Oct. 24, 1961 L. L. DOLLINGER 3,005,206

VALVE FOR A FLUSH TANK

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FIG. 3

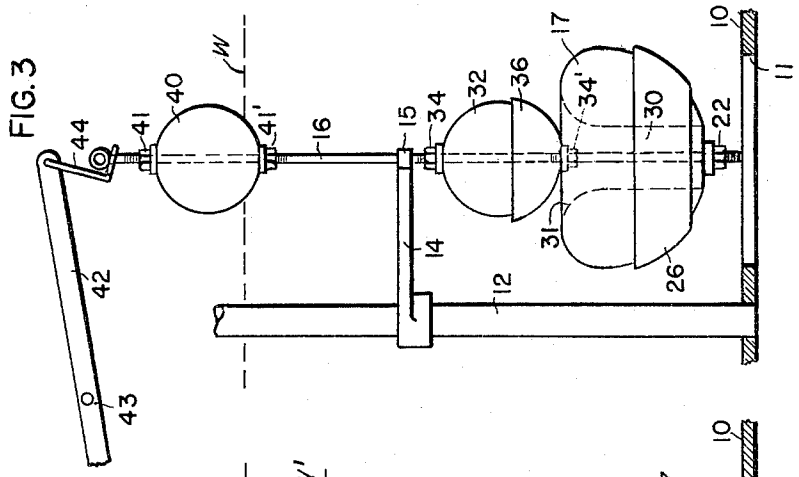


FIG. 2

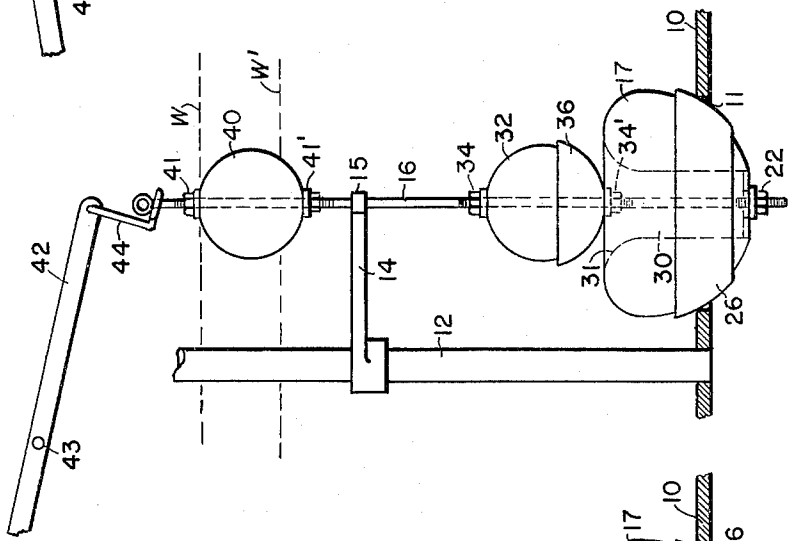
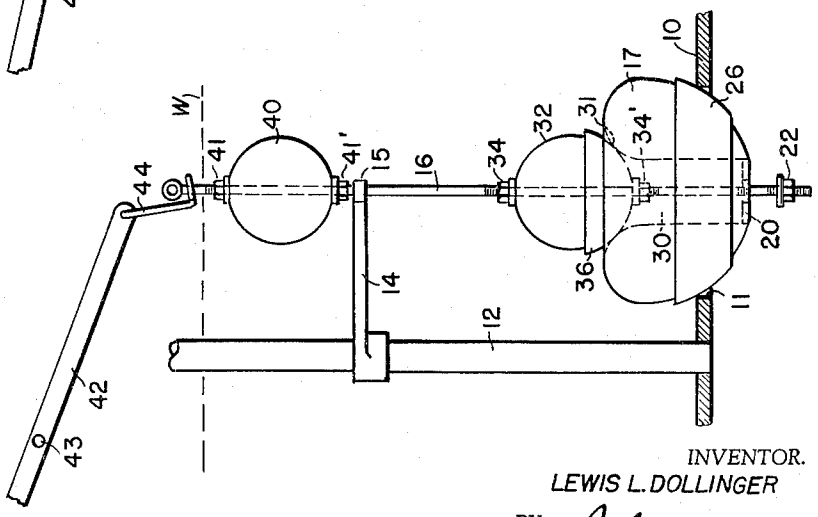


