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DUAL FLUSHING UNIT FOR TOILET BOWLS

Filed May 17, 1961

Fig. 1

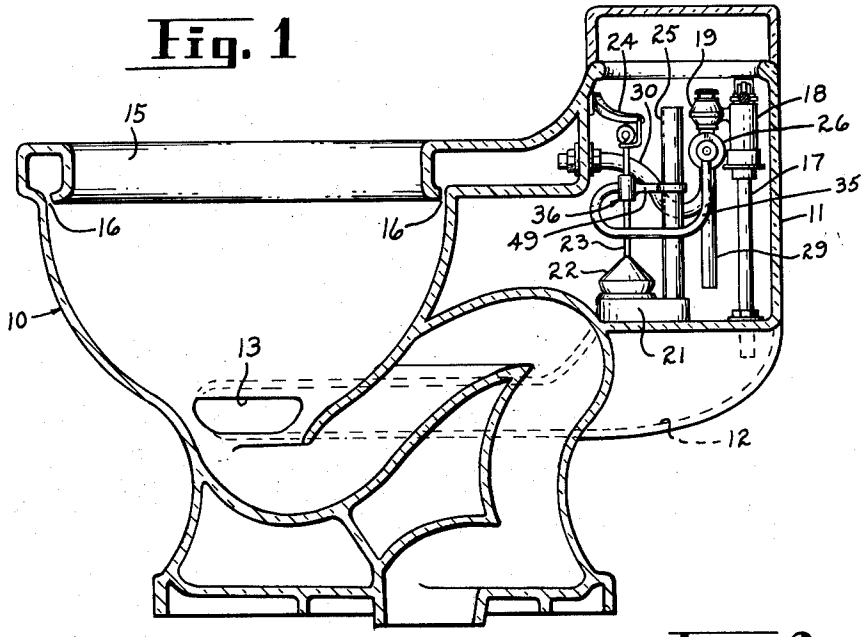


Fig. 2

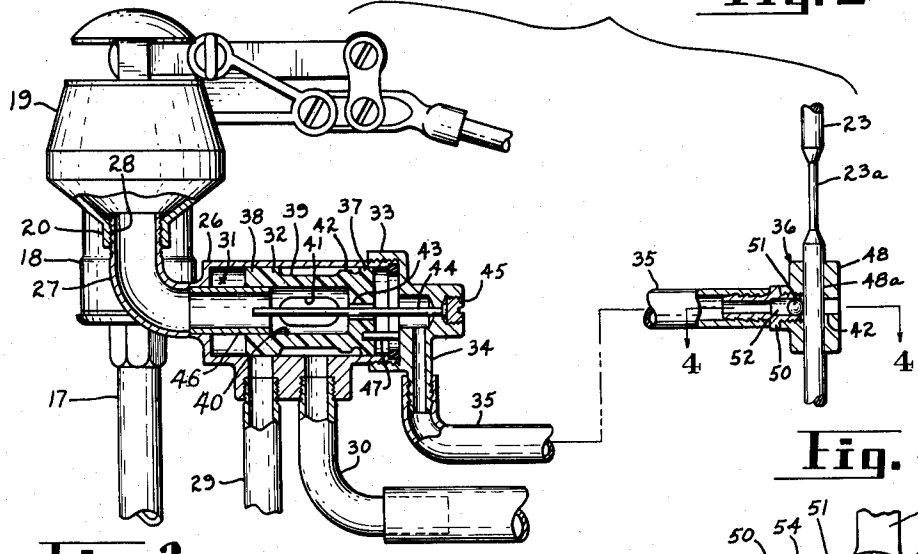


Fig. 3

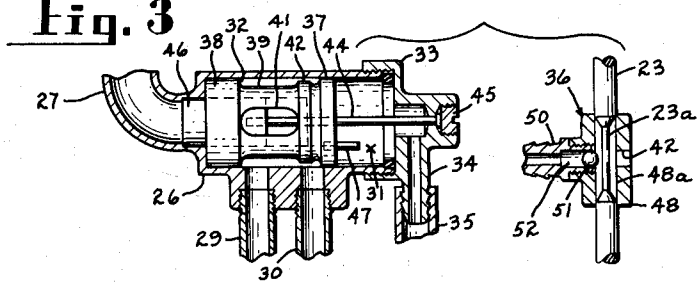
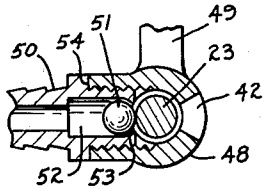


Fig. 4



INVENTOR

Edward H. Barlow

BY

H. F. Johnston

ATTORNEY

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DUAL FLUSHING UNIT FOR TOILET BOWLS

Edward H. Barlow, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn., a corporation of Connecticut

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This invention is an improved dual flushing unit for toilet bowls. More particularly, the invention utilizes a diverter valve for directing the water flowing from the ball cock to a rim flush during the time the tank is being emptied.

