June 12, 1962 J. W. BEAZLEY 3,038,491

FLUSH VALVE APPARATUS

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FIG.1

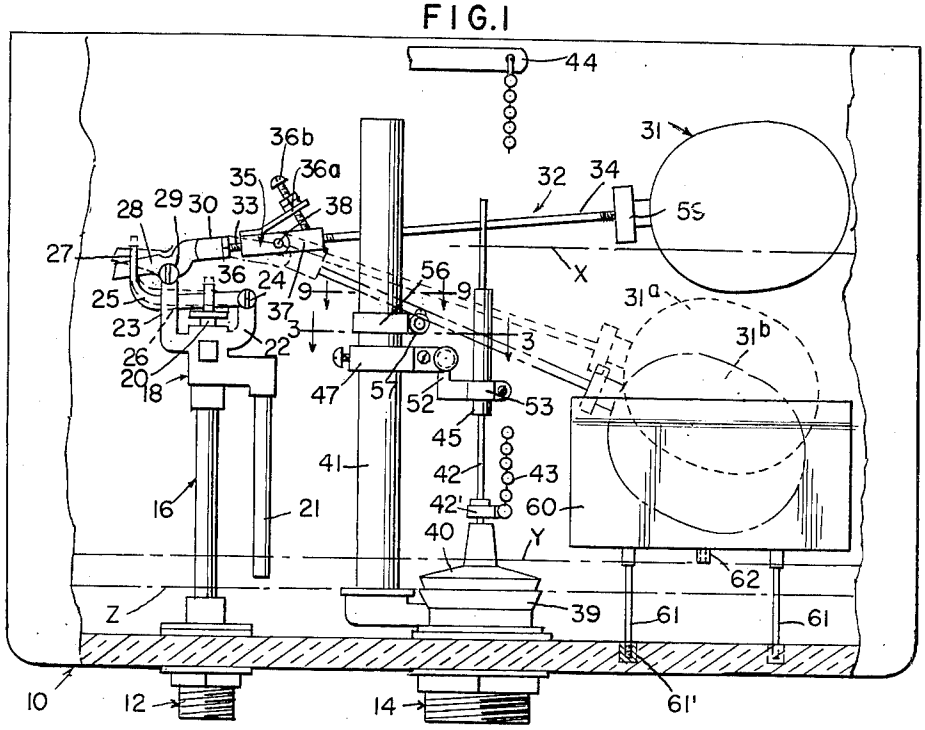



FIG.2

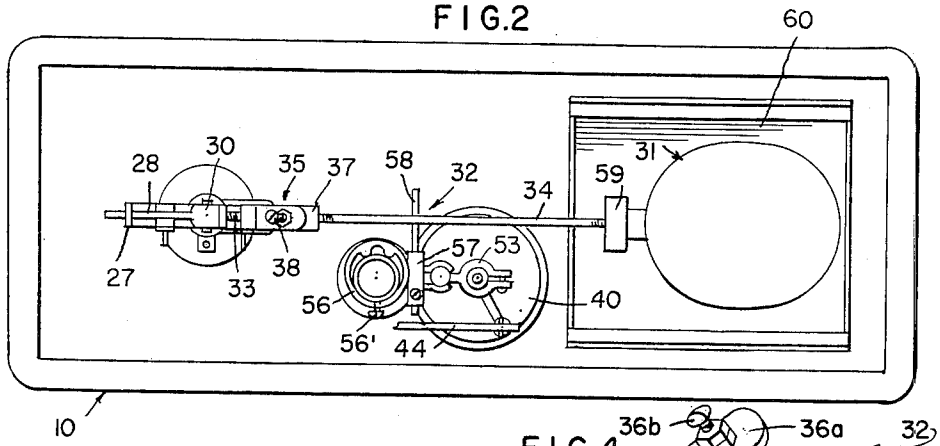



FIG.3

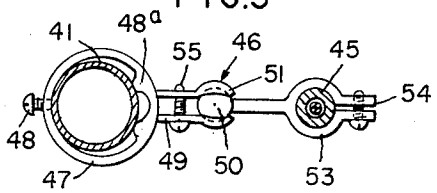
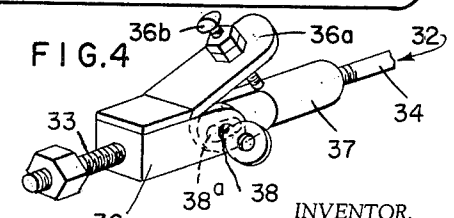



