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ANTISIPHON SILENCER FOR BALL COCKS

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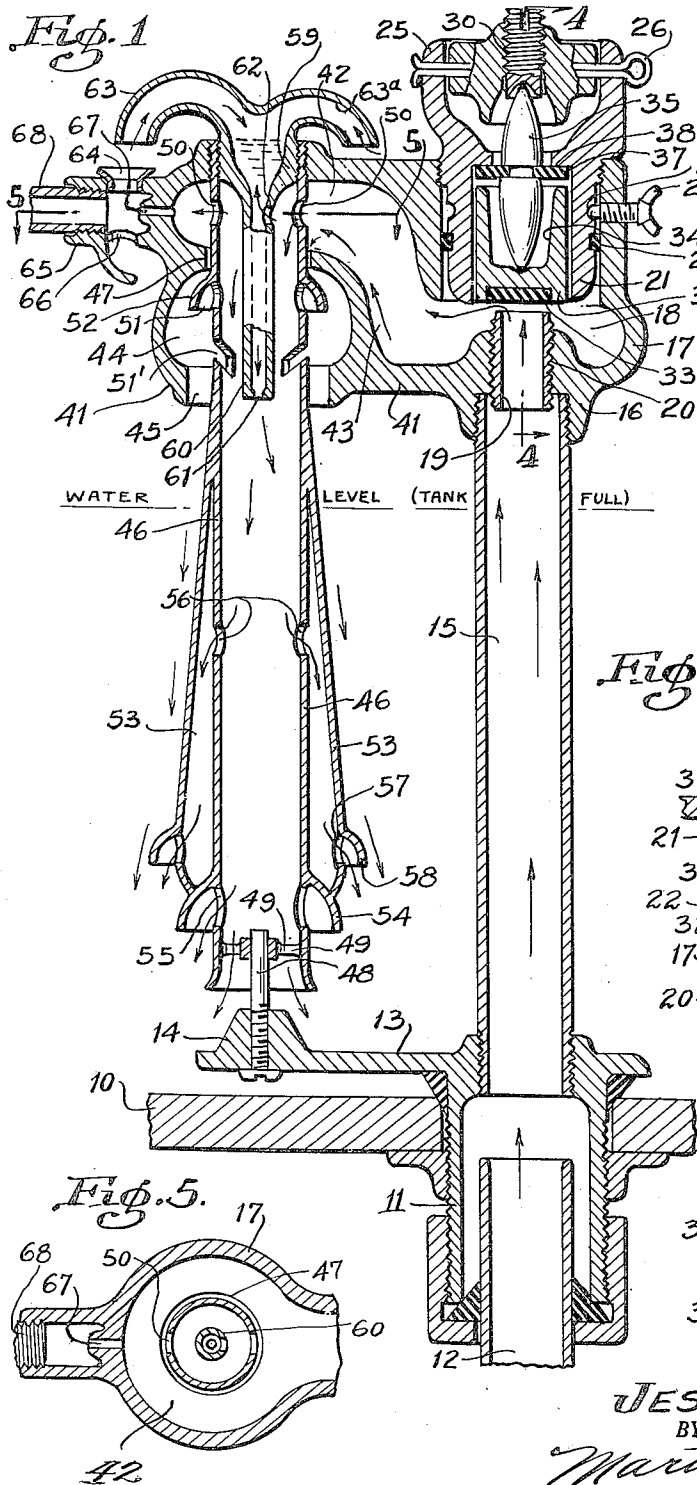


Fig. 2.

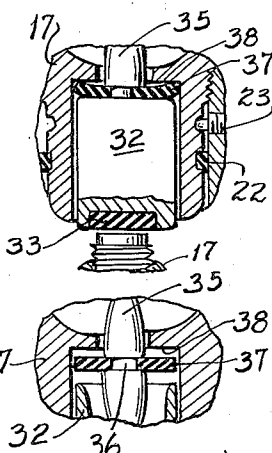


Fig. 3.

