April 17, 1956 E. G. SCHMIDT 2,741,775

TANK DISCHARGE VALVE

Filed March 18, 1955 2 Sheets-Sheet 1

Fig. 1.

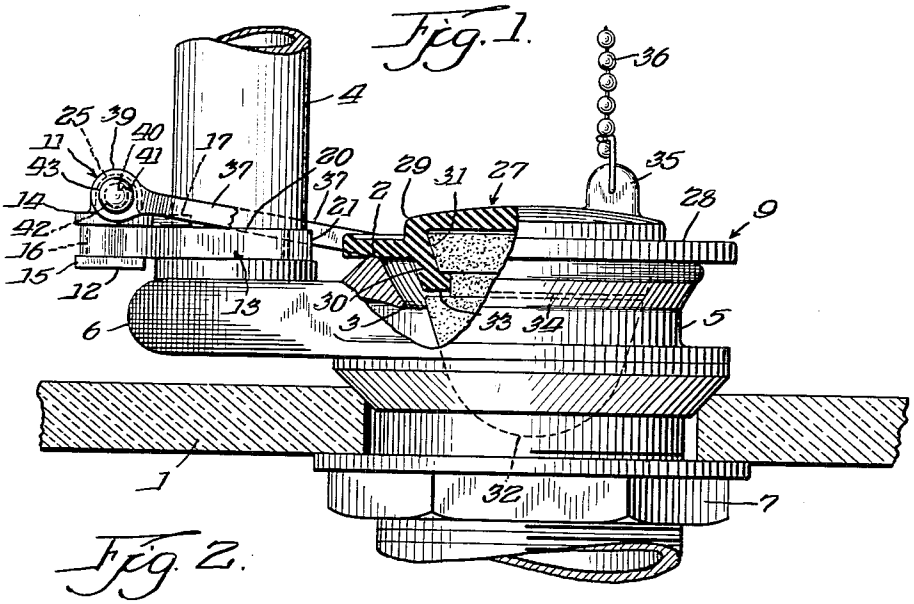


Fig. 2.

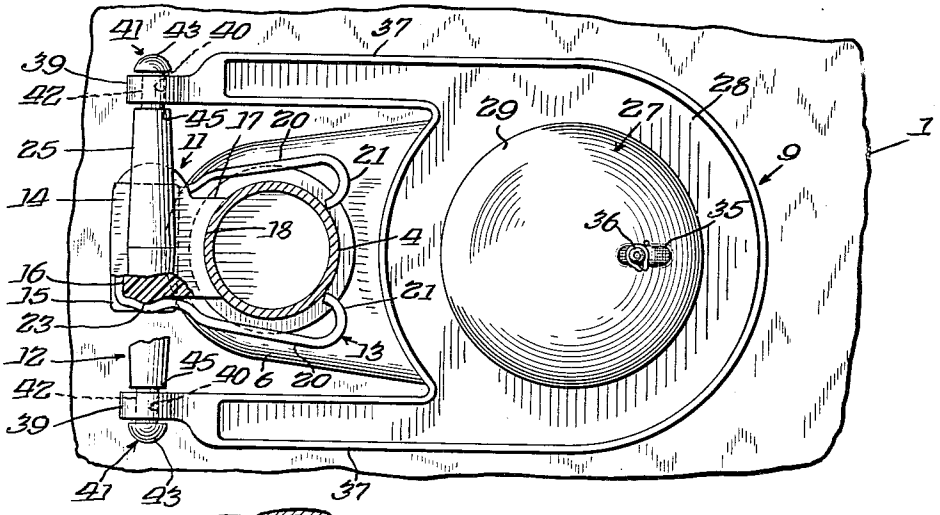
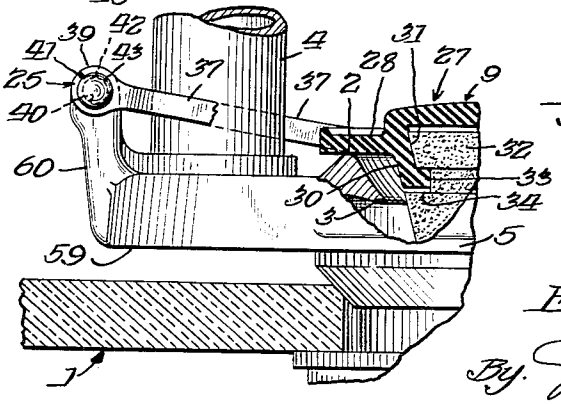


Fig. 5.



