United States Patent [19]

Ducey

[11] **3,716,870**

[45] **Feb. 20, 1973**

[54] **VALVE CONTROL MECHANISM**

[76] Inventor: **James A. Ducey,** 607 W. Chestnut St., Robinson, Ill. 62454

[22] Filed: **Jan. 18, 1971**

[21] Appl. No.: **107,115**

[52] **U.S. Cl.** .....**4/41,** 4/57 R, 4/67 R

[51] **Int. Cl.** **E03d 1/36**

[58] **Field of Search** ...4/18, 41, 56, 57 R, 57 P, 67 R, 4/67 A; 73/322.5; 137/185, 186, 410, 416, 429, 434; 251/321

[56] **References Cited**

UNITED STATES PATENTS

2,888,531	5/1959	Bochan	73/322.5 X
1,794,640	3/1931	Owens	4/41
3,172,128	3/1965	Ducey	4/41
136,724	3/1873	Hopkins	251/321

FOREIGN PATENTS OR APPLICATIONS

241,301	11/1911	Germany	4/41

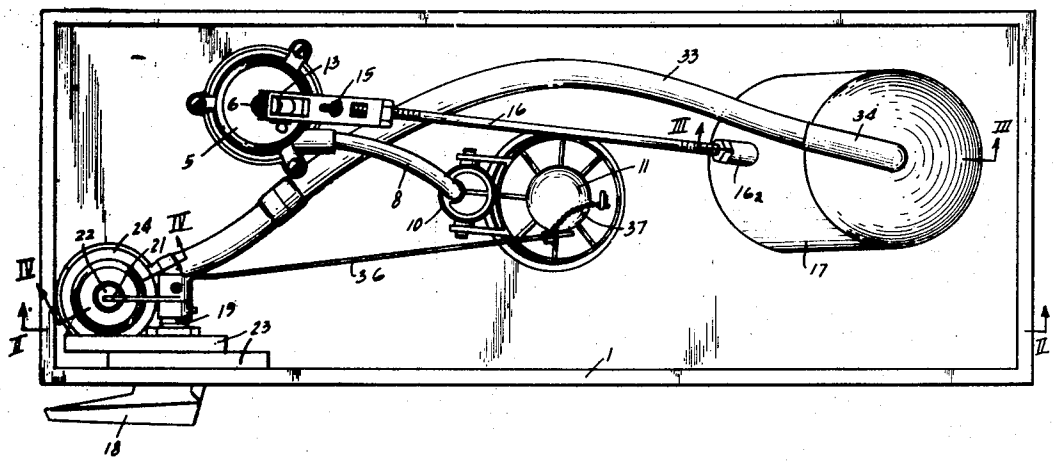
Primary Examiner—Henry K. Artis

Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

The invention herein disclosed relates to a valve control mechanism particularly designed for use with toilet flush tanks. This mechanism includes an open end cup type float, wherein air is compressed as the liquid level in which the open end of the float is immersed rises, together with means for releasing such compressed air to permit rapid dropping of the float and complete opening of a liquid supply valve controlled thereby.