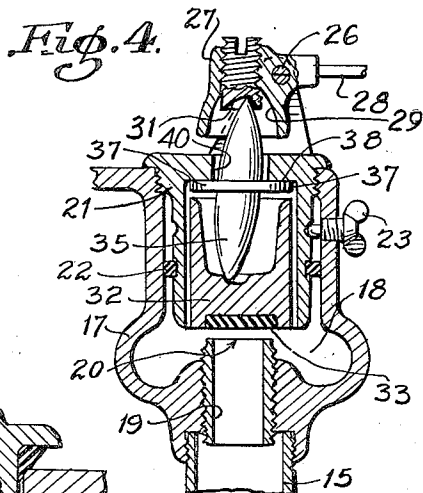
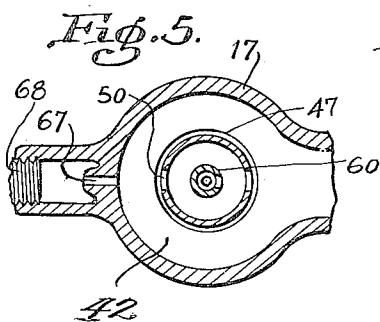
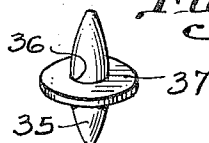


Fig. 6.



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ANTISIPHON SILENCER FOR BALL COCKS

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6 Claims. (Cl. 137-111)

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My invention relates to an antisiphon ball cock flush valve of the general type disclosed in U. S. Letters Patent #2,290,145 issued to me July 14, 1942.

The principal objects of my present invention are, to generally improve upon and simplify the construction of the valves disclosed in my aforesaid issued patent and further to provide simple and effective means for minimizing, insofar as possible the hissing and gurgling noises which usually attend the discharge of water from a ball cock valve into a storage tank.

A further object of my invention is, to provide means of the character referred to, with ports and openings for the admission of air, for the particular purpose of counteracting the development of siphonic conditions which may arise and tend to draw contaminated water backwardly through the valve into and through the supply pipe therefor.

With the foregoing and other objects in view my 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:

Fig. 1 is a vertical section taken through the center of my improved ball cock and silencer and showing the valve per se, in full open position.

Fig. 2 is a fragmentary section showing the valve member partially closed.

Fig. 3 is a sectional view similar to Fig. 2 and showing the valve actuating member in that position thereof wherein it holds the valve fully closed upon its seat.

Fig. 4 is a vertical cross section taken on the line 4-4 of Fig. 1.

Fig. 5 is a horizontal section taken on the line 5-5 of Fig. 1.

Fig. 6 is a perspective view of a toggle pin which forms a part of the valve control mechanism.

Referring by numerals to the accompanying drawings, which illustrate a preferred embodiment of my invention, 10 designates the bottom of a flush tank, 11 a tubular fitting therein, 12 a supply pipe connected to said fitting, 13 a short arm projecting from the upper end of said fitting just above bottom 10, and 14 a truncated conical lug on top of the end portion of said arm.

Seated in the upper portion of fitting 11 is the lower end of a vertically disposed pipe 15, to the upper end of which is secured a separately

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formed casting 16 which includes a valve housing 17 having a chamber 18.

A short vertically disposed tube 19 is screw seated in the bottom of housing 17 with its bore in communication with tube 15 and the upper end 20 of said tube 19 functions as a valve seat.

Removably positioned in the upper portion of housing 17 is a tubular member 21, with a packing ring 22 between said housing and member; and to secure said member in said housing, the inner end of a screw 23, seated in the wall of housing 17 enters a circumferential groove 24 formed in the outer face of said member.

Projecting upwardly from the top of member 21 are spaced ears 25 in which is seated a removable pin 26 which serves as an axis for a rocking head 27, to which is secured one end of a float-carrying arm 28.

Formed in the under side of head 27 is a recess 29 and seated in said head above said recess is a screw 30 provided in its lower end with a recess 31 (see Fig. 4). This recess 31 is substantially conical in shape, with its apex offset from the axis of the screw, which arrangement enables said apex, which serves as a bearing for a toggle pin hereinafter described, to be positioned at different distances away from the vertical plane occupied by the axis of pin 26 by the simple expedient of rotating the screw 30 about its own axis.

This adjustment changes the leverage between the axis of the rocking head and the toggle pin, so as to compensate for varying pressures of the water supply encountered by the valve on which the lower end of pin 35 bears.

Screw 30 is positioned so that recess 31 occupies a vertical plane offset from the center of the axis 26 and in all positions of pivoted head 27, said recess is below said pin's axis.

Loosely arranged within tubular member 21 is a short cylindrical valve body 32 in the under face of which is seated a disc 33 of rubber or composition, which normally rests on seat 20.