Inventor.
Edward G. Schmidt.
By Joseph O. Lange
Atty.

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Filed March 18, 1955 2 Sheets-Sheet 2

Fig. 3.

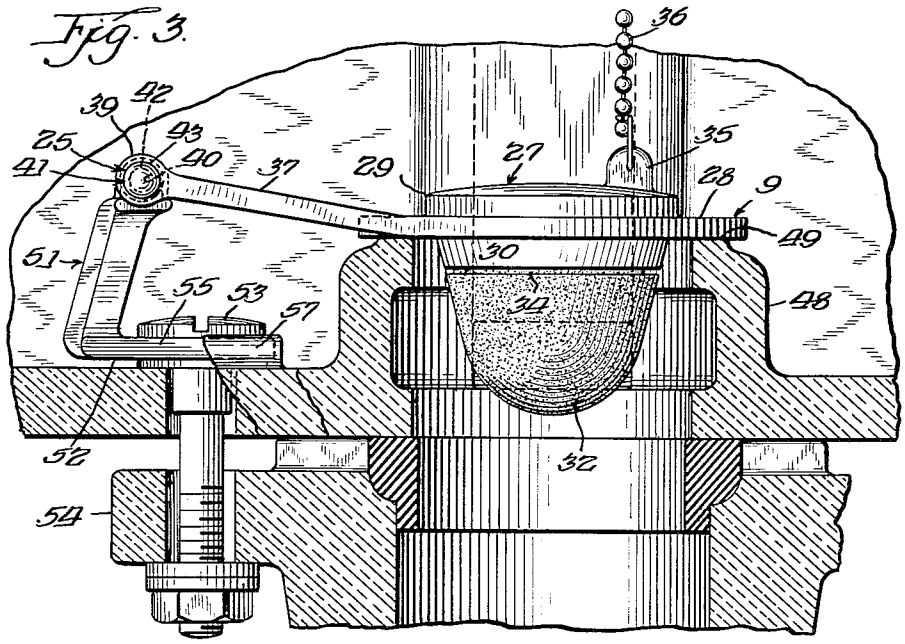
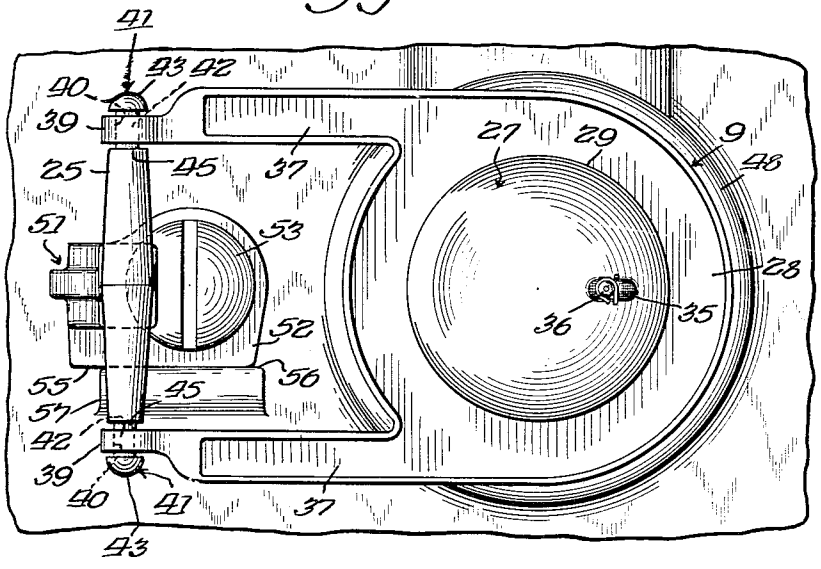


Fig. 4.



