Sept. 2, 1952 T. E. CROCKETT 2,608,991

TOILET FLUSH TANK MECHANISMS

Filed June 8, 1950 2 SHEETS—SHEET 1

FIG. 1.

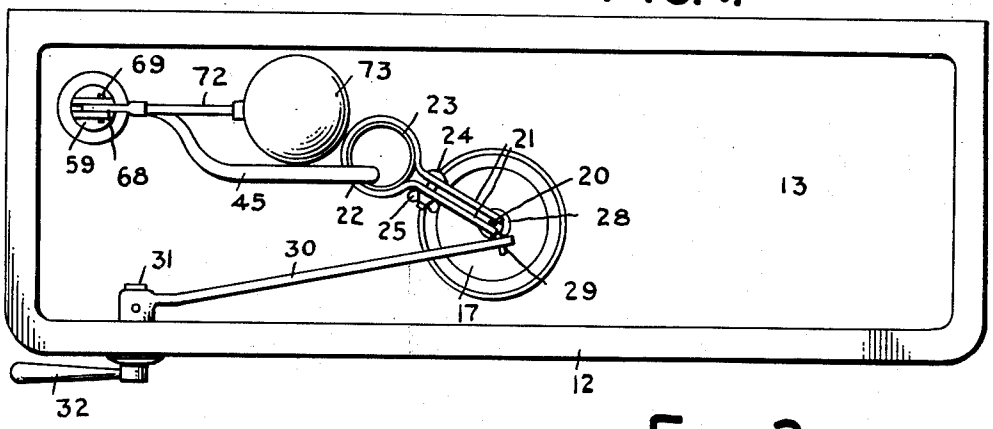
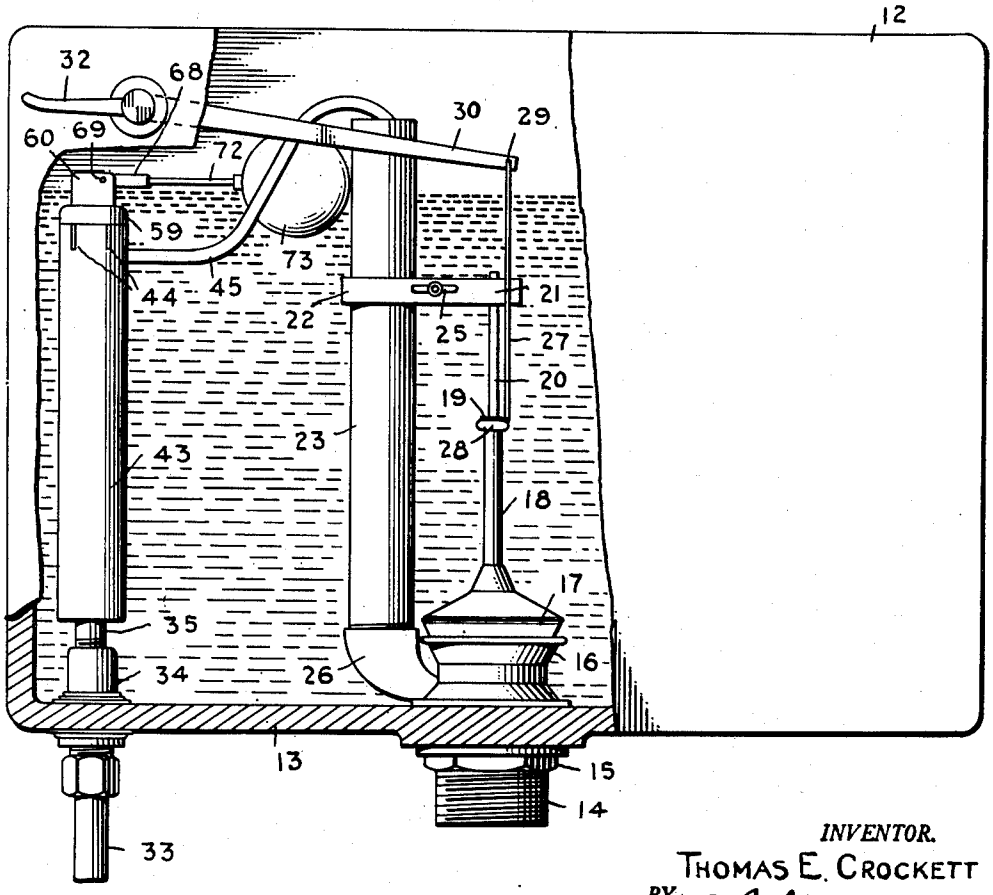


FIG. 2.



