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(54) Method and device for economizing detergent, particularly for an automatic-cycle washing machine.

(57) A method for economizing detergent for an automatic-cycle washing machine (60) comprising a tub (61) housing a rotary drum (62), a discharge pipe (3) connecting said tub to a pump (2) and into which a filter (65) is connected, and a delivery pipe (4) from said pump (2), characterised in that the wash water fed into the machine undergoes a pulsating movement by way of the pump, so that said pump (2) and the relative pipes (3, 4) are washed and the detergent present in the water is dissolved.

This method is implemented by a device characterised by comprising means for effecting the pulse-operation of the pump.

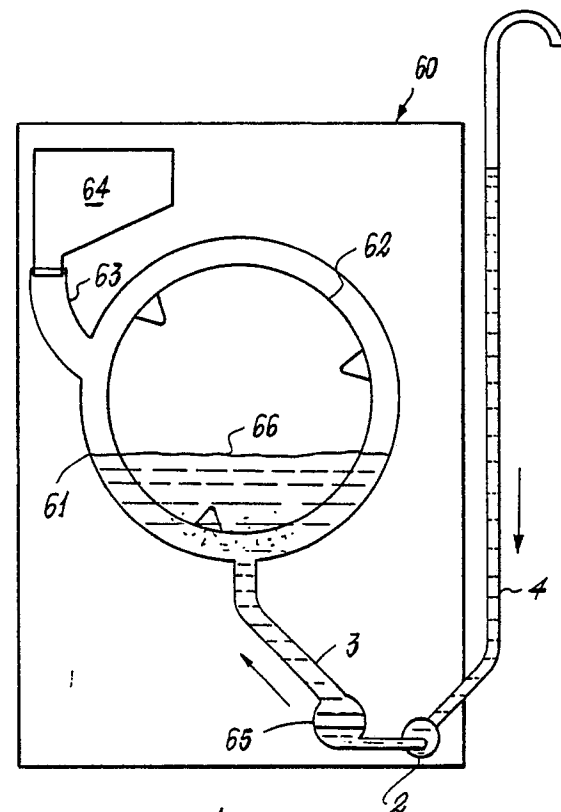


Fig. 1

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METHOD AND DEVICE FOR ECONOMIZING DETERGENT, PARTICULARLY FOR AN AUTOMATIC-CYCLE WASHING MACHINE

This invention relates to a method and device for economizing detergent for an automatic-cycle washing machine comprising a tub housing a rotary drum, a discharge pipe connecting said tub to a pump and into which a filter is connected, a delivery pipe the height of which exceeds the maximum level of the water fed into the tub, a device (distributor) with at least one compartment for the detergent, and means which connect said device to the tub for transfer of the detergent.

Generally in such washing machines the wash cycle commences with water feed into the detergent distributor, removal of said detergent by the water and the entry of the mixture into the tub. As this latter has a bottom aperture it happens that during the filling operation a more or less large quantity of detergent comes to rest within the filter, the pump and the discharge and delivery pipes. This detergent fraction is no longer able to find its way into the circulating wash water and therefore represents a loss which is repeated for each wash cycle.

To obviate this drawback certain expedients have been devised to prevent the detergent entering the discharge pipe or to return the water present in the discharge pipe, filter and pump to circulation so recovering the detergent present therein.

The devices which prevent the detergent entering the discharge pipe are of various types. Some of these use for example, in the discharge pipe, a float valve located at the entry of the discharge pipe into the tub. As this discharge pipe is closed by the float at the commencement of each cycle, the detergent which enters the tub together with the water is unable to fall further and therefore remains in the tub during the entire wash.

Other washing machines use a water reservoir positioned towards the top of the delivery pipe. In this manner, on commencement of each wash, as the pipes are full of water, no vortex is created at the base of the tub towards the discharge pipe with the result that the detergent deposits slowly on the base of the tub. However, as there is no shut-off valve in the discharge pipe, a fraction of the detergent again finishes in this pipe during the wash, and thus becomes unusable for the wash itself. This quantity is however relatively small and the device is moderately efficient. Devices have also been constructed which instead of preventing the detergent escaping from the wash tub recover it by recirculating the water present in the discharge pipe.

In this respect, in some washing machines the

filter is connected to the tub by two pipes (one being the discharge pipe). Because of the drum rotation during washing, water circulates within the two pipes and the water contained in the discharge pipe together with its dissolved detergent return to the tub.

In a different construction, the distributor water-feed valve and the pump are connected together. In this manner a fraction of the water is fed without detergent by said valve to the pump, and rises backwards from this latter within the discharge pipe to return the detergent into circulation within the tub.