Inventor.
Edward G. Schmidt.
By. Joseph O. Lange
Atty.

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TANK DISCHARGE VALVE

Edward G. Schmidt, La Grange, Ill., assignor to Crane Co., Chicago, Ill., a corporation of Illinois

Application March 18, 1955, Serial No. 495,195

7 Claims. (Cl. 4—57)

This invention relates generally to outlet valves for water closet flush tanks or the like, and, more particularly, it concerns the novel valve closure therefore and its means of attachment and support in operative relation.

One of the objects of the present invention is to provide a flapper or flat seating type of closure member which is mounted for free pivotal movement, and being additionally adapted to flex out of the way of the tank outlet opening.

Another object is to provide a rigid support for the pivotally mounted closure member for effecting the unyielding positioning of the same.

It is a further object in combination with the above objectives to provide means for retaining flexible arms of the closure member in substantially fixed relation on the supporting member.

It is still another object to provide a novel button-on type of mounting between the flexible arms of the closure member and the supporting structure, said arms being buttoned on from opposite sides of the supporting structure.

Yet another object is to provide for a simpler and more inexpensively produced flapper valve member for use in closet tanks, said valve member being mountable selectively on the overflow tube, the seat member or floor of the tank depending on the installation and the type of mounting desired.

Other objects and advantages will become more readily apparent upon proceeding with the following description read in the light of the accompanying drawing in which

Fig. 1 illustrates a flush tank discharge valve and surrounding portion of the tank, to which the present invention has been applied.

Fig. 2 is a top plan view of the structure in Fig. 1.

Fig. 3 is a view similar to Fig. 1, but showing a modified construction.

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

Fig. 5 illustrates another modified form.

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

Referring in detail to the drawing, particularly Figs. 1 and 2 thereof, the numeral **1** designates the outlet portion of a flush tank for water closets or the like, the said portion being provided with a seat surface **2** at the upper or inner end of an outlet opening **3** therethrough, the said portion also including overflow means **4** in fluid communication with the said port. In the form illustrated, the seat surface is on a separate ported seat member **5**, although the same may be on an integral part of the tank as will be seen for example in Figs. 3 and 4. Also in the present form, the overflow means comprises the usual overflow tube arising from the offset portions **6** of the ported seat member **5**, whereas in Figs. 3 and 4, the overflow means is formed integrally with the tank. In the present instance, the ported seat member is mounted through the floor of the tank in fluid tight relation generally indicated at **7**.

The closure member **9** is secured to the outlet portion

of the flush tank by certain structural means which will now be considered. In the present form, attachment is made to the overflow tube **4** by means of the combined clamp and support member generally designated **11**. This member is comprised of two attachable parts, the support member **12** proper and the enveloping flat spring member **13**. As can be observed, the supporting member is provided with upper and lower flat extensions **14** and **15** of shelf-like form forming a reduced area **16** therebetween for reception of the flat resilient spring member generally designated **13**. The said support member which extends forwardly at **17** is provided with an arcuate shoe surface **18** for supporting contact against the rear cylindrical surface of the overflow tube. Extending forwardly from this support member is the flat spring **13** formed into a pair of arms **20** extending along opposite sides of the overflow tube and formed into inwardly directed reversely bent prongs **21** for contact with the front of the overflow tube. Preferably, these prongs should be so directed that the end surfaces of the prongs contact the overflow tube at only the edge thereof, in the form shown this contact being at the innermost edges of the said prongs, that is, the edges closest to the center line of the closure member. In this connection, it should be observed that the resilient arms extend along the overflow tube out of contact with it except at the forward ends thereof, the engagement between the support or clamp member being at only three places, namely, the two prongs and the rear shoe surface **18**.

