ABSTRACT OF THE DISCLOSURE

A ball cock valve assembly is provided for regulating the water supply in a water closet tank. In the plumbing art a ball cock valve for a water closet tank is the type of water supply control valve which is provided with a float-equipped control arm or lever as an automatic means of operating a movable valve element. A hollow ball connected to the end of the lever arm is gravity-actuated to cause the valve element to move to an open position and allow water from an upstream supply pipe to flow through the valve and fill the storage tank and bowl of a water closet. As the level of the water in the tank rises, the hollow ball floats thereon and moves the end of the lever upwardly, causing the valve to close and restrict the flow of water into the tank.

Conventional ball cock assemblies may be generally classified as two basically different types in accordance with their mounted location within the tank; one is the type that is mounted in a submerged position within the water tank at close proximity to the tank's bottom; the other is the elevated type of ball cock assembly that is mounted above the water level within the tank by means of its attachment to the upper end of a vertical inlet tube or standpipe that is in water-flow communication with the household cold water supply source.

The latter type of ball cock assembly may be further subdivided into two principal types which differ primarily in valve element structure. One utilizes a disc-like flexible element or diaphragm valve that is arranged by means of mechanical linkage to be successively depressed and released through movement of the lever arm; the other employs an internal valve arrangement comprising a sleeve-supported plunger that is linked to the lever arm for reciprocation thereby.

Our invention is specifically directed to the latter type of ball cock assembly wherein the housing of the assembly is stationarily elevated above the level water in a water closet tank, with the housing supporting therein a lever-actuated vertically-reciprocating plunger. We have developed our invention to particularly meet the need for a ball cock valve assembly having an improved and greatly simplified anti-siphon means to prevent the occurrence of a pressure differential between the interior of the housing and the ambient atmosphere.

Modern plumbing codes require that plumbing fixtures be provided with a means to prevent back-siphonation as a precaution against contaminating a household water supply. Such back-siphonation can occur when the water supply to a household is temporarily shut off or the pressure of the water supply is substantially reduced to cause formation of a partial vacuum or low pressure region in the supply line. In the absence of an anti-siphon means on a ball cock valve assembly, back-siphonation will most often occur when there is a drastic drop in water pressure or the water supply is shut off immediately after the toilet tank flush valve has been manually actuated. At this time the chamber within the storage tank is being refilled by a flow of water from the open ball cock valve. The comparatively greater pressure of the water within the storage tank will force the water to flow in a reverse direction and back through the open valve toward the low pressure region within the upstream water supply pipe, thus depositing contaminated water therein which may be later drawn off for drinking or cooking purposes.

It is acknowledged that ball cock assemblies have been heretofore introduced which include anti-siphon means. Such valves of the prior art have one characteristic in common; they are overly complicated in their design and construction. Consequently, production costs are excessive, and undesirable difficulty is often encountered by the plumber or home repairman in overhauling the valve or replacing worn parts in its mechanism.

It has thus been an object of our invention to provide a simplified anti-siphon ball cock assembly that may be economically fabricated and assembled for installation in a water closet.

Another object of our invention has been to provide an anti-siphon ball cock valve mechanism that is relatively uncomplicated in its construction so that it can be easily adjusted for proper operation and can be quickly and inexpensively repaired without necessitating removal of the assembly from its installed position in a water closet tank.

A further object of our invention has been to provide a ball cock assembly having all its movable parts and other parts thereof which are susceptible to normal wear not only easily removable and replaceable but relatively simplified in design so that they are adaptable to mass production methods and can thus be made immediately available as stocked replacement items.

It has also been an object of our invention to provide a ball cock assembly that is easily adjustable to compensate for variations in upstream water pressure and to regulate the depth of stored water within a water closet tank.

Our invention resides in the construction, arrangement, and combination of the various parts of our improved and simplified ball cock assembly, whereby the objectives and features contemplated are attained as hereinafter more fully described and as specifically set forth in the appended claims. The objects and various advantages of our invention will be best understood from the ensuing detailed description when read with reference to the accompanying drawings in which:

FIGURE 1 is a partial front elevational view of a water closet tank, with the front wall thereof cut away in vertical section to illustrate our ball cock assembly in its mounted position for operation in combination with a conventional flush valve.

