

- | | | |
|------|-----------|---|
| [72] | Inventor | Sherwood L. Young
Monson, Massachusetts |
| [21] | Appl. No. | 754,669 |
| [22] | Filed | Aug. 22, 1968 |
| [45] | Patented | Oct. 13, 1970 |
| [73] | Assignee | American Standard Inc.
New York, New York
a corporation of Delaware |

2,582,853	1/1952	Smith	137/403
2,613,686	10/1952	Parson.....	137/404

Primary Examiner—William F. O'Dea

Assistant Examiner—David R. Matthews

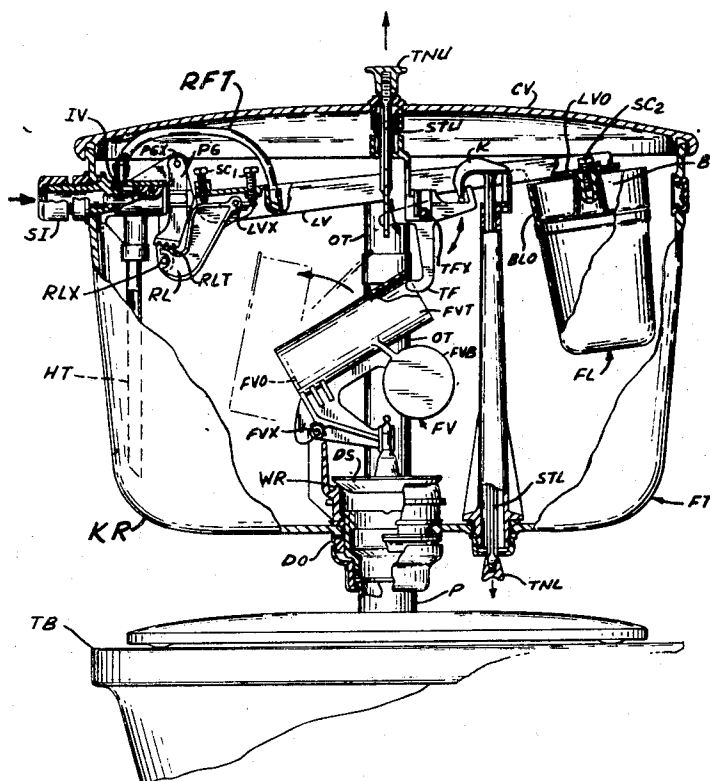
Attorneys—Jefferson Ehrlich, Tennes I. Erstad and Robert G. Crooks

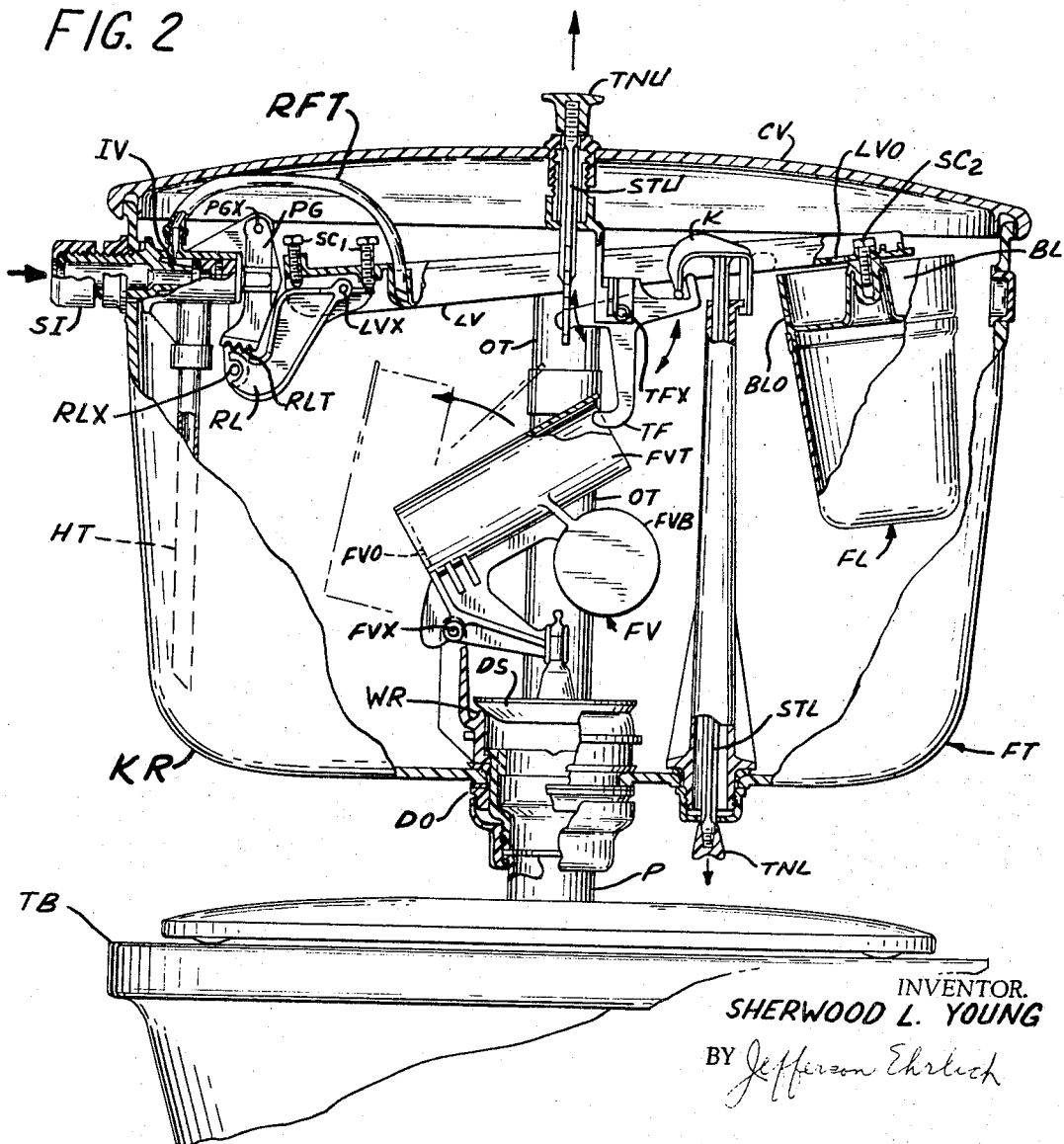
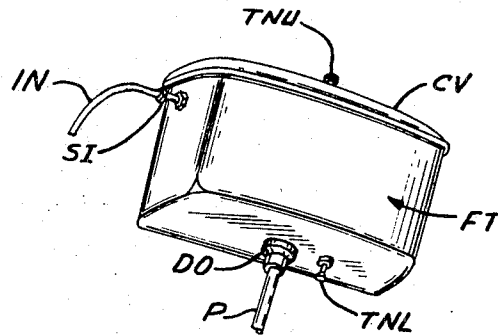
- | | | |
|------|------------------------------------|--|
| [54] | FLUSH TANK APPARATUS | |
| | 20 Claims, 21 Drawing Figs. | |
| [52] | U.S. Cl. | 137/404,
137/424, 137/426, 137/436, 137/443, 137/446 |
| [51] | Int. Cl. | E03 1/33,
F16k 33/00 |
| [50] | Field of Search | 137/403,
404, 406, 408, 424, 425, 426, 427, 434, 435, 436,
442, 443, 446; 4/41 |

