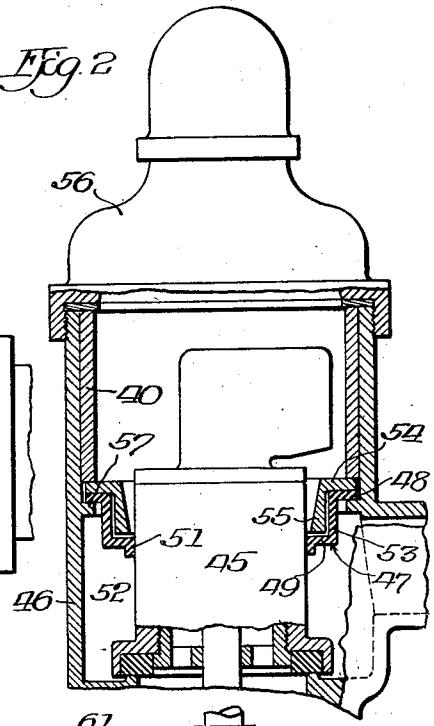
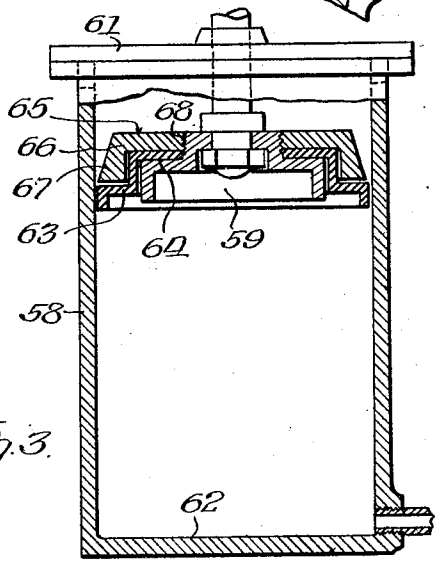


Fig. 3.



Witness:

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UNITED STATES PATENT OFFICE

WILLIAM S. WHITE, OF DENVER, COLORADO

CUP WASHER

Application filed July 27, 1928. Serial No. 295,819.

This invention relates to cup washers in general, and more particularly to cup washers and their use in flushing valves and other devices employing plungers.

In devices employing plungers and washers, particularly cup washers, for preventing leakage between the plunger and the cylinder wall, much difficulty has been experienced because of the tendency of the washer to swell and exert undue pressure upon the cylinder wall necessitating the use of additional force to actuate the plunger.

The primary object of this invention is accordingly to provide a washer adapted to be used in a device of the above character which may swell without causing unnecessary pressure on the walls of the cylinder.

Other and further objects of this invention will be apparent as the same becomes better understood from an examination of the specification and claims in connection with the accompanying drawings wherein,

Fig. 1 is a vertical fragmentary sectional view through a flushing valve embodying this invention,

Fig. 2 is a vertical fragmentary sectional view through a modified form of valve and washer embodying this invention, and

Fig. 3 is a vertical fragmentary sectional view of a pump embodying this invention.

Referring to the drawings more particularly, numeral 2 in Fig. 1 designates an elbow shaped casing having an inlet water connection 3 and a water outlet connection 4, the casing being enlarged between these connections to provide a valve chamber 5. The casing is also provided with an enlarged elbow portion 6 adjacent its outlet end below the chamber 5 for connection of the valve operating mechanism. This mechanism may be of any suitable type, but is preferably that illustrated and described in connection with my copending application Serial No. 238,516 for flush valve, filed December 8, 1927.

The casing 2 is provided with a cap member 7 threadedly connected as at 8 in the upper end of said casing. The cap member 7 is provided with a depending cylindrical flange 9 forming a cylinder within which the piston end of a piston valve 11 is adapted to reciprocate. The valve 11 is provided with a suitable annular washer 12 adapted to cooperate with an annular seat 13 formed integrally with the casing 2 for controlling the communication between the chamber 5 and the outlet of said casing. The piston 11 is manually and positively operable as to its upward movement by means of the mechanism within the enlarged portion 6 and its downward movement is effected by gravity and the pull of the water passing from the inlet 3 to the outlet 4.

The head of the valve member 11 is in the form of a cap member 15 threaded interiorly into the upper end of said valve member. The cap member 15 is provided with a horizontally extending annular and integral flange 16. This flange 16 is provided at its outer edge with a depending integral annular flange 17 the lower end of which presents an annular shoulder 18 which acts as a follower for a cup washer 19 secured by and between the upper end of the valve 11 and the cap member 15.

