Oct. 15, 1929. R. HEARE 1,731,571

FLUSH VALVE

Filed Jan. 17, 1927

Fig. 1.

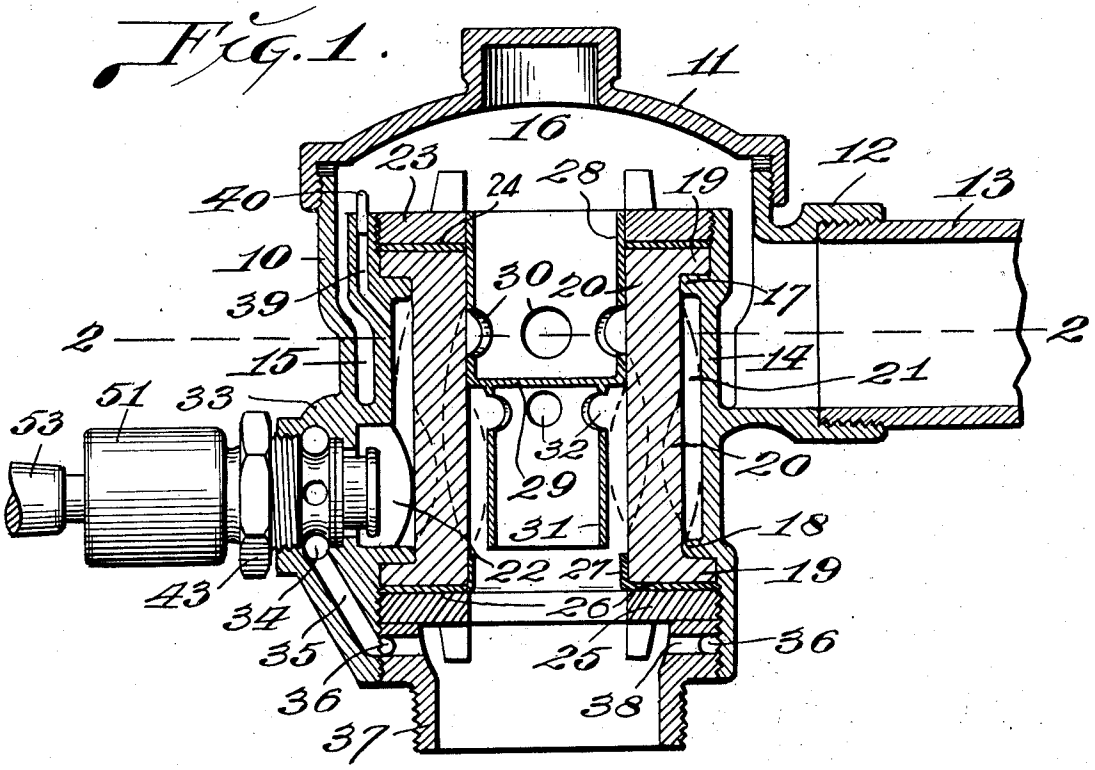



Fig. 2

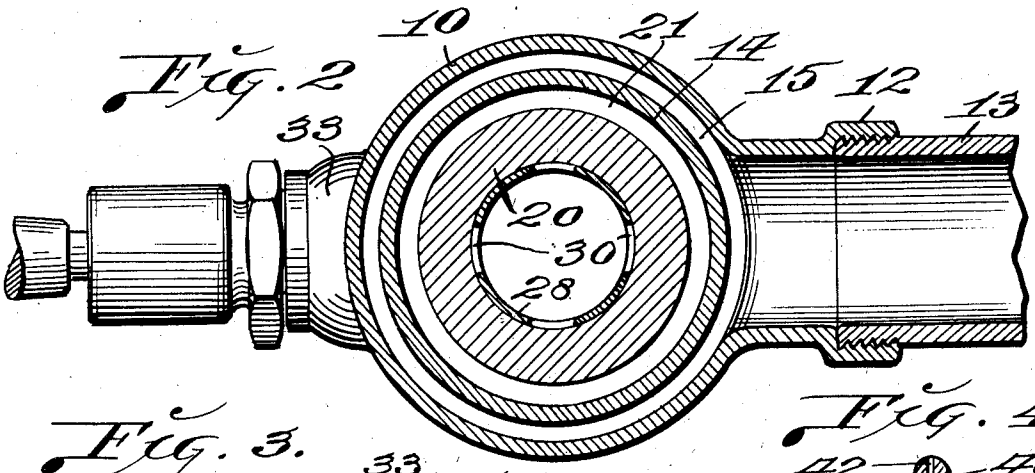



Fig. 3.

