June 18, 1963 R. M. NARDONE 3,093,833

TWO-WAY FLUSH VALVE MECHANISM

Filed July 25, 1961 2 Sheets-Sheet 1

Fig. 1

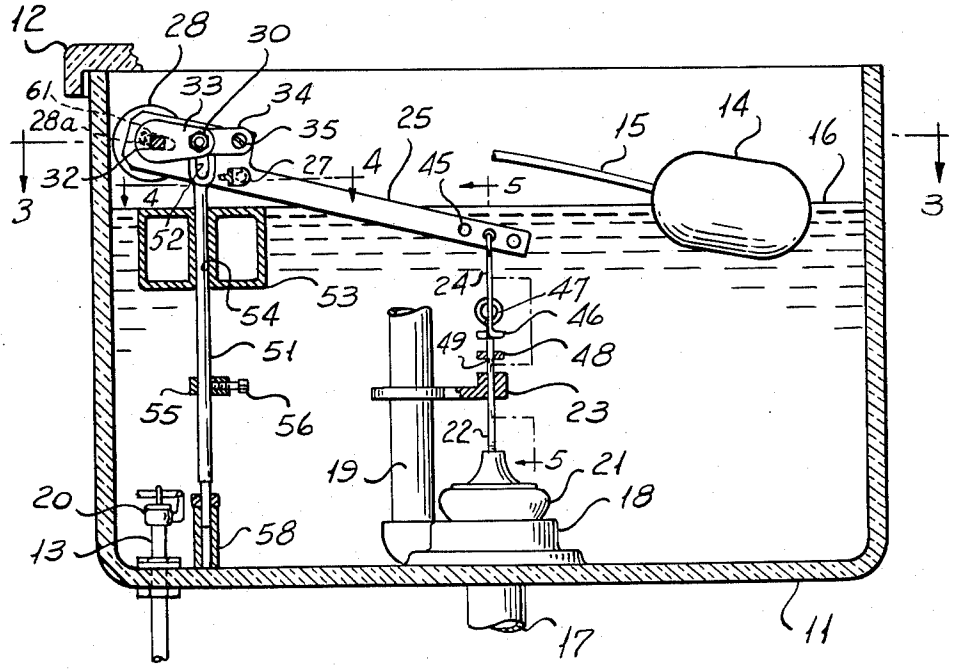
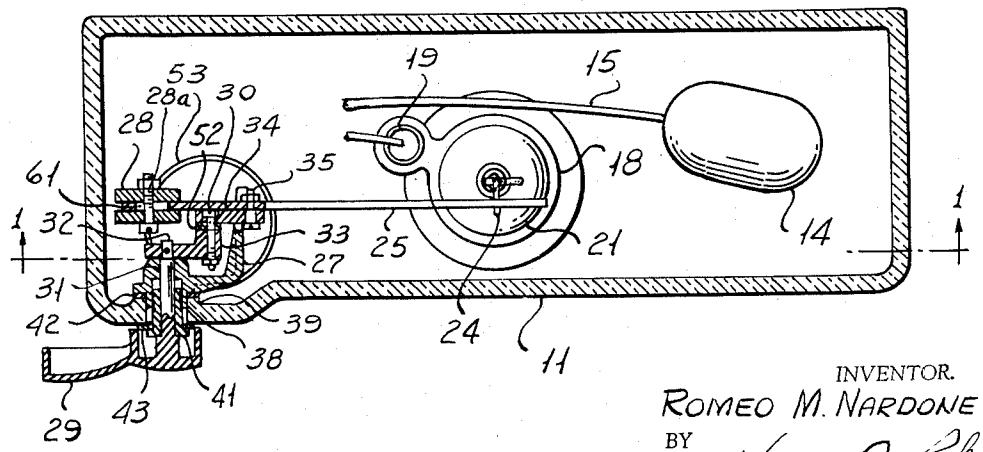


Fig 3



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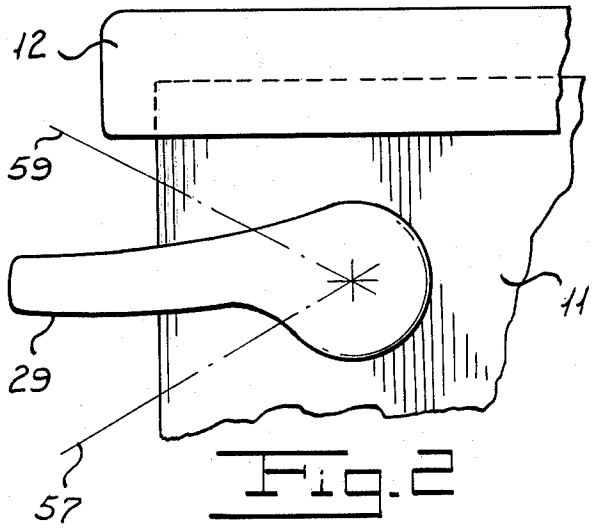


