July 14, 1953 R. J. CHAPMAN 2,644,950

FLUSHING DEVICE

Filed Jan. 2, 1951 5 Sheets-Sheet 1

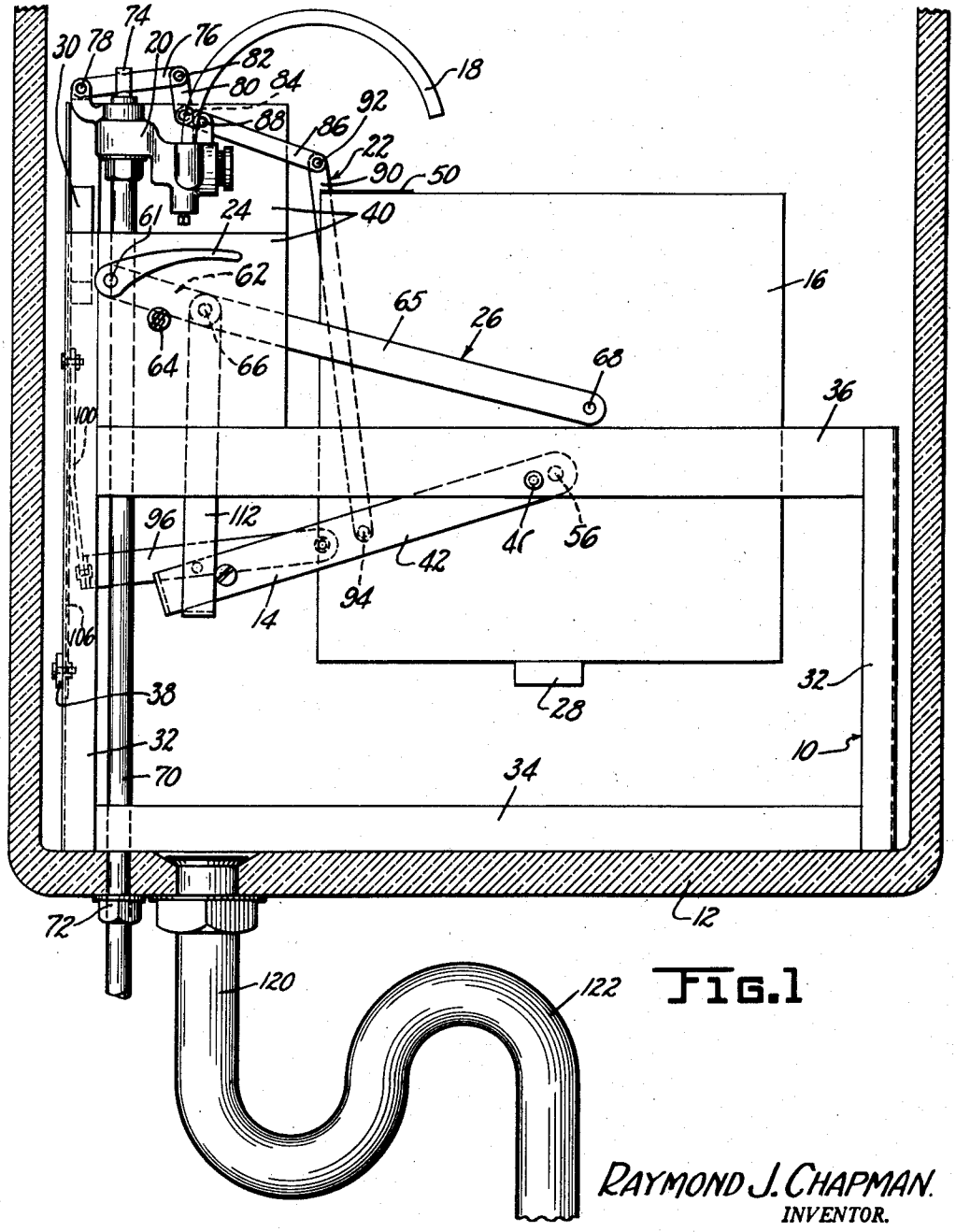


FIG. 1

RAYMOND J. CHAPMAN.
INVENTOR.

