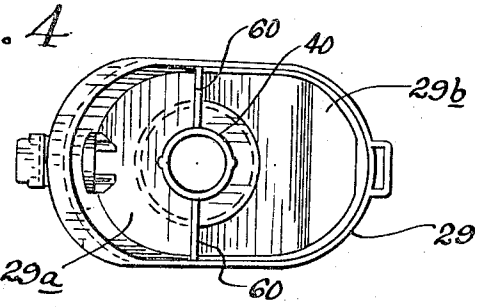
June 20, 1967 F. C. ALEXANDER 3,325,828

FLOW-ADJUSTING TILTING FLUSH VALVE

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FIG. 4



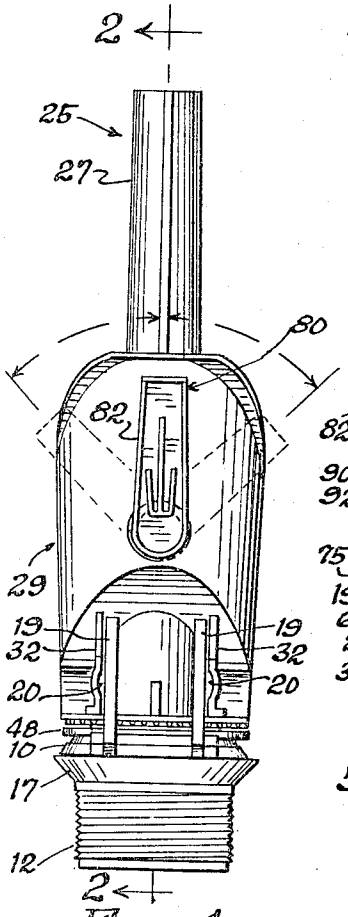


FIG. 1

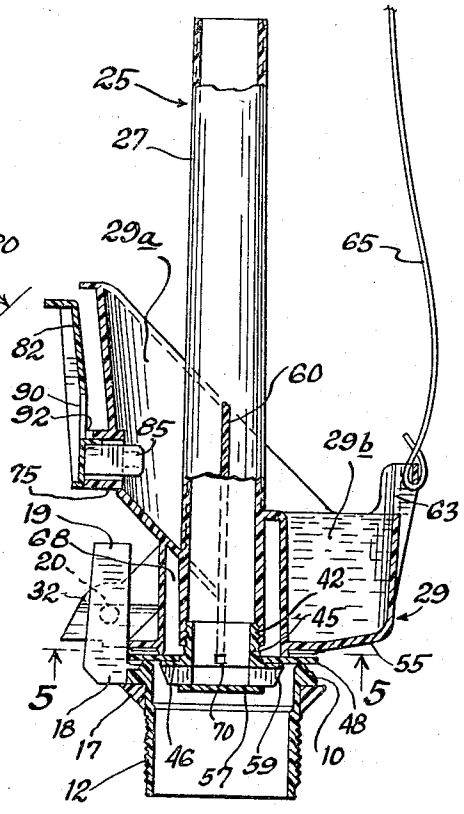


FIG. 2

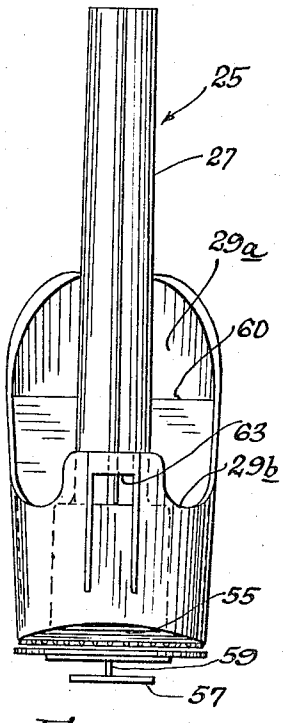


FIG. 3

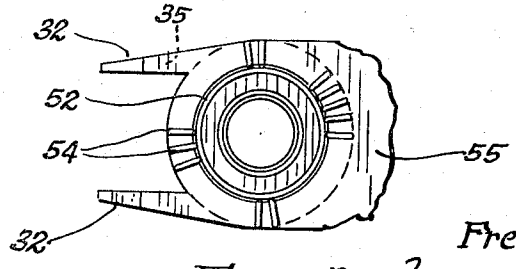


FIG. 5

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FLOW-ADJUSTING TILTING FLUSH VALVE