[56] **References Cited**
UNITED STATES PATENTS

- | | | | |
|-----------|--------|----------------|----------|
| 616,995 | 1/1899 | Wangelin | 137/403 |
| 1,069,658 | 8/1913 | Drew | 137/446X |

ABSTRACT: Relates to flush tank mechanism for a toilet bowl. The flush tank houses, in addition to a conventional flush valve, a water inlet valve and an elongated lever having a built-in channel substantially throughout its length for feeding water incoming through said valve to the flush tank. A float is physically coupled to the free or front end of the elongated lever and the float includes an open-ended chamber for receiving water from the channel of the lever, but the water is discharged from the chamber through an aperture therein. The channel of the lever provides one path for the incoming water reaching the tank while a hush tube, also coupled to the inlet water valve, provides a second path for incoming water. The lever is coupled to the inlet valve by geared members and they are operated to translate the rotary motion of the lever into linear motion to close the inlet valve.





INVENTOR.
SHERWOOD L. YOUNG
BY *Jefferson Ehrlich*

FIG. 3

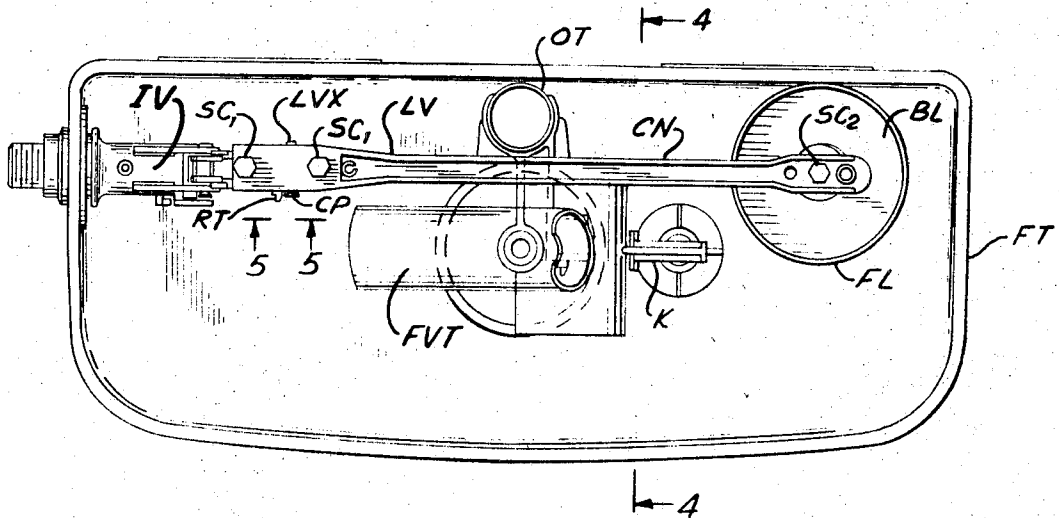


FIG. 5

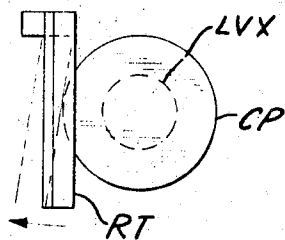


FIG. 6

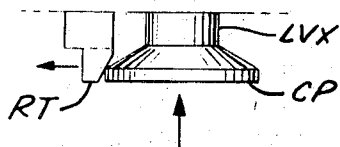


FIG. 7

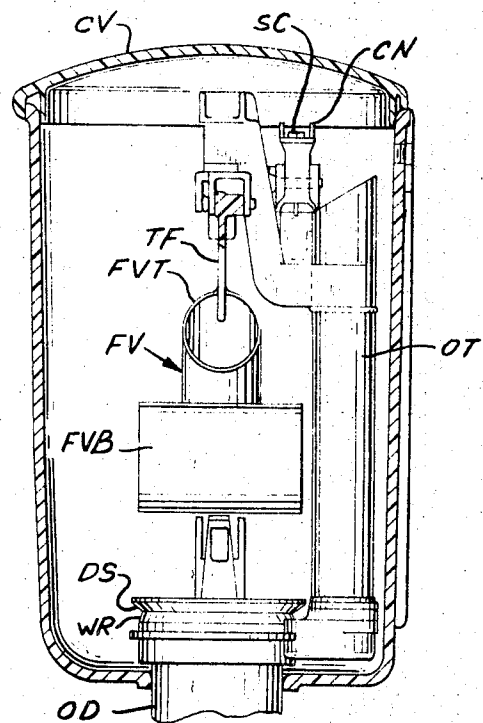
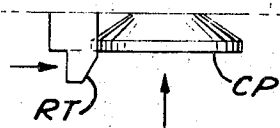


FIG. 4

INVENTOR.
SHERWOOD L. YOUNG

BY

FIG. 8

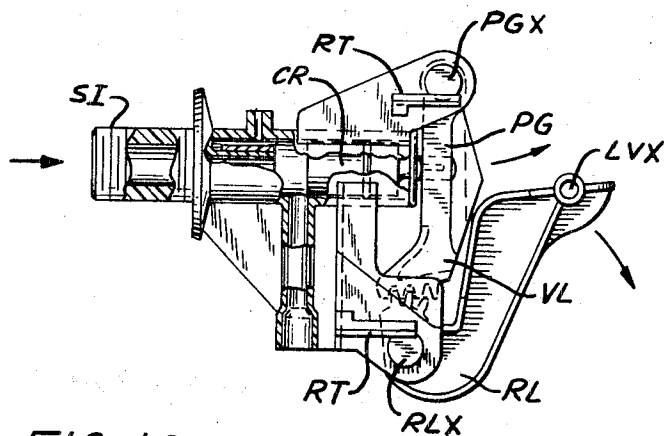


FIG. 9

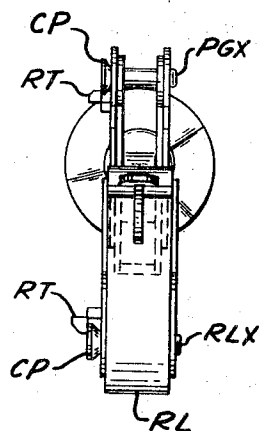


FIG. 10

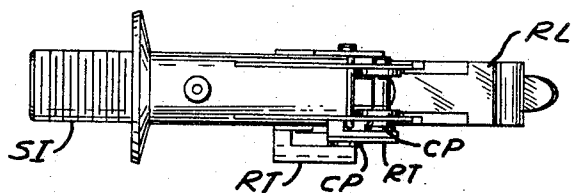


FIG. 11

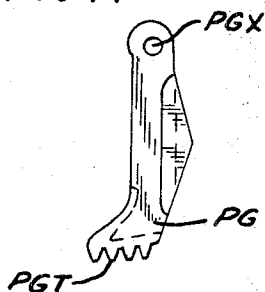


FIG. 12

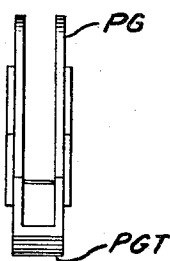


FIG. 15

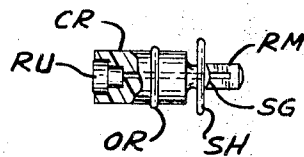


FIG. 16

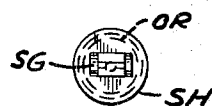


FIG. 13

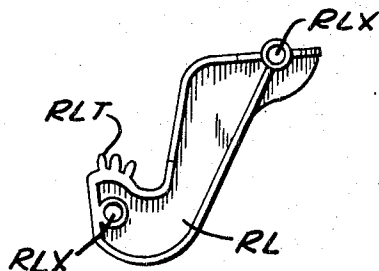
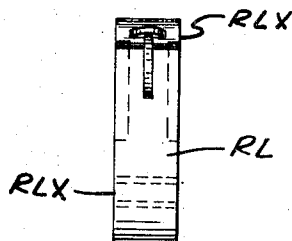


