Nov. 24, 1964 H. BACHLI ETAL 3,158,173

TYPE OF BALL COCK

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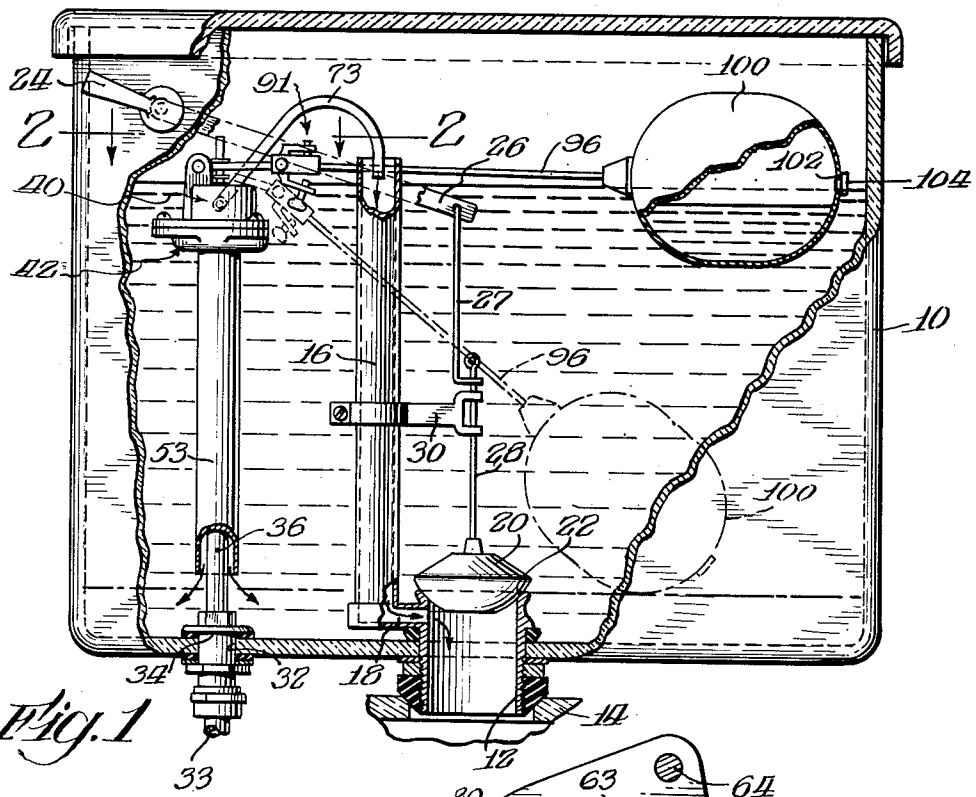


