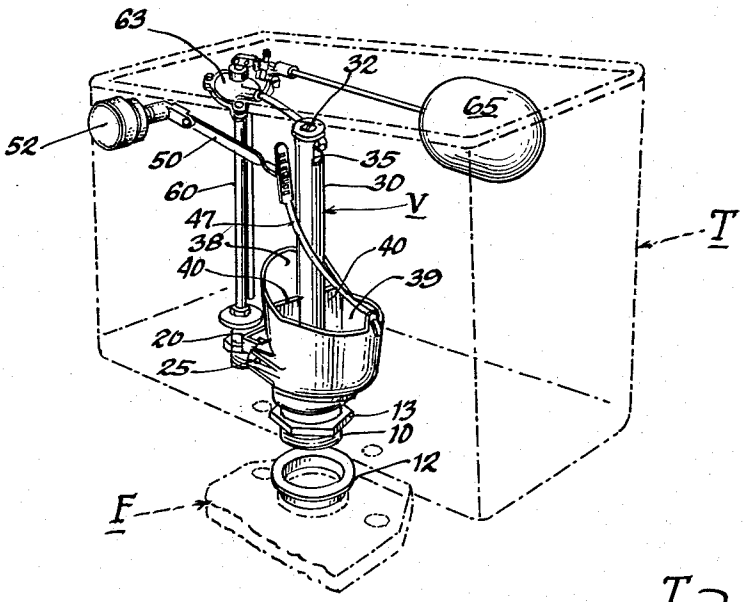
Oct. 10, 1961 F. C. ALEXANDER 3,003,156

TILTING FLUSH VALVE FOR TOILET

Filed June 18, 1959 3 Sheets-Sheet 1

FIG. 1



