Dec. 24, 1963 W. B. DELAMATER 3,115,153

FLUSH VALVE FOR TOILET TANKS

Filed April 13, 1961 2 Sheets-Sheet 1

FIG. 1.

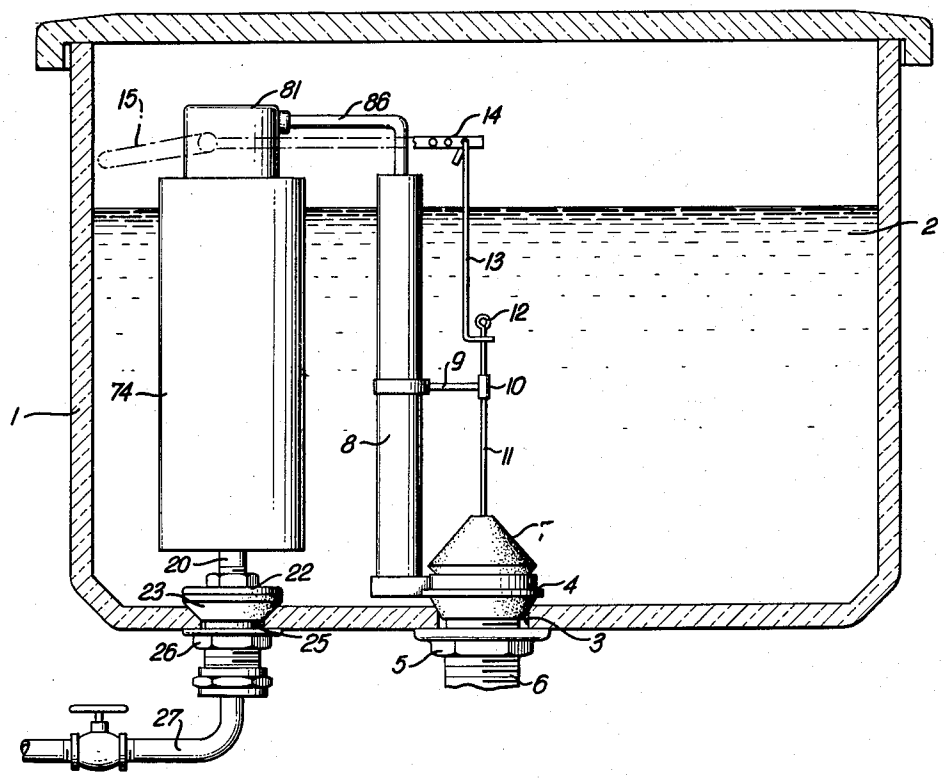


FIG. 4.

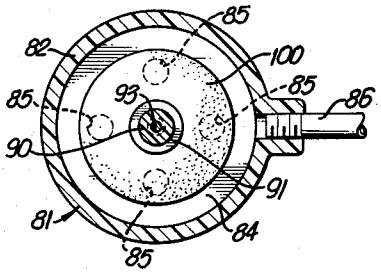
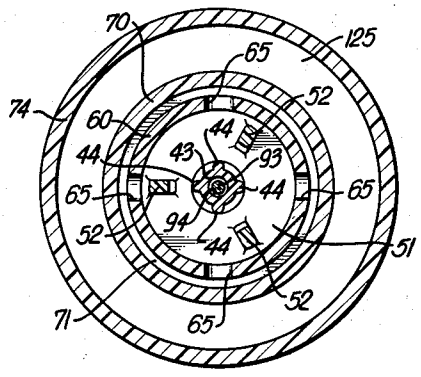


FIG. 5.



INVENTOR,
WILLIAM BRUCE DELAMATER;
BY
J. Calvin Brown
ATTORNEY.

Dec. 24, 1963 W. B. DELAMATER 3,115,153

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Filed April 13, 1961 2 Sheets-Sheet 2

FIG. 2.

