Aug. 14, 1945. L. M. HARVEY 2,382,562

DRAIN VALVE FOR WASHING MACHINES AND THE LIKE

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Fig. 1.

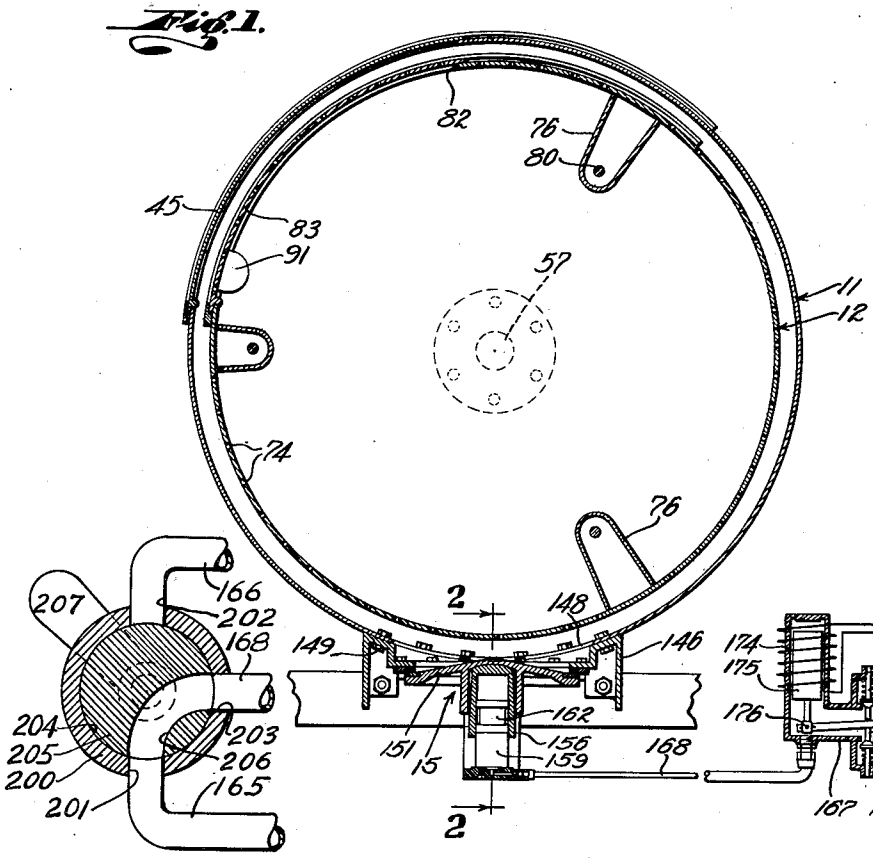
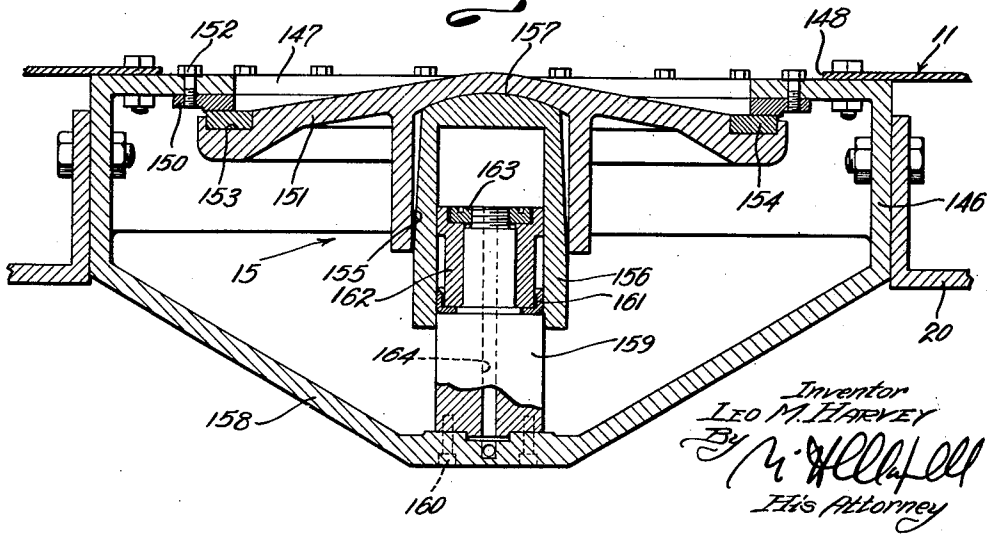


Fig. 3.