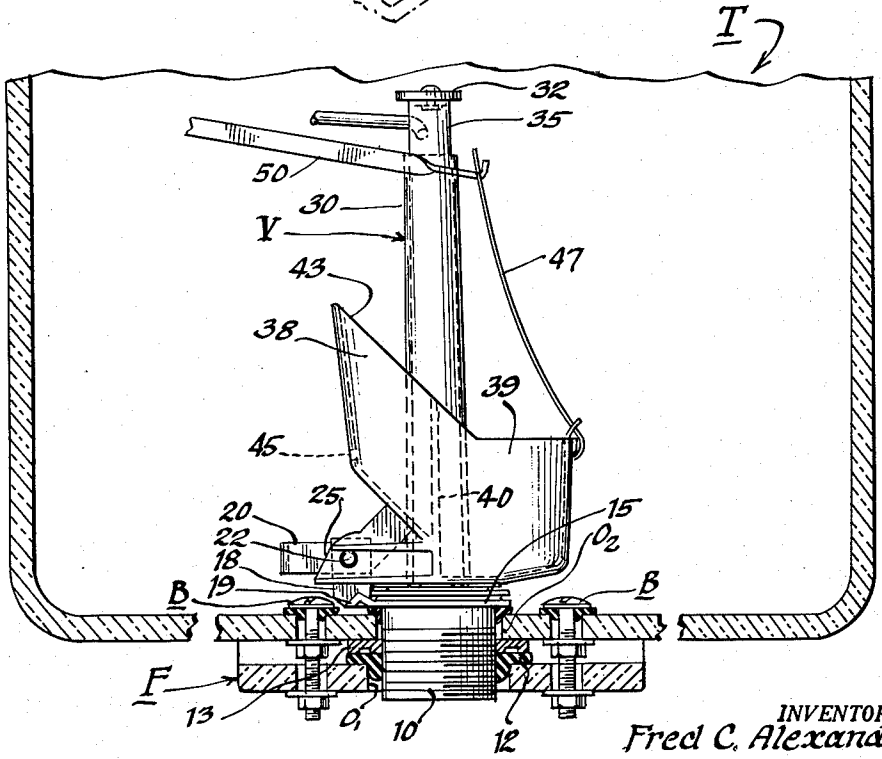


FIG. 2

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FIG. 3

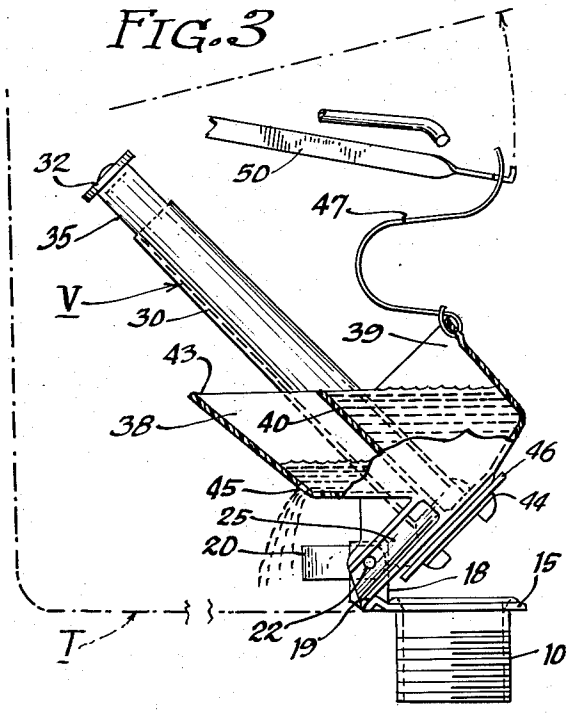
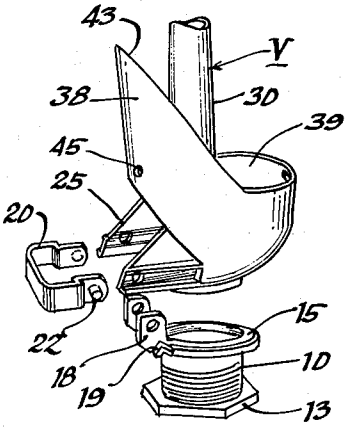