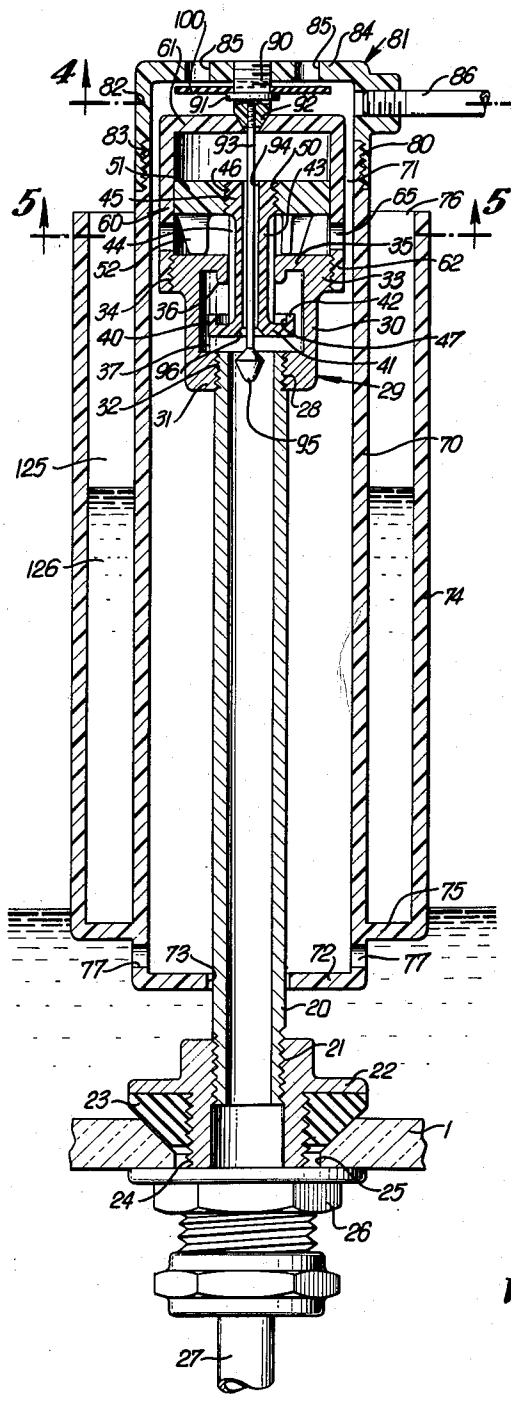
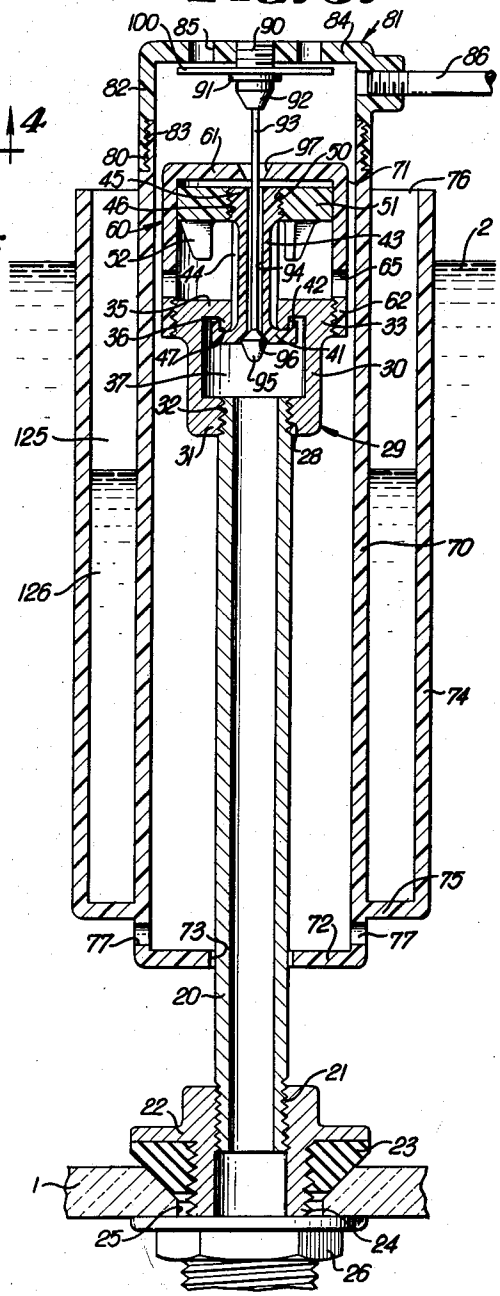


FIG. 3.



INVENTOR,
WILLIAM BRUCE DELAMATER;
BY
J. Calvin Brown,
ATTORNEY.

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FLUSH VALVE FOR TOILET TANKS

William Bruce Delamater, Norwalk, Calif., assignor to Imperial Valve Co., Monterey Park, Calif., a corporation of California

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3 Claims. (Cl. 137—426)

The present invention relates to a flush valve for toilet tanks and has among its objects the provision of a self contained unit of compact form, which does not require the usual ball float, is positive in operation, easily adjusted to regulate the depth of liquid contained in the toilet tank, simple to manufacture, of few parts, economical in construction and easily installed in a toilet tank.

A further object is the provision of a flush valve for toilet tanks which is substantially leak proof and wherein the operating parts thereof are so constructed and arranged as not to require frequent service.