The objects of my invention are: to provide an improved valve of the above type which will be quiet in operation, compact and economical to make, and which is controlled automatically without additional effort other than that required to lift the usual tank outlet valve. Preferably, the invention involves the automatic hydraulic operation of the diverter valve which directs the inlet flow to the rim flush by a pilot valve actuated by vertical movement of the lift rod of the tank outlet valve.

A further object is to provide a diverter valve which is more positive in operation and which will direct substantially the full flow of water from the ball cock valve directly into the rim flush.

Another object is to provide a diverter valve in which the refill to the toilet bowl is controlled by the position of the piston in the diverter valve during the time the tank is being refilled.

Other objects and advantages will appear from the following description and accompanying drawing in which:

FIG. 1 is a cross-sectional view through a conventional toilet bowl and integral tank combination having a dual flush unit embodying my invention;

FIG. 2 is an elevational end view of a conventional ball cock valve and a cross-sectional view of my hydraulic control showing it in rim-flush operating position;

FIG. 3 is a similar view of the hydraulic control only showing it in the tank-refill position; and

FIG. 4 is a cross-sectional view through the pilot valve taken along line 4—4 of FIG. 2.

Referring now to the drawing, the numeral **10** designates a toilet bowl having an integral water supply tank **11** associated therewith. A passageway **12** leads from the tank **11** to a discharge port **13** adjacent the base of the bowl. The bowl **10** is formed with the usual hollow rim **15** having a series of discharge ports **16** through which water is directed for the rim-flushing operation.

Water is supplied to the tank **11** through a feed pipe **17** having a conventional ball cock valve **18** mounted on its upper end. Associated with the ball cock valve is an anti-siphonic unit **19** to which water is directed and discharged through a dependent boss **20**. Mounted on the base of the tank **11** is the usual valve seat **21** which is normally closed by a tank outlet float-type ball valve **22** having a lift stem or rod **23** connected thereto. A trip lever **24** for actuating the flushing mechanism is connected to the upper end of the lift rod **23**. The usual overflow pipe **25** is conected to the valve seat **21**.

A hydraulically-controlled diverter valve unit is arranged to control the flow between the ball cock valve and the tank. As best shown in FIGS. 2 and 3, the diverter valve consists of a housing **26** having a hollow angular neck **27** integrally joined to one end of the housing. The opposite end of the neck **27** is threaded into a tapped hole **28** in the dependent boss **20** of the anti-siphonic unit for supporting the housing and connecting it directly to the fluid supply. The underside of the housing **26** is connected to a tank-refill pipe **29** and to another pipe **30** leading to the hollow rim **15** of the toilet bowl for

the rim-flush. The housing **26** is formed with a hollow chamber or cylinder **31** within which is slidably mounted a floating piston **32**. The end of the cylinder **31** is closed by a cap **33** having a lateral nipple **34** to which is connected a flexible hose **35** leading to a pilot valve unit **36** to be more fully described later.

Considering now the details of the floating piston **32**, it is constructed with cylindrical right and left end portions **37** and **38** respectively, for slidable engagement within the cylinder **31** and with a reduced portion **39** therebetween. The piston **32** is provided with a hollow chamber **40** opening through the left cylindrical portion **38** and closed by the right cylindrical portion **37**. One or more ports **41** are provided in the piston-reduced portion **39** to direct water from the piston chamber **40** to the area surrounding the reduced portion. Adjacent the right cylindrical portion **37** is a slightly reduced cylindrical portion **42** of about .010" less than the diameter of the cylinder **31**. When the storage tank is being refilled, this clearance allows a small amount of water to flow into the rim flush pipe **30** when the piston is in its normal retracted position as shown in FIG. 3 for the purpose of replenishing the water in the toilet bowl up to its normal level.

To allow a limited amount of water to flow through the piston **32** into the right end of the cylinder **31**, the right closed cylindrical portion **37** is provided with a central bleed aperture **43** through which a rod **44** is slidably passed. The aperture **43** is dimensioned to be a few thousandths larger than the rod **44** to allow for a fluid bleed space therebetween. The rod **44**, which is anchored to the closure cap **33** by a screw plug **45**, is for the purpose of keeping the aperture **43** free of any foreign matter which may become lodged within the bleed aperture **43**.

To direct the full force of the supply water passing through the ball cock valve **18** and the anti-siphonic unit **19** into the floating piston **32** for the purpose of obtaining a quicker movement of said piston, a tubular extension **46** is driven into the angular neck **27** and is of such length and diameter as to have slidable engagement in the hollow chamber **40** of the piston **32** even when the latter is at its outmost position of FIG. 2. Movement of the piston **32** to the right in the cylinder **31** is arrested by a stop pin **47** carried by the right closed end **37** of said piston and adapted to abut against the inner face of the end cap **33** as a stop as seen in FIG. 2. It will be noted that in this position of the piston, the left cylindrical portion **38** closes off the port to the tank refill pipe **29** and aligns the piston-reduced portion **39** with the port leading to the rim flush pipe **30**.