FIGURE 2 is a side and elevational view of a water closet tank having the end wall thereof cut away in vertical section to show our ball cock assembly as taken from the left side of our assembly as shown in FIGURE 1.

FIGURE 3 is a view taken from a point directly above the end portion of a water closet tank to show a top plan view of our assembly.

FIGURE 4 is a view in enlarged scale of a portion of FIGURE 1.
Figure 5 is an elevational view of our invention in partial vertical section, illustrating the position of various parts of the device when the valve is in its open position to allow water to flow through the assembly.

Figure 6 is a partial vertical section similar to Figure 5, here showing the relative positioning of movable parts when the valve mechanism is closed to prevent water from passing through the assembly.

Figure 7 is an exploded view in partial vertical section taken from the same direction and on the same scale as Figures 5 and 6, illustrating details of some of the parts or elements in the construction of our invention.

Figure 8 is a top or plan view of a closure plug first shown in vertical section in Figures 4, 5, and 6, and is utilized to illustrate details of one of the elements of the device that is removable for servicing or replacement.

Figure 9 is a top plan view of a valve seating sleeve which is first shown in vertical section in Figures 4, 5, and 6, and illustrates details in the construction of another removable and replaceable element of our assembly.

In Figure 1 there is shown a water closet tank or water supply storage vessel having a liquid-retaining wall. The wall is constructed to define openings through the bottom portion thereof and enclose interior storage area or chamber A having mounted therein a conventional flush valve mechanism which will operate cooperatively with our anti-siphon ball cock assembly so that the chamber A and a flush bowl (not shown) may be repeatedly flushed and refilled.

The flush valve mechanism 17, which is typical of such valves in the plumbing art, comprises a drain opening portion or annular hollow base member 17a having extending downwardly therefrom a flush line or drain pipe 17b which extends through the opening 8c and is held stationary by conventional mounting means which also sealably contains stored water within the chamber A. The lower end (not shown) of the drain pipe 17b would be connected in water flow communication with a toilet or flush bowl. The flush valve 17 further comprises a flush ball or valve element 17c which is sealably held by pressure of the water against an annular valve seat collar portion 17d extending upwardly from the base member 17a.

For each flushing operation, the flush valve 17 is actuated (by conventional manual means not shown) and the flush ball 17c is caused to move upwardly away from the valve seat collar 17d to allow water from the chamber A to gravitate downwardly through the drain pipe 17b to assist the toilet bowl. The ball 17c then floats downwardly upon the receding water until it resists against the valve seat collar 17a to cause water to again rise in the chamber A.

A flush valve of this type is ordinarily furnished with a water-flow by-pass means for receiving reflux water from the ball cock assembly and directing it directly to the toilet bowl. Such a means is shown in Figure 1, comprising a water receiving pipe 17f, commonly referred to as an overflow pipe, which has its lower end connectively joined to a drain inlet passage 17e. The drain inlet passage 17e is an integral extension of the drain opening or base member 17a and carries reflux water from the ball cock assembly 18 to the flush L 17b at the same time that storage water is being backed up in the chamber A.

Referring to our ball cock assembly 18, particularly as shown in Figures 1, 2, and 4, water from the household cold water supply source is directed to the vicinity of the tank 8b by means of an upstream pipe or conduit 10 that is connected in water-flow communication with a water supply tubular member or standpipe 11. The standpipe 11 conducts the flows of water to a horizontally-elongated valve housing or casing 20 of the assembly 18. A conventional mounting means 12 joins the upstream pipe 10 to the standpipe 11 and serves to sealably-contain stored water within the chamber A. The standpipe 11 thus serves also as a support member for stationarily mounting the housing 20 in its elevated position.

In Figures 1 to 5, our anti-siphon ball cock assembly is shown as being provided with an anti-siphon device having connected thereto the water supply tubular or standpipe 11. Extending downwardly from the housing 20 in a substantially parallel relation to the standpipe 11 is a water outlet conduit or hose pipe 41, the purpose of which is to direct a refilling flow of water from the housing 20 to the chamber A after each flushing operation.

The pipe 41 is extended downwardly so that its lower end is submerged beneath the level of water within the chamber A as to provide a means of muffling the gurgling noise of water spilling into the chamber A.

