July 2, 1935. J. F. GOODWIN 2,007,048

FLOAT VALVE

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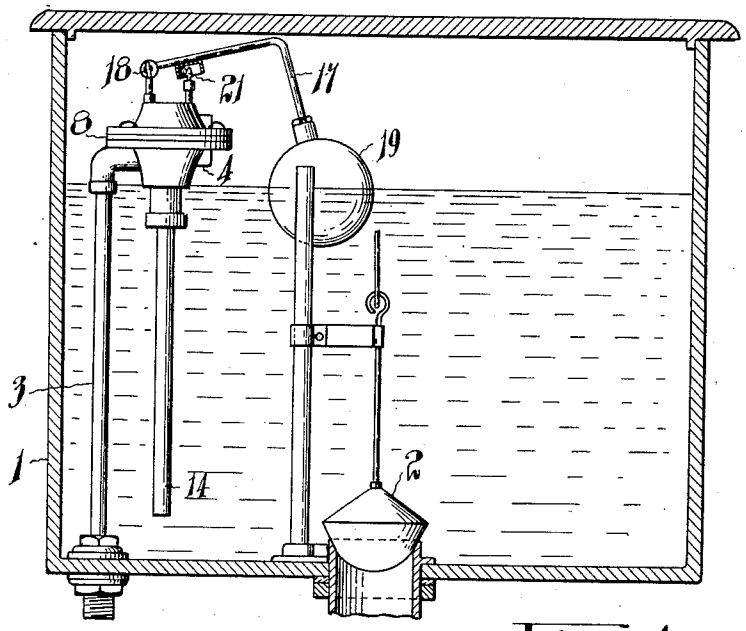


Fig. 1.

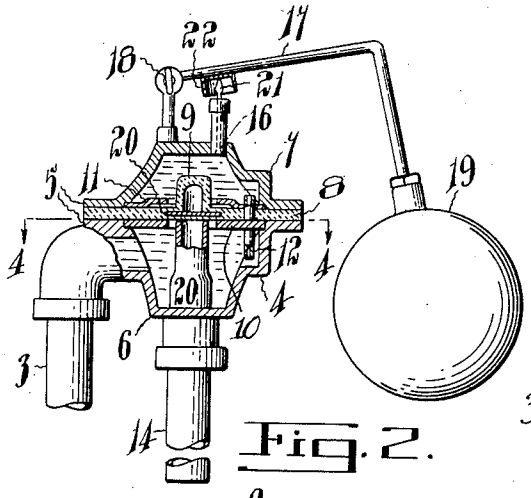


Fig. 2.

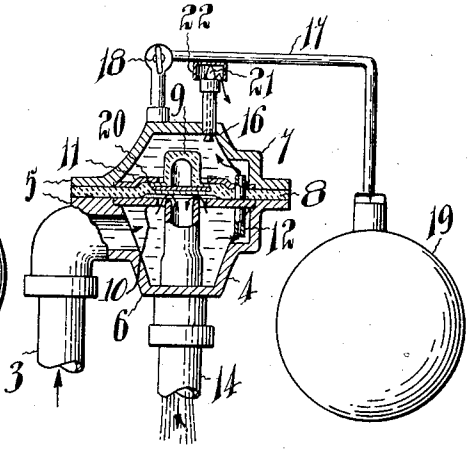


Fig. 3.

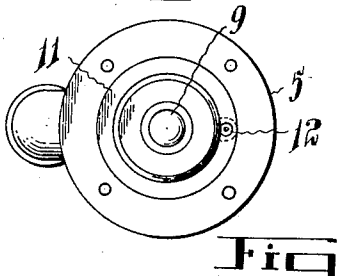


Fig. 4.

Inventor
J. F. Goodwin
By J. Edw. Maybee
ATTY.

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FLOAT VALVE

John F. Goodwin, Sarnia, Ontario, Canada, assignor of one-fourth to Harold R. Goodwin, Detroit, Mich.

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4 Claims. (Cl. 137—104)

This invention relates to float valves particularly adapted for use in closet flush tanks.

As such valves are ordinarily constructed the valve is closed against the pressure of the water supply by the lifting effect of the water on the ball float and it is difficult therefore to obtain and maintain accurate closure of the valve at all times and at a predetermined water level.

My object therefore is to devise a float valve in which the water pressure itself is utilized to open and close the valve, and the float is used merely to control the application of the water pressure, and not to directly close the valve.

I attain my object by means of an arrangement which may be briefly described as follows. A closed chamber is provided separated into two compartments by a flexible diaphragm. Into one compartment the water inlet opens and from it extends the water outlet formed with a seat engageable by the diaphragm to close the outlet. The second compartment is formed with a small outlet provided with a normally closed valve adapted to be opened by a ball float. A restricted by-pass forms a communication between the two compartments adapted, normally, to equalize the pressure in the two compartments. Under such conditions the outlet is closed by the diaphragm. When pressure is vented from the second chamber, the diaphragm lifts and the outlet is opened.

The invention is hereinafter more fully described and is illustrated in the accompanying drawing in which

Fig. 1 is an elevation of my improved valve installed in a tank;

Fig. 2 a vertical section of parts of the same in the closed position;

Fig. 3 a vertical section of the same parts in the open position; and

Fig. 4 a cross section on the line 4—4 in Fig. 2.

In the drawing like numerals of reference indicate corresponding parts in the different figures.

Referring to the drawing, 1 is an ordinary flushing tank provided with ordinary flushing mechanism 2, which is only partly shown in Fig. 1 of the drawing.

