Jan. 13, 1959 J. A. GRAY 2,867,820

SUBMERGED FLUSHING DEVICE

Filed July 8, 1957 2 Sheets-Sheet 1

Fig. 1

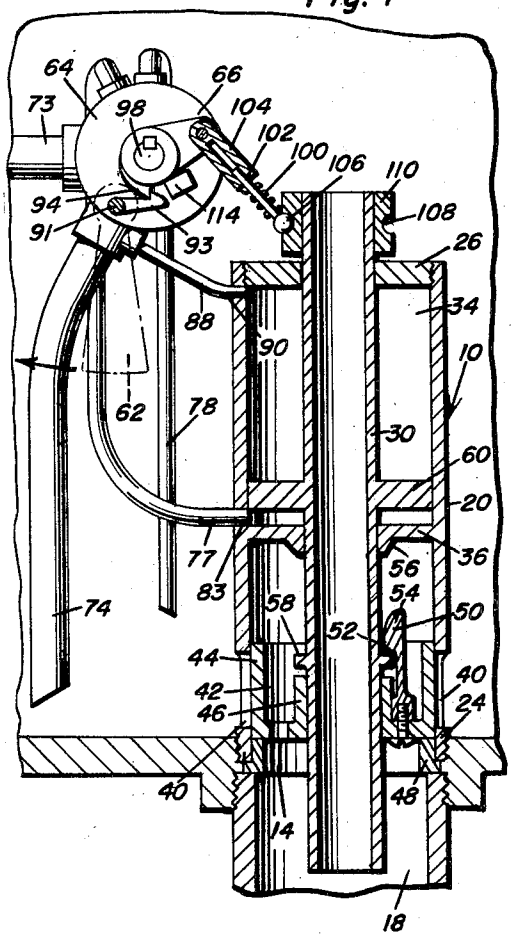


Fig. 3

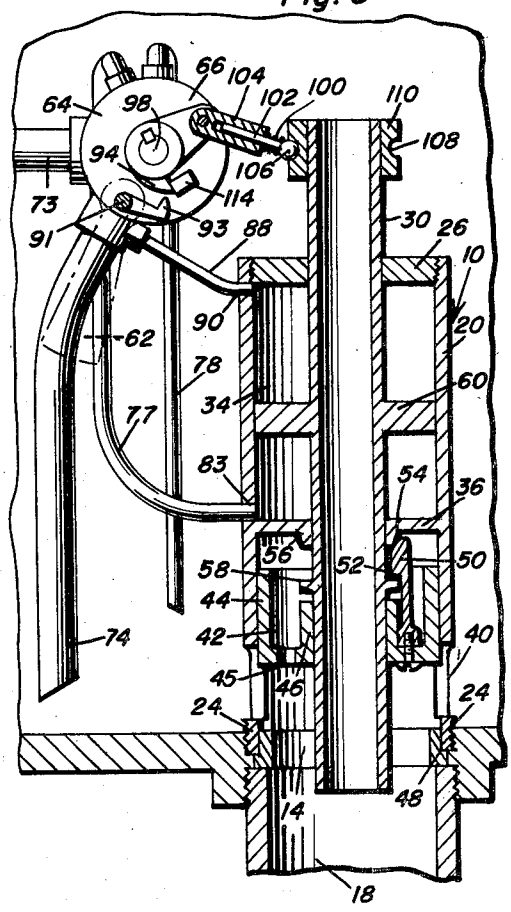
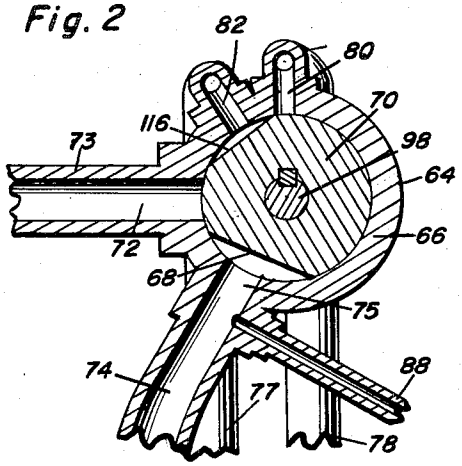


Fig. 2



James A. Gray

INVENTOR.