A second means of conducting water from the housing 20 is provided by a flexible outlet tube or bowl-refilling hose 42 which extends upwardly from an intermediate opening in the top of the housing 20 and has its outer end turned downwardly and inserted into the upper open end of the flush valve overflow pipe 17f.

A vertically-translatable or axially-rotatable plungor 23, which is housed substantially within the housing 20, has the upper end of stem 23d thereof projecting above the housing 20, where it is movably connected to actuating means or lever arm linkage 33. Also projecting upwardly from the top of the housing 20 is the upper portion of a vented protective cap or sleeve-like member 40, having side openings or oppositely-facing air vents 40a.

As shown in Figures 5, 6, and 7, the housing 20 encloses a substantially cylindrical sleeve-like water control chamber or valve passageway B. Laterally adjacent and in fluid communication with the valve passageway B is a water distribution region or outflow chamber C. The cylindrical chamber B serves as a piston cylinder or plungor bore in which the reciprocating plungor 23 is movably supported. The outflow chamber C, during the operation of our device, receives water moving upwardly through the standpipe 11 and through a valve arrangement in the cylindrical chamber B. The chamber C distributes the water both downwardly through the outlet pipe 41 to fill the closor chamber A, and upwardly to the flexible tube 42 which guides the refill flow of water ultimately to the toilet bowl.

Referring again to Figure 7, the housing 20 is provided with an internally-threaded lower inlet collar portion 20a which is internally cored to open into the bottom of the valve passageway B. The inlet collar portion 20a is adapted by means of internal threads to receive a valve seating sleeve 21 that threadably screws downwardly into the inlet collar 20a. With the valve seating sleeve 21 in its seated position within the inlet collar 20a, an annular positioning flange 21c of the sleeve 21 will register on an annular ledge 20c provided on the upper end of the collar 20a. The sleeve 21, in its seated position, occupies and registers circumferentially with approximately half the length of the internal threaded area within the collar 20a. The remaining length of the collar 20a is for threadably-receiving and sealably-engaging with the externally-threaded end 11a of the standpipe 11.

The housing 20 is further provided, through its upper wall, with an internally-threaded opening 20e. The opening 20e provides access for the internal insertion of the sleeve 21 down through the chamber B to its seated position in the collar portion 20a, but serves the primary purpose of adaptively receiving a bushing or containing nut or plug 26. The plug 26 then serves to centrally support the vertically-elongated plungor 23 which operates within the cylinder B, as will be hereinafter described in greater detail.

There is shown also in FIGURE 7 the upwardly-projecting nipple or bowl-refilling outlet portion 20f of the housing 20 which has an annular saw-tooth outer con-
figuration so that the end of the flexible tube 42 may be forced therefore to provide a means of passing water from the chamber C to a toilet bowl.

Projecting centrally-downwardly into the chamber C is a cylindrical opening or annular sleeve portion 20c shaped to receive and support a vented protective cap or air intake element 40. The annular sleeve portion 20g is delicately projected downwardly into chamber C to permit sufficient air intake therethrough to prevent back-siphonage while preventing the exodus of water therefrom. The air intake element 40 serves to prevent foreign particles from falling in through the cylindrical portion 20g. Directly below the annular sleeve portion 20g and through the floor of the chamber C is an internally-threaded outlet opening or discharge passageway 20h. The outlet opening 20h is constructed to sealably-receivable the threaded end 41a of the hose pipe 41.

The cylindrical chamber or valve passageway B is defined by a housing wall portion 20h having a circular horizontal cross section, with part of the sidewall thereof formed by a downward-protruding casting or internal body portion 20b. The air intake element 40 serves to prevent the various parts of our ball cock valve assembly that operate with respect to the chamber B will be best understood through consideration of their chronological installation into position within the housing 20.

In assembling the various parts, the valve seating sleeve 21 is first inserted, with its threaded end 21a downward, through the opening 20c. The valve-seating sleeve 21 is installed in the floor of the chamber B, where it is screwed downwardly into the opening through the internally threaded collar portion 20a of the housing 20. The sleeve 21 is rotatably-inserted into the collar portion 20a until its annular positioning flange 21c registers firmly on the annular flange-seating ledge 20c.