By virtue of the inherent resiliency of the arm portions and its engagement at the front of the overflow tube, the rear supporting portion **12** and its arcuate surface are thus in effect pulled forwardly into tight engagement with the rear of the overflow tube, and the latter frictional engagement in combination with the edge or biting contact of the front of the prongs provides a fixed mounting on the overflow tube and prevents rotation relative thereto in the course of operation.

The spring member **13** is mounted on the rear supporting member **12** prior to assembly on the overflow tube by sliding the spring forwardly onto the reduced portion **16** of the supporting member and on into interlocked relation occasioned by the side extensions **23** (only one being shown in the drawing) on opposite transverse sides of the reduced portion and the conforming shape of the spring member which snaps thereonto. The assembled clamp member may be then mounted on the overflow tube by merely pulling the resilient arms slightly apart and slipping the member over the top of the overflow tube, the said member then sliding easily down into mounted relation at the bottom of the overflow tube. The clamp member may be slightly turned into proper aligned position for the desired ultimate seating relation of the valve member.

The rear supporting portion of the clamp member is further provided with a transversely extending portion **25** for actual attachment of the closure member. This latter portion is adapted for pivotal support of the closure member by means which will be brought out hereinafter.

Considering the closure member, this member is of the flapper or flat seating swinging type, in this instance, being pivotally mounted for free rotation about its attachment. The member is therefore provided with a closure portion **27** of general disc-like form extending across the outlet opening and seat surface in the closed position shown in substantial flat seating engagement with the latter as shown. In the form of closure illustrated, a marginal flat portion **28** is provided for actual contact with the seat surface. The inner part on the other hand is raised at **29** presenting together with a depending annular skirt **30** an inwardly tapered cavity **31** for reception and retention of the float element **32** preferably of

lightweight sealed cellular and inherently fluid impervious construction, such as foam polystyrene or foam polyethylene. The skirt is preferably inwardly turned at the bottom to form the lip 33 for reception within the groove 34 extending around the float element for further retention of the float element. Projecting from the top of the closure portion is the flat lug 35 to which is attached a flexible chain 36 for lifting of the closure from the closed position by means of the usual operation, not shown.

Extending from the rear of the closure portion are a pair of arms 37 of suffiicent length to project rearwardly beyond the overflow tube. These arms are provided with enlarged ends 39 coaxially bored at 40. The transversely extending portion or cross support 25 of the clamp member 11 is formed into a pair of oppositely disposed aligned button formations 41 for engagement and support of the closure member. These portions comprise reduced stem portions 42 projecting through the bored portions 40 for pivotal support of the closure member.

Outwardly of the stem portions, the enlarged buttonheads 43 are provided for retention of the arms 37 on the stems in operative relation. It should be noted that the said buttonheads are rounded or of hemispherical shape on the outer side to facilitate passage of the arms 37 over them in mounting, while the inside is flat for retention of the arms when so mounted. In this connection, the closure member 9 is preferably constructed entirely of flexible material, such as rubber, except for the float element. Also, the raised portion 29 of the closure member may be of hard rubber or internally reinforced for stiffness. The use of rubber or like material provides for distortion and expansion of the enlarged ends 39 over the buttonheads in the course of mounting. It should also be noted that the reduced stem portions 42 terminate inwardly in flat surfaces 45 of annular form opposite the flat inner surfaces of the buttonheads which are also annular for positioning of the flexible arms therebetween. The length of the stem portions are only slightly in excess of the width of the enlarged ends 39 of the closure member, the inner and outer surfaces of the latter enlarged ends being flat to provide for smooth bearing engagement with the inner or outer flat surfaces of the reduced stem portions during rotational movement of the closure.

