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1,598,166

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FLUSH VALVE

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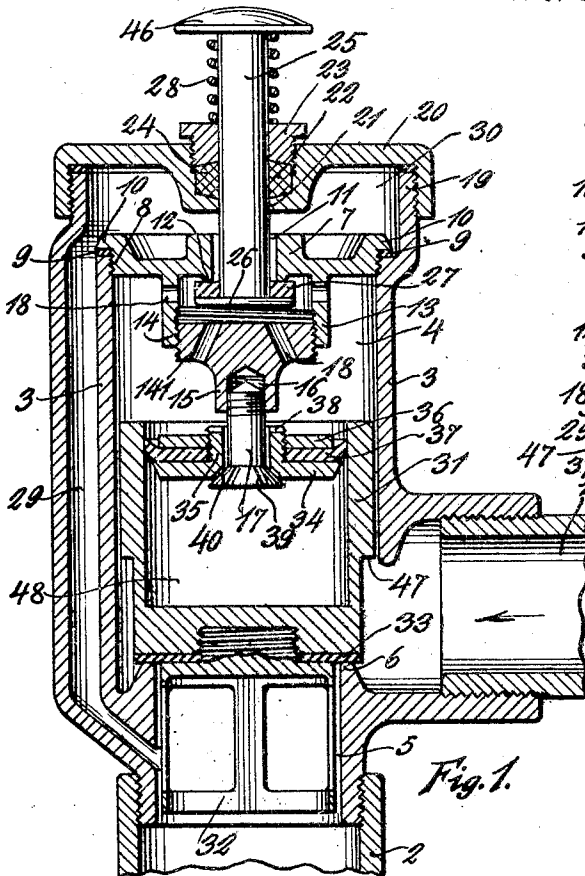


Fig. 1.

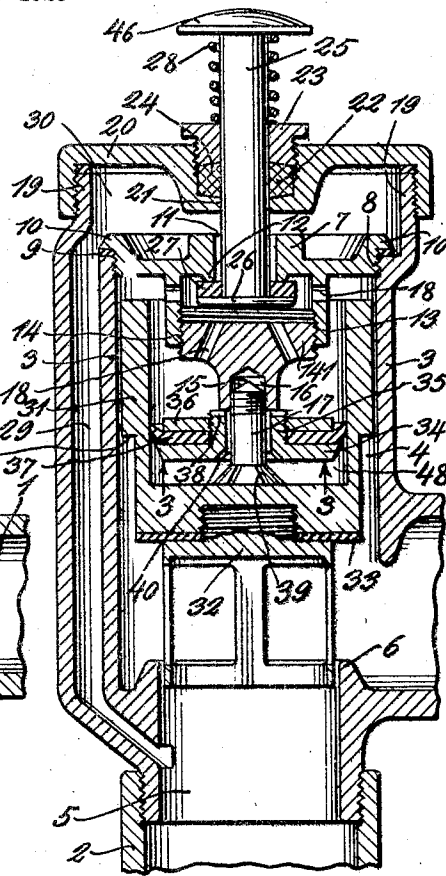


Fig. 2.

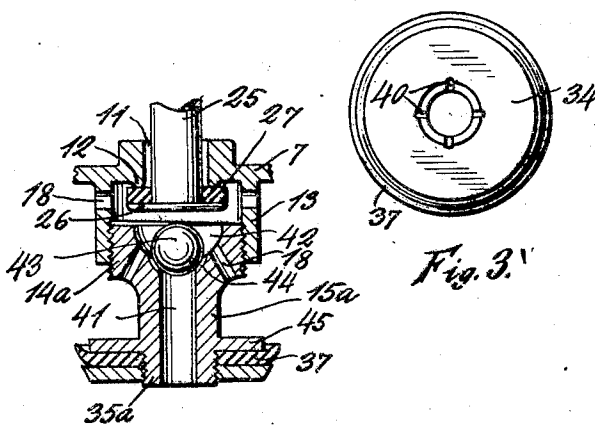


Fig. 3.

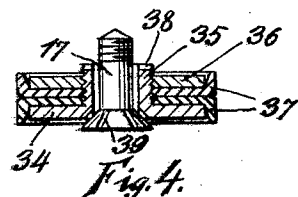


Fig. 4.

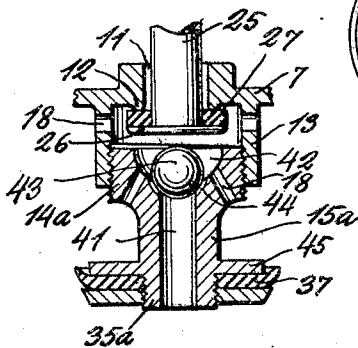


Fig. 5.

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UNITED STATES PATENT OFFICE.

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FLUSH VALVE.

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This invention relates to improvements in flush valves of the type usually employed in connection with toilet fixtures.

It is the object of this invention to produce a valve of simple, practical construction that shall be positive in its operation and which will have no small openings that are liable to clog up and render the device inoperative.