4 Claims, 4 Drawing Figures



PATENTED FEB 20 1973

3,716,870

SHEET 1 OF 2

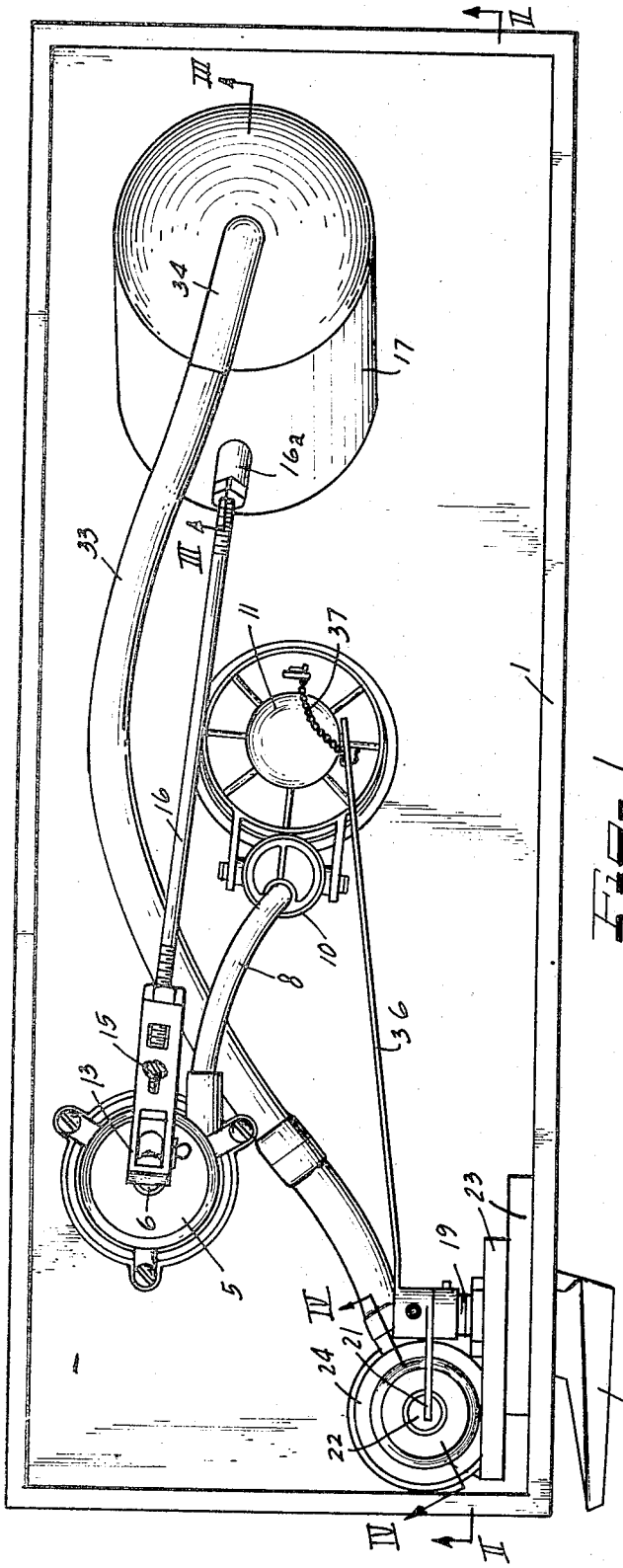


Fig. 1

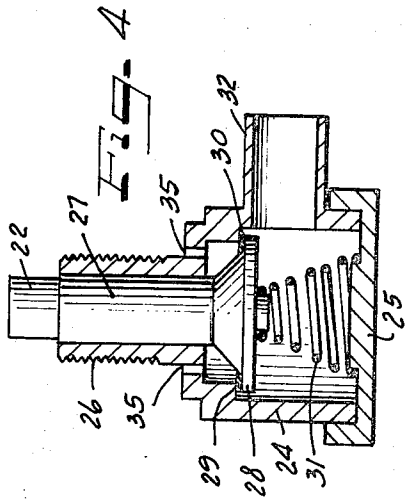


Fig. 4

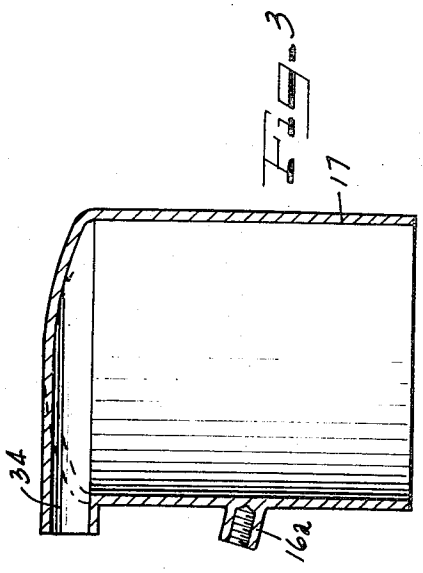


Fig. 3

INVENTOR.

