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Kern et al.

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[45] **June 28, 1974**

[54] **WATER CONSERVING METHODS AND APPARATUS FOR FLUSH TOILETS**

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[52] **U.S. Cl.** ..... **4/18**, 4/57 P, 4/67 A

[51] **Int. Cl.** **E03d 1/14**, E03d 1/22

[58] **Field of Search** ..... 4/18, 34, 67, 67 A, 57, 4/57 P, 52, 42, 41, 1, 18.5

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Primary Examiner—Henry K. Artis

Attorney, Agent, or Firm—Burns, Doane, Swecker & Mathis

[57] **ABSTRACT**

A barrier for retaining fresh water within a flush toilet tank comprises an end retainer wall, a pair of side retainer walls attachable to the end retainer wall, and a pair of wedges insertable between the end retainer wall and an upstanding tank wall to press the barrier into sealing engagement with the tank interior. The wedges engage sloping pressure faces of the end retainer wall which distribute the pressing forces of the wedge into horizontal and vertically downward components. The side retainer walls are freely interengageable with the end retainer wall, such that the retainer walls may be assembled together within the tank. The tank-contacting edges of the retainer walls are defined by integral, beveled peripheral portions of the retainer walls.

17 Claims, 7 Drawing Figures

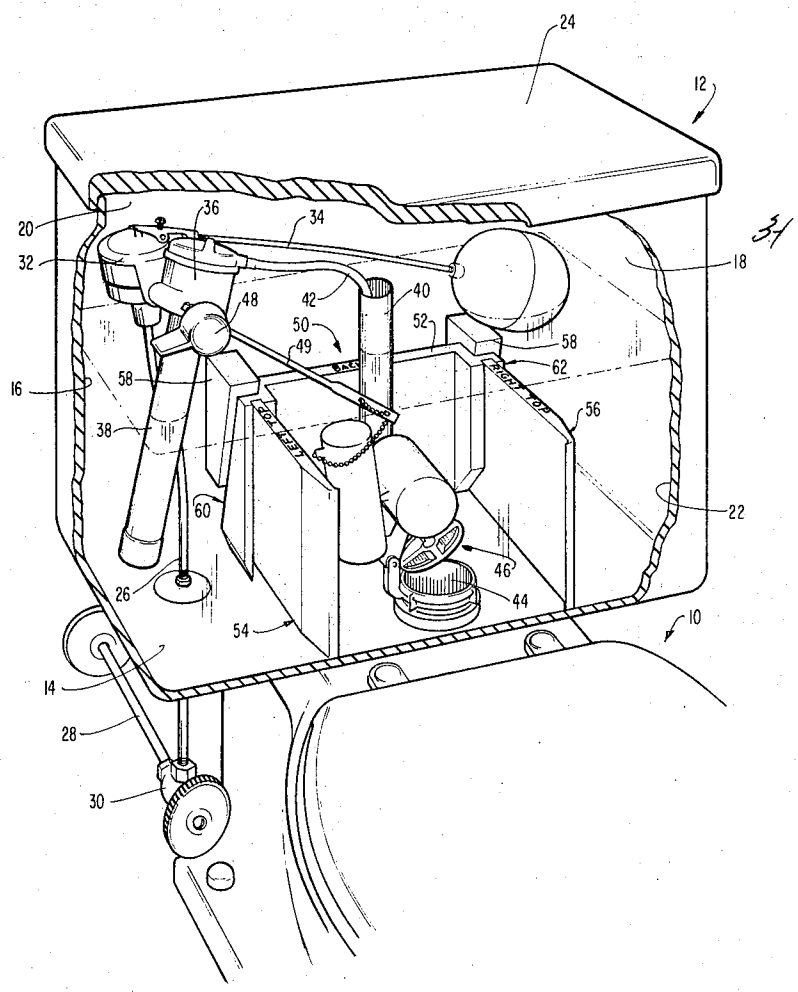


FIG. 1

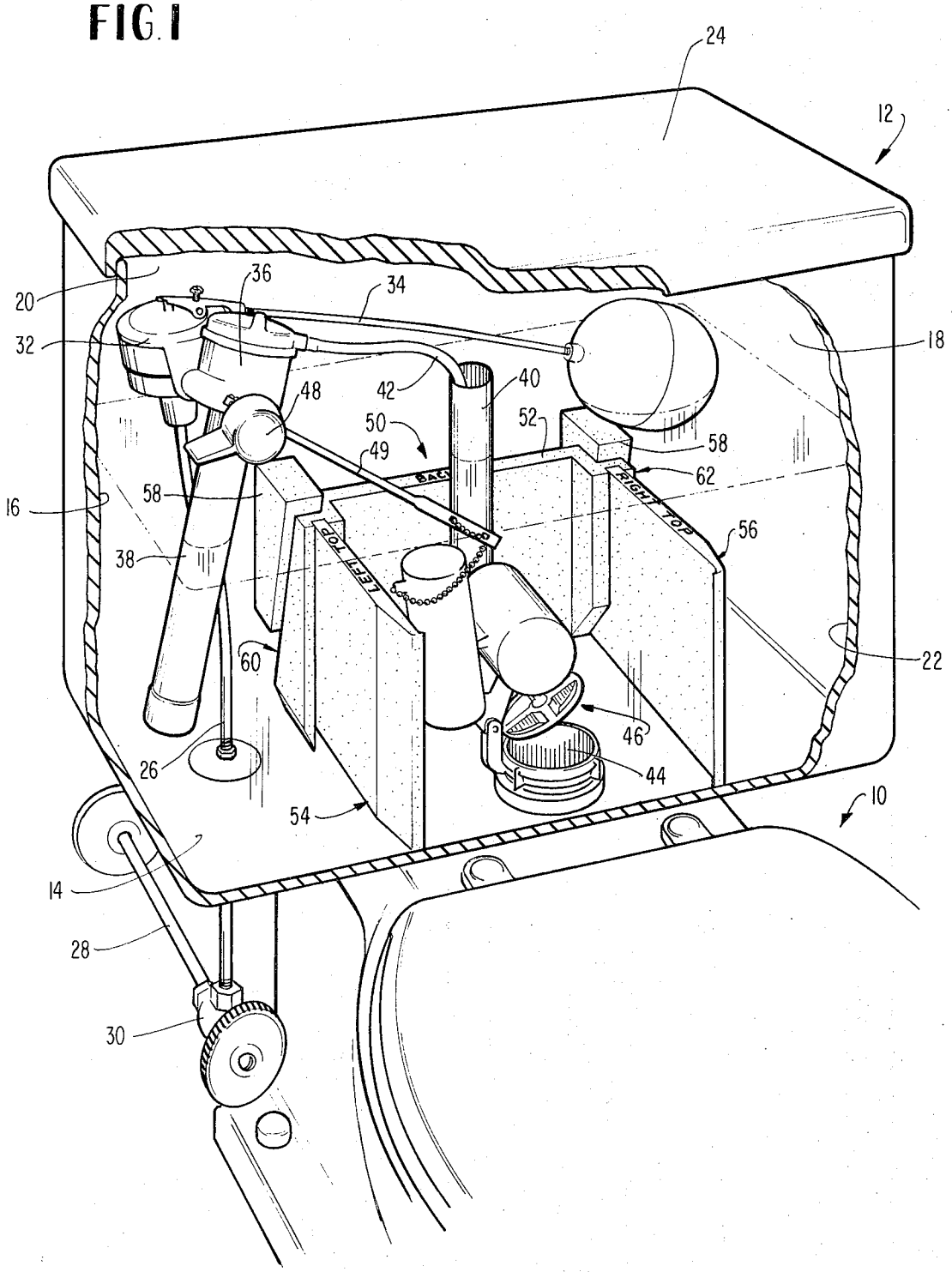
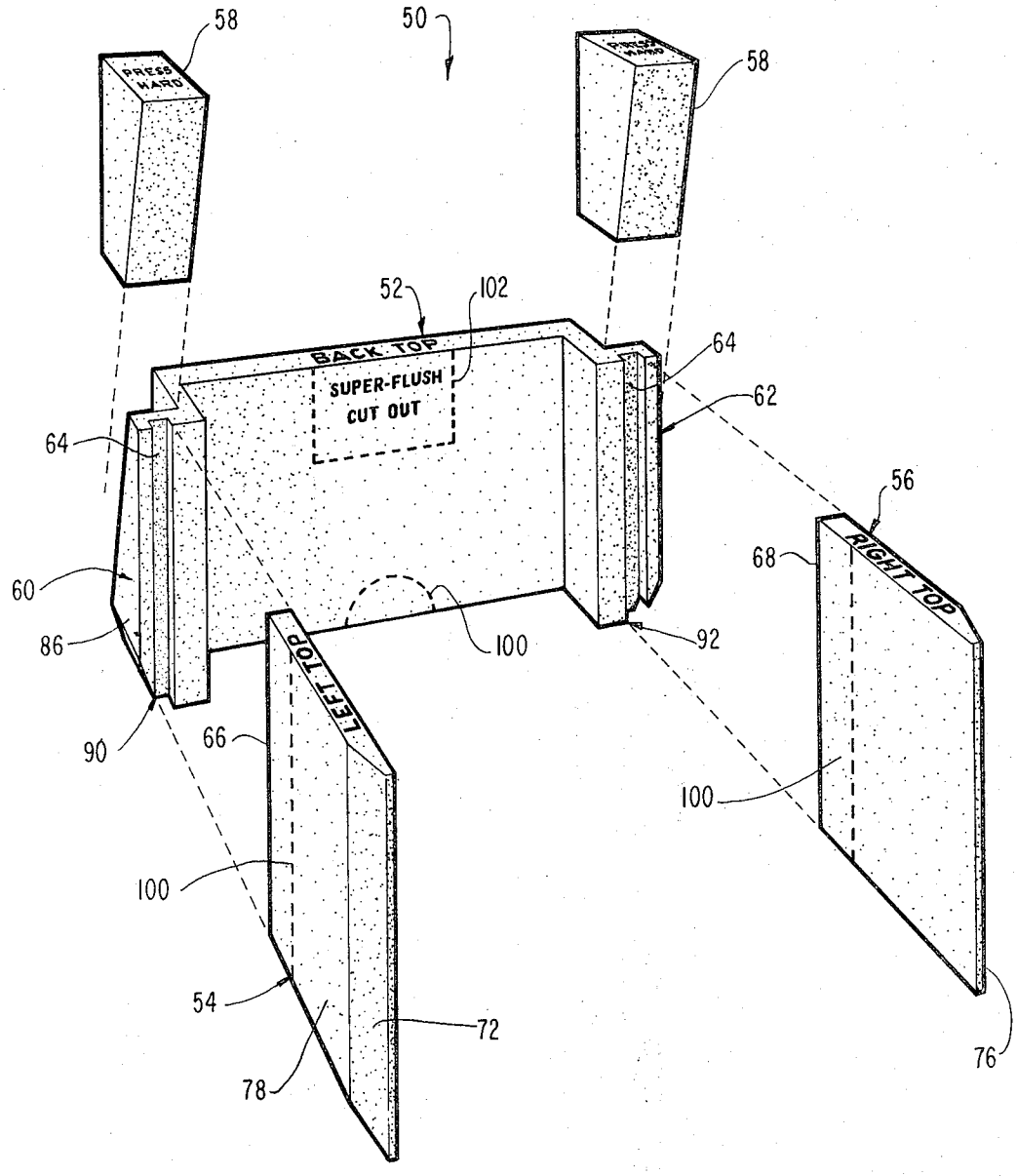