With the above mentioned objects in view, the invention consists of the novel and useful provision, formation, construction, association and relative arrangement of parts, members and features, all as shown in a certain embodiment in the accompanying drawings, described generally, and more particularly pointed out in the claims.

In the drawings:

FIGURE 1 is a vertical sectional view of a toilet tank incorporating within the same the invention;

FIGURE 2 is a fragmentary, vertical sectional view of the invention shown secured to the base of the toilet tank;

FIGURE 3 is a vertical sectional view of the invention, parts thereof shown in a moved position from that of FIGURE 2;

FIGURE 4 is a sectional view on the line 4—4 of FIGURE 2; and,

FIGURE 5 is a sectional view on the line 5—5 of FIGURE 2.

Referring now to the drawings and specifically to FIGURE 1, a standard form of toilet tank is shown at 1 for holding water 2 to a selected depth, the bottom wall of the tank having an enlarged opening at 3 for receiving flush valve fittings 4 and 5 connected to the usual flush water pipe 6 leading to the toilet bowl or trap. These parts are standard for most toilet tanks.

The drain valve 7 is raised from or engages the valve seat 4 to allow the water 2 to drain from the tank 1 through the pipe 6 and to be seated so that the tank may be filled with water. As is usual, in constructions of this type, a stand or overflow pipe 8 has connection at its lower end with the fitting 4. The usual bracket 9 secured to pipe 8 has an extended arm carrying a guide sleeve 10. An elongated pin 11 secured to valve 7 is passed through guide sleeve 10. The upper end of the pin has the usual ring 12, the pin being passed through an opening in the offset end of a link 13, with the upper end of the link secured to a lever 14 connected to a drain valve lever 15. When the drain valve lever is depressed the arm 14 is raised to lift the link 13 and thereby lift the pin 11 and the valve 7 from seat 4. The overflow pipe 8 has an open top generally positioned above the normal height of the water 2 and for draining the water 2 if the level of the water rises too high within the tank. These features are common and are for illustration only, as no claim is made to any novelty therein.

The flush valve of the present invention is shown in the remaining figures and includes a filling tube 20 externally threaded at its lower end 21 and internally threaded to a fitting 22 carrying a gasket 23. The fitting has a threaded portion 24 passed through an opening 25 of the tank 1 with a nut 26 external the tank and carried on the threads 24. The nut when tightened, clamps the fitting 22 to compress the gasket 23 at the opening 25 to prevent water leak at this portion. A valved pipe 27 leading from a source of water supply connects in the usual manner with the fitting 22 to furnish water for filling tube 20. The filling tube is of extended length and externally screw threaded at its upper end 28.

A valve casing 29 has a circular side wall 30, an annular base 31 integrally formed with the side wall and provided with internal screw threads 32 for engagement with the screw threads 28 of the filling tube. The side wall is flanged at 33, the flange being externally screw threaded at 34. An annular top wall 35 is internally provided with an annular valve seat 36, the annular valve seat being concentric with the center opening of the top wall 35. As shown, the annular opening of the top wall is substantially of the same diameter as the internal diameter of the filling tube 20. The valve casing construction provides an internal chamber 37.

Within the chamber 37 and lying axially thereof is a valve 40. Valve 40 includes a disk 41 provided with an annular or peripheral upstanding flange 42, an integrally formed valve stem 43 carried by the valve disk axially thereof and which stem is externally provided with longitudinal grooves or flutes 44. The stem is provided with an enlarged head 45 which is screw threaded at 46. The stem is adapted to pass through the annular opening of the top wall 35 of the valve casing and when the valve disk 41 moves upwardly to the position shown in FIGURE 3, the valve seat 36 is received in the annular groove 47 defined by the annular flange 42 and the fluted peripheral surface of the stem to thereby have a sealing engagement between the seat and the valve disk. The threads 46 of the head 45 of the valve stem are adapted to have threaded engagement with the threads 50 of a piston 51, the piston to this end being annular in form. The piston is provided on its base surface with legs or stops 52 which are adapted to engage the external surface of the top 35 of the valve casing when the piston is in the position shown in FIGURE 2. The reason for this construction will be set forth later. The piston 51 is fitted within a cylinder 60. This cylinder is of inverted cup form in that it has a circular side wall and a head or top wall 61, the circular side wall being internally threaded at 62 for engagement with the threads 34 of the valve casing. The cylinder 60 has its circular side wall provided with a circular series of spaced transverse upper discharge ports 65 which ports are located between the external surface of the top of the valve casing and the piston 51.