FIG. 14



INVENTOR.
SHERWOOD L. YOUNG
BY *Jefferson Ethelick*

FIG. 17

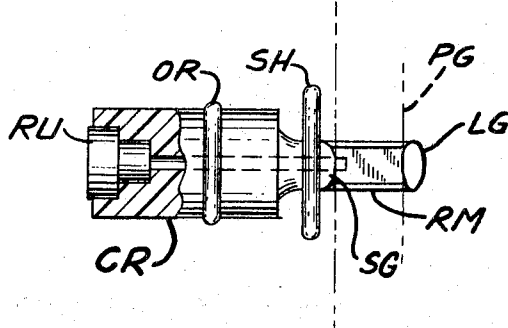


FIG. 18

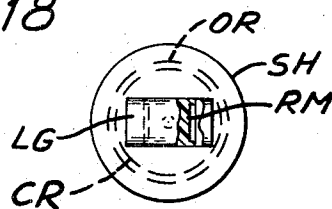


FIG. 19

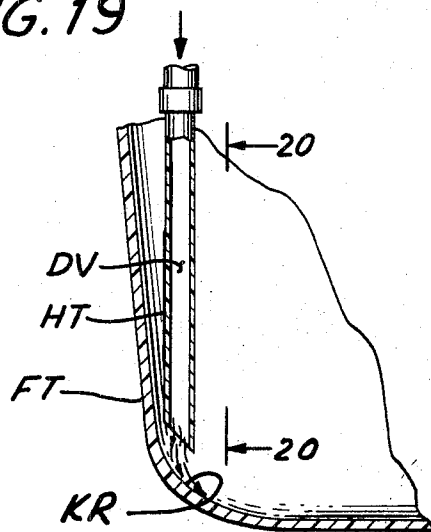


FIG. 20

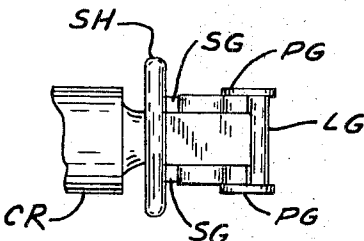
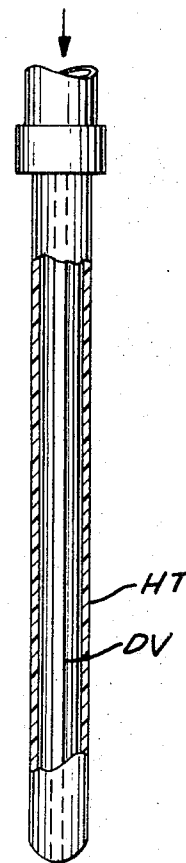


FIG. 18a

INVENTOR.
SHERWOOD L. YOUNG

BY *Jefferson Shulick*

FLUSH TANK APPARATUS

This invention relates to structures and fittings for a flush tank of the type that is used with a toilet bowl. More particularly, this invention relates to novel and improved mechanisms for controlling the flow of water into a flush tank and for releasing and discharging water from the flush tank into the toilet bowl.

As is well known, the flush tank usually associated with the conventional toilet bowl serves as a reservoir for a limited or predetermined quantity of water. The flush tank is generally filled to its assigned capacity and the water is later discharged from the flush tank into the toilet bowl as may be required to empty the contents of the toilet bowl. Water is usually allowed to enter the conventional flush tank from the local or city water supply system so as to fill the tank to the desired level at a fairly slow rate. When this level has been reached, the flow of water into the flush tank is shut off and remains shut off until, at a later time, the water is discharged into the toilet bowl and another supply of water must be transmitted to the flush tank. Usually a knob or lever, mounted on the outside of the conventional flush tank, is manipulated by the user to actuate the mechanism within the flush tank so as to release the water stored therein and to discharge the stored water into the toilet bowl. It is a general and common experience that the inflow of water to fill the flush tank to its full capacity, because of the slow rate of water influx, requires considerable time before the predetermined level is reached. Because of this long delay, discharges of a full head of water from the flush tank can only occur at relatively long time intervals. This is obviously a handicap in many eventualities. For one thing, the number of uses of the facilities is definitely reduced or limited by the long intervals. As another factor, the operation of the control knob or lever before the full head of water has been accumulated within the flush tank can only result in inefficient and unnecessarily repeated cleansing of the toilet bowl with its obvious consequences. The speedy influx of water into the flush tank as well as the speedy efflux of water are both prime requisites of good and efficient service and proper hygienic conditions. As a third factor, the operating mechanism within the flush tank develops hisses and other noises which are disturbing and unnecessary, and these disturbances should be materially reduced, if not eliminated.

The fittings and equipment for a flush tank have been standardized for a long time with relatively little change in their general construction or operation. Basically, the fittings are metallic and have remained metallic. They usually comprise a supply inlet valve to control the entrance or influx of water into the flush tank from the local water supply; a tank refill or hush tube which is designed to conduct water from the supply inlet valve into the flush tank when it is to be filled; an overflow preventer, usually in the form of a standing tube or pipe, serving not only to discharge any excessive supply of incoming water into the toilet bowl to prevent overflowing of the flush tank and flooding of the bathroom, but serving also as a safety device to prevent the water fed into the flush tank from being returned to the local water supply system to contaminate it; and a flush valve, generally including a disc mechanism, for coupling the flush tank to the toilet bowl, the disc mechanism being lifted from time to time in response to the operation of the control knob or lever to release the water accumulated in the flush tank into the toilet bowl to drive the contents of the toilet bowl into the sewer system.

One of the main objects of this invention is to improve the fittings for a flush tank and their construction so that the overall mechanism will be of superior reliability, of improved operational and functional characteristics and capable of filling the flush tank at a much more rapid rate. As already suggested hereinabove, one of the objects will be to speed up the inflow of water into the flush tank so that repeated and efficient discharges of water from the flush tank may occur at more frequent intervals.

Another of the principal objects of this invention is to improve the fittings and mechanism of the flush tank so that they

will be lower in manufacturing cost and at the same time freer from problems requiring repair or maintenance. One of the features of this invention is the employment of simple plastic parts substantially throughout the entire construction.

Still another of the objects of this invention involves the design and construction of parts making up the overall mechanism of the flush tank so that a relatively unskilled mechanic may readily disassemble the parts and repair or replace any of the parts. One of the parts of the mechanism for accomplishing this objective is a linear pin having a cap or head and a movable retainer bar, so arranged that the cap or head may be moved essentially only when the retainer bar is deflected. That is, by deflecting the retainer bar, the pin may be moved into its assigned position to serve for example, as a pivot for a pair of cooperating parts or, when desired, the retainer bar may again be deflected so that the head of the pin may be released to enable the pin to be lifted out of its position so as to uncouple the parts which are controlled or coupled by the pin.

