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TANK INLET VALVE MEANS

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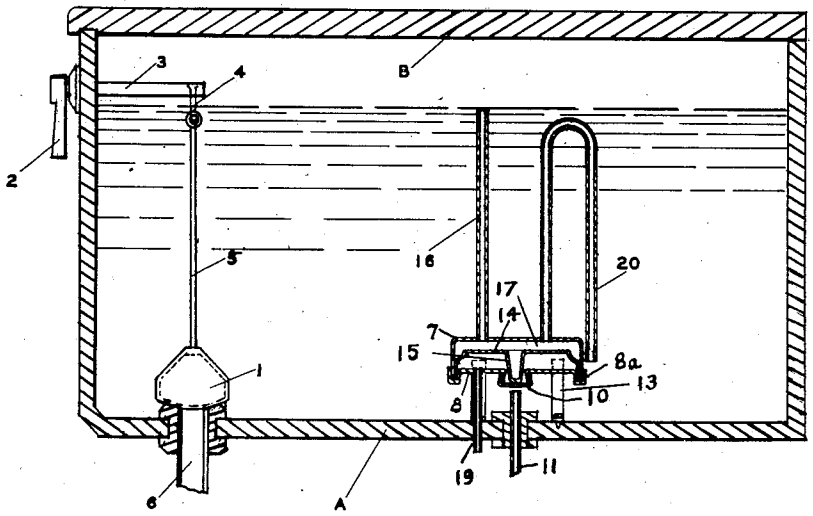

Fig. 1.

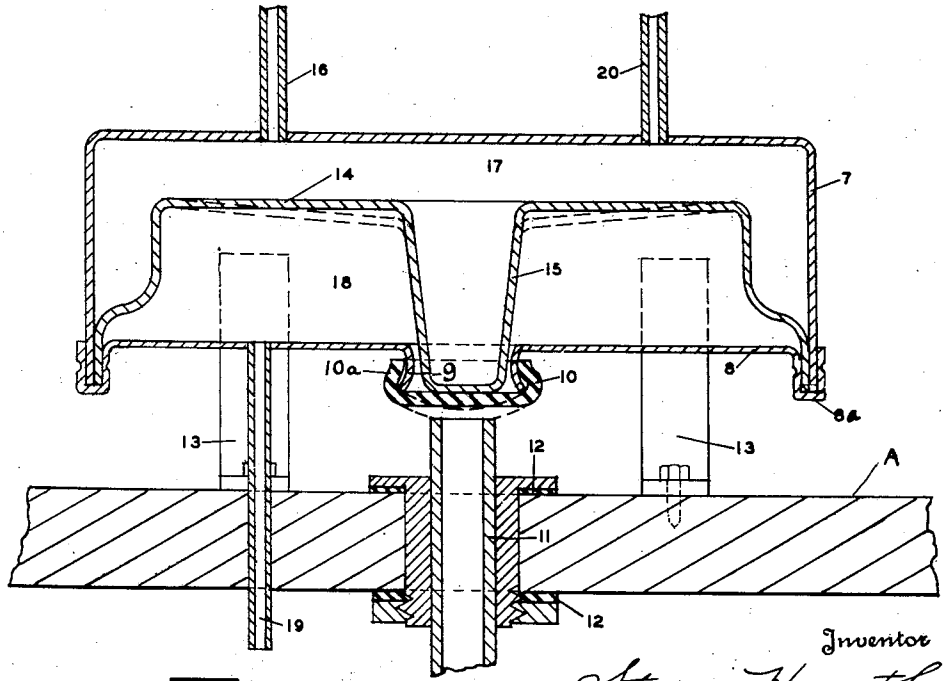

Fig. 2.

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TANK INLET VALVE MEANS

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6 Claims. (Cl. 137—68)

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My present invention relates to improvements in flush tanks for closets and pertains particularly to novel means for controlling the admission of the water to the tank preliminary to its use for the customary bowl flushing purposes.

The improved means hereof may be employed in conjunction with any tanks wherein an outlet valve is used to empty the receptacle and automatically controlled valve means is desired to be availed of for refilling the tank to a predetermined level.

A particular object of my invention has been to provide certain novel valve means for admitting and cutting off the supply of the water to the flush tank, which means operates substantially instantaneously in performing the cut-off function, and also provides a silent closing action with the resultant advantages derived from the latter.

A full understanding of my invention will be had upon reference to the following detail description of the special construction of parts used, in conjunction with the annexed drawing, the same describing and illustrating a preferred embodiment of the invention, which, however, may be modified as to construction within the scope of my claims appended hereto.

In the drawing:

Figure 1 is a general cross sectional view of a flush tank disclosing the arrangement of the customary outlet ball valve and also showing the inlet valve means of my present improved invention.