The valve casing 29, cylinder 60, and filling tube 20 are positioned axially within an elongated tube 70. Tube 70 loosely surrounds the cylinder 60 and it will be observed that the diameter of the cylinder 60 is greater than the diameter of the valve casing 29. This provides an annular space 71 between the periphery of the cylinder 60 and the interior surface of the tube 70. Tube 70 has an annular base 72 through the central opening 73 of which the filling tube 20 extends. The opening 73 is of greater diameter than the diameter of the filling tube 20. Tube 70 is jacketed by a further tube 74 termed the jacket tube and which tube 74 has a base 75 integrally connected to the tube 70 above the base 72. The jacket tube 74 is open at the top 76. The tube 70 is provided with a circular series of transverse ports 77 positioned below the base 75 and above the base 72. These are known as lower discharge ports.

The upper end of tube 70 is externally threaded at 80 to receive a cap or fitting 81. Fitting 81 has a curved side wall 82 which is internally screw threaded at 83 to fit the threads 80 of the tube 70 and has a top 84 formed

with transverse ports **85**. This fitting is formed to carry a tube **86** leading to the interior of the fitting and to the overflow pipe **8**, see FIGURE 1.

Depending from the top **84** is a fitting **90** provided with a flange **91** and a conical tip **92** which tip functions as a needle valve. This fitting is bored axially and screw threaded to carry a stem **93**. The stem **43** is axially bored at **94** and the stem **93** is loosely passed through said bore **94** and carries at its inner end a needle valve **95**. Stem **93** is termed the needle valve stem. The needle valve **95** is adapted to have contact with a conical seat **96** of the disk valve **41** when in the position shown in FIGURE 3 so as to close passage of any liquid between the needle valve stem and the bore **94** into the cylinder above the piston **51**.

The conical tip **92** is adapted for reception within a tapered seat **97** in the head **61**, see FIGURE 2. Carried upon the fitting **90** between the flange **91** and the top **84**, is a disk **100**. This disk floats so that it may cover the ports **85** during certain operation of the flush valve mechanism.

The operation, uses and advantages of the invention just described, are as follows.

In FIGURE 1 the tank **1** is filled with water **2** to a given depth. The valve **7** is closed to its seat and the parts of the flush valve of the invention are in the position shown in FIGURE 3. To govern the height to which the water **2** rises in the tank, I pour into the jacketed space **125** between the jacket cylinder **74** and cylinder **70**, water **126**. The level of the water **126** will determine the height to which the tubes **70** and **74** will rise in water **2** and one important feature of the tubes **70** and **74** is their function as a float. The weight of the water **126** will determine the buoyancy of the float, it being observed that the two tubes **70** and **74** are closed at the bottom by the wall **75** and therefore in the specification this will be termed the float of the flush valve. The length of the jacket tube **74** is such as to be always above the water level in the tank **1**, otherwise there would be no buoyant effect. In FIGURE 3 the needle valve **95** is closed to its seat **96** and the disk valve **40** is closed to its seat **36**. Consequently, water which would enter normally through the pipe **27** into the filling tube is prevented from flowing through the valve casing **29**. That is to say, that water entering the chamber **37** of the valve casing will be entrapped therein.

If the handle **15** is depressed to lift the valve **7** from its seat, the toilet is flushed and the parts of the flush valve will assume the position shown in FIGURE 2. The supply water will pass through pipe **27** into filling tube **20** and thence into the chamber **37** of the valve casing. The needle valve **95** is unseated from seat **96** and the disk valve **40** is unseated from the annular seat **36**. This for the reason that the float, which constitutes the tubes **70** and **74**, moves downwardly as the water **2** in the tank is flushed to its lowest position in the tank, as shown in FIGURE 2. The filling tube **20** is stationary as to position in the tank **1**. As a consequence, the cylinder **60** and the valve casing **29** has a fixed position and the tubes **70** and **74** move relative to these fixed position members. The tube **70** controls movement of the needle valve **95** and its stem **93** and as the tubes **70** and **74** move downwardly the needle valve is unseated. Water from the source of supply, after the tank has been flushed, enters the space **37** of the valve casing, passes through the bore **94** as this bore is larger in diameter than the diameter of the needle valve stem **93**, into the space above the piston **51** in the cylinder **60**. The length of the needle valve stem **93** is such that when the parts are in the position of FIGURE 2, the conical tip **92** is seated within the conical seat **97** of the cylinder head or top **61**. Consequently, water will not pass outwardly from said cylinder above the piston. However, water received within the chamber **37** will be directed by the flutes or grooved construction **44** below the piston and the top **35** of the