Fig. 2

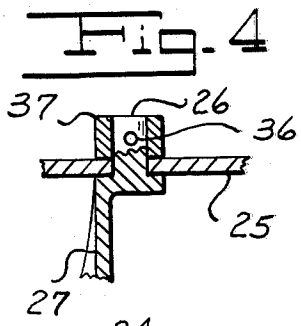


Fig. 4

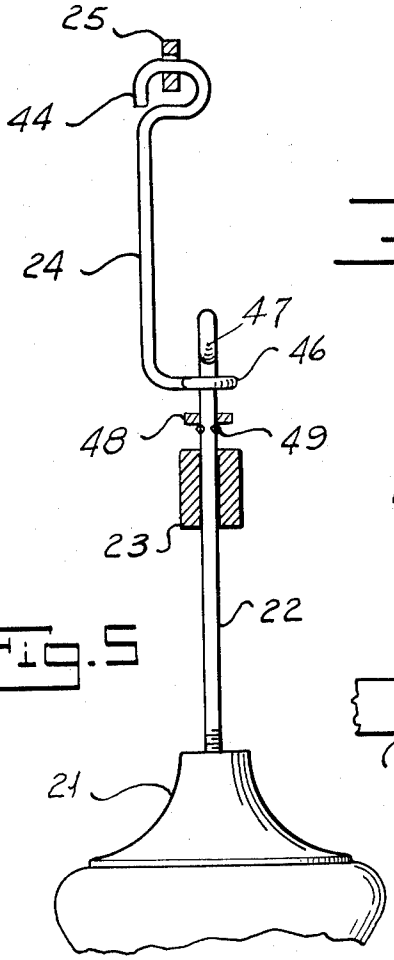


Fig. 5

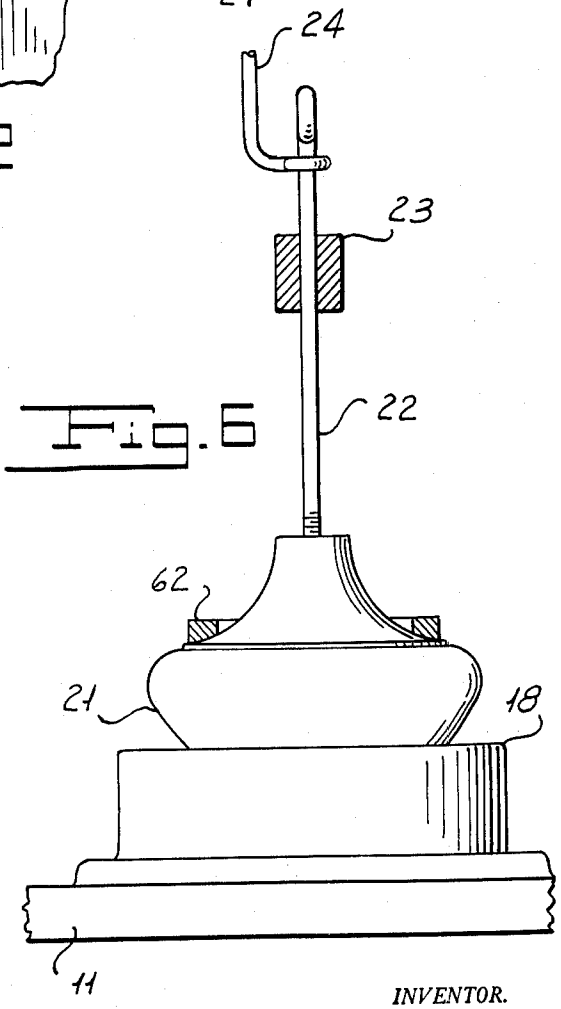


Fig. 6

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TWO-WAY FLUSH VALVE MECHANISM

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2 Claims. (Cl. 4—67)

This invention relates to flush toilets of the type having a gravity tank from which flows flushing water.