Fig. 2



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DRAIN VALVE FOR WASHING MACHINES AND THE LIKE

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6 Claims. (Cl. 137—21)

This invention has reference to valves and has particular reference to drain valves for commercial washing machines and the like. A general object of this invention is to provide a simple, practical and very effective drain valve of this nature.

This application is a continuation in part of application for Letters Patent of the United States, Serial No. 352,582, filed August 14, 1940, now Patent No. 2,323,993, granted July 13, 1943.

In operating commercial washing machines it is the general practice to change the washing fluids several times in washing each batch of the clothes or materials. A drain opening is provided in the bottom of the washing shell and this opening is controlled by a drain valve. The valve usually opens upwardly or inwardly and difficulty is often encountered in opening the valve against the weight of the liquid and the wet materials in the shell. Further, small articles such as buttons, pins, etc., often interfere with the complete closing of the drain valve with the result that the washing liquids leak out during the cyclic washing operations.

An object of the present invention is to provide a commercial washing machine embodying a positively operated remotely controlled dump valve. The valve of the present invention will readily open irrespective of the weight of the materials in the washing shell.

Another object of this invention is to provide a dump valve for commercial washing machines which is self-balancing and self-equalizing to make a perfect seal under practically all conditions of operation.

Another object of this invention is to provide a dump valve of the character referred to which is fluid pressure operated utilizing water pressure, or the like, for the operation.

Another object of this invention is to provide a dump valve of the character referred to embodying a novel cylinder and piston operating means which provides for or permits even seating of the valve closure under all conditions of operation.

A further object of this invention is to provide a drain valve of the character mentioned embodying a simple, yet very effective and dependable remotely controlled electrically energized pilot valve or control valve for the fluid pressure employed in operating the dump valve.

The various objects and features of my invention will be readily understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a vertical detailed sectional view through the cylinder and shell elements of a commercial washing machine showing the dump valve of the present invention in the closed position and illustrating the dump valve pilot or control. Fig. 2 is an enlarged vertical detailed sectional view of the dump valve in the closed position, being a view taken as indicated by line 2—2 on Fig. 1, and Fig. 3 is a fragmentary sectional view of another form of control valve that may be embodied in the invention.

While the valve of the present invention is adapted for numerous applications it is primarily intended for use on commercial washing machines. Accordingly, in the drawing I have illustrated the valve mechanism associated with one form of commercial washing machines. It is to be understood that the invention is not to be construed as limited or restricted to the specific form or application of the invention herein described and illustrated but is to be taken as including any features or modifications that may fall within the scope of the claims.

The portion of the commercial washing machine illustrated includes a pair of spaced generally horizontal frame members **20** forming parts of the washing machine supporting the frame. A stationary cylindrical shell **11** is supported on the washing machine frame and contains or houses a rotatable or oscillatable perforated cylinder **12**. The cylinder **12** is supported for turning on its longitudinal axis by end trunnions **57**. Perforations **74** are spaced throughout the side wall of the cylinder **12** to admit the water, washing mixtures, etc. The shell **11** has an opening normally closed by a sliding door **45** and the cylinder **12** has a similar opening **82** adapted to register with the opening in the shell and normally closed by a door **83**. The door **83** is controlled by a selected latch **91**. The clothes or goods to be washed are introduced and removed through the opening in the shell **11** and the opening **82** in the cylinder **12** when the doors **45** and **83** are open and the cylinder **12** is stopped. The cylinder **12** is rotated or oscillated by a power means and drive, not known, and tumbling ribs or lifting ribs **76** are provided on the interior of the cylinder **12** to tumble or lift the clothes, etc. Strengthening rods **80** which connect the opposite ends of the cylinder **12** extend through the hollow ribs **76**. Water and mixtures of water and other materials such as bleaches, etc., are introduced into the shell **11** at selected intervals

and these liquids are drained away at the end of each stage of the washing operation. The outlet opening or drain opening 148 is provided in the bottom or lower wall of the shell 11.

