The present invention relates to a filling and emptying system for a washing machine which utilizes a centrifugal pump for emptying purposes and adapted for domestic use.

An object of this invention is to construct a filling and emptying system for a washing machine in such a manner that air lock or suds lock in the discharge pump is substantially eliminated.

Another object of this invention is to construct a filling and emptying system for a washing machine in such a manner that the elements of the system do not interfere with the operation of the washing machine.

Another object of this invention is to construct a filling and emptying system for a washing machine in such a manner that hot and cold water is thoroughly mixed before entering the water inlet.

The advantages of the present invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which:

FIG. 1 is a front view of a washer-extractor unit according to the present invention, mounted in a cabinet and supporting framework with the cabinet broken away to show the arrangement of certain parts of the unit;

FIG. 2 is a side view of the washer-extractor unit of FIG. 1 with the cabinet broken away to show the arrangement of the parts;

FIG. 3 is a back view of the unit of FIG. 1 with parts of the cabinet broken away;

FIG. 4 is a schematic diagram showing the principles of the present invention; and

FIG. 5 is a sectional sectional view taken in line 5-5 of FIG. 4, looking in the direction of the arrows, showing how the water enters the mixing tube according to the present invention.

Referring first to FIG. 4 the device of the present invention comprises a non-rotary tub 10 which may be resiliently mounted for free vibration within any suitable framework and enclosed in a cabinet as will later appear. Reference is made to a copending application by Walter W. Searle, Serial No. 76,296, filed December 16, 1960, now forfeited, for one manner in which the tub may be resiliently mounted.

Routinely mounted within the tub 10 is a perforated clothes receiving basket 11 and rotatably mounted within the basket is an impeller 12.

As shown, the tub 10, basket 11 and impeller 12 are mounted at an angle of about 35° so that a small quantity of water may be used for efficient operation.

Drive means not shown in detail is provided for rotating the basket at a slow speed for a tumble washing operation and at a high speed in the same direction for spin extraction operation. During slow speed operation of the basket 11 the impeller 12 is selectively rotated at a high speed in the reverse direction to aid in the washing operation.

The tub 10 is provided with an access opening 13 aligned with an access opening 14 in the basket 11 through which clothes may be inserted into the basket 11.

In order to provide for free vibration of the tub 10 on its mounting the access opening 13 of the tub is connected to the access opening of the cabinet by means of an annular bellows 15 to prevent leakage between the tub 10 and the cabinet.

As shown the normal water level 16 for washing operations partially covers the impeller 12 but is below the level of the access opening 13 of the tub so that the water will not spill from the tub but will be sufficient for washing operations. That is one of the reasons for mounting the unit at an angle as shown.

Water is supplied to the tub 10 by hot and cold water pipes 17 and 18 respectively, controlled by electromagnetically actuated valves 19 and 20 and is delivered to a combined mixing pipe, stand pipe and vent pipe 21 of comparatively large diameter, as shown in FIGS. 4 and 5.

The inlet pipes 22 and 23 enter the upper end of pipe 21 in a tangential direction so that the hot and cold water is thoroughly mixed as it flows down the stand pipe 21.

A vent opening 24 is provided in pipe 21 well above the water level 16 in tub 10 for a purpose which will presently appear.

In order to prevent the water flowing down pipe 21 from flowing out of vent opening 24, a shroud 25 is provided which closes against opening 24 when water is being admitted but which opens to provide venting of the pipe 21 at other times.

A combined drain and charging pipe 26 of comparatively large diameter communicates with the tub 10 at one end through a flexible bellows pipe 27 and at its other end with stand pipe 21. The pipe 26 slopes upwardly to the right as shown in FIG. 2 and a centrifugal discharge pump 28 has its inlet connected to the pipe 26 adjacent to the entrance of the stand pipe 21 to the pipe 26.

A discharge pipe 29 connects to the discharge of pump 28 and may empty to any suitable point of discharge such as a sink.

The connection of the pipe 26 to the stand pipe 21 adjacent to the inlet to the pump 28 and the upward slope of pipe 26 toward the pump inlet serves a number of important functions. The inlet 27 to the pipe 26 forms the lowest point of the tub 10 so that when the pump 28 is operated all of the water in the tub 10 will be evacuated and any vapor or foam in the tub will be vented through stand pipe 21 before it reaches the pump 28 to interfere with its operation. As long as water remains in the inlet 27 of the tub 10, the pump 28 is primed so as to be operative immediately.

Any water which may be splashed into gasket 15 is drained back to pipe 26 by a drain pipe 30.