FIG. 1



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VALVE FOR A FLUSH TANK

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FIG. 7

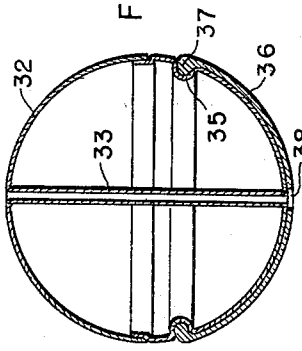


FIG. 8

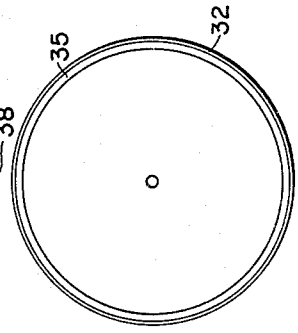


FIG. 9

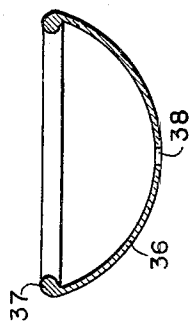


FIG. 4

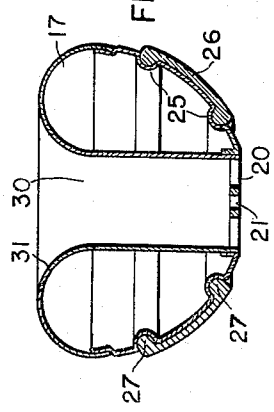


FIG. 5

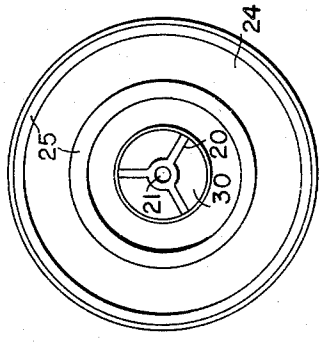
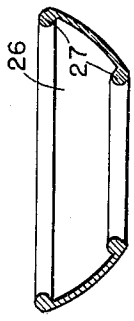


FIG. 6



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VALVE FOR A FLUSH TANK

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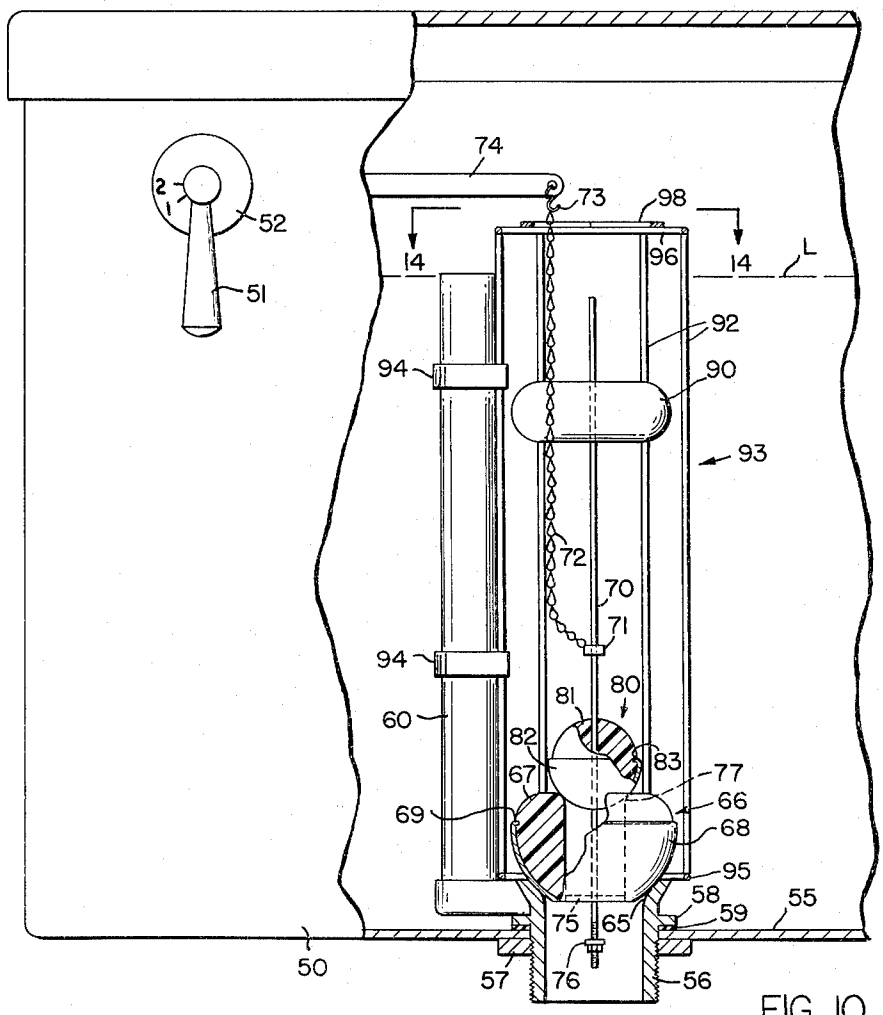


