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DRY TOILET TANK FLUSHING MECHANISM

Filed May 22, 1964

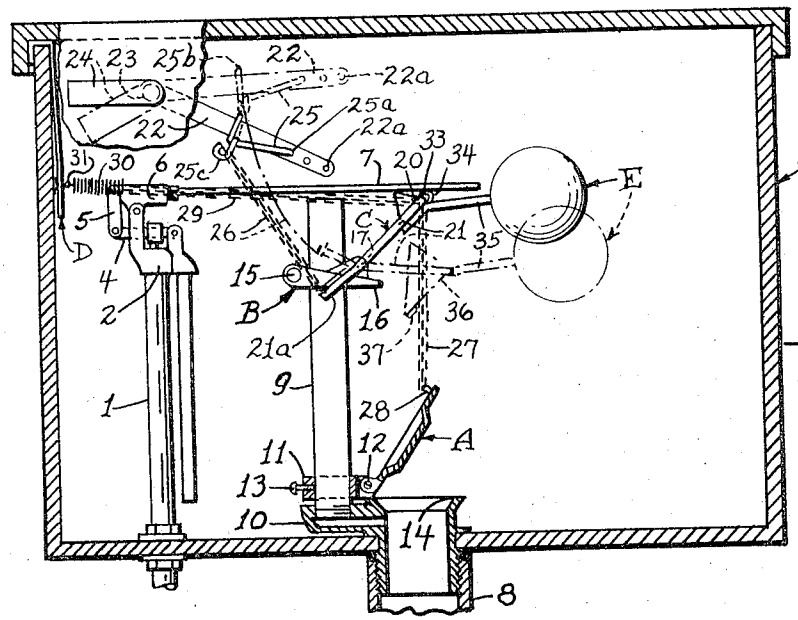


FIG. 1

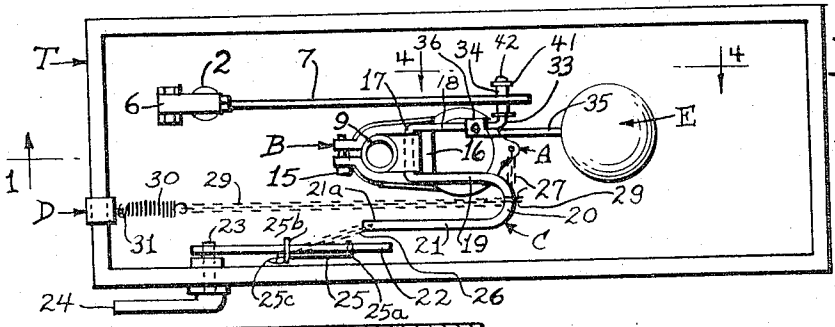
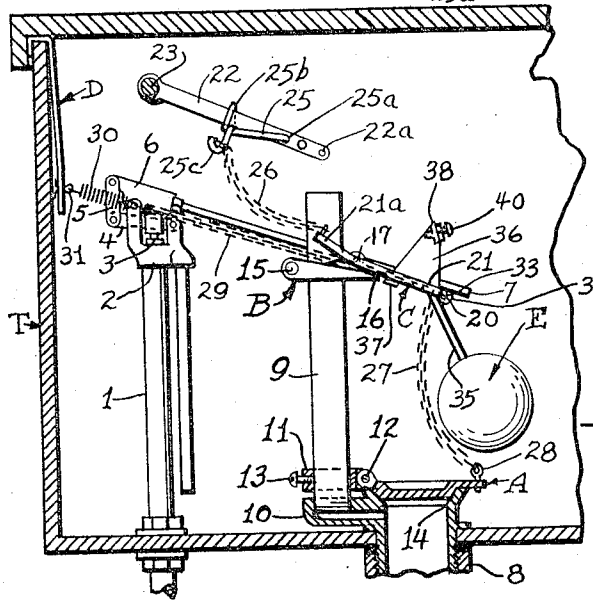


FIG. 2



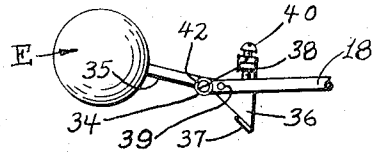


FIG. 4

FIG. 3

INVENTOR
CHARLES J. CLARK
BY William R. Piper
ATTORNEY

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TOILET TANK FLUSHING MECHANISM

Charles J. Clark, 18584 Carlwyn Drive, Castro Valley, Calif. 94546

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The present invention relates to improvements in a toilet tank flushing mechanism, and it consists in the combination, construction, and arrangement of parts as hereinafter described and claimed.