FIG.4




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FIG.5

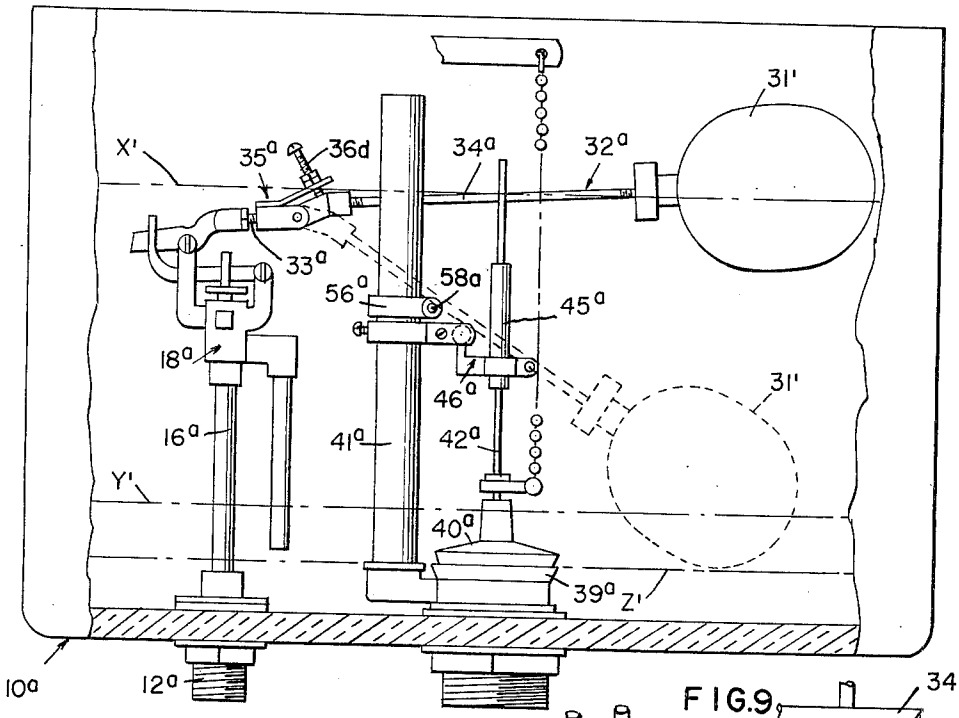



FIG.13

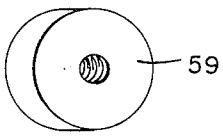



FIG.10

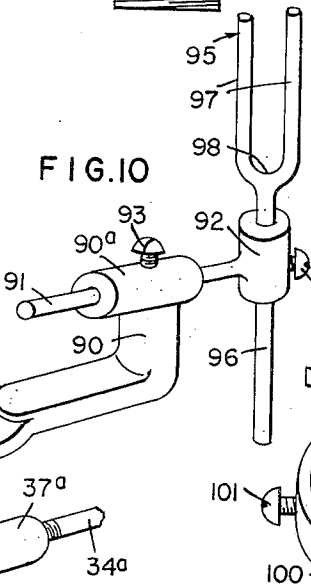



FIG.9

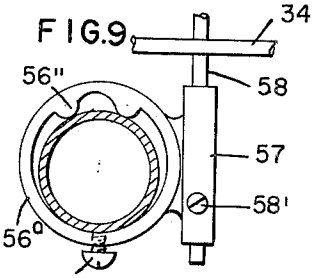
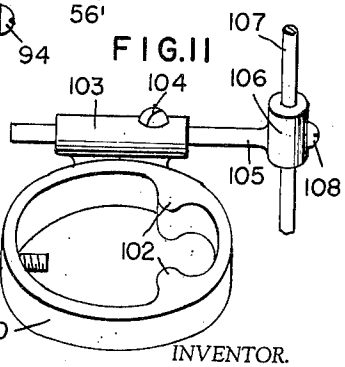