This invention will be better understood from the more detailed description hereinafter following when read in connection with the accompanying drawing in which:

FIG. 1 shows a perspective of the exterior of the flush tank;

FIG. 2 illustrates a partial cut-away of the flush tank so as to reveal some of the internal construction of the mechanism incorporated therein;

FIG. 3 shows a top plan view of the flush tank with its cover removed;

FIG. 4 is a view of the internal tank mechanism when viewed along the lines 4-4 of FIG. 3 (with the tank cover in place);

FIGS. 5, 6 and 7 show three respective views of the pin and retainer bar construction employed in this invention;

FIG. 8 shows a front lateral view of the water supply inlet valve and the mechanism controlling its operation;

FIG. 9 shows a side view of the mechanism of FIG. 8;

FIG. 10 shows a top plan view of the mechanism of FIG. 9;

FIG. 11 shows a front lateral view of the plunger device of this invention;

FIG. 12 a side view of said device;

FIG. 13 shows a front lateral view of the rod lever control mechanism which is geared to the plunger device of FIGS. 11 and 12;

FIG. 14 shows a side view of the rod lever control mechanism;

FIGS. 15 and 16 respectively illustrate a side elevation of certain parts of the water supply inlet valve and a side view of said parts;

FIGS. 17 and 18 respectively illustrate side elevations of parts, corresponding to those of FIGS. 15 and 16, of an improved modification of said parts;

FIG. 18a illustrates a partial top plan view of the FIG. 18 arrangement;

FIG. 19 is a partial view taken from FIG. 2 to illustrate a divided hush tube; and

FIG. 20 is a partial section taken along lines 20-20 of FIG. 19. Throughout the drawing like parts will be designated by like reference characters.

FIG. 1 generally illustrates a view of the external mechanism of the flush tank. The flush tank is designated FT, the cover CV; there are two control trip knobs, the upper one designated TNU and the lower one TNL. The water inlet pipe is designated IN and the supply or inlet opening or coupling is designated SI. At the bottom of the tank, the discharge opening or coupling DO is connected by an appropriate pipe P to the toilet bowl (not shown in FIG. 1). As will be described hereinafter, water is supplied from the local water supply system through the inlet pipe IN to the flush tank FT. Either the upper trip knob TNU or the lower trip knob TNL may be pulled or manipulated so as to promptly release the water accumulated within the flush tank FT into the toilet bowl TB.

FIG. 2 shows some of the more important components of the fittings and mechanism contained within the flush tank FT.

The supply inlet coupling **SI** is connected to the water inlet valve **IV**. The opening and closing of the water inlet valve **IV** is controlled by a plunger **PG** which is geared to rod lever **RL** which in turn is adjustably coupled to a lever **LV**. The lever **LV** is coupled to the rod lever **RL** by means of a pivot pin **LVS**. The rod lever **RL** controls, by means of its toothed structure **RLT**, the movement of plunger **PG** which in turn controls the opening or closing of the valve **IV**, as well as the speed with which the valve **IV** is opened or closed. The lever **LV** will be moved axially about another pivot pin **RLX** so as to swing the plunger **PG** in a lateral direction to operate the inlet valve **IV**. The teeth **RLT** of rod lever **RL** mesh with the teeth **PGT** of plunger **PG** to impart lateral movement to the plunger to control the valve **IV**. Each angular displacement of lever **LV** is therefore accompanied by a corresponding movement of plunger **PG** and a corresponding change in the size of the opening of valve **IV**.

The valve **IV** is positioned so that it enables water to enter from the inlet opening or coupling **SI** into a hush tube **HT** through which water is fed into the tank **FT**. A similar inlet valve is disclosed in applicant's U.S. Pat. No. 3,369,560, issued Feb. 20, 1968, entitled "Flush Tank Refill Valve." The rotatable lever **LV** has a built-in water channel **CN** extending substantially throughout its length (See FIG. 3) which is coupled by means of a flexible refill tube **RFT** to the inlet valve **IV**. When the water inlet valve **IV** is open, some of the incoming water will flow into the flexible refill tube **RFT** and through the channel **CN** of the lever **LV** to the supply or ballast chamber **BL** of the float **FL**. Thus, there are two separate and distinct passages for influent water; one through the hush tube **HT** and the other through the flexible refill tube **RFT** and channel **CN** to the ballast chamber **BL** and then to the tank **FT**.

The flush valve **FV** may be of a conventional type and it is shown in solid lines in FIG. 2. It is employed for controlling the main discharge of water from the flush tank **FT** through the discharge opening **DO** and pipe **P** into the toilet bowl **TB**. A somewhat more detailed description will now be provided as to the operation of the fluidic and mechanical arrangement broadly illustrated in FIG. 2.

The flush valve generally designated **FV**, which may be of any well-known construction, is preferably of the type shown and described in the Hurco et al. U.S. Pat. No. 2,773,267, issued Dec. 11, 1956, entitled "Flush Valve." The flush valve **FV** includes a rotatable disc device **DS** which, in its normally closed position, rests upon a weir or collar **WR**. When so positioned, water within the tank **FT** will be unable to traverse or break the seal established between the disc **DS** and the weir **WR**. When the water in tank **FT** is at its highest level, the float **FL**, which is affixed to lever **LV**, will be in its uppermost position as shown in FIG. 2, and the inlet valve **IV** will be closed. However, when the flush valve **FV** is operated to release the water of tank **FT**, the disc **DS** reaches a position shown in dotted lines in FIG. 2. The disc **DS** is tilted and thereby raised above the weir **WR** so that water may then travel rapidly and voluminously through the discharge opening **DO** and into the toilet bowl **TB**. The disc device **DS** is rotated about the pivotal axis **FVX** of the flush valve **FV**. When the tank water is discharged, float **FL** will be at its lowermost position and the pressure of the water at the supply inlet will cause the inlet valve **IV** to be opened.

