Dec. 25, 1956 A. B. NELSON ET AL 2,774,972

FLAPPER DISCHARGE VALVE FOR FLUSH TANKS

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Fig. 1.

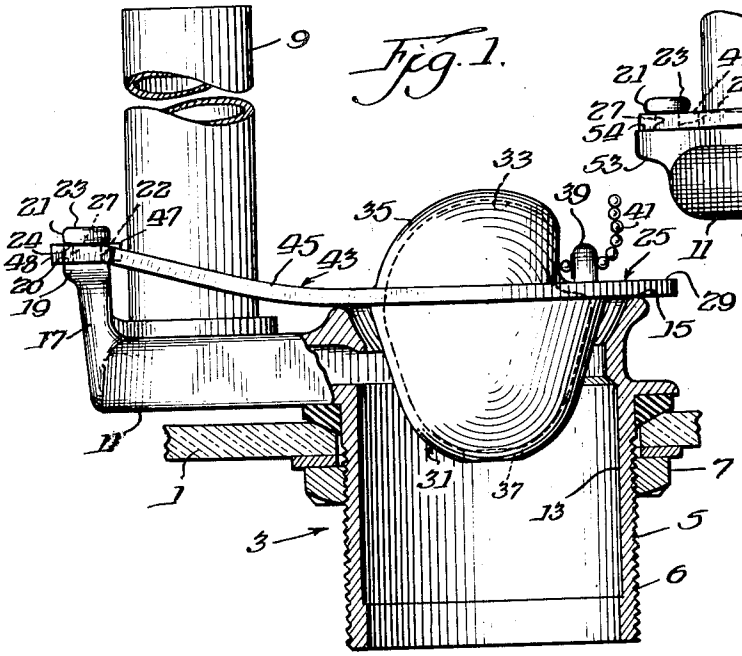


Fig. 3.

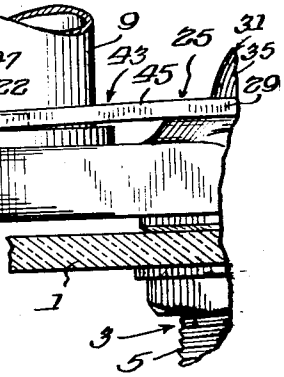


Fig. 2.

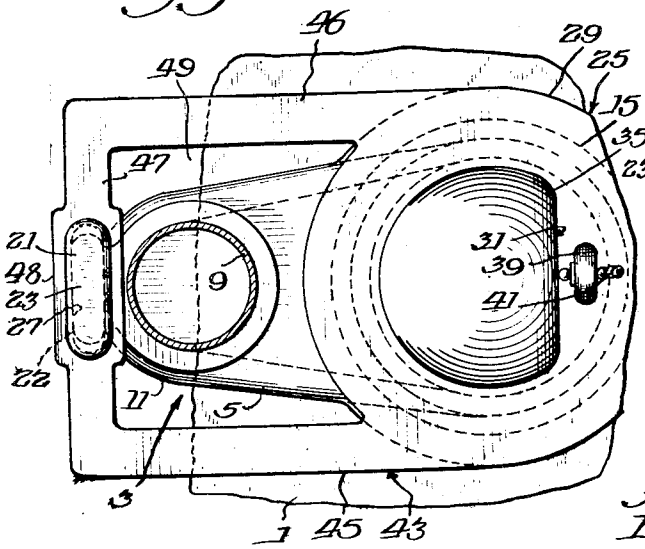
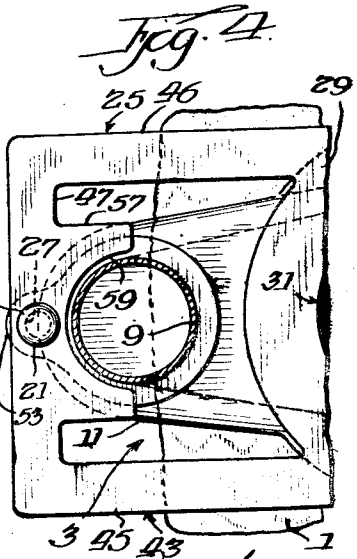


Fig. 4.



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Fig. 5.

