Aug. 4, 1964 F. B. LACKENMAIER ETAL 3,142,846

FLUSH VALVE

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FIG. 1.

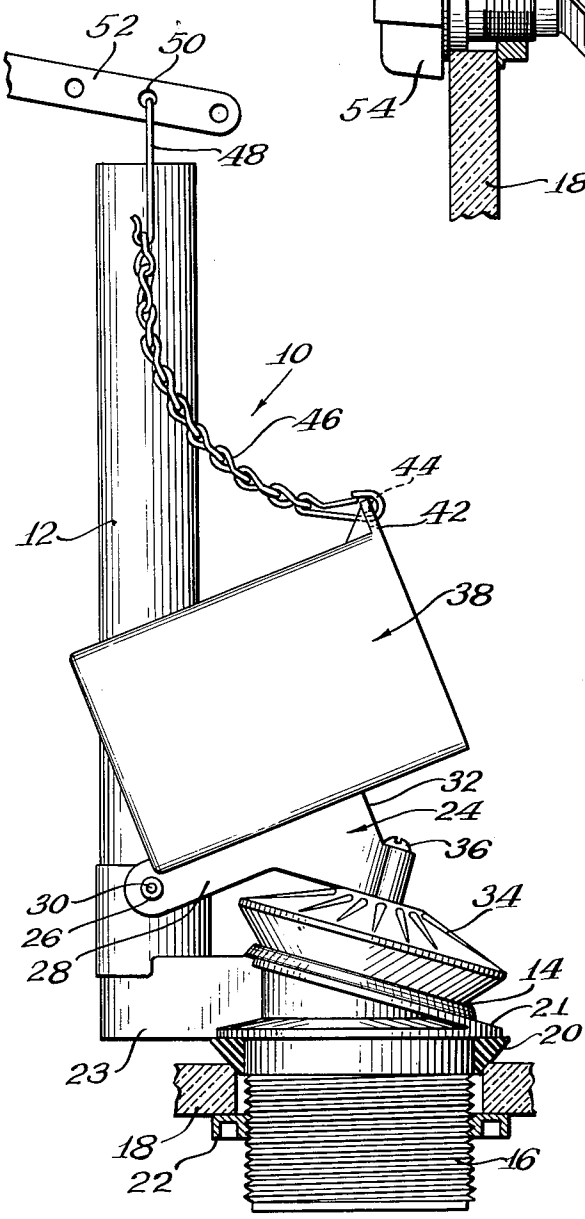
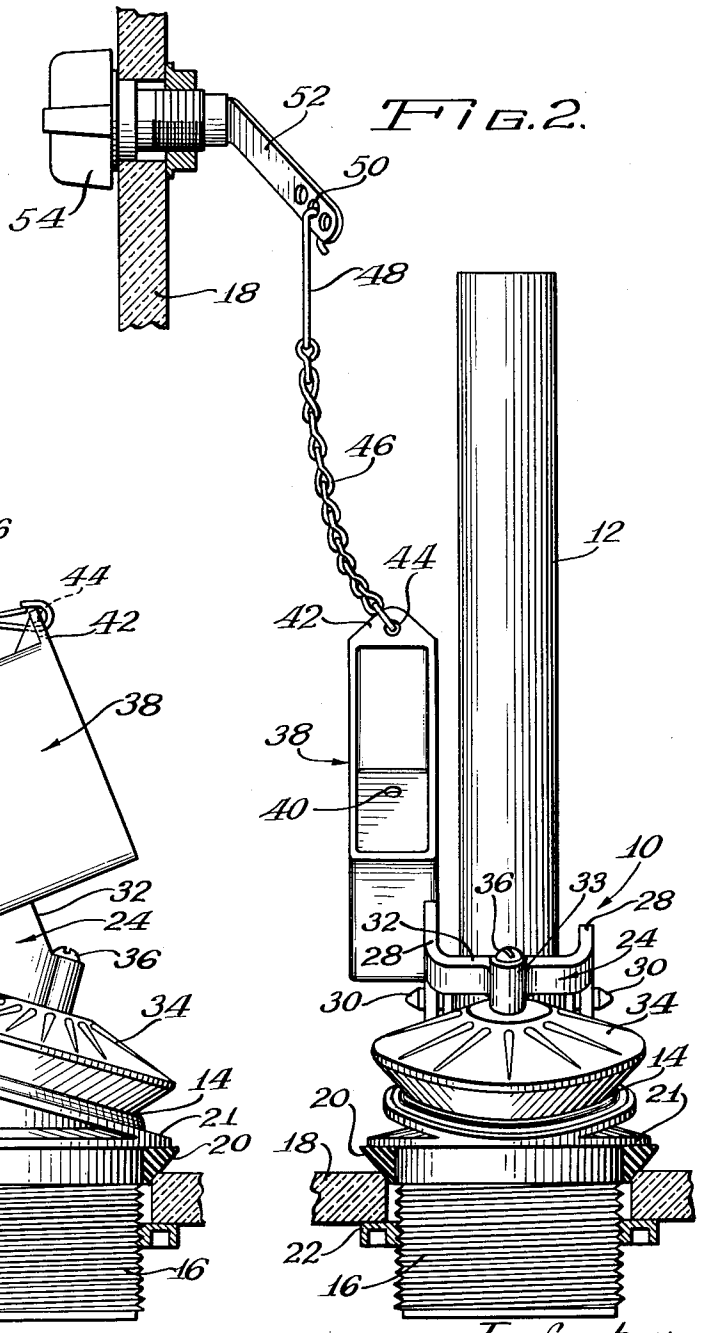