Although the closure member is mounted for relatively free and unrestrained pivotal movement, it is also adapted to flex in the course of opening. In the form presently being considered, this flexure particularly occurs in the later stage of valve opening. Such flexure takes place principally in the flexible arms 37 and is desirable for effecting the full opening of the valve. Considering the opening movement, after tripping of the actuating lever (not shown) and pulling upward of the chain 36, the closure member primarily rotates about the pivots 42 in free pivotal movement for the first stage of its opening movement. This stage ends when the rear edge of the disc-like closure portion 27 makes contact with the overflow tube, therefore preventing further pivotal movement. If the spaced arms 37 and the rest of the closure were constructed of non-flexible material, the opening movement would be limited to this stage. This amount of opening, however, is not sufficient for the unrestricted discharge of the tank fluid and the withdrawal of the depending float element upwardly beyond the usual downward pull of the discharge stream. Inasmuch as the arms 37 of the closure member and the member generally are of flexible construction, the closure portion is permitted to swing beyond this point, about the bottom which is in contact with the overflow tube, into a substantially vertical position along side the overflow tube. The closure portion including the depending float element therefore swings free of the outlet opening for the desired valve operation. The closure member, of course, remains in

floatation until the water level has fallen to a point sufficiently low to no longer sustain the same under the influence of the discharging stream, at which time it is drawn into the closed position. The latter part of the tank discharge is particularly significant in that the position of the closure member is particularly critical because as it approaches the outlet it increasingly loses its ability to resist the downward pull of the water.

It is very important, however, for maximum efficiency and the desired level of performance for the closure member to remain in suspension sufficiently long to allow the proper prescribed amount of water to discharge in the flushing operation and that the closure member will not preseat or close before this amount has passed. To guard against such preseating and to insure efficiency of operation, it should be noted that all restraint to floatation is eliminated in the present construction by providing for free pivotal movement of the closure during the latter part of the tank discharge. This is therefore one of the salient features of the present invention and together with the lightweight construction of the float portion insures the desired reliability of valve performance or operation.

Also of pertinence in the overall valve performance is the rigidity of the supporting structure 25. This portion which is of substantial size and strength affords inflexible fixed support to the closure member. This of importance in that it prevents any substantial distension of the closure member forwardly so as to cause the rear edge of the closure portion thereof to become lodged within the outlet portion under the action of the discharging water and hanging of the float element on the opposite chamfered surface of the port in a partly open position.

Although the closure member has been shown mounted to the overflow tube of a separate and commonly employed seat assembly, the member may, of course, be mounted to the outlet portion 1 of the tank by other means, such as illustrated in Figs. 3 and 4. In this case, the mounting is directly to the floor of the tank, the outlet portion of the tank preferably being provided with an integral ceramic ported seat portion 48 having a seat surface 49. The supporting or mounting member 51 is provided with a flat base 52 through which extends the bolt 53 for attachment to the floor of the tank. In the instance shown, the bolt 53 continues on through the flanged portion 54 of a water closet shown fragmentarily which is connected in close coupled relation to the flush tank. The base portion 52 of the mounting member is provided with a flat surface 55 for contact with a corresponding flat surface 56 on a raised lug 57 of the tank. These surfaces provide for fixed positioning of the closure member for predetermined seating engagement of the closure member. The top of the mounting member is provided with a cross arm 25 of identical construction to that shown in connection with the Fig. 1 form, the same closure member 9 also being employed therewith. This construction is essentially the same as that of the other form, except for the adaptation for connection to the floor of the tank and further description will be dispensed with.

Although mountings have been shown to overflow tube and floor of the tank, other types of mountings are also possible as for instance to the separate seat member 59 of that of Fig. 5 form. In this case, the post portion 60 extends directly from the rear extension of the seat member, which is otherwise like that of Fig. 1, being integrally formed therewith. This portion is provided with the cross arm 25 above described in connection with the other two forms, the same closure member also being used.

It should be understood that while I have shown certain preferred embodiments of my invention, these are illustrative only, and other variations may be made to meet differing conditions and requirements, and I con-

template such modifications as come within the spirit and scope of the appended claims.