BY Lawrence O'Brien and Harvey B. Jacobson Attorneys

Jan. 13, 1959 J. A. GRAY 2,867,820

SUBMERGED FLUSHING DEVICE

Filed July 8, 1957 2 Sheets-Sheet 2

Fig. 5

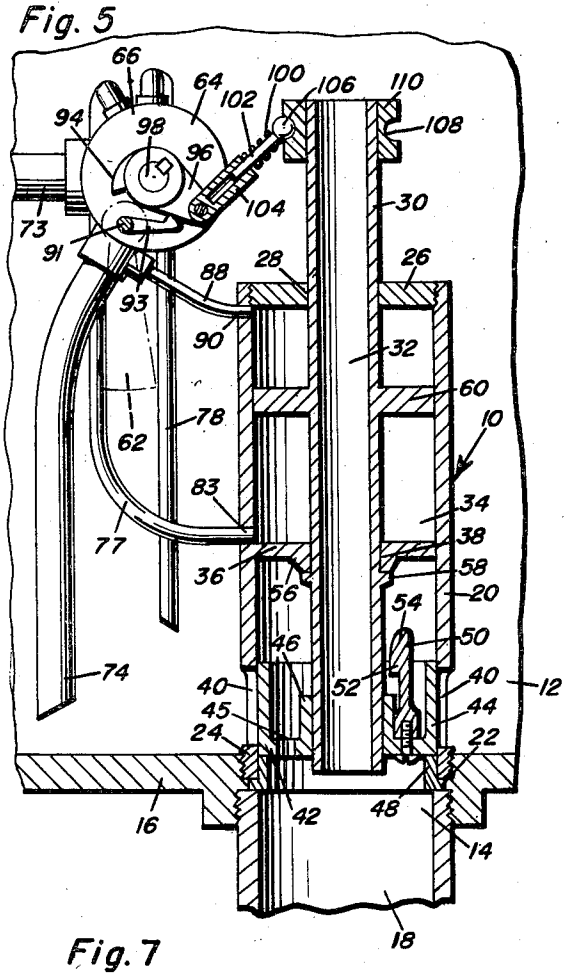


Fig. 4

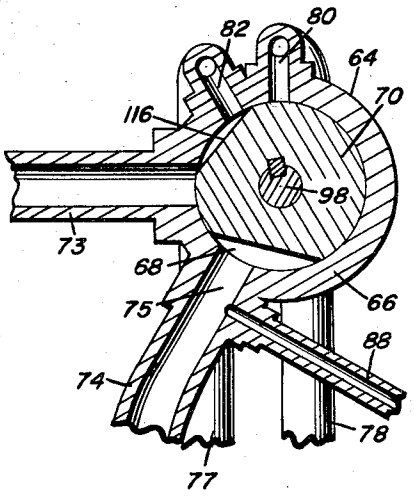


Fig. 6

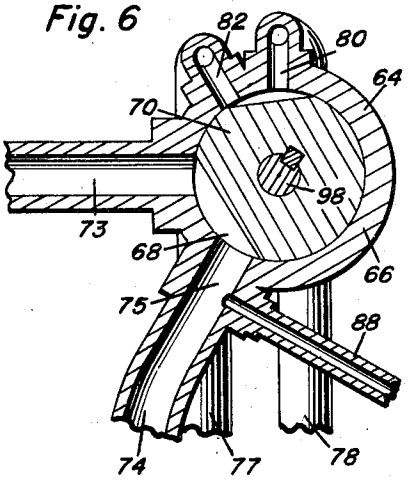
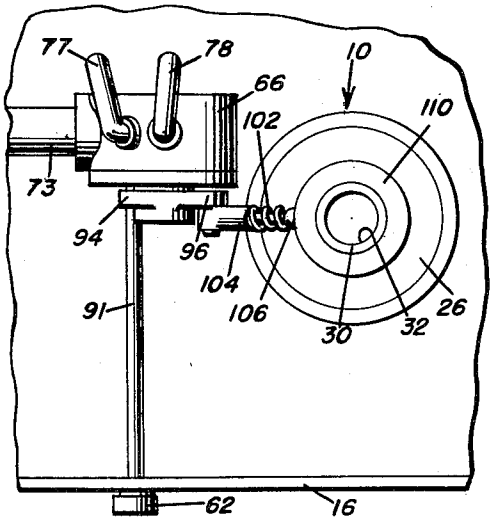