Fig. 1

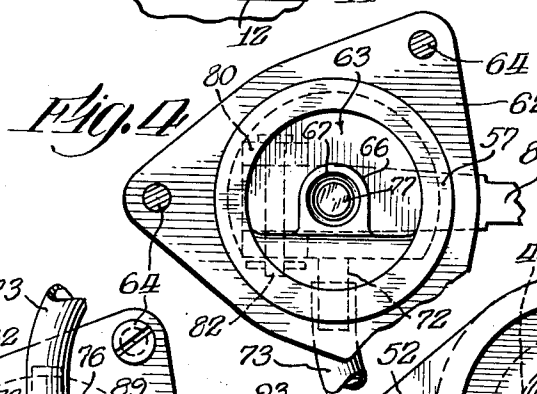


Fig. 4

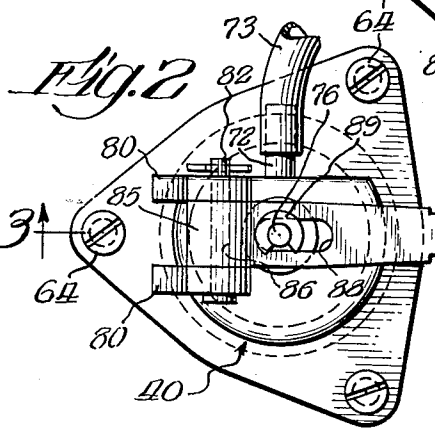


Fig. 2

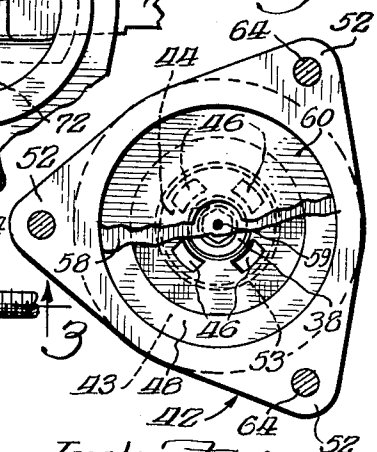
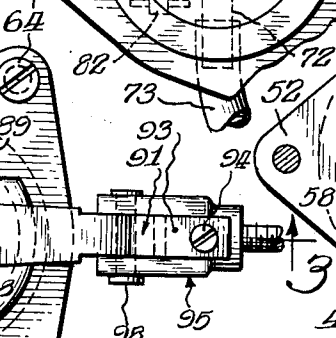


Fig. 5