Formed in the upper portion of valve body 32 is a recess 34 which receives the lower portion of a toggle pin 35, the lower end of which is pointed and bears on the bottom of recess 34. The substantially pointed upper end of this pin 35 bears in the recess 31 in the lower end of screw 30; and carried in a groove 36 at the center of the pin is a packing washer 37 of rubber or elastic composition. When the valve 33 is open, the packing washer 37 bears against the under surface of a shoulder 38 at the upper end of member 21 and thereby packs the joint between pin 35 and

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the opening 40 at the upper end of said member through which said pin passes.

Opening 40 is slightly larger than the diameter of pin 35, thus enabling the latter to tilt slightly when head 27 rocks on its axis.

Formed integral with housing 17, is a laterally disposed housing 41 provided with an upper chamber 42 which communicates with chamber 18 by means of a short duct 43. The housing 41 also contains a lower chamber 44 provided at its lower end with a large opening 45. Seated in the top of housing 41 is the upper end of a tube 46 which extends downward through an opening 47 in the partition between chambers 42 and 44 and through opening 45, with the flared lower end of said tube disposed just above lug 14.

The lower end of tube 46 is held in place by a screw 48 seated in lug 14 and engaging a spider 49 in the lower end of said tube.

Formed in that portion of tube 46 which passes through chamber 42 are apertures 50 and formed in that portion of said tube which passes through chamber 44 are apertures 51 above which are arranged external hoods 52. The opening 47 between the chambers 42 and 44 and through which the upper end of the tube 46 extends, is only slightly larger in diameter than the tube, with the result that flow of water through the opening 47 is restricted to the extent that a material portion of the water entering the upper chamber 42 of the housing 41 will be forced to the interior of the tube 46 through its inlet openings 50.

Formed in tube 46 just below apertures 41, are downwardly inclined slots 51'.

Secured to tube 46 just below opening 45 in the bottom of housing 41 is the upper end of a tube 53 which gradually increases in diameter toward its lower end, the latter resting on an external hood 54 on the lower portion of tube 46, just above apertures 55 that are formed in said tube.

Formed in the wall of tube 46 intermediate its ends and inside the outer, flaring tube 53 are apertures 56; and formed in the wall of the tube 53 just above its lower end are apertures 57, above which are located externally disposed hoods 58.

Removably seated in the upper end of tube 46 is a tubular plug 59, from which depends a tubular stem 60, the lower end of which terminates just below slots 51 in the tube 46. The lower end of the tubular stem 60 is contracted to define a restricted discharge port 61 opening into the bore of the tube 46.

Formed in stem 60 just below plug 59 and in line with one of the apertures 50 in tube 46 is an aperture 62.

Extending upwardly and outwardly from plug 59 are branch tubes 63 and 63a, the end of branch 63 being disposed just above the cupped upper end of an aperture 64, formed in the upper portion of a short tubular member 65, that projects horizontally from the upper portion of housing 41.

Formed in the bottom of member 65 in vertical alignment with aperture 64 is an aperture 66, below which is arranged a deflector which projects toward housing 41.

Formed through the wall of housing 41 and leading from chamber 42 to the chamber in member 65 is a horizontally disposed jet aperture 67, adapted to direct a jet of water across the chamber in member 65, between apertures 54 and 66 and into the end of a conventional refill tube 62 that is connected to said member.

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Under normal conditions with the water level within the tank in the plane indicated in Fig. 1, and with the float carried by arm 23 resting on top of the water, valve 32 is held at its lower limit of movement with packing disc 33 resting on seat 20.

When the tank is flushed, the float lowers, thereby swinging head 27 upward, thus relieving pressure on pin 35 and valve 32, so that same move upward a short distance under the force exerted by water from supply pipe 15 flowing through tube 19, and such upward movement continues until stopped by the engagement of packing washer 37 against shoulder 38, at which time the valve 33 is in full open position as seen in Fig. 1.

Water then flows from tube 19 into chamber 18, thence through duct 43 into chamber 42, from which a portion of the water flows through apertures 50 downward through tube 46 and the remainder of said water flows down through aperture 47 into chamber 44 and thence down the outer surface of tapered tube 53.

Water may flow in either direction through apertures 51 and slots 51'. Thus practically all the water from chamber 42 is caused to flow down either through tube 46 or over tube 53. Most of the water flowing through said tube 46 discharges through apertures 55 and from the open lower end of said tube into the bottom of the tank, although the apertures 56 permit a small amount of water to pass from the tube 46 to the space between tubes 53 and 46. The water flowing downward over tube 53 discharges from hood 53 into the bottom of the tank. This flow control of water into the tank, is effective in eliminating practically all of the hissing and gurgling noises which usually attend delivery of water under pressure into a flush tank.