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FIG. 3.

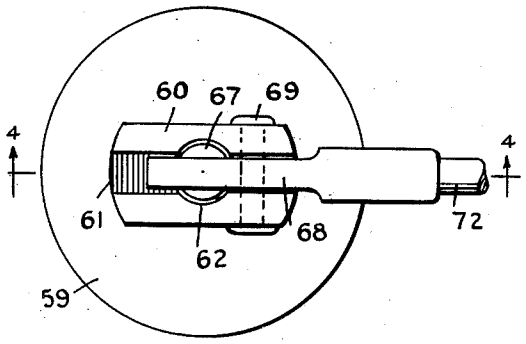


FIG. 6.

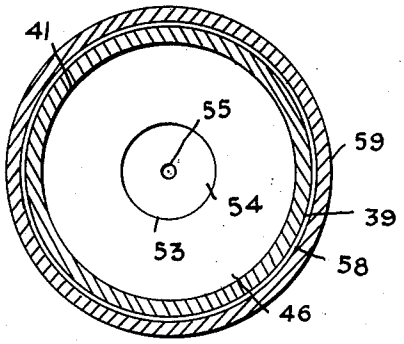


FIG. 4.

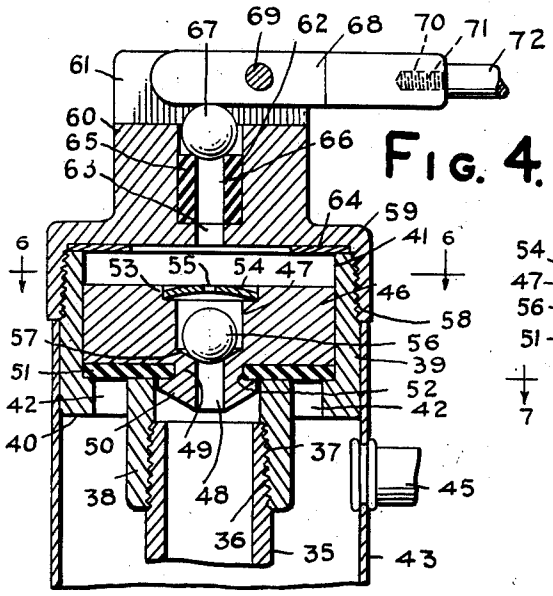


FIG. 5.

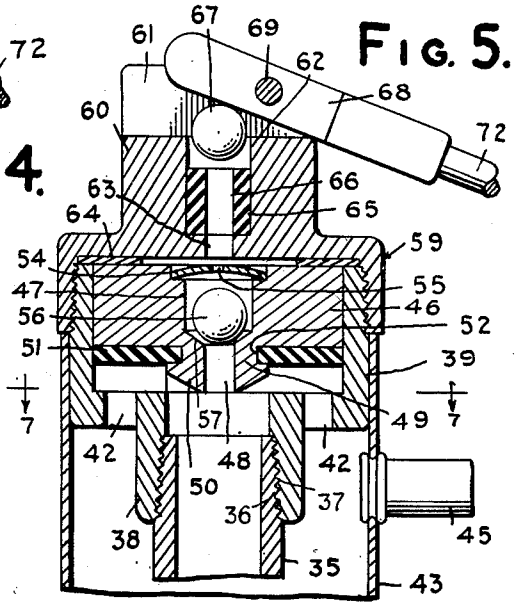


FIG. 8.

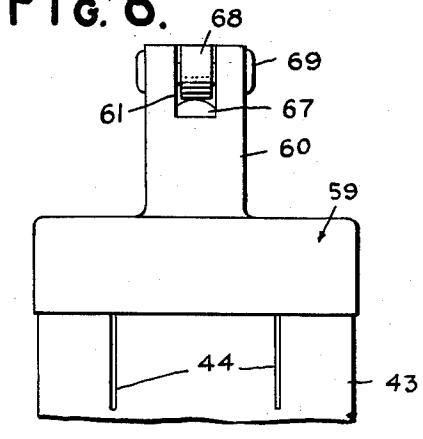
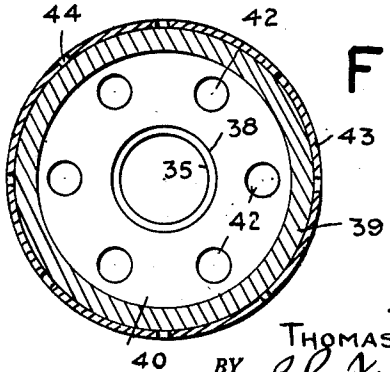


FIG. 7.



