July 7, 1936. J. P. LOFTUS ET AL 2,046,640

VALVE

Filed Sept. 5, 1934

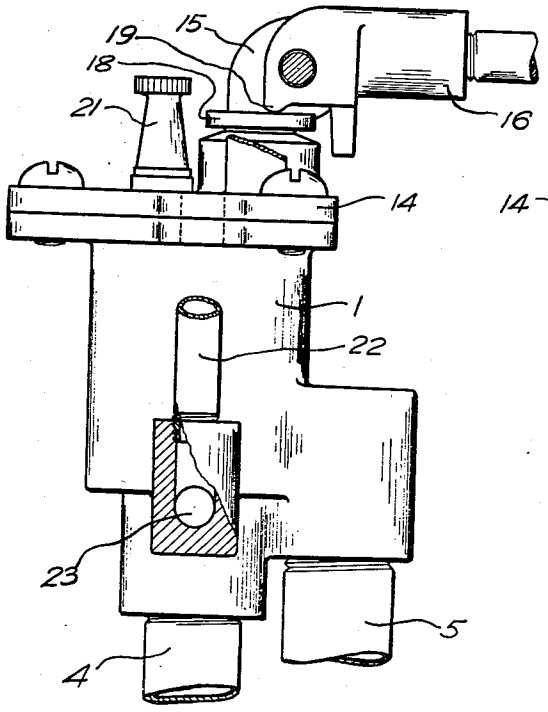


FIG. 1.

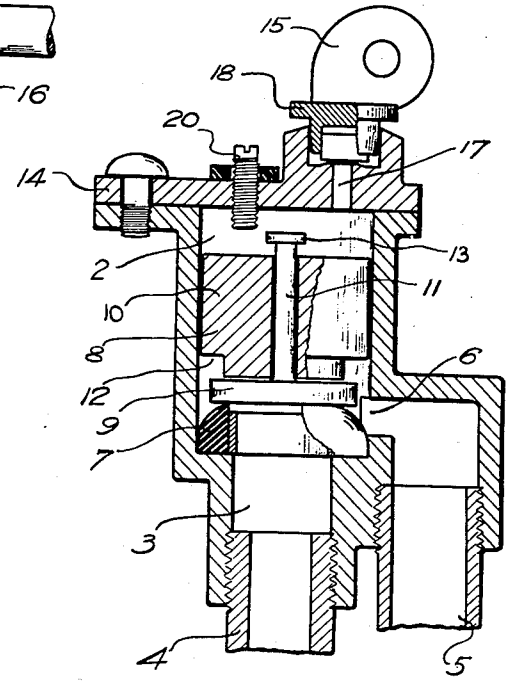


FIG. 2.

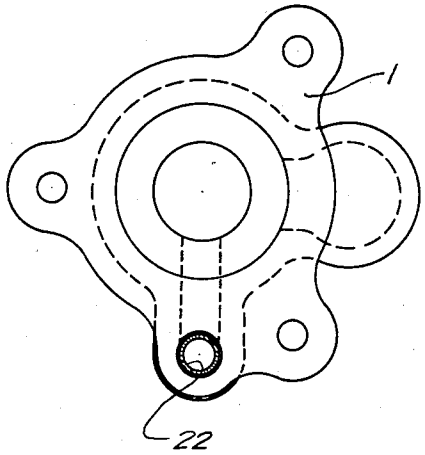


FIG. 3.

INVENTORS
JOHN · PATRICK · LOFTUS
FRANK · REGINALD · CHESTER.

BY Fetherstonhaugh & Co

ATTORNEYS.

Patented July 7, 1936 2,046,640

UNITED STATES PATENT OFFICE

2,046,640

VALVE

John Patrick Loftus, Vancouver, British Columbia, Canada, and Frank Reginald Chester, Seattle, Wash.

Application September 5, 1934, Serial No. 742,790

2 Claims. (Cl. 137—139)

Our invention relates to improvements in ball float valves which are particularly adapted for use in toilet tanks and the like. The objects of the invention are to provide hydrostatic means for closing the valve and a water cushion to prevent water hammer, further objects are to provide means whereby the operation of the valve will not be affected by extensive wear of parts.

The invention consists essentially of a valve chamber fitted with a two piece plunger, wherein one of the pieces is actuated in advance of the other on the opening of the valve, as will be more fully described in the following specification and shown in the accompanying drawing, in which:—

Fig. 1 is an elevational view of the invention.

Fig. 2 is a vertical sectional view.

Fig. 3 is a plan view of the valve body with the cover plate removed.

In the drawing like characters of reference indicate corresponding parts in each figure.

