Sept. 2, 1958 F. C. HOFBERGER 2,849,724

FLUSH TANK AND OPERATING MEANS THEREFOR

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Fig. 1

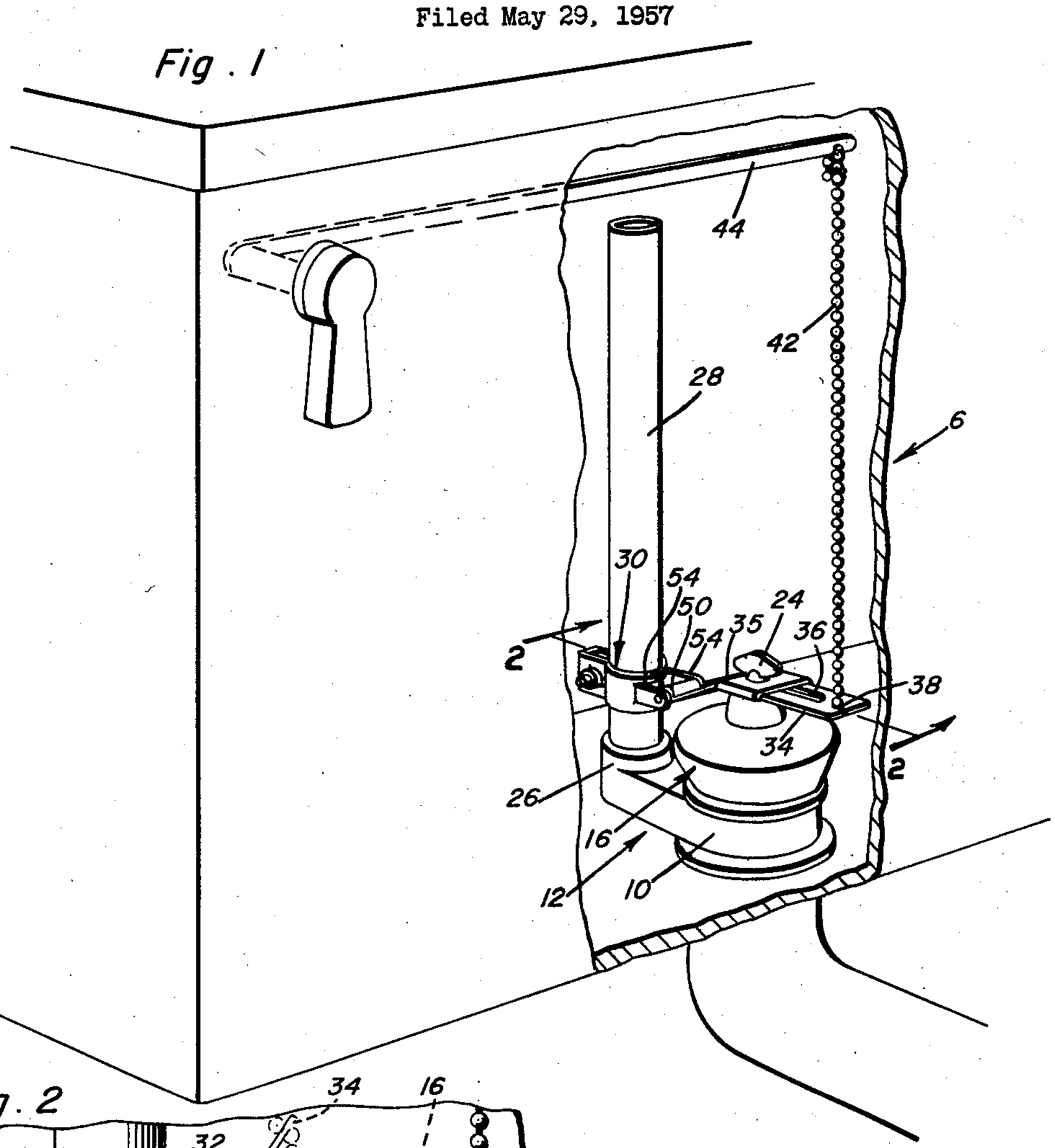


Fig. 2

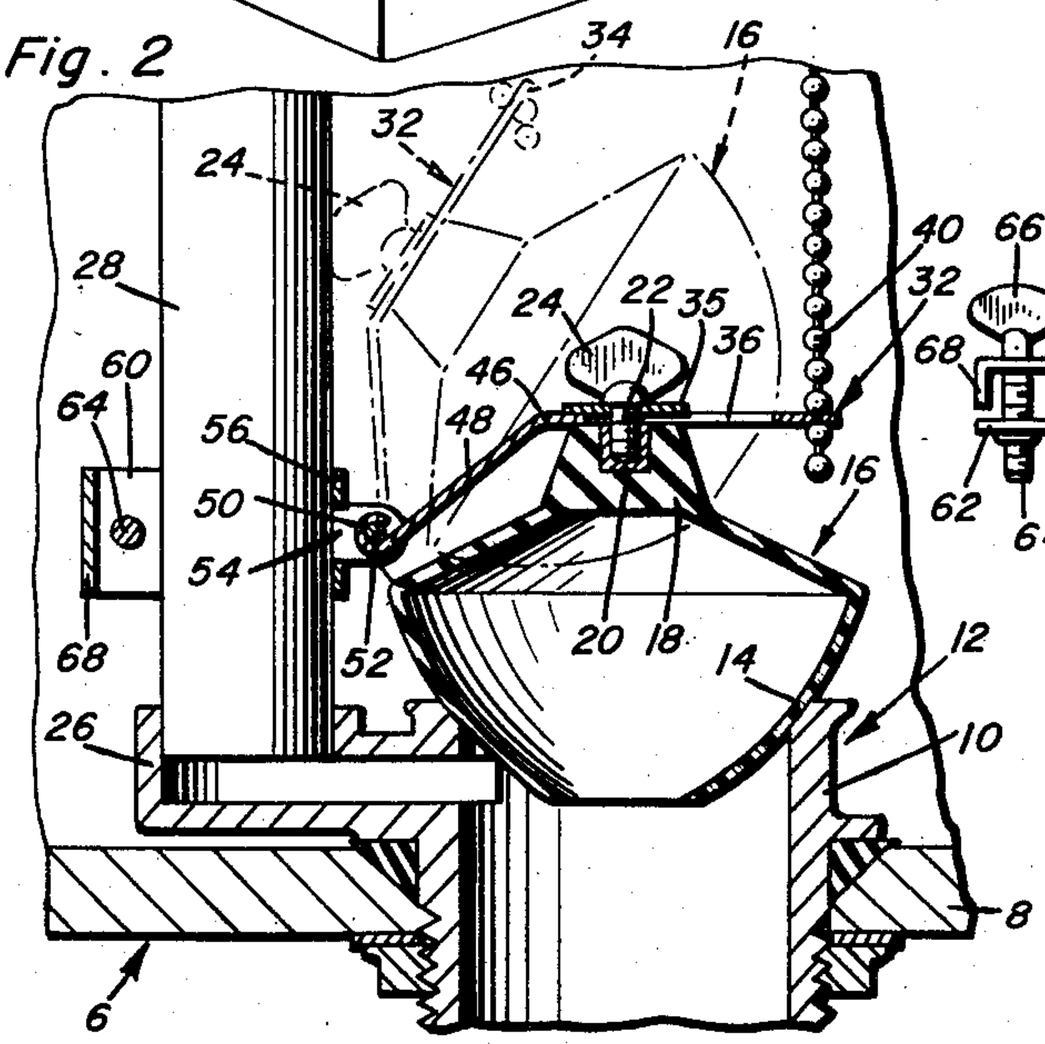
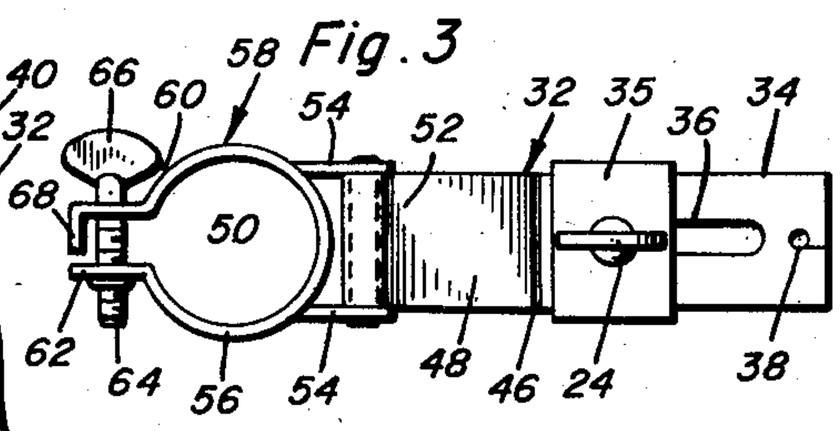