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Patented Sept. 2, 1952 2,608,991

UNITED STATES PATENT OFFICE

2,608,991

TOILET FLUSH TANK MECHANISM

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Application June 8, 1950, Serial No. 166,922

3 Claims. (Cl. 137—413)

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My invention relates to improvements in toilet flush tank mechanism.

A primary object of the invention is to provide simplified, efficient and durable flush tank mechanism, including a novel float operated valve for regulating the flow of water into the flush tank.

A further object is to provide a float operated valve for a toilet flush tank which has a snappy operation in opening and closing and which may be readily operated with a small float and without compound leverage.

A further object is to provide a float operated valve of the above-mentioned character which will overcome the usual singing or hissing noise caused by the gradual closing of float operated valves when the flush tank is filling with water.

A further object is to provide a float operated valve which is easy to assemble and disassemble, cheap to manufacture, and subject to substantially no damaging wear.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout same,

Figure 1 is a plan view of a flush tank equipped with mechanism embodying my invention,

Figure 2 is a side elevation of the same, part broken away and parts in section,

Figure 3 is an enlarged plan view of a float operated valve, part broken away,

Figure 4 is a central vertical longitudinal section taken on line 4—4 of Figure 3,

Figure 5 is a similar section showing parts of the valve in different operative positons,

Figure 6 is a horizontal section taken on line 6—6 of Figure 4,

Figure 7 is a similar section taken on line 7—7 of Figure 5, and,

Figure 8 is a side elevational view of the valve illustrated by Figure 3.

In the drawings, where for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 12 designates a toilet flush tank of conventional construction, and provided in its bottom 13 with a discharge pipe or sleeve 14, rigidly secured in place by a coupling nut 15. Formed integral with the discharge sleeve 14 is an upwardly directed conical valve seat 16 for the usual conical flush valve element 17 of rubber or the like. The flush valve element 17 has rigidly secured to it an upstanding vertical guide tube 18, flaired at its top end as at 19. The guide tube 18 slidably receives a rigid vertical guide rod 20, in turn rigidly held between horizontal radial support arms 21 of a split clamp 22. The split clamp 22 is rigidly secured to an upstanding vertical overflow pipe 23 by means of a screw 24 and winged nut 25 connecting the radial arms 21, as shown. The overflow pipe 23 is rigidly secured to and supported by a tubular overflow extension 26, leading into the discharge sleeve 14 below the valve seat 16. The extension 16 is permanently rigidly secured to the discharge sleeve 14, and preferably formed integral therewith.

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A vertical pull or trip rod 27 is provided at its lower end with a horizontal circular loop or eye 28 surrounding the guide tube 18 below the flaired upper end 19. The eye 28 is slidable over the guide tube 18, but smaller in diameter than the flaired end 19, so that when the trip rod 27 moves upwardly the flush valve element 17 will be unseated. The arrangement is such that the flush valve element 17 is pulled from its seat 16 with an even vertical pull, and the rod 20 coacts with the tube 18 to accurately guide the flush valve element toward and from its seat 16. The top end of the trip rod 27 is pivotally connected as at 29 with the free end of a vertically swinging lever 30, rigidly secured to a horizontal rock shaft 31, journaled in the forward side of the tank 12 and operated by an exterior hand lever 32.

A water inlet or supply pipe 33 leads into the bottom of the tank 12 near one end of the same, and is connected by means of a suitable coupling 34 with a vertical inlet pipe extension 35, extending to a point near and below the top of the tank. The coupling 34 serves to rigidly secure the pipes 33 and 34 to the tank bottom 13.

The upper end of the supply pipe 35 is screw-threaded, as at 36, Figure 4, for engagement within a screw-threaded opening 37 formed in the lower end of a depending sleeve 38, formed integral with a cylindrical valve body or casing 39 having a flat bottom 40 and a large cylindrical bore 41 formed in its upper end. The bottom 40 is provided with a group of circumferentially spaced discharge openings 42 surrounding the depending sleeve 38 and leading from the bottom of the bore 41 and into the upper end of a depending vertical silencing tube 43 which surrounds the inlet pipe 35 and has its side wall spaced a substantial radial distance from the pipe 35, as shown. The silencing tube 43 has its top end vertically slotted, as at 44, and the tube 43 engages over the bottom of the cylindrical

valve body 39 and has a spring fit therewith. The bottom end of the silencing tube 43 terminates near and above the tank bottom 13, Figure 2.