Fig. 7



James A. Gray

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

United States Patent Office 2,867,820
Patented Jan. 13, 1959

2,867,820

SUBMERGED FLUSHING DEVICE

James A. Gray, San Francisco, Calif., assignor to Alessandra Gray, Verona, Italy

Application July 8, 1957, Serial No. 670,406

14 Claims. (Cl. 4—41)

This invention relates to a flushing device for the tank of a water closet.

One of the objects of the invention is to provide a flushing device for a flush tank of a water closet, the device having a valve controlled port through which the tank is emptied, there being water pressure operated means to move the valve to the port opening position and including a multiple position valve whose settings are adjusted in response to movement of the water pressure operated means. The multi-position valve is set into operation to cause a full flushing cycle by merely releasing the multiple position valve so that the water pressure and mechanical movements caused by it will follow.

Another object of the invention is to provide a device which is adapted to be installed in the flush tank of the ordinary household water closet and which provides a novel automatic means to enable the gravity emptying of the tank into the toilet in response to a single handle operation, my device automatically moving through a complete cycle of operation during which various parts of the movements in the cycle are caused by water under pressure of the domestic water supply system.

More particularly, it is an object of the invention to provide a submerged flushing device that has a casing adapted to connect in registry with the flush tank outlet, this casing being provided with a port or a plurality of ports that are controlled by a movable valve. The movements of the valve are caused by initially manually operating a handle of a multi-position valve and this causes water to flow into a chamber in the casing thereby elevating a piston in the chamber. The piston rod has a mechanical connection with the valve which causes the movement of the piston rod to be transmitted to the valve. But, when the upper limit of the piston movement is attained, the mechanical fastening connection between the piston rod and valve is opened which will enable the valve to be gravity lowered to the port closing position.

The piston and piston rod and consequently the valve are moved by water under pressure thereby requiring no manual exertion beyond a servo force. The same situation prevails in connection with the lowering of the piston after the valve has opened the ports and is returning to the port closing position. The multi-position valve which is operated by the handle, is automatically set by a mechanical linkage between the piston rod and the valve. Therefore when the piston rod is elevated to the top position, the multi-position valve is adjusted to direct the water under pressure into the chamber and on the other side of the piston. At the same time the initially applied water under pressure is permitted to drain into the flush tank. Therefore, the piston is positively returned by water pressure until it achieves its starting position at which the multi-position valve is automatically reset for further operation of my flushing device.

Other objects and features of importance will become apparent in following the description of the illustrated form of the invention.

Figure 1 is a fragmentary sectional view of an attachment constructed in accordance with the invention, the attachment being mounted in an ordinary flush tank, parts of the attachment being shown in elevation;

Figure 2 is a sectional view of the multi-position valve showing the setting thereof when the attachment is at the rest position of Figure 1;

Figure 3 is a longitudinal sectional view similar to that of Figure 1 but showing the positions of the parts when the valve has been moved to the port opening position but prior to the opening of the means which fasten the valve to the piston rod;

Figure 4 is a sectional view of the multi-position valve showing the adjustment thereof which corresponds to the position of parts in Figure 3;

Figure 5 is a sectional view of my attachment showing the same when the valve has returned to the port closing position but prior to the resetting of the piston and piston rod as well as the multiple position valve;

Figure 6 is a sectional view of the multiple position valve as it would appear when the attachment is adjusted as shown in Figure 5; and

Figure 7 is a fragmentary top view of a flush tank and a flushing device mounted therein.

In the accompanying drawings there is a flushing device **10** which is adapted to be installed in a standard flush tank **12** and in registry with the outlet **14**, usually in the bottom wall **16** of an ordinary flush tank. Pipe **18** conducts the water from the flush tank **12** to a point of use which is usually a toilet bowl.