An object of my invention is to provide an improvement over my patent on a toilet tank flushing mechanism, Patent Number 3,095,577, issued July 2, 1963. In my patent I disclose a toilet tank provided with the usual overflow pipe communicating with the outlet pipe that leads to the toilet bowl for flushing it. A flexible flush valve for closing the inlet end of the outlet pipe is normally held in open position by the flushing mechanism described in the patent and is pivotally mounted near the overflow pipe. When the flushing mechanism is actuated, the flexible flush valve, which is made of rubber in my patented device, is first permitted to close the outlet pipe while the water inlet valve is opened and the tank will fill with water up to the desired level. The flushing mechanism will then automatically open the flexible valve and permit the water in the tank to flow into the toilet bowl for flushing it. I have found that it is difficult to open the flexible valve when the tank is filled with water because the weight of the water on the valve will tend to keep it closed. During the opening movement of the flexible valve, one end of the valve will first be lifted and the valve body will flex and will be formed into a curve and therefore the curved valve body will gradually open the outlet pipe as the end of the valve is still moved into open position. The body of water in the tank will bear down upon the curved valve as it is being opened and will tend to retard this movement.

One of the objects of my present invention is to provide a hinged valve for the outlet pipe that is non-flexible. Therefore when the toilet-flushing mechanism lifts the valve at the time the tank fills with water, the entire valve body will swing about its pivot and will immediately be spaced from the entire rim of the inlet to the outlet pipe. The tank water will start flowing into the outlet pipe around its entire rim and there will be less tendency for the weight of the body of water to keep the valve closed.

A further object of my invention is to provide a flushing mechanism in which a stop is provided for the pivoted frame that has the float ball operatively connected therewith so that the downward swinging movement of the frame and ball is stopped at a predetermined point.

Furthermore in my patent I show the pivoted frame that carries the float ball as having an eyelet that slidably receives the rod for operating the water inlet valve for the inlet pipe. The eyelet has a tendency to bind on the rod. In the present invention the pivoted frame carries a roller that contacts with the valve-closing rod when the frame is in its raised position and holds the flush valve for the outlet pipe in open position.

The ball float has a rod that is pivotally connected to the pivoted frame and novel adjustable means is provided for limiting the swinging of the float, and rod with respect to the frame so that the desired quantity of water will be received in the tank before the flushing mechanism will automatically open the valve for the outlet pipe.

Other objects and advantages will appear as the specification continues. The novel features of the invention will be set forth in the appended claims.

Drawing

For a better understanding of my invention, reference should be made to the accompanying drawing, forming part of this specification, in which:

FIGURE 1 is a longitudinal vertical section through the device and a toilet flushing tank and is taken substantially along the section line 1—1 of FIGURE 2. Parts of the device are shown in elevation and the flushing mechanism is in normal position.

FIGURE 2 is a top plan view of FIGURE 1 with the cover for the tank removed and parts of the flushing mechanism shown in a horizontal plane.

FIGURE 3 is similar to FIGURE 1 and illustrates the flushing mechanism in a different position.

FIGURE 4 is a view of the ball float when looking in the direction of the arrows 4—4 in FIGURE 2, and illustrates how the ball is operatively connected to the flushing mechanism.

While I have shown only the preferred form of my invention, it should be understood that various changes, or modifications, may be made within the scope of the annexed claims without departing from the spirit thereof.

Detailed description

In carrying out my invention, I make use of a flush tank T for a toilet, not shown. This tank is provided with the usual water supply pipe 1 and this pipe has a valve casing 2 secured to its top, see FIGURES 1 and 3. The valve casing 2 has a water inlet valve 3 that is normally held in closed position by a lever 4. One end of the lever is pivoted to the valve casing 2 while the other end is pivotally connected to a link 5. The link in turn has its free end pivotally connected to one end of a lever 6 and this lever is pivotally carried by the valve casing 2. A valve actuating rod 7 extends from the free end of the lever 6 and when this rod is held in raised position as in FIGURE 1, it will maintain the water inlet valve 3 in closed position. The parts just described are of standard construction and form no part of my invention except insofar as they cooperate with the toilet tank flushing mechanism.