In order to vent the tub 10 when the access door of the cabinet is closed, a vent pipe 31 is provided between the upper part of the tub 10 and the top of stand pipe 21.

A pipe 32 leads from the lower end of inlet pipe 26 to a level measuring vessel 33 which is positioned below the normal liquid level 16 in the tub 10.

The vessel 33 is divided into a compartment 34 of comparatively large area and a compartment 35 of relatively smaller area by a partition extending downward from its top. A vent pipe 37 leads upwardly from compartment 35 and communicates with atmosphere so that water will rise in pipe 37 to the level of the water in the tub 10 as shown.

A pair of small diameter tubes 38 and 39 extend upwardly from the chamber 34 to two well known diaphragm actuated switches 40 and 41, in which the diaphragms of the switches 40 and 41 snap upwardly in response to a change of pressure in the chamber 34 as the water level therein rises and falls.

The area of the surface of the water in chamber 34 is so large compared to the area of the diaphragms of switches 40 and 41 that the change of the level of the water in chamber 34 is negligible as the diaphragms of switches 40 and 41 are actuated.

The switch 40 may be calibrated to actuate the electromagnets 19 and 20 when the water level in tub 10
reaches the proper level and the switch 41 may be calibrated to start a spin extracting or other operation when the liquid level in tub 10 falls to the proper level.

There are two of the hot and cold water valve magnets 19 and 20 which may be controlled in any suitable manner by a thermostat positioned either in the tub 10 or in the stand pipe 21.

Referring to FIGS. 1, 2 and 3 the washer-extractor of FIG. 4 is mounted in a supporting framework and cabinet as shown in the drawing.

The entire unit including the motor for driving the basket is resiliently mounted on a framework encased within a cabinet generally indicated by the reference numeral 42.

The arrangement of the framework within the cabinet 42 and the manner of mounting the washer-extractor on the framework forms no part of the present invention and has not been shown in detail.

The cabinet 42 is provided with a sloping front panel 45 which coincides with the front access opening 13 of tub 10 and is normally closed by a door panel 44 over an access opening 45 and to which bellows 15 is attached.

The drain pipe 30 is shown in FIGS. 1 and 2 in the form of a flexible hose which extends downwardly along the front interior of cabinet 42 to connect with the pipe 26 which extends across the front of the cabinet and rearwardly along the right hand side to the bottom of cabinet 42.

The flexible bellows 27 is shown in the form of a flexible hose extending forwardly slightly from the outlet 46 of tub 10 and connected to the side of pipe 26.

The tube 32 extends along the interior of the cabinet 42 to the liquid level measuring vessel 33 at the right hand side of the cabinet as shown by FIGS. 1 and 2. The tubes 37, 38 and 39 extend upwardly along the right hand side of the cabinet 42 as shown by FIG. 2.

As shown by FIG. 3 the tubes 38 and 39 extend across the back of the cabinet to pressure switches 40 and 41.

As shown by FIGS. 2 and 3 the discharge pipe 29 of the pump 28 extends upwardly along the right hand side and back of the unit to a fitting 47 to which a hose 48 is connected for the purpose of leading the discharge water to a sink or other suitable point of disposal.

In FIG. 2 the inlet pipe 23 is shown extending from one side of the vent pipe 21 while the inlet pipe 32 extends from the opposite side of vent pipe 21 and is not visible. As shown by FIG. 3 the pipes 22 and 23 then extend along the back of the machine to fittings 49 and 50 which are connected to hose sections 51 and 52 which may be connected to sources of hot and cold water respectively.

The solenoid valves 19 and 20 are shown in FIG. 3 partially hidden behind the upper ends of hose sections 51 and 52, being connected between the pipes 22 and 23 and the fittings 49 and 50 respectively.

The cabinet 42 has an extension 53 in which the hose sections 48, 51 and 52 may be stored when not in use.

Operation

The door 44 is opened and clothes inserted into the basket 11 through charging openings 40, 13 and 14 along with a suitable amount of detergent and the hose 51 and 52 connected to sources of hot and cold water respectively.

The amount of hot and cold water may be varied manually at the taps and will depend on the relative temperatures of the hot and cold water or the valves 19 and 20 may be controlled thermostatically by a thermostat in the mixing tube 21 or in the tub 10.

In any event the water flows through fittings 49 and 50, valves 19 and 20 and pipes 22 and 23 into the upper end of stand pipe 21.

The hot and cold water will enter the top of stand pipe 21 in a tangential direction as shown by FIG. 5 and become completely mixed as it flows downwardly through stand pipe 21 past the shroud 25 over the vent opening 24.