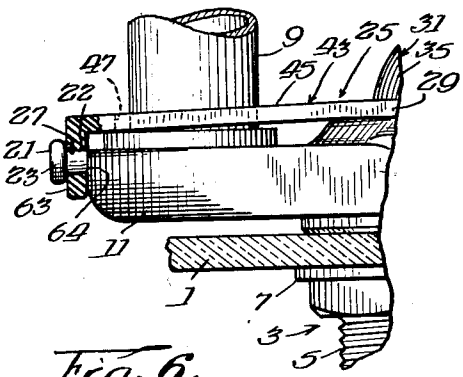


Fig. 8.

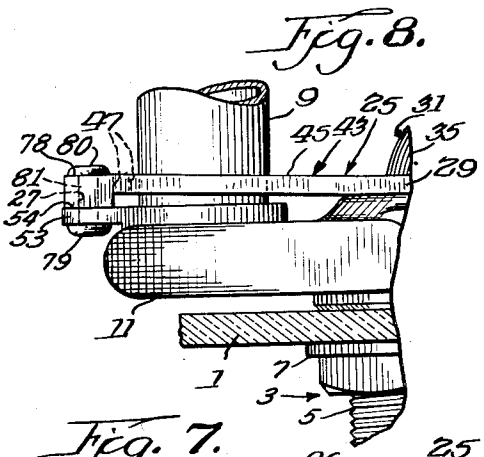


Fig. 6.

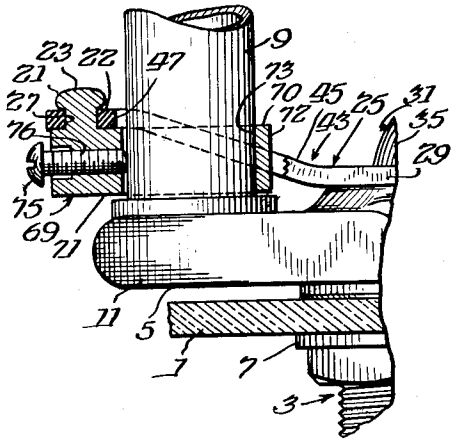
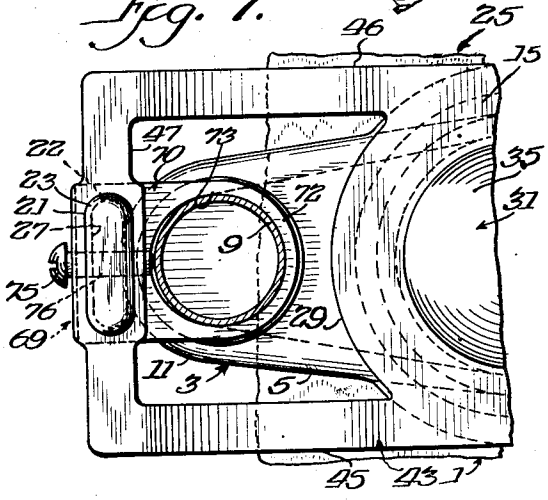


Fig. 7.



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Fig. 9.

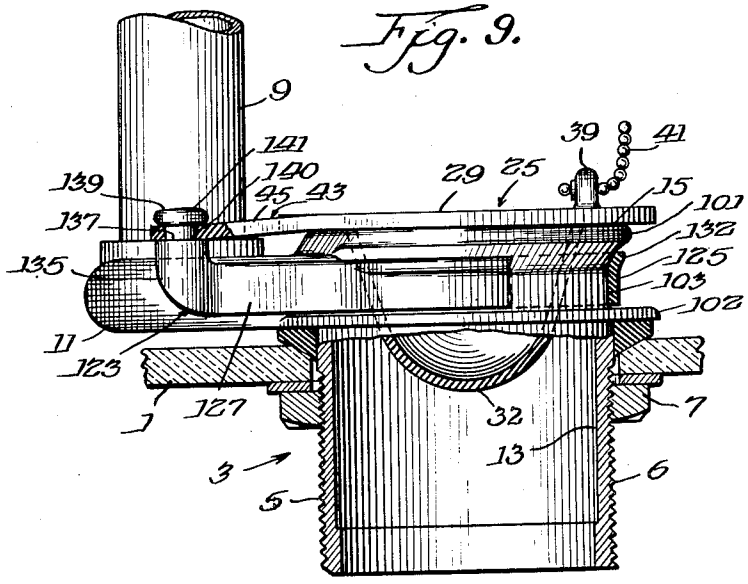
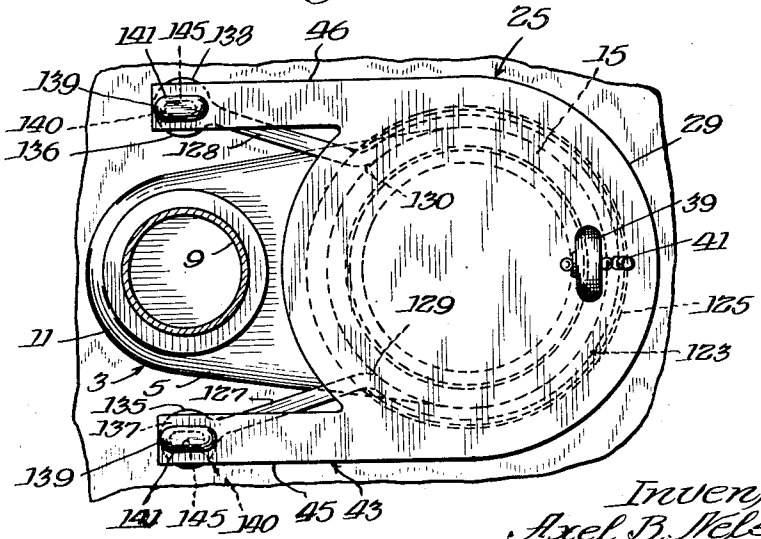