The improved drain valve of the present invention is indicated generally by the numeral 15 and may be said to comprise, generally, a supporting frame 146, a valve member 151 supported in the frame 146 to seal therein, and remotely controlled cylinder and piston means for operating the valve member 151.

The supporting member or frame 146 is arranged below or at the under side of the shell 11 at the opening 148. The upper portion of the frame 146 is shaped to conform to the shell 11 around the opening 148 and may be secured to the shell by bolts 149 as illustrated. The frame 146 may be bolted or otherwise fixed to the spaced members 20 of the washing machine frame. The upper wall of the supporting frame 146 has a central opening 147 which communicates with the opening 148 of the shell. The opening 147 may be somewhat smaller than the opening 148 and the under side of the frame 146 at the opening 147 is flat and horizontal to carry a seat ring 150. Screws 152 secure the seat ring 150 to the frame 146.

The valve member 151 is arranged within or below the frame 146 and is adapted to seal upwardly or move upwardly to close the opening 147 and thus close the bottom of the shell 11. The valve member 151 is a generally disc shaped member somewhat larger in diameter than the opening 147 and having a rounded or convex upper surface. Means is provided on the upper side of the valve member 151 for cooperating with the seat ring 150. An annular recess 153 is formed in the upper side of the valve member 151 adjacent its periphery to carry a sealing ring 154. The sealing ring 154 may be formed of a yielding resilient sealing material such as rubber, synthetic rubber, rubber composition, or the like. The sealing ring 154 is of substantial thickness and is proportioned and positioned to have extensive engagement with the seat ring 150.

The means for supporting the valve member 151 for operation is a feature of the invention. In accordance with the invention the valve member 151 is supported and operated so that it is self-equalizing and capable of making a tight seal with the frame 146 even though small articles, such as buttons, pins, etc., may be trapped between the seat ring 150 and the sealing ring 154. The under side of the valve member 151 is equipped with a downwardly projecting centrally located boss or hub having a downwardly directed socket 155. The socket 155 is cylindrical and of substantial depth. The upper wall of the socket 155 is concave and partially spherical. The means for supporting and operating the valve member 11 further includes a cylinder 156 which extends upwardly into the socket 155. The cylinder 156 is round or annular in transverse cross section and that portion of the cylinder which enters the socket 155 has an upwardly tapered or convergent external surface. The parts are proportioned so that the lowermost wall part of the socket 155 may cooperate with or rather accurately engage about the tapering cylinder 156 while the remaining portions of the socket side walls are clear of the tapering cylinder 156.

A free working ball and socket engagement is provided between the valve member 151 and the supporting cylinder 156 to allow the valve member to rock, tilt or incline to a limited extent so that it may accurately conform to and engage its seat. The upper end surface 157 of the cylinder 156 is convex and partially spherical to seat or bear in the upper wall of the socket 155 which is of complementary configuration. The convex upper end 157 of the cylinder 156 cooperates with the concave end wall of the socket 155 to support the valve member 151 for limited rocking or universal tilting. This movement of the valve member 151 on the cylinder 156 is limited by the engagement of the walls of the socket 155 with the tapering surface of the cylinder 156, the initial clearance between the socket wall and the cylinder surface being sufficient to permit the desired play and movement of the valve member 151.

The dump valve 15 of the present invention is fluid pressure operated and remotely controlled. The means for operating the drain valve or dump valve 15 includes a transverse web 158 formed on or secured to the supporting frame 146 and extending transversely below the cylinder 156. In the construction illustrated the web 158 is integral with the frame 146. A ram 159 is secured to the web 158 by screws 160, or the like, and projects upwardly to enter the cylinder 156. The upper portion of the ram 159 is reduced in diameter to present an upwardly facing annular shoulder against which bears an upwardly directed cup leather 161. A piston element 162 surrounds the reduced upper portion of the ram 159 and clamps the cup leather 161 in position against its shoulder. A nut or ring 163 is threaded on a reduced stem part of the ram 159 to hold the piston element 162 in position. A central longitudinal port 164 extends through the ram 159 from the web 158 to the interior of the cylinder 156.