Figure 2 is an enlarged sectional view of the valve unit for the control of the admission of water to the tank and constituting the essential phase of my present improvement.

Referring to the accompanying drawings in the figures of which similar parts are referred to by like reference numerals or characters, A denotes a flush tank which may be of any ordinary construction, and in this tank is mounted the usual ball valve 1 operated by the handle 2 external to the tank and carried by the shaft 3 which has an arm 4 attached by a link rod 5 directly to the valve 1. The valve 1 controls the egress of the water from the tank A through the outlet pipe 6 which leads to the closet bowl, after ordinary practice.

At any suitable place in the tank A is mounted the water inlet valve unit of my invention, and said unit is comprised primarily of a casing 7 of somewhat drum-like form and which may preferably be made round or of any desired shape. The casing 7 is provided with a bottom 8 at the

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central portion of which is located a downwardly projecting tubular extension, the walls of which diverge outwardly toward the lower extremity thereof, said extension being designated 9.

Engaged over the tubular extension 9 of the bottom 8 of the casing 7 is a cup-like valve member 10, which valve member is preferably made from rubber or some suitable equivalent resilient substance, and is formed with an upper contracted portion 10a that fits over or around the lowermost portion of the tubular extension 9 that projects from the bottom 8 of the casing 7. By reason of the resiliency or flexibility of the horizontal bottom portion of the valve member 10, said portion is adapted to move upwardly and downwardly a slight distance in the performance of its valve function as will be more fully pointed out hereinafter.

Extending from and through the bottom portion of the tank A is an inlet water pipe 11 which projects a short distance above the bottom of the tank A and is held in place by any suitable coupling means involving gasket packing member or members 12.

The inlet pipe 11 terminates at its upper end within the tank A and at a point slightly below the normal plane of the underside of the flexible valve 10.

The casing 7—8 may be supported on the bottom of the tank A by any suitable means, such, for instance, as the supporting brackets 13, and within the said casing is disposed the flexible diaphragm 14 made of any suitable resilient substance such as metal, composition or the like, said diaphragm having its peripheral edge portion received by the U-flange 8a which is formed at the edge portion of the bottom 8 of the casing. This same U-flange 8a receives the lower edge of the side wall of the casing member 7, and by application of pressure upon the side portions of the said U-flange 8a, the lower edges of the parts 7 and 14 are clamped in the U-flange in air and water tight connection with the member 8.

At its central portion the diaphragm 14 is provided with a hollow valve actuating projection or lug designated 15, the lower end of which is adapted to abut with and under certain conditions move downwardly the valve 10 for causing the lower side of the valve 10 to seat against the upper end of the water in-flow pipe 11 so that the said pipe may be closed at this portion to discontinue the inflow of such water.

Extending upwardly from the casing 7 is a water pressure pipe 16 which communicates at its lower end with the upper pressure chamber

17 on the casing 7, said pipe 16 being open at its upper end and terminating some distance short of the top B of the tank A.

The lower chamber of the casing 7 is designated 18 and is an air chamber from which leads downwardly the vent pipe 19 which opens to the atmosphere and permits passage of air from the chamber 18 to the atmosphere during certain operations of the diaphragm 14 to be later set forth.

Also extending from the top of the chamber 7 is the U-shaped siphon pipe 20 which leads upwardly from the valve unit and then downwardly to a point of termination in a plane somewhat below the plane of the top of the unit casing 7.

An understanding of the construction of my valve unit being had in the light of the foregoing description of the detail features and parts as assembled, the operation of the valve means will now be set forth.

It will be assumed that the tank A has been emptied by reason of the operation of the handle and the ball valve 1, the latter being of course raised from its seat in such emptying operation. With the tank A empty, the parts of the valve unit will be in the position in which they are illustrated in large degree in Figure 2. Under these conditions, as seen in Figure 2, the valve member 10 is upraised from the upper end of the water inflow pipe 11, and water enters the tank A from the pipe 11 in a steady stream until the lower end of the siphon pipe 20 is submerged, and until the level of the water in the tank reaches the upper open end of the pressure pipe 16. Thereupon the water in the tank enters the pipe 16 and also enters the water pressure chamber 17 of the casing 7—8. As soon as the pipe 16 is filled, the column of water contained therein acting upon the water in the pressure chamber 17 will effect a downward flexing or resilient movement of the actuating member or projection 15 of the diaphragm 14. Such movement of the member 15 will also move downwardly the flexible valve member 10, until the latter, at the underside, closes the upper end of the inflow pipe 11 and cuts off the flow of water into the tank, which result will be accomplished shortly after the level of the water in the tank is such as to enable the water to overflow into the pressure pipe 16. When the valve 10 is closed on the pipe 11, the body of the diaphragm 14 is slightly bellied downwardly, and it is this flexing of the diahragm that carries the projection 15 to its closing position at the upper end of the pipe 11, for pressing valve member 10 downwardly.