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FIG. 6

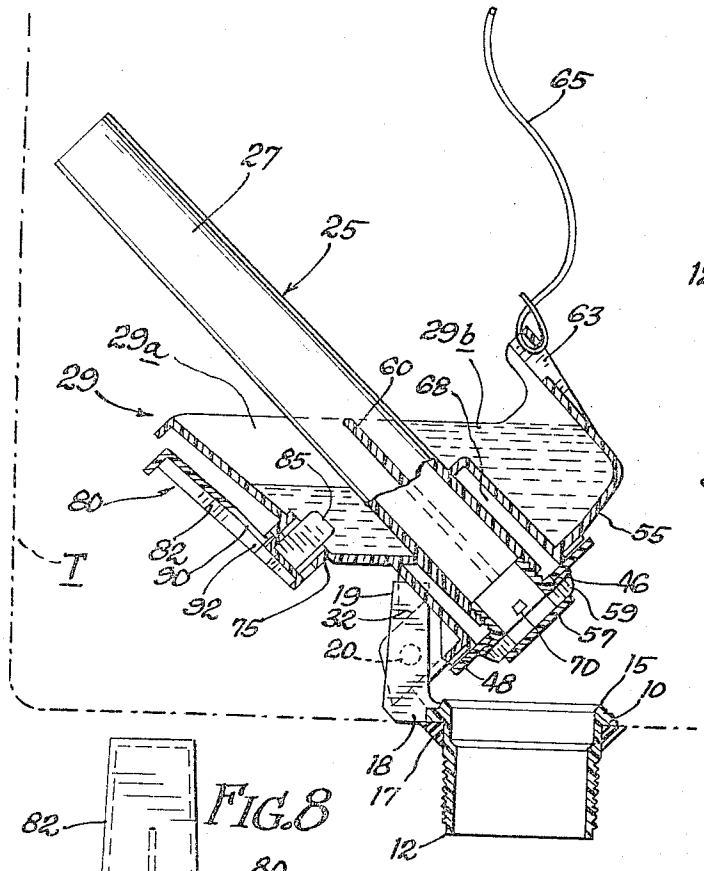


FIG. 7

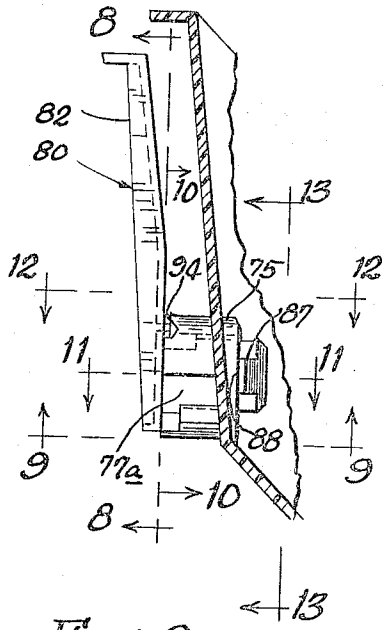


FIG. 8

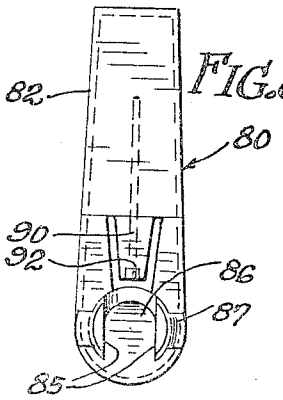


FIG. 9

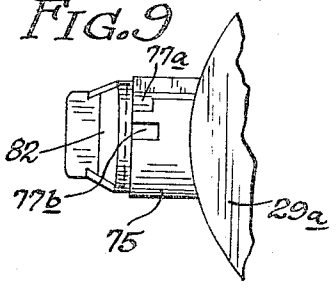
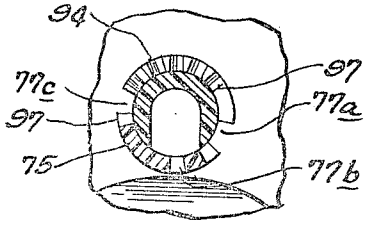


FIG. 10



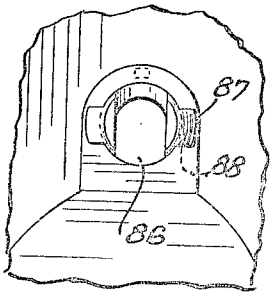


FIG. 13

FIG. 11

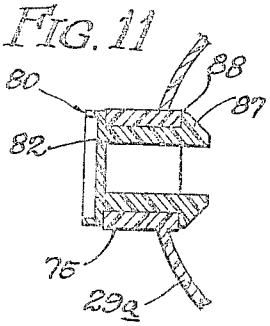
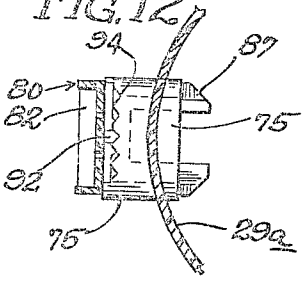