Electrically operated valve means is provided to control the delivery of fluid under pressure to the cylinder 156 to operate the dump valve 15. This electrically operated valve means may be positioned at any selected point remote from the valve 15 and in most instances would be supported on the washing machine frame, not shown, some distance away from the dump valve 15. The control means for the valve 15 includes a pipe 165 carrying fluid under pressure, say water under pressure, and a discharge pipe 166. The remote pilot valve or control valve governs the pipes 165 and 166 and includes a valve body 167 connected between the pipes to have communication therewith. A pressure line 168 extends from the valve body 167 to the web 158 where it communicates with the port 164. The pipe 168 and the port 164 put the interior of the valve body 167 in communication with the interior of the cylinder 156. A spring urged valve 170 controls the delivery of fluid under pressure from the pipe 165 into the valve body 167. A similar but opposed spring urged valve 171 controls communication between the interior of the valve member 167 and the outlet pipe 166. The valves 170 and 171 have opposing axially aligned stems 172.

The pilot valve or remote control valve further includes a lever 173 for operating the valves 170 and 171. The lever 173 is pivoted in the valve body 167 and engages between the ends of the opposing valve stems 172. The engagement of the lever 173 between the valve stems 172 is such that the lever controls the valves 170 and 171. The lever 173 has two positions, one where it holds the valve 170 open as illustrated in Fig. 1, and one where it holds the valve 171 open.

The control lever 173 may be operated in any selected manner. In the preferred construction

illustrated electromagnetic means is provided for operating the lever 173 between its two positions. The electromagnetic means includes an armature 175 pivotally and slackly connected with the lever 173 and a solenoid coil 174 for the armature. When the coil 174 is deenergized or in its normal condition the lever 173 assumes the position illustrated where it holds the valve 170 open. Under these conditions fluid under pressure from the line 165 is delivered to the cylinder 156 to hold the valve member 151 in its closed position. When the coil 174 is energized the lever 173 is pivoted so that the valve 170 closes and the valve 171 opens. This operation allows the fluid under pressure to bleed from the cylinder 156 and gravity aided by the weight of the material in the shell 11 and the cylinder 12 moves the valve 151 downwardly to the open position so that the liquid may drain from the cylinder.

It is believed that the operation of the improved drain valve or dump valve of the present invention will be readily understood from the foregoing detailed description. When the cylinder 12 is in operation the solenoid 174 remains deenergized so that the lever 173 is in the position illustrated in Fig. 1 holding the valve 170 open and allowing the valve 171 to remain closed. With the valve 170 open and the valve 171 closed the interior of the cylinder 156 is in communication with the pressure pipe 165 and the fluid under pressure in the cylinder holds the valve member 151 in its closed position. The sealing ring 154 is held in tight sealing cooperation with the seat ring 150 by the action of the fluid pressure. When the shell 11 is to be drained the circuit to the solenoid 154 is completed. In this connection it is to be understood that the circuit of the coil 174 may extend to any selected point or station for ready manual control or for control by an automatic timer means or both. Energization of the coil 174 results in closing of the valve 170 and opening of the valve 171 so that the pressure in the cylinder 156 is immediately relieved. This allows the valve member 151 to move to the open position and the liquid contents of the shell 11 rapidly drain out through the opening 47.

To reclose the dump valve 15 the circuit to the solenoid 174 is opened so that the lever 173 returns to its normal position to open the valve 170 and to allow the valve 171 to close. This puts the interior of the cylinder 156 in communication with the pressure pipe 165 and the valve member 151 is closed by the fluid pressure acting between the ram 159 and the cylinder 156. In closing, the valve member 151 is free to equalize itself on the seat ring 150 and may tilt or tip to a limited extent as may be required. Accordingly, the valve 151 may assume a good sealing position even though a small object such as a button, or the like, may be trapped between the seat ring 150 and the sealing ring 153. The bearing of the valve member 151 on the partially spherical surface 157 permits this self balancing or seating action of the valve member 151. The yieldable sealing ring 154 yields to small objects, such as a button or the like, caught between it and the seat ring 150 and the presence of such a small object will not prevent the valve from making a good tight seal.