FIG.11



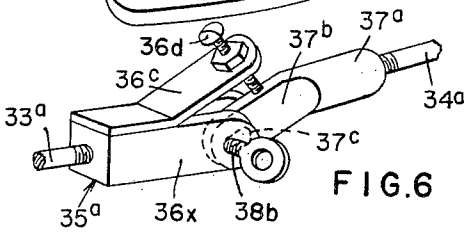




FIG.6

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FLUSH VALVE APPARATUS

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FIG.7

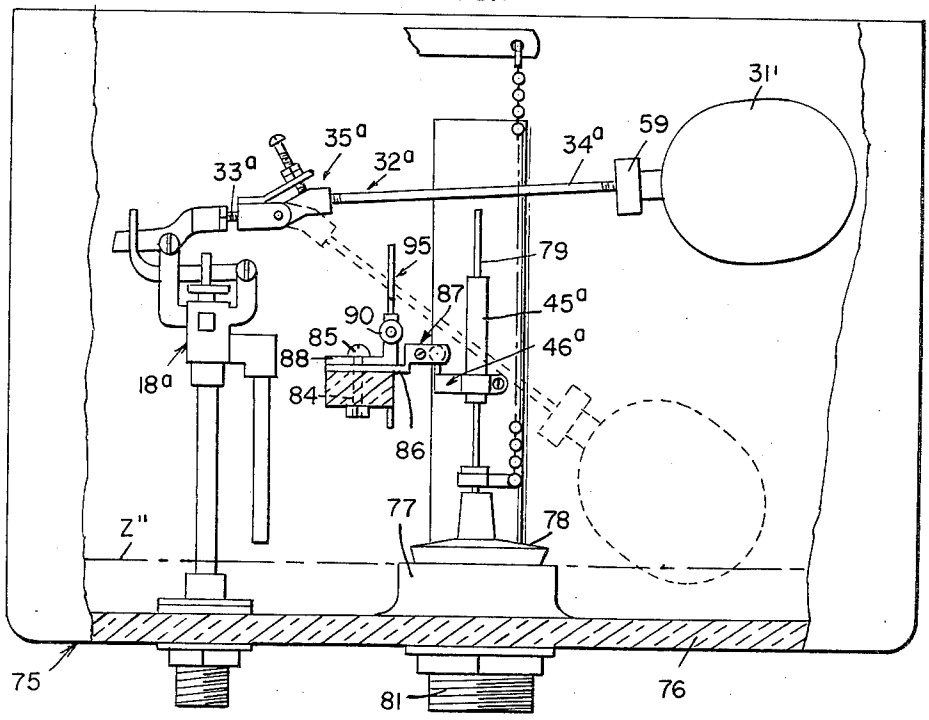



FIG.8

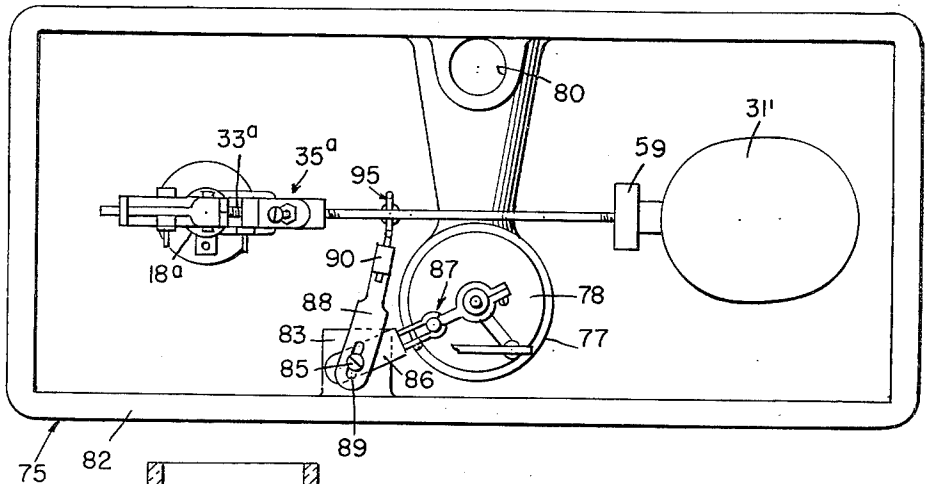
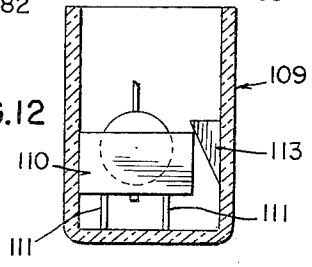



FIG.12




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United States Patent Office 3,038,491
Patented June 12, 1962



3,038,491

# FLUSH VALVE APPARATUS

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Filed Aug. 26, 1959, Ser. No. 836,236
6 Claims. (Cl. 137—426)

This invention relates to the class of plumbing fixtures and is directed particularly to improvements in inlet valve mechanism for flush tanks.

In conventional flush tank structures the inlet valves embody a flexible valve ball which closes the outlet to the tank leading to the underlying fixture and such valve ball is lifted from its seat by a lever mechanism when the apparatus is to be flushed. This is, of course, standard and well known structure and it is also well known that in such a structure the valve ball occasionally fails to seat cleanly so that after the tank has emptied, the inflowing water merely runs out of the tank instead of refilling the tank to elevate the inlet valve actuating float ball. When this occurs it is necessary to take off the top or cover for the flush tank and manually set the valve ball back on its seat so that the tank will be refilled in the proper manner. If the fact that the valve ball fails to seat itself goes unnoticed, then the tank will remain empty and water inflowing through the open control valve becomes wasted.

It is a particular object of the present invention in the light of the foregoing to provide in association with the tank enclosed apparatus a novel coupling between the inlet valve controlling or operating float and an element of the inlet valve whereby in the event that the float drops beyond a certain level such as would occur if the outlet valve ball fails to seat itself, the inlet valve will be automatically actuated to shut off the inflowing water.

Another object of the invention is to provide a new and novel jointed float arm or rod whereby the foregoing object may be accomplished in cooperation with an auxiliary element, which novel float rod is adapted to be substituted for the present one-piece float rod without necessitating the making of any changes in the present conventional inlet valve structure.

Still another object of the invention is to provide a novel jointed float rod wherein means is provided for adjusting the extent of angulation of the rod parts when the joint is articulated in connection with the operation of the mechanism, thereby permitting the float to be adjusted for rising and lowering to different elevations in the operation of the mechanism.