BY Attech & Knoblock

ATTORNEYS

July 14, 1953 R. J. CHAPMAN 2,644,950

FLUSHING DEVICE

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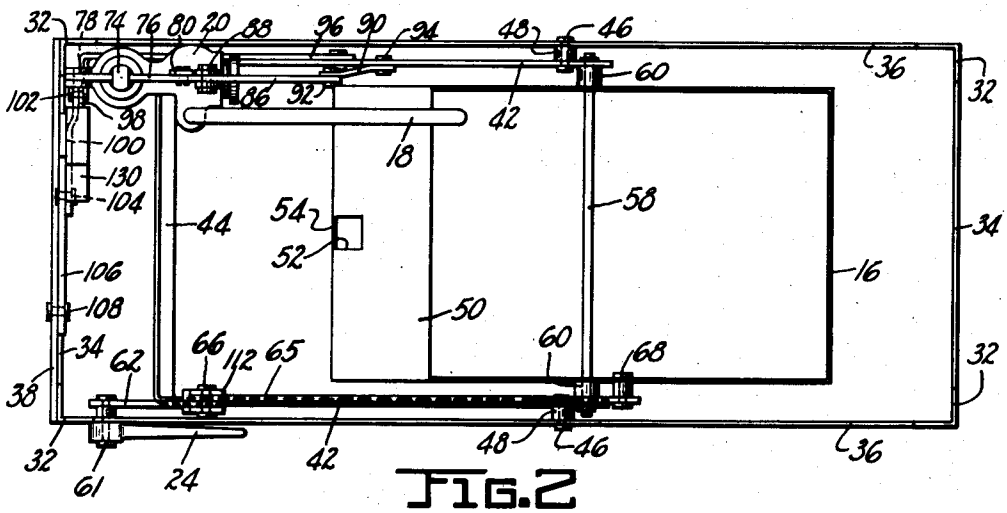