Flushing device **10** is constructed of a casing **20** that has an open lower end provided with a shoulder **22** that seats in outlet **14** and that accommodates the nut **24**. This holds the casing **20** rigidly fastened in place within the flush tank **12**. The upper end of the flush tank has an end wall **26** threaded thereon and provided with a central aperture **28** through which piston rod **30** passes. The piston rod is hollow so that the passage **32** extending completely through it functions as an overflow for the flush tank. A chamber **34** is formed in the casing **20** by a part of the side wall of the casing above transverse wall **36** which is located intermediate the ends of casing **20** and below the top wall **26**. Wall **36** has a central aperture **38** in alignment with aperture **28** and through which the piston rod **30** is passed and guided. Ports **40** are formed in the lower end of casing **20** and are arranged to register the interior of tank **10** with the outlet **14** and pipe **18**. Accordingly, the flushing water is passed from the interior of tank **10** through ports **40**, outlet **14** and pipe **18**.

Valve **42** is slidably mounted in casing **20** and is in the form of a piston with skirt **44** slidable on the inner surface of the side wall of casing **20** and sleeve **46** concentrically arranged with the skirt and slidable on the lower end of piston rod **30**. The valve is loosely fitted in casing **20** and/or has a breather port **45** to enable the valve to move freely between the upper port **40** opening position and the lower port **40** closing position. The lower limit of travel for the valve **42** is established by a shoulder **48** which is formed in the lower end of casing **20** below ports **40**.

A spring latch **50** is attached to the valve **42** and has a shoulder **52** at the upper end thereof. The upper extreme end of latch **50** has a cam surface **54** formed on it, this cam surface being adapted to slide over the fixed cam **56** that is on the lower surface of wall **36**. Shoulder **52** is engageable with the annular flange **58** on piston rod **30** in order to hold the valve **42** releasably fastened to the piston rod. Therefore flange **58** and latch **50** constitute means by which to releasably fasten the valve **42** to the piston rod **30**. Inasmuch as the wall **36** is fixed, as the piston rod is elevated, cam surface **54** bears against the

stationary or fixed cam surface **56** thereby releasing the fastening means for the valve and enabling the valve to be gravity lowered.

Piston **60** is attached to the piston rod **30** between the ends of the piston rod and is captive within the chamber **34**. The purpose of the piston is to provide a surface against which water pressure reacts on either the upper or the lower surface thereof so that the valve **42** is controlled by a servo control force applied to handle **62** of the multiple position valve **64**.

Valve **64** is constructed of a valve body **66** provided with a valve chamber **68** in which rotary core **70** is mounted. Inlet port **72** is formed in valve body **66** and is connected by pipe **73** with a source of water under pressure. The tank filler tube **74** is registered with port **75** formed in the valve body **66**, and two conduits **77** and **78** are connected with two ports **80** and **82** respectively that are formed in the body **66**. Conduit **77** is also registered with an opening **83** in the casing **20** in order to conduct water under pressure from the multiple position valve **64** to the chamber **34** below the piston **60**. Conductor **78** is a return line which opens into the tank **12** in order to conduct the water from the lower part of chamber **34** back into tank **12** when the lower part of chamber **34** is purged of water. This occurs when water under pressure is applied to the top part of chamber **34** through conductor **88** which is registered with port **75** in valve body **66** and with an opening **90** in the side wall of the casing near the top thereof.

Handle **62** is attached to spindle **91**. Dog **93** is secured to the spindle **91** and is engageable with stop **94**. This stop is attached to an arm **96** which is keyed to spindle **98**, the key also being connected to core **70**. The function of handle **62** is to release dog **93** from stop **94** enabling the valve **64** to be adjusted to the position shown in Figure 4. This adjustment is obtained by the action of spring **100** that is concentrically mounted on push rod **102**. This push rod is slidably disposed in sleeve **104**, the latter being pivoted to arm **96**. The opposite end of the push rod **102** has a ball **106** formed on it, this ball being located in an annular groove **108** in collar **110** that is fixed to the upper extremity of piston rod **30**. Therefore, upon release of dog **93** from stop **94** and with the piston rod in the down position as shown in Figure 1, the stored energy in spring **100** will rotate the spindle **98** to the position shown in Figure 3 at which the stop **94** comes to bear against abutment **114** on the end wall of valve body **66**.