The separate knobs **TNU** and **TNL** may individually control the operation of the flush valve **FV**. One of the knobs **TNU** is coupled to and controls the left lobe or finger of the trip lever **TF**. The other knob **TNL** is mechanically coupled to and controls the right lobe or finger of the trip lever **TF**. The lower lobe or finger of the trip lever **TF** in turn controls the actuator **FVT** of the flush valve **FV**. By pulling either of the knobs **TNU** or **TNL**, the trip lever **TF** will be rotated clockwise, tilting the actuator **FVT** from its normal position (shown in solid lines in FIG. 2) to its operated position (shown in dotted lines). In other words, the manipulation or operation of either of the knobs **TNU** or **TNL** will result in a rotation of the three-fin-

gered trip lever **TF** in a clockwise direction through a predetermined angle to rotate the disc **DS** about its pivot **FVX** and thereby to release the flush valve **FV**, hence breaking the seal between the disc **DS** and the weir **WR**. Consequently, the water in the tank **FT** will be promptly discharged over the weir **WR** and through the discharge opening **DO** into the toilet bowl **TB**.

After the water within the tank **FT** has receded below the rim of the weir **WR**, the float **FL** attached to the lever **LV** will be in its lowermost position, as already mentioned. In this position the water inlet valve **IV** will be fully opened, permitting water to enter from the supply inlet **SI** at a rapid pace. The incoming water will flow in one path through the flexible tube **RFT** and channel **CN** to the ballast tank **BL**, and into tank **FT**, and in another path through the hush tube **HT**. As water enters the flush tank **FT** and rises in level, the rising water will buoy the float **FL** and cause it to move upwardly in step with the level of water in the flush tank **FT**. Thus, water will be entering the tank **FT** not only through the hush tube **HT** but also from the parallel path of the flexible tube **RFT** and the channel **CN** of the lever **LV** and into the ballast tank **BL** of the float **FL**.

The ballast tank **BL** is a cylindrical chamber which is open at the top to receive water. However, there is a small opening—or several small openings—generally designated **BLO**, within the ballast tank **BL** through which water fed to the ballast tank **BL** will be released into the flush tank **FT**. Hence, the joint reception of water by tank **FT**, through the hush tube **HT** and the ballast tank **BL**, speeds up the accumulation of water within tank **FT**. As the level of the water in tank **FT** rises further, the rotation of the lever **LV** in a counterclockwise direction about its pivotal axis **RLX** gradually, but fairly rapidly, closes the water inlet valve **IV**, thereby reducing the inflow of water into the tank **FT**. This reduction in water accumulation in tank **FT** occurs only near the end of the travel of the lever **LV**. Thus, the water accumulation within the tank **FT** will generally be at a rapid pace, faster than is now achieved in conventional flush tanks. The time interval required to fill tank **FT**, reduced by the dual entrance paths, makes the tank **FT** available for more rapid sequential operations when associated with the improved mechanism.

The tank **FT** embodies a vertical overflow tube **OT** which is coupled to the discharge opening **DO** (See FIG. 4). The upper end of the overflow tube **OT** is open so that, as water reaches the level of the upper opening, it will be released through the overflow tube **OT** and through the discharge opening **DO** to the toilet bowl **TB**. The overflow tube **OT** is also employed to permit excess water reaching the tank **FT** to be discharged into the toilet bowl **TB** rather than to be fed back to the supply inlet opening **SI** and in turn to the local water supply system and possibly contaminate the water system.

In accordance with this invention, the volume of water entering the ballast tank **BL** of the float **FL** during the early stages immediately following the opening of the valve **IV** will exceed the amount drained through the opening **BLO** of the ballast tank **BL**. Hence, the effective buoyancy of the tank float **FL** will be rapidly reduced in the early stages of the opening of inlet valve **IV**. As the float **FL** rises further and reaches the set or predetermined water level in the tank **FT**, the plunger **CR** of the water inlet valve **IV** (See FIGS. 8, 15 and 17) is advanced to the left to reduce the inflow of water through the flexible tube **RFT**. Hence water will enter the ballast tank **BL** at a slower rate than the rate at which water drains out of ballast tank **BL** through its drain hole or holes **BLO**. As the ballast tank **BL** empties, it effects an increased buoyancy on the float **FL**, which quickly rises and shuts off the flow of water into tank **FT** via the water inlet valve **IV**. The float **FL** may be viewed as "jumping" through the last segment of its return to its uppermost position to bring about the rapid closing of the water inlet valve **IV**. In a conventional water inlet valve, the final shutoff of the valve is slow and produces a prolonged hissing sound because the float of the conventional flush tank slowly overcomes the inlet water pressure. As al-

ready indicated, when the lever LV and its float FL are at or near the uppermost position as shown in FIG. 2, the water inlet valve IV will be fully closed, and no more water will be fed through the supply inlet SI.

