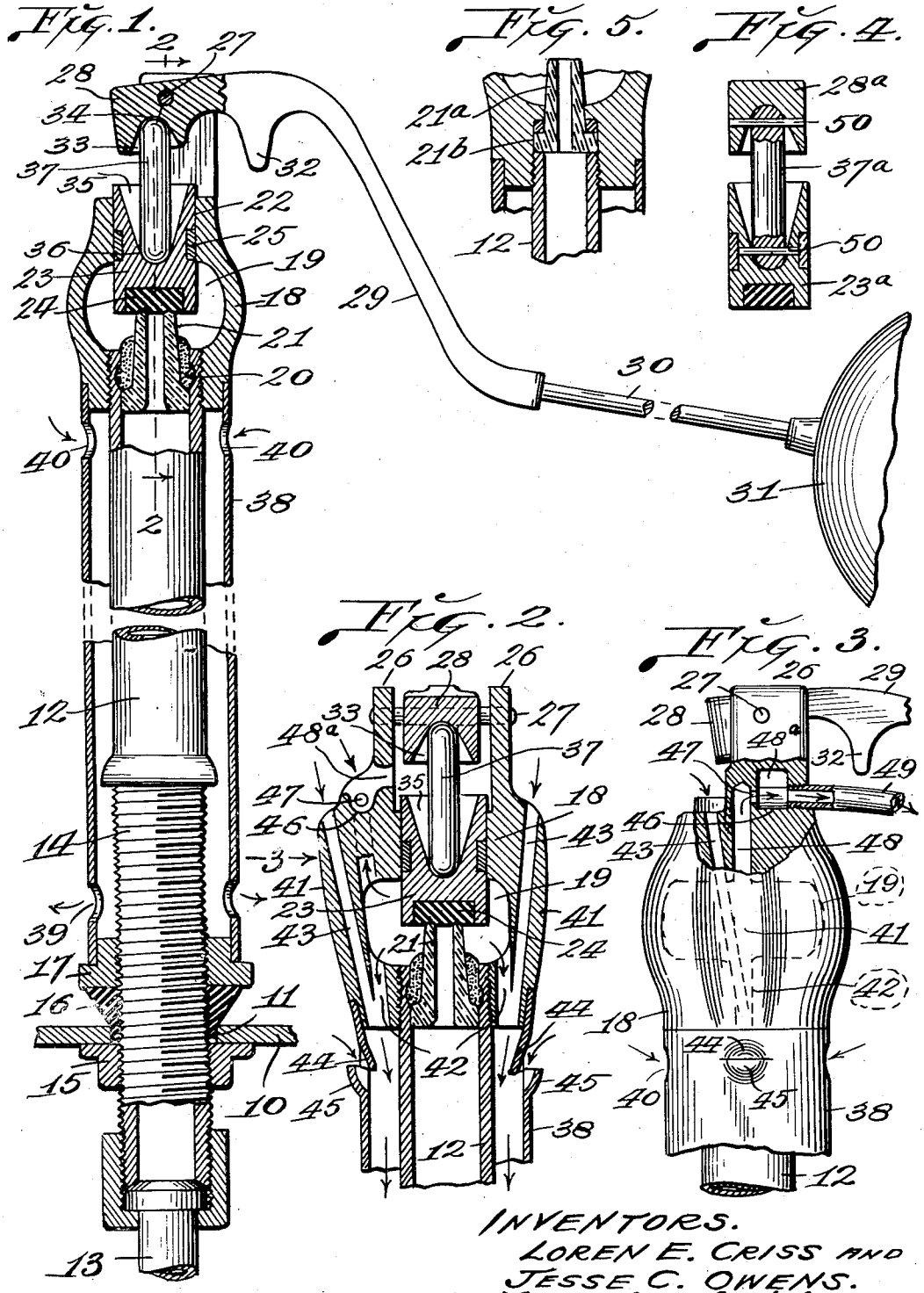
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ANTISIPHON BALL COCK AND SILENCER

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ANTISIPHON BALL COCK AND SILENCER

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Our invention relates generally to ball cock valves of the type particularly designed for use in connection with toilet flush tanks, and the structure herein set forth is an improvement upon United States Letters Patent Number 2,283,973, issued May 26, 1942, to Loren E. Criss, also the constructions forming the subject matter of the following copending patent application: Antisiphon ball cock and silencer, filed by Loren E. Criss on December 16, 1940, Serial Number 370,395, and the application of Jesse C. Owens for Siphonic valve and the like, filed June 17, 1940, Serial Number 340,934, now Patent No. 2,090,145, granted July 14, 1942, and the application of Jesse C. Owens on Siphonicproof valve for toilet tanks and the like, filed May 24, 1939, Serial Number 275,447.