Still another object of the present invention is to provide a new and novel guide for the ball valve stem with novel means for supporting the guide, whereby a very accurate alignment of the ball valve with its seat may be effected and whereby the possibility of the ball valve failing to seat accurately following the flushing or emptying of the tank, is avoided.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming part of the specification, with the understanding, however, that the invention is not confined to a strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

FIG. 1 is a view in elevation of one embodiment of the present invention showing the same installed in a flush tank, a portion of the wall of the tank being broken away and the mechanism having the parts thereof in the position assumed when the flush tank is filled with water and showing in dotted or broken lines different positions assumed by the float when the ball valve is seating properly and when it fails to seat properly;



FIG. 2 is a view in top plan of the tank with the top removed and showing the mechanism therein;

FIG. 3 is a sectional view on an enlarged scale taken substantially on the line 3—3 of FIG. 1;

FIG. 4 is a view in perspective of the rod joint unit forming a part of the float arm shown in FIG. 1;

FIG. 5 is a view corresponding to FIG. 1 but showing another form of the joint structure in the float arm for the operation of the mechanism;

FIG. 6 is a view in perspective of a second or modified form of float arm joint used in the mechanism illustrated in FIG. 5;

FIG. 7 is a view corresponding to FIGS. 1 and 5 but showing the invention applied to or used in association with a form of flush tank structure having a different type of overflow from that illustrated in FIGS. 1 and 5;

FIG. 8 is a view in top plan of the structure shown in FIG. 7;

FIG. 9 is a horizontal section on an enlarged scale taken substantially on the line 9—9 of FIG. 1 illustrating the fulcrum member carried by the overflow pipe and showing the attaching means which is adapted to receive pipes of different diameters;

FIG. 10 is a view in perspective on an enlarged scale of the float valve arm guide and fulcrum employed in association with the form of the mechanism shown in FIGS. 7 and 8;

FIG. 11 is a view in perspective of the fulcrum and guide associated with a collar adapted for engagement upon the overflow pipe;

FIG. 12 is a detail illustrating the wedge means for maintaining the pan or receptacle in position in a tank in which the receptacle supporting legs merely rest upon the bottom of the tank;

FIG. 13 is a view in perspective of a form of weight adapted for attachment to the outer end of the float arm for use in those structures where the float may be made of plastic or other very light material.

Referring now more particularly to the drawings, the invention illustrated in the embodiment of FIGS. 1 to 4 will first be described.

In these figures the numeral **10** generally designates a conventional flush tank having in the bottom thereof the coupling **12** for the connection of a water supply pipe, not shown, and a second and larger coupling **14** adapted to have attached thereto the outlet pipe, not shown, through which water is conveyed from the tank to a hopper.

The numeral **16** designates the riser pipe which is connected with the coupling **12** to conduct the inflowing water into the tank and this riser pipe carries upon its upper end the conventional valve fixture which is generally designated **18**. This valve fixture **18**, together with the riser pipe is generally referred to in the trade as the ball cock, and, as stated, is of conventional form but in order to properly describe the operation of the actuating means therefor certain standard parts will have to be referred to. Fixture **18** includes a valve element **20** which in order to be unseated to open the valve, must be raised and, of course, its movement downwardly effects the closing of the valve to shut off the inflow of water. Such inflow, when the valve is open, passes through the tube **21** which terminates at its outlet end in close proximity to the bottom of the tank. The unit **18** also includes an upstanding pivot arm **22** and, at the opposite side therefrom, a longer upstanding guide and pivot arm **23**. The arm **22** has pivotally connected to its upper end at **24** the valve actuator lever **25** which passes through a guide slot **26** in the arm **23** and terminates in the upward extension **27** which is likewise slotted in the

well known manner to receive an end of the rock lever 28 which is pivotally mounted as at 29 upon the top end of the arm 23. These parts are, of course, all conventional and the rock lever 28 which is pivoted midway between its ends, has the end remote from the upturned end 27 of the arm 25, provided with a threaded socket 30 which in conventional apparatus receives the threaded end of a single or one-piece straight rod or arm which has its other end attached to a valve actuating float.

In accordance with the present invention the valve actuating float, which is here generally designated 31, is attached to one end stem of an articulated arm which is generally designated 32. The articulated arm comprises the threaded inner end portion 33, the long outer end rod portion 34 and the articulation or hinge joint which is generally designated 35 between the parts 33 and 34. The hinge joint embodies the inner and outer parts designated 36 and 37 respectively and they are pivotally coupled together by a suitable pivot pin 38 which is set so that the joint will move on a horizontal axis.

The inner end part 36 carries a forwardly and upwardly curving tongue 36*a* through which is threadably extended an adjustment screw 36*b*. The lower end of this screw is positioned to engage the top of the outer joint portion 37 forwardly or outwardly of the pivot 38 so that the extent of upward swinging movement of the rod part 34 of the arm with the portion 37 of the joint may be controlled. As shown in FIG. 1, the threaded inner end portion 33 of the arm is secured in the socketed end 30 of the rock lever 28.

The inner end of the outlet coupling 14 where it is located in the tank 10 is formed in the usual manner to provide a seat 39 upon which is adapted to be positioned the ball valve 40. Also associated with the inner or upper end portion of the coupling 14 is the upstanding overflow pipe 41.

The ball valve 40 carries the long stem 42 to which is attached by a loose connection 42′ an end of a pull chain 43. This chain has its other end connected to a lever 44 which is operatively coupled with a handle, not shown, located outside of the tank for use in unseating the ball valve 40. The rod 42 carried by the valve ball is positioned for sliding movement in a long guide sleeve 45. This guide sleeve is secured to the overflow pipe 41 by a coupling which is shown in top plan in FIG. 3 and generally designated 46. This coupling 46 is of novel construction and permits the accurate alignment of the guide sleeve 45 with the axial center of the valve ball seat 39 and also permits the guide sleeve to be set in a perfectly vertical position.