FIG. 2

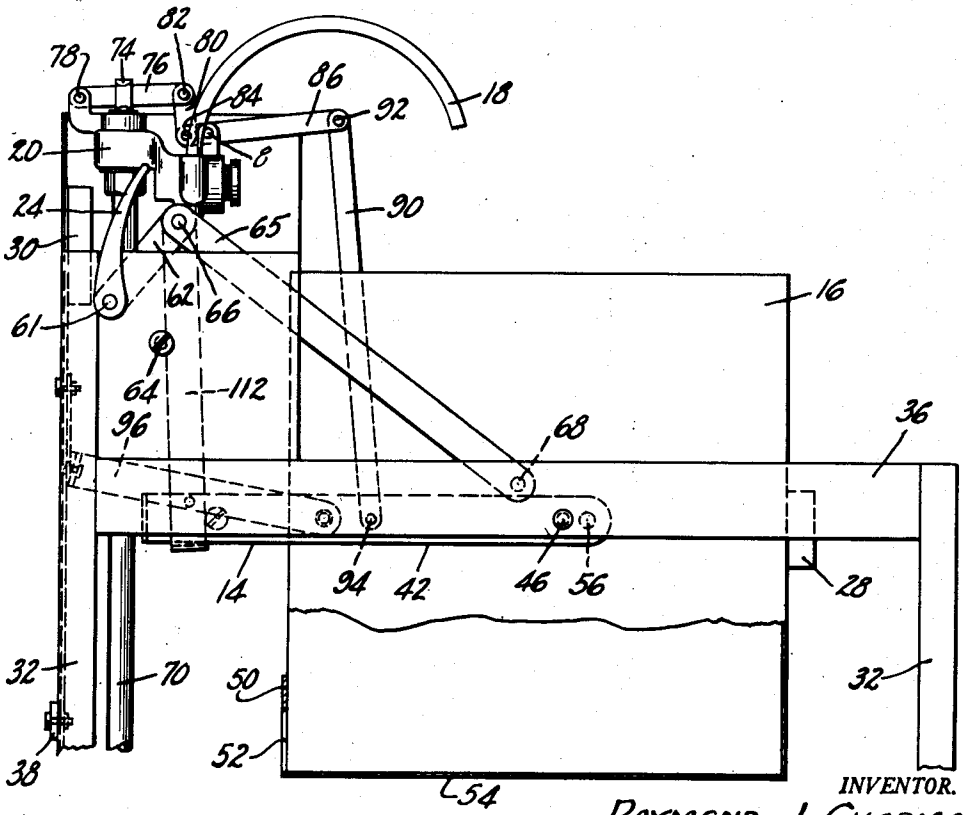


FIG. 7

INVENTOR.
RAYMOND J. CHAPMAN
BY
Attch & Knoblock
ATTORNEYS

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FLUSHING DEVICE

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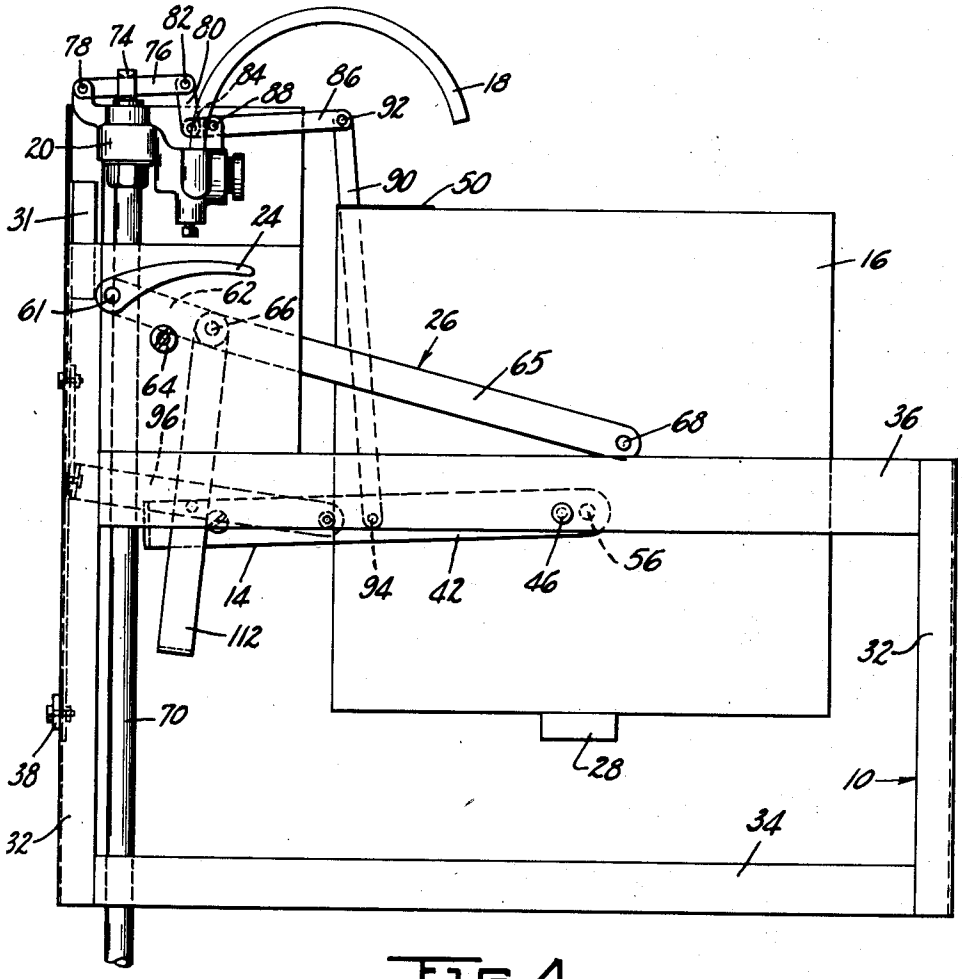


FIG. 4.

RAYMOND J. CHAPMAN.
INVENTOR.

BY Altsch & Knoblock

ATTORNEYS

July 14, 1953 R. J. CHAPMAN 2,644,950

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Filed Jan. 2, 1951 5 Sheets-Sheet 4

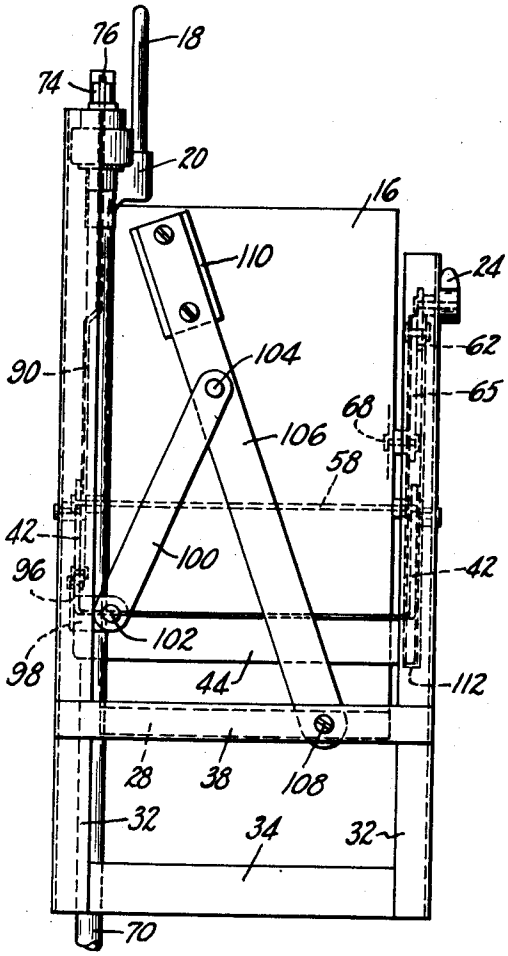


FIG. 3

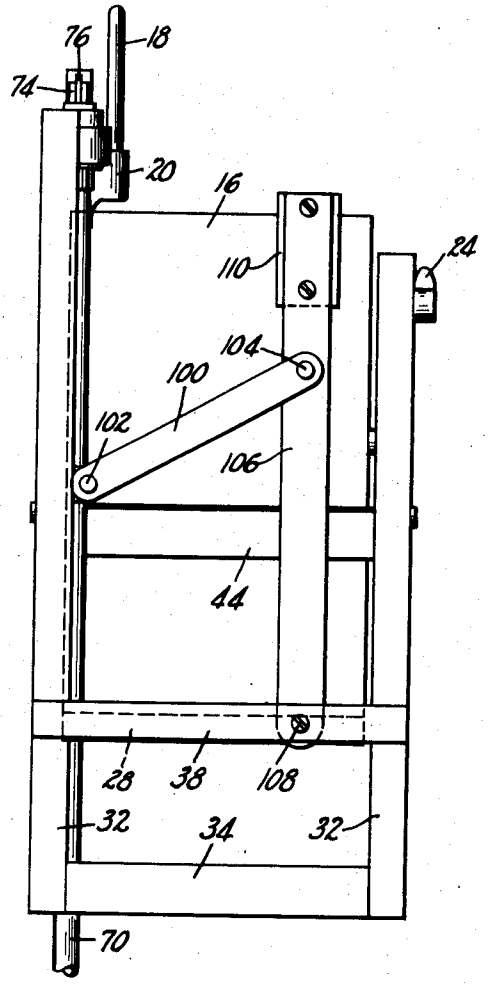


FIG. 5

RAYMOND J. CHAPMAN.
INVENTOR.