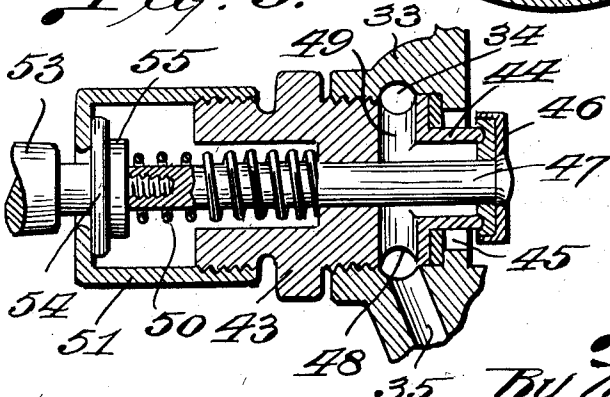
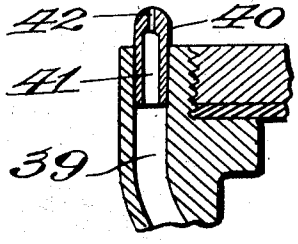



Fig. 4.

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# UNITED STATES PATENT OFFICE

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## FLUSH VALVE

Application filed January 17, 1927. Serial No. 161,565.

My invention relates to a flushing valve and has for its principal object the provision of a relatively simple, practical and efficient valve that may be advantageously employed in connection with water closets or wherever a relatively strong flow of water for a predetermined length of time is desired.

Further objects of my invention are to generally improve upon and simplify the construction of the existing forms of flush valves; further, to provide a flushing valve of the character referred to wherein the flow of water through the valve is controlled by a substantially tubular member formed of rubber and which provision eliminates the usual forms of metal valves that are generally employed in flush valves for controlling the flow of water therethrough; and further, to provide a valve that is inexpensive of manufacture and which will be positive and reliable in action and which will not be subject to appreciable wear or deterioration, thus materially increasing the lift or time of service of the valve.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawing, in which—

Fig. 1 is a vertical section taken on a central plane through a flush valve of my improved construction.

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail section of the manually operable valve that is utilized for opening the flush valve.

Fig. 4 is an enlarged detail section of a nipple that controls the closing of flush valve.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 10 designates a substantially cylindrical shell that serves as a housing for the operating parts of the valve and the upper end of said shell or housing being closed by a readily removable cap 11. Formed integral with and projecting laterally from the upper portion of the housing 10, is a short tubular member 12 that is connected in any suitable manner to a source of water supply, for instance, a service pipe 13 that is connected to the city mains.

Formed integral with the housing 10 and arranged on the interior thereof is a concentric wall 14, the same being spaced a slight distance from the wall of the shell or housing and the annular chamber 15 that is formed between the wall of the housing and said wall 14 constitutes a pressure chamber that is in direct communication with the chamber 16 that is immediately beneath the cap 11 and with the source of water supply that is conveyed to the housing through supply pipe 13.

Projecting inwardly from wall 14 a short distance below its upper end, is a circumferential flange 17 and a corresponding flange 18 projects inwardly from wall 14 a short distance above its upper end.

Overlying the flanges 17 and 18 are the flanged ends 19 of a tubular member 20 that is formed of practically pure rubber. The wall of this tubular member is relatively thick and owing to the provision of the flanges 17 and 18, the wall of said member is spaced a slight distance apart from the inner wall 14 of the housing, thus providing a circular pressure chamber 21.

Formed through the lower portion of the wall 14, preferably at a point diametrically opposite from the inlet connection 13 is an opening 22.

The flanged upper end of the tubular member 20 is clamped on flange 17 by a ring nut 23, which latter is screwed into the upper end of the circular wall 14 and interposed between said nut 23 and the top of member 20 is a thin washer or shim 24, preferably of metal.