FIG. 7



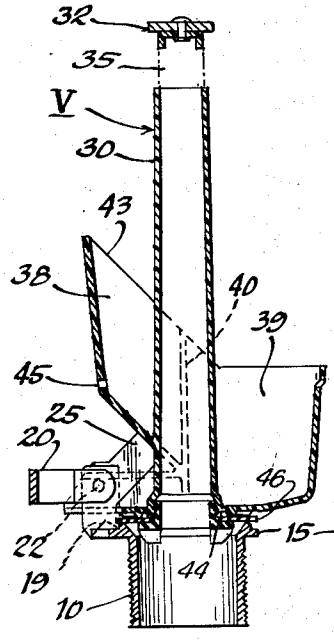


FIG. 6

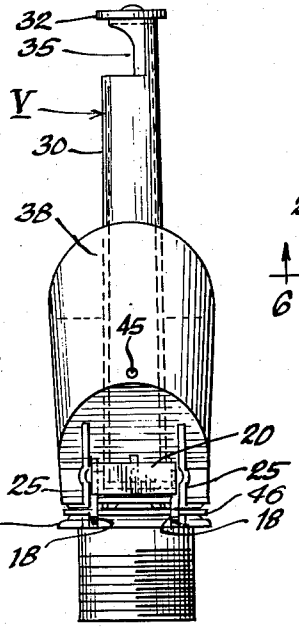


FIG. 5

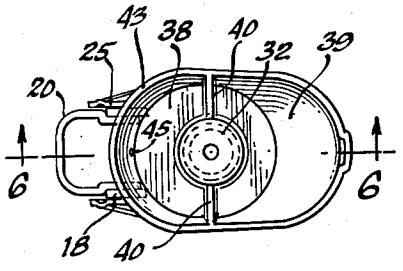


FIG. 4

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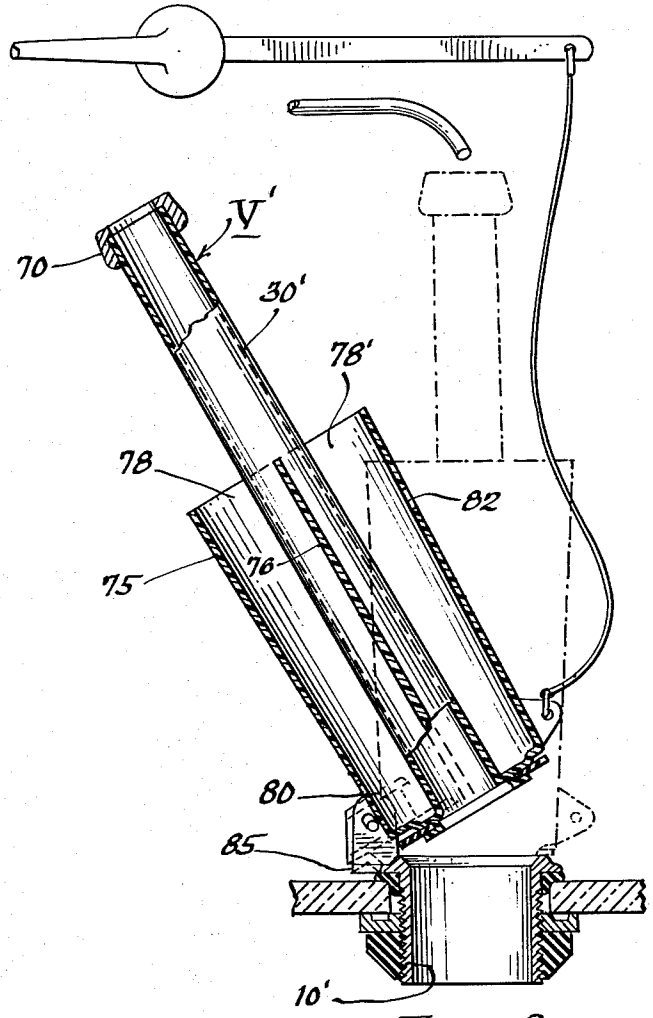

FIG. 8

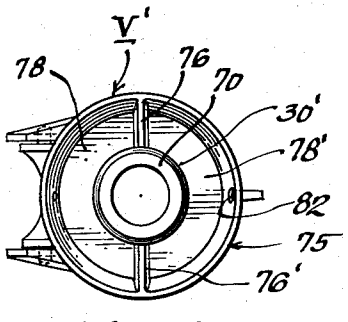

FIG. 9

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TILTING FLUSH VALVE FOR TOILET

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Filed June 18, 1959, Ser. No. 821,187
14 Claims. (Cl. 4—60)

My invention relates to toilet flush valves and more particularly to discharge valves for toilet flush tanks or reservoirs of the common type wherein the valve is tripped or opened manually, resulting in gravity discharge of the contents of the tank into the toilet bowl associated therewith, whereupon the flush valve automatically closes and the tank is automatically refilled with water.

The improvement contemplated by my invention consists of a novel discharge valve in combination with an overflow tube. My improved valve is characterized in that it is hingedly mounted within the tank as a unit combined with an overflow tube on a horizontal axis and the tripping thereof pivots or tilts the valve about its axis to effect discharge of the tank contents; associated with the valve and tube is hydrostatic means to restore the valve automatically to its original closed position where it normally retains its seat by hydrostatic pressure until it is again manually tripped.

A particular advantage of my invention is that the parts may be so proportioned relative to each other that all or part of the tank contents may be discharged before the valve is re-seated and the tank refilled.

Further objects of my invention are to produce a valve of the character described which will be certain in operation, being effectively retained in open position during the discharge of the tank and firmly seated during the refilling of the tank; which will be relatively inexpensive to produce, trouble free, and generally satisfactory for the purposes desired.

Various other objects and advantages will become apparent as the description proceeds.

