

[54] **PRESSURE DISCHARGE WASTE
DISPOSAL APPARATUS**

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4/78, 91, 86, 92

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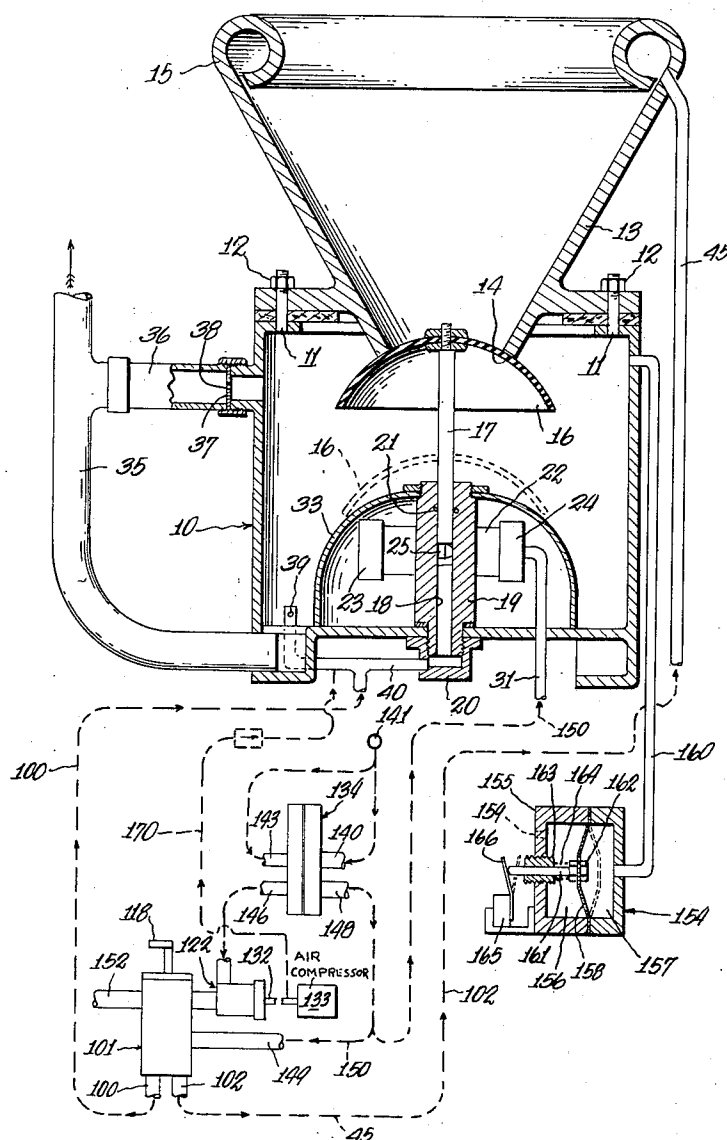
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