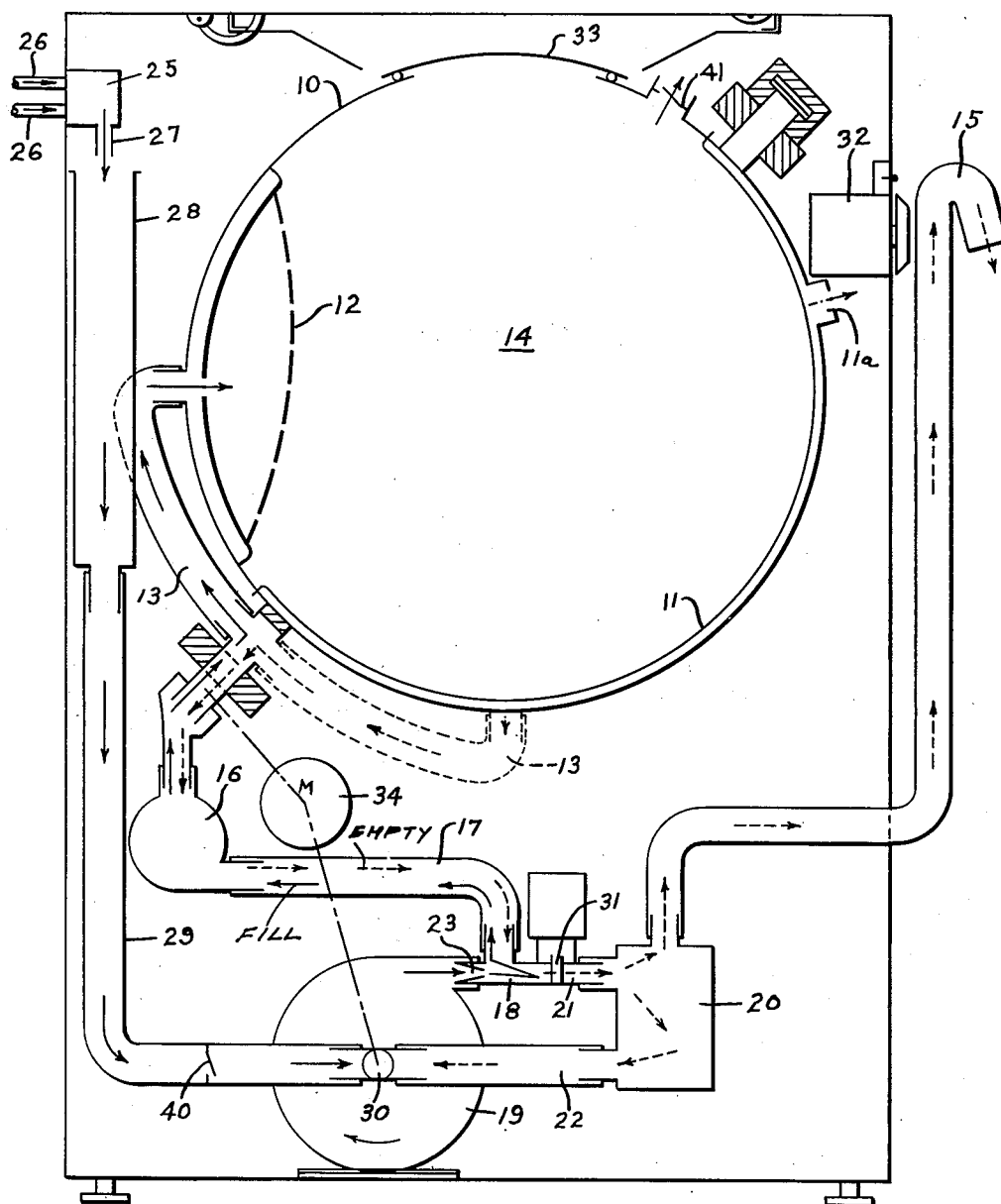


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FLUID CONTROL APPARATUS
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FLUID CONTROL APPARATUS

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This invention relates to domestic appliances and more particularly to washing machines.

An object of this invention is to provide a pumping device for a washing machine which is adapted to pump liquid into the washing machine to fill the same, and alternatively to discharge liquid therefrom.

Another object of this invention is to provide a washing machine requiring a vacuum to be imparted to it, with a pumping system whereby the pump acts to introduce wash-water into the tub, and to withdraw liquid and impart a vacuum to wring the clothes.

Another object of this invention is to provide a washing machine with a jet action pump capable of introducing liquid into the washing machine for washing purposes, and to impart a vacuum to the machine to wring the clothes.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing the figure is a diagrammatic representation of a machine embodying features of my invention.

A washing machine 10 is provided with a flexible diaphragm 11 and a drainage chamber 12 connected to an intake and discharge pipe 13. The construction is such that the washing chamber 14 is under atmospheric pressure during the washing operation, and is under a partial vacuum during the wringing operation, to collapse the flexible diaphragm 11 against the clothes, and to discharge the wash-water through the pipe 13 eventually into the discharge hose 15 to a suitable drain. A vent 11a is provided to allow air under atmospheric pressure to enter and leave the space behind the diaphragm 11. Any washing machine requiring the introduction of liquid, and the imposition of a vacuum may be used. By way of example merely, a washing machine of the character disclosed in my copending application S. N. 34,038, filed June 19, 1948, may be used. However, it is to be understood that washing machines of a different character may embody features of my invention.