FIG. 10

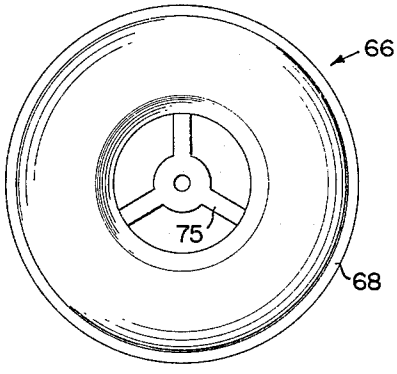


FIG. 13

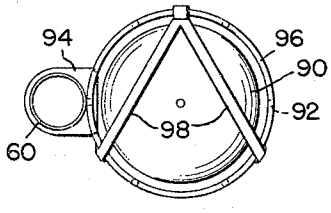


FIG. 14

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VALVE FOR A FLUSH TANK

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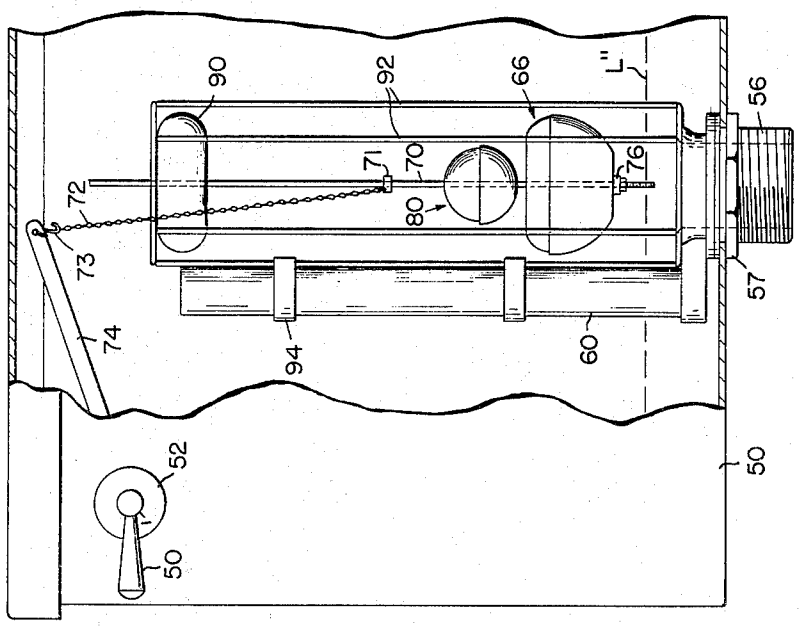