A copper tube 45 has one end secured with the silencing tube 43 near and below the valve body 39, and the other end of the tube 45 empties into the top of the overflow pipe 23, thus acting as an anti-syphoning device and maintaining a liquid seal in the toilet bowl.

Mounted within the cylindrical bore 41 for reciprocation is a cylindrical piston 46 which is shorter than the length of the bore 41, as shown. This piston 46 is provided in its top face with a central cylindrical recess or bore 47, leading into a lower reduced passage or port 48, opening through the bottom of a depending reduced tubular extension 49 having an enlarged head or button 50 adapted to enter the bore of the sleeve 38, as shown. The port 48 thus communicates with the top of the supply pipe 35. A flat rubber valve disc 51 covers the bottom of the piston 46, and is secured to the piston by the head or button 50, the valve disc 51 having a central opening 52 adapted to be stretched over the button 50, and snugly engaging the tubular extension 49. The flat bottom 40 forms a seat for the valve disc 51, which is adapted to seal off or cover the discharge ports 42. The piston 46 is further provided in its top face with a shallow recess or counterbore 53, receiving therein a convex orifice disc 54, rigidly secured therein and having a small central orifice 55 communicating with the bore 47. Freely disposed within the bore 47 is a ball valve 56, adapted to seat against a conical seat 57 formed at the junction of the bore 47 and port 48. The ball valve 56 is only slightly smaller than the diameter of the bore 47, and the ball valve functions as a check valve for the piston 46 and also as a filtering element to prevent any foreign particles from passing upwardly through the bore 47 and clogging the orifice 55.

The upper end of the valve casing 39 is externally screw-threaded, as at 58, for the reception of a screw-threaded cap or head 59, having an upstanding extension or block 60 provided in its top with a transverse slot 61 and a cylindrical recess or bore 62 leading into a reduced port 63, in turn opening into the top of the bore 41. A flat gasket 64 of rubber or the like is arranged between the cap 59 and the upper end of the valve body 39, and this gasket extends radially inwardly of the bore 41 for engagement with the top of the piston 46 when the same is in the elevated position. Fixedly mounted within the bore 62 is a rubber sleeve or valve seat 65, having a bore 66 in registration with the port 63 and having its upper end terminating below the top of the bore 62. A ball valve element 67 is disposed within the bore 62 above the rubber seat 65, and projects into the transverse slot 61, for engagement with a vertically swingable ball actuator or lever 68, pivotally mounted within the slot 61 by means of a transverse pivot pin 69. The actuator or lever 68 has its free end extending beyond the block 60, and provided with a screw-threaded opening 70 for the reception of a reduced screw-threaded extension 71 of a generally horizontal float rod or stem 72 having a small float 73 secured to its free end.

In operation, when the toilet is flushed by pulling the hand lever 32, the water in the tank 12 empties through the discharge sleeve 14 into the toilet bowl, and the float 73 is lowered, as shown in Figure 5. The inner end of the lever 68 is elevated so that the ball valve 67 may be unseated. When this occurs, water from the supply pipe 35 impinges against the head 50 and also against the ball valve 56 and the piston 46 is elevated, since there is no longer any resistance to its upward movement, the ball valve 67 being unseated. The piston 46 travels upwardly until its top face contacts the gasket 64, and while the piston is elevated water flows through the discharge ports 42 and downwardly through the silencing tube 43 to fill the tank 12. Since the orifice 55 is much smaller than the bore 66, no pressure can build up above the piston 46, when the ball valve 67 is unseated, which permits the piston 46 to move upwardly and prevents its downward movement before the ball valve 67 is again seated.

When the tank 12 is filled with water, the float 73 is elevated to the point indicated in Figure 2, and the actuator or lever 68 returns to a substantially horizontal position. The lever 68 forces the ball valve 67 downwardly against the rubber seat 65, and water may no longer pass upwardly through the port 63. The water from the supply pipe 35 continues to pass the ball valve 56 and passes through the orifice 55, building up pressure above the piston 46 causing it to descend in the bore 41 until the rubber valve disc 51 seats itself against the bottom 40 and closes the discharge ports 42. When this occurs, no more water can enter the tank 12.