The above and other objects that will become apparent as the description proceeds are attained by a construction that I will now describe in detail, reference for this purpose being had to the accompanying drawing in which the preferred construction has been illustrated and in which:

Fig. 1 is a vertical diametrical section showing my improved valve in closed position;

Fig. 2 is a sectional view similar to that shown in Fig. 1 but in which the parts are shown in open position;

Fig. 3 is a view taken on line 3—3, Fig. 2 and shows the bottom of the piston;

Fig. 4 is a sectional view of a modified construction of piston, and

Fig. 5 is a diametrical section showing a modified construction.

Numeral 1 represents the supply pipe and 2 the discharge pipe, the ends of which are connected by my valve. The supply pipe is connected to a source of water under pressure and pipe 2 is usually connected to a toilet fixture although it may be connected to anything else as my valve may be employed for many different purposes. My valve consists of a body member 3 having a cylindrical chamber 4 which is open at the top and has an opening 5 at the bottom. An upwardly extending flange 6 surrounds the upper end of opening 5 and serves as a valve seat. The walls bounding the chamber 4 are internally threaded at the top and a closure member 7 has a threaded portion 8 which engages the threads on the chamber walls. A rubber washer 9 is clamped between the upper end of the wall and the flange 10 so as to form a seal. The closure 7 has a central opening 11 whose lower end is surrounded by a downwardly projecting flange 12 which serves a valve seat. Surrounding the seat or flange 12 is a cylindrical downwardly projecting wall 13 having its lower interior surfaces threaded as indicated by numeral 14. A plug 141 is threadedly connected with the part 13 and has a

downwardly extending cylindrical part 15 of somewhat smaller diameter than the part 141, it also has a threaded axial opening 16 for the reception of the screw 17. The plug 141 has a plurality of openings 18, although these may be dispensed with if the cylindrical part 13 has openings like those indicated by numeral 18. Extending upwardly from member 3 is a cylindrical wall 19 which is exteriorly threaded for the reception of the cap 20 that is provided with a central opening 21 which extends through the bottom wall of the recess 22 which is threaded interiorly for the reception of the plug 23 that serves to compress the packing material 24 about the valve stem 25 which extends through the gland and through the opening 11 in the cover member 7. This stem has an integral flange 26 on its inner end. A ring 27 of rubber, leather, fiber or any other suitable material rests upon the upper surface of the flange 26 and is adapted to be moved upwardly against the seat 12 by the combined action of the spring 28 and the pressure of the water within chamber 4. A passageway 29 connects the space 30 between the cover members 7 and 20 with the outlet 5 so that any liquid that enters the space 30 will flow through the passage 29 into the outlet pipe 2. Located within the chamber 4 is a hollow cylindrical plunger or piston 31 whose outer diameter is somewhat smaller than the interior diameter of the chamber 4. A guide member 32 is threadedly connected with the bottom of member 31 and serves to hold the resilient washer 33 in place. Secured to the screw 17 is a piston comprising a member 34 having a tubular central hub 35 which is threaded, on its exterior surface, for the reception of a clamping nut 36 which serves to secure the leather cup 37 in place. If it is desired, two leather cups 37 may be employed in the manner shown in Fig. 4 as such an arrangement will prevent the passage of liquid in either direction. The opening in the hub 35 is larger in diameter than the screw 17 so as to form an annular space between the two cylindrical surfaces. The upper end of the hub 35 is provided with a plurality of notches 38 so as to prevent sealing when the parts occupy the position shown in Fig. 2. The conical sides of the head of the screw 17 has one or more small grooves which provide small leakage channels when the parts are in the position shown in Fig.

1. If it is found desirable similar small grooves 40 may be provided in the seat in the member 34 or these may be employed to the exclusion of the grooves 39.

5 Instead of employing the screw 17 and the grooves above described, the member 14 may be constructed in the manner shown in Fig. 5 where the corresponding part is designated by 14^a. The downwardly extending portion 15^a has a central opening 41
10 whose upper end is enlarged in the manner indicated by numeral 42, for the reception of a ball 43. The seat upon which the ball rests has one or more grooves 44 which permits a slight leakage downwardly past the ball, the part 15^a has an outwardly projecting flange 45 and below this flange a threaded projection 35^a which receives a clamping nut 36^a which serves to hold the leather cup
15 37 in place.

Let us now assume that pipe 1 is connected to a source of water under pressure and that pipe 2 is connected to a toilet fixture or to any other receiver. Spring 28 tends to hold
25 the gasket 27 against the seat 12 and prevents water from flowing out through the opening 11. The gasket 33 rests upon the seat 6 and prevents the water from flowing downwardly into pipe 2 through the opening
30 5. It is obvious that the pressure of the water will tend to seal the openings 5 and 11. Let us now assume that pressure is applied to the head 46 and that the rod 25 is moved downwardly sufficiently to unseat the
35 opening 11. Water will now rush through the openings 18, through the opening 11 into chamber 30 and thence down through the passage 29 into pipe 2. When the pressure in chamber 4 is released by the downward
40 movement of the rod 25, water will begin to flow through the annular space between the piston 31 and the interior surface of chamber 4 and will also exert an unbalanced pressure against the shoulder 47 thereby producing a force that moves the piston 31 upwardly towards the position shown in Fig.
45 2. When the combined piston and cylinder 31 starts its upward movement, the plunger comprising parts 34, 36 and 37, which remain stationary, will have a relative movement with respect to the part 31 until the
50 bottom of the chamber 48 comes into contact with the head of the screw 17 (Fig. 2). Any water in the chamber 48 escapes
55 through the opening in the hub 35 and through the grooves 38. When the parts reach the position shown in Fig. 2, water will flow from pipe 1 through the openings in the guide 32 and into pipe 2. The weight
60 of the piston 31 with its attached guide 32 as well as the action of the water produces a force tending to move the parts downwardly into the position shown in Fig. 1. This movement is retarded by the action of the
65 plunger attached to the screw 17, which pre-