24
12
20
36
34
32
18
48
42
40
50
52
49
58
62
16
58
BACK
RIGHT TOP
LEFT TOP
56
38
22
60
46
26
44
54
10
14
28
30

FIG. 2


58
50
58
PRESS HARD
PRESS HARD
52
102
BACK TOP
SUPER-FLUSH CUT OUT
64
62
64
56
68
RIGHT TOP
60
86
100
92
90
66
LEFT TOP
100
100
54
72
78
76

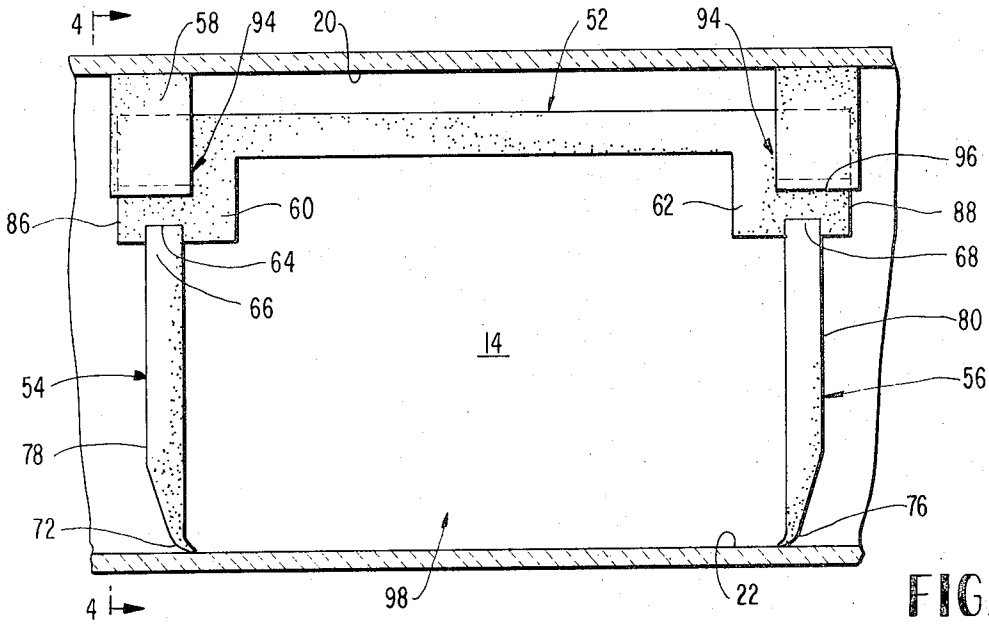


FIG. 3

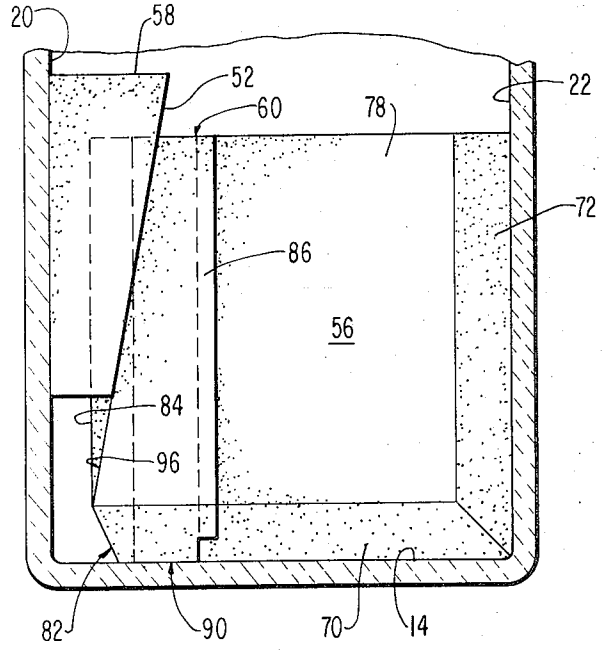
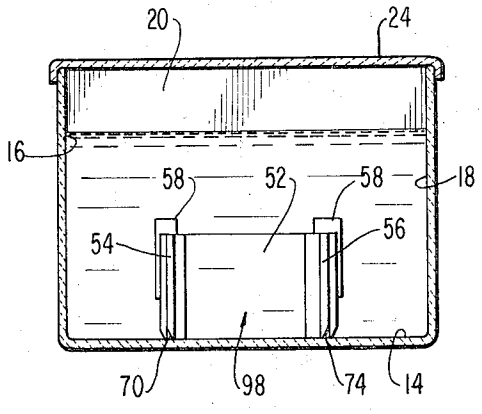


FIG. 4

FIG. 5



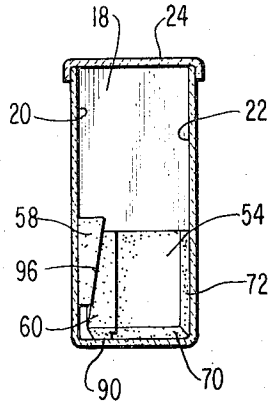
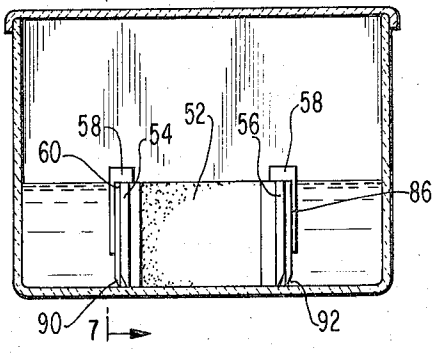


FIG. 7

FIG. 6



WATER CONSERVING METHODS AND APPARATUS FOR FLUSH TOILETS

BACKGROUND AND OBJECTS OF THE INVENTION

This invention relates to water closets, and particularly concerns a water-retaining barrier which is insertable within a flush toilet tank to limit the amount of water discharged therefrom.

A conventional form of flush toilet presently in wide use basically includes a bowl portion and a water-dispensing tank disposed above the bowl. The tank is provided with an inlet conduit coupled to a pressurized source of fresh water. A valve mechanism is connected to the inlet conduit to automatically maintain the tank supplied with a charge of fresh water. Situated at the bottom of the tank is a valved discharge opening which, when uncovered, admits water from the tank to the bowl to flush the latter. Many toilets of this type are designed to discharge as much as from five to seven gallons of water per flush. It is recognized, however, that less than this amount of water, perhaps only one-half as much, is actually required for the toilet to flush properly. It will thus be realized that large quantities of fresh water can and are being wasted by the use of these types of flush toilets.

Various proposals have been heretofore made for conserving fresh water by restricting or limiting the amount of water discharged by a flush toilet. Exemplary of such proposals are those described in U.S. Pat. Nos. 1,323,703 and 3,259,918. These patents disclose one-piece chamber-defining units which are insertable around the discharge opening of a flush toilet tank. Such units are intended to retain within the tank a portion of the water which would otherwise be discharged from the toilet during a flushing operation.

