July 15, 1952 C. M. McCORMACK ET AL 2,602,934

WATER SAVING DEVICE FOR FLUSH TANKS

Filed Sept. 28, 1950

Fig. 1.

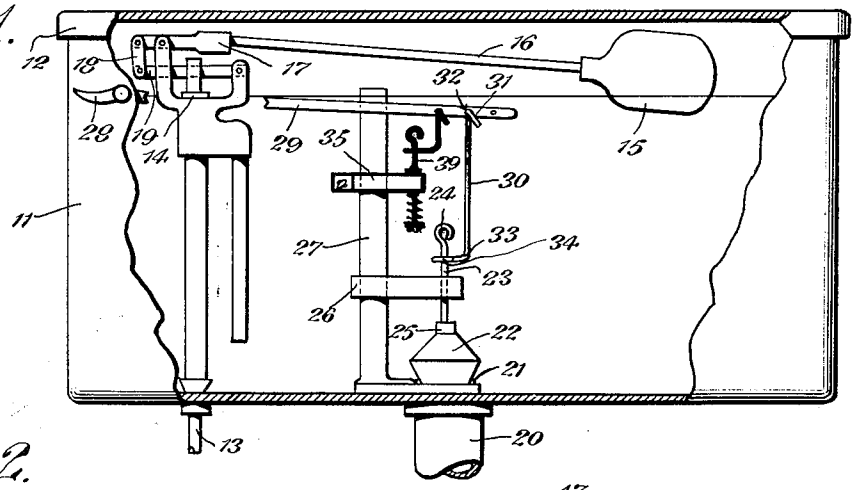


Fig. 2.

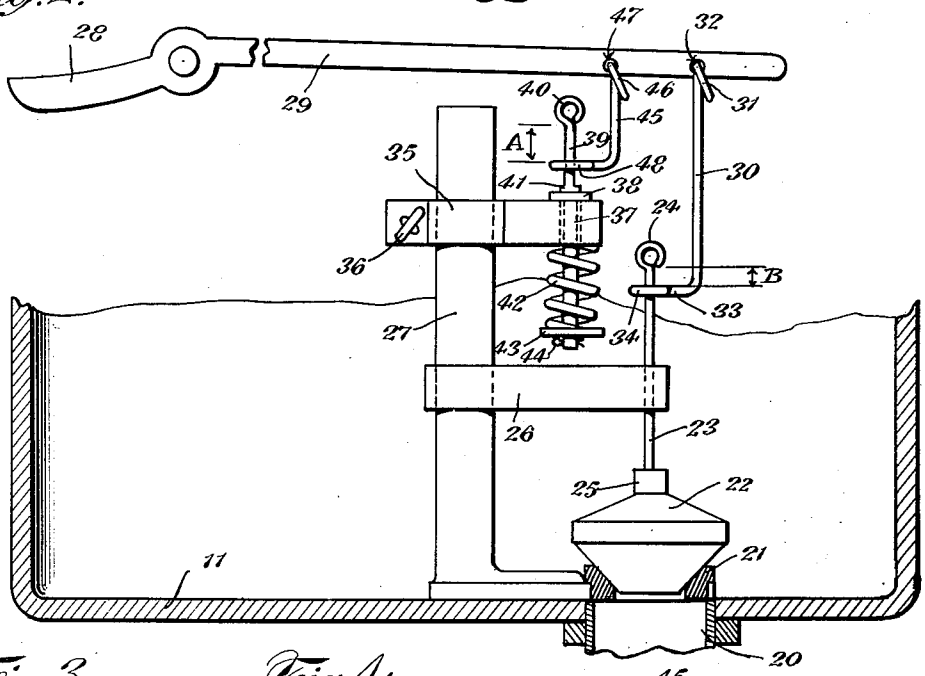


Fig. 3.

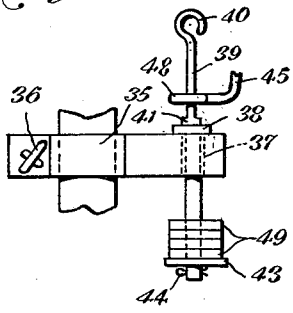


Fig. 4.