At this valve setting the pasasge **116** in valve core **70** registers the inlet line **73** with the port **82**. Water under pressure passes through the valve **64**, conduit **77** and into the lower part of chamber **34**. This forces the piston **60** upward carrying piston rod **30** with it and thereby elevates valve **42** in order to open the ports **40**. Water from tank **12** is then capable of flowing through outlet **14**, pipe **18** and into the toilet. As indicated previously the upward movement of valve **42** continues so long as the fastening means between the piston rod and valve **42** are engaged. They are disengaged when the piston rod is elevated to the position slightly higher than that shown in Figure 3 at which the cam surfaces **54** and **56** engage and cause the latch **50** to release from flange **58**. After release of valve **42** it is gravity lowered. After the valve **42** has been elevated to the position at which the valve is released from piston rod **30**, the link formed by spring **100**, push rod **102** and sleeve **104**, passes through the overcenter position (compare Figures 3 and 5) and this results in further adjustment of the multi-position valve **64**. The operation caused by the new setting of the valve (Figures 5 and 6) enables the lower part of chamber **34** to be drained through conduits **77**, ports **82** and **80** and conduit **78**. The water, so drained, is returned to tank **12**. At the same time water under city pressure is passed through valve **64** and into the upper part of chamber **34** through conduit **88**. Meanwhile, (Figure 6) the filler tube **74** is refilling tank **12**.

Piston **60** continues to lower as more water under pressure is applied to the upper surface thereof by entering the top of chamber **34**. Therefore valve **42** becomes again engaged with piston rod **30**. Following the engagement of valve **42** with rod **30**, the link formed by sleeve **104**, rod **102** and spring **100**, again passes through the overcenter position, causing valve core **70** to return to the position shown in Figure 1. The dog **93** automatically engages with stop **94**. When this condition exists tank **12** has again had its water supply replenished and the flushing device is ready for another cycle of operation.

It is understood that various modifications may be made without departing from the scope of the following claims.

What is claimed as new is as follows:

1. In a flushing device for a flush tank of a water closet having an outlet, said device comprising a casing in registry with the flush tank outlet and having a water port near said outlet, a generally vertically movable valve to open and close said port and movably mounted in said casing, a wall having an aperture and disposed in said casing and which separates the casing into a chamber, a piston having a piston rod extending through said aperture and disposed in said chamber, means including a multiple position valve to conduct water under pressure into said chamber alternately on opposite faces of said piston to move said piston, means releasably fastening the part of said piston rod on the exterior of said chamber to said valve so that said valve is moved to the port opening position in response to the application of water under pressure into said chamber on one face of said piston and the consequential movement of said piston.

2. In a flushing device for a flush tank of a water closet having an outlet, said device comprising a casing in registry with the flush tank outlet and having a water port near said outlet, a generally vertically movable valve to open and close said port and movably mounted in said casing, a wall having an aperture and disposed in said casing and which separates the casing into a chamber, a piston having a piston rod extending through said aperture and disposed in said chamber, means including a multiple position valve to conduct water under pressure into said chamber alternately on opposite faces of said piston to move said piston, means releasably fastening the part of said piston rod on the exterior of said chamber to said valve so that said valve is moved to the port opening position in response to the application of water under pressure into said chamber on one face of said piston and the consequential movement of said piston, and means in said casing to release said valve from engagement with said piston rod when said valve is moved a predetermined distance in said chamber.

3. In a flushing device for a flush tank of a water closet having an outlet, said device comprising a casing in registry with the flush tank outlet and having a water port near said outlet, a generally vertically movable valve to open and close said port and movably mounted in said casing, a wall having an aperture and disposed in said casing and which separates the casing into a chamber, a piston having a piston rod extending through said aperture and disposed in said chamber, means including a multiple position valve to conduct water under pressure into said chamber alternately on opposite faces of said piston to move said piston, means releasably fastening the part of said piston rod on the exterior of said chamber to said valve so that said valve is moved to the port opening position in response to the application of water under pressure into said chamber on one face of said piston and the consequential movement of said piston, and means in said casing to release said valve from engagement with said piston rod when said valve is moved a predetermined distance in said chamber after which said valve is gravity lowered to the port closing position, means connected to said rod and said multiple position valve and responsive to continued movement of said

piston rod for adjusting said multiple position valve to a new position at which said chamber is registered on the other face of said piston with said tank to empty said chamber and enable said piston to be lowered.