The lower flanged end of member 20 is clamped against flange 18 by a ring nut 25, which latter is screwed into the lower end of the circular wall 14 and interposed between said nut and the lower end of member 20, is a relatively thin washer or shim 26 of metal. Formed integral with the shim or washer 26 around the edge of the opening therein, is an upwardly projecting circular wall 27 that fits snugly within the circular opening through member 20, thus forming a support for the lower end of member 20 and holding the same

against inward movement as a result of abnormal pressures within chamber 21.

Secured to nut 23 around the opening therein, is the upper end of a cup 28, preferably formed of suitable sheet metal and which cup extends downwardly into the opening through the elastic member 20 and formed through the wall of said cup a short distance above its bottom or floor 29, is a series of openings 30. Depending from the bottom or floor of the cup 28, is a tubular member 31, open at its lower end, said tubular member being slightly smaller in diameter than the cup 28 and formed through the upper portion of wall 31 just below the floor 29 of the cup, is a series of apertures 32.

Formed on the exterior of the housing 10 directly opposite the opening 22, is a boss 33 that is provided with a chamber for the reception of the inner end of the manually operable valve that is effective in opening the flush valve and formed within said boss around the chamber therein, is an annular groove 34, from the bottom of which leads downwardly through the housing 10, a duct 35. The lower end of this duct communicates with a circumferential groove 36 that is formed in the outer face of the upper portion of a short coupling member 37 and which latter is screwed into the lower end of housing 10 and bears against the under face of ring 25.

Leading from groove 36 inwardly through the wall of the coupling 27, is a series of ports 38. The lower threaded portion of coupling 37 is adapted to be directly connected to the pipe or conduit that leads to the bowl with which the flush valve is associated.

Formed in the upper portion of wall 14 and leading from the top thereof downwardly and communicating at its lower end with pressure chamber 21, is a duct 39 that functions as a by-pass between chamber 16 and said pressure chamber 21 and seated in the upper end of said duct 39 is a relatively small nipple 40 that is formed of non-corrodible metal. Formed axially through this nipple, is a relatively small bore 41, the upper portion thereof being reduced in diameter to form a minute inlet aperture 42.

Instead of being located in the upper portion of wall 19, the by-pass just described may be located at any point in said wall 14 so as to provide a restricted duct between the outer pressure chambers 15 and 16 and the inner pressure chamber 21. However, I prefer to locate the nipple so that it occupies a vertical position as illustrated in Figs. 1 and 4 and by forming the duct 39 larger than the duct 41 and the latter larger than the inlet orifice 42, the opening or duct through which the water travels from the outer pressure chamber to the inner pressure chamber 21 gradually increases in diameter and therefore there is no restricted area or shoulders which might otherwise accumulate silt or sediment and which latter would materially interfere with the successful operation of the valve.

Screw seated in boss 33, is a plug 43 provided at its upper end with a short tubular extension 44 that projects through an opening 45 into opening 22, and the end of this extension 44 provides a seat for a disk valve 46 that is carried by the inner end of a stem 47 and which latter is axially arranged within plug 43 .

Formed in the periphery of plug 43, is an annular grove 48, which when the plug is seated in the boss, coincides with groove 34, from which leads outlet duct 35. Leading from the chamber within the tubular extension 34 radially outward to groove 48, are short ducts or ports 49.

Associated with stem 47, is an expansive coil spring 50 that normally retains valve 46 on its seat at the end of extension 44.

A housing 51 is screw-seated on the outer end of plug 43 and pivotally supported in the outer end thereof, is the inner end of a short lever 53 that functions as a handle in the operation of the valve and the inner end of this handle carries a disk 54 that bears against a disk 55 on the outer end of stem 47.

Under normal conditions, the water supply under pressure fills chambers 15, 16, and 21, the latter being filled by the water that passes through nipple 40 and duct 39, which constitute the by-pass.

Valve 46 is retained on its seat by the power of spring 50 plus the pressure of the water against said valve and thus no water can escape through plug 43 and outlet duct 35. The pressure of the water within chamber 21 forces the upper portion of the elastic tube 20 against the periphery of cup 28, thereby tightly closing apertures 30 so as to cut off the passage of water therethrough, and that portion of the elastic tube that is below the bottom or floor of the cup is forced inwardly into engagement with the wall of tubular member 31 (see dotted lines Fig. 1).

Thus, the wall 51 functions as a support for the lower portion of the elastic tube while the valve is inactive and the parts thereof are in their normal position.