JAMES A. DUCEY

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

PATENTED FEB 20 1973

3,716,870

SHEET 2 OF 2

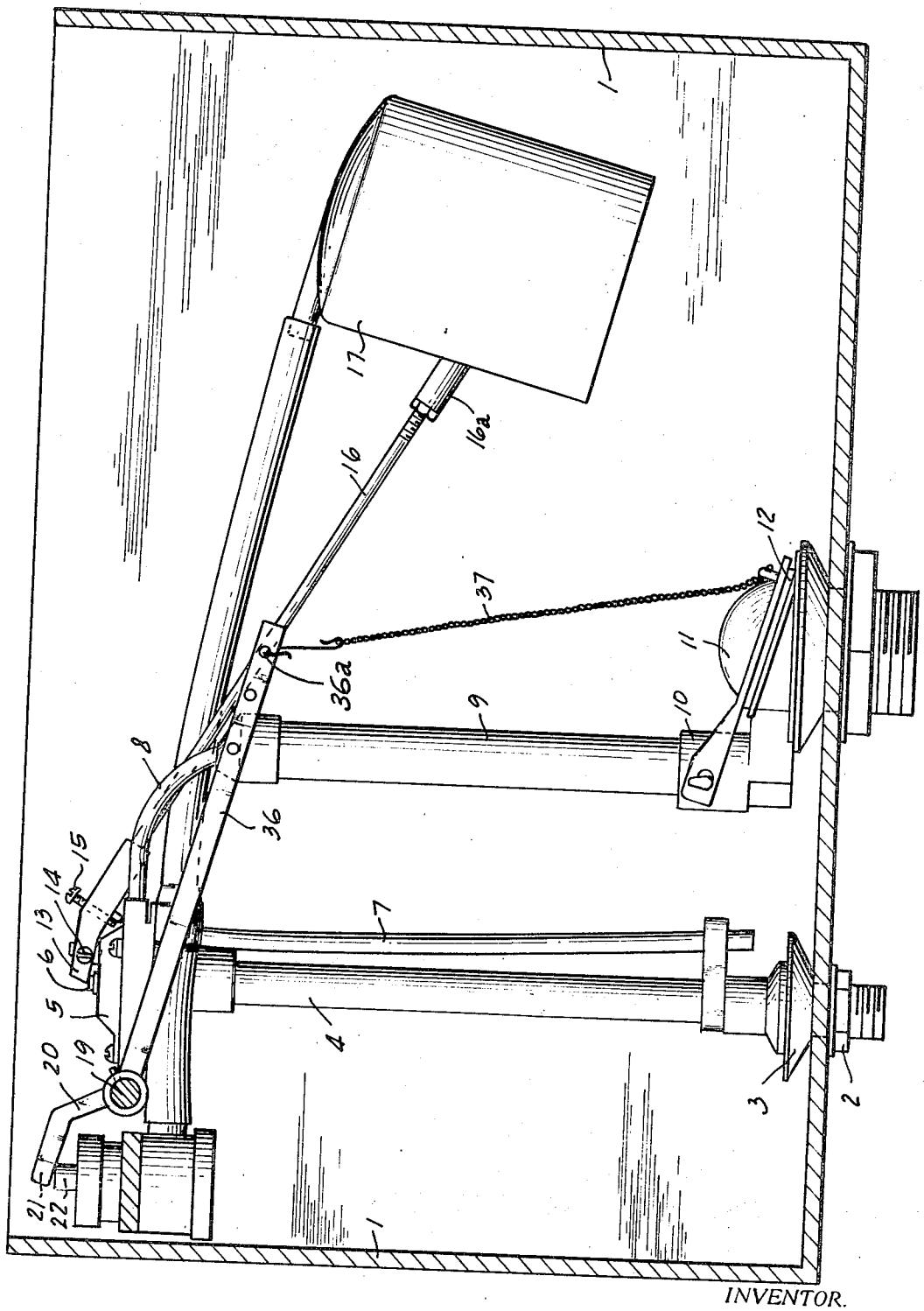


Fig. 2

INVENTOR.

JAMES A. DUCEY

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

VALVE CONTROL MECHANISM

BACKGROUND OF THE INVENTION

SUMMARY OF THE INVENTION

The invention disclosed herein consists of means for controlling supply and discharge of liquid from a toilet flush tank during flushing of a toilet. The liquid level in the tank is controlled by an open end cup type float wherein air is compressed as the level of liquid in which the open end of the float is immersed rises. This float controls a usual type of liquid inlet valve normally biased to an open position. When the liquid level rises to a predetermined height, a lever connected to the float moves the liquid supply valve to a closed position and the level of liquid in the tank remains constant until the next flushing operation. Flushing is accomplished by a manipulation of a control handle which simultaneously opens a discharge valve to discharge flushing fluid into a toilet bowl and releases compressed air from within the float permitting the float to drop rapidly, thus providing for a full flow of supply liquid into the tank to rapidly occur and thereof after completion of manipulation of the control handle again permits closing of the discharge valve.

The use of open-end cup type floats is not broadly new. However, the novel combination of such a float with air release means which permits immediate dropping of the float and full opening of a liquid inlet valve controlled thereby upon actuation of a control handle, which also actuates the discharge valve, is believed to be novel and provides the distinct advantage of a quick opening of the liquid inlet valve.