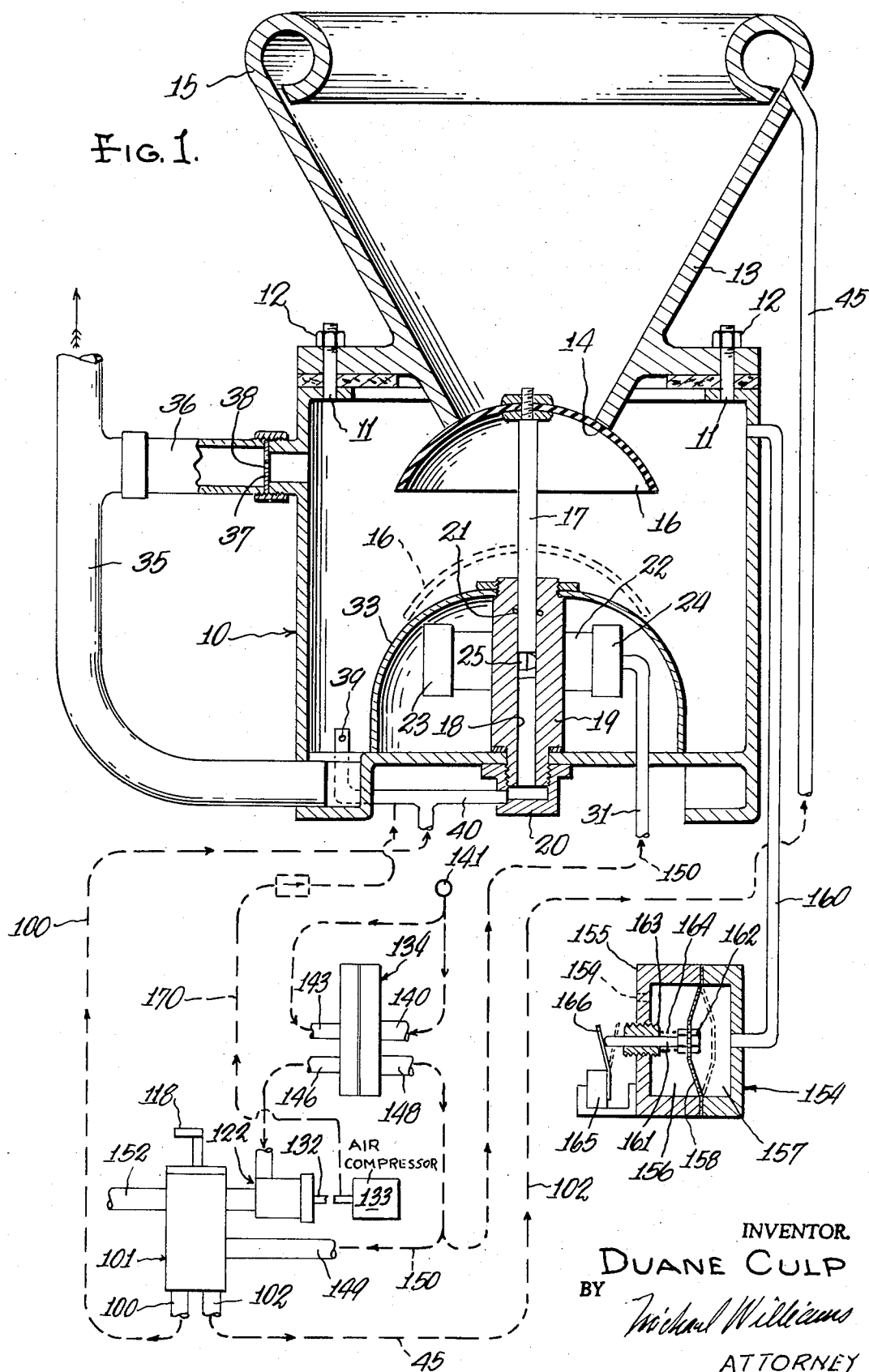
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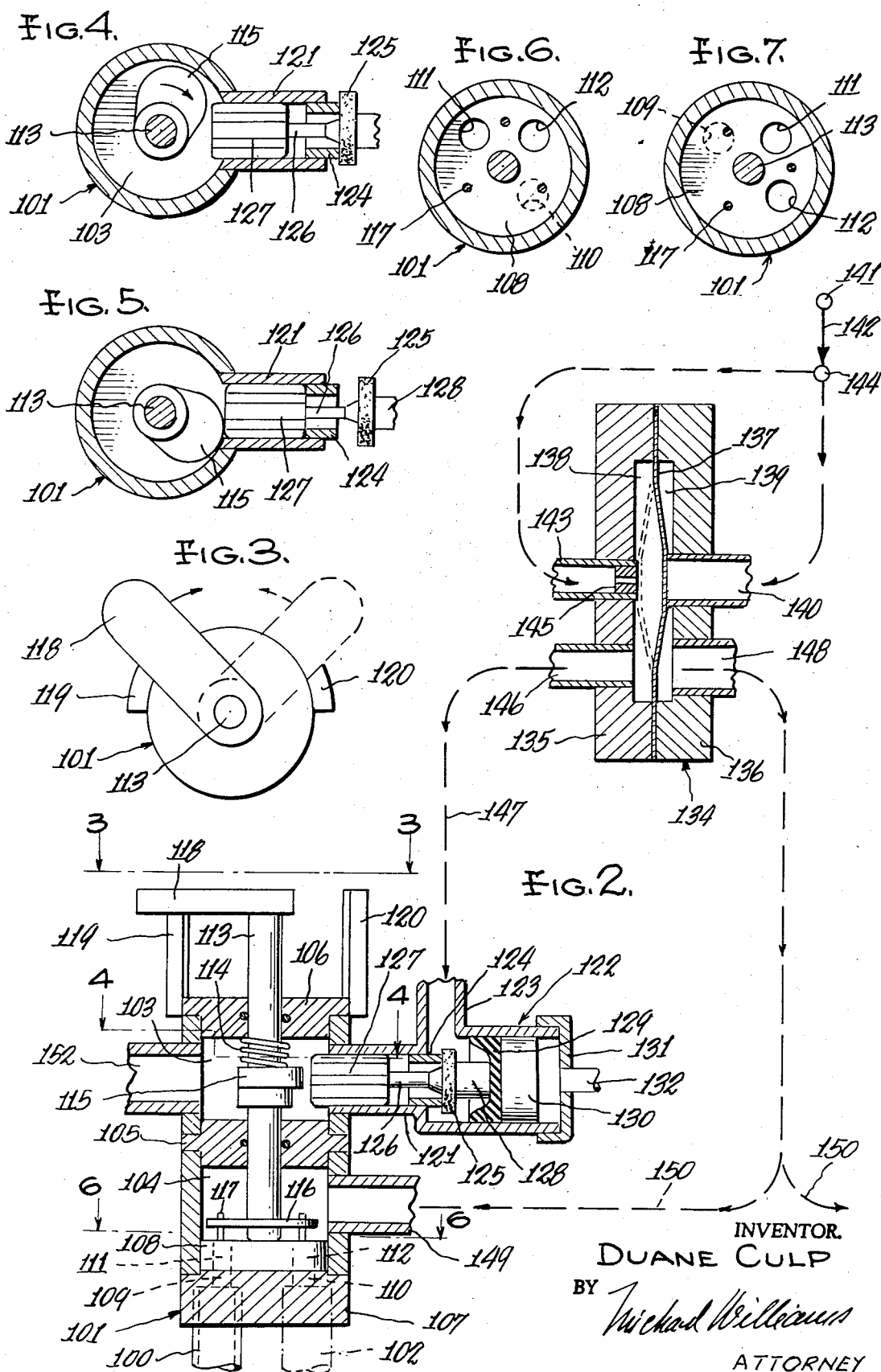
[57] **ABSTRACT**