4. In a flush device for a flush tank of a water closet having an outlet, said device comprising a casing in registry with the flush tank outlet and having a water port near said outlet, a generally vertically movable valve to open and close said port and movably mounted in said casing, a wall having an aperture and disposed in said casing and which separates the casing into a chamber, a piston having a piston rod extending through said aperture and disposed in said chamber, means including a multiple position valve to conduct water under pressure into said chamber alternately on opposite faces of said piston to move said piston, means releasably fastening the part of said piston rod on the exterior of said chamber to said valve so that said valve is moved to the port opening position in response to the application of water under pressure into said chamber on one face of said piston and the consequential movement of said piston, and means in said casing to release said valve from engagement with said piston rod when said valve is moved a predetermined distance in said chamber after which said valve is gravity lowered to the port closing position, means connected to said rod and said multiple position valve and responsive to continued movement of said piston rod for adjusting said multiple position valve to a new position at which said chamber is registered on one side of said piston with said tank to empty said chamber and enable said piston to be lowered, and at which water under pressure is introduced in said chamber on the opposite side of said piston to force said piston to the lowered position in said casing and connect said releasable fastening means between said piston rod and said valve.

5. For use in a flush tank which has a water outlet and a water inlet connected with a water supply, a flushing device comprising a casing connected with said outlet and having a port, a valve to control said port and mounted in said casing for movement between an upper port open position and a lower port closing position, means for moving said valve to the port opening position and including a multiple position valve together with a pair of water conductors connected respectively with said valve and to spaced parts of said casing and through one of which water under pressure is conducted to said casing in moving said valve to said port opening position, a piston between said spaced parts of said casing, a piston rod attached to said piston and to which said valve is releasably connected, means attached to and responsive to the movement of said piston rod for adjusting said multiple position valve to a new position after said valve is moved to the port opening position at which new position water under pressure is applied through one of said conductors into said casing on the opposite side of said piston and at which the water in said casing on the other side of said piston is exhausted.

6. For use in a flush tank which has a water outlet and a water inlet connected with a water supply, a flushing device comprising a casing connected with said outlet and having a port, a valve to control said port and mounted in said casing for movement between an upper port open position and a lower port closing position, means for moving said valve to the port opening position and including a multiple position valve together with a pair of water conductors connected respectively with said valve and to spaced parts of said casing and through one of which water under pressure is conducted to said casing in moving said valve to said port opening position, a piston between said spaced parts of said casing, a piston rod attached to said piston and to which said valve is releasably connected, means attached to and responsive to the movement of said piston rod for adjusting said multiple position valve to a new position after said valve is moved to the port opening position at which new position water under pressure is applied through one of said conductors into said casing on the opposite side of said piston and at which the water in said casing on the other side of said piston is exhausted whereby said piston and piston rod are lowered to again engage said piston rod with said valve, said means connected with and responsive to the movement of said piston rod and including an extensible link which for adjusting said multiple position valve when said piston rod is lowered.

7. In a flushing attachment for a toilet bowl, the combination of a casing, a piston rod having a piston in said casing, a water inlet port in said casing, a valve in said casing to control said port and movable between raised and lowered portions in said casing, means releasably fastening said valve to said piston rod so that upon movement of said piston and piston rod said valve opens said port and moves said means to a raised position, means in said casing for releasing said fastening means thereby releasing said valve from said piston rod enabling said valve to be gravity returned to the port closing position.

8. In a flushing attachment for a toilet bowl, the combination of a casing, a piston rod having a piston in said casing, a water inlet port in said casing, a valve in said casing to control said port and movable between raised and lowered positions in said casing, means releasably fastening said valve to said piston rod so that upon movement of said piston and piston rod said valve opens said port and moves said means to a raised position, means in said casing for releasing said fastening means thereby releasing said valve from said piston rod enabling said valve to be gravity returned to the port closing position, a wall having an aperture and located in said casing separating said casing into a water chamber and a second chamber in which said piston is operable, said rod extending through said aperture and occupying both chambers, a multi-position valve adapted to be connected with a source of water under pressure, conductors operatively connecting said valve with said chamber on opposite sides of said piston, and means connected with said rod for adjusting said valve to sequential positions at which water under pressure is first applied to one side of said valve in said chamber through one of said conductors to move said piston, said piston rod and said valve to the position at which said fastening means release said valve, and then water under pressure is applied through another of said conductors to the opposite side of said piston in said chamber and thereby returns said piston and rod to the lowered position in said casing while the originally applied water under pressure in said chamber is emptied.