A typical toilet tank, as specified, capable of meeting today's standard practice, generally contains 6 to 8 gallons of water. In many instances it is possible to conduct a satisfactory flushing operating with the use of much less water. With a tank as now provided, there is no means for using fractional quantities of the water in the tank, so more water is used than needed and there is increased expense and waste of water.

Accordingly, my invention is designed to provide a mechanism which may be incorporated in a conventional toilet tank and which will permit the user to flush the toilet with either the entire tank capacity or with only a fraction thereof, in accordance with whether the operating handle is turned in one direction or the other.

An object of my invention is to provide means whereby when the fluid level in the tank lowers to a selected elevation, the control valve may be replaced on its seat and the flow of water from the tank terminated.

A further object of my invention is to provide novel and improved automatic means to move the flush valve back on its seat over the outlet pipe when the water in the tank is at some predetermined level thereabove.

Another object of my invention is to achieve economy of the water consumption by automatic means including a float coactive in a novel way with the flush valve actuating lever to accelerate closing of the flush valve.

These and other objects and advantages will become apparent from the following detailed description when taken with the accompanying drawings. It will be understood that the drawings are for purposes of illustration and do not define the scope or limits of the invention, reference being had for the latter purpose to the appended claims.

In the drawings, wherein like reference characters denote like parts in the several views:

FIGURE 1 is a vertical sectional view of apparatus embodying my invention, on the line 1—1 of FIGURE 3 in the direction of the arrows, parts being shown in elevation.

FIGURE 2 is a fragmentary front elevational view of the upper left hand portion of the tank, showing the operating handle.

FIGURE 3 is a horizontal sectional view, on the line 3—3 of FIGURE 1 in the direction of the arrows.

FIGURE 4 is a fragmentary sectional view, on the line 4—4 of FIGURE 1 in the direction of the arrows.

FIGURE 5 is a fragmentary elevational view, with parts in section on the line 5—5 of FIGURE1 in the direction of the arrows.

FIGURE 6 is a fragmentary elevational view, corresponding with FIGURE 5 but showing a modification.

Referring to the drawings in detail and first considering the embodiment of my invention illustrated in the FIGURES 1 to 5, inclusive, there is shown a conventional toilet tank 11 normally closed by a cover 12 and having a water supply pipe 13 shown fragmentarily. The valve 20 controlling the flow of water from the supply pipe 13 is conventional and not here fully illustrated. Flow through said valve 20 is controlled in the usual manner by a float 14 carried by a lever or operating arm 15, in order to admit water from the pipe 13 through the valve 20 to the tank 11 when the level therein drops below the

normal water line 16 and cut off the water when the level thereof rises to said water line.

There is an outlet pipe 17 leading to the toilet bowl which is of conventional construction. There is a valve seat 18 on the pipe 17 and a connected overflow pipe 19. A hollow rubber ball valve 21 normally engages the seat 18 and stops the flow of water to the pipe 17, that is, during periods of non-use. The ball valve 21 may be conventional construction and have some buoyancy. It may be actuated in a conventional manner by means of its stem 22 extending upwardly therefrom and passing through an appropriate aperture in stem guide 23 which may be clamped to the overflow pipe 19. There is a link 24 connecting the upper end portion of the stem 22 with a ball valve actuating lever 25 pivoted with respect to the tank about a stud 26 projecting from a tank-secured bracket 27. One arm of lever 25 is provided with counterweights 28 so it tends to approximately balance about the stud 26.

The mechanism which enables my invention to allow for the discharge of only a fractional part of a tank full of water will now be described in more detail. Commencing with the operating handle 29, shown in FIGURES 1 and 3, means are provided for pivoting said handle with respect to the tank 11 and allowing for operating from a neutral or horizontal position to an upper normal operating position or to a lower economizer position. The handle 29 desirably has a shaft 31 integral therewith, the inner end portion 32 of which is desirably square or non-circular in cross section and carries thereon a driving arm or link 33.

The arm 33 is operatively connected to the ball valve lever 25 by means of a link 34 which has one end pivoted to the lever 25 by means of a pin 35. The other end of said link 34 is pivotively connected to the arm 33 by means of a pin 30 to form a toggle joint between arm and link. The pivoting of the lever 25 to the stud 26 is maintained by a cotter pin or other retaining device 36 which holds a collar 37 thereon, between which collar and the bracket 27 the lever 25 pivots.

The bracket 27 has a non-circular or square section 38 which fits a corresponding hole in the tank 11 and the bracket is secured against a boss 39 on the inside wall of said tank by a bushing 41 threaded thereinto, which bushing also serves as a bearing for the shaft 31. Suitable washers 42 and 43 are desirably used between the apertured wall portion of the tank 11, which may be of porcelain, and the secured members.