The convenience afforded by these types of structures is somewhat limited due, in part, to the difficulty of installing a one-piece unit around the plumbing and flushing equipment located within the toilet tank, and maintaining the bottom edges of the unit in tight sealing engagement with the tank floor. Proposed solutions to the latter problem are, in terms of economy, ease of installation, and longlasting dependable performance, less than ideal, however.

Another type of water-retaining apparatus which has been suggested comprises a flexible, one-piece element which is to be bent, within the tank, into a U-shaped configuration around the discharge opening. This element utilizes a pair of horizontal spring-biased arms having rubber cups which engage one of the tank walls to press the ends of the bent unit against an opposite wall of the tank. A strip of rubber moulding is installed along the tank-contacting periphery of the element in an attempt to provide sufficiently resilient sealing edges.

One problem relating to the use of an element such as that previously described involves the difficulty of exerting sufficient downward pressure on the bottom sealing edges of the element to effect a suitable seal. If firm pressure is not exerted, the bottom edge of the element may tend to rise slightly during a flushing operation, allowing water to seep therebeneath. In addition, the provision of spring-biased arms, rubber cups, and auxiliary mould stripping adds to the cost of the element. Moreover, it may be somewhat difficult in certain instances to properly bend the element around the plumbing and valving equipment disposed within the toilet tank.

It is, therefore, a general object of the invention to obviate or minimize problems of the types previously discussed.

It is a particular object of the invention to provide novel methods and apparatus for limiting the discharge of water from water-dispensing tanks.

It is another object of the invention to provide a novel and inexpensive water-retaining barrier which may be conveniently installed within a conventional toilet tank.

It is yet another object of the invention to provide a novel water-retaining barrier which effects a tight water seal in the absence of add-on resilient stripping.

It is still another object of the invention to provide novel methods for installing a water-retaining barrier within a toilet tank.

Yet another object of the invention is to provide a barrier assembly which may be easily adapted to toilet tanks of diverse configurations.

A BRIEF SUMMARY OF THE PREFERRED EMBODIMENT

As least some of the foregoing objects are intended to be accomplished by the provision of a water-retaining barrier which is suitable for insertion within the tank of a flush toilet mechanism. The barrier includes an end retainer wall, a pair of side retainer walls, and a pair of wedges, which may be formed of a material such as polystyrene or polyurethane. The end retainer wall has a pair of channels which receive coupling edge portions of the side retainer walls. The end and side retainer walls include tank-contacting edges which are capable of being urged into tight sealing engagement with the tank interior. The outer surface of the end retainer wall includes a pair of sloping pressure faces which are arranged to receive the wedges. The wedges may be manually pressed between these sloping faces and an upstanding wall of the tank to produce forces which urge the barrier against the tank interior. The sloping pressure faces direct these forces horizontally and vertically to maintain the bottom and upstanding tank-contacting edges of the barrier in tight sealing engagement with the tank interior.

The side retainer walls are manually interengageable and disengageable within the channels of the end retainer wall such that the retainer walls may be assembled together within the tank, thereby facilitating installation of the barrier around the plumbing and flushing equipment located within the tank. The tank-contacting edges are defined by integral, beveled peripheral portions of the retainer walls.

THE DRAWINGS

Other objects and advantages of the present invention will become apparent from the subsequent detailed description thereof in connection with the accompanying drawings in which like numerals designate like elements and in which:

FIG. 1 is a perspective view of a flush toilet tank having portions broken away to expose a water-retaining barrier in its installed condition, according to the present invention;

FIG. 2 is an exploded, perspective view of the water-retaining barrier;

FIG. 3 is a plan view, partly in section and with parts removed, depicting the barrier in its assembled condition in the tank;

FIG. 4 is a side elevational, sectional view taken along line 4-4 of FIG. 3;

FIG. 5 is a front elevational, schematic illustration, partly in section, of a barrier installed within a tank, prior to a flushing operation;

FIG. 6 is a view, similar to FIG. 5, showing the water which is retained within the tank by the barrier subsequent to a flushing operation; and

FIG. 7 is a side elevational, schematic view taken along line 7—7 of FIG. 6.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A preferred form of water-retaining barrier according to the present invention will be described in conjunction with a conventional type of flush toilet having a boil portion **10** and a water tank **12** disposed thereabove. The tank **12** includes a floor **14**, a pair of opposed upstanding side walls **16** and **18**, opposed upstanding front and rear walls **22** and **20** and a lid **24**, as depicted in FIG. **1**.

Mounted within the tank **12** is a vertical inlet water pipe **26**, which communicates with an external supply conduit **28**. The supply conduit **28** is connected to a pressurized source of fresh water and is provided with a main shut-off valve **30**. An inlet valve **32** is disposed atop the inlet water pipe **26** and is operated by a float-carrying actuating arm **34** in the conventional fashion to regulate the inflow of fresh water to the tank.