FIG. 12



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FLOW-ADJUSTING TILTING FLUSH VALVE

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Filed May 3, 1965, Ser. No. 452,736
7 Claims. (Cl. 4—60)

ABSTRACT OF THE DISCLOSURE

A tilting discharge valve for a reservoir such as a toilet flush tank, wherein the valve closure is carried at the base of an overflow tube adapted for pivotal mounting on the bottom of the reservoir, said tube carrying the lower portion thereof a pair of oppositely disposed open-top chambers, one of said chambers being closed at the bottom and serving, when occupied by liquid, as a counter-balance, while the other chamber has manually adjustable discharge means for controlling the speed of discharge of the reservoir. Also carried by the tube is a buoyant air-trapping chamber for accelerating the opening of the valve.

My invention relates to flushing valves for toilet tanks, and has to do more particularly with a tilting type of valve adapted to be mounted in a flush tank for pivotal movement when tripped for the flushing of a toilet bowl.

My invention may be considered an improvement over that described and claimed in my Patent No. 3,003,156, granted Oct. 10, 1961.

Broadly considered, the present invention, like my patented invention, contemplates a discharge valve assembly pivotally mounted on a spud in the bottom of a flush tank in combination with an overflow tube and a pair of open-top chambers carried by the valve and tube, one of said chambers having a discharge orifice whereby, after the valve has been tripped and the tank discharged, the water contained in said chamber will be discharged wholly or in part through said orifice, this chamber being disposed on the pivot side of the valve and overflow tube; the other chamber, disposed on the opposite side of the valve and overflow tube and having a charge of water which will not be discharged, serves when the valve is open as a counterweight, acting to restore the valve to closed position after sufficient water has been bled from the first mentioned chamber for the valve to become overbalanced.

The present invention contemplates a number of important changes and improvements over said patented invention.

One object of the present invention is to provide means for varying the rate of discharge of water from the perforated chamber. This determines the amount of water delivered from the tank during the flushing cycle, said requirements determined by variations in the level position of the toilet bowl and tank or in the flushing operation of the bowl itself.

A further object of my invention is to provide a chamber at the base of the assembly, buoyant when the valve is tilted in the open position, preferably concentric with the overflow tube, to assist in expediting the opening of the valve after it has been tripped and to maintain it in open position during the initial stages of the flushing cycle and until the tank has been sufficiently discharged and the valve has become overbalanced, restoring itself to closed position. Said chamber is non-buoyant when valve is in closed position, being open to atmosphere. This chamber replaces the counterweight in the form of a metal disc secured to the top of the overflow tube, as embodied in my aforesaid patent for accomplishing a similar function. My improvement in this feature represents a substantial saving of cost and is otherwise advantageous.

The metal counterweight employed at the top of the overflow tube in my former invention functioned additionally as a baffle to prevent a jet of water from shooting out of the top of the overflow tube at the moment the valve is tripped. If no baffle is used, the water at this moment, seeking its own level, will shoot up the overflow tube with such force that it is likely to hit the tank cover and may creep along the underside of the cover and drip down the outside of the tank. Accordingly, some baffling is required to prevent such malfunction.

An object of the present invention is to provide, in lieu of the metal baffle provided at the top end of the overflow tube in my prior invention, a disc or baffle spaced below the bottom extremity of the overflow tube. Such an arrangement also prevents the dripping sound of water running down the overflow tube into the toilet bowl, or greatly reduces such annoying sounds.

Still another object is to provide a tilting valve which may to a major extent be molded of a synthetic resin, preferably with a specific gravity of approximately 1.00, in order that the weight of the valve assembly, when immersed, may be minimal, in a minimum of parts, making for greater economy in production.

Various other objects and advantages accruing to my invention will become apparent as the description proceeds.