The cup washer 19 includes a horizontal annular flange 21 on its inner periphery and disposed between the flange 16 and the upper end of the body of the piston valve 11 for attaching said washer to said valve. A flat horizontal annular flange portion 22 of the washer 19 is adapted to be held against the shoulder 18 by the pressure of the water within the chamber 5 and is provided with a depending cylindrical integral flange portion 23 at its outer periphery in engagement with the walls of the cylinder 9. In the cup washers of the type used heretofore, no provision was made for taking up the horizontal expansion of the portion corresponding to the flange portion 22, as such portion swelled from contact with water in the casing. The result was that the flange portion corresponding to the portion 22 was caused to press unnecessarily hard against the wall of the cylinder. In order to prevent the undue pressure of the washer against the walls of the cylinder when the washer swells, I provide it with an integral depending cylindrical flange portion 24 connecting the outer margin of the portion

21 with the inner margin of the portion 18. This portion 24 is pliable and is disposed at substantially right angles to the portions connected thereby. Sufficient space 25 is provided inwardly of the portion 24 in order that as the portion 22 increases in width by swelling, the latter portion may, together with the lower end of the portion 24, extend inwardly to thereby accommodate the increased width and not be forced undesirably hard against the wall of the cylinder 9.

The valve member 11 is provided with a horizontal integral wall 26 disposed intermediate its seat 12 and its head 15. The wall 26 is spaced from the lower end of the cap or head 15 and from a ball seat 27 formed on a bridge portion 28 of said cap to provide a chamber 29 which has communication past a ball check valve 31 therein and through a valve seated opening 32 in said wall through one or more openings 33 in a spider diaphragm 34 provided in the valve member 11 and through openings 35 in a spider plug 36 with the outlet 4 whenever the ball 31 is raised from its seat by operating pin 37 which is journalled for sliding movement in spiders 34 and 36. The pin 37 is prevented from dropping down by an integral flange 38. The chamber 29 also has communication at all times with the inlet through an orifice 39 formed in its side wall.

The piston head or cap 15 is cored out to provide a chamber 41, a continuation of the chamber 29, an auxiliary chamber 42 and a passage connecting the chambers. The chamber 42 is open at its lower end and this end is closed by an interiorly seating ball check valve 43. The check valves 31 and 43 are both adapted to be opened, the first mechanically through the manually operating mechanism including the pin 37 and the latter automatically through the action of the water when the ball 31 is lifted.

In operation, when it is desired to raise the main valve 11, the manually operating mechanism is actuated to raise the pin 37 and the ball check 31. The ball check 31 then allows water to flow into the various chambers therebeneath. Upon the continued upward movement of the pin the ball 31 engages the seat 28 and upon the further movement of the pin the main valve 11 is urged upwardly into the cylinder. During the upward movement of the valve 11 water trapped in the storage chamber above the piston head has escaped to the outlet by raising the ball check 23 from its seat and passing out through the auxiliary chamber 42, the chambers 41 and 29, the orifice 32 and the passages 33 and 35. When the operating mechanism is released allowing the valve 11 to drop by gravity, the flow just described will be reversed, a bleed passage 44 past the valve 43 permitting this.

It is obvious in a valve of this type that were the cup washer 19 permitted upon swelling to press unnecessarily hard against the walls of the cylinder 9, the piston valve 11 would not return to its seat by gravity, but would stick in the cylinder.

Referring to the modification shown in Figure 2, there is illustrated a slightly different form of valve here designated as 45 and a casing 46 therefor. In this modification the cup washer here designated as 47, instead of being attached to the piston valve 45, is attached at its outer horizontal marginal flange 48 to the inner wall of the casing 46. In this modification an inner horizontal flange 49 of the cup washer corresponds to the outer horizontal flange 22 in the previous embodiment. The flange 49 is provided with a vertical cylindrical flange 51 which surrounds the outer surface of the piston valve 45 and is adapted to be held in engagement therewith by the pressure of the water in the chamber 52 corresponding to the chamber 5 in the previous embodiment. As before, the cup washer is provided with a cylindrical pliable portion 53 joining the adjacent marginal edges of the flange portions 48 and 49, respectively. The follower for the cup washer in this instance, as before, includes an annular horizontal flange 54 and a depending integral flange 55. In this case, however, the depending flange is on the inner periphery of the horizontal flange instead of on the outer periphery thereof. The follower comprising the flanges 54 and 55 is engaged by a cylindrical sleeve 40 beneath the cap member 56 and cooperate with an annular shoulder 57 on the interior of the casing to clamp the flange 48 of the cup washer.

The operation of this form of the valve is substantially the same as that of the previous embodiment, the exception being that here the cup washer is attached to the casing and frictionally engages the piston valve, whereas in the previous embodiment the cup washer was attached to the piston valve and frictionally engaged the cylinder walls.

In Figure 3 there is shown the use of a cup washer embodying this invention in connection with a pump. Referring to this figure more particularly, numeral 58 designates the pump cylinder. A plunger 59 is operable in the cylinder 58 between the head 61 and the foot 62. A cup washer 63 of substantially the same shape as the cup washer shown in Figure 1 is clamped against a shoulder 64 on the piston 59 by means of a follower 65. This follower 65 includes an annular portion 66 and an integral depending flange 67. This follower 65 is threaded to the piston 59, as at 68, and cooperates with the said piston and said cup washer in the same manner that the follower in the first embodiment cooperates with the piston valve.