As above pointed out, movement of the piston **32** is controlled by a pilot valve unit **36** which consists of a guide boss **48** having a vertical bore **48***a* within which the ball valve lift stem **23** has a relatively loose slidable fit. The guide boss **48** is formed as an integral part of a bracket clamp **49** adjustably mounted on the overflow pipe **25**. Threaded into the guide boss **48** is a nipple **50** to which the flexible hose **35** is attached. A ball check valve **51** operates within an enlarged chamber **52** in the nipple **50** and is normally urged against a valve seat **53** at the inner end of said nipple by the static water pressure in the hose line **35**.

The ball check valve **51** extends a substantial distance beyond the seat **53** so as to project into the vertical bore **48***a* in the boss **48** when the nipple is assembled thereto. The amount of projection of the ball valve **51** in the bore **48***a* can be predetermined by the position of a shoulder **54** on nipple **50** abutting against the boss **48**. The ball check valve **51** is controlled by the lift stem **23** which has an intermediate reduced portion **23***a* normally positioned in line with the check valve **51** as shown in FIG. 3, when the ball float valve **22** is in closed position on its

valve seat **21**. However, when the stem **23** rises as it does during the flushing operation, the full diameter portion of the stem **23** will engage the ball check valve **51** to open the valve.

From FIG. 4 it will be noted that there is an opening **42** in the guide boss **48** diametrically opposite the ball check valve **51**. This is to provide a quick discharge for the water as soon as the check valve **51** is opened, thus expediting the release of water pressure in the right side of the piston chamber **31**.

Operation

When the trip lever **24** is actuated to operate the flushing mechanism, the ball float valve **22** will be elevated from its valve seat **21** to its upper position as determined by contacting the underside of the guide boss **48**. This operation places the full diameter of the lift stem **23** in contact with the ball check valve **51** unseating it from the valve seat **53** and relieving the static pressure in the hose line **35** and from the right end of the cylinder **31** whereupon the piston **32** will be forced to the right as shown in FIG. 2. In this position, the port to the tank-refill pipe **29** will be closed and the full force of the water passing through the ball cock valve **18** and antisiphonic unit **19** will be directed to the piston **32**, out through the ports **41** and into the rim flush pipe **30**.

During this period, the water will be draining from the tank **11** for flushing the bowl **10** and as the water level drops within the tank, the float valve will descend with the water level until finally sucked into closed position with the valve seat **21**. The closed position of the float valve **22** will, of course, bring the reduced portion **23***a* of the lift stem **23** into alignment with the check valve **51** permitting it to seat and close the pilot valve whereupon water pressure will build up in the hose line **35** and in the right side of the cylinder **31**, thus causing the piston **32** to move back to its normal left position of FIG. 3, it being understood that the pressure on the left side of the piston will be reduced because of the free flow through the ports **41**. The main flow of water will now be directed through the tank refill pipe **29**, and also by reason of the reduced cylindrical portion **42**, some amount of water will continue to flow through the rim-flush pipe **30** to establish the normal water level within the toilet bowl **10**. The flow of water through the diverter valve for filling the tank and recharging the bowl will be shut off at the ball cock valve **18** under the control of the usual ball float.

Various changes and modifications may be made in the details of construction and design of the above described embodiment of the invention and come within the scope of the following claims.

What I claim is:

1. Flushing apparatus for toilet bowls having a rim flush comprising a tank, a float-type tank-outlet ball valve therein, a ball cock valve, a diverter valve between the ball cock valve and tank, said diverter valve comprising a cylinder having a rim-flush outlet port and a tank-refill outlet port, a piston slidable in said cylinder which in one position serves to close said tank-refill port and open said rim-flush port and in another position serving to open said tank-refill port and close said rim-flush port, hydraulic means for shifting said piston between such positions including a pilot valve, and means carried by and responsive to the position of said tank-outlet valve for actuating said pilot valve.

2. Flushing apparatus as defined in claim 1 wherein said piston when positioned in said cylinder to open said tank-refill port has means to allow some fluid to pass out through said rim-flush port.

3. Flushing apparatus for toilet bowls comprising a tank, a float-type outlet ball valve therein having a lift stem, a ball cock valve, a diverter valve comprising a cylinder having intermediate its ends a rim-flush outlet port and a tank-refill outlet port, a piston slidable in said cylinder which at one end of the cylinder serves to close said tank-refill port and open said rim-flush port and when at the other end of the cylinder the piston will open said tank-refill port and close said rim-flush port, a pilot valve associated with said lift stem, means connecting said one end of said cylinder to said ball cock valve and said other end to said pilot valve, said piston having a bleed opening therethrough to equalize the pressures on each side of the piston, and means on said lift stem for opening and closing said pilot valve whereby when said pilot valve is open said piston will move to said one end of said cylinder and when closed said piston will move to the said other end of said cylinder.

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