Feb. 20, 1968 R. E. HAROLD 3,369,259

FLUSH TANK FLAPPER VALVE

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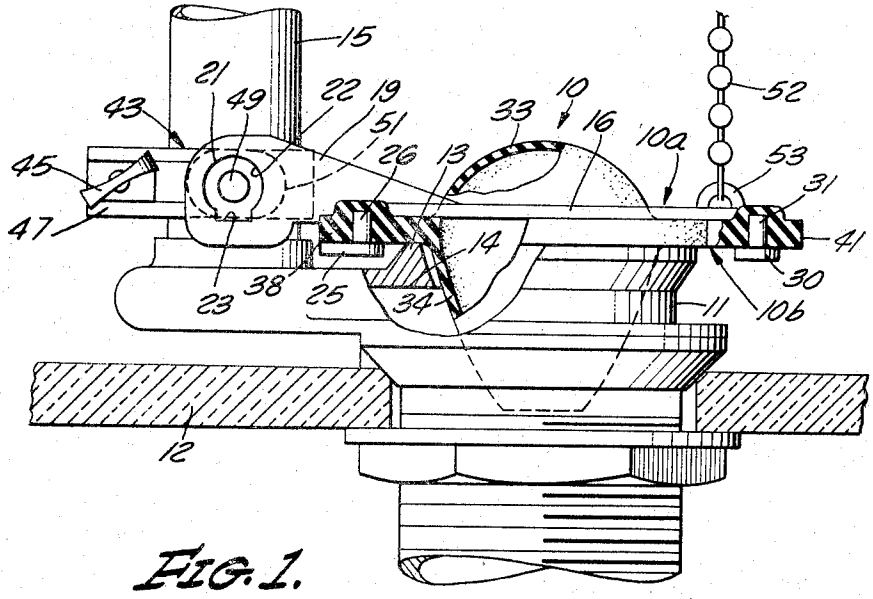


FIG. 1.

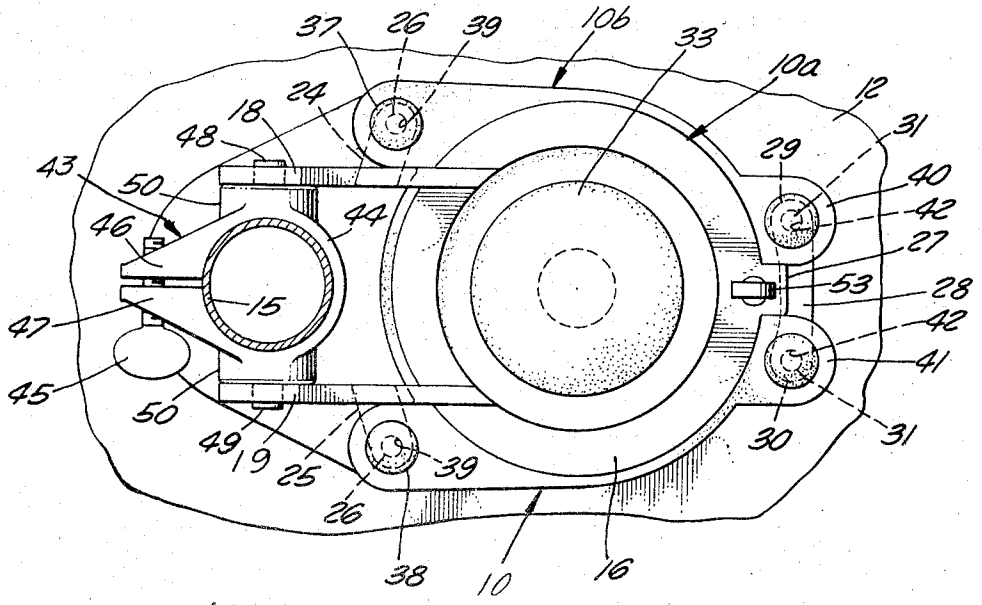


FIG. 2.

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FIG. 3.