The coupling which is generally designated 46 comprises a collar or band 47 adapted to encircle the overflow pipe 41. This collar is formed so that it may be firmly mounted on pipes which may vary in diameter and to accomplish this the collar carries a set screw or binding screw 48 and upon the inner side of the collar at the side thereof remote from the set screw there are located the two inwardly projecting lugs 48*a* which function as rests for engagement against the wall of the pipe 41. These lugs or rests 48*a* are located on opposite sides of the axis line of the screw 48 which passes diametrically through the collar. The collar also carries the two outwardly extending resilient fingers 49 which terminate at their outer ends in the opposed cup-like members 50 which cooperate to form a socket for the ball 51 which is formed integral with an upstanding end portion 52 of the clamp member 53 which is secured to and around the guide sleeve 45. The clamp member 53 is in the form of a split ring having screw means 54 for drawing the ends of the same together so as to effect its gripping engagement with the guide sleeve 45.

The ball 51 is held in the socket formed by the opposing members 50 by means of a screw 55 coupling the fingers 49 together.

Mounted upon the overflow pipe 41 above the collar 47



is a second collar formed in a similar manner to the collar 47 and which is designated 56. This collar 56 carries the set screw 56′ and on the inner side of the collar are the two positioning or rest lugs 56″ (see FIG. 9) which are on opposite sides of the diametrical line passing axially through the screw and on the side of the collar opposite from the screw as in the structure previously described which supports the float guide means. Fixed to the outer side of the collar 56 to extend tangentially thereof is a guide sleeve 57 and this guide sleeve has adjustably positioned therein an end portion of a fulcrum pin or finger 58 and threaded through the wall of the sleeve 57 is a set screw 58′ by means of which the fulcrum pin or finger 58 is secured in adjusted position.

The collar 56 is set on the overflow pipe 41 so as to direct the guide sleeve 57 in the direction of the depth of the tank from front to rear and the fulcrum finger 58 will then be extended in the same direction to lie perpendicular to the outer end portion 34 of the float arm and beneath this portion so that when this portion 34 of the float arm is lowered in the manner hereinafter described, it may come to rest upon or engage the fulcrum pin or finger.

The numeral 59 designates a weight element which, as shown in FIG. 1 and certain succeeding figures, may be in the form of a threaded washer or collar. This weight element is provided for use in association with floats which may be made of light material such as plastic or the like so that when the water drains from the tank there will be sufficient weight on the outer end of the arm to cause the float to drop with the proper degree of force to effect the desired breaking of the joint 35.

In the embodiment of the invention thus far described there is employed a pan or receptable 60 having supporting legs at 61. These legs are here shown as being secured in the bottom of the tank as indicated at 61′. The pan has an open top which is positioned beneath the float 31 and this open top is of sufficient size to permit the float to descend into the pan. The bottom of the pan is provided with a bleed outlet 62 which is sized to permit the contents of the pan to escape when the water level in the tank drops below this outlet, the approximate time allowed for the escape of the water through the pan outlet being around 9 or 10 seconds.

In the operation of the mechanism as thus far described and as illustrated in FIG. 1, when the valve ball 40 is properly seated and the tank is filled with water, the float will be elevated on the surface of the water to approximately the position shown in full lines in FIG. 1. The top level of the water in the tank is here designated by the broken line which is marked *x*. In this position of the float the articulated arm will be substantially straight and the adjustment screw 36*b* will engage the outer portion 37 of the joint unit, as shown, and as will be understood by those familiar with the water inlet valve or ball cock mechanism, when the arm is in this raised position the valve actuating rock lever 28 will have its free end pressed down against the valve thrust lever 25 and the valve will be maintained closed.

Under the conditions described the pan 60 will, of course, be filled with water.

Upon the actuation of the ball valve lever 44 the ball valve 40 will be raised from its seat in the usual manner, its upward movement being limited by the distance between the lower end of the guide sleeve 45 and the point at which the chain 43 is attached and the water will be discharged from the tank.

As is well known, in flush valve apparatus of this character, when the water level drops approximately to the line designated *y*, the valve ball 40 will be sucked back to its seat and the pan 60 is supported at an elevation above the bottom of the tank so that when this water line *y* is reached the outlet 62 of the pan will remain covered or closed so that the water cannot readily escape from the pan. The ball float, falling with the level of the water from the line *x* will then come to rest upon the surface of

the water contained within the pan which is at a substantial distance above the line *y* and when in this position the outer end portion **34** of the arm **32** may be free of contact with the fulcrum finger **58** or in light contact therewith. This is an intermediate position between the maximum and minimum elevations to which the float is capable of moving and the float in this intermediate position is shown in dotted lines and designated **31***a*. As the float drops and finally comes to rest in the position designated **31***a*, the inlet valve **18** will be open or if the portion of the arm is lightly engaging the fulcrum, it may be only slightly closed, and water will flow into the tank to replenish the same with the result that the float eventually will be raised to its maximum elevation and the inlet valve, or ball cock, will be shut off, this being the usual or normal operation of such a mechanism.