Fig. 10.



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Fig. 11.

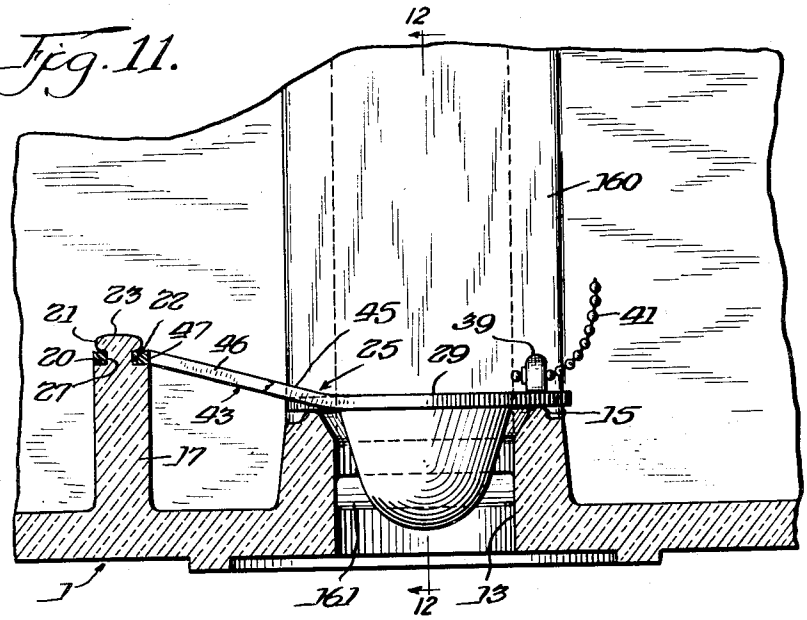
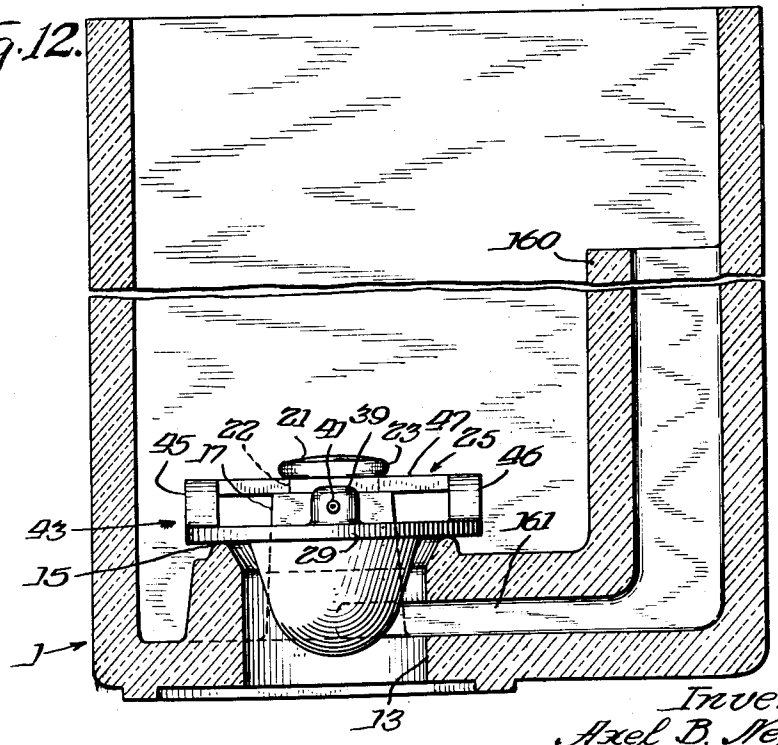


Fig. 12.