The link 24 is desirably attached to the long end or arm portion of the lever 25 as by having an upper looped portion 44 passed through a selected aperture 45 near the right hand end, as viewed in FIGURE 1. The lower end portion of the link 24 is looped at 46 to slidably connect with the stem 22. Slidable motion therebetween is limited upwardly by a looped upper portion 47 of the stem 22 and downwardly by a washer 48 supported on the stem 22 by raised or upset portions 49 thereof. These portions 49 are placed at a position selected so that they are high enough to, at the proper part of the sequence of operations, transmit force from the link 24 to the ball valve 21.

There is a rod 51 with a longitudinally elongated opening 52 in its upper end portion and through which the pin 30 passes to thereby provide for support with lost motion therebetween. This lost motion allows for clockwise turning of the handle 29 without moving said rod 51. The rod 51 is, however, moved upon counterclockwise movement of the handle 29, that is, upon break of the toggle in an upward direction. Carried on the rod 51 is a float 53 desirably made of heavy gage material, so that it just barely floats when free, and apertured as

indicated at 54 to allow for sliding on said rod until stopped by a collar 55.

This collar 55 may be set permanently at a selected location, but it is desirably adjustable and secured in an adjusted position on the rod 51 by means of a set screw 56. The setting of the collar is in accordance with the fractional part of the water in the tank which is to be employed upon moving the handle 29 counterclockwise, or to the position 57 of FIGURE 2. Desirably threaded on the lower end of the rod 51, in order to allow for adjustment, is an extension 58 which normally rests on the bottom of the tank 11 to limit downward movement of the rod 51 beyond a predetermined neutral position.

Describing the operation of the flush mechanism, the toggle 33, 34, 30 is normally horizontal as shown in FIGURE 1 and acts on the lever 25 after the fashion of a bell-crank lever, and in order to use only a predetermined fraction of the water in the tank, the handle 29 is pushed or rotated counterclockwise, that is, to the position designated 57 in FIGURE 2. This rotates the shaft 31 and arm 33 thereon, breaking the toggle upwardly and lifting the long end portion of the lever 25 and the rod 51. This operation of the lever 25 lifts the link 24 to its maximum point, permitted by the guide 23, and unseats the ball valve 21, allowing water to flow to the pipe 17. As water pours out, its level drops, and with it the float 53, which was originally fully submerged, until said float contacts the collar 55 on the rod 51. The float then stops, but places no force on the collar until it begins to be exposed by the receding water. When fully exposed, its entire weight is applied to return the rod 51 and the arm 33, the link 34, connecting pin 30 and lever 25 to their original positions, forcing the link 24 to contact the washer 48 and reseating the ball valve 21 to stop the release of water. The collar 55 may be located along the rod 51 until a suitable position has been obtained for the amount of water to be used. The lower the position of the collar 55, the more water is used.

In normal operation, for a full flush the handle 29 is rotated clockwise, or to the position 59 in FIGURE 2, rotating the shaft 31 and its arm 33 clockwise to break the toggle downward and again raise the long end of the lever 25 and ball 21 off its seat. The rod 51, in this instance, is not lifted but remains fixed, since it cannot move down, as the pin 30 slides down along the elongated slot 52. When the level of the water gets to about the level of the ball valve 21, the latter falls by its own weight, assisted by the outrushing water, and reseats. This reseating brings its stem 22 and link 24 to neutral position, unaffected by any operation of the float 53.

It will also be understood that the ball 21 may be reseated at any time, during either economy or normal operation, by manually returning the handle 29 to normal or neutral position. The weights 28 off-set the unbalance of the long arm of the lever 25 and link 24. The balance may be adjusted by moving the bolt 28*a* carrying weights 28 along a slot 61 in a short or wide end portion of the lever 25. If it were not for this counterbalancing, the long right hand end portion of the lever 25 would drop, forcing the ball 21 to reseat.

Referring now to the embodiment of my invention illustrated in FIGURE 6, there is disclosed a modification in which an annular weight 62 is placed around the ball valve 21. The weight is so chosen that it overcomes, by a slight amount, the buoyancy of the conventionally hollow ball valve 21, so that said valve will just sink in the water when fully submerged. In order to neutralize the weight 62 the amount of the weight 28 to balance the lever 25 is correspondingly increased.