FIG. 2.



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FIG. 4.

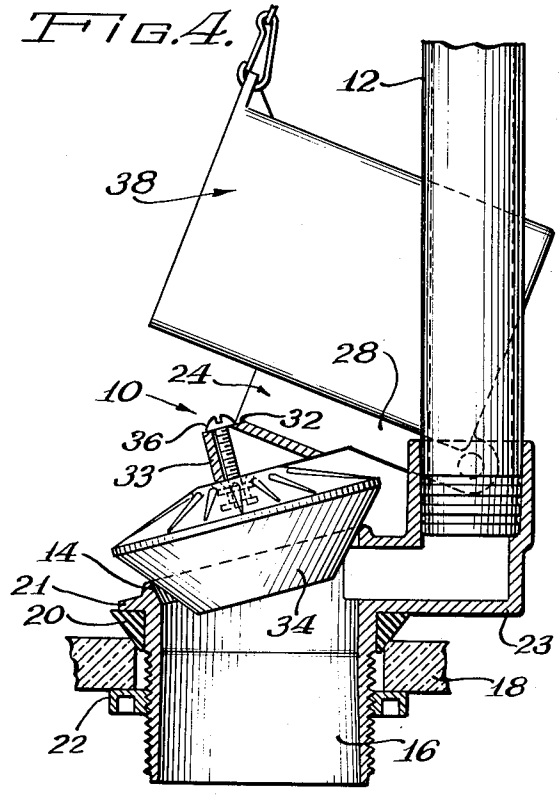
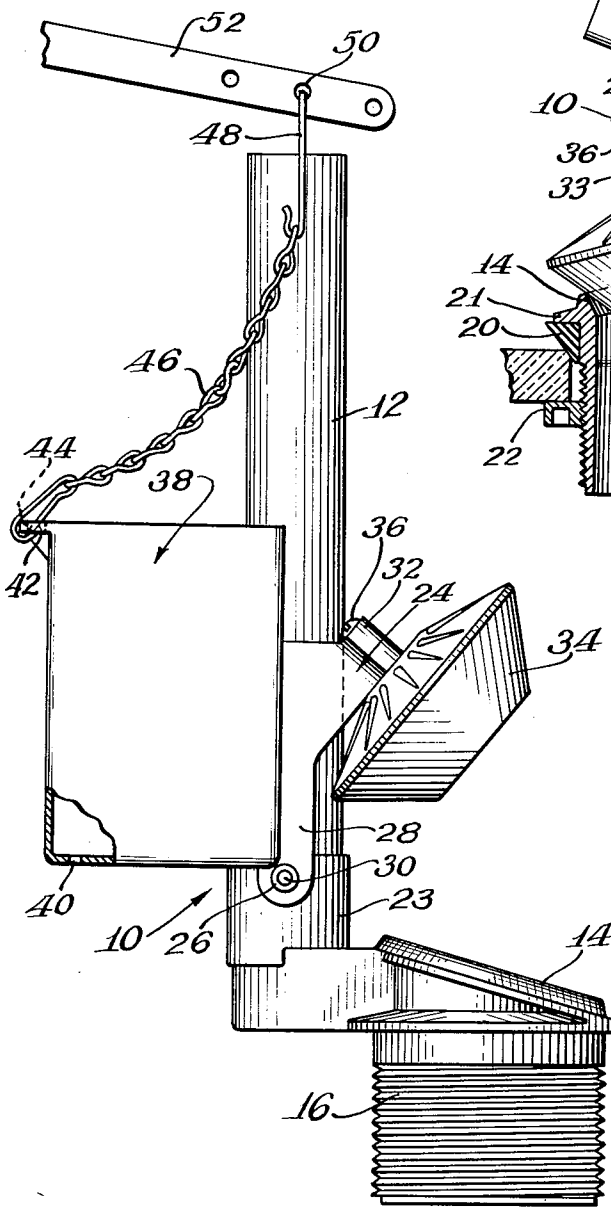


FIG. 3.