The present invention is an improvement on the construction shown in U.S. Pat. No. 3,566,415, issued to me on Mar. 2, 1971. The toilet structure is substantially the same as in the patent and the improvement resides in controls for water and air used in flushing the toilet and removing waste therefrom.

13 Claims, 7 Drawing Figures







PRESSURE DISCHARGE WASTE DISPOSAL APPARATUS

BACKGROUND AND SUMMARY

In my U.S. Pat. No. 3 566 415, I have disclosed electrically actuated controls for the water and air used in flushing the toilet and removing waste therefrom. Such controls have operated satisfactorily, and with proper installation the apparatus was safe for use in the intended manner.

The present invention provides a manually initiated, hydraulic flush cycle control which does not require the electrical controls of said patent and is more simple, more reliable and less expensive to manufacture. In addition, the present invention eliminates any possible hazard which may result from careless installation of electrical controls and therefore meets the present-day requirements for product safety.

DESCRIPTION OF THE DRAWINGS

In the drawings accompanying this description and forming a part of this specification, there is shown, for purpose of illustration, an embodiment which my invention may assume, and in these drawings:

FIG. 1 is a vertical sectional view of the toilet structure with the piping shown in diagrammatic manner,

FIG. 2 is an enlarged, sectional view of certain valves of the improved control, with the piping again shown in diagrammatic manner,

FIG. 3 is a plan view corresponding to the line 3—3 of FIG. 2,

FIG. 4 is a fragmentary sectional view corresponding to the line 4—4 of FIG. 2, showing the valve in one position,

FIG. 5 is a view similar to FIG. 4 but showing the valve in another position,

FIG. 6 is a sectional view corresponding to the line 6—6 of FIG. 2, showing valve parts in one position, and

FIG. 7 is a view similar to FIG. 6 but showing the valve parts in another position.

DISCLOSURE OF PREFERRED EMBODIMENT

Reference is made to my patent 3 566 415 and the same parts herein disclosed will be given the same numerals as in the patent to facilitate cross reference. For the purpose of this disclosure a brief description of certain parts of the patent will be sufficient.

Generally, and as in the patent, the pressure discharge toilet comprises a hollow base 10, preferably cylindrical. Seated upon and suitably gasketed to the open top of the base 10 is a receptacle or toilet bowl 13 into which the user discharges his waste. The bowl 13 may be secured to the top of the base 10 by means of studs 11 and nuts 12.

The receptacle has downwardly and inwardly sloping walls in the manner of a cone, and has an opening 14 at the lower end. The upper open rim of the receptacle is margined by a rounded hollow rim 15, for the comfort of the user and for a purpose to appear.

Normally closing the receptacle opening 14 is a generally spheroid valve head 16 formed of flexible, yet tough, material, such as rubber reenforced with a tough fabric or the like. As seen in FIG. 1, the valve head is of ample size to close and seal the receptacle opening 14.

The valve head 16 is connected to the upper end of a plunger 17 and the latter is vertically reciprocable within a bore 18 of a housing 19. The lower end of the housing is reduced in diameter and passes through an opening in the floor of the hollow base 10, and a cap 20 is threaded onto the protruding lower end to hold the housing firmly in position, a suitable gasket being interposed between the inner surface of the base floor and the shoulder formed by the reduced lower end to prevent leakage. The housing bore 18 is sealed against leakage of fluid outwardly through its upper end by a conventional O-ring 21.

Disposed at an intermediate portion of the housing 19 and extending transversely thereof is cylinder 22 (which may be integral with the housing 19). Opposite ends of the cylinder are closed by end caps 23, 24 which are threaded thereon. Slidably disposed within the cylinder 22 is a latch member 25 which is constructed and mounted for actuation in the manner shown in my said patent. As before, a conduit 31 is connected to the cap member 24 to admit fluid under pressure to the interior of the cylinder to move the latch member to the left, and a spring, not herein shown, but disclosed in said patent, urges the latch member to the right.

A rounded shield 33 is connected to the upper part of the plunger housing 19 and extends to the floor of the hollow base 10 to enclose the housing, the cylinder 22 and its end caps 23, 24 to prevent waste from accumulating thereon.

A waste outlet conduit 35 communicates with the interior of the hollow base 10 adjacent to its floor and at the outer periphery thereof. Conduit 35 extends upwardly, in the disclosed embodiment, for connection to a sewer line (not shown). Extending between a portion of the conduit 35 and an upper portion of the hollow base 10 is a branch conduit 36 in which is replaceably disposed a rupture disc 37 having a small aperture 38, the disc and aperture being for the purpose mentioned in said patent.

Disposed within the hollow base 10 is a fluid discharge nozzle 39 arranged to discharge fluid tangentially of the base so as to impart a swirling motion thereto. Further, nozzle 39 is preferably disposed to direct fluid across the entrance to the waste outlet conduit 35 to prevent clogging of the latter. It will be appreciated that several nozzles, like nozzle 39 may be employed, preferably disposed within the hollow base in circumferentially spaced relation.