It will be noted that in each embodiment the horizontal flange of the cup washer which is adapted to be pressed against the follower

by the pressure of fluid in the pressure chamber of the respective device with which it is used, may increase in width from swelling without causing unnecessary pressure on the walls of the cylinder.

I am aware that many changes may be made without departing from the principles of this invention and I therefore do not wish to be limited to the details described.

I claim:

1. In combination with a piston and a cylinder wall, an unsplit cup washer carried by the piston having an annular flange bearing on and positioned to be expanded against said wall by pressure in the cylinder beyond one end of the piston, an annular disc portion of the washer integral with said flange and extending radially inwardly at substantially 90° to said flange, an annular abutment carried by the piston abutting said disc portion near the first said flange for opposing recession of the cup washer when under pressure yet not preventing inward sliding movement of the disc portion due to swelling of the latter, and a second annular flange on said washer integral with the disc portion and extending from the inner edge of said disc portion substantially parallel to the piston but spaced radially therefrom, the cup washer being clamped in sealed relation to the piston near one margin of said second flange leaving the latter free to swing toward the piston upon swelling of the cup washer.

2. In combination with a piston and a cylinder wall, an unsplit cup washer composed of fibrous material prone to swell in the presence of moisture and carried by the piston having an annular flange bearing on and positioned to be expanded against said wall by pressure in the cylinder beyond one end of the piston, an annular disc portion of the washer integral with said flange and extending radially inwardly at substantially 90° to said flange, and a second annular flange on said washer integral with the disc portion and extending from the inner edge of said disc portion substantially parallel to the piston but spaced radially therefrom, the washer being clamped in sealed relation above said second flange to the piston, abutments carried by the pistons for supporting the disc portion and second flange of the washer against expanding pressures, said second flange and disc portion being mounted to be free to swell radially inwardly to thus avoid undue distortion of the washer and undue pressure thereby against the cylinder wall.

3. In combination with a piston and a cylinder wall, an unsplit cup washer, composed of fibrous material prone to swell in the presence of moisture and carried by the piston, having an annular flange bearing on and positioned to be expanded against said wall by pressure in the cylinder beyond one end of the piston, an annular disc portion of the washer integral with said flange and extending radially inwardly at substantially 90° to said flange, and a second annular flange on said washer integral with the disc portion and extending from the inner edge of said disc portion substantially parallel to the piston but spaced radially therefrom, the cup washer being clamped in sealed relation to the piston near one margin of said second flange leaving the latter free to swing toward the piston upon swelling of the cup washer.

4. In combination with a piston and a cylinder wall, an unsplit cup washer, composed of fibrous material prone to swell in the presence of moisture and carried by the piston, having an annular flange bearing on and positioned to be expanded against said wall by pressure in the cylinder beyond one end of the piston, an annular disc portion of the washer integral with said flange and extending radially inwardly at substantially 90° to said flange, an annular abutment carried by the piston abutting said disc portion near the first said flange for opposing recession of the cup washer when under pressure yet not preventing inward sliding movement of the disc portion due to swelling of the latter, and a second annular flange on said washer integral with the disc portion and extending from the inner edge of said disc portion substantially parallel to the piston but spaced radially therefrom, the cup washer being clamped in sealed relation to the piston near one margin of said second flange leaving the latter free to swing toward the piston upon swelling of the cup washer.

5. In combination with a piston and a cylinder wall, an unsplit cup washer having an annular flange paralleling and contacting said wall, a second annular flange substantially parallel to the first flange of lesser diameter and connected therewith by a disc portion, means for securing and mounting said washer on the piston constructed to allow the disc portion and second flange to move and expand radially inwardly, while supporting both when the cup washer is subject to internal expanding forces.

6. In combination with a piston and a cylinder wall, a cup washer composed of fibrous material prone to swell in the presence of moisture having an annular peripheral flange contacting said wall, means for securing the central marginal portions of the washer to the piston, an imperforate web connecting said flange and said marginal portion bent therebetween, and abutment surfaces on the piston for supporting said web during distension of the cup washer, said web being free to move radially inwardly when swelling.

7. In combination with a piston and a cylinder wall, a cup washer composed of fibrous material prone to swell in the presence of

moisture having an annular peripheral flange contacting said wall, means for securing the central marginal portions of the washer to the piston, an imperforate web connecting said flange and said marginal portion bowed therebetween toward the inner side of the cup washer, and abutment surfaces on the piston for supporting said web during distension of the cup washer, said web being free to move radially inwardly when swelling.

8. In combination with a piston and a cylinder wall, a cup washer having a peripheral annular flange contacting said wall, means for securing the central marginal portion of the washer to the piston, a web connecting the central marginal portion of the washer and said flange, a portion of which extends perpendicular to the cylinder wall, the last said portion and the remainder of the web being supported by the piston against undue distension but being free to move radially inwardly when swelling.

In witness of the foregoing I affix my signature.

WILLIAM S. WHITE.