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FLAPPER DISCHARGE VALVE FOR FLUSH TANKS

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Application December 10, 1953, Serial No. 397,456

6 Claims. (Cl. 4—57)

This invention relates generally to valves, and more particularly, it concerns discharge valves for flush tanks or the like.

In one of these types of valves presently known, a one-piece rubber flapper member is employed which extends around and resiliently grips the overflow tube for its positioning. To mount this member, however, it must first be stretched over the overflow tube and then pulled or otherwise worked down the entire length thereof into operative position at the bottom against the frictional resistance that is relied on to keep it in position. Further, the mounting is subject to loosening because of deterioration, flow or loss of resiliency of the rubber, permitting the flapper valve to eventually change its position, thus impairing proper valve operation or even preventing valve closure. The present invention constitutes an improvement over the above general type of valve.

It is accordingly one of the important objectives of the invention to provide a flush valve or the like in which the flapper member loosely slips over the overflow tube for ease of mounting or, the overflow means may be repositioned or eliminated entirely in other forms of the invention.

Another important object is to provide a valve in which the flapper member is positively attached to prevent moving of the flapper member upwardly and out of position.

A further object is to provide a valve in which the flapper member is also retained and supported sidewardly in proper alignment for predetermined closing engagement with the valve seat.

Still another object is to provide a comparatively simple button on means for attachment of the flapper member.

A further object is to provide a valve in which the flapper member can be quickly and conveniently mounted in the first instance and as easily removed or replaced.

A still further object is to provide a flapper type valve which is simple and dependable in operation and is relatively easy and inexpensive to manufacture.

Other objects and advantages will become more apparent upon proceeding with the specification read in light of the accompanying drawings, in which

Fig. 1 is an assembly view of a preferred form of the present invention.

Fig. 2 is a top plan view of the same.

Fig. 3 is an assembly view of another form of the invention shown in broken section for convenience of illustration.

Fig. 4 is a top plan view of the latter form.

Fig. 5 is a fragmentary view of a slightly different form of valve.

Fig. 6 is a fragmentary assembly view of still another form of the invention.

Fig. 7 is a top plan view of the latter form.

Fig. 8 is a fragmentary view showing a different form of connection of the flapper member to the valve assembly.

Fig. 9 is an assembly view showing a modification of the latter form.

Fig. 10 is a top plan view of the same.

Fig. 11 is a sectional assembly view of another form of the invention.

Fig. 12 is a view taken on line 11—11 of Fig. 11.

Similar reference numerals refer to similar parts throughout the several views.

Referring to Figs. 1 and 2 of the drawings, the numeral 1 refers to the outlet portion of a flush tank for a toilet bowl or the like, shown fragmentarily, said portion being provided with an outlet opening and including a seat surface around the opening at the upper or inner end thereof and overflow means in fluid communication with the outlet opening. Although not necessary, as will be seen by referring briefly to Figs. 11 and 12, a separate member 5 is employed through which the fluid discharging from the tank actually flows and which contains the seat surface of the tank. This member may be the seat member in common use, as shown, modified to some extent for this invention. This member together with the usual overflow tube 9 connected thereto will be referred in this application as the valve seat assembly generally designated 3. The latter assembly comprises a ported seat member 5 actually extending through the floor of the tank and connected in fluid tight relation therewith by the usual means generally indicated at 7. The assembly also includes the overflow tube 9 as mentioned above which is secured as by welding or threading at the bottom to the hollow or ported side extension 11 of the seat member 5 through which the tube is in fluid communication with the port or passage 13 through the seat member. The latter port originates through the seat 15 at the top. Up to this point, the construction of the seat member is conventional. A separate discharge or outlet member may of course be provided in lieu of the portion 6 to which the ported seat member would then be connected by suitable means.

At the rear of the seat member or more particularly the side extension 11 thereof and behind the overflow tube 9 an upwardly extending portion 17 is provided which is adapted to support and position the flapper valve member 25 in a manner to be described hereinafter.