The mixed water will flow through pipes 26 and 27 into the bottom of tub 10 until it reaches the level 16 at which time the pressure in chamber 34 of vessel 33 will be sufficient to actuate the switch 40 to close the valves 19 and 20.

The washing operation may then be carried out in the usual manner.

After the washing operation has been completed the end of hose 48 is placed in a sink and the pump 28 energized either manually or by any suitable program control.

It is noted that the pump 28 is of the centrifugal type and will always remain primed as long as water remains in the tub 10 since the pump inlet is positioned below the bottom of tub 10.

When the tub 10 becomes empty, some wash water may flow through pipe 26 toward the pump 28 but will be vented when it reaches the lower end of stand pipe 21. Any suds or foam remaining in pipe 26 will be washed back into the tub 10 when the tub is refilled since the filling liquid passes in the opposite direction through the same pipe 26.

When the tub is empty the pressure in chamber 34 of vessel 33 will fall and that fall in pressure is used to actuate switch 41 to de-energize the pump 28 and institute a spin extracting or other operation.

From the foregoing it can be seen that the present invention provides a simple filling and emptying system for a domestic washing machine where space is at a premium. In view of the foregoing it is maintained laterally of the tub in order to save space and in which the pump is always maintained in a primed condition for a succeeding operation.

While we have shown but a single embodiment of our invention it is to be understood that that embodiment is to be taken as illustrative only and not in a limiting sense. We do not wish to be limited to the specific structure shown and described but wish to include all equivalent variations thereof except as limited by the scope of the claims.

We claim:

1. A washing machine comprising a tub, a centrifugal pump for emptying said tub, said pump being mounted independently of and positioned laterally of said tub, said pump having its inlet at a level near the level of the outlet of said tub, a flexible laterally extending combined inlet and outlet pipe extending between the outlet of said tub to the inlet of said pump, a combined inlet and vent stand pipe of comparatively large diameter extending upwardly from said laterally extending pipe and connected thereto at a point adjacent to the inlet of said pump, liquid supply means for introducing liquid into said stand pipe so as to enter said stand pipe from its bottom thereof through said laterally extending pipe, automatic means for maintaining a proper liquid level in said tub, a vent opening in said stand pipe above said liquid level, and a shroud over said vent opening to prevent leakage of water through said opening as the water flows downwardly through said stand pipe.

2. In a washing machine, a supporting structure, a tub mounted on said supporting structure, said tub having a low portion, an outlet in said low portion of said tub, a centrifugal pump mounted on said supporting structure independently of said tub, said pump being mounted in a position displaced a substantial distance horizontally from said low portion of said tub, said pump having an inlet and an outlet, a flexible pipe connected between the outlet of said tub and the inlet of said pump, said flexible pipe sloping downwardly from said pump to said outlet of said tub, and a stand pipe connected to said flexible pipe at a point adjacent said inlet to said pump, said stand pipe extending upwardly to a liquid supply means.

3. A washing machine according to claim 2 wherein said tub is mounted with its longitudinal axis inclined and said supporting structure comprises a cabinet enclosing said tub, an access opening in said cabinet to the top of said tub, a U-shaped flexible conveying member having its ends connected between the periphery of the top of said tub and the periphery of said access opening in said cabinet.
with the inner concave portion of said U-shaped member facing the longitudinal axis of said tub, and a tube extending from the lowest portion of said U-shaped member to said flexible pipe.

4. A washing machine comprising a supporting structure, a tub mounted on said supporting structure, a closed vessel positioned to the side of said tub below the normal liquid level in said tub, a tube extending from said tub below the normal liquid level thereof to the bottom of said vessel, a plate in said vessel, said plate extending completely across said vessel and having its top edge secured to the top interior of said vessel, the bottom edge of said plate being spaced a small distance above the bottom of said vessel, said plate dividing said vessel into two chambers, a first pipe entering one of said chambers through the upper portion of said vessel, said first pipe extending upwardly from said vessel above the normal liquid level in said tub and having its upper end open to the atmosphere, at least one pressure pipe having one end entering the other of said chambers through the upper portion of said vessel, the other end of said pressure pipe being connected to a pressure switch, said pipes being connected to said vessel a substantial distance above the bottom edge of said plate, whereby when said tub is filled with the liquid the liquid will enter said vessel through said tube and will rise in said one chamber and said first pipe until it reaches the normal liquid level in said tub whereupon the pressure in said other chamber and said pressure pipe causes actuation of said pressure switch.

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