The numeral 1 indicates a valve body having a valve cylinder 2 and a concentric outlet passage 3 to which a discharge pipe 4 is fitted. An inlet pipe 5 communicates with the cylinder 2 through a port 6 in the peripheral wall of the body. Fitted within the cylinder 2 is a rubber valve seat 7 which is substantially dome shaped. Slidably mounted in the cylinder is a plunger 8 formed of two pieces, viz: a valve 9 and a piston 10. The piston is bored axially to slidably receive the stem 11 of the valve 9 and is provided with a lower peripheral rebate 12, the purpose of which will hereinafter appear. The valve stem 11 is fitted with a nut 13 at its upper end by which the valve 9 is lifted off its seat in response to vertical movement of the piston 10.

The valve body 1 is enclosed by a cover plate 14 having a pair of hinge lugs 15 in which a ball arm 16 is pivotally mounted. A relief orifice 17 extends through the cover plate 14 and between the lugs 15, which is adapted to be closed by a valve plug 18 being forced down over it by a projection 19 extending below the ball arm.

Extending through the cover plate 14 is an adjustable stop 20, which serves to limit the upward movement of the piston 10 and the valve as may be desired, this stop is covered with a screw cap 21.

A small pipe 22 communicates with the outlet passage 3 through a port 23, this pipe is adapted to discharge into the stand pipe in the toilet tank in the usual way and is adapted to supply water for sealing the toilet bowl trap during the time that the tank is being refilled.

The operation of the valve is as follows:—

When the ball arm 16 is lowered due to the emptying of the tank in which the valve is fitted, the water pressure within the cylinder forces the valve plug 18 upwards, permitting the pressure to be relieved through the orifice 17 from the top of the plunger. The pressure of the water from the pipe 5 which is exerted in an upward direction on the horizontal face of the rebate 12 of the piston 10 being then greater than that which is exerted downwardly onto the top of the piston, causes said piston to rise. During the initial lift of the piston, the pressure on the top of the valve 9 holds it closed, but as soon as the piston is raised into contact with the nut 13 of the valve stem 11 the valve 9 is lifted off its seat 7 by virtue of the fact that the total bottom area of the piston is greater than the top area of the valve.

The dimensions of the piston 10 are such as to permit a substantial leak between its periphery and the walls of the cylinder 2, and between the valve stem 11 and the bore of the piston, this leak being obviously less than through the relief orifice 17 when its valve 18 is open.

When the ball arm 16 is raised and the orifice 17 is closed in consequence, water flows upwardly, around the piston 10, tending to equalize the pressures through the cylinder 2, the initial pressure surplus being exerted to drive the piston 10 downwardly until the valve 9 is seated, immediately then pressure is relieved from the underside of the valve and is augmented above, holding it down upon its seat. As the leak past the piston is relatively slow, the valve 9 is retarded in its downward movement, so that no shock is developed in closing. As soon as the valve comes to rest the piston moves out of contact with the nut 13, thus allowing an upward flow of water between the piston 10 and the stem 11 which added to the flow between the piston and the cylinder walls increases the downward speed of the piston and allows its weight to be added to the valve with some rapidity, thus definitely sealing the valve and preventing chatter or vibration. The seating of the piston upon the upper face of the valve 9 is cushioned by the water between them, so that no noise occurs during the final closing movement. The volume of water between the valve 9 and the plunger is subsequently transferred to the top of the cylinder 2 above the piston, as the said piston slowly sinks into contact again with the valve 9. During the discharge from the valve through the pipe 4 water also discharges upwards through the port

23 and the pipe 22 to seal the trap of the toilet bowl. The flow of water through the pipe 22 may be increased by raising the stop 20 and permitting a greater piston movement and greater opening of the valve 9.

Obviously if the valve is used for other purposes there will be no necessity for the pipe 22.

What we claim as our invention is:

1. A valve comprising a cylinder having a discharge outlet at one end, a relief valve at the other and an inlet port adjacent the discharge outlet, a piston freely slidable within the cylinder between the discharge outlet, the inlet port and the relief valve, a stem having free sliding movement axially of the piston, said stem having a member adapted to contact with the upper end of the piston as the piston is moving upwards in the cylinder and a valve at the other adapted to close the discharge valve and to contact with the lower end of the piston as said piston reaches its lowermost limit in the cylinder.

2. A valve comprising a cylinder having a discharge outlet at one end, a relief valve at the other and an inlet port adjacent the discharge outlet, a piston freely slidable within the cylinder between the discharge outlet, the inlet port and the relief valve, a stem having free sliding movement axially of the piston, said stem having a member adapted to contact with the upper end of the piston as the piston is moving upwards in the cylinder and a valve at the other adapted to close the discharge valve and to contact with the lower end of the piston as said piston reaches its lowermost limit in the cylinder, said relief valve being adapted to be opened in the direction of the water flow therethrough.

JOHN PATRICK LOFTUS.
FRANK REGINALD CHESTER.