The action of the piston 46 in both directions is sudden or snappy, and there is no gradual closing of the ports 42 as the float 73 is elevated by the rising water level in the tank. In most conventional flush tank mechanisms, the gradual elevation of the float slowly closes a valve and causes an annoying hissing or singing noise as the water passage through the valve gradually decreases. With my construction, the ball valve 67 is not seated against the rubber seat 65 until the float 73 reaches the top of its travel, and when this occurs the piston 46 travels downwardly with a snappy action to cover the discharge ports 42. Therefore, no hissing or singing noise occurs at the ports 42 since they do not close gradually. The tube 43 silences the flow of water into the bottom of the tank 12.

The tube 45 will carry some water out through the overflow pipe 23, which also eliminates all air which might be trapped in the silencing tube 43. This arrangement will also prevent any syphoning of water through the silencing tube 43.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A float controlled valve comprising a casing for connection with a supply pipe and having a main bore and a discharge opening leading from the main bore, a piston valve mounted within the main bore for reciprocation and having a restricted opening communicating with the main bore and supply pipe, a cap mounted upon the casing and having a discharge passage leading from the main bore of the casing, the cap having an enlarged recess in its upper end leading into the discharge passage of the cap, a resilient sleeve mounted within the enlarged recess of the cap and having its upper end terminating below the

upper end of the enlarged recess, the resilient sleeve having a bore communicating with the discharge passage of the cap, a ball valve disposed within the enlarged recess above the upper end of the resilient sleeve and adapted to cover and uncover the bore of the resilient sleeve, the ball valve projecting above the upper end of the enlarged recess, and a float lever pivotally connected with the cap and engaging the ball valve above the upper end of the enlarged recess to urge the ball valve against the upper end of the resilient sleeve, the float lever serving to maintain the ball valve within the enlarged recess of the cap.

2. A float controlled valve comprising a casing having a main bore and a lower end provided with a generally central inlet opening and a discharge opening spaced from the inlet opening, the upper end of the casing being open, a cap mounted upon the upper end of the casing and having a discharge passage leading from the main bore of the casing, a pilot valve contained within the cap for covering and uncovering the discharge passage of the cap, float operated means to close the pilot valve, a reciprocatory piston valve mounted within the main bore of the casing and provided in its upper end with a shallow recess and a relatively deep recess of lesser width than the shallow recess and opening into the shallow recess, a tubular extension secured to the lower end of the piston valve and having a bore leading from the relatively deep recess, the bore of the tubular extension being smaller than the width of the relatively deep recess for forming a valve seat at the bottom of the relatively deep recess, the tubular extension having an enlarged head spaced below the lower end of the piston valve and adapted to enter the generally central inlet opening in the lower end of the casing when the piston valve moves downwardly in the main bore of the casing, a disc of resilient material mounted upon the lower end of the piston valve and having a central opening snugly receiving the tubular extension after the disc has been stretched over the enlarged head, the enlarged head then serving to secure the disc in place against the lower end of the piston valve, a check valve element disposed within the relatively deep recess of the piston valve and engaging said valve seat and adapted to cover the bore of the tubular extension, and a disc disposed within the shallow recess of the piston valve and having a restricted opening leading to the main bore of the casing, the disc serving to retain the check valve element within the relatively deep recess.

3. A float controlled valve comprising a casing for connection with a supply pipe and having a main bore and a discharge opening leading from the main bore, a piston valve mounted within the main bore for reciprocation and having a restricted opening in communication with the main bore and said supply pipe, a cap for the upper end of the casing and having a discharge passage leading from the main bore of the casing, the cap having an enlarged recess in its upper end leading into the discharge passage of the cap, a resilient sleeve mounted within the enlarged recess and having its upper end terminating below the upper end of the enlarged recess, the bore of the resilient sleeve being in communication with the discharge passage of the cap, a ball valve mounted within the enlarged recess of the cap above the resilient sleeve and engaging the upper end of the resilient sleeve and adapted to cover the bore of the resilient sleeve, the ball valve projecting above the upper end of the enlarged recess, the cap having a transverse slot formed in its upper end and extending through a side of the cap, the slot forming laterally spaced upstanding shoulders above the upper end of the enlarged recess and disposed upon opposite sides of the enlarged recess, a lever pivotally mounted between the upstanding shoulders for vertical swinging movement and engaging the ball valve above the upper end of the enlarged recess to urge the same downwardly against the resilient sleeve, the lever maintaining the ball valve between it and the upper end of the resilient sleeve, and a float secured to the lever for actuating the same.

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