3 is the water inlet pipe passing through the bottom of the tank in the usual manner and connected at its upper end with a chamber 4. This chamber 4 is formed in halves and provided with the flanges 5 whereby the parts may be secured together. A diaphragm 8 has its rim secured between the flanges 5, thus dividing the chamber into two compartments 6 and 7. With the lower compartment the inlet pipe 3 communicates. Extending up through the bottom of the compartment 6 is the outlet pipe 14, the upper end of which is so positioned that it may be closed by the diaphragm 8. This diaphragm 8 is formed of resilient flexible material, preferably rubber. The center of the diaphragm preferably has a disk 20 of metal or hard rubber embedded therein to give the center of the diaphragm sufficient stiffness to enable it to properly engage and close the end of the outlet pipe 14.

The diaphragm is partly supported by the plates 10 and 11 fitted in rebates formed in the body of the chamber 4. These plates have central openings therein somewhat larger than the external diameter of the outlet pipe 4. The upper plate 11 is also preferably dished, as shown, to provide room for the lifting of the diaphragm to open the upper end of the outlet pipe 14.

The upper side of the diaphragm carries the projection 9 formed on or integrally connected therewith. This projection 9 nearly but not quite fills the opening in the upper plate 11 and is formed as a resilient cushion. While this projection may be formed of soft rubber and be solid throughout a better cushioning effect is obtained by making it hollow, as shown.

A restricted by-pass between the compartments 6 and 7 is formed by means of the by-pass tube 12, which is formed with a restricted bore. Preferably the bore tapers from the lower end upwards to prevent clogging of the bore by particles of solid material entering with the water and passing through the outlet.

The tube necessarily must extend through openings in the diaphragm and the upper plate 11.

A valve controlled vent 16 is provided leading from the upper compartment 7. The valve may be of any known type tending to close. A valve of the tire type may be employed having the stem 21 positioned below a bent arm 17 fulcrumed at 18 on the chamber 4 and carrying a hollow ball or float 19 adjustably connected with its outer end.

The cup 22 secured to the arm serves to direct downwardly any water passing up through the valve controlled outlet.

The operation of the device is substantially as follows: Normally the parts are in the position shown in Fig. 2, the arm 17 being held raised by the float 19 so that the valve 16 is closed. Owing to the provision of the by-pass 12 pressure in the two compartments 6 and 7 is equal, but as the upper side of the diaphragm exposed to the pressure is greater than the underside exposed to

pressure, owing to the presence of the outlet pipe 14, the diaphragm is held firmly in contact with the upper end of the latter and no water flows to the outlet 14. As soon, however, as the venting of the water in the tank permits the ball float 19 to drop low enough the valve 16 is opened and pressure in the chamber 7 vented. The pressure of the water in the chamber 6 then lifts the diaphragm and the water from the inlet flows to the outlet, as indicated in Fig. 3. As soon as the tank fills up sufficiently the ball float 19 is raised and the valve 16 closed. The shock of closure is, however, small, since the pressure on the upper side of the diaphragm is not materially greater than that on the lower side. Further, the closing movement is cushioned by the effect of the projection 9, which permits only of a limited flow from the upper chamber 7 through between the projection and the hole in the upper plate to the upper surface of the diaphragm. The shock of closure is also further cushioned due to the fact that the projection 9 is compressible and the pressure of the water in the upper chamber is thus exerted on the diaphragm through the medium of a shock absorber, thus completely preventing any water hammer.

A valve constructed as above described will be found to be very effective, since the work to be done by the float or ball 19 is only the controlling of the valve 16, which requires the exercise of very little power.

The device is also very durable, since the parts are subjected to very little wear.

From the above description it will be seen that I have devised a construction which will satisfactorily attain the objects of my invention as set out in the preamble to this specification.

What I claim as my invention is:

1. In a valve the combination of a chamber; a flexible diaphragm dividing the chamber into two compartments, the first provided with a water inlet and with an outlet controlled by the diaphragm; a hollow closed rubber cushion connected with the diaphragm within the second compartment and opposite the outlet; a restricted by-pass forming a communication between the compartments; and means controllable by a float valve for venting the second compartment.

2. In a valve the combination of a chamber; a flexible diaphragm dividing the chamber into two compartments, the first provided with a water inlet and with an outlet controlled by the diaphragm; means for admitting water from the inlet into the second compartment; and means for venting pressure from the said compartment, the diaphragm being formed of rubber and having a compressible rubber cushion connected therewith opposite the outlet from the first mentioned compartment.

3. In a valve the combination of a chamber; a flexible diaphragm dividing the chamber into two compartments, the first provided with a water inlet and with an outlet controlled by the diaphragm; means for admitting water from the inlet into the second compartment; and means for venting pressure from the said compartment, the diaphragm being formed of rubber formed with a stiffened center, and having a compressible rubber cushion connected therewith opposite the outlet from the first mentioned compartment.

4. In a valve the combination of a chamber formed in two parts; a flexible imperforate diaphragm having its rim clamped between the parts and dividing the chamber into two compartments and having its central portion stiffened; an outlet pipe extending from one compartment and having its inner end positioned below the center of the diaphragm so that it is closable by the latter; a stationary plate secured above the diaphragm limiting its lift and having a circular opening therein of larger diameter than that of the outlet pipe; an upwardly extending resilient and compressible projection at the center of the diaphragm nearly but not quite filling the said circular opening; means for admitting water into the compartment below the diaphragm; means for providing a restricted passage of water between the compartments; and means for venting pressure from the second compartment directly to the outside.

JOHN F. GOODWIN.