As shown in FIGURE 9, the removable valve seating sleeve 21 has an axial bore 21d which allows water to pass therethrough and into the housing 29 from the standpipe 11. The sidewall of the bore 21d has pairs of counter-positioned longitudinal grooves, giving the bore 21d a semi-cylindrical shape with a four-cornered configuration to permit tightening of the sleeve 21 into the internally-threaded collar 20a by means of a flat-bladed tool such as a large screwdriver.

After installing the sleeve 21 in its seated position, an upper cylindrical portion 22a of resilient hat-shaped valve element 22 is press-fitted into the downwardly facing bore 23a of the plugger or vertically-elongated piston 23, with the disc-like valve seat portion 22b of the element 22 registered firmly within a complementary circular recess 23b provided in the end of the plugger 23. An O-ring or elastically resilient gasket or sealing ring 24 is stretched slightly to allow it to be passed over the lower end of the plugger 23 to where it contracts to a clamping fit within an annular groove 23c. Then, a resilient washer or diaphragmatic cushioning element 25 is slipped down over the stem portion 23d of the plugger 23.

The plugger 23, now supporting the valve element 22, the O-ring 24, and the washer 25, is then inserted down through the opening 20e of the housing 20. The plugger 23 is inserted downwardly through the chamber B until the circular outer edge of the disc-like face portion 22b of the valve element 22 is abutted against the annular valve seat portion 21b of the sleeve 21.

With the plugger thus positioned within the chamber B, the closure plug or containing nut 26 is slipped over the stem 23d of the plugger 23, and the threaded end portion 26d of the plugger 26 is screwed downwardly into the internally threaded opening 20e of the housing 20. As shown in FIGURE 8, the enlarged upper end portion 26b of the closure plug 26 is suitably shaped to permit its final tightening rotation by means of a wrench. By rotatably-tightening the closure plug 26 down into the opening 20e, the installation of the valve arrangement within the chamber B of the housing 20 is completed.

The downward-facing end surface of the closure plug 26 is provided with a circular recess 26a which surrounds the end of the opening 20e. Thus, putting downwardly from the lower end of the plug 26 is an annular, outer-edge, extended portion or ridge 26c.

With the closure plug 26 rotatably-tightened down into the opening 20e, the annular ridge 26c compresses or engages against the outer peripheral edge of the washer 25, thereby compressing the washer's outer edge against the annular seating ledge 20d of housing 20 to form a firm annular seal therewith. The washer 25 is thus positioned with its outer peripheral edge stationarily gripped between the ridge 26c and the ledge 20d, while the central portion of the washer 25 circumferentially surrounding the plugger stem 23 is spaced in a spaced-apart relation in respect to the downward-facing end of plug 26.

In addition to serving as a gasket or means of sealing the closure plug 26 against the seating ledge 20d of the housing 20, the washer 25 also cooperatively serves in combination with the valve element 23 as a resilient stopping or impact-absorbing means for cushioning and silencing the movement of the vertically-reciprocal plunger 23. The body of the plunger 23 impacts against the undersurface of the washer 25 and the washer flexes upwardly to absorb shock at the end of the upward stroke and furtherveses as a sound-absorbing means of braking the plunger 23. The valve element 22 is purposely designed with the substantially thick disc-like lower seating portion 22b. The hat-shaped resilient element 22 also has a substantially large upper body as compared to valve elements generally used for the same purpose. The plug-like upper end 22a of the valve element 22 is substantially large in vertical cross section and has a substantial surface area contiguous to the body plunger 23. The valve element 22 will thus serve as a means of cushioning and silencing the plunger 23 when it completes its downward reciprocation by the disc-like portion 22b contacting, against its underside, the annular valve seat 21d.

In a preferred modification of our assembly, as shown in FIGURE 5A, the resilient washer 25 is not utilized. Instead, the enclosure plug 26 is rotated downwardly to the opening 20e of the housing 20 so that the annular ridge 26c at the lower end of the closure plug 26 abuts firmly against the seating ledge 20d. Therefore, at 20d, the end of the upward movement of the plunger 23, the piston-like body portion of the plunger 23 impacts against the end or underside of the closure plug 26.