FIG. 12

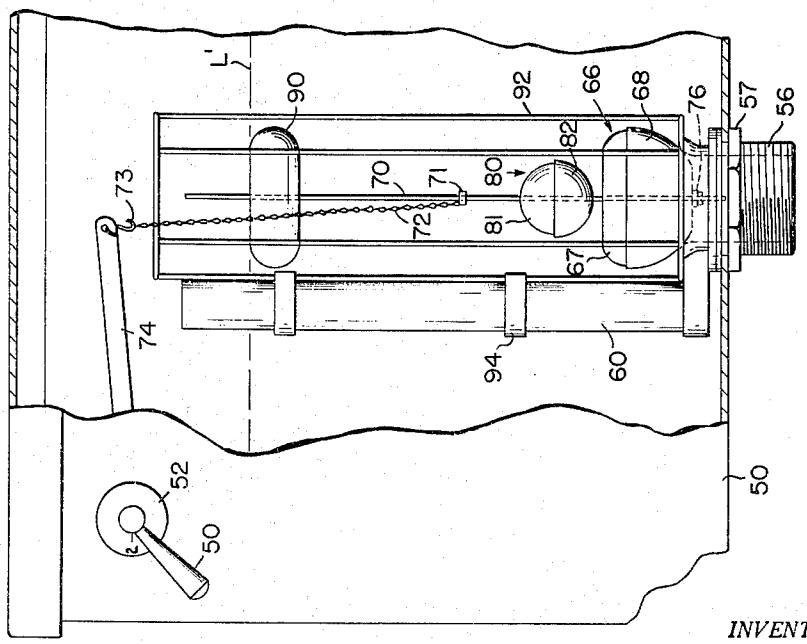


FIG. 11

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United States Patent Office 3,005,206 Patented Oct. 24, 1961

3,005,206

VALVE FOR A FLUSH TANK

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Filed Aug. 13, 1959, Ser. No. 833,627
6 Claims. (Cl. 4—57)

This invention relates to a valve mechanism for water closets. In particular, the invention relates to a valve mechanism that may be operated to drain a predetermined part, or all, of the water from the tank.

In ordinary water closets, the flushing tank is completely emptied every time the toilet is flushed. This often results in a waste of water, because when the toilet is used merely for urination, only a small fraction of the water in the tank would suffice to flush the toilet sufficiently.

To avoid this waste of water, on some farms, that depend on wells for water supply, it is a common but unsanitary practice to permit excretions to accumulate in the toilet bowl, until a complete flushing is required, in order to conserve the water supply. This practice is most unsanitary when it is most prevalent, that is, in the hot summer months, when the water table is low.

Where the waste of water is condoned, and the toilet is completely flushed each time it is used, there are frequently side effects, other than the actual waste of water, which can be serious. Thus, on farms and in other locations where a septic tank is employed, the excess water, resulting from complete flushing of the tank each time the toilet is used, only tends to fill the septic tank and to prevent its proper operation. In cities, where all the water has to be treated, there are the extra effort and expense involved in treating the water, that is wasted; and there is the extra sewer capacity required to dispose of it.

In most cities, moreover, there is a constant haunting fear of water shortages, and a constant search goes on for additional sources of water supply. In some cities the water shortage is so acute in summer that sprinkling of lawns and operation of air-conditioning units, are not infrequently prohibited for extended periods of time. The water, that is wasted on unneeded toilet flushings, would go a long way to make up the recurrent summer shortages and permit sprinklings of lawns and operation of air-conditioning units to be continued when the need is greatest.

Valves have been proposed in the past that would permit the water tank to be discharged partially or completely, at the will of the operator, but these valves have either been too complicated or too expensive to permit their widespread adoption.

One object of the present invention is to provide a valve mechanism for a water closet that will permit the closet tank to be discharged partially or completely, at the will of the operator, and that is inexpensive and simple in construction, and easy to operate.

Another object of the invention is to provide a valve mechanism of the character described, that will require little or no maintenance, and that can be repaired easily.

Another object of the invention is to provide a valve mechanism of the character described that can be substituted readily for the conventional valve mechanism in a standard water closet.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawings:

FIG. 1 is a partial section through a water closet tank, showing in side elevation a valve mechanism constructed according to one embodiment of this invention, in its closed position;

FIG. 2 is a similar section showing the valve mechanism in its partially open position;

FIG. 3 is a similar section showing the valve mechanism in its fully open position;

FIG. 4 is an axial section of the lower valve member of the mechanism;

FIG. 5 is a bottom plan view of this lower valve member with its gasket removed;

FIG. 6 is an axial section of the gasket for the lower valve member;