Such economizer devices, although resulting in less detergent wastage, require additional components to be fitted to the washing machine such as valves, water reservoirs and various pipes which complicate the machine, increase its manufacturing costs and sometimes disturb its operation.

An object of the present invention is to provide a simple method and means for economizing the detergent used in washing machines, said method and means neither involving particular constructional complications nor penalising the machine manufacturing costs, with the result that it can be marketed at the same price as conventional machines.

This and further objects which will be apparent to the expert of the art are attained by a method of economizing detergent for an automatic-cycle washing machine of the initially described type, characterised in that the wash water fed into the machine undergoes a pulsating movement by way of the pump, so that said pump and relative pipes are washed and the detergent present in the water is dissolved.

This method is implemented by a device characterised by comprising means to cause the pump to undergo pulse-operation. According to the invention the pump is operated with short-duration pulses. The pulse duration is chosen such that the water rises in the delivery pipe but without escaping therefrom. The interruption pause, ie the interval between one pulse and the next, enables the water to return to the interior of the tub and thus return therein the detergent which would otherwise be lost.

The present invention will be more apparent from the accompanying drawing which is provided by way of non-limiting example and in which:

Figure 1 is a diagrammatic section through a washing machine during a stage in the application of the method according to the present invention;

Figure 2 is a block diagram of a first embodiment of the device according to the present invention;

Figure 3 is a diagrammatic representation of a second embodiment of the device according to the present invention.

Figure 1 shows a washing machine 60 with which a detergent economizer device according to the present invention is associated.

Said machine 60 comprises substantially a tub 61 housing a rotary drum 62. A pipe 63 extends from a detergent drawer or distributor 63 to said tub 61. From the bottom of the tub 61 there extends a discharge pipe 3 in which there is connected a normal filtering member or filter 65. Said pipe terminates at a pump 2 from which a delivery pipe 4 extends.

In one embodiment of the method according to the present invention, after filling the tub 61 with water 66 and during the wash stage after the detergent contained in the distributor 64 has passed into the water 66, the pump is pulse-operated (for example with pulses lasting between 25/100 and 35/100 seconds separated by pauses lasting 1 second).

This operation is repeated several times during the wash stage (for example from 20 to 30 times) to obtain high recovery of the detergent dispersed in the wash water.

It will now be assumed that the washing machine is in its wash stage, with water and detergent already present in the tub 61 and discharge pipe 3.

If the pump 2 is now operated for a very short time (for example 25-35/100 of a second), the pump will urge the water mass present in the tub 61 and discharge pipe 3 into the delivery pipe 4 to a height exceeding the water level originally present in the tub. This height (for example 40-80 centimetres) is however insufficient to cause overflow from the pipe 4 of the water which has flown into it.

At this point, if the movement of the pump 2 is interrupted the water which has risen in the pipe 4 flows back from it into the pipe 3 by passing through said pump, which is not of the tight shut-off type. This happens by natural means without the need for mechanical aids, because of the difference in the hydrostatic level attained by this water in the pipe 4 and in the washing machine tub 61 respectively. By means of this back flow, the water purges the pump 2 and the relative pipe 3 (carrying the filter 65) to return to the tub 61 the detergent (dissolved in the water) which had flowed from the tub 61 during the stage prior to the operation of the pump 2.

By now repeating the two said operations (pump starting and stopping) after a predetermined

time interval, such as 1-2 seconds, a sequence of flows and back flows for the water mass containing the detergent is obtained from the tub 61 to the pipe 4 and from this latter to the tub 61. In this manner, an improved dispersion and dissolving of the detergent in the wash water is obtained with consequent greater use.

In a further embodiment of the method according to the present invention, pump movement commences during the introduction of detergent into the tub 61 if, for example, this introduction occurs after detergent-free water has entered said tub to provide a water preload.

With reference to Figure 2, the device according to the present invention comprises a electronic circuit 1 acting on the washing machine pump 2 comprising the discharge pipe 3 from the tub (not shown in Figure 2) and the delivery pipe 4. The electronic circuit 1 is connected to a programmer 5 comprising contacts 6, 7, 8, 9 relative to the different methods of operating the washing machine.

Depending on the method of operating the washing machine, the contacts 6, 7, 8, 9 are contacted by a switch 10 from which there extends a branch 11 which at a node 12 is divided into two branches 13 and 14. The branch 13 takes the signal from the programmer 5 and feeds it to a normal electronic circuit which controls the operation of the washing machine during all its operating stages.