The tank T also has an outlet pipe 8 that leads from the bottom of the tank to the toilet bowl, not shown. An overflow pipe 9 is supported by a casting 10 which in turn has a passage for placing the overflow pipe in communication with the outlet pipe. These parts are also of standard construction and form no part of my invention except insofar as they cooperate with the toilet flushing mechanism now to be described.

I provide a collar bracket 11 and mount this on the overflow pipe 9 and adjacent to the top of the casting 10. The collar bracket pivotally carries a flush valve A. FIGURES 1 and 3 show the flush valve pivotally secured at 12 to the collar bracket 11. The collar bracket in turn has a set screw 13 that secures the bracket in adjusted position on the overflow pipe 9. The casting 10 receives the top of the outlet pipe 8 and the casting has an inlet water passage communicating with the outlet pipe. The entrance end of the water passage forms a valve seat 14 for receiving the flush valve A when the latter is in closed position, as shown in FIGURE 3.

The toilet tank flushing mechanism normally holds the flush valve A in open position so that the toilet tank T will remain empty of water until the flushing mechanism is actuated. I provide an upper bracket B that has a cylindrical portion for receiving the overflow pipe 9. This bracket is secured in the desired position on the overflow pipe by tightening a set screw 15. The upper bracket B also has a lip or stop portion 16 for a purpose now to be described.

An S-shaped pivoted member C, see FIGURE 2, has a

U-shaped portion **17** pivotally received in a transverse bore provided in the upper bracket B. Parallel arms **18** and **19** extend from the U-shaped portion **17** and when these arms swing downwardly during the operation of the flushing mechanism, they will strike the stop **16** on the upper bracket B and will be prevented from further downward swinging movement. The S-shaped member C also has a second U-shaped portion **20** that connects with the arm **19** and has another arm **21** extending therefrom and that parallels the arm **19**. The free end of the arm **21** is bent at a slight angle and is shown at **21***a* in FIGURES 1 and 3.

I will now describe the mechanism for actuating the member C for causing it to swing in a clockwise direction when looking at FIGURE 1, when the tank flushing mechanism is actuated. A lever arm **22** has one end connected to a stub shaft **23** and this shaft extends through the front wall of the water tank T. An operating handle **24** is secured to the portion of the stub shaft projecting forwardly from the front wall of the tank. A rocking of the handle **24** in a counter-clockwise direction when looking at FIGURE 1, will also rock the lever arm **22** and will raise the free end of this arm to the dot-dash line position. The lever arm **22** is disposed within the water tank and it has a plurality of spaced apart openings **22***a*. An adjustable wire clip **25** has a bent end **25***a* that may be inserted into any one of the desired openings **22***a* in the lever arm. The adjustable wire clip **25** has a looped portion **25***b* that receives the lever arm **22** and then the wire clip has a depending eyelet portion **25***c* to which one end of a chain **26** is connected. The other end of the chain is connected to the free end of the bent portion **21***a* of the member C.

When therefore the handle **24** is manually rocked in a counter-clockwise direction for actuating the flushing mechanism as in FIGURE 1, the lever arm **22** will be swung upwardly and will cause the wire clip **25** to pull upwardly on the chain **26**. The chain in turn will act on the end **21***a* of the member C to rock this member in a clockwise direction about its pivot **17**. A second chain **27** has its upper end connected to the U-shaped portion **20** of the member C and has its lower end connected at **28** to the flush valve A.

I will now describe the means for maintaining the swingable member C in a position where it will hold the flush valve A in open position until the flushing mechanism is actuated. A third chain **29** has one end connected to the U-shaped portion **20** of the member C and has its other end connected to a coil spring **30**, see FIGURE 2. The free end of the coil spring **30** is connected to an eyelet **31** and this eyelet is mounted in any one of a number of openings in a bracket D. The bracket has a hook-shaped portion that is hung on the upper edge of the side wall of the water tank T. The coil spring **30** will yieldingly pull on the chain **29** at all times and the chain in turn will normally hold the swingable member C in the position shown in FIGURE 1, and therefore the member will hold the flush valve A in open position.