The principal objects of our invention are to generally improve upon and simplify the construction of the valves described in the aforesaid patent and patent applications, to provide a ball cock flush valve that is particularly adapted for controlling and preventing fluid contamination when the valve passage is closed by permitting air to pass through the outlet pipe of the valve, and thereby prevent any siphonic action of water through the valve into the water supply pipe to which the valve is connected and further, to construct the valve so that it may be firmly secured to the flush tank with the valve and valve operating parts at different elevations as may be required for tanks of different heights. Further objects of my invention are to provide a ball cock flush valve of the character referred to wherein the noise incident to the flow of water through the valve during the valve operation, and while the tank is re-filling is greatly minimized, if not entirely eliminated, further to provide an improved form of ball bearing leverage between the float actuated lever and the valve that controls the flow of water into the valve housing, and, further to provide the valve with a tubular shell which is particularly designed for minimizing the noise incident to the flow of water from the valve housing into the toilet tank.

With the foregoing and other objects in view, our invention consists in certain novel features of construction and arrangement of parts which will be hereinafter more fully described and claimed, and illustrated in the accompanying drawing, in which:

In the drawing:

Fig. 1 is a vertical section taken through the center of our improved valve.

Fig. 2 is a vertical cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is an elevational view taken looking in the direction indicated by the arrow 3 in Fig. 2 with the upper portion of the valve housing in section.

Fig. 4 is a vertical section of a modified form of the anti-friction toggle connection between the float carrying arm, and the valve.

Fig. 5 is a detailed section showing a modified arrangement for anchoring the water inlet nipple in the valve.

Referring by numerals to the accompanying drawing which illustrates a preferred embodiment of our invention, 10 designates the bottom of a toilet tank, and formed therethrough is an opening 11 through which passes the lower portion of a vertically disposed tube 12, the lower end thereof below the tank being connected by conventional means to a water supply pipe 13.

A considerable portion of tube 12 from its lower end upwardly is screw threaded as designated by 14 in order to enable the tube 12 to have a wide range of vertical adjustment so as to position the valve housing carried by the upper end of the tube to occupy the proper position in flush tanks of different heights, and screw seated on this threaded portion of the tube and bearing against the under-side of the bottom 10 of the tank is a nut 15. Surrounding the threaded portion 14 of the tube directly above the bottom 10 is a packing ring 16, preferably or rubber, that is squeezed downward against the tank bottom and tube 12 by a nut 17 which latter is screw seated on the threaded portion 14 of the tube, thus providing a watertight joint between the tube and tank bottom 10.

The upper end of tube 12 is screw seated in the lower portion of a valve housing 18, in the central portion of which is formed a chamber 19. Seated in the upper end of tube 12 and secured thereto in any suitable manner, preferably by means of cement 20, is a nipple 21 of earthen material, such as porcelain or glass, and the upper end of this nipple terminates in the central portion of chamber 19. Formed in the upper portion of valve housing 18 is a vertically disposed opening 22, and arranged for slight movement therethrough is a short cylindrical valve body 23 in the lower end of which is seated a disc 24, preferably of rubber, which is adapted to rest on the upper end of nipple 21 thereby effectively cutting off the flow of liquid therethrough.

Seated in the periphery of the valve body 23 is a packing ring 25 which maintains a tight joint between the valve body and the housing. Formed integral with and projecting upwardly from the top of valve housing 18 to the sides of the opening 22 are a pair of parallel lugs 26, in which are seated the ends of a pin 27 and journalled on said pin between said lugs, is a block 28 which is formed integral with one end of an arm or lever 29, and to the end of this

arm, opposite the block, is secured the rod 30 that carries at its outer end a float 31.

Formed integral with the underside of arm 29, adjacent the block 28, is a depending lug 32 which is adapted to strike against the upper portion of the valve housing 18, thereby limiting the downward movement of the float as the water discharges from said tank during a flushing operation.

The pin 27 which provides an axis for the arm 29 that carries the float 31 and head 28 occupies a position a slight distance, for instance, one-sixteenth of an inch, more or less, rearwardly from the vertical axis of the valve 23.

Formed in the underside of head 28 is a substantially conical recess 33, the upper end of which is shaped to form a semi-circular bearing 34, and formed in the upper portion of valve body 23, is an inverted conical recess 35, the lower end of which is shaped to form a semi-circular bearing 36.

Positioned between valve body 23 and head 28 is a toggle pin 37 having semi-spherical ends that engage the correspondingly shaped bearings 34 and 36, thus providing, in effect, ball and socket joints between said toggle pin, and said head and valve, and which construction minimizes friction while the parts are in operation.

When the toilet tank is filled to the proper degree, the float 31 resting on the surface of the water within the tank maintains the head 28 in position so that toggle pin 37 occupies a substantially vertical position, with its axis substantially coincident with the axis of the valve body, and which latter axis as heretofore described, passes slightly in front of the pivot pin 27.