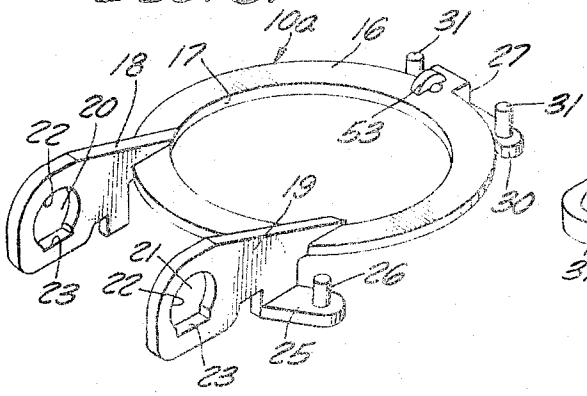
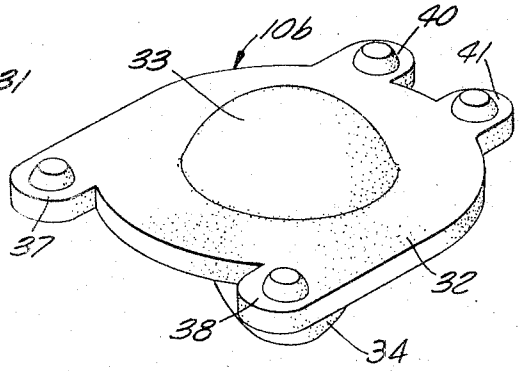


FIG. 4.



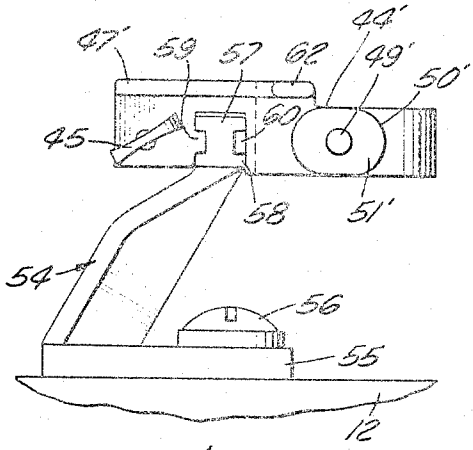
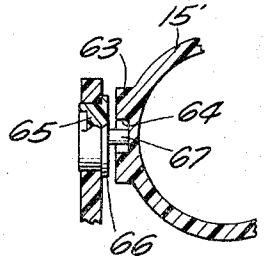


FIG. 5.

FIG. 7.



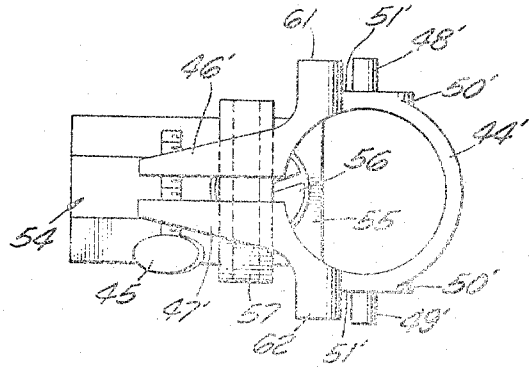
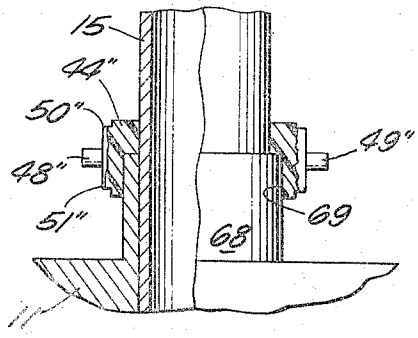


FIG. 6.

FIG. 8.



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FLUSH TANK FLAPPER VALVE

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10 Claims. (Cl. 4—57)

ABSTRACT OF THE DISCLOSURE

A composite ball valve of the flapper type for a flush tank in which a rigid frame structure is pivotally supported on a fixed clamp member attached to a fixed bracket or a pipe, the frame structure having spaced arms laterally deflectable to engage associated trunnions, the rigid frame having a ring body from which the arms extend in parallel, and a valve member of rubber carried by the frame, the valve member having a generally rectangular body with a flat peripheral marginal portion from which a rounded dome wall extends upwardly through the ring body of the frame and a downwardly tapered frusto-conical wall extending below the marginal portion, the frame and valve member being releasably interconnected by a plurality of upstanding pins carried by the frame arranged to seat into recesses or sockets in the marginal portion of the valve member.

The present invention relates generally to valves for outlets of toilet flush tanks and the like, and is more particularly concerned with improvements in valves of the flapper type and its means of attachment and support.

Heretofore, flapper valves have in the main been constructed with a more or less resilient material with a valving part being integrally formed with its attaching arms. These prior structures also included separate means such as cork, floats and the like to provide the requisite buoyancy characteristics for efficient operation. These structures inherently embodied compromises in design which were undesirable and prevented the various parts from fulfilling their objectives and purposes to the fullest.

Having the foregoing in mind, the present invention has for one object the provision of a separately formed carrier mounting bracket of a substantially rigid material, and removably attached valve seat member of resilient material having a built-in buoyancy chamber.