Inventors:
Herman Bachli
Eugene B. Shapiro
By Max R. Freeman Atty.

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Fig. 3

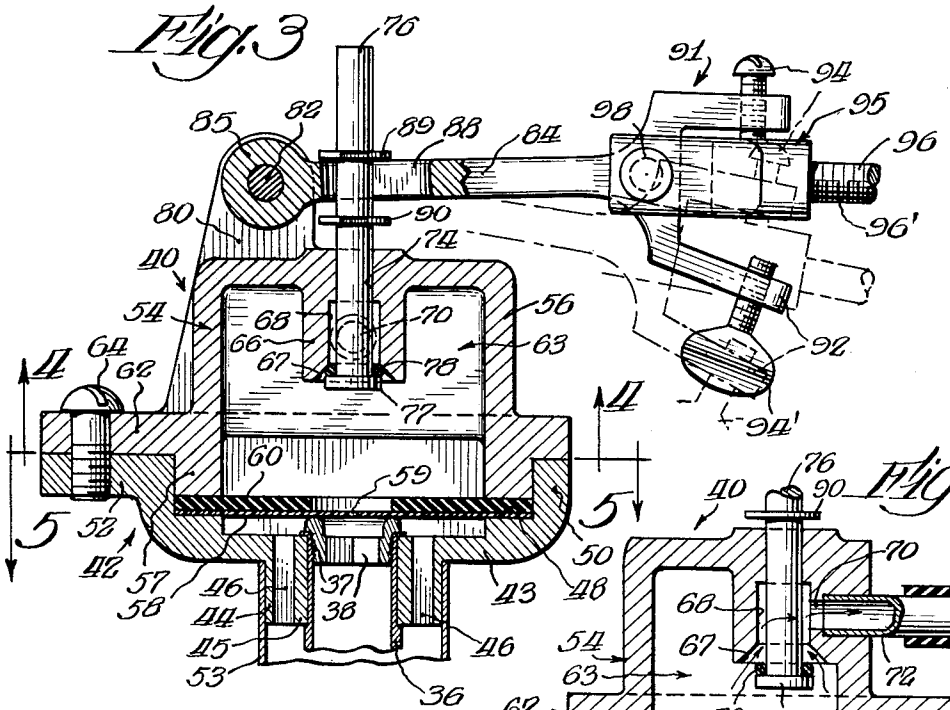
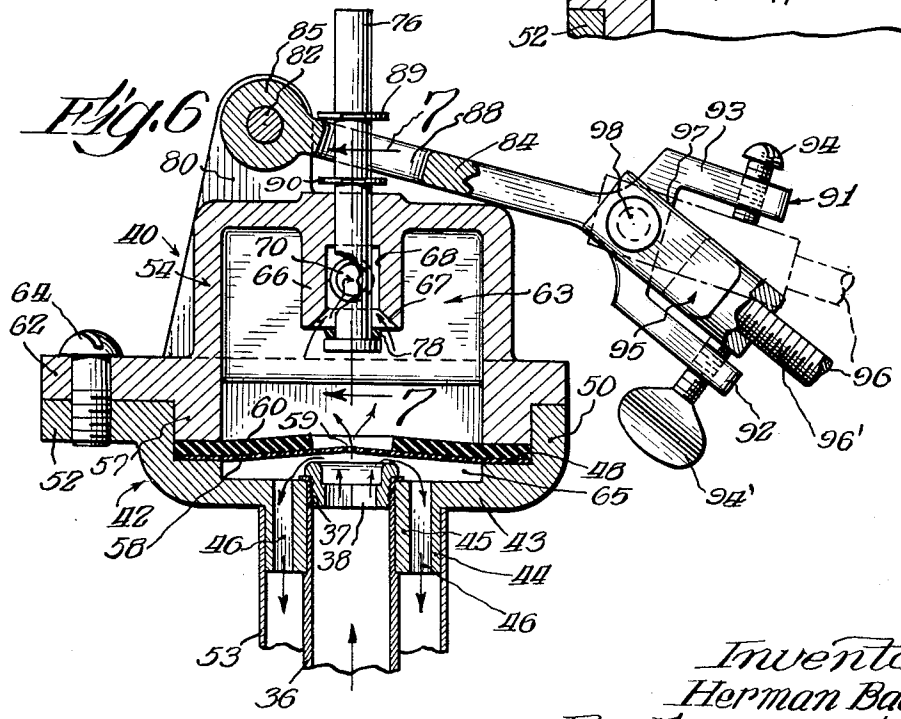