When the handle **24** is actuated for swinging the lever arm **22** in a counter-clockwise direction, the chain **26** will pull upwardly on the end **21***a* of the member C for rocking the member in a clockwise direction to lower the chain **27** and permit the flush valve A to close. When the member C nears its lower position during its swinging movement, the U-shaped portion **20** will pass below an imaginary line that extends from the eyelet **31** and through the pivot **17**. Therefore when the U-shaped portion **20** passes this line, the coil spring **30** will pull on the chain **29** and will urge the member C to continue swinging in a clockwise direction. The parallel arms **18** and **19** will strike the lip or stop **16** on the upper bracket B and will prevent any further clockwise swinging of the member C. The member C will remain in this position even though the handle **24** is released. The flush valve A will therefore remain closed.

The water in the water supply pipe **1** is under pressure and it will open the water inlet valve **3** and enter the tank T. The opening of the inlet valve **3** will act on the lever **4** and link **5** for swinging the lever **6** in a clockwise direction about its pivot and this will swing the valve actuating rod **7** downwardly at an angle, see FIGURE 3.

I will now describe the means for causing the rising water level in the tank to actuate a ball float E and to raise the float and return the member C to normal position. The ball float E is connected to the member C and will swing this member in a counter-clockwise direction when returning it to normal position. The member C has a portion **33** bent at right angles to the arm **18**. A roller **34** is rotatably mounted on the portion **33** and this roller is positioned under the valve actuating rod **7** so as to contact with the rod as the member C swings back into normal position. As the rising float E moves upwardly and swings the member C counter-clockwise, the roller **34** will be brought into contact with the underside of the rod **7**. A further upward movement of the roller **34** will swing the rod **7** in a counter-clockwise direction and through the lever **6**, link **5** and lever **4** will move the water inlet valve **3** into closed position. When this takes place, the member C has been swung into a position for opening the flush valve A by pulling upwardly on the chain **27**. The chain **29** with its coil spring **30** will pull on the U-shaped portion **20** of the member C and hold the member in a position to keep the flush valve open.

FIGURES 1, 3 and 4 show the ball float E mounted on a rod **35** and this rod has a flat triangularly-shaped portion **36** at one end with spaced apart stops **37** and **38** being integral with the flat portion. The arm **18** has a pivotal connection at **39** with the triangular flat portion **36**. The rod **35** and the flat portion **36** swing as a unit about the pivot **39** when the ball float E swings about the pivot.

A set screw **40** is received in a threaded opening in the stop **38** and this set screw may be adjusted for limiting the upward swinging movement of the ball float E with respect to the arm **18**. When the end of the set screw **40** contacts with the arm **18**, further upward swinging movement of the ball float E with respect to the arm is prevented. The set screw **40** can be adjusted to change the amount of swinging movement permitted between the ball float E and the arm **18**. By this arrangement the water level in the tank T can be controlled before the flush valve A will be opened. This will be described when setting forth the operation of the device.

The roller **34** is held in place on the portion **33** by means of a washer **41** and a screw **42** is threaded into an axially aligned threaded bore in the end of the portion **33** and holds the washer in place. The various parts of the toilet flushing mechanism can be mounted in a water tank T that has the usual water supply pipe **1** and water inlet valve **3** with the valve actuating rod **7**. The water tank T is also provided with the outlet pipe **8**, the overflow pipe **9** and the casting **10** that connects the two together and has a passageway placing the overflow pipe in communication with the outlet pipe.

Operation

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The toilet tank flushing mechanism is mounted on the overflow pipe **9**. The member C is swung into the position shown in FIGURE 1, so as to hold the flushing valve A in open position by means of the chain **27**. The chain **29** and the spring **30** will yieldingly hold the member C in this position until the handle **24** is actuated. The tank T will therefore remain without water in it until the handle is operated.

When the handle **24** is actuated for swinging the lever arm **22** upwardly, the chain **26** which is connected to the lever arm by the wire clip **25** will act upon the member C to swing it clockwise about its pivot **17**. This move-

ment will permit the chain **27** to move downwardly and allow the flush valve A to close. The U-shaped portion **20** of the member C will swing beyond dead center before the parallel arms **18** and **19** will strike the stop **16** on the upper bracket B. The chain **29** and the spring **30** will therefore exert a force on the member C which will tend to yieldingly hold the member in a position where the parallel arms **18** and **19** will rest on the stop **16**.