A dome-shaped cover or splash cap 27, having a centrally-disposed hole or opening 27a, is included in our assembly to shed water away from the shaft or upper stem portion of the plunger 23. The splash cap 27 is preferably of a resin composition and is semi-resilient or elastic so that it will yield in the area of its central opening 27a to permit it to be slidably snapped over the stem end portion of 23f, after which it will resume its original shape to conformedly fit in an annular groove 23e.

With reference to FIGURE 4, the housing 20 is provided with a side projection or offset mounting portion 20i for supporting a lever arm support bracket 30. The housing projection 20i has a laterally-elongated recess or groove 20j into which a complementary shaped ridge 30b mountably-engages. The ridge 30b is an integral extension of the lower base portion 30a of the bracket 30, and by its engagement in the recess 20j, prevents shifting of the bracket 30. Screw 31 is extended through the base portion 30a and is threadably secured in the projection 20i to stationarily maintain the bracket 30 in its mounted position.

The upwardly extended end of the support bracket 30 is a bifurcated mounting portion comprising two spaced-apart parallel arms 30c and 30d which, in combination with a thumb screw 32, constitute a pivot support or fulcrum for an actuating arm or lever 33a. The horizontal
fulcrum pin or pivot element or thumb screw 32 has a threaded shank or end 32a which extends through the support arm 30c and thence centrally-transversely through the lever arm 33a. The threaded end 32a of the thumb screw 32 is threadably secured to the support arm 30d for the purpose of pivotally mounting the lever arm 33.

The actuating linkage or lever arm assembly 33 is comprised of a substantially short rod portion or lever 33a and a relatively larger end portion or rod extension 33b. As is typical in design of such linkage, the lever 33a is preferably provided with an integral internally threaded collar end portion 33c which threadably-engages one end of the lever extension portion 33b. The other end of the lever extension 33b is threadably-secured into an internally threaded socket portion 34a of a hollow ball or float 34.

The arm or lever 33a is further provided with a connector portion in the form of a back-end cylindrical extension or projecting lug 33d. The lug 33d is centrally bored to provide an internally threaded opening 33e which permits the passage of an adjustable connecting means or set screw 35 therethrough. The set screw 35 is installed with its threaded shank 35a extending downwardly through and beyond the cylindrical extension 33d so that the end of the shank 35a contacts against the upper flat end-face 35b of the plunging stem 26d.

The connecting means or set screw 35 is easily adjusted by means of a screw driver. The screw 35 is positioned with the head thereof facing directly upwardly so that an increased opening movement of the valve element requires the removal of the lid (not shown) of the water closet storage tank 8. With reference to FIGURE 4 it will be seen that the space between the plunging stem end-face 23b and the lever lug 33d may be increased or decreased by adjustment of screw 35 to regulate the distance of travel of the plunging 23 within the cylindrical chamber B of the housing. Adjustment of the set screw 35 to increase the distance between the bottom of the lug 33d and the stem end-face 23b will proportionately decrease the size of the "throat" or water passageway area through which incoming water may flow between the valve element 22 and the annular valve seat 21b (FIGURE 5).

Thus, the water passageway area may be regulated in accordance with prevailing water pressure. High water pressure will require that the set screw 35 be adjusted to limit the movement of the plunging 23, allowing only limited opening movement of the valve element 22. For low water pressure the screw would be oppositely-adjusted to permit relatively greater upward movement of the valve element 22.

Although the means of substantially changing the height of the water level w within the storage chamber A of the water closet tank 8 is generally accomplished by slightly bending the arm extension 33b of the lever linkage 33 either up or down to change the position of the float ball 34, the set screw 35 may be employed as a "fine" adjustment means for slightly varying the height of the water level within the storage chamber A, within the limits that water pressure requirements will permit.

The operation of our assembly, as with a conventional ball cock valve assembly, is dependent for its actuation upon the manual actuation of the flush valve 17 (shown in FIGURE 1). With the flush valve 17 in its normally closed position, that is, with the flush ball 17c sealably-seated against the annular valve seat 17d, the water w within the chamber A of the tank 8 causes the ball 34 to float, thus exerting an upward force against the lever linkage assembly 33. This upwardly-directed force is translated to the plunging 23, which is pressed downwardly to maintain the valve element 22 against the valve seat 21a, thus preventing water from the standpipe 11 from entering the housing 20.