It is an object, therefore, of this invention to provide a novel valve control mechanism for flush tanks wherein the float may be actuated to permit a rapid opening of the liquid inlet valve.

It is a further object of this invention to provide an open-end cup type float which may be rapidly operated to drop to a depressed position by the release of air compressed within the closed end of the cup by liquid in which the open end of the cup is immersed.

Other and further objects of the present invention will be apparent from the disclosures in the following specification and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a toilet flush tank with the cover removed showing a general plan view of an installation embodying the principles of the present invention.

FIG. 2 is a side elevation of the apparatus shown in FIG. 1 with the walls of the flush tank shown in section.

FIG. 3 is a section taken along the lines III—III of FIG. 1.

FIG. 4 is a detail section taken along the lines IV—IV of FIG. 1.

DETAILED DESCRIPTION OF THE DRAWINGS

The reference numeral 1 represents a liquid type flush tank which is usually provided with a removable cover (not shown) and into which liquid is introduced through a standard supply line 2 provided with a control valve 3, a standpipe 4, and a fitting 5 on which the control float is pivotally mounted to operate a longitudinally movable valve control rod 6 in a manner to be

described hereinafter. Liquid introduced through the standpipe 4 is conveyed toward the bottom of the tank by an overflow pipe 7 communicating with the interior of the fitting 5, and liquid entering the fitting 5 from the standpipe 4 is partially bled off through a conduit 8 which opens into a conduit 9 terminating in a discharge valve fitting 10 on which there is pivotally mounted a flapper type of discharge valve 11 which cooperates with a valve seat 12 to control the discharge of fluid from the flush tank to a toilet bowl (not shown).

Fluid entering the conduit 9 through the fitting 8 is discharged directly into the toilet bowl beyond the valve seat 12 in a usual manner. This ensures refilling of the toilet bowl after each flushing.

None of the foregoing parts are shown and described in detail since they are old and well-known in the art and the function and operation thereof will be fully understood by anyone skilled in the art. For example, the valve shown at 3 is a valve which is biased to an open position so that fluid flows in through the conduit 4 until the liquid level in the tank reaches a predetermined height at which time such inflow is cut off by closing of the valve 3 against the operation of a biasing force and through the pressure of a float actuated lever arm 13 pivoted at 14 as clearly shown in FIGS. 1 and 2. The position of the end of the lever arm 13 in reference to the valve actuating rod 6 is determined by a set screw 15 which abuts against the fitting 5.

A rigid arm 16 connects the pivoted lever arm 13 with a cup type of float 17 open at its lower end and provided with a fitting 16a into which the end of the rod 16 is threadedly engaged.

The float 17 as above noted is of the cup type open at its lower end and closed at its upper end, so that when the lower end is immersed in liquid within the tank 1 air in the upper end of the cup is compressed as the float rises. When the float 17 reaches a predetermined upper position, depending upon the height of liquid desired to be retained in the tank 1, the lever arm 13 actuates the valve rod 6 to close the valve 3, this closing action being in a manner well known in the art. At this time the tank is full and in readiness for a flushing operation.

In order to effect the flushing operation, a rotatable handle 18 mounted on the outside of the tank 1 is turned to operate a shaft 19 connected thereto and rotatable therewith. This shaft carries a projecting bell-crank type of lever 20 which has an arm 21 which engages an air release button 22 on an air release valve mechanism shown in detail in FIG. 4 and now to be described. This air release valve mechanism is mounted on base members 23 (in which the shaft 19 is rotatably mounted) and said base members 23 are secured to the inner wall of the tank 1.

The air release valve mechanism comprises a body portion 24 mounted on a base 25, the body portion 24 being provided with an upwardly extending member 26 in which a valve stem 27 carrying a valve member 28 is reciprocably mounted. The valve 28 cooperates with a seat 29 formed on the inside of the fitting 24 and is provided with a sealing gasket 30 so as to prevent the ingress or egress of air into or from the bottom portion of the interior of the fitting 24 beneath said valve 28. The valve 28 is normally held in a closed position by a spring 31. Communicating with the body 24 is a passaged fitting 32 which, in turn, is in airtight commu-

nication with a flexible hose-like member 33 communicating with the interior of the float cup 17 at the upper end thereof through a fitting 34.

When the valve 28 is opened by engagement of the portion 21 of the lever 20 against the member 22, air escapes from the interior of said member 24 and from the inside of the top of the float 17 through ports shown at 35.