valve casing through the discharge ports **65** and thence downwardly between tubes **20** and **70** through ports **77** into the tank. The water passing through ports **77** is discharged into a small amount of water within the tank with the consequence that water passes through the ports **77** silently. As the tank fills with water, the float structure; to wit: tubes **70** and **74**, will gradually rise until the needle valve **95** closes to its seat **96** and the disk valve **40** closes to its seat **36**. When this occurs, water will not pass through the flutes **44** nor through the bore **94**. A certain amount of water initially will be received above the piston in the cylinder **60**, and this water so received acts as a cushioning means for movement of the piston as it rises in the cylinder to the position shown in FIGURE 3. When the position is reached for the piston as shown in FIGURE 3, the conical tip **92** has been raised from its seat **97** and water above the piston within the cylinder may escape therethrough. In fact, water is constantly escaping at this point as the valves **95** and **40** close to their respective seats. The arrangement is such that the floating disk **100**, when water is received above the cylinder head **61**, will cause the disk to move upwardly and close the ports **85** and direct water through tube **86**, which constitutes a secondary water discharge tube, into the overflow pipe **8**. The floating disk **100** and ports **85** which open to the atmosphere, function as a vacuum breaker means which prevents water from syphoning from the tank into the supply system.

FIGURES 2 and 3, while on a reduced scale from the actual size of the flush valve of the invention, nevertheless shows the parts in substantially their true relationship. For example, the stem **93** must be of sufficient length and held by the fitting **90**, that the needle valve **95** is open from its seat when the tank is flushed with the disk valve **40** lowered from its seat so as to permit inflow of water through both the bores **94** and through the flutes **44** outwardly of the ports **65** and **77**. When the float is elevated to its desired position to stop flow of supply water into the tank, the valve **95** must be closed to its seat as likewise must be disk valve **40** to its seat **36** with the piston **51** elevated from the position of FIGURE 2 to that of FIGURE 3.

The flush valve of the invention in actual practice has been found to function smoothly and efficiently and to require little attention after once installed within a tank. It will be found that all parts of this invention operate axially. Thus the float moves vertically and axially as does likewise the needle valve, its stem and the piston, disk valve **40** and the disk valve stem **43**. Only vertical movement is contemplated for the moving parts and consequently there is no linkage nor rotary valve movement such as is ordinarily employed in flush valves which have a ball float with a float arm which actuates a valve. Valve wear is therefore not a factor in the present invention and the device of the invention is substantially leakproof in operation. It may be noted that when the intake water is directed upwardly through the filling tube **20** into the space **37** of the valve casing that the disk valve **40** is not raised due to the fact that the conical tip **92** is seated against the conical seat **97** and the incoming water is directed through the bore **94** into the cylinder space above the piston **51**. This holds the piston downwardly so that it cannot move towards the cylinder head and as a consequence allows the incoming water to pass through the flutes **44**, outwardly of the ports **65** and thence through ports **77** into the flush tank. It is only when the conical tip **92** is lifted from its seat **97** that water can escape from above the piston in the cylinder as the float moves upwardly carrying with it the stem and needle valve **95**, which needle valve when seated to its seat **96** will lift the disk valve **40** upwardly raising the piston within its cylinder. There is no water hammer or chatter in the operation of my flush valve.

I claim:

1. A flush valve for toilet tanks, the toilet tank having

a base with a fitting in said base connected to a source of water supply under pressure, including: a filling tube having outlet and inlet ends within the toilet tank with the inlet end thereof adapted to be secured to the fitting in said base with the filling tube extending substantially normal to the toilet tank base, a float concentrically surrounding the filling tube and movable relative thereto, said float comprising inner and outer concentric spaced apart tubes, the outer tube provided with an annular base wall joined to the inner tube near its lower end, and having an open annular upper end, said inner tube being provided with discharge ports between its lower end and the annular base wall of the outer tube, and valve means and port means within the inner tube adjacent the top thereof for controlling passage of water through the filling tube into the inner tube of the float for passage through the outlet ports into the supply tank.

2. The device as set forth in claim 1, the space between the inner and outer tubes adapted to receive water to different heights therein to regulate the buoyancy of the float in water received within the toilet tank to in turn control the closing of the valve means.

3. The device as set forth in claim 1, said valve means including a disk valve co-axial with the axis of the filling

tube and positioned above the outlet end of said filling tube for positive liquid pressure engagement, a casing secured to the upper end of the filling tube and surrounding the disk valve, said casing provided with said port means and with an annular valve seat for engagement with the disk valve, and a stem carried by the disk valve and passing axially through the valve seat, the construction being such that water may pass between the stem and the valve seat and through said port means outwardly of the casing and into the inner tube of the float when the disk valve is unseated.

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