A further object is to provdie a valve of the flapper type with attaching means by which the valve may be selectively adapted for different types of mountings such as upon the overflow tube, the seat member or support mounted directly upon the tank floor.

A further object is to provide a valve structure of the flapper type which includes a resilient valving member of the ball type which is releasably attached to a rigid or semi-rigid carrier bracket in such a manner that the valving member is permitted in closed position to flexibly accommodate to the associated seating surface.

A further object resides in the provision of a flapper valve in which a substantially rigid carrier member releasably supports a resilient valve member in such manner that it can quickly and easily be removed for replacement without the need of tools.

Another object is to provide as an article of manufacture a flapper valve constructed from a resilient material having a high degree of buoyancy, and which includes a built-in buoyancy chamber.

It is also an object to provide as an article of manufacture, a valve carrier bracket of rigid or semi-rigid material having projecting arms which are rigid in a vertical direction, but may be laterally deflected from a normal position for attaching the carrier bracket to a support.

Yet another object is to provide as an article of manufacture, an improved clamp type fitting for attaching the flapper valve unit to a supporting structure.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is an elevational view of a flush tank discharge valve according to the present invention, as applied to a typical flush tank, portions being cut away to reveal certain features of construction;

FIG. 2 is a fragmentary top plan view of the structure shown in FIG. 1;

FIG. 3 is a perspective view of the carrier bracket of the valve unit;

FIG. 4 is a perspective view of the ball valve of the unit;

FIG. 5 is an elevational view of an alternate supporting structure for the valve unit;

FIG. 6 is a plan view of the mounting shown in FIG. 5;

FIG. 7 is a fragmentary detailed sectional view of a modified pivotal mounting for the valve unit; and

FIG. 8 is a fragmentary elevational view, partly in section, showing a modified construction of clamping means for mounting the valve unit.

Referring more specifically to the drawings, particularly FIGS. 1 and 2, the valve unit of the present invention as generally indicated by the numeral **10** is shown as being operatively associated with the outlet portion of a flush tank such as utilized for toilets, water closets and the like. The installation includes, in the illustrated form, an outlet fitting **11** securely mounted within the outlet portion of a flush tank bottom wall **12**. The outlet fitting has an annular seat surface **13** at the upper or inner end of an outlet opening **14** therethrough and which is in communication with an overflow tube **15** in laterally offset relation to the outlet opening. Although, in the present instance the fitting is shown as comprising a separate unit, in some flush tank constructions the valve seat and overflow means are formed integrally with the tank. The valve unit **10** is of two part construction and comprises a carrier bracket **10*a*** as shown in FIG. 3, and a flapper ball valve member **10*b*** as shown in FIG. 4. The construction of these separate parts will now be described, together with the manner in which they are interconnected to form the composite valve unit.

The carrier bracket is fabricated by molding or other appropriate technique so as to form an integral structure from an appropriate rigid or semi-rigid plastic or other suitable material. The carrier bracket is formed with a flat ring body **16** having a central opening **17** therein. A pair of extensions **18** and **19** are integrally formed at one side of the ring body and extend therefrom outwardly in spaced apart parallel relation to provide a pair of arms by means of which the carrier bracket may be supported in an operative position in a manner which will subsequently be explained. It will be observed that these extensions are of increasing height towards their outmost ends and are provided with aligned keyhole openings **20** and **21** respectively, each of these openings being formed with an upper circular portion **22** which is in communication with a lower straight edged portion **23** in each case. As thus constructed, the extensions are relatively rigid in a vertical direction, but may be laterally deflected from a normal parallel position.

The extensions **18** and **19** respectively have integrally formed outwardly extending projections **24** and **25** which form supports for upstanding pin members **26** in each case. At the opposite side of the ring body **16**, the body

is formed with a downwardly deflected extension **27** which has its lower end connected with a cross bar **28**, this bar at its ends providing laterally extending projections **29** and **30** that respectively support upstandnig pin members **31** in each case. It will be observed that the lateral spacing of the pins **26—26** is of greater distance than the distance between the pins **31—31**. Also, it will be noted that the projections **24**, **25**, **29** and **30** are at a level below the level of the ring body **16**.