Connected to the inlet valve **32** is a water distributing element **36** which distributes incoming water to both a downwardly opening chamber filler tube **38** and a downwardly opening overflow tube **40**. The overflow tube **40** is connected at its base to the tank floor and communicates with the distributing element via an overflow conduit **42**.

Located in the tank floor **14** is a discharge opening **44** which fluidly communicates the tank **12** with the bowl **10**. An outlet valve assembly **46** is pivotally disposed above the discharge opening **44**. The outlet valve assembly **46** is operably connected to a handle **48** by means of a link **49** and a chain **51**. The handle **48** is operable to pivot the outlet valve assembly **46** from a closed position covering the discharge opening **44** to an open position uncovering the discharge opening **44**, as shown in FIG. **1**.

The previously described tank and flushing equipment are of conventional construction and operate in a well-known fashion. That is, with the valve assembly **46** in a closed position, the inlet valve **32** is operable to supply a predetermined charge of water within the tank **12**. Rotation of the handle **48** pivots the outlet valve assembly **46** to an open position and allows water to flow from the tank **12** into the bowl **10**. If unrestricted, substantially all of the fresh water within the tank would flow through the discharge opening **44**.

In accordance with the present invention, however, a water-retaining barrier **50** is provided which limits the amount of water discharged from the tank per each flushing operation.

The barrier **50** comprises a freely attachable and detachable assembly which includes an end retainer wall **52**, a pair of side retainer walls **54** and **56**, and a pair of wedges **58**. These retainer walls **52, 54,** and **56** and wedges **58** are preferably fabricated of a material such as polystyrene or polyurethane, for example.

The end retainer wall **52**, at its ends, is provided with a pair of upright, channel-defining flanges **60** and **62**. The channels **64** defined thereby are configured to receive the coupling ends **66** and **68** of the side retainer walls **54** and **56**.

The coupling ends **66** and **68** of the side retainer walls are manually engageable and disengageable within the channel **64** to facilitate assemblage of the barrier **50** within the toilet tank **12**. In this fashion, difficult maneuvering around the plumbing and flushing equipment located within the tank is minimized.

The side retainer walls **54** and **56** include integral, beveled, tank-contacting bottom and distal edges **70, 72** and **74, 76** (FIGS. **3** and **4**). These edges are preferably formed by tapering the outer surfaces **78** and **80** of the side retainer walls along their bottom and front peripheries.

By beveling the edges **70, 72, 74** and **76**, the edges will be able to more easily conform to, and sealingly engage, the corresponding tank surfaces, i.e., the floor **14** and the upstanding wall **22**. Such beveling also reduces the area of contact between the side retainer walls and the tank floor, thus concentrating along a smaller area any securing forces which may be applied thereagainst.

The end retainer wall **52** includes an integral, beveled, tank-contacting bottom edge **82** (FIG. **4**). This edge is preferably formed by tapering the outer surface **84** of the end retainer wall along its lower periphery. In similar fashion, the outer surfaces **86** and **88** of the flanges **60** and **62** are tapered to define integral, beveled, tank-contacting edges **90** and **92** (FIGS. **4** and **6**).

In order to provide sufficient pressure to urge the tank-contacting edges of the barrier **50** into tight sealing engagement with the tank, a wedging apparatus, preferably in the form of the pair of tapered wedges **58**, is provided. These wedges **58** are operable to be manually inserted between the rear upstanding wall **20** of the tank and the outer surface **84** of the end retainer wall **52**.

To facilitate wedge insertion, and to properly orient the forces produced thereby, the outer surface **84** of the end retainer wall includes a pair of shoulders **94** disposed behind the channels **64**. The shoulders **94** are defined by a pair of pressure faces **96** which slope upwardly away from the rear tank wall **20**, i.e., toward the channels **64**. The degree of the slope corresponds to the degree of tapering of the sealing wedges **58**. In this fashion, the wedges may be easily manually pressed between the rear tank wall **20** and the pressure faces **96**. The sloping pressure faces will transmit horizontal and vertical components of force to the retainer walls **52, 54, 56**. In so doing, the distal edges **72, 76** and the bottom edges **70, 74, 82, 90** and **92** will be urged into water-sealing engagement with the front tank wall **22** and the tank floor **14**, respectively, as will be subsequently discussed.

BARRIER INSTALLATION

Installation of the barrier is preferably intiated by evacuting the water from the tank **12**. This is done by closing the primary shut-off valve **30** and flushing the bowl in the usual manner.