At the time the handle is rotated to rotate the shaft 19 to effect such opening of the valve 28, another lever member 36 non-rotatably secured at one end to the rotatable shaft 19 is lifted to, in turn, lift the valve 11 to an open position by reason of the end of the lever being connected to the exterior of said valve by a chain 37. The chain 37 may be secured at its upper end in any one of a series of apertures 36*a* in the lever 36 depending upon the desired degree of lift of the valve 11.

It will be apparent from the foregoing construction that upon rotation of the operating handle 18 and consequent rotation of the shaft 19, the bellcrank lever 20 is rotated to cause the end 21 thereof to engage the member 22 and thus move the valve 28 to an open position where air is immediately discharged or bled not only from the interior of the fitting 24 but also from the space above the liquid inside the float 17. This causes the float immediately to drop, releasing the push rod 6 and permitting the valve 3 to assume an open position so that water flows into the tank in the manner previously described both through the conduit 7 and also through the interior of the conduit 9 and bypassing the seat 12 of the flush valve to fill the toilet bowl.

This immediate dropping of the float 17 permits of the valve 3 assuming full open position at once. It will be understood, of course, that upon rotation of the operating handle 18 back to its original position the flapper valve 11 drops by gravity into a closed position, thus completing the flushing operation and permitting the refilling operation to continue until the liquid in the tank again attains the desired predetermined level. Thus, air is again compressed within the upper portion of the float as the liquid level rises until the float reaches a position where the valve rod 6 is again actuated by the lever arm 13 to close the liquid inlet valve 3.

The structure of this invention possesses a distinct advantage of the buoyant closed type of float valve generally employed in the control of toilet bowl flush tanks. In the structure of this invention, when the air release valve is actuated to permit release of air past the seat 29, the float 17 immediately assumes a position so that the inlet valve 3 is promptly open. In former types of buoyant float valves the inlet valve only gradually opens as the valve lowers. Then, the arrangement of this invention permits a more rapid opening of the inlet valve 3.

The apparatus of this invention is simple, relatively inexpensive, and superior in its operation to those of the prior art. While I have shown and described the use of this apparatus in connection with a well-known type of valve controlled inlet and flush discharge valve mechanism, it is understood that it readily may be used with other commercial types of inlet valve, flush valve or discharge valve operations, all of which are well-known in the art.

I am aware that changes may be made and details varied without departing from the principles of this invention and I, therefore, do not purpose limiting a patent granted hereon otherwise than indicated by the scope of the appended claims.

I claim:

1. In a control mechanism for controlling the addition of liquid to a toilet flush tank having a discharge passage with a valve seat to receive a valve member to close said passageway, said valve member being moved toward the seat by the force of gravity and actuating means connected to said valve member and connected to the exterior of the tank for moving the valve member from the seat to initiate discharge of liquid from said tank, a conduit for supplying liquid to the tank having an inlet valve for controlling the flow of liquid in the conduit, said inlet valve being normally opened and being closed by the control mechanism which has a float to actuate the mechanism to close the inlet valve as the liquid in the tank has attained a predetermined level, the improvement in the control mechanism comprising the float being an open end cup wherein air entrapped in said cup by a rising water level in the tank closing the open end compresses said air therein, and means for releasing compressed air from said cup comprising an air conduit connected to the interior of the cup and extending to an air release valve for releasing the air pressure therein, and means connected to the actuating means for opening said air release valve when the actuating means is operated to discharge liquid from the tank so that the air is immediately released from the cup to permit the cup to rapidly descend and to rapidly open the inlet valve to immediately begin adding water to the tank as liquid is being discharged therefrom.

2. In a control mechanism according to claim 1, wherein said air conduit is a flexible conduit having an end attached to a fitting on said cup and movable with the float.

3. In a control mechanism according to claim 1, wherein said actuating means for said valve member comprises a rotatably mounted shaft having a level for applying a lifting force on said valve member and wherein said air release valve includes a housing having at least one air port, a valve member normally biased to close the air port, and having a stem engaged by a lever carried by said shaft so that turning of such shaft causes simultaneous venting of the float and opening of the discharge passage.

4. In a control mechanism according to claim 1, wherein the air release valve comprises a casing connected by the conduit to the interior of the float, air vents in the casing, a valve normally closing said air vents, and means engageable by the actuating means for the discharge valve member for opening the valve to permit release of air compressed within the float.

* * * * *