When the flush valve 17 is manually actuated or "tripped" to raise the flush ball 17c, the stored water within the chamber A drains therefrom outwardly through the flush L 17b to rinse the toilet bowl. As the level of the water w in the chamber A recedes, the float ball 34 floats downwardly, causing the lever 33a to swing on its fulcrum or pivot point. The cylindrical projection or projecting lug 33d of the lever arm 33a is thus raised upwardly, carrying screw 35 therewith. With the downward force thus removed from the plunging 23, pressure of the household water supply in the standpipe 11 will cause the plunging 23 to move upwardly and permit water to flow from the standpipe 11 and inwardly over the valve seat 21b, and thence into the water distribution chamber C.

The valve arrangement of our assembly is automatically closed to halt the water flowing into the chamber C by action of the rising water level in the chamber A of the tank 8. At the end of the bowl flushing operation, the flush ball 17c seats by force of gravity against the annular valve seat 17d. Inflowing water from the flush pipe 41 begins to refill the chamber A, and as the water level therein begins to rise, sufficient pressure is exerted downwardly against the flush ball 17c to maintain it in its sealed or closed position. The rising water in the chamber A also causes the float ball 34 to float upwardly so that the plunging 23 is pressed downwardly by the pivoting lever linkage 33 to interrupt the water flow moving into the housing 20 from the standpipe 11.

The cylindrical portion 20a which extends downwardly into the water distribution chamber C provides an inexpensive and simplified means of venting the interior of the housing 20. Such venting or provision for atmospheric communication is desirable to assure that pressure within the chamber C is never less than the exterior or ambient pressure. The protective cap or sleeve-like element 40 is designed so that the lower end thereof can be inserted or press-fitted into the cylindrical portion or venting means 20c. The laterally-facing vents or openings 40c are preferred, since an upwardly facing opening would tend to permit dirt particles to fall into the chamber C.

In the embodiments of our invention shown and described herein, the housing 20 and many of the movable and the renewable parts of the assembly may be preferably constructed of a resin material such as high density polyethylene or nylon or the like. Such construction reduces the cost of producing our assembly, materially prolongs its useful life, and greatly simplifies future servicing of the assembly.

Plumbing fixtures which are installed in a damp environment or in constant contact with water tend to build up electrolytic deposits when constituent parts formed of unlike metals are in contact with each other. Thus, the use of a chemically inert resin composition for the construction of various parts in the assembly tends to substantially reduce this problem. The parts of the assembly thus do not become "welded" by oxidation-reduction reaction. Threaded parts do not become frozen in position and are more easily removed for servicing or replacement. Rapid build up of deposits which would tend to cause moving parts of the assembly to snag or jam against adjacent stationary parts is avoided.

While proper choice of material utilized for the construction of various parts of the preferred embodiment of our assembly provides a means of reducing its production cost and increasing its useful life, no limitation to the use of such material is intended; the provision of metal in place of plastic for the construction of such parts is considered within the scope of the invention and the alternative use of plastic, either rigid or resilient, for the construction of the various parts of the assembly is expressly anticipated.

Although only certain parts are symbolically indicated in the accompanying drawing as being composed of a resin material, in a prototype of our assembly that we have constructed, all the parts of our assembly, with the exception of the standpipe 11, the upstream supply pipe 10, the connecting means 12, the reciprocal plunger 23,
the lever linkage 33, and the set screw 35, are of a resin composition.

A critical feature of this invention is the provision of the annular sleeve-like portion 20g which extends downwardly into the water distribution chamber C of the housing 20. The sleeve-like portion 20g functionally cooperates with other portions of the housing 20 to effect the distribution of water from the chamber C. This feature can best be understood by considering how water would be distributed from the chamber C if the cylindrical projection 20g was removed, and the anti-siphon means comprised only the opening or hole through the upwardly-facing wall of the housing above chamber C. In such a construction, water flowing inwardly from the standpipe 11 would pass over the annular valve seat 21d and thence toward the chamber C. The water would tend to be dispersed in three directions: upwardly and outwardly through the nipple portion 20f, downwardly through the hush pipe 41, and outwardly through the opening in the rear upper wall of the chamber C.