In operating the tank 11 to use only a predetermined fraction of the water normally hterein, the ball valve 21 with its weight 62 is lifted by the link 24 and stem 22 the full or normal distance, as in the preceding embodiment, upon swinging the handle 29 counterclockwise. It remains in this up position until the float 53 is exposed

by the water and its weight straightens out the links 33 and 34 forming the toggle joint, to lower the right hand end of the lever 25.

The link 24 then slides down along the stem 22 and as it does so the weight 62 assists in lowering the ball valve 21 to seat it. In accordance with this construction, the ball valve 21 and stem assembly move freely straight down without being forced sidewise by action of the link 24 on the washer 48, tending to bind the stem 22 in the guide 23. Except as specifically described, the construction and operation of this embodiment is the same as that in accordance with the first embodiment.

In normal operation, since the float 53 plays no part in the movement of the lever 25 and since the mechanism is balanced about the stud 26, the ball valve 21 will not drop until it is exposed by the receding water. At that time, the weight 62 together with the weight of the ball valve 21 and its stem 22 causes said valve to drop quickly on its seat 18, bringing the linkage back to normal position.

From the foregoing disclosure, it will be seen that I have provided means whereby water economy may be effected and the amount of economy predetermined by the setting of the collar 55 on the rod 51. It will be understood that although the collar is shown as adjustable, the construction could be such that the collar would be fixed, thereby permitting the user to select only for normal operation or a predetermined fraction of the water normally in the tank.

It will be understood that, in any event, a greater efficiency in the use of the water is effected by my apparatus because the fractional part of the water used is the top part, whereby it flows down under a greater average head than when operating conventionally. It will also be understood that although the extension 58 is shown adjustable, it may be fixed, assuming that the mechanism is standardized for use in tanks 11 of uniform depth or uniform distance from the axis of the stud 26 to the bottom of the tank. Although, in the embodiment of FIGURE 6, a separate weight 62 is shown applied to the ball valve 21, yet I may accomplish the same result by using a special ball valve. Such a valve would be of correspondingly greater weight, as by having thicker than normal walls with a smaller hollow interior, and thus not need extra weight as it would normally tend to slowly sink in water.

I claim:

1. In a toilet tank, a water supply pipe, an inlet valve, a float controlling the flow of water from said pipe through said valve, an outlet pipe, a ball valve normally closing said outlet pipe, mechanism including a lever pivotally mounted in said tank, a link connecting one arm of said lever to said ball valve, a handle oscillatably mounted in said tank, means connecting said handle to said lever for lifting said ball valve and permitting escape of water in said tank through said outlet pipe, and another float and means other than said lever connecting said float directly to the last-named means to return the ball valve to its seat when a selected fraction of the water in said tank has been discharged through said outlet pipe.

2. In combination with a flush tank having an outlet pipe with a valve seat, a ball valve in said tank and normally tending to sink in water in the tank seat on said valve seat to close said outlet pipe during periods of non-use, a stem upstanding from said valve, a ball valve lever, a pivot bracket pivotally mounting said lever intermediate its ends in said tank, a link with its upper end portion connected to one arm portion of said lever and its lower end portion slidable on the upper end portion of said stem, means at the upper end of said stem engaged by the lower end portion of said link for lifting said stem and ball valve upon swinging of the lever in one direction, a counterweight on the other arm of said lever, an actuating handle for said lever pivotally mounted on said tank, a toggle including a first link rigidly connected at one end to said handle, a second toggle link pivotally connected at

one end to said lever above said pivotal mounting thereof, a pivot pin connecting the other ends of said toggle links so that the toggle is normally horizontal with the lever pivots in vertical alignment for raising the valve ball so that upon turning the handle in either direction the ball valve is raised and the pivot pin is raised or lowered, a rod mounted for limited vertical movement and extending downwardly from said pin between the handle end and mounting having a longitudinally elongated opening in the upper end thereof and through which said pin passes to provide lost motion between said pin and said rod on downward swinging of said toggle links, but when the pin is raised to lift the rod, allowing said rod to exert a downward pull on said pin, a float vertically slidable on said rod and normally submerged at the surface of water in the tank, and means for limiting downward movement of said float on said rod as the level of the water descends, whereby when the handle is turned in one direction to lift the pivot pin and break the toggle and thus lift the ball valve,

release of water by said ball valve is checked when the float is exposed by lowering of the water level and its weight is applied to said rod to return said toggle to its horizontal position, causing the link to move downwardly on said stem and consequent reseating of the ball valve, while when the handle is turned in the other direction, said rod is not moved and the float has no effect.

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