Extending between the nozzle 39 and the cap 20 is a conduit 40 which establishes communication of each with a source of water under pressure from a conduit 100 leading from a control housing 101. A conduit 45 has its upper end in communication with the interior of the hollow rim 15 and its lower end connected to a conduit 102 which also leads from the control housing 101.

The control housing is divided into chambers 103, (see FIG. 2) by a partition 105. Opposite ends of the housing 101 are closed by end caps 106, 107 which, like the partition 105, are sealed against fluid leakage in any suitable manner.

The inner surface of end cap 107 is accurately machined to closely but slidably fit with a like machined under surface of a rotatable control disc 108. Ports 109 and 110 are formed in the end cap 107 and

the disc 108 has openings 111, 112 extending therethrough, the opening 111 being aligned with the port 109 in one position of the disc 108 with the disc closing port 110 in such position. In another position of the disc, the opening 112 is aligned with the port 110 and with the disc closing port 109.

A shaft 113 is supported for rotation by the end cap 106 and the partition 105 and has its lower end pressed against the upper surface of the disc 108 by means of a spring 114 which is disposed between the inner surface of the end cap 106 and the upper end of a cam 115 which is keyed to the shaft. The pressure exerted by the lower end of the shaft 113 against the disc 108 maintains the machined surfaces of the disc and end cap 107 in fluid tight relationship.

A circular plate 116 is fixed to the shaft and has openings to pass drive pins 117 extending upwardly from the disc 108. An operating lever 118 is fixed to the upper end of the shaft 113 and is swingable between two positions (see FIG. 3) which are determined by stops 119, 120 fixed to and extending upwardly from the end cap 106. The operating lever 118 is disposed within easy reach of a person using the toilet.

Communicating with the interior of the chamber 103 is a conduit 121 which forms part of a pilot valve casing 122. This casing is shown as a one-piece construction although it will preferably be made as a fabrication of parts. A conduit 123 leads from the casing 122 at right angles to the conduit 121 for a purpose to appear. A valve seat member 124 is fixed within the conduit 121 and has its end engageable with a valve head 125 which is positioned in communication with the conduit 123.

The valve head 125 is carried by a valve rod 126 which terminates in an inner fluted end 127 guided for reciprocation by the inner wall of the conduit 121. Extending from the opposite side of the valve head is a pusher member 128 bearing against a rubber piston 129 which is backed by a metal disc 130, the piston and disc sliding within an enlarged part of the valve casing 122. An end cap 131 closes the end of this enlarged part and a conduit 132 is adapted to establish communication between the interior of such enlarged part and the discharge line of an air compressor 133 (see FIG. 1).

A diaphragm valve 134 forms part of the combination disclosed herein and is formed in halves 135, 136 between which a flexible diaphragm 137 is clamped to form chambers 138 and 139. A water pipe 140 leads from the center of the half 136 and establishes communication between the chamber 139 and a source of water supply, such as a commercial water main schematically shown at 141. A hand valve schematically shown at 142, controls flow of water from the main 141.

A pipe 143 of smaller diameter than the pipe 140 establishes communication between the central part of the chamber 138 and the water pipe 140, the connection being schematically shown at 144. A ported disc 145 is disposed within that part of the pipe 143 which is in communication with the chamber 138.

A water pipe 146 is in communication with the chamber 138, in off-center relation therewith, and is connected with the conduit 123 of the pilot valve casing 122, as shown by the dash line 147. A further water

pipe 148 is in communication with the chamber 139, in off-center relation therewith and is connected with a conduit 149 leading to the chamber 104 of the control housing 101, the connection being shown by the dash line 150. The connection 150 also leads to the conduit 31 extending from the end cap 24 of the latch cylinder 22.