BY Attech & Knoblock

ATTORNEYS

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Filed Jan. 2, 1951 5 Sheets-Sheet 5

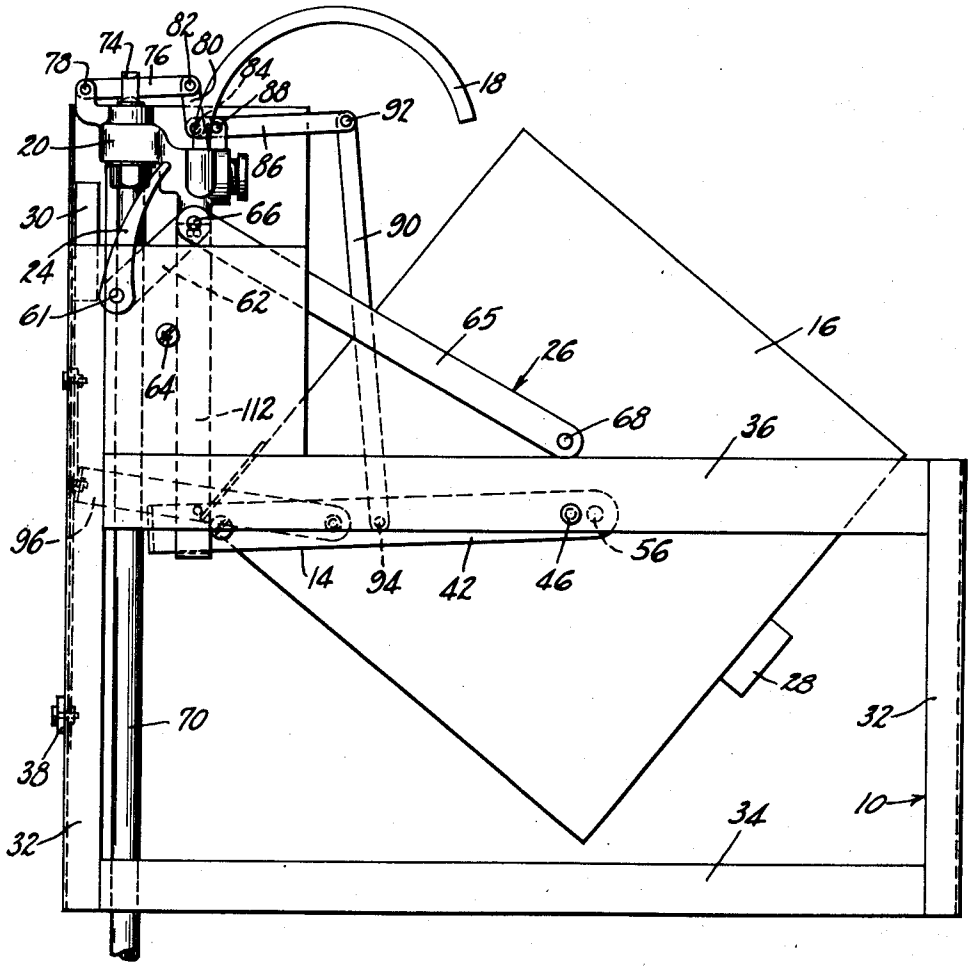


FIG. 6

RAYMOND J. CHAPMAN
INVENTOR.

BY Attach & Knoblock
ATTORNEYS

Patented July 14, 1953 2,644,950

UNITED STATES PATENT OFFICE

2,644,950

FLUSHING DEVICE

Raymond J. Chapman, Wawaka, Ind., assignor of one-sixth to Roy J. Jorg, one-sixth to Grace C. Jorg, and one-sixth to Roy J. Jorg, Jr., all of Ligonier, Ind.

Application January 2, 1951, Serial No. 204,016

2 Claims. (Cl. 4—32)

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This invention relates to improvements in flushing devices of the character adapted to supply a measured quantity of liquid upon each actuation thereof. More particularly, the invention relates to a flushing device for use in connection with a water closet of a toilet.

The primary object of this invention is to provide a device which will operate satisfactorily for its intended purpose, which is substantially free from trouble, which eliminates the use of a float member for valve controlling purposes, and which eliminates the use of a discharge valve so that only a supply valve is required with the device.

A further object is to provide a device of this character having a water supply valve and a water container pivotally mounted upon a weigh beam connected to the water supply valve to control said valve in response to the weight of the container and its contents.