Fig. 3



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FLUSH TANK AND OPERATING MEANS THEREFOR

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4 Claims. (Cl. 4—57)

The present invention relates to certain new and useful improvements in a flush tank valve, a supporting and operating arm for said valve, and a bracket to which a cooperating end of the arm is connected and which, in turn, is constructed to be readily and adjustably mounted on the usual upstanding overflow pipe.

The art to which this invention relates is well developed. Many and varied attempts have been made by others working in this line of endeavor to solve the problem of more satisfactorily supporting and operating tank valves. An objective in the instant matter is to structurally, functionally and otherwise improve upon the mounting bracket and supporting arm and, in doing so, to provide a more novel selection and assemblage of parts and to better comply with the manufacturing requirements and economies of manufacturers, and the needs of plumbers, users and others interested in developments of this line of endeavor.

A further object, generally speaking, is to improve upon and reduce the number of parts entering into the over-all combination, thereby not only increasing the efficiency of the structural assemblage as a whole, but rendering the same less costly to manufacture and to otherwise simplify factors of assembling, sale, installation, and repair.

The concept also has to do with an adaptation which, as a novel entity, lends itself to cooperative and efficient use on and in conjunction with conventional flush valve components, standard fasteners, and involves the use of a flush valve that not only operates better, but virtually insures trouble free service and long and efficient operation.

In carrying out the principles of the invention, a practical structural adaptation is provided which is characterized by simplicity, is constructed of rigid materials, involves the use of a hinge which is employed in such a manner that its respective parts perform the function of attaching the device to the overflow pipe of a flush tank for support and to accurately guide the ball valve in both opening and closing positions.

Novelty is also predicated on a construction utilizing rigid materials that accurately and unfailingly places the sealing lip of a flush valve in the valve seat in a leak-proof position when the valve closes.

Briefly summarized, the invention in its preferred embodiment is characterized by a ready-to-install attachment embodying a buoyant ball valve which is cooperable with the seat on a conventional-type flush valve body. Means is utilized whereby the ball valve may be accommodatingly and operably supported from the overflow pipe within the confines of the very limited space between the axial center of the valve seat and the front segmental surface of the overflow pipe, that is, the surface nearest to the valve seat. The means, more particularly stated, has to do with an arm having one end portion free to swing upwardly and toward the overflow pipe in a prescribed limited arc. The free end portion of the arm normally assumes a horizontal plane which is parallel

to the horizontal plane of the valve body proper and is detachably and adjustably joined to the upper axial portion of the ball valve. Thus, it is adapted to accommodating a lifting chain. The other end portion of the arm adjacent to the overflow pipe is disposed in close proximity to the front surface of the pipe and has a hinge knuckle which is hingedly joined to a horizontal hinge or pivot pin carried by a portion of a cooperating attaching or anchoring bracket.

Other objects, features and advantages will become more readily apparent from the following description and the accompanying sheet of illustrative, but not restrictive, drawings.

In the drawing, wherein like numerals are employed to designate like parts throughout the views:

Fig. 1 is a fragmentary perspective view of a flush tank with a portion broken away to show conventional parts and also the improved flush tank valve and attaching and operating means, the valve being shown closed.

Fig. 2 is a view on an enlarged scale taken on the plane of the line **2—2** of Fig. 1, looking in the direction of the arrows and with parts in section and elevation, showing the valve closed in full lines and open in phantom lines.

Fig. 3 is a top plan view showing the attachment by itself with the flush valve or ball omitted.