Fig. 3 of the drawing illustrates a manually operable pilot valve or remote control valve which may be embodied in the invention. The valve illustrated in Fig. 3 may be employed in place of or in substitution for the electrically operated remote control valve described above. The valve of Fig. 3 includes a body 200 having spaced ports 201 and 202 and the fluid pressure supply and discharge pipes 165 and 166 are respectively connected with these ports. The valve body 200 has a third port 203 and the line or pipe 168 extends from this port 203 to the port 164 of the ram 159. The central bore or opening 204 of the valve body 200 carries a turnable plug or core 205. A curved or angular port 206 is provided in the core 205. The core 205 is movable between a position where its port 206 connects the port 201 with the port 203 and a position where its port 206 connects the discharge port 202 with the port 203. A suitable handle or lever 207 is provided on an end of the core 205 to facilitate its operation or turning. The valve 200 is adapted to be arranged at a position where its operating handle or lever 205 is conveniently accessible to the operator of the washing machine. It will be apparent how the operator may turn the lever 207 to bring the core 205 to the position illustrated where its port 206 connects the pressure supply port 201 with the line 168 to close the valve member 151 and to hold the valve member closed. When the valve member 151 is to be opened the lever 207 is moved to the position where the port 206 connects the line 168 and port 203 with the discharge pipe 166. This allows the pressure to bleed out of the cylinder 156 and the valve 151 opens as above described.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A valve for the outlet opening of a container comprising a seat around the opening, a valve closure for moving into and out of cooperation with the seat, the closure having a central projection having an opening forming a socket with a concave end wall, a cylinder received in the socket and having a tapered exterior extending into said projection and having a convex end cooperating with said end wall, the cylinder forming the sole means to guide and operate the closure so that the closure may rock and tip to conform to the seat, a stationary piston received in the cylinder and forming a support therefor, and means for supplying fluid pressure to the cylinder to operate and control the closure.

2. A structure of the character described comprising, a valve seat, a closure adapted to seal upwardly against the seat, the under side of the closure having an elongate vertical socket, and a fluid pressure actuated mechanism for operating the closure including a movable cylinder engaging in the socket to tiltably support and operate the closure, the side wall of the socket being engageable with the cylinder to limit tilting of the closure, a stationary ram on which the cylinder operates, the ram extending to a point within said socket and having an opening communicating with the interior of the cylinder, and means for supplying fluid pressure to the opening and cylinder.

3. Valve means for controlling a fluid opening including a seat around the opening, a closure for moving into and out of cooperation with the seat, the closure having an elongate socket provided with a concave end wall and a side wall, and means for guiding and operating the closure com-

prising a stationary piston, a cylinder movable on the piston to be guided thereby and entering said socket to guide and operate the closure, the cylinder having a convex end face cooperating with said end wall of the socket to support the closure for tilting movement on the cylinder, the side wall of the socket and the side surface of the cylinder diverging toward the closure to provide freedom of tilting movement of the closure on the cylinder so that the closure may correctly conform to the seat.

4. Valve means for controlling a fluid opening including a downwardly facing seat around the opening, a support below the opening, an upstanding stationary piston on the support concentric with the seat, a cylinder movable vertically on the piston to be guided thereby, a closure for moving into and out of engagement with the seat, the under side of the closure having a central elongate projection with a socket which receives the cylinder, the top of the cylinder and the upper wall of the socket having spherically curved cooperating surfaces to provide for universal tilting movement of the closure so that the closure may readily conform to the seat, the side surface of the cylinder serving to guide the closure from the cylinder and being upwardly convergent to allow for said tilting movement of the closure, and means for supplying fluid under pressure to the cylinder to operate the closure.

5. Valve means for controlling the fluid discharge opening of a container including a seat around the opening, a stationary support located below the seat, a closure for cooperating with the seat, a depending tubular wall on the closure, an upstanding stationary piston carried by the support and extending to a point within said wall, a movable cylinder telescoping down over the piston and telescoping upwardly into said wall, the under side of the closure and the upper end of the cylinder having cooperating spherically curved surfaces so that the closure is supported by the cylinder for free tilting movement, the external surface of the cylinder being upwardly convergent so that the closure may have limited universal tilting movement, and controllable means for supplying fluid under pressure to operate the closure.

6. In a valve of the character described; three telescoping elements, one a closure having a central cylindrical socket, one a fixed piston projecting into the socket with substantial clearance and the other a cylinder located between the other two elements so that it slidably fits the piston and had a guiding fit in the socket, and means for supplying fluid under pressure into the cylinder beyond the piston so the cylinder is moved to operate the closure.

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