A further object of this invention is to provide a device of this character wherein a weighbeam member pivotally supports a liquid tank and has associated therewith a tripping mechanism for tilting the tank to discharging position and a counterweighted mechanism for returning the tank to upright position after its contents have been discharged.

A further object is to provide a device of this character having a tiltable water measuring and discharging tank provided with a large opening in its normally upper end and a comparatively small opening spaced from said first opening to be positioned at a slightly lower level than said first opening when the tank is in discharging position, whereby the tank will rapidly discharge the major portion of its contents and thereafter will discharge the remainder of its contents at a slower rate.

A further object is to provide a device for this character wherein the water supply valve is held closed during the tripping of the tank and until the tank is returned to upright position.

A further object is to provide a device of this character wherein the open end of the water tank has an apertured barrier wall formed at the end thereof positioned lowermost during liquid discharge so as to control the balance of the mechanism and insure a complete flushing operation and avoid any tendency of the tank to return to its starting or upright position before being emptied.

A further object is to provide a device of this character wherein the tripping mechanism constitutes a toggle normally locked in over-center position and preventing accidental tilting of the tank or discharge of the device.

A further object is to provide a device of this character having a single counterweighted mechanism serving the purposes of holding the tank upright and the supply valve open until the tank is filled, assisting in the transfer of the weight of

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the filled liquid tank in a manner to completely apply the weight to the purpose of closing the water supply valve and thus preventing leakage or dripping, assisting in the return of the tank from its tilted discharging position to its upright position after being emptied, and assisting in shifting the tripping mechanism to fully locked position as the tank is returned from discharge to upright position.

A further object is to provide a device of this character which increases the speed of a flushing operation, and particularly the speed at which the flushing device can be refilled after each discharge.

Other objects will be apparent from the following specification.

In the drawings:

Fig. 1 is a side view of the device with the tank in upright position assumed immediately following discharge and during the filling operation.

Fig. 2 is a top plan view of the device in the position illustrated in Fig. 1.

Fig. 3 is an end view of the device in the position illustrated in Fig. 1.

Fig. 4 is a side view of the device with the parts in the position occupied when the tank is filled and the device is ready for operation to flush the same.

Fig. 5 is an end view of the device when in the position illustrated in Fig. 4.

Fig. 6 is a side view of the device illustrating in full lines its partially tilted position.

Fig. 7 is a view illustrating the container in its fully tilted or discharging position.

The invention preferably consists of a frame or support 10 which is adapted to be interposed in a tank or water closet 12, such as that commonly used in a toilet. It will be understood that the support, while preferred, is not essential and that, instead of employing such a support, the various parts associated therewith may be connected and find support directly upon the container 12. The support pivotally mounts a weighbeam member lever 14 to which is pivoted a tank 16 adapted to receive liquid from the outlet 18 of a liquid supply unit controlled by the valve 20. The valve 20 has connection through a toggle linkage 22 with the weighbeam 14. The device has a tripping device controlled by the handle 24 and including a toggle 26 pivoted to the tank spaced from the pivotal connection of the tank with the weighbeam 14. The tank 16 is preferably provided with a counterweight 28 and is also influenced in its position by a counterweighting mechanism 30.

These parts aforementioned function and operate substantially as follows: Considering the device in its empty but normal position, that is, the position it has assumed immediately following the flushing actuation, the parts will be in the position illustrated in Fig. 1 with the tank 16 upright to receive liquid from the inlet 18, the

toggle 22 for controlling the valve 20 having opened that valve in response to the position of the weighbeam 14 and the tank 16. When the tank has been filled to a predetermined level, the weighbeam 14 counterweighted by the mechanism 30 will be swung upwardly in a clockwise direction incident to a lowering of the water tank. The movement of the weighbeam 14 shifts the valve actuating linkage 22 in a direction to close the valve and shifts the counterweight mechanism 30 to a high level position. In both positions, that is, the empty and the filled position of the device with the tank upright, the trip toggle 26 is extended and serves to lock or stabilize the tank to prevent its tilting. When this mechanism is manually actuated to the position illustrated in Fig. 6, the tank 16 is tilted to be emptied. When empty the counterweight mechanism associated with the counterweight 28 of the tank serves to restore the tank to its upright position.

Referring to the mechanism more specifically, the frame 10 may be formed of rigid frame members, preferably metal, and constituting uprights 32, preferably four in number interconnected at their lower ends by bars or straps 34 which form a base for the device. The base will preferably be so contoured that it will be supported in a firm and stable position upon the bottom of the tank 12 when positioned within that tank. At a point intermediate the height of the tank, the uprights 32 are preferably connected by a pair of longitudinal side bars 36, and at a point intermediate the height thereof the uprights at one end are interconnected by an end frame member 38. The uprights 32, at the end of the frame at which the cross member 38 is positioned, preferably extend upwardly above the level of the longitudinal member 36, and as here shown are enlarged in size to provide plate-like portions 40. The form of the frame as above described is illustrative and may be altered materially in appearance by the use of metal stampings or by changes in design. Alternatively, parts comparable to the individual frame parts may be connected to the water tank, and a unitary frame, as such, may be dispensed with. I prefer to use the unitary frame, however, inasmuch as it facilitates the fabrication of the device as a unit which can be preassembled before being installed in a tank and avoids the necessity of reaching into the tank for the purpose of assembling and positioning the various parts.