FIG. 7 is an axial section of the upper valve member;

FIG. 8 is a bottom plan view of the upper valve member, with the gasket removed;

FIG. 9 is an axial section of the gasket for the upper valve member;

FIG. 10 is a part side elevation, part sectional view of a water closet tank, and showing partly in side elevation and partly in section a valve mechanism constructed according to another embodiment of this invention, the valve mechanism being shown in its closed position;

FIG. 11 is a similar view showing this modified valve mechanism in its partially open position;

FIG. 12 is a similar view showing this modified valve mechanism in its fully open position;

FIG. 13 is a bottom plan view on an enlarged scale of the lower valve member of this modified valve mechanism; and

FIG. 14 is a section on the line 14—14 of FIG. 10 looking in the direction of the arrows.

Referring now to the drawings by numerals of reference and first to FIGS. 1 to 9 inclusive, 10 denotes the bottom of the flush tank of a water closet. It has a circular discharge aperture 11 which communicates with a discharge pipe or other outlet. An overflow tube 12 is mounted on the bottom 10 in the conventional way, and an arm 14 is mounted on the tube 12. The arm 14 is formed at its outer end with an eye 15. A rod 16 passes through the eye 15 for vertical reciprocatory movement along a path that is aligned with the axis of the discharge opening 11 in the bottom of the tank.

The discharge opening 11 is adapted to be closed by a lower valve member 17 which is adapted to seat in this discharge opening 11, and which has a spider 20 formed or secured in its lower end that has an aperture 21 through which the rod 16 passes. A nut and washer combination 22 is threaded onto the lower end of the rod 16, to be disposed below the spider 20 in the closed position of the valve, to permit the rod 16 to be lifted a predetermined distance while the valve member 17 remains stationary. Instead of being at the bottom of the valve member 17, however, spider 20 might be positioned at any position along the height of the valve member.

In this embodiment of the invention, the valve member 17 is hollow and may be made of a light-weight metal such as brass or copper. It is preferably made in two parts, soldered or brazed together. One section of the valve member has a generally semi-spherical lower surface 24 (FIG. 5) that is pressed inwardly to provide a pair of verticaly-spaced, circumferential recesses 25 (FIG. 4). A ring-type gasket 26, made of rubber or other compressible, rubber-like material, is disposed over a part of the lower surface 24 of the valve member. The gasket 26 is generally in the shape of a segment of a sphere, and is formed with a pair of inwardlly protruding lips 27 along its upper and lower edges. These lips 27 engage resiliently in the circumferential recesses 25, detachably to secure the gasket 26 to the valve member 17. The gasket 26 is disposed to engage the rim of the

opening 11 in line contact, to form a fluid-tight seal when the valve is in its closed position.

The other section of the valve member 17 has a cylindrical tubular portion 30 whose axis is aligned with the axis of the discharge opening 11 of the water tank when the valve member 17 is properly seated, and it is formed at its upper end with a semi-toroidal seating surface 31.

A generally spherical upper valve member 32 is also mounted on the rod 16. This valve member is also hollow and is preferably made of a light-weight metal such as brass or copper. It may be made in two or in three parts. It has a tube 33 mounted diametrically inside it. The tube 33 is brazed or soldered to the spherical member 32 in fluid-tight relation. The rod 16 passes through this tube 33. A pair of nut and washer combinations 34, 34', are threaded to the rod 16 and engage against the upper and lower surfaces of the member 32, respectively, to position the member 32 on the rod. The member 32 is pressed inwardly to provide a single circumferential recess 35 (FIGS. 7 and 8). A pad or gasket 36, made of rubber, or other compressible rubber-like material, is removably secured on the valve member 32. It is generally shaped like the polar cap of a sphere, and is formed at its upper edge with an inwardly extending lip 37. This lip 37 engages resiliently in the circumferential recess 35 of the upper valve member 32, detachably to hold the gasket 36 over the lower face of the valve member 32. The gasket 36 is also formed with an opening 38 that is aligned with the bore of the tube 33. In the closed position of the valve, the gasket 36 engages in line contact against the seating surface 31 of the lower member 17, to form a fluid-tight seal therewith.