vents water from entering chamber 48 except through the grooves 39 or 40 which may be made sufficiently small to retard the closing to any extent desired. By turning the screw 17 into the opening in the plug 15 or 70 by unscrewing it, the extent of the upward movement of the piston 31 can be regulated and this will regulate the time it takes the valve to close. It is evident that if the grooves 39 and 40 are made very small, it
75 will take a longer time for the water to fill the chamber 48 than if they were larger so that the time for closing is also determined by the extent of this leakage as well as by the position of the screw 17. When pressure
80 is removed from the head 46 the opening 11 will be closed; the pressure above the piston 31 will now very quickly become equal to the pressure below wherefore the weight of the parts and the action of the water as it
85 flows through and past the guide member 34 produces a force that tends to move the valve parts from the position shown in Fig. 2 to that shown in Fig. 1. This movement
90 can only take place as fast as the water can enter the chamber 48 and, as above explained, this depends upon the leakage through the grooves 39 and 40 or equivalent leakage channels.

I desire to call particular attention at this
95 point to the fact that my valve is self-cleaning by which is meant that the small leakage ports such as the passages for the flow into and out of the chamber 48 are formed by relatively movable parts that will not clog
100 up, which nearly always happens where small holes are used for this purpose. When a double leather, like that shown in Fig. 4 is employed, the liquid can enter and leave the chamber 48 through the opening about
105 the screw 17 only and since it is necessary that the valve shall open quickly and close slowly, it is obvious that the passage must be larger when the parts are in the position shown in Fig. 2 than when in the position
110 shown in Fig. 1.

Having now described my invention, what I claim as new is:

1. A flush valve comprising a body portion having a cylindrical chamber, a closure for
115 the upper end thereof, an inlet port opening into said chamber near the lower end thereof, a hollow piston slidable in said chamber, said piston being of a slightly smaller diameter than the chamber so as to permit leakage,
120 said piston having an axial cylindrical opening, said closure member being provided with a central opening, a valve seat surrounding said opening on the lower side of the closure, a downwardly projecting cylindrical wall surrounding said valve seat, a
125 plunger extending through the central opening, a gasket secured to the plunger in a position to engage the valve seat, a plug threadedly connected to the inner surface of
130

the cylindrical wall, a piston secured to the lower end of said plug, said piston being adapted to cooperate with the inner wall of the cylindrical opening (48) in the hollow piston, and means for permitting liquid to flow into and out of the cylindrical opening, said means permitting the liquid to flow outwardly at a greater rate than inwardly.

2. A flush valve having, in combination, a body member provided with a cylindrical chamber, a hollow piston slidable within said chamber, said body member having an inlet opening near its lower end and an outlet opening in communication with the lower end thereof, a valve seat surrounding the upper end of said outlet, said piston having a guide member adapted to cooperate with the outlet and a shoulder adapted to engage the seat, a cover member removably connected to the upper end of said body member, said cover member having a central opening and a valve seat surrounding the lower end of said opening, a valve stem extending through the opening, an outwardly extending flange surrounding said stem and adapted to cooperate with said valve seat to close the opening, a downwardly extending cylindrical wall surrounding the valve seat on the cover member, a plug threadedly connected to said wall, a piston connected to the plug, said piston being adapted to cooperate with the opening in the hollow piston, said piston having

an opening extending from one side thereof to the other, means comprising a valve device for controlling the effective area of said opening and for permitting liquid to flow in either direction past the piston, said means permitting liquid to flow out of the hollow cylinder at a faster rate than it can flow into the same.

3. A flush valve comprising, in combination, a body member having a cylindrical opening, a valve seat of smaller diameter than the opening and located near the lower end of the opening, a piston slidably mounted in said cylindrical opening, said piston having an annular shoulder adapted to engage the valve seat, an inlet opening into the cylindrical chamber directly above said valve seat, said piston being of slightly smaller diameter than the chamber in which it is located, said piston being also provided with a cylindrical axial opening, a second piston member secured to the body member and slidable in the opening in the first piston, said second named piston being provided with an opening through which liquid may flow from one side of the piston to the other side thereof and means for changing the effective area of said opening in the piston so that the liquid may flow faster in one direction than in the other direction.

In testimony whereof I affix my signature.

CLIFFORD W. STEWART.