The construction just described provides in effect a toggle arrangement for maintaining the disc 24 of the valve on the upper end of the nipple 21, thus providing an effective fluid pressure tight joint.

Surrounding tube 12 and spaced a slight distance therefrom, is a tube 38, the lower end of which is fitted onto the upper portion of nut 17, and the upper end being fitted on the lower end of the valve housing 18. As heretofore described, the provision of a long thread 14 on the lower portion of tube 12 enables said tube to be utilized on tanks of different standard heights but for such tanks, the lengths of the tubes 38 that are associated with the tube 12 must vary in length according to the height at which the valve housing is positioned within the tank. Formed through the lower portion of this tube, just above the nut 17, are outlet openings 39 which permit the discharge of water from the chamber between the tubes 12 and 38 into the flush tank, and formed in the upper portion of this tube 38, just below housing 18, are air inlet openings 40.

Formed on the sides of the valve housing 18, at right angle to the plane occupied by float carrying lever 29, are vertically disposed lugs, or ribs 41, and formed through the lower portion of valve housing 18 inwardly from the lower portions of these lugs or ribs are short vertically disposed ducts 42 which establish communication between chamber 19 in the valve housing, and the chamber between the tubes 12 and 38. Formed through the lugs or ribs 41 outwardly from the ducts 42 are vertically disposed ducts 43, the upper ends of which are open in the upper end of the valve housing, and the lower ends of said ducts communicating respectively with the lower portions of the ducts 42.

Ducts 42 permit the flow of water from chamber 19 to the chamber between the tubes 12 and 38 and the ducts 43 provide for the admission of air into the upper portion of the chamber between the tubes 12 and 38.

The metal in tube 38 immediately above the openings 40 that are positioned below the ducts 42 are bent inwardly as designated by 44 to prevent the discharge of any water from the lower ends of the ducts 42 outwardly through the air inlet openings 40, and to maintain normal flow of air into these particular openings 40, the metal in the tube 38 just below these openings are bent outwardly as designated by 45. (See Fig. 2.)

Formed in the upper portion of valve housing 18, below one of the lugs 26, a short distance inwardly from the upper portion of the adjacent duct 43 is a substantially cup shaped depression 46, one end of which communicates by means of a port or jet opening 47, with the upper end of a duct 48, which latter leads from the upper portion of chamber 19 upwardly through the valve body.

This duct 48 is substantially in vertical alignment with the corresponding one of the ducts 42 in the lower portion of the valve body. Formed through the lower portion of lug 26 that is positioned above the pocket 46 is an aperture 48^a, and seated in the upper portion of valve body 41, in front of pocket 46, and directly in horizontal alignment with jet opening 47, is one end of the conventional refill tube 49.

Under normal conditions with the tank filled to its normal level, as illustrated in Fig. 1, the float actuated arm or lever 29 maintains the toggle pin 37 in a substantial vertical position so that valve body 23 is at its lower limit of movement with compressible disc 24 seated upon the upper end of nipple 23, and thereby cutting off the flow of water from supply line 13 through tube 12 and said nipple.

When the bowl, with which the flush tank is associated, is flushed, the level of the water within the tank lowers thereby correspondingly lowering the float 31, and as arm 29 swings on its axis, the pin 27, block 28, swings upward and slightly forward from the axis provided by pin 27, thus permitting toggle pin 37 to move upward and the pressure of the supply water through pipe 13, tube 12 and nipple 21 elevates the valve and water under pressure discharges from the nipple into chamber 19. From chamber 19, water discharges downwardly through ducts 42 into the chamber between tubes 12 and 38, and which action draws air downwardly through the ducts 43, thereby to a considerable extent minimizing the noise ordinarily produced by the discharge of water into the tank, and this silencing effect is enhanced by the admission of air into the upper end of tube 38 through the openings 40.

The water and air, after passing downwardly through the chamber, between the tubes 12 and 38, discharges into the tank through openings 39. A certain amount of water that discharges into the chamber 19 during the flush operation will flow upwardly through duct 48 and discharge through port or jet opening 47 horizontally through the pocket 46 into the refill pipe 49, and this horizontally disposed jet or water draws with it a certain amount of air with the result that the hissing noise ordinarily attending the flow of water into the refill tube is greatly minimized, if not entirely eliminated.

As the block 28 swings upward and outward from its axis, the pin 27 when the float lowers in the tank as just described, the semi-circular bearing at the upper end of the recess 33 moves

away from the rounded upper end of pin 37, but the upper end of said pin can not drop out of the recess due to the length of the latter, and during this movement, the rounded upper end of the pin travels a short distance downwardly on the inclined surface of the recess. After a flushing operation, and as the tank is refilled, block 28 will gradually move downward thereby imparting downward movement to pin 37, which in turn forces valve 23 downward until the disc 24 rests on the upper end of nipple 21 to cut off the further flow of water through tube 12.