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FLUSH VALVE

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This invention relates to a valve for toilet flush tanks and more particularly to an improved valve construction for use with flush tanks of shallow depth.

It is well known that flush tanks may be constructed of shallower depth if substantially all the contents of the flush tank will be drained therefrom before reseating of the flush valve occurs. One method of delaying re-seating of a flush valve in a toilet flush tank of shallow depth is by providing a predetermined time delay between the time the flush valve is first opened and the time when the flush valve closes, as is disclosed, for example, in Schulz Patent 2,525,556.

Prior devices that have sought the same desirable features as achieved by this invention have been complex, or have utilized extra float members, or have not been readily adapted for use with a fitting that has an overflow tube connected thereto.

Thus, the principal object of this invention is the provision of an improved flush valve of the time delay type, which improved valve is characterized by its effectiveness, reliability, inexpensiveness, and simplicity.

Another object of this invention is to provide an improved flush valve of the type with a time delay feature and adapted particularly for use with a flush fitting that has an overflow tube connected thereto.

Further purposes and objects of this invention will appear as the specification proceeds.

A particular embodiment of the present invention is illustrated in the accompanying drawings wherein:

FIGURE 1 is a side elevational view of our flush valve in the closed position;

FIGURE 2 is an elevational view of the device of FIGURE 1 looking from the right of FIGURE 1;

FIGURE 3 is a side elevational view of the flush valve in the open position; and

FIGURE 4 is a fragmentary, sectioned, side elevational view of the flush valve in the closed position.

Referring to the drawings, the flush valve assembly, generally indicated as **10**, includes an overflow tube structure **12**, which is of hollow construction and has an open upper end. Connected to the overflow tube structure **12**, in laterally offset relation thereto, is a downwardly extending discharge tube **16** having an upwardly facing but inclined valve seat portion **14** at the upper end thereof. The inclined valve seat portion **14** slopes downwardly and away from the overflow tube **12**.

The downwardly directed discharge tube **16** is adapted to pass through the opening normally provided in the bottom of a flush tank **18**. The opening of the flush tank is sealed by means of a sealing gasket **20** of triangular cross-section, which is positioned around the discharge tube **16** below an abutment flange **21**. The clamping nut **22**, which threads onto the threaded portion of the discharge tube **16** and is tightened against the underside of the bottom of the flush tank **18**, causes the gasket **20** to seal the annular opening between the discharge tube **16** and the opening of the flush tank **18**.

The overflow tube **12**, the valve seat **14** and the discharge tube **16** may be included in the same assembly and may be constructed as an integral piece. However, as shown in FIGURE 4, the tube portion itself may be made separately and may be cemented, or secured in other appropriate manner, within the opening provided in an L-shaped connecting portion **23** that may be molded integrally with the valve seat portion **14** and the discharge tube **16**. The described parts are preferably constructed of a molded plastic material of suitable strength so that the valve is rugged, yet economical to manufacture and not subject to corrosion.

Pivotably mounted on the L-shaped connecting portion **23** is a U-shaped lever, generally **24**. Apertures **26** are provided near the ends of the arms **28** of the U-shaped lever **24** and are adapted to be pivotably received by the outwardly extending pivot fingers **30** on the overflow tube structure **12** or the connecting portion **23**. The U-shaped lever **24** is preferably constructed of a molded plastic material, which has flexible or springable characteristics, whereby the arms **28** may be sprung away from each other so that the apertures **26** may be inserted upon the pivot fingers **30**. The lever **24** is adapted to straddle the overflow tube structure **12** in such a manner that the bight **32** of the lever **24** is adapted to abut the exterior of the overflow tube **12** so as to provide a stop during the upward raising of the lever **24**.

Securely mounted to the bight **32** of the U-shaped lever **24** and directed downwardly therefrom is a valve member **34** having a frusto-conical side portion for entering into and sealing against the circular valve seat opening **14**. The valve member **34** may be secured to the bight **32** of the lever **24** in any suitable manner, as by means of a bolt **36** extending through an opening provided in the knuckle **33** on bight **32** and threadably attached to the valve member **34**. Desirably, the valve member **34** is hollow so as to provide buoyancy, and preferably the valve is formed of rubber or other resilient material. It is important that the valve member **34** remain pivotably aligned with the valve seat **14** in order that the valve be guided into proper sealing engagement with the valve seat for preventing leakage of water past the seated valve.

In order to hold the valve member **34** away from sealing engagement with the valve seat **14** after the flush valve has been opened, a hollow container or box **38** with a restricted discharge therefrom is provided on one of the arms **28** of the lever **24** and is located laterally of the overflow tube **12** and is particularly arranged to provide a counterbalancing effect for the valve **34**, as hereinafter described. Preferably, the container **38** is molded integrally with the lever **24** and is made of a plastic material so as not to be subject to corrosion.