Referring now to the drawings forming a part of this specification and showing a preferred embodiment of my invention,

FIG. 1 is a perspective view of a valve embodying my invention together with its associated parts, a flush tank and a portion of the toilet bowl being shown in dot-dash lines;

FIG. 2 is a side elevation of the valve shown in FIG. 1, the associated flush tank and bowl being shown fragmentarily in vertical section;

FIG. 3 is an elevational view of the valve in open or flushing position, the flush tank being fragmentarily indicated in dot-dash lines;

FIG. 4 is a top plan view of the valve;

FIG. 5 is an elevational view of the same viewed from the left of FIGS. 2 and 4;

FIG. 6 is a sectional view taken substantially along the line 6—6 of FIG. 4;

FIG. 7 is an exploded perspective view of the valve, on a reduced scale;

FIG. 8 is a section-elevation of a modified form of flush valve embodying my invention, shown in full lines in tilted or open position and in dot-dash lines in closed position, and

FIG. 9 is a top plan view of the flush valve shown in FIG. 8.

The character T represents a flush tank, which may be of standard type, associated with a toilet bowl having a flange F, the tank being secured to the flange F by any suitable means, such as bolts and nuts B.

The tank T and toilet bowl flange F have aligned apertures O_1 and O_2 for passage of a spud 10, gasket 12 and nut 13 being disposed on the spud and interposed between the tank and bowl.

A collar 15 is disposed on the spud 10 at its upper extremity, said collar having integral laterally extending perforated ears 18 and lugs 19 having diagonally sloping surfaces for limiting pivotal movement of the valve, as hereinafter described. Said collar provides a seat for the valve, as seen in FIGS. 2, 3, 6 and 7.

A unitary flush valve assembly embodying my invention, indicated generally by the character V, is pivotally attached to the spud in the following manner, said assembly including a valve, overflow conduit and counterbalancing means. I provide a U- or stirrup-shaped locking member 20 having outwardly extending alined pintles 22 journaled in laterally opposed apertures formed in the ears 18, said pintles 22 also extending through similarly disposed apertures formed in legs 25 projecting laterally from opposite sides of the bottom portion of valve assembly V. The ears 18 are disposed between the legs of locking member 20 and the legs 25 of valve assembly V, the latter being on the outside and the locking member on the inside, as seen best in FIG. 5.

The locking member 20 preferably is formed of tempered metal or suitable plastic such as "nylon," etc., having sufficient resilience to exert pressure in an outward or lateral direction in order to assure retaining of the parts in assembled relation by means of the pintles 22 in spite of any turbulence in the tank.

The valve assembly V, except as expressly stated to the contrary, is preferably molded of a suitable synthetic plastic materials of a composition especially selected so that its specific gravity is close to that of water, as for example in the range of 1.04 to 1.06. A suitable material which will meet this requirement may be obtained readily on the market and may be of a well known medium-impact polystyrene or other suitable type of moldable plastic.

The valve assembly V comprises an over-flow tube 30 normally disposed vertically when the valve is closed. At the upper extremity of tube 30 is secured a counterweight-shield in the form of a disk 32 of suitable metal of the desired specific gravity and of such size and weight as to provide a counterweight for purposes hereinafter described. The upper extremity of the tube is provided with side opening 35 for passage of water.

At the lower portion of valve assembly V and outside of the tube 30 I provide a pair of receptacles indicated generally by the numerals 38, 39. It will be noted that these receptacles 38 and 39 are separated from each other by means of transverse walls 40, 40 and that the receptacles are closed at the bottom and sides, the top edge of the side wall of receptacle 38 sloping upwardly as seen at 43 when the valve is in closed position, as seen in FIGS. 2 and 6. A relatively small orifice 45 is provided near the bottom of receptacle 38 for escape of water.

Below the receptacles and concentric with overflow tube 30 is an annularly grooved boss 44 seating a valve disc 46 of flexible rubber or the like which normally rests on the seat provided by collar 15 when the valve is closed (FIGS. 3, 5 and 6).

Attached to the upper portion of receptacle 39 is a flexible pull cord 47, chain, etc., the latter being attached at its upper end to a trip lever 50 controlled from outside the tank as by a crank 52 or other suitable manual control.

Also disposed within the tank T is suitable filling means which may be of standard type, such as an inlet pipe 60 provided with a suitable valve 63 controlled by the usual float 65.