Fig. 7

Fig. 6

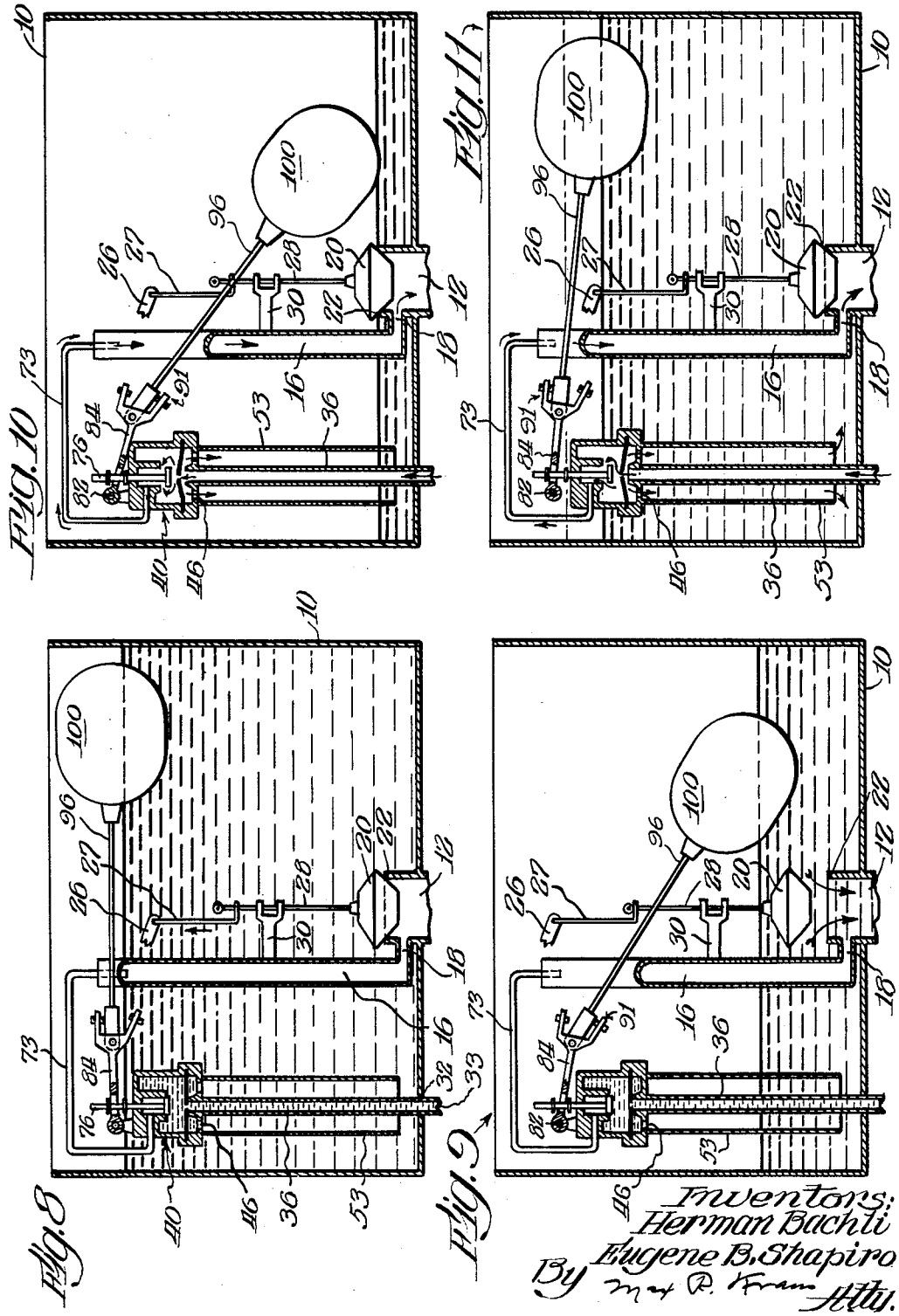


Inventors:
Herman Bachli
By Eugene B. Shapiro
May R. Krauss Atty.

Nov. 24, 1964 H. BACHLI ETAL 3,158,173

TYPE OF BALL COCK

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3,158,173

TYPE OF BALL COCK

Herman Bachli, Chicago, and Eugene B. Shapiro, Skokie, Ill., assignors to Chicago Specialty Manufacturing Co., Chicago, Ill., a corporation of Illinois

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1 Claim. (Cl. 137—414)

This invention relates to a new and improved type of ball cock.

One of the objects of this invention is to provide improved means for controlling the flow of the water supply to the flush tank in refilling the tank so that water to the tank will be shut off during the flushing operation.

Another object of this invention is to provide an improved type of ball cock wherein the operation of the ball cock has a delayed action, such that the valve permitting the flow of water into the flush tank will not operate to open until the water level in the tank and the float has dropped to a prescribed extent, so that during the flushing operation the valve will be closed to shut off the flow of water to the tank, thereby eliminating the waste of water inherent in constructions where water is supplied to the flush tank during flushing operation.

Another object of this invention is to provide a ball cock with a delayed action which will not close the valve to shut off the full water flow until the water level and float have risen to the prescribed extent.

Another object of this invention is to provide a ball cock having a delayed action valve and a water pressure responsive diaphragm which operates silently, which parts will not get out of order and wherein servicing and replacement is reduced to a minimum.

Another object of this invention is to provide a ball cock in which there is a predetermined freedom of movement of the float relative to the valve, thereby delaying the operation of the valve for controlling the water until the water level in the tank and the float have reached prescribed limits.

Another object of this invention is to provide means for adjusting and regulating the shut-off and the "on" positions.

Other objects and advantages will become apparent as this description progresses.

In the drawings:

FIGURE 1 is a side elevational view partly in section, showing the application of this invention in a flush tank;

FIGURE 2 is a plan view taken on lines 2—2 of FIGURE 1, showing in particular the ball cock of this invention;

FIGURE 3 is a sectional view taken on lines 3—3 of FIGURE 2, showing the parts in "shut-off" position;

FIGURE 4 is a plan view taken on lines 4—4 of FIGURE 3;

FIGURE 5 is a view taken on lines 5—5 of FIGURE 3;

FIGURE 6 is a sectional view similar to FIGURE 3, but with the parts in "on" position, allowing the water to flow into the flush tank;

FIGURE 7 is a sectional view taken on lines 7—7 of FIGURE 6;

FIGURE 8 is a diagrammatic view showing the uppermost position of the float, with the parts in "shut-off" position;

FIGURE 9 is a diagrammatic view showing the float in its lowered position, with the parts in "shut-off" position and just prior to operation of the parts to open position;

FIGURE 10 is a diagrammatic view showing the float in its lowermost position, with the parts in open position for the filling of the flush tank; and

FIGURE 11 is a diagrammatic view showing the float in its upward movement, with the parts in open position and just prior to operating the parts to "shut-off" position.