The weighbeam member or lever 14 is preferably of U-shape, as best seen in Fig. 2, the same being provided with a pair of substantially parallel lever arms or runs 42 and an end part 44. The arms 42 are spaced apart a distance greater than the width of the tank 16 and less than the spacing of the frame members 36. The arms 42 of the weighbeam are pivoted to the opposite frame parts 36 at 46. As here shown, the pivots 46 constitute rigid headed hinge pins positioned in axial alignment and extending horizontally and transversely and having associated therewith spacer members 48 positioned between the frame parts 36 and the weighbeam arms 42 to space the weighbeam from the frame.

The tank or container 16 may be of any size and shape found suitable, and is here shown as substantially rectangular and of narrower width than the spacing of the arms 42 of the weighbeam between which it is positioned. The counter-weight 28 is secured substantially centrally to the bottom of the tank 16 as illustrated.

The major portion of the top or upper end of the tank is open and constitutes a large discharge opening, but at one end thereof, being the end which is positioned lowermost when the tank is in discharging position as illustrated in Fig. 7, a plate or wall 50 is provided extending completely across the top of the tank, that is, from side to side thereof, and extending from one end wall inwardly for a small extent of the total length of the tank, for example, an extent less than one-quarter of the length of the tank. The wall 50 has a comparatively small opening 52 formed therein at the outer end of the tank for purposes to be described. The opening 52 preferably extends to the adjacent end wall 54 of the tank. The tank is pivoted to the end portions of the arms 42 of the weighbeam at 56 at a point centrally of the length of the tank but below the vertical center of the tank. As here illustrated the tank pivot constitutes a shaft or rod 58 extending crosswise through the tank, and extending through the end portions of the arms 42 of the weighbeam suitable spacers 60 serve to hold the parts in proper spacing. The bar 56 is preferably welded or otherwise fixedly secured to the tank and fits rotatably within apertures within the weighbeam arms 42 and thus prevents occurrence of leaks when the tank is filled with liquid at a level at or above the bar 58. The spacing between the pivotal connection 46 between the weighbeam and the frame and the pivotal connection 56 between the weighbeam and the tank is small compared to the dimensions of the weighbeam and the dimensions of the tank, and the exact dimensions required in any instance will depend upon the proportions of the parts and the size of the container and the amount of liquid which is desired shall be measured and dispensed at each flushing operation.

The handle 24 of the tripping device has a pin or shaft 61 fixed thereto which is adapted to extend through the wall of the tank 12 and is journaled in one of the enlarged plate portions 40 of the frame. A link or lever 62 is fixedly secured to the shaft 61. The arrangement is such that the link 62 will swing with the handle 24 with which it is in fixed relation. The position of the handle and the link when at rest is determined by the position of a pin or stud 64 carried by and projecting from the frame plate portion 40 and underlying the lever part 62. The tripping mechanism 26, of which the handle 24 and the lever 62 are parts, includes the link 65 which is pivotally connected to the lever 62 at 66 and cooperates therewith to form a toggle member. The free end of the toggle member 65 is pivoted to the tank 16 at 68, the parts here shown with the pivot 68 positioned above and to one side of the pivot mounting 56 of the tank. The pivot point 68 is so located and positioned that, with respect to the shaft 60 and the stud 64, the toggle will be extended and preferably slightly over center in a downward direction when the tank is upright and the parts are in the position shown in Figs. 1 and 2. The tripping mechanism 26 with its positioning stud 64 provides means to position and lock the tank 16 in its upright position normally.

The water-supply system of the device includes the conduit 70 which extends into the tank 12 at any suitable point, here shown as the bottom of the tank, the same being provided with a suitable seal at 72 to prevent leakage at the point of entry. The valve 20 is mounted upon the upper end of the conduit 70 and may have connection with the frame plate 40 for stability, if

desired. The outlet conduit 18 connected with the valve is preferably of the gooseneck form herein illustrated, and the discharge end of the outlet 18 is so positioned that the discharge therefrom will enter the tank 16 when in its upright position. The valve may be of any type found suitable and, as here illustrated, is of the type having a shiftable valve member 74 actuated by a lever 76 pivoted at 78 to the valve body. A link 80 is pivoted at 82 to the lever 76, and at 84 to a second lever 86 pivoted intermediate its ends at 88 to the valve body. The pivots 84 and 88 are preferably close spaced and the lever 86 is comparatively long so that it affords substantial leverage for operation of the valve mechanism. The lever 86 forms a part of the toggle 22, and the link 90 pivoted to the lever 86 at 92 forms the other part of the toggle 22. The link 90 is pivotally connected at 94 to the weighbeam 14 intermediate the length of one of the arms 42 thereof.