OPERATION

When all connections have been made, the valve 142 leading from the water main 141 is opened. In non-operative relation of the toilet, the operating lever 118 is in the full line position shown in FIG. 3 and the valve head 125 (FIG. 4) is shown closing the valve seat member 124. With the lever 118 in its full line position, opening 111 of the disc 108 is in alignment with port 109, while port 110 is closed by the control disc. Since the valve head 125 (FIG. 2) is now tightly engaged against the valve seat member 124, water under pressure will build up in diaphragm chamber 138 and in the conduit 123. Since the effective area of the side of the diaphragm 137 in chamber 138 is greater than the effective area of the opposite side of the diaphragm, the latter will remain in its full position, despite the fact that equal water pressure exists in conduit 140, until the toilet user actuates the operating lever 118. Also, because water under pressure bears against the larger rear surface of the valve head 125, the valve will be held closed.

The toilet is now in condition for use. After the user has deposited his waste in the bowl 13 he grasps the operating lever 118 and rotates it toward the dash line position shown in FIG. 3. With reference to FIG. 4, it will be noted that the cam 115 will engage the inner end of the fluted valve guide 127 shortly after the operating lever 118 is moved, to unseat the valve head 125, whereupon the water pressure in the diaphragm chamber 138 is lowered and the diaphragm 137 will snap to its dash line position to restrict the flow from the inner end of pipe 143 and provide for flow of water from pipe 148, through connection 150 to conduit 149. Water from the chamber 138 and pipe 123 may flow through a conduit 152 to a suitable drain.

When the operating lever 118 has been completely moved to its dash line position in FIG. 3, the opening 112 in control disc 108 will be aligned with port 110 and water under main pressure will flow through conduits 102 and 45 to the interior of the hollow rim 15, and such water will flow down the interior wall of the bowl 13, preferably with a swirling action, to flush downwardly any waste which might have accumulated on the bowl wall.

Since the connection 150 also leads to the conduit 31 extending from the end cap 24 of latch cylinder 22, the latch plunger 25 will be driven to the left from its position in FIG. 1 so as to withdraw it from engagement with the lower end of valve head plunger 17. Since the port 111 (FIG. 2) is now closed by the control disc 108, no water pressure exists in conduit 40 and therefore the plunger 17 and its valve head 16 will drop, under the influence of gravity and the weight of the waste and water above it, to the dash line position shown in FIG. 1, which position corresponds to that shown in FIG. 2 of my said patent. The waste and water will therefore drop to the bottom of the hollow base 10.

The operating lever 118 is held in the dash line position shown in FIG. 3 for a very short time to continue the flushing of waste from the bowl 13 and thereafter will be returned to its full line position shown in FIG. 3. The operating lever may be returned manually by the user, or may be spring-retained, a suitable delay device (not shown) being provided to retard return of the operating lever 118 for the proper interval.

As the operating lever returns from dash line to the full line position of FIG. 3, the pilot valve head 125 will remain open because the water under pressure flowing through the conduit 123 will be now operating against the larger affective area on the left hand side (FIG. 2) of the head 125, and therefore the diaphragm 137 will also remain in its dash line position.

However, the opening 111 of the control disc 108 is now in alignment with the port 109 and therefore water now flows through conduits 100 and 40 to issue from discharge nozzle 39. The water also enters cap 20 and bore 18 to drive plunger 17 upwardly and seat the valve head 16 to close the lower end of the bowl.

As the water continues to issue from discharge nozzle, its swirling action will tend to break up any solid matter and also such water will build up a static head pressure in the hollow base 10 to a point where a pressure responsive switch 154 (see FIG. 1) will be actuated. The pressure responsive switch 154 comprises a housing 155 divided into chambers 156, 157 by a diaphragm 158. The chamber 156 is connected to the atmosphere by means of a port 159, whereas the chamber 158 is connected to the upper interior of the hollow base 10 by a conduit 160. An operating rod 161 is connected to the diaphragm by nuts 162 and is slidable through an adjusting sleeve 163 which is threaded into a wall of chamber 156. A coil spring 164 is interposed between the sleeve 163 and the nut 162 within the chamber 156 and the pressure exerted by the spring against the diaphragm 158 may be adjusted by the sleeve 163 to determine a selected pressure setting for actuating the diaphragm from its normal full line position to the dotted line position.