The end retainer wall **52** may then be inserted behind the overflow tube **40** such that the channels **64** are in facing relationship with the front wall **22** of the tank. The side retainer walls are then fitted within their associated channels **64** in stradling relation to the discharge opening **44** and such that the distal edges **72, 76** are disposed adjacent the front tank wall. It will be realized that by assembling the barrier within the tank, interference posed by the plumbing and flushing equipment disposed in the tank is minimized. The wedges **58** are then manually pressed downwardly between the rear tank wall **20** and the sloping pressure faces **96.**

It will be apparent that due to the sloping nature of the pressure faces **96,** the forces exerted by the wedges **58** will be directed downwardly and forwardly. As a result, the distal edges **72, 76** of the side retainer walls and the bottom edges **70, 74, 82, 90, 92** of the end and side retainer walls **52, 54, 56** will be urged into firm sealing engagement with the front wall **20** and the floor **14,** respectively, of the tank. Thus, any tendency for these bottom edges to rise from the floor will be effectively resisted.

The integral, beveled edges of the retainer walls provide sealing edges **18** which conform to the tank profile, and seal thereagainst, without the need for add-on rubber sealing strips.

With the barrier disposed in sealing engagement with the tank interior, as depicted in FIGS. **1, 3** and **5,** the end and side retainer walls **52, 54, 56,** together with the front upstanding tank wall **22,** define a chamber **98** located above the discharge opening. When the flushing mechanism is actuated to open the outlet valve assembly **46,** the water within this chamber **98,** and directly thereabove, will be exhausted through the discharge opening **44** and into the bowl. Much of the water, however, will be restrained by the barrier and retained within the tank, as shown in FIG. **6.**

The barrier may be easily adapted to tanks of varying sizes containing various equipment. For example, it will be apparent that the tapered nature of the wedges **58** affords compensation for certain minor variances in dimension between the front and rear walls of diverse tanks. For larger variances in dimension, wedges of different sizes may be utilized.

Moreover, by fabricating the barrier assembly from materials which may be easily cut, such as polystyrene and polyurethane, for example, the shape of the barrier walls may be suitably altered. Note in FIG. **2,** for example, where, at the time of fabrication, certain reference lines and indicia **100** are imprinted on the retainer walls to enable a user to conveniently modify the barrier for use in certain conventional tanks. A super-flush reference line **102** may be provided to indicate a suitable location for slotting a barrier wall to enable a greater amount of water to be discharged from the tank.

Although the invention has been described in connection with a preferred embodiment thereof, it will be appreciated by those skilled in the art that additions, modifications, substitutions and deletions not specifically described may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A water-retaining barrier for use in a flush toilet tank having a bottom floor, a plurality of upstanding walls, fresh water inlet conduit means, inlet valve means for regulating the inflow of water from said inlet conduit means into the tank, water discharge opening means in the tank floor, discharge valve means for covering said discharge opening, and means for selectively opening said discharge valve means, said barrier comprising:

an end retainer wall having bottom edge means for sealingly engaging said tank floor;

a pair of side retainer walls extending outwardly from said end retainer wall;

said side retainer walls each having bottom edge means for sealingly engaging said tank floor, and distal edge means for sealingly engaging one of said upstanding tank walls;

said end and side retainer walls being arranged to define, with said one upstanding tank wall, a chamber disposed above the tank discharge opening; and

wedge means manually insertable between said end retainer wall and another of said upstanding tank walls, located opposite said one upstanding tank wall, for urging each of said bottom edge means and said distal edge means into water-sealing engagement with said tank floor and said one upstanding tank wall, to restrict the amount of water which can be discharged through the tank discharge opening.

2. The barrier according to claim **1** wherein said bottom and distal edge means are defined by beveled, integral peripheral portions of said end and side retainer walls.

3. The barrier according to claim **1** wherein said end retainer wall and said side retainer walls include manually interengageable and disengageable coupling portions such that said end and side retainer walls are arranged to be assembled together within said tank.

4. The barrier according to claim **3** wherein said coupling portions comprise a pair of channel means carried by said end retainer wall, and coupling edges carried by said side retainer walls, said coupling edges being receivable in said channels.

5. The barrier according to claim **1** wherein said bottom and distal edge means are defined by beveled, integral peripheral portions of said end and side retainer walls; and said end retainer wall and said side retainer walls including manually interengageable and disengageable coupling portions such that said end and side retainer walls are arranged to be assembled together within said tank.

6. The barrier according to claim **1** wherein said end retainer wall, said side retainer walls, and said wedge means are formed of polystyrene.

7. The barrier according to claim **1** wherein said end retainer wall, said side retainer walls, and said wedge means are formed of polyurethane.

8. The barrier according to claim **1** wherein an outer surface of said end retainer wall includes pressure surface means having a slope corresponding to the taper of said wedge means for frictionally receiving said wedge means; said sloping pressure surface means being operable to distribute pressing forces of said wedge means in horizontal and downwardly vertical directions.