The flapper ball valve member **10***b*, as shown in FIG. 4, comprises a unitary structure which is molded or otherwise formed from a resilient plastic material having a high degree of buoyancy. The valve member is of substantially rectangular configuration and formed to provide a peripheral substantially flat marginal portion **32** which surrounds a central upwardly bulged rounded dome wall **33** and a downwardly projecting frusto-conical wall **34**, these walls coacting to provide a buoyancy chamber **35** for the valve member. The lowermost end of the buoyancy chamber communicates with an opening **36** (FIG. 2) at the small end of the frusto-conical wall **34**. At one side of the valve member, the marginal portion **32** is provided with projections **37** and **38** which are formed with downwardly opening recesses **39** which have the same distant spacing as the pins **26—26** of the carrier bracket. At the opposite side, the marginal portion is provided with projections **40** and **41** which are similarly provided with recesses **42—42** having the same spacing as the pins **31—31** of the carrier bracket.

As shown in FIGS. 1 and 2, the carrier bracket and flapper ball valve member are assembled by placing the latter on the underside of the ring body **16** so that the rounded dome wall **33** will extend upwardly through the central opening **17** of the carrier. The valve member is releasably suspended in this position by placing the projections of the valve member above the projections of the carrier bracket and inserting the associated pins on the carrier into the recesses in the projections of the valve member. As thus arranged, the valve member will be suspended at four spaced points from the carrier so that it will be free to accommodate to the seat surface **13** during its operation.

As shown in its mounted position in FIGS. 1 and 2, the extensions **18** and **19** are in straddled relationship to the overflow tube **15**. In this mounting, the valve unit is pivoted for swinging movement by means of an attaching fitting **43** which comprises a split sleeve **44** which is adapted to surround the tube **15** and to be clamped thereon by means of a clamping screw **45** contained in a pair of projecting arms **46** and **47** which are integrally formed and extend from the ends of the split sleeve. Diametrically on opposite sides of the sleeve **44**, the sleeve carries a pair of outwardly extending trunnions **48** and **49** which extend from an enlarged base portion **50** in each case and which is formed with an ovate abutment bearing surface **51**.

By utilizing the above described fitting, the valve unit is mounted for swinging movement by means of a flexible chain **52** which is attached to the ring body **16** of the carrier bracket by means of a fixed eyelet **53**, this chain connecting with the flushing mechanism (not shown) of the flush tank. The extensions **18** and **19** have their outer ends normally spaced a distance which is less than the distance between the end extremities of the trunnions **48** and **49**. By deflecting the outer ends of the extensions apart, the extension ends can be slipped over the ends of the trunnions, and upon being released the extensions will occupy their normal position and cannot move to a position wherein they would be detached from the trunnions. It will be observed in FIG. 1 that the keyhole openings at the outer ends of the extensions are in loosely surrounding spaced relation in each case to the associated trunnion so that there will be no binding effect which will interfere with the seating of the valve unit. The valve unit adjacent its seated position is free for shifting movement within the limits of the circular portion **22** of the opening, but in the raised position of the valve unit additional movement is provided by the straight edged portion **23** of the opening which permits the associated pivot to move into a dwell position at one corner thereof.

In some flush tank embodiments, the seating surface **13** is integrally formed with the ceramic material of the flush tank bottom wall, and instead of having an overflow tube **15**, the overflow is constructed as a constituent integral part of the tank strucure. In such cases it is not possible to have a clamping fitting which can be attached to the overflow tube. A different arrangement therefore has to be provided for supporting the valve unit, and for such purpose there is provided a post type fitting **54** having a lower end base portion **55** which is anchored by means of a mounting screw **56** so as to project upwardly from the tank bottom. In the embodiment shown, the post fitting at its uper end carries a transversely extending I-bar **57** which has its ends extended on opposite sides of the post. In the case of this type of mounting, a modified clamping means with respect to that previously described, is provided. Similar parts are indicated in FIGS. 5 and 6 by primed numerals. In this modified form, the arms **46′** and **47′** are provided in each case with an opening **58** into which side tongues **59** and **60** project so as to provide a slidable keyed connection with the I-bar **57** and retain the fitting against rotative movement on the bar. Since in this type of mounting there is no overflow tube, other means have been provided to limit the upward swinging movement of the valve unit. For such purposes, the split sleeve is provided adjacent its ends with projecting abutments **61** and **62** which are positioned adjacently above the trunnions **48′** and **49′** in the swinging path of movement of the carrier extensions **18** and **19**.

In other types of installations, the overflow tube **15** may be constructed of a plastic and contain integrally formed side portions **63**, as shown in FIG. 7, which have recesses **64** adapted to receive a trunnion which forms a part of the valve unit support. In such cases, the extensions **18** and **19** of the present invention may be readily adapted for such a mounting. For such purpose, a disc-like insert **65** is provided to be placed in each of the openings **20** and **21** of the extensions. This insert is inserted from the inner side of the extension and is provided with a projecting flange **66** to limit the amount of movement and properly position the insert in the extension opening. The insert carries a central projecting trunnion **67** which is adapted to enter an associated recess **64**. These reversed trunnions provide proper pivotal support for the valve unit when used with such modified overflow tubes.