I claim:

1. In combination with a flush tank or the like having a portion provided with an outlet opening and including a seat surface around the opening at the inner end thereof and overflow means, a valve closure engageable with the seat surface in the closed valve position, said valve closure including a pair of extending arms, said arms being provided with aligned apertures adjacent the ends thereof, means for attaching said valve closure to the said portion of the tank for free pivotal movement into the open and closed positions, said latter attaching means including portions extending through said apertures in the arms for the pivotal movement of the valve closure, said extending portions being formed into reduced stem portions and enlargements outwardly thereof for retention of the said arms on the stem portions, the apertured portions of the said arms being deformable for passage over said enlargements and onto the stem portions for the retention thereon.

2. In combination with a flush tank or the like having a portion provided with an outlet opening and including a seat surface around the opening at the inner end thereof and overflow means, a valve closure engageable with the seat surface in the closed valve position, said valve closure including a pair of extending arms, said arms being provided with aligned apertures adjacent the ends thereof, means for attaching said valve closure to the said portion of tank for free pivotal movement into the open and closed positions, said latter means including means extending between said arms presenting outwardly directed annular surfaces and having oppositely disposed button formations extending outwardly beyond said annular surfaces, said button formations comprising reduced stem portions extending directly from the said surfaces and enlarged head formations at the ends of the latter, said head formations being rounded on the outside and having inner annular surfaces facing the aforesaid annular surfaces for retention of the said apertured arms of the closure between the said surfaces when the apertured portions of the arms are applied over the enlarged buttonheads and the arms pushed therepast onto the reduced stem portions, said apertured portions of the closure being deformable for insertion over the said enlarged buttonheads.

3. In combination with a flush tank or the like having a portion provided with an outlet opening and including a seat surface around the opening at the inner end thereof and overflow means, a valve closure adapted to extend across said seat surface in substantially flat seating contact therewith in the closed valve position, said valve closure including a pair of extending arms, said arms being provided with aligned apertures adjacent the ends thereof, means for attaching said valve closure to the said portion of the tank for free pivotal movement into the open and closed positions, said latter means comprising at least

normally nonmovable means extending between said arms presenting outwardly directed annular surfaces and having oppositely disposed button formations extending outwardly beyond said annular surfaces, said button formations comprising reduced stem portions extending directly from the said surfaces and enlarged head formations at the ends of the latter, said head formations being rounded on the outside and having inner annular surfaces facing the aforesaid annular surfaces for retention of the said apertured arms of the closure between the said surfaces when the apertured portions of the arms are applied over the enlarged buttonheads and the arms pushed therepast onto the reduced stem portions, said apertured portions of the closure being deformable for insertion over the said enlarged buttonheads, said extending arms of the closure having at least portions thereof permitting flexure of the closure in the direction of valve opening.

4. In combination with a flush tank or the like having a portion provided with an outlet opening and including a seat surface around the opening at the inner end thereof and overflow means, a valve closure engageable with said seat surface in the closed valve position, said valve closure including a pair of extending arms, said arms being provided with aligned bores adjacent the ends thereof, means for attaching said valve closure to the said portion of the tank for free pivotal movement into the open and closed positions, said latter means including a rigid at least normally nonmovable portion extending between said arms and through the bores thereof for support of the closure in the pivotal movement, said latter extending portion having reduced portions for actual reception of the bored arms of the closure in operative relation and enlarged portions outwardly of the reduced portions at each end thereof for retention of the said arms on said reduced portions, the bored portions of the said arms being deformable and permitting introduction of the arms over the enlargements and onto said reduced portions for retention thereon, said reduced portions terminating inwardly and outwardly in flat annular surfaces for limiting lateral movement of said arms and for positioning of the same in the mounted relation.

5. The subject matter of claim 1, said means for attaching said valve closure to the said portion of the tank being connected directly to the floor of the tank.

6. The subject matter of claim 2, said means for attaching said valve closure to the said portion of the tank being connected to said overflow means thereof for support of the said means.

7. The subject matter of claim 1, said portion of the flush tank having the outlet opening including a separate member, the said seat surface around the outlet opening being on the separate member, said means for attaching said valve closure to the said portion of the tank being connected to said separate member.

No references cited.