Upon the next opening of the tank A to use its water for flushing purposes by exit through the pipe 6 accomplished by operating the handle 2 and ball valve 1, the water flows out of the tank A through the pipe 6 until the water level drops sufficiently to start a siphoning effect in the pipe 20 which withdraws the water from the chamber 17 and the pressure pipe 16 until the head of the water in the pressure pipe 16 has been drawn down to the level of the top of the chamber 17, at which level the siphon will break as the lower end of the short leg of the siphon is uncovered. Due to the removal of the head of water in the pipe 16, the diaphragm 14 and the valve 10 reflexes back to normal full line position shown in Figure 2, the release of the valve 10 being aided by the pressure of the incoming water from the supply pipe 11.

The maintenance of a quantity of water in the chamber 17 serves a special purpose. Sometimes the ball valve 1 will return to its seat on the exit pipe before the water in the tank is fully discharged, or it may be that due to repairs in the water system, the main supply of water for the tank, and consequently the pressure thereof, may be cut off. Under these conditions, the weight of water in the chamber 17 will move the diaphragm 14 downwardly and close the valve 10 against the pipe 11. This latter functioning of my valve is desirable in order to prevent residuum water at the bottom of the flush tank A from being permitted to re-enter the water inflow pipe 11 when the pressure flow in the latter has been discontinued. Thus, any contaminated water that might be at the bottom of the tank A will be prevented from flowing back into the water system through the pipe 11.

Of course, when the pressure of the water in the pipe 16 and chamber 17 is released by the siphoning action previously referred to, the valve 10 will rise under the action of the inherent resiliency of the diaphragm 14 and thereby the downwardly slightly distended bottom portion of the valve 10 will move upwardly under the pressure of the inflowing water coming again from the inflow pipe 11. The tank will thus be refilled and the operation of emptying the tank may be performed again in the manner previously described.

In Figure 2 of the drawings the dotted lines show the diaphragm body 14 as when deflected downwardly by pressure, and other dotted lines show the position of the valve 10 as when closing down upon the upper open end of the inflow pipe 11.

As the diaphragm 14 moves downwardly in the chamber 17, any air beneath the diaphragm and between it and the bottom 8 of the unit will pass from the air chamber through the vent pipe 19.

It will be understood that my invention may be adapted to uses other than that described. My valve unit is susceptible of use for any liquid tanks or receptacles which it may be desired to refill automatically from a pressure liquid supply line, irrespective of whatever discharging mechanism is availed of for the receptacle.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, a tank, a water inlet pipe leading into the tank, a valve in the tank cooperable with the inlet end of the pipe to open and close the same, and means to operate the valve, including a casing, a pressure pipe adapted to receive a pressure water column from the water entering the tank, a diaphragm in the casing to which the pressure pipe supplies a pressure head to cause coaction between the diaphragm and valve for closing of the inlet pipe, means to cause said pressure head on said diaphragm to be relieved progressively as and when lowering of the water level in the tank occurs, and means connecting the diaphragm to the casing normally to permit opening of the valve.

2. In combination, a tank, a water inlet pipe leading into the tank, a valve in the tank cooperable with the inlet end of the pipe to open and close the same, and means to operate the valve including a casing, a pressure pipe adapted to receive a pressure water column from the water entering the tank, a diaphragm separating the casing into an upper water pressure chamber and a lower air chamber, means to vent the air chamber to the atmosphere, a water pressure pipe con-

nected to the water chamber of the casing and terminating at a point above the casing to be filled when the water entering the tank reaches a predetermined level thereby to act on the valve to close the inlet pipe, and means in the tank to siphon water from the water chamber of the casing when the water in the tank is caused to discharge therefrom.

3. Means as claimed in claim 2, in which the siphon means is a pipe leading upward from the water chamber and down to a discharge end above the plane of the bottom of said water chamber.

4. Means as claimed in claim 2, in which the valve comprises a flexible valve member attached to the casing, and wherein the diaphragm has a part to flex said valve to cause it to close the inlet water pipe.

5. Means as claimed in claim 2, in which the valve comprises a flexible valve member attached to the casing, and wherein the diaphragm is movably attached to the casing and operatively engageable with the valve.

6. Means as claimed in claim 2, in which the casing has a hollow extension downward from its under side, a flexible valve surrounding the said extension and movable down on the inlet end of the water inlet pipe, the diaphragm having a downwardly projecting member engageable with the valve, and also having resilient connection to the casing to move up and down thereon for valve closing and opening operations.

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REFERENCES CITED

The following references are of record in the file of this patent:

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