Other installations, as shown in FIG. 8, may include a fitting **11** in which the overflow tube is supported within a relatively higher tubular collar **68** than in the usual arrangement. In such cases, the utilization of clamping means having a split sleeve of a size to fit the overflow tube would result in mounting the trunnions at two high an elevation to permit proper operation of the valve unit. In such cases, the fitting sleeve is provided with a counterbore **69** which permits the sleeve to slide over the collar portion and thus lower the elevated position of the trunnions to a proper operating position.

From the foregoing description and the drawings, it will be clearly evident that the delineated objects of the invention will be accomplished.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form shown or uses mentioned, except to the extent indicated in the appended claims.

I claim:

1. In valve closure means for use with a flush tank or similar tank having an outlet and an adjacent upstanding fixed member:

(a) valve closure means for said outlet;

(b) a pair of arms extending from said means, said arms being vertically substantially rigid and laterally

resiliently deflectable from a normal position and having apertures adjacent their ends; and

(c) clamp means for gripping an elevated part of the fixed member including diametrically opposed trunnions extending therefrom into said apertures and planar abutment surfaces respectively extending around the base ends of the trunnions in right angled relation to the trunnion axis, said apertures being of a size to loosely surround said trunnions, and said trunnions having a greater spacing between their ends than the normal spacing between said apertures, but enabling passage of said apertured arms thereover when deflected.

2. In valve closure means for use with a flush tank or similar tank having an outlet and an adjacent upstanding fixed member having aligned openings on its opposite sides:

(a) valve closure means for said outlet;

(b) a pair of arms extending from said means, said arms being vertically substantially rigid and laterally resiliently deflectable from a normal position and having apertures adjacent their ends; and

(c) removable disc inserts respectively for said arm end apertures, said discs having central projections adapted to form inwardly facing trunnions positionable in the openings of the fixed member upon deflection of said arms.

3. As an article of manufacture, a carrier bracket for a flush tank outlet valve, comprising:

(a) a ring body of a substantially rigid material

(b) a pair of integrally formed extensions at one side of said ring providing spaced parallel arms having aligned openings at their outer ends;

(c) laterally extending projections respectively positioned on opposite sides of said extensions;

(d) laterally extending projections at the opposite side of said ring; and

(e) upstanding pins respectively supported by said projections.

4. An article of manufacture according to claim 3, wherein the pins on the first mentioned projections are spaced apart a greater distance than the pins on the secondly mentioned projections.

5. An article of manufacture according to claim 3, wherein the openings at the outer ends of the extensions are substantially key-hole shaped with a circular upper portion and a straight sided bottom portion.

6. An article of manufacture according to claim 3, including removable disc inserts for the openings at the outer ends of the extensions having central projections adapted to form inwardly facing aligned trunnions for said extensions.

7. As an article of manufacture, a flush tank outlet valve, comprising:

(a) a generally rectangular shaped body of resilient material having a peripheral flat marginal portion;

(b) a hollow integrally formed portion providing a buoyancy chamber surrounded by said marginal portion and having a rounded dome wall extending above the marginal portion and a downwardly tapered frusto-conical wall extending below the marginal portion; and

(c) a plurality of support projections extending from the marginal portion of said body.

8. An article of manufacture acording to claim 7, wherein the support projections have downwardly opening end recesses.

9. An article of manufacture according to claim 7, wherein the projections are arranged in pairs on opposite sides of said body, and on one of said pairs the projections are spaced apart a greater distance than in the other pair.

10. As an article of manufacture, a clamp fitting for attaching a flapper valve for a flush tank outlet, comprising:

(a) a split sleeve of semi-rigid flexible material having outwardly projecting substantially parallel arms extending from the sleeve ends, said arms including flanged portions having parts for making sliding non-rotatable keyed engagement with an associated post support member;

(b) diametrically aligned trunnions projecting from opposite sides of said sleeve, said sleeve at the base of each trunnion being formed to provide a planar abutment surface extending around the trunnion in right-angled relation to its axis, and said sleeve at its upper end being formed with abutment shoulders above the trunnions to limit swinging movement of a flapper valve pivoted thereon; and

(c) means for moving said arms towards and away from each other to motivate the split sleeve into clamping and non-clamping positions.

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