It is, of course, one of the features of this invention to provide two separate and distinct main avenues or paths for simultaneously feeding water from the supply inlet to the flush tank FT. One of these main supply channels is provided by the flexible tube RFT and channel CN to ballast tank BL and the other by the hush tube HT, as already observed. The channel and other port dimensions have been selected to provide the proper time interval for tank fillage.

The lower knob TNL is employed primarily to enable children to conveniently control the operation of a flush tank. On the other hand, taller people can readily reach the upper knob TNU to control the operation of the tank FT. Dual controls are highly desirable especially in situations in which the flush tank FT is elevated considerably above the level of the toilet bowl TB.

The upper knob TNU has a threaded cap so that it may be coupled by a stem STU through an appropriate housing or enclosure to the left arm of the trip lever TF. The knob TNU is intended to hold the cover CV closed against the upper rim of the tank FT. A similar stem STL couples the lower knob TNL to the right arm of the trip lever TF via a coupling element K.

The relative position and angular displacement of the lever LV can be controlled by two threaded screw members SCI which are located at opposite sides of the pivot pin RLX of the lever RL, as is plainly shown in FIG. 2. By moving these screws SCI in relatively opposite directions, the angular position of the lever LV may be controlled and this in turn governs the maximum height to which float FL may be raised. This then determines the maximum level to which the water may rise within tank FT. Each rise in the water level will be accompanied by a delay in the time of closure of the inlet valve IV. The maximum water level of tank FT will be increased and the time interval during which valve IV is opened will be increased by manipulation of screws SCI, as above indicated. Conversely, by reversing the relative adjustments of the two screws SCI, the lever LV may be relatively lowered so that a lower level of water will be accumulated within the tank FT and the opening time of valve IV will be reduced. In the latter case, the inlet valve IV will come to complete closure at an earlier time phase.

It will be observed that the float FL is permanently fastened to the channeled lever LV by a plastic threaded screw SCI. These two elements are therefore caused to move together so that each change in the vertical elevation of the float FL will be accompanied by a corresponding angular displacement of lever LV.

FIGS. 2 and 8, for example, show the mechanism adjacent to and immediately controlling the water inlet valve IV. The plunger PG is movable about its axial pin PGX, but the plunger PG exercises a lateral displacement of the inlet valve IV. That is, the rotary motion of plunger PG is converted into a lateral or linear displacement of valve IV.

The movable mechanism of the inlet valve IV is shown particularly in FIGS. 15 and 16. A modified mechanism is shown in FIGS. 17 and 18. A rubberized cylindrical member RU is fixed within a collar CR. The collar CR supports an O-ring OR. A shoulder SG on the disk SH of the mechanism of FIG. 15 puts a limit on the amount by which the movable mechanism here shown and described can travel into the external housing of the inlet valve IV. The O-ring OR is located to the right of the flexible tube RFT and of the hush tube HT (which are illustrated in FIG. 2) so that incoming water may be received by these two tubes but cannot pass the O-ring. The slotted segment RM of the mechanism is positioned in a corresponding channel of the plunger PG so that the plunger PG may control and laterally move the slotted segment RM to the left to reduce or to close the opening of the inlet valve IV. The water pressure applied through the supply inlet SI can cause limited movement to the right of the movable mechanism of

valve IV, but any movement in the opposite direction is controlled by the plunger PG.

FIGS. 17, 18 and 18a show projecting lugs LG and rounded shoulders SG between which the plunger lever PG is positioned and retained. Hence, when the float FL drops as the flush tank FT empties, the plunger PG is rotated away from the inlet valve IV to release the movable mechanism of this valve and thereby open the valve. The opening of valve IV as the float FL drops will occur even when the water pressure in the supply inlet SI is low and insufficient per se to move the rubber member RU away from its seat. Thus, by the construction of FIGS. 17 and 18, the valve IV will be opened regardless of the magnitude of the incoming water pressure.

The pivot pins TFX, RLX, LVX and PGX are several similar general purpose pins employed in this invention to couple two parts together so that one or the other or both of the parts may be rotatable. The general form of these pins is shown in FIGS. 5, 6 and 7. The pin LVX, for example, has a cap CP. This pin LVX and its cap CP are associated with a retainer arm RT, forming a unitary structure. The retainer arm RT is flexible, and therefore, one end is movable. Although shown in solid lines in FIG. 5 in its normal position, the retainer arm RT may be deflected by relatively minor finger pressure to the dotted position also shown in FIG. 5. In the latter or dotted position, the cap CP of the pin LVX may be released from the retainer arm RT so that the pin LVX may be removed from its opening to sever the parts coupled together by pin LVX. On the other hand, when the retainer arm RT is returned to its normal position while the cap CP is in the position shown in FIG. 5, it will be impossible to remove the pin LVX. FIG. 6 shows the cap CP about to be moved into engagement beneath the retainer arm RT so that it may be held by the retainer arm RT. On the other hand, in FIG. 7, the retainer arm RT is undeflected so that the cap CP may not be removed from its position.

It will be observed from FIGS. 2 and 3 that the axial pin LVX couples the rod lever RL to the channeled lever LV. In those figures the axial pin LVX is held in its assigned position to maintain the two levers coupled to each other. However, should it be desired to uncouple or sever the two levers from each other, it is only necessary to deflect the retainer arm RT and hold it deflected until the cap CP is slid beyond the retainer arm to remove the pin LVX. The levers will thence be uncoupled. To recouple the levers RL and LV, it is again necessary to deflect the arm RT until the cap CP of pin LVX has been moved back beyond the arm RT. Hence, the pin LVX will again serve as a pivot for the two levers. Obviously, each of the other axial pins TFX, RLX and PGX are similarly constructed and are associated with similar retainer arms and perform in the same general manner.