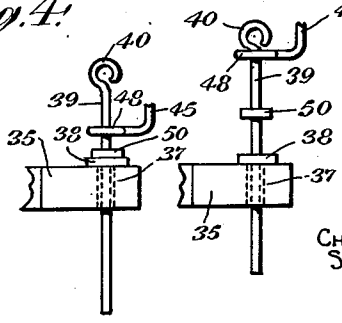
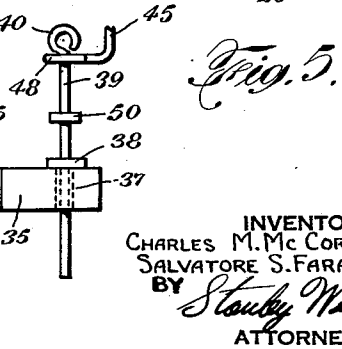


Fig. 5.



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WATER SAVING DEVICE FOR FLUSH TANKS

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7 Claims. (Cl. 4—67)

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The problem has been previously attacked, but prior designers have felt it necessary either to provide for a reduced automatic flush which must be semi-permanently set in, or to incorporate means, distinct from the operating handle to enable a manual closing of the buoyant ball valve controlling the discharge of water.

An object of our invention is to provide a simple assembly which may be added to or incorporated in a conventional flush tank system to enable a user to choose either a full automatic flush or control the amount of water permitted to flow from the tank.

A further object of our invention is to provide such an assembly which may be economically and easily manufactured and simply incorporated in conventional flush tank systems.

Another object of our invention is the provision of such an assembly including yieldable detent means adapted to signal a user of the condition where additional pressure on the operating handle of the flush tank system will result in an automatic full flush, and hence to permit a fully controlled discharge from the tank.

Briefly, our invention includes the addition of yieldable detent means to a conventional flush tank system so as to permit the user to sense increased resistance to further depression of the operating handle when a critical point of elevation of the buoyant ball valve (of the outlet valve) is reached, above which point an automatic full flush will result, but which point is not high enough to prevent said ball from reseating itself and thus closing the outlet valve should the user then release the operating handle. In a preferred embodiment this is accomplished by mounting a detent rod so that it will be engaged, by means associated with the operating handle, against the pressure of a spring only after the said critical height of the buoyant ball valve is approximated, thus warning the user that further depression of the operating handle will bring about an automatic flush. Unless such further depression is made, water will pour through the outlet valve into the water closet in sufficient volume to maintain a flushing operation. Such operation is halted upon release by the user of pressure on the operating handle.

Other objects and a fuller understanding of our invention may be had by referring to the description and claims which follow, taken in conjunction with the accompanying drawing which illustrates preferred embodiments thereof, it being understood that the foregoing statement of the objects of our invention and the brief summary

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thereof is intended to generally explain the same without limiting it in any manner.

Fig. 1 is a side elevational view of a flush tank broken away to show a conventional system to which has been added an assembly embodying our invention.

Fig. 2 is an enlarged detail of Fig. 1, showing said invention, omitting the members relating to the inflow system.

Fig. 3 is a fragmentary elevational view of another embodiment of our invention.

Fig. 4 is a fragmentary elevational view of still another embodiment of our invention showing the detent rod in its lowest position.

Fig. 5 is a similar view of the same showing the detent rod in an elevated position.

Referring to the drawing and more particularly, Fig. 1, there is shown a conventional flush tank 11, having a cover 12, the inflow system of which includes an inflow pipe 13, which empties into a ball-cock valve 14 controlled by float 15, which is linked by its radius arm 16, pivotally mounted saddle 17, and links 18 and 19, so that when the water, and hence the float, is below a predetermined level, the valve remains open, but when said level is reached, the valve is closed.

The discharge system of said tank, omitting the heavily outlined portion which illustrates an assembly incorporating a preferred embodiment of our invention, includes a discharge pipe 20 which terminates in outlet-valve seat 21, upon which is seated a buoyant ball valve 22. An upward-extending valve stem 23 terminating in a looped portion 24 is threaded into a bushing 25 in the top of ball valve 22 and is kept in vertical alignment by laterally-extending guide bracket 26 secured to overflow pipe 27. An actuating member includes operating handle 28, extending outside of tank 11 and lever arm 29. The member is pivotally mounted so that as said handle is depressed, said lever is raised. Lift wire 30 is suspended from lever arm 29, being secured thereto by its upper looped portion 31 which passes through aperture 32 in said arm. The lower portion of said wire is bent to form a laterally-extending arm 33 and terminates in a lateral eye 34 which is slideable along valve stem 23.