The upper part of the extending portion is preferably enlarged at 19 and formed to present the horizontally disposed surface 20. Extending beyond this surface is a post or projection 21 terminating in a second enlargement or button-like formation 23 spaced from the first enlargement and preferably presenting a downwardly directed flat surface 24 in parallel relation with the upwardly directed surface 20. Received within the reduced portion 22 of the post or button intermediate enlargements 19 and 23 is a flapper valve member 25 preferably of resilient rubber or the like, although a flexible material may be employed. This member is recessed or apertured at 27 for projection of the post 21 through the same and is adapted to conform to the side walls of the post when mounted for snug reception. The member is retained or anchored in position by engagement between the upper and lower faces or surfaces thereof with the flat surfaces 24 and 20, respectively of the extending portion or positioning means 17.

The flapper member is preferably of one-piece construction and comprises a circular closure portion 29 for seating engagement with the valve seat 15 in the closed valve condition. The closure portion includes a float element 31 which extends both above and below the plane of the closure portion around the same in the manner shown.

The front of the closure portion is provided with a projection 39 which is apertured for reception of a cord or pull chain 41 connected at the top to the usual operator (not shown) for lifting the valve member from its seat for the opening thereof. Extending from the rear of the closure portion and preferably along each side of the overflow tube is the attachment portion generally des-

ignated 43 and comprising a pair of spaced arms 45 and 46 and a cross piece 47 at the rear thereof. The crosspiece is of increased width near the center and is there provided with the recess or aperture 27 for snug reception of the post 21.

The flapper member 25 is easily installed or mounted in position for operation by simply allowing the same to drop loosely along the overflow tube through the open interior at 49 and slipping the recessed portion 48 of the cross bar over the enlargement or button head 23 and onto the reduced portion of the post or post proper in button on fashion, the portion around the recess stretching or deforming for admission and passage of the enlarged head 23. The closure member is as conveniently and easily removed for inspection or replacement by simply employing the reverse process.

In operation, the flapper member is secured substantially fixedly in the direction of swinging movement of the closure at one end in the region of its attachment to the post 21 and against vertical movement while being permitted to freely swing at the other into the open and closed positions, the flapper member flexing beyond its point of attachment.

It should be especially noted from Figs. 1 and 2, that the positioning means 17 is elongated near the top including the extending post 21 and the surfaces 20, 24 thereof. The recess or aperture 27 of the flapper member is likewise elongated to conform substantially to the reduced portion 22 of the post. This elongation is preferably normal or at right angles to the longitudinal axis of the seat member and flapper as shown and performs the very important function of preventing or reducing to a minimum any side movement or rotation of the flapper member about the post to preserve substantial alignment for the desired seating engagement and proper operation free from sticking. If allowed to shift laterally out of the preset position, not only is there a possibility of improper seating, but even more important, there is the likelihood of the closure portion canting and the float becoming lodged or wedged within the port 13 of the seat thereby causing the valve to become stuck in a partially open or closed position rendering it inoperative. This preventive measure constitutes one of the salient features of the invention and is not found in former valves of this type.

The present manner of mounting therefore represents a very simple and compact means for securing or fixing the flapper member in position crosswise or laterally as well as vertically for its swinging movement.

Although it is preferred to anchor or mount the flapper member above the plane of the valve seat as shown so that the same is under a somewhat stressed condition when closed to assist in the initial opening of the valve when the lever mechanism is first tripped, the post may extend directly from the seat member if desired without any appreciable elevation thereof.

This basic arrangement is illustrated in Figs. 3 and 4 wherein the post 21 extends from the outwardly extending flattened portion 53 of the seat member, the flapper valve being anchored or positioned for swinging movement as before between the flat surface here designated 54 at the bottom of the post and the enlargement or buttonhead 23 at the top. In these figures, however, the post and recess 27 of the closure member are shown as being round or circular to illustrate that this arrangement may also be used if desired in lieu of the elongated connection of Figs. 1 and 2. In the present instance, other provisions are had to prevent rotation or displacement of the flapper member sidewardly out of alignment for the proper opening and closing operation. This guidance broadly calls for direct cooperative engagement between the flapper member and at least a portion of the seat assembly. In Figs. 3 and 4, the crosspiece 47 has been inwardly or forwardly extended at 57 to partially enclose the overflow tube 9, being curved at 59 to conform with the same. Slight clearance is provided between the inside of the portion 57 and the overflow tube to avoid binding while still preserving the substantial alignment desired. Other arrangements may be had, of course, as for instance, guide elements may extend from each side of the seat member to lightly contact the inside of the arms 45, 46 to prevent appreciable sidewise movement.