The conventional flush tank 10 is provided at the bottom thereof with the conventional discharge pipe 12 communicating with the toilet bowl 14. The overflow pipe 16 communicates as at 18 with the discharge pipe 12. A flush ball 20 is adapted to seat on the flush valve seat 22 and said flush ball is manually lifted by means of a trip lever handle 24 operating a trip lever 26 connected to a wire link 27, in turn connected to rod 28 which is connected to the flush ball 20. The rod 28 is guided by guide arm 30 mounted on the overflow pipe 16. All of the foregoing is conventional.

The bottom of the flush tank 10 is also provided with an opening 32 which through suitable fittings 34 supports a water inlet pipe 36 which is connected exteriorly of the flush tank to the conventional water supply pipe 33. As best seen in FIGS. 3 and 6, the top of the inlet pipe 36 is internally threaded as at 37 to receive an externally threaded renewable seat 38 which extends above the top of the water inlet pipe 36.

Also secured to the top of the water inlet pipe 36 is a housing generally designated at 40 which is formed preferably of two sections. The lower section 42 has a central bottom portion 43 having a depending extension 44. The extension has a central tubular portion 45 which has a press fit engagement with the top of the water inlet pipe 36 for locking engagement therewith. The depending extension 44 is also provided with four equally spaced discharge outlets 46 exteriorly of the circumference of the central tubular portion 45. The lower section 42 of the housing has an internal annular ledge or seat 48 above the bottom portion 43 and an annular wall 50 extending upwardly thereof from which extend laterally triangularly shaped ears 52.

A tube 53 is press fitted to the depending extension 44 and said tube extends around the water inlet pipe 36 and terminates near the bottom of the tank, as best shown in FIG. 1 to communicate with the interior of the flush tank.

The upper section 54 of the housing 40 includes a dome-shaped body 56, the lower portion 57 of which telescopes within the lower section 42 and clamps between it and the lower section 42 an annular diaphragm 58, made preferably of nylon, and a resilient washer 60. The diaphragm rests on the annular ledge or seat 48 and extends across the internal diameter of the lower section 42 and over the water inlet pipe 36 and renewable seat 38, as well as over the four discharge outlets 46 of the lower section. The diaphragm 58 is provided with a central opening 59.

The upper section 54 of the housing 40 is provided with laterally extending triangularly shaped ears 62 identical to the ears 52 of the lower section and all said ears have cooperating threaded bores engaged by threaded bolts 64 for holding the two sections 42 and 54 together and for retaining the diaphragm 58 in position. The two sections form a chamber above the diaphragm designated by the numeral 63 and a smaller chamber 65 below the diaphragm.

The upper section 54 has a central internally depending portion 66 provided at the lower end with a tapering valve seat 67. The depending portion 66 communicates with the interior of the housing and provides a passageway 68 which communicates with the upper chamber 63. The passageway 68 is for the discharge of the water above the diaphragm 58. The passageway 68 communicates with a lateral passage 70 (FIG. 7) in the upper section, which supports a short tubular extension 72 to which is

secured a tube 73 leading to the overflow pipe 16. The tube 73 is the refill tube.

The upper section 54 of the housing 40 has an opening 74 communicating with the passageway 68, which opening supports a plunger 76, the lower end of which has a valve 77 on which an O ring 78 is positioned. The valve 77 serves to close the opening into passageway 68 from the chamber 63. The plunger 76 is operated by means of a rocker arm and float, to be described.

Extending upwardly of the upper section 54 is a pair of spaced ears 80, having alined transverse openings to receive a pin 82 on which is pivotally supported the rocker arm 84. One end of the rocker arm is enlarged to provide a boss 85 which has a transverse opeing 86 which is received on the pin 82. The pin 82 is retained in place by a head at one end and a cotter pin at the other end. The rocker arm 84 has an elongated slot 88 through which the plunger 76 extends. A pair of spring washers 89 and 90 is secured to the plunger on the opposite sides of the rocker arm so that a pivotal movement of the rocker arm will through engagement with the spring washers move the plunger to the up and shut-off position shown in FIG. 3, or to the down and open position shown in FIG. 6. The forward end of the rocker arm 84 terminates in a substantially U-shaped member 91 having spaced legs 92 and 93 forming stops for the pivotal movement of the float rod, to be described. The lower leg 92 of member 91 inclines downwardly. The upper leg 93 and the lower leg 92 each have a threaded opening to each support a threaded adjusting screw designated at 94 and 94' which permits adjustment to limit the pivotal movement of the float rod.