The swinging of the member C in a clockwise direction by the chain **26** will move the roller **34** downwardly and away from the valve actuating rod **7**. The water pressure in the water supply pipe **1** is now sufficiently great to open the water inlet valve **3** and permit water to enter the tank T. The opening of the inlet valve **3** will swing the lever **4** in a clockwise direction and lift the link **5** and permit the lever **6** to swing clockwise and cause the valve actuating rod **7** to swing downwardly because the roller **34** has been moved away from the rod. The parts will remain in this position during the filling of the tank T with water.

As the level of the water in the tank rises it will lift the ball float E. The set screw **40** has previously been set so that the ball float E will cause its rod **35** to first swing about the pivot **39** until the set screw **40** contacts with the arm **18** of the member C. As soon as this takes place, the continued upward movement of the ball float caused by the rising level of water in the tank T will start to raise the arm **18** and swing the member C about its pivot **17** in a counter-clockwise direction. The ball float E will continue to rise and the member C will rotate counter-clockwise and finally take up the slack in the chain **27** and pull on the flush valve A to swing it into open position. The ball float E will be in the dot-dash line position shown in FIGURE 1 when the flush valve is opened.

As previously stated, the flush valve A is made of metal and as soon as it starts to swing about its pivot **12**, the entire rim of the valve will be separated from the valve seat **14** and permit the water in the tank to start to flow through the outlet pipe **8** for flushing the toilet. The chain **29** and its spring **30** will be swung beyond dead center and will hold the member C in its raised position. The swinging of the member C into the position shown in FIGURE 1, will cause the roller **34** to contact with the underside of the valve actuating rod **7** and to swing this rod in a counter-clockwise direction. This swinging movement will also swing the lever **6** and cause the link **5** to move downwardly and in turn to move the lever **4** for closing the water inlet valve **3**. The parts will now remain in this position until the next time the handle **24** is actuated. The tank T will contain no water because the flush valve A will be held in open position. The stop **37** on the triangular member **36** will contact with the arm **18** and will hold the rod **35** and ball float E in the full line position shown in FIGURE 1.

I claim:

1. The combination with

(a) a toilet flush tank;

(b) a water inlet pipe for the tank and communicating with a source of water under pressure;

(c) a water inlet valve for the water inlet pipe for controlling the water entering the tank;

(d) means including a swingable rod for closing the inlet valve when the rod is swung upwardly, said means swinging the rod downwardly when the water pressure opens the valve;

(e) a water outlet pipe for the tank and having a valve seat at its entrance end;

(f) a non-flexible flush valve pivotally mounted adjacent to said valve seat and adapted to swing into closed position to cover the valve seat;

(g) a member pivotally mounted in said tank above said flush valve and being swingable from a raised to a lowered position;

(h) a flexible connection between said member and said flush valve for swinging said flush valve into open position when said member is in raised position;

(i) yielding means for holding said member in raised position;

(j) a roller carried by said member and engaging with the underside of said rod when the member is raised, for holding the rod in raised position for keeping the inlet valve closed against the water pressure;

(k) hand-operated means for swinging said member into a lowered position for permitting said flush valve to close and for causing said roller to move away from said rod and permitting the inlet valve to open and to swing said rod downwardly;

(l) a stop attached to said water outlet pipe and positioned in the path of said swingable rod for limiting further swinging movement of said member into its lowered position when said member contacts with the stop;

(m) said yielding means holding said member in contact with said stop when said hand-operated means is freed; and

(n) a float operatively connected to said member and raised by the water entering said tank for swinging said member into raised position and causing said roller to swing said rod upwardly and close said inlet valve when the water level in the tank reaches a predetermined point;

(o) said member when in raised position causing said flexible connection to swing said flush valve open and permit water to flow from the tank and out through said outlet pipe.

2. The combination as set forth in claim **1**: and in which the operative means between the float and said member includes

(a) a rod connected to said float;

(b) said rod having a triangularly-shaped outer end pivoted to said member;

(c) said triangularly-shaped outer end having spaced apart stops designed to contact with said member to limit the swinging movement of said rod and float with respect to said member; and

(d) an adjusting screw carried by one of said stops and adapted to contact with said member for limiting the swinging of said rod and float in one direction.

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LAVERNE D. GEIGER, *Primary Examiner.*

H. ARTIS, *Assistant Examiner.*