The relationship and arrangement of the container **38**, hollow valve member **34**, and axis of pivot of the lever **24** is so selected that when the valve member **34** first raises from the valve seat **14**, the buoyancy of the hollow member **34** within the flush water contained in tank **18** operates to move the lever **24** to the position in FIGURE 3, with the center of gravity of container **38** and valve member **34** then positioned on opposite sides of the pivot axis of lever **24**. The bight end of the U-shaped lever **24** inclines away from container **38** to effectively provide for a biasing moment by the valve **34** connected thereto.

The hollow container **38** is maintained in the position of FIGURE 3 by the bight **32** contacting the overflow tube **12** for preventing overtravel of the lever beyond the desired counter-balancing point. As the level of water in tank **18** first falls below valve **34**, the lever **24** maintains said position by reason of the weight of water in container **38**. However, as the water continues to discharge through the discharge tube **16**, water is passing more slowly through the restricted discharge orifice **40** provided in the bottom of the hollow container **38**. After the preselected time delay has occurred that is, when substantially all the water has been discharged from the flush tank **18** and enough water has been discharged through the orifice **40** for the weight of the valve member **34** to overcome the weight of the container **38** and the remaining liquid contained therein, the lever **24** pivots down-

wardly about the pivot fingers 30, whereupon the valve 34 moves into positive sealing engagement with the valve seat 14. Thereafter, fresh water will enter to fill the tank 18.

The container 38 is provided with an ear 42 at its upper end and at the side opposite to its connection with the lever 24. The ear 42 is provided with an opening 44 for receiving the end of a chain 46 which at its opposite end is connected by means of a hook to an opening 50 in the lever 52. The lever 52 may be suitably operated by a handle 54 projecting from the flush tank 18. Thus, upon rotation of the handle 54, the lever 52, through the chain 46, lifts the lever 24, the container 38, and the valve 34 upwardly, whereupon the discharge valve is initially opened to begin the flush cycle.

It will be seen that when the flush valve is in the position of FIGURE 3, since the container 38 is secured to one arm of lever 24 and is laterally offset from the valve member 34 and overflow tube 12, there is no interference between the parts and as a result a very compact structural arrangement is achieved. The U-shaped lever 24, by securement of both arms thereof to pivot fingers 30 on opposite sides of overflow tube 12 insures alignment of valve 34 with valve seat 14, despite the lateral offset of counterbalance box 38, and the bight 32 conveniently serves to rigidify the arms of lever 24, to serve as a mounting for valve 34, and as a stop member for abutting tube 12 to limit movement of the counterbalance assembly.

Thus, it is seen that all the foregoing objects are accomplished by the above-described valve. In essence, the applicant has provided a simply constructed flush valve which provides a positive seal and which is of extremely reliable operation since the valve is always maintained in alignment with the valve seat 14. Furthermore, a flush valve having a minimum number of parts is provided, wherein the parts are easily assembled together without the necessity of special tools.

While in the foregoing there has been a detailed description of a particular embodiment of the present invention, it is to be understood that all equivalents obvious to those having skill in the art are to be included within the scope of the invention as claimed.

What we claim and desire to secure by Letters Patent is:

1. A flush valve for a flush tank of the type provided with a discharge tube having a valve seat at the upper end thereof and an overflow tube connected to said discharge tube and offset therefrom; said valve comprising, in combination, a pair of spaced pivot elements located on opposite sides of the overflow tube, a U-shaped lever having its legs pivotly mounted on said pivot elements so as to straddle the overflow tube, a valve member carried by said U-shaped lever below the bight of the U and being normally adapted to seal against said valve seat, and a hollow container mounted on one leg of said U-shaped lever and being positioned to move in a plane laterally offset from the overflow tube so that there is no engagement between the hollow container and the overflow tube, said container having a restricted discharge orifice therein for providing a time delay between the time when the valve is first opened and the time when the valve re-closes.

2. The flush valve of claim 1 wherein the bight of the U-shaped lever carries the valve member and is also positioned to engage the overflow tube to limit pivoting of the lever in one direction about said pivot elements.

3. The flush valve of claim 1 wherein the valve seat is inclined to project downwardly in a direction away from the overflow tube and wherein the valve member is a hollow body with a frusto-conical exterior portion adapted for engagement with the valve seat.

4. The flush valve of claim 1 wherein the U-shaped lever and hollow container are integrally formed of a plastic material which affords spreading of the free end of the arms of the U to permit assembly of the valve on the pivot elements, and wherein the bight end of the lever inclines away from the container and carries thereon the valve member.

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