A small amount of water from chamber 42 discharges in jet form through aperture 67 thence through tubular member 65 between apertures 64 and 66 and this water passes into and through refill tube 68. A small amount of water entering the upper end of the tube 46 through the apertures 50 enters the stem 60 through its aperture 62 which, as indicated in Figure 1, is directly in line with one of the apertures 50. Since the escape of water from the lower end of the stem 60 is retarded by the restricted nature of the outlet port 61 in its lower end, the stem 60 will quickly be filled with water; and thereafter that quantity of water entering the stem in excess of the quantity which can escape from the lower outlet will escape from the stem through the open ends of the branch tubes 63 and 63a. However, during the entire time that water is thus caused to flow upwardly within the stem 60, it serves to seal off the bore of the stem 60 from the atmosphere outside the valve housing and thereby prevent the entrance of air to the interior of the housing through the stem. This prevents air from being sucked into the upper end of the tube 46 during the progress of the tank air filling operation and thereby removes one of the principal causes of the bubbling and gurgling noises which, in more conventional constructions, constitute one of the objectionable features of toilet fixtures. Nevertheless, upon completion of its function of refilling the toilet's flushing tank, water which has been retained within the stem 60 will drain off through the outlet port 61, thereby re-establishing communication between the outside atmosphere and the interior of the valve housing, with the result that it provides effectual means for preventing siphoning of water from the storage

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tank back into the pipe 15 and the service supply pipe 12 in the event of failure of the water supply service and the consequent development of partial vacuum below the valve 33.

The end of branch tube 63 discharges directly into cupped aperture 64 and water discharging from aperture 66 is deflected against the lower portion of housing 41.

The structure just described provides a plurality of outlets and paths of travel for all the water entering and passing through the ball cock and is particularly effective in silencing the flushing and subsequent filling of the tank and at the same time, provides a simple and highly efficient antisiphon.

To adjust the valve for use in connection with water systems having a pressure of one hundred or more pounds, screw 30 is rotated so as to position the apex of recess 31 near to the vertical plane occupied by the axis of pin 26, thus shortening the distance between the bearing of the upper end of the toggle pin with the rocking head and the axis of pin 26 and consequently increasing the leverage of the rocking head against the toggle pin when the float arm is swinging upward to close the valve.

For lower water supply pressures, the screw may be partially rotated so as to shift the apex of aperture 31 away from the vertical plane occupied by the axis of the pin 26 for the rocking head, thus increasing the distance between said axis and the bearing between screw 30 and toggle pin and correspondingly decreasing the leverage between the valve closing parts.

After the flushing function and water discharging from pipes 46 and 53 rises in the tank, the upward movement of the float carried by arm 28 to actuate the valve closing parts is intermittent rather than continuous, such action being due to the leverage action between rocking head 27, pin 35 and valve 32. Valve 32 is subject to water pressure of, say, one hundred pounds and it will not be moved downward until the float acting through head 27 and toggle pin 35 exerts sufficient pressure to overcome the pressure acting on said valve. Thus, the float may be almost completely submerged in the turbulent water entering the tank through pipes 46 and 53, before it acts to rock head 27 a short distance and act through pin 35 to impart downward movement to and partially close valve 32.

Then the upward movement of the float and the leverage action of head 27 and pin 35 ceases for a few seconds or until the buoyancy of water again acts on the float to elevate same, and actuate pin 35, the upper end of which has been brought closer to the vertical plane occupied by axis pin 26, to increase the leverage action and force valve 34 onto its seat and thereby cut off the further flow of water to the tank.

Repeated tests and experiments made with my improved valve show that the closing thereof is accomplished with the intermittent action as just described.

When the valve is fully closed the bearing between the upper end of pin 35 with the lower end of screw 30, is very close to the vertical plane occupied by the axis of the pin 26 and a substantial distance below the horizontal plane occupied by said axis pin and thus the valve 32 will be firmly held on its seat by the normal pressure of the float, resting on the surface of the water.

When valve 35 is fully closed, there is only a slight angle between its axis and the line of thrust from the bearing between the upper end

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of pin with screw and the axis of pin 26 and this condition tends to lock the valve 32 upon its seat.