Pivotally secured to the member 91 is a clevis 95 which supports the float rod 96. The opposite sides of the clevis 95 are positioned adjacent the vertical section 97 of the U-shaped member 91 and a cross-pin 98 passing through alined openings in the opposite sides of the clevis 95 and the section 97 of member 91 pivotally secures the clevis 95 to member 91. The forward end of clevis 95 extends between the legs 92–93 of the U-shaped member 91 and same has a threaded opening to receive the threaded end 96' of the float rod 96. The other end of the float rod supports a hollow float 100, made preferably of polyethylene material and having an opening 102 closed by a removal plug 104. The float 100 may be weighted to desired extent by filling with water through the opening 102, sufficient to break valve seal 77. The valve 77 is a delayed action valve and is held in closed position by the water supply pressure, hence the water weighted float 100 breaks the seal of valve 77.

It will be seen that there is a pivotal movement between the float rod 96 with the float 100 thereon as one element and the rocker arm 84 as the other element and that the pivotal movement is adjustable, thus the float 100 moves, for example, downward to a considerable extent when the flush tank 10 is emptying before the float rod 96 operates the rocker arm 84 to in turn operate the plunger 76 and unseat the valve 77 to allow the water to flow into the flush tank for refilling same, and conversely the float rod 96 will on the upward movement of the float and the refill of the flush tank, pivot with respect to the rocker arm 84 and will not operate the rocker arm until the water level is at the point where the shut-off takes place.

The operation of the device will now be described.

When the water level in the flush tank is high and the float is in the position shown in FIG. 8, the parts will be as indicated in full lines in FIG. 3, and also in FIG. 8. The plunger valve 77 will be seated on the valve seat 67, as shown. The chamber 63 will be filled with water as water enters the chamber through the inlet pipe 36 and the diaphragm opening 59. With the plunger valve 77 closed the water is trapped in the chamber 63 above the diaphragm.

The water pressure is hydrostatically equalized on both sides of the diaphragm 58 and this maintains the diaphragm 58 in contact with the top of the renewable seat 38 to close off the upper end of the outlet pipe 36, as shown in FIGS. 3 and 8, to shut off the entrance of water from the inlet pipe 36. Until such time that the plunger 76 is depressed this condition prevails. However, when the toilet is being flushed, as when the flush ball 20 is lifted and the water discharged from the tank into the discharge pipe 12, the float 100 will descend in the tank with the level of the water. While the float 100 descends it will not, however, due to the pivotal connection of the float rod 96 with the rocker arm 84, operate to depress the plunger 76.

As seen in FIG. 9, the float 100 has descended without operating or depressing the plunger 76 to unseat valve 77, thus the water from the inlet pipe 36 is shut off and no water is flowing into the flush tank for refilling same. FIG. 9 shows the lowermost position of the float before it moves to actuate the plunger valve to open position, as in FIG. 10. Thus, the plunger will remain as in FIG. 3, shutting off the flow of water into the flush tank 10 until such time that the float 100 has pivoted the float rod 96 to where it engages the lower adjusting screw 94', at which time it first pivots the rocker arm 84 to in turn cause the plunger 76 and valve 77 thereon to move down, as shown in FIG. 6, to unseat the valve 77.

With the unseating of the valve 77, the water in the chamber 63 heretofore trapped will enter the passage 68 and flow through the lateral passage 70, tubular extension 72, pipe 73, and into the overflow pipe 16, thereby reducing the pressure on the top side of the diaphragm 58 and with the greater pressure against the bottom of the diaphragm, the diaphragm 58 will be lifted, permitting the inflow of water through the inlet pipe 36.