In operation, when operating handle 28 is depressed, lever arm 29 is elevated, carrying with it lift wire 30 which in turn raises ball 22 sufficiently so as to permit its buoyancy to overcome the suction of the outflowing water and the weight of the ball. After said ball "floats," i. e., has shot upward, it will not be reseated until the

water has reached a predetermined lower level, at which point, said suction and gravity operate to settle the ball against its seat and thus halt the further discharge of the tank. What has been described thus far is conventional. We have added a simple assembly to permit less than a full discharge.

A preferred form of our invention, shown in Fig. 2, includes a detent bracket 35, secured at one end for vertical adjustment to outlet pipe 27 by wingnut 36, the other end extending laterally, underneath lever arm 29 and gripping a vertically extending sleeve 37, having a lipped head 38; a detent rod 39, terminating at its upper end in eye 40, is slideably secured in said sleeve by means of a laterally-extending shoulder 41 which may rest upon head 38 and an encircling spiral spring 42, the upper end of which may be normally in contact with the lower portion of bracket 35, and the lower portion of which may rest upon a spring washer 43 held in place by a cotter pin 44 which passes through a bore in the lower portion of said rod; a lift wire 45, its upper bighted portion 46, passing through an aperture 47 in lever arm 29 and its lower laterally extending eye 48 slideably engaging an upper portion of detent rod 39, completes the assembly.

The assembly may be installed easily in an existing discharge system. Detent bracket 35 is first splipped over or around overflow pipe 27 and loosely held in place by screwing home wingnut 36. The upper portion of lift wire 45 is then passed through aperture 47 in lever arm 29 and bent over to form bighted portion 46. Then, bracket 35 is tightly secured in place by wingnut 36 so that the distance A (see Fig. 2), between the top of laterally-extending eye 48 of lift wire 45 and the lower portion of eye 40 of detent rod 39 is sufficiently greater than distance B, between the top of lateral eye 34 of lift wire 30 and the lower part of the looped portion 24 of valve stem 23, so that when ball valve 22 is raised by downward pressure upon operating handle 28 to the point where eye 48 of lift wire 45 just engages eye 40 of detent rod 39, the critical height (point of elevation) of ball valve 22 will not be exceeded. Said critical point has been described as the point above which the buoyancy of ball valve 22 will exceed the downward forces of gravity and suction of the water discharging through the outlet valve, and cause said ball to "float," thus precipitating a full or automatic flush. In the latter case the user looses control of the valve and it will not reseat itself when operating handle 28 is released, but will remain open until the level of the water in the tank brings ball valve 22 low enough so that gravity and suction will cause it to settle upon valve seat 21. As a practical matter, the distance, A minus B, may be found by trial and error or it may be set at from one-half to five-eighths of an inch, a distance range we have found workable in every application we have made.

The assembly itself, is put together in self-evident fashion. In using the device, if the user desires less than a full or automatic flush, he presses down upon operating handle 28 until he feels a definite resistance to further pressure. At this point eye 48 of lift wire 45 has engaged eye 40 of detent rod 39 and the user feels the opposition of spring 42. Also at this point ball valve 22 has been lifted the distance A minus B or approximately one-half inch and water sufficient for flush action is pouring out of the outlet valve. If, without exerting additional downward pressure on operating handle 28, the user releases said handle, ball valve 22 will reseat itself and halt the flush. If the user at that point exerted sufficient additional pressure, instead, on said handle, then a full flush would result.

Another embodiment of our invention is illustrated in Fig 3, where in lieu of the spring, weights 49 are employed, so that when eye 48 of lift wire 45 is brought into engagement with eye 40 of detent rod 39, the user will encounter resistance represented by the effective weight of said weights 49 instead of the resistance of spring 42. Otherwise this second form is the same as the first.

Still another embodiment is shown in Figs. 4 and 5, where the resistive influence is supplied by a magnet 50 which is tightly affixed to detent rod 39. Here another change may be required, namely that head 38 of sleeve 37 be of a magnetic material. In this form up to the point where eye 48 of lift wire 45 engages the lower portion of eye 40 of detent rod 39, magnet 50, preferably one of great strength for its size, such as an "Alnico" magnet, remains fixed to head 38 by magnetic attraction. At this point, the user feels the increased resistance due to the magnetic attraction between said magnet and head. If pressure sufficient to break the contact between said magnet and head is exerted by the user on operating handle 28, then a full flush will result. If the user does not pass this point, he may control the flush.