It is common knowledge that those working in the line of endeavor under consideration rely on the buoyancy of the tank ball to keep the valve open during flushing. However, with the conventional arrangements, the tank ball must carry the entire weight of the vertically guided rod during flushing. This necessitates the employment of a very light and fragile rod and guide assembly that leads to early failure and the necessity of frequently "jiggling" the operating handle on the flush tank in an effort to get the valve to close completely. With my device the tank ball is attached to a hinged arm, the center of gravity of which is in a position approximately only 10 degrees from a vertical line drawn upward from the axis of the hinge pin when the valve is open or in flushing position. Therefore, more than 75% of the weight of the arm is carried by the hinge pin, with the remainder of the weight being supported by the buoyancy of the tank ball. Therefore, the arm to which the tank ball is attached can be of sufficient size and weight to permit the sturdiness in construction that promotes the unerratic operation and long trouble-free life of my invention.

With reference now to the description of the details and with further reference to Fig. 1, the numeral **6** designates a conventional flush tank, the bottom **8** (Fig. 2) of which is apertured to accommodate the neck portion or fitting **10** of the one-piece valve body **12**. The upstanding portion of the neck is provided as usual with a conical endless seat **14** for a conventional-type rubber or equivalent ball or tank valve **16**. The upper portion of the valve at **18** is provided with a socket or the like **20** to accommodate the shank of a screw-type fastener **22** having a thumb grip **24**. The left hand end portion of the valve body is of customary construction as at **26** and the lower end portion of the conventional overflow pipe **28** is connected thereto. These are all conventional parts except that in the instant invention it is the intention to sell the ball valve **16** as a part of the assembly or "attachment" as it is most frequently called.

The attachment includes the ball valve and the attaching and anchoring bracket **30** and flat strap metal or equivalent one-piece arm **32**. The median and right hand free end portion of the arm, denoted at **34**, has a lengthwise slot **36** therein to accommodate the shank of the screw **22**. The extreme free end is apertured as at **38** to accommodate the lower end portion **40** of an operating chain **42** connected with the operating arm **44**

in the manner seen in Fig. 1. The median portion of the arm is bent as at **46** and is inclined downwardly toward the pipe **28** as denoted at **48**. The end portion of the arm is curled or bent upon itself at **50** and fashioned into a hinge knuckle which is operatively connected with a stationary hinge pin **52** supported in the space between a pair of outstanding ears **54** on one side of the band or body portion **56** of a split collar **58**. The split end portions **60** and **62** have holes therein to accommodate the adjusting and retaining bolt **64** operated by the finger grip **66**. The free end of the arm portion **60** may be laterally bent as at **68**. This adjustable portion of the collar is diametrically opposite to the outstanding ears **54** and the width of the arm **48** is such that there is no undue lateral shifting or play of the knuckle **50** between the ears **54**. This split collar with its components is referred to broadly as a clamping and attaching bracket. Therefore, by way of a simple bracket, the unique arm described is properly hinged on the overflow pipe notwithstanding the limited space available between the center points of the overflow pipe and valve seat **14**.

The thumb screw may be attached to the arm by a common washer (not shown) or by way of the plate-like cleat **35**. This construction provides for accurate positioning of the tank ball in its seat in any of the conventional flush valve bodies on the market regardless of their make or variation in center-to-center dimensions between the overflow pipe and valve seat. Thus, it will be necessary to manufacture only one size and type of this device to accommodate all makes of conventional flush valves.

The invention is designed to employ as its sealing element the common and very inexpensive tank ball obtainable in almost any and every hardware, plumbing establishment, 5 and 10¢ store, and so on. The invention is such that accuracy of placing the tank ball in the seat is provided for, and consequently the tank ball has a much longer service life than when used with the common guided rod assembly (not shown).

Manifestly, a special ball if the same were necessary would be more costly and would place the retail price of the overall adaptation, including the ball, above a price which the instant invention may be sold for. The prospective customer knows that the common tank ball is readily obtainable in the average hardware store or plumbing supply house and even in five and dime stores and may be reluctant to purchase a product employing a special ball that may not be universally available. To the average person, a tank ball is just the part in a flush tank that poses troublesome problems when the components it operates in conjunction with become worn. This is evidenced, to some extent, by the number of patents which have already issued on constructions intended to eliminate tank ball trouble. However, to the engineer, the ball is a scientifically designed component. Its thin spherical seating section, conical shaped heavier upper section and hollow construction with the discharge opening in the bottom are all engineered for compatibility with the natural laws governing its successful operation when employed with components that will always keep it in a perpendicular position throughout the complete cycle of sealing, flushing and return to its sealing position. The thin spherical seating bottom portion provides flexibility, a compensating factor adapted to function even under conditions of slight misalignment of the axis of the ball with the axis of the valve seat. Undue misalignment or excessive pressure on one side of the seat compared to the other sets up strains in the seating section that soon produces uneven surfaces through which water escapes. The comparatively heavy upper conical section is designed to the correct weight so that gravity, plus hydrostatic pressure imposed on its conical surface will hold it in its seating position with a uniformity of pressure for the