The diaphragm 58 is a metering valve. The area under the diaphragm across the seat 38 is greater than the area of the metering opening 59 which permits the diaphragm to push up and unseat from the seat 38 and allows most of the water to enter chamber 65 below the diaphragm and pass into the four discharge outlets 46 and down the outer tube 53 into the flush tank 10 refilling same. A small amount of the water will pass through diaphragm opening 59 into chamber 63, which subsequently passes through pipe 73 into overflow pipe 16. This operation continues as long as the plunger valve 77 remains unseated, as in FIG. 6.

FIGS. 8 and 9 show the extent of travel or movement of the float without operating the plunger to unseat the plunger valve 77. During this period of flushing operation the shut-off to the flush tank is complete and no water is supplied to the flush tank from the water supply pipe 36. Thus, a saving of water is effected as no water is supplied into the flush tank during flushing. However, as soon as the level of water and the float 100 drops below that shown in FIG. 9, it will operate the rocker arm 84 to depress the plunger 76 and unseat the valve 77, as shown in FIGS. 6 and 10. FIG. 10 shows the lowermost limit of the float with the valve 77 open.

The refilling of the flush tank causes the float 100 to rise, however, it will not actuate the plunger 76 due to the pivotal connection, until the float rod 96 has been moved into engagement with the upper adjusting screw 94. At the time the upward movement of the float rod 96 will pivot the rocker arm 84 on pin 82 upwardly to move the plunger 76 upward, seating plunger valve 77 to close entrance to passage 68 and trap the water in the chamber 63 so that the pressure in the chamber 63 maintains the diaphragm 58 in the position shown in FIG. 3, shutting off the flow of water into the flush tank 10, as heretofore described. The cycle of operation is repeated.

In the upward movement of the float during the refilling of the flush tank, the valve 77 is still in open position at the level shown in FIG. 11, however, as the float moves about that level shown it will operate to close the valve 77. It will be seen that while the valve 77 is open (FIG. 6) and the flush tank is being refilled, the water is also flowing from chamber 63 into passageway 68,

pasage 70 and pipe 73 into overflow pipe 16. The adjusting screws 94, 94' permit adjustment and regulation of the shut-off and opening of the water supply, thus the timing of the shut-off and "on" may be regulated.

With this construction very little pressure is needed to operate the diaphragm, therefore, the diaphragm may be made very thin and it will have a long life. The parts will not require servicing. Furthermore, the operation is almost silent and economies are effected by a saving in water.

It will be understood that various changes and modifications may be made from the foregoing without departing from the spirit and scope of the appended claim.

What is claimed is:

Control means for a flush tank, comprising a water inlet pipe, a chamber communicating with the inlet pipe, a first outlet from said chamber communicating with the flush tank, a diaphragm supported in said chamber above said first outlet for closing said first outlet, an upper chamber above said diaphragm, said diaphragm having an opening permitting the passage of water from the inlet pipe to said upper chamber when said diaphragm has closed said first outlet, a depending portion extending into said upper chamber and providing a first communicating passageway with said upper chamber, a lateral passage communicating with said first communicating passageway and forming a second outlet, a plunger extending into said first communicating passageway for vertical movement, valve means on said plunger wholly within said upper chamber for closing the entrance to said first communicating passageway, means for operating said valve means so that the water in the upper chamber discharges through said second outlet and reduces the hydrostatic pressure on said diaphragm and allows said diaphragm to move to open said first outlet and permit water from the inlet pipe to pass through said first outlet, and an arm extending above the top of said upper chamber and having a first lost-motion connection with said plunger, float means having a pivotal second lost-motion connection with said arm for operating said arm and providing the sole means for moving said plunger vertically in either an upward or downward movement, said first and second lost-motion connections permitting the valve to remain in its extreme position until the second lost-motion connection has been moved to its upper or lower position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,228,552	Arbogast	Jan. 14, 1941
2,895,707	Bailey	July 21, 1959

FOREIGN PATENTS

17,344	Great Britain	Sept. 15, 1893
102,794	Sweden	Oct. 14, 1941
122,123	Sweden	June 29, 1948
153,027	Australia	Aug. 31, 1953
519,147	Canada	Dec. 6, 1955