FIGS. 19 and 20 show a modified form of hush tube RT. This hush tube HT has a divider DV to provide two longitudinal channels within tube HT. The divider DV acts as a sort of baffle to slow down the inflow of water through the water inlet valve IV. This has the effect of reducing the turbulence of the water flowing through the inlet valve IV to and past the rubberized member RU of the inlet valve IV. This materially reduces the noise at the inlet valve IV, reducing the noise at this point to a practical nullity.

It is also observed from FIG. 19 that the slope of the sides of the flush tank FT is toward the base of the tank. Due to the slope of the wall of tank FT adjacent to the hush tube HT and due also to the curvature KR at the intersection of the wall and tank base, the water emitted by the hush tube HT will impinge against the tank surface at a very small angle and hence the water will glide smoothly into the base of the tank FT. This smooth, nonturbulent emission substantially reduces noise. Such noise is generated especially in a conventional flush tank in which the hush tube is parallel to the tank walls and emitted water flows squarely (perpendicularly) against the tank base. Thus, because of the taper of the tank wall and the curvature KR, substantially noiseless operation is effected.

Thus, in accordance with this invention, two distinct sources of noise are effectively suppressed from the tank operation.

All of the parts and fittings within the flush tank FT, as well as the flush tank FT itself, are made of plastic materials. They are relatively light in weight and inexpensive; consequently, the cost of manufacture of the various parts of the overall combination will be relatively low. Moreover, all of the parts are readily removed whenever desired and replacements may be made expeditiously by even an inexperienced mechanic, as well as by the home owner.

It will be apparent that the structures and features which are described and illustrated and claimed are capable of a wide range of variations for accomplishing the same or similar objectives.

I claim:

1. A flush tank comprising a water inlet valve positioned near the top of the tank, an elongated lever one end of which is pivotally coupled to said valve and is shaped to provide a channel which is open substantially throughout the length of the lever to transmit water traversing said valve into said tank, and means controlled by said lever to open or close said valve, the uncoupled end of said lever being positioned above the level of said valve when said valve is closed and positioned below the level of said valve when said valve is open.

2. A flush tank according to claim 1 in which the lever control means includes two rotatable arms geared to each other to effect a linear displacement of the water inlet valve.

3. A flush tank according to claim 2 including also a float supported substantially at the uncoupled end of the lever, said float being elevated in response to increases in the level of the water in the tank.

4. A flush tank according to claim 3 including a screw adjusting member mounted on the lever and adjustable to control the maximum height to which the float may rise.

5. A flush tank according to claim 3 in which the float includes a chamber for receiving water transmitted over the channel of the lever and having a hole therein for discharging water from said chamber into the flush tank.

6. A flush tank according to claim 4 including also means for controlling the buoyancy of the float, said buoyancy control means including a chamber in the float for receiving water traversing the channel of the lever, said chamber having an aperture therein for discharging water from said chamber and into the tank.

7. A flush tank according to claim 6 including also a substantially vertical tube coupled to the water inlet valve to provide a second passage for water entering said valve.

8. A flush tank according to claim 2 including a float suspended from the uncoupled end of the lever and being buoyant so as to be elevated as the water in the tank rises, thereby correspondingly elevating the position of the lever.

9. A flush tank according to claim 8 in which the float includes a receiving chamber to receive water traversing the channel of the lever, said channel having a hole therein for

discharging water from said chamber into the flush tank.

10. A flush tank comprising a water inlet valve, an elongated lever having a channel formed substantially throughout its length to transmit water from said valve and into said tank, and a substantially vertical tube to provide a second channel for transmitting water from said valve into said tank.

11. A flush tank according to claim 10 including means controlled by said lever to control the closure of said valve.

12. A flush tank according to claim 11 in which the lever control means includes two rotatable arms geared to each other to effect a linear displacement of the inlet valve to thereby close that valve.

13. A flush tank according to claim 12 including also a float physically suspended from one end of said lever and responsive to changes in the water level in the tank to correspondingly change the elevation of the end of the lever to which the float is connected.

14. A flush tank according to claim 13 in which the lever includes a mechanism mounted thereon for adjusting the maximum height to which the lever may rise.

15. A flush tank according to claim 14 including means for controlling the buoyancy of the float.

16. A flush tank according to claim 15 in which the buoyancy control means includes an apertured chamber for receiving water from the channel of the lever and discharging the water into the flush tank.

17. A flush tank comprising a water inlet valve, a lever which is channeled to transmit water from said valve into said tank, said lever being pivoted within said tank and having a float attached thereto, and means to couple said lever to said valve, said coupling means including two members which are geared to each other, each angular movement of the lever in one direction about its pivot causing the members to progressively reduce the opening of said water inlet valve and each movement of the lever in the opposite direction about its pivot causing the members to progressively increase the opening of said water inlet valve regardless of the water pressure at said inlet valve.

18. A flush tank comprising a pivoted lever having a channel, a water inlet valve to transmit water over said channel into said tank, and means to render the operation of the valve independent of the external water pressure, said means including mechanism to couple said lever to said valve so that each angular displacement of said lever will produce a linear displacement of said valve to change the size of its opening.

19. A flush tank according to claim 18 in which said mechanism includes two coupled arms one of which is connected to the movable element of the water inlet valve and the other to the lever.

20. A flush tank according to claim 19 in which the two arms are geared to each other.

55

60

65

70

75