A rigid bar or arm 96 is secured to one of the arms 42 of the weighbeam 14 to project longitudinally from the end 44 of the weighbeam toward one end of the frame. The arm 96 has an end portion 98 bent perpendicularly therefrom at its outer end, and a link 100 is pivoted to the end portion 98 at 102. The link 100 extends in a generally upward direction in the normal position of the parts as illustrated in Fig. 3, and at its upper end is pivotally connected at 104 to an elongated swinging arm 106. The swinging arm 106 is pivoted at 108 to the frame member 38 at its lower end. The pivot point 104 is positioned intermediate the length of the arm 106 and below a weight member 110 carried by the upper end of the swinging arm 106. The parts 96 to 110, inclusive, constitute the counterweighting mechanism 30 hereinbefore mentioned. In the normal position of the parts, that is, when the tank 16 is positioned upright, the parts will be so positioned that the arm 106 will be inclined as shown in Fig. 3, and in the discharging position of the device the arm will be positioned substantially upright as illustrated in Fig. 5.

A strap 112 forming a hook or a loop is pivotally suspended from the tripping mechanism 26 preferably at the pivot axis 66. This hook extends downwardly to pass around one of the arms 42 of the weighbeam to have a free engagement therewith in certain operating positions, for instance in the position illustrated in Figs. 1 and 6. The purposes of the strap 112 will be more fully expressed hereinafter.

In the operation of the device, assuming that the device has just been flushed and that the tank has just returned to upright position so that the parts are in the position illustrated in Fig. 1, the weighbeam 14 will be tilted or inclined as a result of the position of the counter weighting mechanism 96—110 in the position shown in Fig. 3. In this position of the parts the pivot 56 for the tank 16 will be positioned at a level slightly above the level of the pivot 46 connecting the weighbeam to the frame member 36. The strap 112 in association with other parts of the device will limit downward tilting of the weighbeam 14. The valve operating toggle 22 will be positioned by the downward pull upon the toggle member 90 to cause an opening movement through the connected linkage 76, 86 so that the valve actuator 74 is raised and the valve 20 is opened. Liquid passing through the valve is discharged through the outlet 18 and enters the tank 16 to fill the same.

When the tank 16 has been filled to a predetermined level, that is, to such a level that the weight of the tank and the liquid acting through the weighbeam 14 overcomes the action of the counterweighing mechanism illustrated in Fig. 3, the weighbeam is shifted to the position illustrated in Fig. 4, thus lowering slightly the level of the tank 16 with respect to the mounting frame. The upward swinging movement of the part 14 of the weighbeam, to which the valve operating toggle 22 is connected, shifts that toggle by upwardly swinging the link 90 and the lever 86 and actuating the connected link 80 and lever 76 associated with the valve actuating member 74 to close the valve. The upward movement of the free end of the weighbeam 14 carries with it the extension member 96 which swings upwardly the link 100 and causes the weighted arm 106 to assume a substantially upright position, as illustrated in Fig. 5. During the movement of these parts, the tripping toggle 26 swings freely to accommodate the movement and to maintain the tank 16 in its upright position with the tripping toggle 26 still extended and preferably slightly over center in a downward direction, as illustrated in Fig. 4. For the best results, the parts are so proportioned that the movement from the Fig. 1 to the Fig. 4 position will not occur until the container or tank 16 has been filled to such a level that it is inherently unstable. Stated differently, the level to which the tank is filled should be a level such that the center of mass of the tank and its contents will be located above the level of the pivot center 56.

When it is desired to operate the device for flushing purposes, the handle 24 is grasped and manipulated to throw the toggle upwardly over center of the device. This is accomplished by a counter-clockwise movement of the handle when considered as viewed in Fig. 4. This movement of the toggle exerts a pulling force on the toggle member 65 and swings the tank in a counter-clockwise direction, thereby tilting the tank 16 toward discharging position. The inherent instability of the loaded tank, due to the location of the center of pivot of the tank below the center of mass, causes the tank to swing to the full discharging position shown in Fig. 7, thus continuing automatically to the full extent required for the manipulation of the device the pivoting of the tripping toggle 26. As the tripping toggle 26 is pivoted it pulls upwardly upon the strap 112 and causes that strap to underlie and engage the weighbeam 14. Consequently as the contents of the tank are discharged so that the leverage acting upon the weighbeam changes, the weighbeam is nevertheless prevented from returning to its Fig. 1 position as long as any substantial amount of water remains in the container.