Fig. 5 shows another circular button arrangement centrally disposed as before, but extending horizontally and rearwardly rather than vertically from the extending portion 11 of the seat member. The closure member 25 has been modified accordingly to extend downwardly at 63 for buttoning over the post 21 in the same manner as explained before through the recess or aperture 64. The depending portion of the flapper may be moulded, or otherwise shaped, to conform to and engage the curved rear end of the seat member or, as shown, the inner surface may merely be pressed tightly against a somewhat flattened rearmost portion of the seat member to provide substantial lateral stability and positioning of the closure member to prevent rotation thereof around the point of attachment. The downward formation of the flapper member at the rear and the horizontal means of attachment inherently tends to resist dislocation without special provision to this end; however, the extending formation of Fig. 4 may also be employed if desired as an added precaution against rotation.

In order to use the conventional seat member as is without requiring any changes thereof, the arrangement of Figs. 6 and 7 may be employed. Here, an adapter member generally designated 69 is provided for attachment to the seat assembly through the overflow tube 9 thereof. This member is flat on the top and bottom at 70 and 71 and is rounded at the front at 72. A recess or aperture 73 is provided near the front so as to slip over the overflow tube relatively loosely. A set screw 75 is preferably provided at the rear extending through the threaded opening 76 for securing the adapter ring onto the overflow tube so as to prevent both vertical and rotative movement thereon.

Extending from the upper surface 70 at the rear thereof is a vertical post or button formation 21 which is shown identical to that of Figs. 1 and 2 including the lateral or normal elongation. This structure is for exactly the same purpose as explained in connection with those figures. The similar flapper valve 25 is mounted and positioned on the post formation in the same way and functions in the same manner during the opening and closing operations. The set screw may, of course, be located at the side and button formation extend from the rear rather than the top in the manner of the Fig. 5 form, if desired, or other securing means such as those previously suggested may be employed with the adapter ring.

Although the posts in the various forms already disclosed have been shown as cast or otherwise formed integrally with the seat member or the adapter ring in the case of the last form, the same may, of course, be attached by suitable means after formation or may comprise a screw threadedly received within the seat member or adapter ring or even a bolt extending through these members and the flapper valve. Fig. 8 illustrates the use of means extending from the seat member between the same and the flapper valve (or from an intermediate member in turn connected to either the seat member or to the overflow tube) which is not integral with the seat member (or the intermediate member). In this figure, a simple rivet 78 is employed for this connection, being headed at 79 and 80 and extending therebetween through the rearwardly extending portion 53 of the side extension 11 of the seat member and through the flapper valve 25. An elongated element may be used instead of the conventional round rivet to more positively retain the closure member in proper alignment laterally.

Figs. 9 and 10 show such an arrangement wherein 125

is the curved or circular front portion of the mounting or positioning member **123** adapted to spring or snap on over the seat member **5** or equivalent from the front as before. **127** and **128** are the bent out portions of the member adapted to engage the opposite sides of the extension **11** of the seat member at **129** and **130**, respectively, to prevent rotation of the mounting member. The forward portion may also be flared at the top at **132** to conform to the configuration of the recessed portion **103** of the seat member between the lip **101** and flange **102**.

The bent out portions **127**, **128** are turned upwardly at **135** and **136**, respectively, and are preferably of somewhat enlarged section as shown, presenting flat, co-planar horizontally extending surfaces **137** and **138**. Extending from each of these surfaces is a post or button formation **139** of the same general configuration and functioning in the same way as that of Fig. 1, for instance, including the stem or reduced portion **140** and enlargement or head portion **141**. A similar flapper valve member **25** is employed to that of the last form except the opening at the bottom of the float has been omitted to illustrate the use of a non-perforated float in the various forms and also, the spaced arms **45**, **46** are each recessed or apertured at **145** so as to fit over the buttonheads **141** and snugly receive the reduced portions **140** of the posts for the type of anchoring explained in connection with Fig. 1. In this instance, however, there are spaced buttons or points of attachment instead of the single ones shown in Figs. 1 through 11. A plurality of round buttons or posts may be employed in the other forms either at the back or sides, if desired. The spaced attachment of course tends to prevent rotation and provides for lateral positioning and alignment of the flapper member as pointed out previously. To assist in this result, the buttons **139** in the latter form have been shown elongated. However, to illustrate that this elongation need not necessarily extend normal or crosswise to the longitudinal axis of the flapper member, in this instance, it is shown running in the direction of this axis. Although the head or button portions have been shown integral with the rest of the post in this and the other forms, the same may, of course, constitute separate elements secured to the stem portions by suitable means as by threading, for instance.