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

FIG. 1 is an end elevational view of one embodiment of tilting flush valve assembly embodying my invention;

FIG. 2 is a longitudinal sectional view of the valve in closed position taken substantially along line **2—2** of FIG. 1;

FIG. 3 is an end elevation of the same viewed from the side opposite that seen in FIG. 1;

FIG. 4 is a top plan view thereof;

FIG. 5 is a fragmentary bottom plan view taken substantially along the line **5—5** of FIG. 2;

FIG. 6 is a sectional view substantially similar to that of FIG. 2 but showing the valve in tripped or open position;

FIG. 7 is a fragmentary section-elevation on an enlarged scale detailing the adjustable means for controlling the period of flushing;

FIG. 8 is an elevational view of the control lever element taken substantially along the line **8—8** of FIG. 7;

FIG. 9 is a fragmentary plan view taken substantially along the line **9—9** of FIG. 7;

FIG. 10 is a section-elevation taken substantially along the line **10—10** of FIG. 7;

FIG. 11 is a sectional view taken substantially along the line **11—11** of FIG. 7;

FIG. 12 is a plan-section taken substantially along the line **12—12** of FIG. 7; and

FIG. 13 is a fragmentary elevational view taken substantially along the line **13—13** of FIG. 7.

As seen in FIGS. 1 and 6, my invention contemplates a tilting valve assembly mounted on an annular flange **10** of a spud **12** which conducts flushing water from the usual flush tank T into a toilet bowl (not shown). The spud is provided at its upper extremity with a relatively sharp-edged ring portion **15** providing a valve seat. A washer **17** provides a leak-proof passage between the tank and spud.

Flange **10** has a lateral extension **18** with integral upstanding arms **19** on which are formed pintles **20** projecting laterally therefrom, which may be substantially similar to the arrangement shown in my aforesaid patent, for pivotally supporting my improved valve, to be described. The spud and parts integral therewith is preferably

molded of a suitable plastic such as acetal, polycarbonate, etc. The arms **19** may conveniently be grasped between the fingers in assembling the device, said arms being resiliently yieldable.

My valve combination, designated generally by numeral **25**, is preferably molded, for the most part integrally, of a suitable synthetic plastic having the desired properties of strength, rigidity, and also preferably having a specific gravity of approximately 1.00. Many suitable synthetic plastic compositions are well known to those skilled in the art to be eminently suitable to my purpose, such as the polystyrenes, ABS Group, etc. In general, a plastic is suitable which has minimal water absorbency.

Generally speaking, my improved valve assembly comprises an overflow tube **27** and, concentric therewith at its lower extremity, a reservoir portion **29**.

Extending laterally from the reservoir portion is a pair of spaced arms **32** apertured as at **33** to receive pintles **20** carried by arms **19**.

Overflow tube **27** is interiorly threaded at its lower extremity as indicated at **42** for receiving an exteriorly threaded nut **45**, also of molded plastic, which has integral therewith an annular disc **46** seating a resilient washer **48** formed of rubber, synthetic rubber or the like. Formed on the bottom face **55** of reservoir portion **29** is a series of downwardly extending spaced radial ribs or serrations (FIG. 5).

A circular baffle disc **57** is molded integrally with nut **45** and plate **46**, being joined to the latter by a pair of diametrically opposed web members **59**. This baffle plate or disc **57**, being disposed directly below overflow tube **27**, although spaced therefrom, serves effectively to prevent a surge of water up the tube when the valve is suddenly tripped, as explained above, which action may result in the undesirable effects mentioned.

Reservoir portion **29**, which is disposed outside of and generally concentric with over-flow tube **27**, is provided with opposed diametrical walls **60**, **60** on opposite sides of tube **27**, providing separate chambers or reservoirs **29*a*** and **29*b*** on opposite sides of the tube. The end wall of reservoir **29*b*** is perforated as at **63** or otherwise deformed to provide means for securing a flexible bail or strap **65** (FIGS. 2 and 6), the latter being attached in the usual manner by looping strap, links, etc., to a crank on the outside of the tank for tripping the valve.

As seen in FIGS. 2 and 6, a dead air chamber indicated generally by the numeral **68** is provided in the reservoir portion **29** immediately outside of and concentric with overflow tube **27**. Said air chamber **68** is closed at the top and sides and open at the bottom, being of generally annular shape. Nut **45** is provided with one or more apertures **70** extending entirely therethrough (in the instant case I provide a pair of diammetrically disposed apertures **70**), these passages being for the purpose of bleeding air into chamber **68**, said chamber thus communicating with the atmosphere.

Inasmuch as air will always be present in chamber **68**, this chamber will function similarly to the metal cap at the upper extremity of the overflow tube in my patented invention, referred to above, serving to accelerate the opening of the valve when tripped. Should any water flow into said chamber **68**, as during the flushing operation, it may readily escape therefrom through apertures **70** when the valve is closed.

As in my patented valve construction, provision is made for draining reservoir **29*a*** when the valve has been tripped and water is being discharged from the tank through the spud therebelow, in which situation the valve will have assumed the position shown in FIG. 6. In accordance with the present invention, however, I provide means for varying the rate of discharge of water from reservoir **29*a***.