full 360° of the seat that can only be altered by malfunctioning of other components it cooperates with. The hollow construction with an opening in the bottom provides atmospheric pressure on the inside of the ball when it is seated and eliminates buoyancy that would cause the ball to rest only lightly on its seat. When seated the ball is heavier than water and it seats naturally. However, when the ball is raised for flushing, the air is trapped within it and the ball becomes buoyant and floats. This bouyancy factor prevents the ball from sinking back to its seat through gravitation or being sucked down to its seat by the vacuum caused by the outrushing water until the tank is almost completely empty and flushing cycle is complete.

It is also worthy of note that the common ball valve is designed to float naturally to its seat with no firm means to guide it there other than its characteristic shape which, through its compatibility to the hydrostatic pressure encompassing it that it is intended to seat evenly and with equal pressure on the full 360° of its seat. Therefore, in pivotally swinging it to its seat great care must be exercised in selecting a pivotal point that will, as near as possible, duplicate the evenness of seating pressure on the entire seat. The instant invention has to do with the construction, as is evident, which allows for uniform pressure of the ball on its seat, eliminating strains that would cause wrinkling of the seating surface and premature failure of the ball due to leakage.

When the ball **16** is in the phantom line position shown in Fig. 2 there is still a small amount of air in the upper portion of the ball contributing to the overall buoyancy factor. The lowermost portion of the ball in this position is in close proximity to the valve seat and the space between the ball and discharge opening of such size that outflowing water has a lifting action on the ball with a resulting tendency to tumble the ball towards the overflow pipe thus placing the center of gravity almost directly above the pivot points **50** and **52**. In the full line position it will be noted that the tank ball is resting on its seat with an angular pressure of approximately 22° on the side adjacent the pivot point. By placing the point of pivot on a horizontal plane near midway near the top and bottom of the tank ball and vertically as near the discharge opening axis as possible, any pressure exerted on the ball, either hydrostatic or by gravity, can be no less than 16° toward the side of the seat opposite the side where the ball makes contact at a 22° pressure angle. Thus, the true angular pressure of the tank ball on the portion of the seat adjacent the overflow pipe can be no greater than 6° which is self-corrected through the very flexible upper portion of the ball where it is attached to the lifting and lowering arm.

The invention, without change or adjustment, adapts itself to all common or conventional flush valves regardless of the make or variation in center-to-center dimensions. It is believed that the device shown is the only one in the field that is of such design as to permit the use of rigid materials of sufficient weight in its manufacture to promote the necessary strength and wear resistance to insure long and lasting trouble-free service. The invention requires the removal of no parts of the old assembly it replaces that necessitates the use of screwdriver, pliers, wrenches or other tools. When common thumb screws are used as fasteners, no tools of any kind are required for the installation of the invention.

By considering the stated objectives, the description of the details and features and advantages in conjunction with the views of the drawing, a clear and comprehensive understanding of the invention, mode of attachment and use will be clear. Consequently, a more extensive description is believed to be unnecessary.

Minor changes in shape, size, materials and rearrangement of parts may be resorted to in actual practice

without departing from the spirit of the invention or the scope of the invention as claimed.