The mounting members **123** and **97** of the present and last forms, respectively, are constructed of resilient material which may be of hard rubber, metal, or rubber coated metal for the member **123** and preferably metal for the member **97**.

It is thus seen that various forms of discharge or outlet valves for flush tanks or the like have been disclosed varying in certain more or less slight ways, all of which are improvements over the form previously noted in that they avoid the drawbacks and disadvantages of that form while at the same time incorporating ease and convenience of mounting and in the preferred forms positive assurance against rotation and displacement.

Although the closure member has been described as extending rearwardly along each side of the overflow tube, it should of course be understood that the same may extend in any direction or in a manner unrelated to the overflow tube in the forms in which there is no connection to the latter, the seat member extending where necessary for mounting of the closure member. Or, the overflow tube may be remote from the flapper member, or not even form part of the valve assembly or ported seat to use the latter term broadly, or even eliminated in these forms without affecting the invention. Although the seat portion has been disclosed as being a separate part of the tank and merely mounted therein, it should be understood that the same may, of course, be formed as an integral part of the tank within the term "valve assembly" or "ported seat" or "seat portion" broadly, or in the case of the Fig. 1 mounting particularly this part of the overall valve may comprise a portion of the tank floor from which an annular seating surface may rise and also

integral or even bolted or threadedly attached mounting means rising or projecting from a location (or locations for plural means) which is spaced from the seating surface. To make such an arrangement more apparent and as an illustration only of other possibilities, attention is briefly invited to Figs. 11 and 12, wherein **15** is the raised seating surface and **17** the mounting means with the other numerals the same as in Fig. 1. It should be noted that the overflow tube or means **160** has been located to one side and with a connecting port or passage **161** with the port **13** through the seat and further, has been formed integrally with the tank **1** in the side wall thereof. A slightly different flapper valve or closure member **25** is provided as is clearly shown. The overflow means may of course be the conventional tube threadedly or otherwise received in the floor of the tank between the arms **45**, **46** of the flapper member or the same may be formed integrally with the tank in the same location. In this case, the same closure member as shown in Fig. 1 may be used.

The general arrangement of the Figs. 11 and 12 form, however, is definitely preferred and even has certain advantages over the other forms previously described.

It has long been desired in the plumbing industry to provide a flush tank in which the valve seat and overflow means are integral with the china tank, thus eliminating the separate seat member and overflow tube assembly. Attempts to produce such a construction, however, have not proved very satisfactory, because of the inevitable warpage and distortion that takes place in china during firing. The seat surface has invariably been out of shape, requiring an extensive grinding operation to form a properly centered, chamfered seating surface which is of true circular form for the inside circular seating of the conventional type discharge valve employed. This operation is slow and expensive to perform and increases the cost of the construction so much as to defeat its purpose to effect a savings over the use of the separate seat member and overflow tube assembly. Moreover, rejects run especially high on this form because of the failure to get a satisfactory seating surface due to the warpage and distortion which may be so bad as to make any grinding operation futile at all. Because of these difficulties and increased costs, more than limited use of the integral seat and overflow means has not been enjoyed to date.

Now for the first time, an integral china seat and overflow means may be used to advantage when employed in conjunction with the present invention with a definite savings in cost over the use of the separate seat member and overflow tube. This is because first of all the flapper valve member of the invention is mounted independently of the overflow tube and does not even depend on the seat member for mounting which can be dispensed with along with the separate overflow tube. In this case, the seat portion and attachment or mounting means for the closure can rise from the floor of the tank or more particularly the outlet portion thereof and be integral therewith or, the attachment means can be a separate piece rising from and connected to the tank floor non-rotatively therewith. The seating surface, of course, need not be elevated above the floor of the tank, but may be the upper surface of the tank floor adjacent the outlet opening therethrough. Secondly, an integral seat in whatever form desired can be employed in the present instance because warping and distortion of the outlet opening which anyone in the china industry knows cannot be avoided does not make any difference in the present valve, because the flapper type closure lies over the top of the seat rather than seating within the outlet or the chamfered portion as in the case of the conventional type valve. Further, the flapper member possesses extreme flexibility because of the widely spaced slender arms and the nature of the material used which allows the flapper to compensate for any unevenness of the top or inclination of the closure plane. By virtue of this flexibility in combination with the top seating, the seat portion can be used as is without