The valve member 32 has a lost-motion connection with the valve member 17. To adjust the amount of lost-motion between these valve members the nut 22 can be adjusted on the rod 16, and, if necessary, the positions of the upper and lower nuts 34, 34' can also be adjusted on the rod 16, to change the position of the upper valve member 32.

A float 40 is secured to the rod 16 above the support arm 14. A pair of nut and washer combinations 41, 41', are threaded on the rod 16 to engage the upper and lower surfaces of the float 40, respectively, adjustably to position the float 40 on the rod.

An operating lever 42 is mounted for pivotal movement about a pin 43 that is secured in one side wall of the closet tank. The lever 42 is connected to the upper end of the rod 16 by a link 44, in conventional manner, to permit the rod 16 to be lifted to operate the valve.

To use only a part of the water in the closet to flush the toilet, the operating lever 42 is pivoted to the approximate position shown in FIG. 2. As the rod 16 is moved vertically to this position, the upper valve member 32 is lifted to disengage the gasket 36 from the seating surface 31 of the lower valve member 17, thereby forming an annular passage between the gasket 36 of the upper valve member and the seating surface 31 of the lower valve member through which water can escape from the tank through the bore 30 of the lower valve member 17. As the valve member 32 is lifted, the float 40 is also lifted; and the valve member 32 is held away from the lower valve member by the float 40 until the level of the water in the tank is lowered sufficiently, say from the original water level W to the level W', to drop the float 40 to its normal position and to lower the rod 16 and the upper valve member 32 again to engage the gasket 36 against the seating surface 31. By adjusting the position of the float member 40 on the rod 16, the water in the tank may be drained to a preselected level; and the water that is drained from the tank enters the outlet 11 under a maximum head of water, for optimum cleansing and flushing force.

To use all of the water in the tank to flush a bowl, the operating lever 42 is operated to pivot it to the approximate position shown in FIG. 3. As the rod 16 is raised vertically, the upper valve member 32 will be unseated to permit some water to escape through the bore 30 of the lower valve member 17. Then, after the washer and nut 22 have engaged the spider 20 of the lower valve member 17, lower valve member 17 is disengaged from the rim of the aperture 11. Water can then discharge from the tank directly through the discharge opening 11. The float 40 initially holds the valve members unseated, and when the water level drops below the float, the combined buoyancy of the two valve members holds them up. The buoyancy of the lower valve member keeps it afloat until the water level drops sufficiently to seat the lower valve member in the opening 11.

The lever 42 can be manipulated by the conventional turning handle such as shown at 51 (FIG. 10) of the toilet tank. If desired, an escutcheon plate, such as shown at 52 (FIG. 10) may be provided around or adjacent the handle with suitable designations, such as 1, 2, for the two positions to which the handle can be turned for partial or complete flushing, respectively.

Referring now to the embodiment of the invention shown in FIGS. 10 to 14 inclusive, 50 denotes the flush tank of a water closet. Secured in the bottom wall 55 of this tank is a tubular discharge fitting 56 which is secured in position in the bowl by a nut 57 that is threaded on the fitting against the bottom face of the tank. The fitting has a flange 58 intermediate its ends; and this flange is drawn down against a gasket 59, that seats against the inside face of the bottom wall of the tank, by nut 57, to prevent leakage around the fitting.

An overflow tube 60 is secured to fitting 56 to discharge into the fitting. This tube is of conventional construction and is open at its upper end. Its height determines the level L of water in the tank in the usual fashion.

The bore of fitting 56 has a conical or spherical seat 65 formed in its upper end. A valve member 66 is adapted to engage this seat to close the bore of fitting 56 and prevent discharge of water from the tank. This valve member comprises a body part 67 which is solid except for its bore, and which may be made of a suitable plastic such as polyurethane. This part 67 is formed to have a generally semi-spherical lower surface; and if desired this lower surface may be covered by a ring-type gasket 68, made of rubber or other more compressible material than the body part 67. The gasket 68 has the general shape of a segment of a sphere and may be similar to the gaskets 26 and 36 of the first-described embodiment of the invention. It may be secured in place by an internal rib or lip 69, which is integral with it and which engages in a peripheral groove in body part 67. The gasket 68 is disposed to engage the seat 65 of fitting 56 in line contact, to form a fluid-tight seal when the valve is in its closed position. If a gasket is not used, body part 67 itself will form such a fluid-tight seal with seat 65.