In the event that the valve ball **40**, in returning to its seat **39**, does not seat properly but remains for any reason partly open, it will be obvious that the water in the tank may then drop below the line *y* and the level will then terminate at approximately the line designated *z*, this line being in the plane of the top of the valve ball seat **39**. It will also be seen that the outlet **62** for the pan will be uncovered.

After the expiration of the time necessary for the pan to be emptied through the outlet **62**, the float will rock to its minimum elevation or lowermost position, which is shown in broken lines and designated **31***b*. Upon the lowering of the float body to this latter position or just prior to its reaching this latter position, the portion **34** of the arm will engage the top of the fulcrum finger **58**, or more firmly bear thereon, and after this engagement the float will move down farther and this will effect the breaking of the joint **35** so that an upward thrust will be exerted upon the pivot **38** to swing the inner portion **36** up and thus oscillate or tilt the rock lever **28** causing it to press down on the lever **25** and close the valve **20**.

Thus the inflow of water through the valve unit **18** will be cut off and waste of water will be checked until the necessary movement of the valve ball **40** can be effected to cause it to properly re-seat itself. Upon the refilling of the tank after the valve ball **40** has been properly adjusted on its seat, which refilling can be brought about by uncovering the tank and raising the float by hand until sufficient water enters to float it, it will be seen that the pan will also be refilled and the mechanism will be restored to normal operation.

The hinge joint **35** has the two parts thereof substantially straight so that when the float **31** is at its maximum elevation these two parts will be in alignment and in order to permit the necessary lost motion between the parts when the arm portion **34** fulcrums upon the finger **58**, the outer part **37** of the joint has an elliptical opening **38***a* for the passage of the pivot **38**.

In the second embodiment of the invention illustrated in FIG. 5, the structure of the joint between the two parts of the float arm is modified so that the same action is obtained without the employment of the water retaining pan **60**. In this second embodiment those parts which are standard and have already been described hereinbefore, will merely be generally referred to. Accordingly in this FIG. 5 the tank is generally designated **10***a* while the water inlet pipe coupling is designated **12***a* and is connected with the riser pipe **16***a* upon the top end of which is mounted the valve unit **18***a*, all of the parts of which are the same as hereinbefore described in connection with FIGS. 1 and 2.

The articulated arm for the float **31'** is generally designated **32***a* and the modified arm joint or articulation is generally designated **35***a*. The numeral **33***a* designates the inner end portion of the arm while the numeral **34***a* designates the outer end rod portion which is connected to the inner end portion **33***a* by the joint **35***a*, the structural details of which are shown in FIG. 6.

This joint or articulation **35***a* is designed so that the mechanism can be employed to operate in a tank not equipped with a pan or receptacle such as that shown in FIGS. 1 and 2 and designated **60**. Accordingly one of the parts of the articulation is of different form from the corresponding part of the joint or articulation shown in FIG. 4.

The articulation **35***a* comprises an inner end portion **36***x* which, like the portion **36** hereinbefore described, is bifurcated to receive between the furcations a flattened end of an outer part **37***a*, which flattened end is designated **37***b*. The outer end of the outer part **37***a* and the flattened end portion **37***b* are in angular relationship as shown and the flattened end is inserted between the furcations of the part **36***x*, to receive, through an elongated slot formed therein as at **37***c*, the pivot screw **38***b*.

The member **36***c* carries an adjustment or setting screw corresponding to the screw **36***b* hereinbefore described and here designated **36***d*. This screw is, of course, positioned so that its lower end will be in line with the flattened end **37***b* of the outer portion **37***a* and thus functions to limit the upward swinging movement of the arm part **34***a* with respect to the part **33***a*.

The overflow tube **41***a* carries a collar **56***a* corresponding to the previously described collar **56** and this collar carries, like the previous one, a fulcrum finger which is designated **58***a* and which lies in the path of vertical movement of the outer end portion of the float arm to be engaged thereby when the float has descended to an extreme position, which position would only be reached or assumed in case the outlet ball valve for the tank should become unseated and should not seat properly so that the entire contents of the tank might escape or at least the water level might be lowered to the top of the ball valve seat which is designated **39***a*. Such water level is here indicated by the broken line marked *z'*.

In this illustration of the second embodiment the valve ball is designated **40***a* and carries the stem **42***a* which extends through a tubular guide **45***a*. The guide, as in the previous construction, is maintained in position by a supporting means which is generally designated **46***a* and since this is of the same construction as the supporting means **46**, the details thereof need not be described.

In the operation of this second embodiment of the invention, when the tank is filled to the level where the float **31'** is sufficiently raised to effect the closing of the water inlet valve **18***a*, the float arm will be substantially straight, the rising of the float beyond this full tank position being prevented by the adjustment screw **36***d*. In FIG. 5 the maximum water elevation is designated by the broken line *x'*.

When the ball valve **40***a* is unseated in the conventional manner to permit the contents of the tank to escape, then the float will drop until the valve ball is drawn back to its seat to shut off the complete escape of the water and when this action occurs, the water level will then be approximately in the line indicated by the reference character *y'* and the float will be checked in its downward movement before the outer end portion **34***a* of the arm engages the stop finger **58***a*. Thus the arm will still be approximately in the straight or unbroken condition and the valve **18***a* will remain open to permit water to run back into and fill the tank.