Packing disc 35 being composed of live rubber permits the pin 35 to shift slightly when moved by tilting head 27.

Thus it will be seen that I have provided an antisiphon ball cock flush valve which is simple in structure, inexpensive of manufacture and 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 my improved valve may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. An antisiphon device comprising a housing having an inlet and an outlet, a discharge tube carried by said housing and extending downwardly from said outlet, and a tubular stem mounted within said housing and extending downwardly into said discharge tube in spaced relation therewith and having a water inlet port disposed in position to receive some of the water from said housing's inlet, said stem having an air inlet port above said stem's water inlet and opening to the atmosphere exteriorly of said housing and also having an outlet port below said stem's water inlet port and opening into the interior of said discharge tube.

2. An antisiphon device comprising a housing having an inlet and an outlet, a discharge tube carried by said housing and extending downwardly from said outlet, and a tubular stem mounted within said housing and extending downwardly into said discharge tube in spaced relation therewith and having a water inlet port disposed in position to receive some of the water from said housing's inlet, said stem having an air inlet port above said stem's water inlet and opening to the atmosphere exteriorly of said housing and also having an outlet port below said stem's water inlet port and opening into the interior of said discharge tube, said stem's outlet port being substantially smaller than said stem's water inlet port, whereby some of the water entering said stem through said water inlet port accumulates within said stem and thereby effectually closes said stem's outlet port against flow of air there-through into said discharge tube while water is flowing from said housing to said discharge tube.

3. An antisiphon device comprising a housing having an inlet and an outlet, a discharge tube carried by said housing and extending downwardly from said outlet, a tubular stem mounted within said housing and extending downwardly into said discharge tube in spaced relation therewith, said stem having a restricted outlet port at its lower end opening into the interior of said outlet tube and an inlet port above said outlet port and aligned with said housing's inlet so as to receive a portion of the water entering said housing at a rate more rapid than that at which it can escape from said stem through said outlet port, and a tubular extension on the upper end of said stem having its outer end open and directed downwardly and its bore communicating with that of said stem whereby water entering said stem in excess of the amount escaping through said stem's outlet port will escape from said device and be directed downwardly therepast.

4. An antisiphon device comprising a housing having an inlet and an outlet, a discharge tube

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carried by said housing and extending downwardly from said outlet, a tubular stem mounted within said housing and extending downwardly into said discharge tube in spaced relation therewith, said stem having a restricted outlet port at its lower end opening into the interior of said outlet tube and an inlet port above said outlet port and aligned with said housing's inlet so as to receive a portion of the water entering said housing at a rate more rapid than that at which it can escape from said stem through said outlet port, a tubular extension on the upper end of said stem having its outer end open and directed downwardly and its bore communicating with that of said stem whereby water entering said stem in excess of the amount escaping through said stem's outlet port will escape from said device and be directed downwardly therepast, and means for deflecting water escaping from said stem's extension against the outer surface of said housing to minimize splashing.

5. In a toilet tank refilling valve, a housing having an inlet and an outlet, a discharge tube mounted adjacent its upper end within said housing and extending downwardly through said outlet in spaced relation therewith whereby a portion of the water entering said housing can escape therefrom by flowing downwardly around the outside of said outlet tube, said outlet tube having inlet openings therein within said housing whereby the remainder of the water entering said housing can escape through the interior of said outlet tube, and an antisiphon device comprising a tubular stem carried by said housing and extending downwardly into said discharge tube in spaced relation therewith, said stem having an inlet orifice communicating at its upper end with the atmosphere exteriorly of said housing and having an outlet port in its lower end communicating with the interior of said discharge tube.

6. In a toilet tank refilling valve, a housing having an inlet and an outlet, a discharge tube mounted adjacent its upper end within said hous-

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ing and extending downwardly through said outlet in spaced relation therewith whereby a portion of the water entering said housing can escape therefrom by flowing downwardly around the outside of said outlet tube, said outlet tube having inlet openings therein within said housing whereby the remainder of the water entering said housing can escape through the interior of said outlet tube, and an antisiphon device comprising a tubular stem carried by said housing and extending downwardly into said discharge tube in spaced relation therewith, said stem having an inlet port in alignment with one of said discharge tube's inlet openings and also having a relatively small outlet port at its lower end opening into the interior of said discharge tube, and means communicating with the upper end of said stem providing an inlet port communicating with the bore of said stem and with the atmosphere exteriorly of said housing.

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