In each for, it will be noted, that as far as the user is concerned, the yieldable detent force (the force of the agency producing the resistance he feels) is multiplied, since the user is at a mechanical disadvantage. Also in each form, detent rod 39 will return to its normal position, as illustrated in Figs. 2, 3 and 4, after the user releases operating handle 28, since lever arm 29 then falls, effecting a disengagement of eyes 48 and 40. In each case, the agency producing the yieldable detent force, i. e. spring 42, weights 49 and magnet 50, contribute to the force of gravity to reseat said detent rod.

Although we have described our invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous additional changes in the details of construction, combination and arrangement of parts may be resorted to without transcending the scope of the invention as hereinafter claimed.

We claim as our invention:

1. A water saving device for flush tanks for use with such tanks normally filled with water to a predetermined level and having a buoyant-valve discharge system, wherein a buoyant valve is raised from an outlet-valve seat to permit the discharge of water by the upward displacement of a lever arm which in turn upwardly displaces a lift link slideably engaged with the valve stem of said buoyant valve, comprising a detent rod mounted for reciprocal vertical travel and spaced from a vertically movable portion of said lever arm, means to exert a yieldable detent force upon said rod, a lift wire connected with said lever arm at a vertically moving portion thereof and slideably engaged with said detent rod to transmit said yieldable detent force to said lever arm as a force resisting further displacement thereof after said arm has been displaced sufficiently to raise said valve, but before said valve passes the critical height above which its

buoyancy exceeds the downwardly directed forces acting upon it.

2. A device as described in claim 1, said means to exert a yieldable detent force including a spring mounted with relation to said detent rod to oppose further travel thereof before said valve passes said critical height.

3. A device as described in claim 1, said detent rod being vertically slideably mounted so as to become engaged with said lever arm through said lift wire after the same has been displaced sufficiently to raise said valve, but before said valve passes said critical height, and a weight suspended with relation to said detent member so as to oppose further upward travel thereof upon said engagement.

4. A device as described in claim 1, said detent member being engaged by said lever arm through said lift wire and moved in a fixed direction thereby after said arm has been displaced sufficiently to raise said valve, but before said valve passes said critical height, and magnetic means associated with said detent member so as to magnetically oppose further travel thereof in said direction upon said engagement.

5. A water saving device for flush tanks having a buoyant-discharge system wherein a buoyant valve is raised from an outlet valve seat to permit the discharge of water by the upward displacement of a lever arm which in turn upwardly displaces a lift link slideably engaged with the valve stem of said buoyant valve, comprising a vertically slideably mounted detent rod supported independently of said lever arm and being spaced from a movable portion of said lever arm and being engageable thereby, so as to be pulled upwardly when said lever arm has lifted said valve to a predetermined height, a spring mounted in association with said detent rod so as to normally urge the same in a downward direction, whereby when said lever arm has raised said valve to said predetermined position, said detent rod will yieldably oppose further elevation of said valve by said lever arm.

6. A water saving device for flush tanks having a buoyant-discharge system wherein a buoyant valve is raised from an outlet-valve seat to permit the discharge of water by the upward displacement of a lever arm which in turn upwardly displaces a lift link slideably engaged with the valve stem of said buoyant valve, comprising a vertically slideably mounted detent rod supported independently of said lever arm and being spaced from a movable portion thereof and being engageable thereby so as to be pulled upwardly when said lever arm has lifted said valve to a predetermined height, and a weight suspended with relation to said detent rod so as to oppose further upward travel thereof upon the engagement of said detent rod with said lever arm, whereby when said lever arm has raised said valve to said predetermined position, said detent rod will yieldably oppose further elevation of said valve by said lever arm.

7. A water saving device for flush tanks having a buoyant-discharge system wherein a buoyant valve is raised from an outlet-valve seat to permit the discharge of water by the upward displacement of a lever arm which in turn upwardly displaces a lift link slideably engaged with the valve stem of said buoyant valve, comprising a vertically slideably mounted detent rod supported independently of said lever arm and being spaced from a movable portion thereof and being engageable thereby so as to be pulled upwardly when said lever arm has lifted said valve to a predetermined height, and magnetic means associated with said detent rod so as to magnetically oppose further upward travel of said detent rod upon the engagement of said detent rod with said lever arm, whereby when said lever arm has raised said valve to said predetermined position, said detent rod will yieldably oppose further elevation of said valve by said lever arm.

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