In the event that the valve ball **40***a* fails to return to properly seated position to shut off the water flow, then the water will continue to run out until it reaches the level *z'* and the float will drop to its maximum low elevation so that the part **34***a* of the arm will strike the finger **58***a* or come to rest thereon just before this maximum low level is reached and an upward thrust will be imparted to the control rock lever of the valve so that the inflow of water through the valve and through the pipe **16***a* will be shut off.

FIGS. 7 and 8 illustrate another embodiment of the invention designed for use in a tank structure of a form

wherein the overflow pipe or tube, together with the ball valve seat, are all cast together with the tank bottom and back wall.

Certain of the parts in this third embodiment are of the same form or construction as shown in FIG. 5 and the same reference characters will be applied or made use of so as to avoid unnecessary repetition of description.

In FIGS. 7 and 8 the tank structure is generally designated **75** which tank structure is of a standard construction. The bottom **76** of the tank is molded to form a seat **77** for the valve ball **78** which carries the usual long stem **79**. The back wall of this tank **75** is formed in the casting thereof to provide the integral overflow conduit **80** which at its lower end communicates with the body portion forming the ball valve seat **77** which leads to the outlet coupling **81**.

One wall of the tank **75**, here designated as the wall **82**, is cast or molded with the mounting lug **83** upon the inner side thereof, which lug is formed with a suitable aperture **84** to receive a bolt **85** for the purpose about to be described.

Positioned upon the top of the lug **83** is an elongate plate **86** which at one end has attached thereto a two-part adjustable supporting arm generally designated **87** which is of similar construction to the arm **46***a* hereinbefore referred to and which carries the guide tube **45***a* for the valve ball stem **79**. This two-part jointed arm **46***a* like the previously described one which is generally designated **46**, due to the ball and socket connection or coupling between the two parts thereof, affords a convenient and easy means of setting the guide tube **45***a* in axial alignment with the valve ball seat **77**.

The lug **83** also carries a second elongate plate which is designated **88** (see FIG. 10) which supports a fulcrum member in the manner about to be described. This elongate plate constitutes an arm which adjacent to one end has a longitudinal slot **89** therein through which extends the bolt **85** and the slot allows for a certain amount of longitudinal adjustment of the plate, as will be apparent. The outer end of the elongate plate or arm **88** has an upstanding portion **90** to the top of which is fixed a short horizontally arranged guide sleeve **90***a*. Slidable through the guide sleeve **90***a* is a short rod **91**, which on one end is attached to a transversely extending sleeve **92**. The sleeve or guide **90***a* carries a set screw **93** which engages the rod **91** to hold it in adjusted position while the guide sleeve **92** carries a similar set screw **94** which extends into the passage of the guide for the purpose about to be described.

The numeral **95** generally designates a guide fork which is shown on an enlarged scale and in detail in FIG. 10. This guide fork comprises a stem portion **96** which passes through the guide sleeve **92** and is engaged by the screw **94** to hold it in adjusted position therein, and the spaced parallel furcations **97** extending from the upper end of the stem, which forms the fork proper and between which furcations the outer end portion of the float arm is located.

There are conditions in connection with the use of various types of tanks where the arrangement or the spacing between the parts vary and thus by the provision of the adjustments for the rod **91** and for the fork **95** at the outer end of the arm **88**, the fork can be extended transversely of the tank through the in and out adjustment of the rod **91** or it can be raised or lowered in the sleeve **92**, as may be required, so that the fulcrum portion thereof which comprises the bottom of the fork at **98** can be set at the proper elevation to effect the actuation of the ball cock when the water level drops in the tank in the manner hereinafter described.

The operation of the mechanism in this third embodiment which is particularly illustrated in FIGS. 7 and 8 is the same as in the embodiment shown in FIG. 5. From this it will be understood that when the float falls to the maximum extent which would happen in the event of the valve ball **78** failing to properly seat so that the water level drops to the line designated *z''*, the arm portion **34***a*, riding between the fingers or furcations of the fork **95**, will come to rest in the crotch or bottom **98** of the fork which forms the fulcrum and, as in the previous forms, an upward thrust will then be applied to the shut off rock lever of the valve mechanism to close the ball cock. If, however, the ball **78** seats properly after being unseated for the emptying of the tank, then it will be understood that the float arm portion **34***a* may not engage the bottom **98** of the fork or it may engage lightly, and the ball cock **18***a* will remain open so as to permit a refilling of the tank in the usual manner.

FIG. 11 illustrates a fulcrum mounting for attachment to the overflow pipe where it may be desired to use a forked member corresponding to that shown in FIG. 10 and designated **95**. In this FIG. 11 the ring **100** which engages as a collar about the overflow pipe is formed in the same manner as the previously described ring or collar **56**, having threaded therethrough the set screw **101** and at the far side from the screw and on the opposite sides of a diametrical line passing through the screw, the two lugs **102** forming rests for the pipe.