9. The combination of claim 8 wherein said piston rod is hollow and constitutes an overflow

10. The combination of claim 8 wherein said for adjusting said multi-position valve includes an extensible linkage having two parts, and a spring reacting on said extensible linkage parts to extend the parts of said linkage.

11. In a flush device for a flush tank, the combination of a casing, a piston having a piston rod and movable in said casing, a valve movably mounted in said casing, said casing having a port controlled by said valve, means for applying water in said casing and on one side of said piston to thereby move said piston in a first direction in said casing, means releasably coupling said valve to said piston rod so that said valve is moved to the port opening position in response to movement of said piston and piston rod in one direction in said casing, means engageable by said coupling means for releasing said coupling means in response to movement of said valve in said casing beyond a predetermined limit, and means for applying liquid under pressure into said casing and on the opposite side of said piston to thereby return said piston

and recouple by said coupling means said piston rod and valve.

12. A flushing device for a flush tank, said flushing device comprising a casing, a wall having an opening and separating said casing into an upper and a lower chamber, a piston having a piston rod, said piston located in said upper chamber and said piston rod passed through said opening in said wall and disposed in part in said upper chamber and in part in said lower chamber, a portion of said piston rod located on the exterior of said casing, a multiposition control valve adapted to connect with the source of water under pressure, upper and lower conductors operatively connected with said control valve and attached to said casing and in registry with said upper chamber and on opposite sides of said piston, manual means for actuating said control valve to introduce water under pressure into the lower part of said upper chamber and thereby elevate said piston and move said piston rod upwardly, said casing having a water port that registers with said lower chamber, a valve movably disposed in said lower chamber between port opening and port closing positions, means releasably coupling said valve to said piston rod so that said valve is moved to the port opening position in response to the aforesaid upward movement of said piston in said upper chamber, and means operatively connected with the portion of said piston rod that is on the exterior of said casing and operatively connected with said control valve for resetting said control valve in response to movement of said piston rod and thereby introducing water under pressure through the other of said conductors and into the upper part of said upper chamber to return said piston to the lowered position.

13. A flushing device for a flush tank, said flushing device comprising a casing, a wall having an opening and separating said casing into an upper and a lower chamber, a piston having a piston rod, said piston located in said upper chamber and said piston rod passed through said opening in said wall and disposed in part in said upper chamber and in part in said lower chamber, a portion of said piston rod located on the exterior of said casing, a multiposition control valve adapted to connect with the source of water under pressure, upper and lower conductors operatively connected with said control valve and attached to said casing and in registry with said upper chamber and on opposite sides of said piston, manual means for actuating said control valve to introduce water under pressure into the lower part of said upper chamber and thereby elevate said piston and move said piston rod upwardly, said casing having a water port that registers with said lower chamber, a valve movably disposed in said lower chamber between port opening and port closing positions, means releasably coupling said valve to said piston rod so that said valve is moved to the port opening position in response to the aforesaid upward movement of said piston in said upper chamber, and means operatively connected with the portion of said piston rod that is on the exterior of said casing and operatively connected with said control valve for resetting said control valve in response to movement of said piston rod and thereby introducing water under pressure through the other of said conductors and into the upper part of said upper chamber to return said piston to the lowered position, means for releasing said coupling means between said valve and piston rod when said valve is raised to the port opening position, and said coupling means reengaging said piston rod and said valve when said piston is returned to the lowered position in said upper chamber.

14. The combination of claim 13 wherein said means operatively connected to the portion of said rod on the exterior of said casing include an overcenter linkage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,341,116	Owens	Feb. 8, 1944
2,587,901	Robinson	Mar. 4, 1952
2,760,204	Joanis	Aug. 28, 1956

FOREIGN PATENTS

1,087,901	France	Sept. 1, 1954