The valve 66 is adapted to be lifted off its seat 65 by a rod 70 which is connected by collar 71, chain 72, hook 73, and lever 74 to the turning handle 51 of the flush tank. The rod 70 passes through a hole in a spider 75 which is integral with or attached to body part 67 and which is secured in the lower end of the bore of this part. A nut and washer combination 76, that is threaded on rod 70 adjacent its lower end, is disposed below the spider 75 in the closed position of the valve 66 so that the rod 70 must be lifted a predetermined adjustable distance before valve member 66 is lifted off its seat 65.

A generally spherical upper valve member 80 is mounted on the rod 70, above valve member 66 and below collar 71. This valve member is adapted to engage on a spherical or conical seat 77 that is formed at the upper end of the bore of valve body 67. The valve member 80 is secured rigidly to rod 70 and comprises a body member 81 which is solid except for the opening therein through which rod 70 passes. The body member may

be also made of a plastic such as polyurethane. It, too, may have a gasket **82**, made of rubber or other compressible rubber-like material, removably secured thereon by, for instance, an internal lip **83** which engages in a peripheral groove formed on the body member **81**. In the closed position of the valve, the gasket **82** engages in line contact against the seating surface **77** of valve body **67**, to form a fluid-tight seal therewith. If gasket **82** is not used, valve body **81** will engage seat **77** in fluid-tight sealing engagement.

A float **90** is secured to the rod **70** at some distance above collar **71**. This float, which may be a hollow metallic part or of any other suitable construction, is of flattened shape. It is large enough to sort of center and guide the rod **70** in its movement by engagement with the vertically-disposed rods **92** that are spaced equiangularly from one another about a common axis and that together form a cage-like guard **93** for the valve mechanism. This guard is removably secured in place by vertically-spaced clips **94** that engage about overflow tube **60** and that are soldered or otherwise fastened to one of the rods **92**. Rods **92** are secured together at their bottoms by a ring **95** which rests on the upper face of fitting **56**. They are secured together at their upper ends by a ring **96**. A pair of rods **98**, that are arranged in the form of a V and that are soldered to ring **96** at their opposite ends, serve to strengthen the guard structure and also act as a stop to limit upward movement of float **90**.

The valve mechanism of FIGS. 10 to 14 operates in a manner similar to that first described. The nut and washer combination **76** provides a lost-motion connection between the valve members **66** and **80**, the amount of which can be adjusted by adjustment of the nut-washer combination on the rod **70**. To use only part of the water in the tank to flush the toilet, the operating handle **51** is moved to position **1** as shown in FIG. 11. As the rod **70** is moved vertically to this position, the upper valve member **80** is lifted off the seating surface **77** thereby forming an annular passage between upper valve member **80** and seat **77** through which water can escape from the tank through the bores of the lower valve member **66** and of fitting **56**. As the valve member **80** is lifted, the float **90** is also lifted; and the valve member **80** is held away from the lower valve member by float **90** until the level of water in the tank is lowered sufficiently, say to level L′ (FIG. 11), to drop the float **90** to its normal position and to lower the rod **70** and the upper valve member **80** again until the upper valve member again engages lower valve member **66** in sealing engagement. By adjusting the position of the float member **90** on rod **70**, the tank may be drained to a preselected level.

To use all the water in the tank to flush the toilet, the handle **50** is moved to the position **2** shown in FIG. 12. As the rod **70** is raised, upper valve member **80** will first be unseated, and then, after the nut-washer combination **76** has engaged spider **75**, the lower valve member **66** will be unseated. Water can then discharge from the tank directly through the mouth of fitting **56**. The float **90** initially holds the valve members unseated; and when the water level drops below the float, the combined buoyancy of the two valve members holds them up. The buoyancy of the lower valve member keeps it afloat until the water level drops sufficiently to say a level L″ (FIG. 12) where the lower valve will again seat itself.