The washing machine may be connected by the trap 16 and pipe 17 with a jet chamber 18 of a jet pump system including the centrifugal or mechanical pump 19, air and water separator 20 and recirculating pipes 21 and 22. When a vacuum is to be imparted to the washing machine, the jet 23 imparts a vacuum to the pipe 17, and discharges the withdrawn contents, through the

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pipe 21, to the separator 20. Here any air, and excess water are discharged through the pipe 15, and a certain amount of water is recirculated through the pipe 22, pump 19, back to the jet 23, to impart the aforesaid vacuum.

In order to fill the washing machine with washing liquid, the jet pump is utilized to introduce such liquid. To this end a solenoid mixing valve 25 may be supplied with hot and cold water through one or more pipes 26, and the water is discharged at a constant volume through the faucet 27 into the stand pipe 28. The water flows through the pipe 29 to the inlet 30 of the centrifugal pump. A solenoid valve 31 is so controlled that the valve closes, or partially closes, the pipe 21 during the filling operation. Under such conditions, any liquid flowing out of the jet 23 is forced upwardly through the pipe 17, reservoir 16, pipe 13 into the washing machine. Since the timer 32 maintains the valve 25 open for a correct period of time, the correct amount of liquid is introduced into the washing machine.

The purpose of the trap 16 is to receive any liquid standing in pipe 15 and to prevent it from rising into the tub 10 to wet the clothes when the vacuum is being broken.

In the operation of the machine, clothes and detergent are introduced through an opening produced by removing the cover 33. Thereafter the cover is replaced. The motor 34 drives the centrifugal pump 19, and slowly rotates the washing machine 10. The solenoid valve 25 is opened and closed by the timer, so that a measured amount of liquid is discharged into the well 28. At the same time solenoid valve 31 is closed, so that continued rotation of the pump 19 causes this liquid to be backed up through the pipes 17 and 13 into the space 14, where the clothes are washed by the rotating action of the tub 10. After the proper length of time, the timer 32 opens the solenoid valve 31. This allows the liquid discharged from the jet 23 to pass through the pipe 21 into the separator 20. Any excess liquid and/or air are discharged upwardly through pipe 15 to a drain tub or the like. A certain amount of liquid, which may be termed operating liquid, is recirculated through the pump 19 and the jet 23, eventually to impart a vacuum in the chamber 14, causing the flexible diaphragm 11 to collapse against the clothes under atmospheric pressure on the opposite side of the diaphragm, thus wringing the clothes. After the clothes have been wrung, the timer may repeat the water introducing and removing operations

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one or more times, to produce a rinsing and wringing action.

The vacuum in space 14 is broken, while the pump 19 is running, by the closing of solenoid valve 31, which causes air and water to be backed into the space 14. Any water accompanying the air is arrested in trap 16, which is large enough to hold any water that may be standing in the pipes of the machine.

A check valve 40 in the pipe 29, during the vacuum cycle, prevents water from being pumped back into the stand pipe 28.

A check valve vent 41 which is slightly spring-loaded allows air to leave the space 14 during the filling operation; but prevents air from entering the space 14 during the vacuum cycle.

The nozzle 27 is sufficiently above the top of the stand pipe 28 to prevent water from being drawn into the nozzle 27, should the water supply accidentally create a suction effect.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination: an enclosure adapted to have a vacuum imparted thereto and adapted to have liquid introduced therein; a jet pump having its normal intake connected to said enclosure and its discharge connected to a separator; a centrifugal pump; recirculating passages between said separator, centrifugal pump and jet pump; liquid supply means connected to the intake of said centrifugal pump; and an obstructing means between said jet pump and separator to cause liquid to be backed up into said enclosure.

2. In combination: an enclosure adapted to have a vacuum imparted thereto and adapted to have liquid introduced thereto; a jet pump having its normal suction opening connected to said enclosure and having its normal discharge opening connected to a separator; a mechanical pump having its intake opening connected to said separator, and its discharge opening connected to said jet pump; liquid introducing means connected to the intake of said mechanical pump; and an obstructing valve between said jet pump and separator.

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3. In combination: an enclosure; a jet pump having its normal suction connected to the enclosure; means to introduce liquid into the jet of said jet pump, and an obstructing valve in the normal discharge of said jet pump to cause liquid to back up into said enclosure.

4. In combination: an enclosure to be filled with and emptied of liquid; a jet pump having a low pressure jet chamber connected to said enclosure; a mechanical pump and a separator in a fluid recirculating cycle with said jet pump; a liquid supply pipe connected to said cycle; and a restricting device on the discharge side of said jet pump adapted to reverse the flow between said jet pump and enclosure.

5. In combination: an enclosure to be filled with and emptied of liquid; a jet pump having a low pressure jet chamber connected to said enclosure; a mechanical pump and a separator in a fluid recirculating cycle with said jet pump; a liquid supply standpipe open at its upper end to the atmosphere and having its other end connected to said cycle; and a restricting device on the discharge side of said jet pump adapted to reverse the flow between said jet pump and enclosure.

6. In combination: an enclosure to be filled with and emptied of liquid; a jet pump having a low pressure jet chamber connected to said enclosure; a mechanical pump and a separator in a fluid recirculating cycle with said jet pump; a liquid supply standpipe open at its upper end to the atmosphere and having its other end connected to said cycle; a valve to prevent backward flow in said standpipe; and a restricting device on the discharge side of said jet pump adapted to reverse the flow between said jet pump and enclosure.

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