In operation, when the tank T is full of water the receptacles 38 and 39 will likewise normally be full. When the valve is tripped by actuation of the lever 50,

the valve assembly will be tilted to the open position seen in FIG. 3 at which time the valve assembly V will be stopped by reaction of the bottom surface of arms **25** against the diagonally sloping surface of check lugs **19**. The counter-weight-shield **32** at the top of the over-flow tube will retain the valve firmly in open position while the tank water escapes through spud **10** into the toilet bowl.

It will be apparent that the shield element **32** is desirable to retain the valve in open position by the weight of element **32** because of the substantially weightless character of the plastic material chosen for the valve assembly V, as explained above, and despite any turbulence in the tank above the spud either in the escape or refilling action.

While the valve is open, the water of chamber **38** will bleed through orifice **45** until the combined weight of counterweight **32** and the other parts is so reduced as to be counterbalanced by that of the water remaining in chamber **39**, whereupon the valve assembly V will snap back about pintles **22** to re-establish a firmly seated closed position, as in FIG. 2. It is apparent that chamber **39** together with the water therein constitutes a weight means which biases the valve assembly to the closed position. It will also be appreciated that counterweight **32** is mounted so that when the assembly is in the closed position, the counterweight is on one side of the axis of tilting defined by pintles **22** and when the assembly is in the open flushing position, the counterweight is on the other side of the axis of tilting. In the closed position, the valve closing means defined by valve disc **46** is seated on the valve seat defined by collar **15** while in the open position, the valve closing means is spaced from said valve seat.

FIGS. 8 and 9 show a combination valve assembly embodying the same principle as the embodiment of FIGS. 1–7, in a modified form. In this case the valve assembly unit indicated generally by the notation V′ comprises an over-flow tube **30′** with an annular collar **70** formed of metal or other suitable and relatively heavy material, of such size and weight as to function as a counterbalance to retain the valve unit in tilted position in a manner similar to element **32** of the other embodiment. The tube **30′** is preferably molded of suitable plastic as in the previously described embodiment.

Preferably molded integrally with tube **30′** is a cup-like portion **75** encompassing tube **30′** and having more or less diametrical partitions **76, 76′** extending from the outside of tube **30′** to the inner wall of cup-portion **75** so as to divide the latter into two generally similar semi-cylindrical chambers **78, 78′**. The wall of chamber **78** is perforated adjacent the bottom, as at **80**, to permit escape of a major portion of the water from chamber **78** when the valve is tilted, as seen in full lines in FIG. 8. Another orifice **82** is provided near the top of chamber **78** to permit egress of water from said chamber.

It will be understood that the positioning and size of orifices **80** and **82** are so adjusted, in relation to the weight of counterbalance **70** as to provide a wide latitude of control in timing the automatic closure of the valve.

This embodiment of my invention operates on the same principle as the one previously described, in that the valve is tilted for flushing by means of a crank actuator of the usual type, the tilting movement of the valve unit, as in the previous embodiment, being limited by a stop **85** provided at the top of spud **10′**. The water contents of chamber **78** will be bled through orifice **80** to the point where the weight of the water in chamber **78′** below orifice **82** will be sufficient to counterbalance the weight of the valve assembly and will automatically restore the valve to seated postion.

In accordance with my invention the seating action of the valve is quick and positive. On the other hand, when the valve is open the counterweight at the top of the over-flow tube will tend to retain the valve firmly open, despite any turbulence in the escaping water, until the counter movement closing the valve goes into operation.

In either embodiment the means provided for pivotally supporting and limiting the tilting movement of the valve unit may be a separate collar attached to the discharge spud or may be integral with the spud.

In all embodiments my invention permits a wide degree of flexibility of control in timing the closing action of the valve, by correlating the tube counterweight with the other elements of the valve assembly, such as position and size of discharge orifice, etc. Furthermore, all embodiments of my invention provide a completely non-buoyant flush valve unit as distinguished from previously known flush valves which ordinarily depend on a buoyancy factor for effective operation.