However, as shown particularly in FIGURES 5 and 6, we provide for a housing projection 20k in the form of a separating wall which extends upwardly from the floor of the housing 20 and transversely between opposite sidewalls thereof. Thus, water passing to the chamber C is caused to follow a sine wave pattern over the wall-like projection 20k and then is directed downwardly beneath the lower end of the cylindrical portion 20g to empty out through the hush pipe 41. The cylindrical portion 20g acts cooperatively with the floor projection 20k to "throttle" the flow of water moving into the chamber C. The water flowing into the chamber C is thus caused to move through a restricted passage or orifice formed between the upper edge of projection 20k and the lower end of portion 20g that tends to increase the velocity of water moving beneath the portion 20g and to the hush pipe 41. This results in a slightly lower pressure area directly below the cylindrical portion 20g so that air will be drawn in through the openings 40a downwardly to join the water that spills out of the chamber C and down through the hush pipe 41. Therefore, air is free to enter the chamber C by way of the anti-siphon means hereinafore described and water will not tend to pass upwardly therethrough.

While preferred embodiments have been shown and described to clearly illustrate the concept of our invention, it is understood that our invention is subject to other modifications within the spirit of the invention and the scope of the appended claims.

We claim:

1. In a ball cock assembly adapted to be mounted in a water closet and having a housing defining an inlet chamber, a side-connected bowl and tank refilling chamber, a water inlet fitting open to a bottom portion of the inlet chamber, a valve seat about the inlet fitting within the inlet chamber, and a vertically reciprocating valve member in the inlet chamber, the improvement which comprises an open top end portion in the inlet chamber of sufficient size for insertion and removal of the valve member therefrom, a closure plug removably-secured in said open top end portion, the valve member having an operating stem slidably-projecting centrally-upwardly through said closure plug above said housing, the valve member having a downwardly-projecting annular edge about the lower end thereof defining a recessed central end portion therein, a substantially planar resilient washer having an outer edge portion compressively-positioned between said valve stem and the housing thus defining an open space with said recessed central end portion, said washer having a central opening through which said stem extends centrally-upwardly through said closure plug, and said washer being positioned for engagement by an upper end of the valve member when it is moved to an open position with respect to the valve seat.

2. In a ball cock assembly as defined in claim 1, the valve member having a central bore portion open to its bottom end and surrounded by a recess portion, an inverted T-shaped resilient plug-like valve element positioned within said bore and recess portions to project downwardly from the lower end of the valve member for movement with the valve member into and out of closing-off engagement with the valve seat.

3. In a ball cock assembly adapted to be mounted in a water closet and provided with a housing having a vertical inner and a vertical outer wall defining a water inlet chamber and having a vertically-reciprocating valve member in the inlet chamber for opening and closing movement with respect to the valve seat, the improvement which comprises: an open top end portion in the inlet chamber of sufficient size for insertion and removal of the valve member therethrough, a closure plug removably-secured in said open top end portion, the valve member having an operating stem slidably-projecting centrally-upwardly through said closure plug above the housing, the bowl and tank refilling chamber being defined by a substantially horizontally-extending portion of said housing that is open to the inlet chamber adjacent the valve seat, the bowl and tank refilling chamber having an intermediate wall projecting upwardly therewithin adjacent the opening to the inlet chamber and defining a restricted inlet flow passageway with the vertical inner wall of the housing, said intermediate wall having a height greater than the opening to the inlet chamber for directing water being introduced from the inlet chamber in an initial upward flow path within the bowl and tank refilling chamber, a bowl filling fitting in an upper wall of the housing and projecting upwardly therefrom in a position in adjacent vertical alignment with said intermediate wall, a tank supplying water outlet portion open through a lower wall of the housing transversely-outwardly beyond said intermediate wall, a hollow annular vent projecting downwardly-inwardly from the upper wall within the housing and in substantially vertical alignment with said tank supplying water outlet portion for always maintaining atmospheric air pressure within the bowl and tank refilling chamber, whereby negative pressure applied to the inlet chamber will be ineffective in causing a back flow of water into the inlet chamber and out of the inlet fitting.

4. In a ball cock assembly as defined in claim 3, a protective cap element projecting downwardly into said annular vent and having a closed top end for preventing foreign particles from dropping into the bowl and tank refilling chamber, and said cap element having at least one side vent above the housing and open to the atmosphere.

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