An electrical snap switch 165 is carried by the switch housing 155 and has an operating member 166 moved to the full line position shown by the operating rod 161. The switch 165 is connected in electrical circuit with the motor of the air compressor 133 and when the static head pressure in the hollow base 10 exceeds the setting of the pressure diaphragm 158, the latter will snap to its full line position, thus causing the operating rod 161 to move the switch operating member 166 to full line position to close contacts (not shown) in the switch 165 and affect operation of the compressor motor.

With the compressor motor operating, compressed air under pressure will flow through conduit 132 to positively shift the pilot valve to the left (FIG. 2) and thus cause valve head 125 to seat on and close valve seat member 124. Simultaneously, the water pressure in pipe 143 will shift the diaphragm 137 to its full line position. Therefore, flow of water through pipe 148, line 150 and conduit 149 will be interrupted and no further water will be discharged from discharge nozzle 39. Also, since water under pressure is now interrupted in the conduit 31, the latch plunger 25 will be spring-pressed to dispose it under the end of plunger 17 to

lock the valve head 16 in position to close the lower end of the bowl 13.

The air compressor 133 also has a discharge line 170, shown in dash lines in FIG. 1, to the discharge nozzle 39 and now air under pressure, rather than water, will issue from the nozzle to continue to swirl and agitate the waste and water within the hollow base 10. When air pressure within the base exceeds the pressure head within the conduit 35, the waste and water will be forced from the base and into and through the conduit 35 for ultimate discharge into a sewer line. This action will continue until all waste and water has been forced through the conduit, and when this is accomplished, the pressure in the hollow base will be reduced to a point where the spring 164 of the pressure responsive switch will snap the diaphragm 158 to dotted line position so that the switch operating member 166 will return to its dotted line position to open the electrical contacts in the switch 165 and break the circuit to the compressor motor. The toilet has now been cleansed of all waste and water and is in condition for reuse.

I claim:

1. A pressure discharge waste disposal device for use where waste must be discharged upwardly against the force of gravity or against a head of pressure, said device including a receptacle for receiving waste, means forming a chamber beneath said receptacle for receiving the waste from the latter through an opening therebetween, a valve for controlling flow of waste through said opening, and a waste pipe communicating with said chamber and through which waste is forced to a sewer, the improvement comprising:

a first valve having inlet means connected to a source of water under pressure, and having two outlets,

a second valve having an inlet connected to one of the outlets of said first valve,

a third valve having an inlet connected to the other outlet of said first valve and having two outlets, said third valve having a valve head which is shiftable to two positions, one or the other position providing for water flow through an outlet while blocking water flow through the other outlet, one outlet being connected to said receptacle and the other being connected to the chamber beneath said receptacle,

said second valve being operable to shift the valve head in said first valve to establish water flow to the inlet of said third valve,

and means for forcibly removing waste and water from the chamber beneath said receptacle through said waste pipe.

2. The construction according to claim 1 wherein said second valve has an outlet connected to a drain.

3. The construction according to claim 1 and including a manually operable member for shifting the valve head of said second valve.

4. The construction according to claim 3 wherein said manually operable member also shifts the valve head of said third valve.

5. The construction according to claim 3 wherein the valve head of said third valve is connected to an actuating shaft which is moved by said manually operable member, and a cam fixed on said shaft for shifting the valve head of said second valve.

6. The construction according to claim 1 wherein the valve controlling flow of waste through the opening between said receptacle and the chamber therebeneath is of the stopper type which is shiftable vertically and in an upper position blocking flow of waste through said opening and in a lower position permitting flow of waste,

a pressure responsive device for latching said stopper valve in upper position, said device having a water connection with said one outlet of said third valve so that water flowing through the latter will also exert a pressure on said pressure responsive device to shift the latter and unlatch said stopper valve to permit the latter to move to its lower position.