Various changes coming within the spirit of my invention may suggest themselves to those skilled in the art. Hence, I do not wish to be limited to the specific embodiments shown and described or uses mentioned, but intend the same to be merely exemplary, the scope of my invention being limited only by the appended claims.

I claim:

1. In combination, an assembly of the class described comprising an overflow tube having a discharge outlet and valve closing means at the bottom thereof, a first water reservoir and a second water reservoir disposed on opposite sides of said tube and adjacent the lower portion thereof, both of said reservoirs having a relatively large opening at the top and together encompassing said tube, said second reservoir also having an orifice adjacent its bottom, a tank discharge spud having a valve seat near the top thereof, means pivotally mounting said assembly to the upper portion of said tank discharge spud to provide for tilting of said assembly about a horizontal axis between a closed position towards said first reservoir wherein said valve closing means is seated on said valve seat and an open flushing position towards said second reservoir wherein said valve closing means is spaced from said valve seat, and counterweight means mounted on said tube adjacent the top thereof to retain the assembly in the open flushing position when moved thereto with both reservoirs filled with water, said counterweight means being counter-balanced by the water in the first reservoir as the water in the second reservoir escapes through said orifice to tilt the assembly to the closed position.

2. The combination of claim 1, wherein the tube and reservoirs are integrally formed of moldable material.

3. The combination of claim 2, wherein the molded material is a synthetic plastic having a specific gravity close to 1, so that the valve is substantially weightless in water.

4. The combination of claim 2, wherein the reservoirs have a substantially continuous wall spaced outwardly from the tube with coplaner transverse partitions lying substantially in the plane of the tube axis and connecting opposite sides of the tube with said wall, said partitions separating the reservoirs from each other.

5. The combination of claim 4, wherein said means pivotally mounting said assembly comprises a pair of parallel, normally horizontal arms integral with and projecting laterally from the lower portion of the tube, said arms providing pivotally rockable support means for said assembly.

6. The combination of claim 5, having laterally extending means carried by said tank-discharge spud and cooperating with said arms for pivotally mounting the valve, and means on said laterally extending means for limiting the tilting movement of the valve.

7. The combination of claim 2, wherein said means pivotally mounting said assembly comprises a pair of parallel arms extending laterally from the lower portion of said assembly and providing means for rockably supporting the assembly.

8. The combination of claim 7, wherein said discharge spud has means extending laterally from the upper portion thereof and cooperating with said supporting arms for pivotally mounting the assembly on said spud.

9. The combination of claim 8, with stop means on said assembly-mounting means for limiting the pivotal movement of the assembly from valve-closing position.

10. The combination of claim 2 wherein said valve closing means is annular and is disposed below said reservoir and concentric with said tube.

11. A combination as in claim 1 wherein the first reservoir has a discharge orifice disposed a relatively slight distance below the top opening thereof.

12. The combination of claim 1 wherein said counterweight means is mounted so that, in said closed position, it is on one side of the axis of tilting and so that, in the open position, it is on the other side of the axis of tilting.

13. In combination, an assembly of the class described comprising an overflow tube having a discharge outlet and a valve closing means at the bottom thereof, a water reservoir and a weight means disposed on opposite sides of said tube and adjacent the lower portion thereof, said reservoir having a relatively large opening at the top thereof, said reservoir also having an orifice adjacent its bottom, a tank discharge spud having a valve seat near the top thereof, means pivotally mounting said assembly to the upper portion of said tank discharge spud to provide for

tilting of said assembly about a horizontal axis between a closed position toward said weight means wherein said valve closing means is seated on said valve seat and an open flushing position toward said reservoir wherein said valve closing means is spaced from said valve seat, and counterweight means mounted on said tube adjacent the top thereof to retain the assembly in the open flushing position when moved thereto with said reservoir filled with water, said counterweight means being counterbalanced by said weight means as the water in the said reservoir escapes through said orifice to tilt the assembly to the closed position.

14. The combination of claim 13 wherein said counterweight means is mounted so that, in said closed position, it is on one side of the axis of tilting and so that, in the open position, it is on the other side of the axis of tilting.

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