The discharge of water from the container or tank 16 into the water closet 12 is exhausted through the usual outlet conduit 120 connected with an opening in the bottom of the tank 12 and extending to the outlet or other service unit. The outlet conduit 120 usually has associated therewith a liquid trap 122. The water discharged into the tank 12 passes through the conduit 120 with a rapid rush which establishes a siphon action. This siphon action tends to drain the trap 122. Consequently, it is not desirable that all of the water in the tank 16 be discharged at one time but that there shall be an initial discharge of the major portion of the water or liquid followed by a restricted discharge of a quantity of liquid sufficient to close the trap 122. This operation is permitted in the instant device, as illustrated in Fig. 7, by the end closure wall 50 which prevents

the full discharge of all of the container contents as soon as the tank is tilted. A substantial amount of water is retained within the tank below the level of the then uppermost edge of the wall, and this quantity of water can be discharged only at a comparatively restricted rate, depending upon the size of the aperture **52** in the wall **50**. The parts are so proportioned that a quantity of water sufficient to fill the trap **122** will be discharged through the opening **52** at the conclusion of the flushing operation and before the time that the weight of the container and its contents is overbalanced by the counter-weight **28**. In other words, when the tank has been substantially emptied so that the weight of the water is insufficient to overcome the mass of the counter-weight **28**, that counter-weight **28** will become effective to swing the container **16** back to an upright position. The swinging movement of the counter-weight extends the tripping toggle **26** toward the position illustrated in Fig. 1, that is, to a downward over-center locked position. The downward movement of the tripping toggle **26** lowers the strap **112** and permits the weighbeam **14** and its counter-weight mechanism illustrated in Figs. 3 and 5 to resume the positions illustrated in Figs. 1 and 3. This movement acts upon the valve operating toggle **22** and serves to open the valve **20**. Thus it will be evident that the valve **20** is held closed until the tank **16** has assumed its position to receive liquid from the conduit **18**, and that strap **112** defines a lost motion connector associated with trip mechanism **26** and weighbeam **14** to retain the weighbeam and the valve actuator **22** in valve closing position while the tank **16** is discharging.

It will be evident from the foregoing description that the device dispenses with the float usually associated with the water supply valve and that it also dispenses with the usual valve at the outlet opening of the tank. Likewise, the valve which is employed is free and clear of the water at all times, and hence will not be subject to the corrosion common in conventional mechanisms where the valve is usually immersed. The operation of the valve is positive and responds to the weight of the water being measured through a straight balancing action. In other words, the operation of the device depends upon a proper correlation of the mass and leverage of the parts and hence sufficient force is exerted at all times to insure positive operation and to avoid sticking of the parts.

The terminal restricted discharge of liquid during flushing is provided by the design of the device rather than through any particular operation of a mechanical device, such as a valve. By this means it is sure in its operation, and the danger of leakage or dripping due to progressive decreasing rate of speed, as is common in ordinary flushing valves, is avoided. The interconnection of the parts, as through the trap **122**, insures that the cycle will operate in the sequence required for proper operation and prevents undesired interference with the operating cycle and sequence. Note also that the water supply valve is closed at all times except during the filling operation, and particularly, that the valve is closed during the dumping or flushing operation and until such time as the container has been emptied and returned to its upright position. The balance of the parts and the relation of the various links and levers therewith provides a positive mechanical look through the over-center positioning of the tripping toggle **26** bearing against the stop pin **64**. Thus, only when the operating lever **24** is actuated will the device be operated for flushing action. The stable relation of the parts is also facilitated by the counter-weighted lever **106** and its connection with the weigh-beam. This counterweighted lever has the following functions: It holds the empty tank upright and the valve open until the tank has been filled. It transfers the weight of the filled tank in a manner to be applied directly to the function of closing the valve as the weighbeam pivots in response to the weight of the water in the tank. It acts in cooperation with the counter-weight **28** to return the tank to its upright or filling position. One of the advantages of the device operating in this manner is that the valve **20**, when opened, can permit a greater flow of water for refilling purposes than is possible with the ordinary construction. In other words, the usual toilet tank filling valve is progressively closed and a substantial amount of time is required for the refilling operation because of the progressive closing of the valve. In the present device the valve can remain fully open until the tank has been filled and, thereupon, can be immediately and completely closed.

It will be understood that the construction herein shown and described is illustrative and is not intended to be limiting, and that any construction which falls within the scope of the appended claims is contemplated and intended to be within the scope and spirit of the invention.

I claim:

1. A flushing device comprising a support, a tank, a lever pivoted to said support and pivotally mounting said tank centrally thereof, liquid supply means for filling said tank including a valve, a valve actuating link pivotally connected to said lever, the pivot connection of said lever and support being interposed between the pivot connections of said lever with said tank and said link, respectively, whereby said link closes said valve when said tank has been filled to a predetermined level, a toggle unit having a pair of pivotally connected parts, one toggle part being pivoted to said support, the other toggle part being pivoted to said tank spaced from the pivot connection between said tank and lever, a stop for locking said toggle unit in extended position, and a counterweighted linkage pivoted to said support and to said lever for shifting said lever and its valve-actuating link to valve-opening position when said tank is empty.

2. A flushing device as defined in claim 1, wherein said tank has a large opening to initially discharge liquid at a high rate when in discharge position and a comparatively small opening located at a lower level than said large opening in discharge position for continuing liquid discharge after discharge through said large opening ends.

RAYMOND J. CHAPMAN.

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