9. The barrier according to claim **8** wherein said wedge means comprises a pair of wedges and said pressure surface means comprises a pair of sloping pressure surface means disposed at opposite ends of said end retainer wall.

10. A water-retaining barrier for use in a flush toilet tank having a bottom floor, a plurality of upstanding walls, fresh water inlet conduit means, inlet valve means for regulating the inflow of water from said inlet conduit means into the tank, water discharge opening means in the tank floor, discharge valve means for covering said discharge opening, and means for selectively opening said discharge valve means, said barrier comprising:

an end retainer wall having bottom edge means for sealingly engaging said tank floor;

a pair of side retainer walls extending outwardly from said end retainer wall;

said side retainer walls each having bottom edge means for sealingly engaging said tank floor, and distal edge means for sealingly engaging one of said upstanding tank walls;

said bottom and distal edge means of said side retainer walls being defined by integral, beveled peripheral portions of said side retainer walls;

said end and side retainer walls being arranged to define, with said one upstanding tank wall, a chamber disposed above the tank discharge opening; and

means engageable with another upstanding tank wall, opposite said one upstanding tank wall, for urging each of said bottom edge means and said distal edge means into water-sealing engagement with said tank floor and said one upstanding tank wall to restrict the amount of water which can be discharged through said tank discharge opening.

11. The barrier according to claim 10 wherein said end retainer wall and said side retainer walls include freely interengageable and disengageable coupling portions such that said end and side retainer walls are arranged to be assembled together within said tank.

12. The barrier according to claim 11 wherein said coupling portion comprise a pair of channel-defining flanges disposed at the ends of said end retainer wall, and coupling edges carried by said side retainer walls; said coupling edges being receivable in said channels.

13. The barrier according to claim 10 wherein said end retainer wall and said side retainer walls are formed of polystyrene.

14. The barrier according to claim 10 wherein said end retainer wall and said side retainer walls are formed of polyurethane.

15. A water-retaining barrier for use in a flush toilet tank having a bottom floor, a plurality of upstanding walls, fresh water inlet conduit means, inlet valve means for regulating the inflow of water from said inlet conduit means into the tank, water discharge opening means in the tank floor, discharge valve means for covering said discharge opening, and means for selectively opening and closing said discharge valve means, said barrier comprising:

an end retainer wall having bottom edge means for sealingly engaging said tank floor;

a pair of side retainer walls extending outwardly from said end retainer wall;

said side retainer walls each bottom edge means for sealingly engaging said tank floor, and distal edge means for sealingly engaging one of said upstanding tank walls;

said end and side retainer walls being arranged to define, with said one upstanding tank wall, a chamber disposed above the tank discharge opening;

said end retainer wall and said side retainer walls including manually interengageable and disengageable coupling portions such that said end and side retainer walls are arranged to be assembled together within said tank; and

means engagable with another upstanding tank wall, opposite said one upstanding tank wall, for urging each of said bottom edge means and said distal edge means into water-sealing engagement with said tank floor and said one upstanding tank wall to restrict the amount of water which can be discharged through said tank discharge opening.

16. The barrier according to claim 15 wherein said coupling portions comprise a pair of channel-defining flanges disposed at the ends of said end retainer wall, and coupling edges carried by said side retainer walls; said coupling edges being receivable in said channels.

17. A water-retaining barrier for use in a flush toilet tank having a bottom floor, a plurality of upstanding walls, fresh water inlet conduit means, inlet valve means for regulating the inflow of water from said inlet conduit means into the tank, water discharge opening means in the tank floor, discharge valve means for covering said discharge opening, and means for selectively opening said discharge valve means, said barrier comprising:

an end retainer wall having:

bottom edge means for sealingly engaging said tank floor,

a pair of channel defining flanges, and

a pair of sloping pressure faces disposed on an outer surface of said end retainer wall;

a pair of side retainer walls extending outwardly from said end retainer wall;

said side retainer walls each having bottom edge means for sealingly engaging said tank floor, and distal edge means for sealingly engaging one of said upstanding tank walls;

said bottom and distal edge means of said end and side retainer walls being defined by integral beveled peripheral portions of said end and side retainer walls;

said side retainer walls including coupling end portions, opposite said distal edges, manually interengageable and disengageable with said channels, such that said end and side retainer walls are arranged to be assembled together within said tank; and

a pair of wedges arranged for manual insertion between said pressure faces and another of said upstanding tank walls, located opposite said one upstanding tank wall, for urging each of said bottom edge means and said distal edge means into water-sealing engagement with said tank floor and said one upstanding tank wall, to restrict the amount of water which can be discharged through the tank discharge opening.

* * * * *