The outer side of the ring or collar **100** carries the guide sleeve **103** and a set screw **104**. Through the guide sleeve **103** extends a rod **105** which on one end is attached to a transversely extending guide sleeve **106** adapted to receive the stem portion of a forked fulcrum member here generally designated **107**, but corresponding in structure to the member **95**, and a set screw **108** is provided for fixing the forked fulcrum member in adjusted position, as will be obvious.

In describing the pan **60** illustrated in FIGS. 1 and 2, it is stated that the legs of the pan are fixed to or in the bottom of the tank.

The structure of the present invention is such that it may be embodied in a "do-it-yourself" kit for installation in any type of tank. Since tanks vary considerably in size, and particularly old style tanks which frequently are much deeper than present day tanks, the pan may be installed and fixed in proper position in the manner illustrated in FIG. 12. Here the tank is generally designated **109** and is shown in cross section and the float receiving pan is generally designated **110**. The numeral **111** designates feet or legs for the pan which rest upon the bottom of the tank and in order to maintain the pan in position, use is made of a triangular wedge block **113** which is frictionally engaged between the front wall of the tank and one side of the pan in the manner illustrated, the other side of the pan being pressed into frictional engagement against the back wall of the tank. Thus it will be seen that by firmly pressing the wedge **113** down between the wall of the tank and the pan, it will be held against movement when the tank fills with water in the manner described in connection with the first illustrated and described embodiment of the invention.

From the foregoing it will be apparent that there is provided in the present invention in the different embodiments illustrated, a novel mechanism structure, which will prevent unnecessary loss of water through the flush tank in the event that after emptying, the outlet valve ball should fail to properly re-seat itself and such failure should go unnoticed.

The invention also provides a novel mounting for the valve ball stem by means of which the stem can be set accurately to insure the proper vertical movement of the valve ball with respect to its seat.

I claim:

1. As a new combination in a flush tank mechanism embodying a tank, a water inlet pipe carrying an inlet valve including a pivoted valve actuator lever operatively coupled to the valve, a pivoted rock lever having an end operatively coupled with said actuator lever and having a valve opening position in which the other end thereof

is lowered and a valve closing position in which said other end is raised and wherein said other end of said rock lever has a threaded bore; a mechanism for effecting the said valve opening and closing movements of the rock lever and comprising an articulated float arm embodying a rod having an inner and an outer end, a joint having inner and outer parts and a threaded stem carried by said inner part of said joint, said joint parts having interengaged terminal portions, a pivot pin passing transversely through said interengaged terminal portions and one of the said terminal portions being longitudinally slotted to permit longitudinal play between the said portions, said threaded stem extending longitudinally of said inner part and being threadedly engaged in the said threaded bore of said rock lever, a tongue member fixed to the said inner part of the joint and lying above and extending at an upward angle therefrom and over the top of said outer part of the joint when said joint is in operative position with respect to the rock lever, a setting screw threaded downwardly through said tongue member toward and for engagement by the outer part of the joint to limit the pivotal movement of said outer part in one direction relative to the inner part, a threaded coupling between the inner end of said rod and said outer part of the joint, a float, means detachably coupling the float to the outer end portion of the rod, said outer part of the joint being pivoted upwardly into engagement with the setting screw to effect movement of the rock lever to inlet valve closing position upon upward movement of the float, a fulcrum element, a support means in the tank for the fulcrum element, and means adjustably securing the fulcrum element to said support means in a position below said rod and adjacent to said joint whereby the rod will engage and rock on the fulcrum element upon a predetermined lowering of the outer end of the rod and the float to break the joint upwardly and raise the said rock lever to valve closing position.

2. The invention according to claim 1, with an open top water receptacle supported in the tank at an elevation above the bottom of the tank, said receptacle being below the float and having the open top thereof of a size to receive the float, the receptacle having a bottom drain opening adapted to leak-off water therefrom when the water level drops in the tank below such opening, the float being lowered to the said lowest elevation in the pan by the emptying of the pan.

3. The invention according to claim 1, wherein the said means for connecting the fulcrum element to the support means includes a horizontally positioned guide sleeve and the fulcrum comprises a rod engaged in said



sleeve, and means carried by the sleeve engaging and securing the rod in position therein.

4. The invention according to claim 1, wherein said fulcrum support means comprises a vertical pipe secured in a stationary position in the tank and the said means for adjustably securing the fulcrum element to the pipe support means comprises a collar encircling the pipe and having means securing it in adjusted position thereon and a sleeve secured to the outer side of the collar in tangential relation thereto and the fulcrum element comprising a rod engaged in said sleeve, and the sleeve further carrying a set screw engaging and securing the rod in position therein.

5. The invention according to claim 1, wherein the said means securing the fulcrum element to the support means comprises a member attached to the support means, a first guide sleeve secured in horizontal position to said means, a rod having one end portion adjustably engaged in the guide sleeve and carrying a second guide sleeve on and transversely of its other end and the fulcrum element comprising a forked member having a shank adjustably secured in the last mentioned guide sleeve with the fork directed upwardly and receiving the said portion of the arm in the crotch thereof and also forming a vertical guide for the arm.

6. The invention according to claim 5, wherein the said support means comprises a lug carried upon the inner side of a wall of the tank and the said member attached to the support means comprises an elongate arm plate having one end secured to the lug and having the first guide sleeve supported on the other end thereof.

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