The float **90** because of its flattened shape provides a sharper cut-off for the water discharge than the conventional ball-shaped float. By making the valves of polyurethane or a suitable plastic they can readily be molded to shape, and can be replaced, when worn, very inexpensively. The expensive dies and fixtures required in the first-described embodiment of the invention are eliminated.

From the foregoing, it will be apparent that I have devised a new and useful valve mechanism that permits the desired control over the amount of water that may be flushed at any particular time from a toilet tank. Since only about one-fifth of the total content of the water tank is required to flush the toilet bowl after urination, it will be seen that this valve mechanism effects real economy in water, since the water can be used in the most efficient manner. By economizing on water, savings can be also made in the labor and materials that are required to treat city water, for instance, such as, for example, the fluoride compounds that are frequently added to water, and the chlorine that is used to purify the water. Moreover, sewer capacity will be used to best advantage, and sewage treatment facilities will not be over-burdened because they are flooded with water that serves only to dilute the material needing treatment.

The valve mechanism of the present invention is easy to operate and is dependable. Since line contact is achieved upon the seating of each valve member, fluid-tight engagement is assured, and a minimum of frictional resistance to movement of the valve members is offered. Where gaskets are used on the valve members, should it ever be necessary to replace the gaskets, this can be done easily without skilled assistance. To change a gasket, it is not necessary to change the respective valve member itself. The rubber gaskets resist distortion because they are backed up by the valve members, which preferably are sturdily constructed of brass or plastic, or other corrosion-resistant material.

Because the lower valve member has a semi-spherical lower surface, it can be used readily to close discharge openings of different sizes, so that only one single standard size of valve mechanism, constructed according to this invention, would be necessary to replace the conventional valve mechanisms in most existing water closets. Furthermore, the construction of both valve members is such that they need not seat squarely in order to close properly.

Certain features of the invention are susceptible to change, as will be recognized by those skilled in this art. For example, the advantages of the invention can be realized where the seating surfaces of the two valve members are conical, rather than spherical.

While the invention has been described in connection with a specific embodiment thereof, then, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention what I claim is:

1. A valve mechanism for a water closet tank that has a discharge outlet, comprising a first valve member engageable around its perimeter in fluid-tight line contact with said outlet to seat therein, said first valve member having a central bore that communicates at its lower end with said outlet and that has a seat at its upper end, a second valve member engageable around its perimeter in fluid-tight line contact with the last-named seat to close said bore, a float disposed above said second valve member and rigidly connected thereto, means for lifting said second valve member and float to lift said second valve member off its seat, and lost-motion means connecting said lifting means to said first valve member to lift said first valve member off its seat after a predetermined lifting movement of said second valve member and float, and permitting said second valve member to be lifted off its seat without lifting said first valve member off its seat.

2. A valve mechanism as claimed in claim 1 wherein said lifting means comprises a rod which passes through both said float and said second valve member and to

which both said float and said second valve member are secured with said float above said second valve member, said rod being connected by said lost-motion means to said first valve member.

3. A valve mechanism as claimed in claim 2 wherein said first valve member comprises a plastic body which is solid except for said bore, and said second valve member comprises a plastic body that is solid except where said rod passes through it.

4. A valve mechanism as claimed in calim 3 wherein said valve bodies are made of polyurethane and each has a more resilient annular plastic member secured to it around its perimeter to seat on its respective seat.

5. A valve mechanism for a water closet tank that has a discharge outlet, said mechanism being operable to permit control over the volume of water discharged from the tank, comprising a first valve member adapted to seat in said outlet for closing said outlet and comprising a plastic body which has a bore that communicates at its lower end with said outlet and that has a seat at its upper end, a second valve member that is engageable in the last-named seat to close said bore, a vertically-movable

rod for lifting said valve members off their respective seats, said second valve member being a solid plastic member and being fixedly secured to said rod, lost-motion means connecting said first valve member to said rod to permit lifting said second valve member off its seat without opening said first valve member, a float secured to said rod above said second valve member, and a guard secured in said tank and positioned to enclose said valve members and said float and to guide said float thereby to guide said rod in its vertical movement.

6. A valve mechanism as claimed in claim 5 wherein said float is a hollow member having flat upper and lower sides and a periphery that is of arcuate profile shape.

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