What is claimed as new is as follows:

1. For use in conjunction with a conventional flush tank having a water discharging outlet; in combination, a flush valve body having a valve seat registering with said outlet, an upstanding overflow pipe at right angles to said valve seat and communicatively and operatively attached at its lower end to said body, the lower portion of said overflow pipe presenting a front surface portion which, being in close proximity to the valve seat and axis of the seat, defines a confined and appreciably limited space and pivot point between the pipe and seat, a common ball tank valve cooperating with said seat, a bracket embodying a collar embracing and adjustably and detachably mounted on said overflow pipe and disposed in a plane below the upper portion of the valve and above the plane of the valve seat, that portion of the collar which is adjacent to said valve being confined in said limited space and being provided with a pair of outstanding vertical ears, a horizontal hinge pin bridging the space between and secured to said ears, a strap metal arm having a flat horizontal slotted portion at one end portion overlying and detachably and adjustably connected with the axial upper portion of said valve, that portion of the arm between said flat portion and said ears being of a length less than the distance between the overflow pipe and the axial center of said valve and being inclined downwardly toward said ears and the terminal thereof being bent upon itself and fashioned into a hinge knuckle, the length of said knuckle being approximately equal to the distance between said ears, said hinge knuckle embracing said pin and being confined for angular rotation on the pin between the ears.

2. The structure defined in claim 1 and wherein said pivot pin is in a plane well below the plane of said slotted one end whereby the center-to-center axial relationship of the valve seat and vertical axis of the overflow pipe results in the center of gravity of said arm assuming a position which is approximately 10 degrees from a vertical line drawn upwardly from the axis of the hinge pin joint when the valve is open, whereby when the valve is closed it seats itself with even seating pressure for the full 360° of the seat.

3. A ready-to-use attachment for the usual overflow pipe in a flush tank comprising, in combination, a split collar having spreadable adjustably connected free end portions, said collar constituting a bracket and being adapted to be clamped adjustably around the overflow pipe, that portion of the collar diametrically opposite to the free end portions and having a pair of spaced parallel outstanding ears, a hinge pin spanning the space between and having its end portions fixed to the respective ears, a strap metal arm having a flat end portion provided inwardly of its free end with a centralized lengthwise slot, the other end portion of said arm being obliquely bent downwardly and terminating in a hinge knuckle, the terminal end of said knuckle being spaced from the downwardly bent portion and said downwardly bent portion serving to assist in piloting an anti-corrosion chemical or the like along its surface and between the ears and into the knuckle by way of the space existing between the terminal of the knuckle and adjacent the surface of the arm, said knuckle being hingedly connected to said pin and confined for operation between the ears, a ball valve of a conventional-type, and a connecting screw provided with a finger grip, said screw passing through the slot and being detachably connected to the upper axial portion of said valve, said finger grip being disposed in a plane above the slotted portion of said arm, the over-all length of said arm being comparable with the largest diameter of said ball valve and said knuckle occupying a position outwardly of but close to the adjacent perimeter portion of said valve.

4. A ready-to-use attachment for the usual overflow pipe in a flush tank comprising a bracketing collar adapted to embrace and be adjustably and removably mounted on said overflow pipe, said collar comprising a split band having outstanding free end portions which may be spread apart so that the band may be opened up and readily slipped laterally into position over the overflow pipe by way of the restricted or limited space existing between the overflow pipe and an adjacent valve seat and then brought together and bolted by a bolt carried by said end portions, the median portion of said band having a pair of ears struck out therefrom and extending radially beyond the outer periphery of the band, said ears being located diametrically opposite to the aforementioned end portions, said ears serving, in conjunction with the end portions, to readily designate the required position of the ears when in use, a hinge pin spanning the space between and having its end portions fixed to the respective ears, a strap metal arm having a flat end portion which is adapted to overlie the central top portion of a ball tank valve and having adjustable means thereon whereby it may be detachably and adjustably connected with said ball tank valve, the remaining intermediate and opposite end portions of said arm being bent downwardly and terminating in a curl fashioned into a hinge knuckle, this terminal end of said knuckle being spaced from said downwardly bent portion, said knuckle being of a length approximately equal to the space existing between the inner surfaces of said ears and being hinged to said hinge pin, said terminal end defining a space between itself and the upper surface of said bent portion to facilitate placing an anti-corrosion chemical or a lubricant into said knuckle, the over-all length of said arm being comparable with the largest diameter of the ball valve with which it is adapted to cooperate.

References Cited in the file of this patent

UNITED STATES PATENTS

419,566	Scott	Jan. 14, 1890
2,546,766	McWilliams	Mar. 27, 1951
2,731,646	Hughes	Jan. 24, 1956
2,776,437	Detjen	Jan. 8, 1957
2,779,028	Branch	Jan. 29 1957
2,781,520	Micek	Feb. 19, 1957