either rejects or modifications as by grinding. Elongation or out-of-roundness of the seat opening due to firing is therefore of no moment in the present valve. The seat opening is therefore no longer critical in the slightest and the economies and benefits of the integral ceramic seat and overflow means originally envisioned can at last be achieved and realized. Not the least of these benefits is the elimination of the corrosion problem of the metallic overflow tube and seat member which is quite troublesome under many conditions of service.

Although a flapper type closure has been referred to throughout this application, it is not desired to limit the various mounting arrangements of the invention necessarily to a flat seating closure, the invention rather being limited by the terms of the appended claims.

While specific forms and modifications have been illustrated and noted, the present invention should not be limited to these or the details of the same solely, but the appended claims should be construed so as to include yet other forms and details falling within the broad spirit of the invention and read only in the light of the specification and drawings.

We claim:

1. In combination with a flush tank or the like having an outlet portion provided with an outlet opening, the latter portion including a seat surface around the opening at the upper end thereof and overflow means in fluid communication with the outlet opening, a valve closure engageable with the seat surface in the closed valve position, said valve closure including extending means, means for attaching said valve closure to said outlet portion of the tank for swinging movement into the open and closed positions, said attachment means comprising post means projecting through said extending means of the closure, said post means extending substantially in the plane of the swinging movement of the closure, said extending means being flexible in the direction of the swinging movement of the closure and being apertured for the projection of the post means therethrough, said post means being provided with enlarged means extending partly over and retaining said extending means of the closure thereon when the closure is in attached relation, said extending means being of elastic material distortable over the enlarged means and onto the post means therebeyond for effecting the attachment of the valve closure.

2. In combination with a flush tank or the like having an outlet portion provided with an outlet opening, the latter portion including a seat surface around the opening at the upper end thereof and overflow means in fluid communication with the outlet opening, a valve closure engageable with the seat surface in the closed valve position, said valve closure including extending means, means for attaching said valve closure to said outlet portion of the tank for swinging movement into the open and closed positions, said attachment means including surface means and post means projecting therefrom, said post means extending substantially in the plane of the swinging movement of the closure, said extending means being flexible in the direction of the swinging movement of the closure and being apertured for reception by the post means, said post means being provided with enlarged means extending partly over and retaining said extending means of the closure in relatively snug engagement between the same and the aforesaid surface means of the attachment means securing part of the extending means substantially fixedly in the direction of the swinging movement without appreciable movement in this direction, said extending means being of elastic material distortable over said enlarged means and onto the post means therebeyond for attachment of the valve closure.

3. In combination with a water closet flush tank or the like having an outlet portion provided with an outlet opening, the latter portion including a seat surface around the opening at the upper end thereof and overflow means in fluid communication with the outlet opening, a closure member adapted to overlie the seat surface in substantially flat seating engagement therewith in the closed valve position, means for selectively moving the closure member from the closed position, said closure member having extending means, means attaching said closure member to said outlet portion of the tank for swinging movement into the open and closed positions, said attachment means comprising upwardly extending post means having enlarged means at an elevated level therealong, said extending means of the closure member being flexible in the direction of the swinging movement of the closure and being apertured for reception by the post means, said extendin means being of elastic material distortable over said enlarged means and onto said post means therebelow for the attachment of the closure member.

4. The subject matter of claim 1, said post means being elongated in transverse section and the extending means of the valve closure being correspondingly apertured whereby to substantially prevent any sidewise pivotal rotation of the closure about its attachment in a direction normal to the swinging movement of the closure.

5. The subject matter of claim 1, said post means being a single post of elongated transverse section and the enlarged means being a transversely elongated enlargement of the post means whereby to prevent any substantial sidewise pivotal movement of the closure about its point of attachment on the post in a direction normal to the swinging movement of the closure and to retain the said closure on the elongated post in the normal course of swinging movement of the closure respectively, the extending means of the closure having an elongated aperture for attachment thereof and shaped for relatively snug engagement around the said elongated post subsequent to the insertion and distortion of the extending means over the said enlargement of the post.

6. The subject matter of claim 3, said attachment means rising directly from the floor of the flush tank.

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