To open the valve and permit a flow of flushing water from the supply pipe 13 to the bowl with wihch the valve is associated, handle 53 is manually engaged and shifted into an angular position and disk 54 bearing on disk 55 forces the spring hold plunger inward, thereby unseating valve 46.

Immediately the normal water pressure prevailing within chamber 21 will be lowered as the water discharges tubular extension 44, grooves 34 and 48, duct 35, groove 36 and ports 38, with the result that the elastic body of tubular member 20 will bulge outwardly or expand into the position shown by dot and dash lines in Fig. 1, thereby uncovering the openings 30 and permitting a relatively large

volume of water to flow through said openings, and which water flows downwardly past wall 31 and thence through the coupling member that is connected to the pipe or duct leading to the bowl.

Thus the valve is opened and a relatively strong flow of water is permitted to pass through the valve to effect the flushing operation.

Immediately upon relase of handle 53, spring 50 will return stem 47 and valve 46 carried thereby to their normal positions, with the result that the flow of water through the inner end of plugs 43 and duct 35 will be cut off and as this outlet for the water is closed, pressure will begin to build up within chamber 21 by water which slowly enters said chamber through the by-pass comprising duct 39 and nipple 40.

This flow of water into chamber 21 will be controlled by the size of the orifice 42 in nipple 40 and as the water gradually enters said chamber 21 and pressure is built up therein, water will be flowing through openings 30 to produce the desired flushing operation. Gradually the pressure within chamber 21 will force the elastic body of member 20 inwardly toward the cup 28 and wall 31 until the upper portion of the elastic tube snugly engages the outer face of the cup 28, which action will close the openings 30 and consequently cut off further flow of the flushing water.

As the pressure within chambers 21 and 15 is equalized, that portion of the elastic tube below the cup 28 will be forced inwardly into contact with wall 31 and any water that would otherwise be trapped between the elastic tube and the upper portion of wall 31 will flow through openings 32 and pass downwardly to the bowl.

Thus it will be seen that I have provided a flush valve that is relatively simple in construction, inexpensive of manufacture, very compact and having relatively few moving parts. Inasmuch as the main valve has no sliding parts and no metal to metal contact between a valve and its seat, corrosion and wear are eliminated with the result that a long lived, non-leaking valve is produced.

It is a well known fact that practically pure rubber does not deteriorate as a result of constant contact with moisture and water, and for this reason my valve, employing a practically pure rubber tube for controlling the flow of flushing water through the valve housing, produces a structure that has a comparatively long life or period of service.

There is no pounding or chattering of the valve while in operation and there is no noise produced by siphonic action in the bowl during the time the valve is closing.

It will be understood that minor changes in the size, form and construction of the various parts of my flush valve may be made and substituted for those herein shown and described without departing from the spirit of the invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a flushing valve, a housing provided with an inlet and an outlet, an elastic tube supported within the housing between said inlet and outlet, a tubular member fitting snugly within the upper portion of said elastic tube, the upper end of which tubular member is open, the lower end thereof being closed, there being perforations in the wall of said tube adjacent to its lower end, which perforations are closed by the elastic tube while the same is under external pressure, and a hollow cylindrical member depending from the perforated tubular member and serving as a support for the lower portion of the elastic tube while the same is under external pressure, the diameter of which depending cylindrical member is less than the diameter of the perforated tubular member.

2. In a flushing valve, a housing provided with an inlet and an outlet, an elastic tube supported within the housing between said inlet and outlet, a tubular member fitting snugly within the upper portion of said elastic tube, the upper end of which tubular member is open, the lower end thereof being closed, there being perforations in the wall of said tube adjacent to its lower end, which perforations are closed by the elastic tube while the same is under external pressure, a hollow cylindrical member depending from the perforated tubular member and serving as a support for the lower portion of the elastic tube while the same is under external pressure, the diameter of which depending cylindrical member is less than the diameter of the perforated tubular member, a pressure chamber surrounding the elastic tube, a restricted bypass between the chamber in the upper portion of the valve housing and said pressure chamber, a duct leading from the pressure chamber to the outlet opening in the housing, and manually operable valvular means for controlling the flow of fluid through said duct.

In testimony whereof I affix my signature.

RAY HEARE.