7. The construction according to claim 6 wherein said pressure responsive device is spring-pressed to latching position and wherein said other outlet of said third valve also has a water connection to a cylinder in which the rod carrying said stopper valve is vertically reciprocable, whereby when water is flowing to the chamber beneath said receptacle, the water pressure in said cylinder urges said stopper valve to its upper position and said pressure responsive device engages said rod to hold said stopper valve in its upper position.

8. The construction according to claim 1 wherein the valve head of said third valve is connected to an operating shaft which has a handle manually moved to one position by the user of said waste disposal device and returned from said one position after an interval of time, said shaft having a cam for opening the valve head of said second valve when said handle is moved to said one position to thereby shift the valve head of said first valve to establish water flow to the inlet of said third valve and simultaneously shift the valve head of said third valve to cause water to flow to said receptacle,

said cam being moved out of engagement with the valve head of said second valve when said handle is returned from said one position and this valve head being held closed by water pressure while the valve head of said third valve is moved to interrupt water flow to said receptacle and establish water flow to the chamber therebeneath.

9. The construction according to claim 8 wherein the valve controlling flow of waste through the opening between said receptacle and the chamber therebeneath is of the stopper type which is vertically shiftable and in an upper closed position blocking flow of waste through said opening and in a lower open position permitting flow of waste,

means for opening said stopper valve when water is flowing to said receptacle and for closing said stopper valve when water is flowing to the chamber beneath said receptacle, water flowing into said chamber building a pressure therein,

means responsive to a predetermined pressure within said chamber to interrupt further water flow to said chamber and cause compressed air to flow to said chamber to force waste therein through said waste pipe.

10. The construction according to claim 9 wherein flow of compressed air simultaneously seats the valve head of said second valve and the latter causes shifting of the valve head of said first valve to block flow of water to the inlet of said third valve.

11. A pressure discharge waste disposal device for use where waste must be discharged upwardly against the force of gravity or against a head of pressure, said device including a receptacle for receiving waste, means forming a chamber beneath said receptacle for receiving the waste from the latter through an opening therebetween, a valve for controlling flow of waste through said opening, and a waste pipe communicating with said chamber and through which waste is forced to a sewer, the improvement comprising:

a diaphragm valve having both chambers connected to a source of water under pressure, the diaphragm of said valve in one position interrupting flow of water to one chamber and in another position interrupting flow of water to the other chamber,

first valve means having fluid connection with said other chamber and including a valve head which in closed position blocks flow of water in said fluid connection to build up fluid pressure in said other chamber to cause said diaphragm to move to position wherein it interrupts flow of water to said one chamber,

second valve means having a first fluid connection with said one chamber and adapted to control flow of water through either of two outlets which have fluid connections respectively with said receptacle and the chamber beneath the same,

means for shifting the valve head of said valve means to open position to provide for flow of water from said other chamber of said diaphragm valve to thereby reduce pressure in said other chamber and cause said diaphragm to move to position interrupting flow of water to said other chamber, whereby water under pressure will flow to said second valve means and to either said receptacle or the chamber beneath the same, depending upon the position of said second valve means, and means for forcibly removing waste and water from the chamber beneath said receptacle through said waste pipe.

12. The construction according to claim 11 wherein the valve controlling flow of waste through the opening between said receptacle and the chamber therebeneath is of the stopper type which is vertically shiftable and in an upper closed position blocking flow of waste through said opening and in a lower open position permitting flow of waste,

a rotatable shaft having connection with the valve head of said second valve means for shifting the latter between two positions,

a lever fixed to said shaft and manually operated by the user of said waste disposal device,

a cam fixed to said shaft and operable when said lever is moved to one position to open the valve head of said first valve means,

means for opening said stopper valve when water is flowing to said receptacle and for closing said stopper valve when water is flowing to the chamber beneath said receptacle, water flowing into said chamber building a pressure therein,

means responsive to a predetermined pressure within said chamber to interrupt further water flow to said chamber and cause compressed air to flow to said chamber to force waste therein through said waste pipe.

13. The construction according to claim 12 and further including means to interrupt flow of compressed air to said chamber when waste has been evacuated therefrom.

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