In this case a circular sleeve or neck **75** is molded into the side wall of reservoir **29*a***, this neck being provided with a plurality of apertures of different sizes, as indicated by the numerals **77*a***, **77*b*** and **77*c***. These apertures are

so dimensioned and proportioned as to be calculated to permit the discharge of reservoir **29*a*** in predetermined varying periods of time relative to discharge of the tank contents through the spud or, alternatively, to permit a given amount of water to remain in the tank at the conclusion of the flushing period, when the valve will automatically be returned to closed position. In normal flushing, it is usually desired that a residue of from 0 to 3 inches of water remain in the tank at the conclusion of flushing.

Cooperating with neck **75** is a manually adjustable member indicated generally by the numeral **80**, also molded of the same type of material as the valve assembly, or other suitable material, and comprising a crank arm **82** and a pair of opposed arcuate tongues **85**, **85** normal to said arm, said tongues defining a passage **86** therebetween (FIG. 8). Said tongues **85** each have formed adjacent the free extremity there of a boss **87** defining a rectangular shoulder **88** seating against the inner edge of neck **75** (FIG. 11). Said tongues **85** are slightly resilient and, in the assembly of the device, will yield sufficiently to permit said tongues being pressed through neck **75**, after which said bosses **87** will snap into a position as seen in FIGS. 11 and 12, locking the crank and tongues in place.

Formed on crank arm **82** is a coplanar tongue **90** with a detent **92** formed on the inner face thereof (FIG. 8). Said tongue **92** will have a certain amount of resilience, detent **92** being engageable with a series of serrations **94** formed on the outer face of neck **75**, whereby the arm **75** and parts carried thereby are retained in angularly adjusted position. Also formed on said neck are shoulders **97**, **97** which serve as stops to limit the rotation of the arm **82** and parts carried thereby.

It is believed that the operation of the device as described above will be clearly understood. When the valve is installed, the rate of flushing will be adjusted by rotation of control member **80**, as above described, thus fixing the effective discharge aperture leading from chamber **29*a***. When the valve is tripped by the crank on the exterior of the tank and the flushing operation is initiated, the valve will be moved through flexible member **65** from the position seen in FIG. 2 to that of FIG. 6, whereupon, after the water level in the tank has receded to a point below reservoir portion **29** of the valve, the water in chamber **29*a*** will escape, as seen in FIG. 6, at a predetermined rate, until the weight of the water contained in chamber **29*b*** will have overbalanced the valve, whereupon gravity will restore it to its closed position, as seen in FIG. 2.

It will also be apparent that the air trapped in chamber **68** will function, when the tank is full, to expedite the lifting of the valve off its seat once it has been tripped, serving similarly in this respect to the weight secured adjacent the top of the overflow tube in accordance with my afomentioned patent.

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 form shown or uses mentioned, but intend that the scope of my invention be determined solely by the appended claims.

I claim:

1. In combination, a valve assembly for a tank comprising

(a) an overflow tube having valve-closing means adjacent the bottom thereof,

(b) 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 and discharge means adjacent the lower portion thereof,

(c) a tank discharge spud having a valve seat adjacent the top thereof,

(d) means pivotally mounting said assembly on the spud to permit 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 the valve seat, and

(e) air-trapping chamber means carried by and surrounding said tube, serving to accelerate the opening movement of said valve-closing means from said valve seat.

2. A combination as in claim 1, wherein said weight means is an open-top reservoir normally occupied by water in all positions of said valve-closing means.

3. A combination as in claim 1, wherein said air-trapping means is a closed-top chamber disposed outside said tube.

4. A combination as in claim 1, wherein said discharge means is manually adjustable for varying the flushing period.

5. A combination as in claim 1, having a baffle plate disposed in spaced relation below the discharge end of said tube for preventing upsurging of water through said tube.

6. A combination as in claim 2, wherein said air-trapping means is a closed-top chamber disposed outside said tube, said discharge means is adjustable for varying the flushing period, and a baffle plate is disposed in spaced relation below the discharge end of said tube.

7. In combination, a valve assembly for a tank comprising

(a) an overflow tube having valve-closing means adjacent the bottom thereof,

(b) 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 and discharge means adjacent the lower portion thereof,

(c) a tank discharge spud having a valve seat adjacent the top thereof,

(d) means pivotally mounting said assembly on the spud to permit 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 the valve seat, and

(e) manually adjustable means for controlling the flow rate through said discharge means and thus varying the flushing period.

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