As long as the disc 24 is maintained on nipple 21, it is impossible for siphonic conditions which may prevail in line 13, to draw air or water into nipple 21 and tube 12.

If, for any cause, disc 24 shall become unseated or deteriorated to such a degree as to permit leakage into nipple 21, then any siphonic conditions developing in pipe 13, due to breakage of the supply line, and which tend to suck the water in the tank and bowl backwards into the supply line, will be immediately broken by air drawn into the tube 38 through ducts 43 and by air entering refill tube 49 through opening 48a.

In Fig. 4, I have illustrated a modified form of the toggle connection between the valve body and the end of the float carrying arm, and in this construction, the ends of the pin 37a are tied to the block 28a, and valve body 23a by transversely disposed pivot pins 50, the axes of which are parallel with the axis of pivot pin 27.

This arrangement facilitates assembly and dis-assembly of the parts of the valve while the same is being installed, or removed.

In Fig. 5, I have shown a modified arrangement of anchoring the nipple 21 in the lower portion of the valve housing, and in such construction, the flanged lower end of the nipple 21a is seated in a recess 21b that is formed in the lower portion of the valve housing, and the upper end of the tube 12 is screw seated in the lower portion of the recess 21b, and bears against the underside of the nipple.

Thus, it will be seen that we have provided an anti-siphon ball cock and silencer that is relatively simple in construction, inexpensive of manufacture, practically noiseless in operation, and which is very effective in performing the functions for which it is intended.

It will be understood that minor changes in the size, form and construction of the various parts of our improved ball cock valve may be made and substituted for those herein shown and described without departing from the spirit of our invention, the scope of which is set forth in the appended claims.

We claim as our invention:

1. In an anti-siphon ball cock and silencer, a water supply tube adapted to be positioned in a flush tank, a valve housing mounted on the upper end of said supply tube, said valve housing having a chamber, a nipple communicating with the upper end of said tube, and projecting into said chamber, a float actuated valve normally closing the duct through said nipple, a tube surrounding and spaced apart from said first mentioned tube, and arranged between the lower end of the supply tube and said valve housing, said second mentioned tube being provided near its lower end with water outlet openings, and in its upper portion, with air inlet openings, there being water flow ducts formed in said valve housing and leading from the chamber therein downwardly to the chamber between said tubes, and there being air inlet ducts formed in said valve housing, and extending from the upper portion thereof downwardly to the upper portion of the chamber between said tubes.

2. In an anti-siphon ball cock and silencer as set forth in claim 1, with a pocket formed in the upper portion of said valve housing, a duct leading from the chamber within the valve housing to said pocket, and a refill tube leading from said pocket.

3. In anti-siphon ball cock and silencer, the combination with a water supply tube adapted to extend through the bottom of a flush tank, of a valve housing mounted on the upper portion of said tube, said housing being provided with a chamber, a nipple projecting from the upper end of said tube into said chamber, a valve mounted for operation in the upper of said housing for closing said nipple, a float actuated lever pivoted on top of said housing, a toggle pin positioned between the pivoted end of said lever and said valve the axis of the pivot between said lever and housing being disposed a substantial distance above said valve and immediately adjacent the axis of said valve and said valve housing provided with outlet ducts leading from the lower portion of the chamber to the lower end of said housing and with air ducts leading from the upper to the lower portion of said housing.

4. In an anti-siphon ball cock and silencer, the combination set forth in claim 3, with the ends of said pin rounded and said valve and float actuated lever being provided with recesses having rounded bottoms for the reception of the rounded ends of said pin and with widened upper ends to permit rocking movement of said pin.

5. In an anti-siphon ball cock and silencer, the combination set forth in claim 3 with a tube mounted on said water supply tube and surrounding same, water outlets formed in the lower portion of said second mentioned tube and an air inlet opening formed in the upper portion of said second mentioned tube.

6. In an anti-siphon ball cock and silencer, the combination set forth in claim 3 with said valve housing provided with a pocket open to atmosphere, there being a water duct leading from the interior of said valve housing to said pocket and adapted to receive a refill tube.

7. In an anti-siphon ball cock and silencer, a water supply tube adapted to be seated in and project upwardly into a flush tank, a valve housing on the upper end of said supply tube, a float actuated valve for controlling the flow of water from said supply tube into said housing, a tube surrounding said supply tube and provided with water outlet openings, said valve housing being provided with an air duct and water ducts which communicate with the upper portion of said second mentioned tube, said valve housing being provided in its upper portion with a short horizontally disposed pocket opened to atmosphere at its upper end, a duct leading from the chamber within the valve housing to one end of said pocket and the opposite end of said pocket being adapted to receive a refill tube.

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