Specifically, the branch 14 feeds a signal V_1 , originating from the programmer 5, to a microprocessor 15 from which two branches 16 and 17 extend to connect it to a read-only memory (ROM) 18.

The branch 16 carries a signal V_2 to the memory 18 and the branch 17 is a return branch which by means of a signal V_3 enables the microprocessor 15 to act on the pump 2.

A branch 19 extends from the microprocessor 15 to an amplifier 20 connected by a branch 21 to a static switch 22, of which the biasing 23 and 24 is only indicated. A branch 25 extends from said static switch 22 to act on the motor 26 of the pump 2 to enable it to operate.

With regard to the operation of the electronic circuit 1 it will be assumed that the washing machine is in its wash stage with the water and detergent already present in the tub and in the discharge pipe 3. During this stage, for example, in the programmer 5 the switch 10 is in contact with the contact 6.

With the situation as stated, the signal V_1 reaches the microprocessor through the branch 14. The signal V_2 is now fed by said microprocessor to the read-only memory 18 which, depending on the present program, feeds the operation-enabling signal V_3 to the microprocessor 15.

This microprocessor generates in the branch 19 an output V_4 which after amplification by the amplifier 20 reaches the static switch 22 via the branch 21. In this manner, in the presence of the signal V_4 , said switch 22 closes to enable the motor 26 of the pump 2 to operate. Thus said pump 2, in the manner heretofore described, enables the water present in the pipe 32 and in the tub to pass into the delivery pipe 4.

Now, depending on the preset program incorporated into the read-only memory 17, this memory feeds a second signal along the branch 17 to the microprocessor 15 so as to interrupt the output signal V_4 emitted by said microprocessor. In this case, there is no longer any signal present in the branch 19 and the static switch, not receiving any input signal from the branch 21, therefore reopens to stop the motor 26 of the pump 2.

In this manner, during the stage in which the motor is not operating, the water flows back from the pipe in the described manner, passes through the pump 2, through the pipe 3 and into the washing machine tub.

Figure 3 shows diagrammatically a different embodiment of the device according to the present invention. In this figure, parts identical to those of Figure 1 are indicated by the same reference numerals, however the known electrical connections for powering the motor 26 of the pump 2 are not shown.

The device under examination comprises a timer 50 provided with a motor 51, on the output shaft 52 of which there is fixed an eccentric cam 53 which under particular conditions of angular rotation of the shaft 51 comes into contact with a terminal 54 of a branch 55 connected to the motor 26 of the pump 2. Under such conditions, in which there is contact between the cam 53 and terminal 54 (this contact condition lasting for a time of about 25-35/100 of a second), the motor 26 of the pump 2 operates. Again in this case, following the operation and successive stoppage of the motor 26 of the pump 2, the water present in the pump 2 and in the pipes 3 and 4 associated with it behaves in an entirely identical manner to that described in relation to the device shown in Figure 1, this behaviour therefore not being described.

As an alternative to the devices heretofore described, the pulse-operation of the pump can be obtained manually. This can take place for example by means of a pushbutton positioned on the face of the washing machine, by which the user acts on the motor 26 of the pump 2 only when required.

When applied to washing machines particularly of the automatic cycle type, the method of the present invention allows optimum detergent optimisation to be obtained with considerable simplicity of operation.

In addition, the device of the present invention does not require components to be installed in the machine additional to those required for its operation, with the result that the machine manufacturing costs and therefore market price are not penalised.

Claims

1. A method for economizing detergent for an automatic-cycle washing machine (60) comprising a tub (61) housing a rotary drum (62), a discharge pipe (3) connecting said tub to a pump (2) and into which a filter (65) is connected, a delivery pipe (4) the height of which exceeds the maximum level of the water fed into the tub (61), a dispensing device (64) with at least one compartment for the detergent, and means (63) which connect said device (64) to the tub (61) for transfer of the detergent, characterised in that the wash water fed into the machine undergoes a pulsating movement by way of the pump (2), so that said pump (2), the relative pipes (3, 4) and the filter (65) are washed and the detergent present in the water is dissolved.

2. A method as claimed in claim 1, characterised in that during the pulsating movement of the water from and towards the tub (61), said water rises within the delivery pipe (4) to a height advantageously of between 40 and 80 cm but without overflowing from it.

3. A device for implementing the method claimed in claim 1, characterised by comprising means (1, 50) for effecting the pulse-operation of the pump (2).

4. A device as claimed in claim 3, characterised by comprising an electronic circuit (1) connected to a programmer (5) and comprising a microprocessor (15) provided with a read-only memory (18), means (20) for amplifying the output signal of said microprocessor and generating a signal acting on a static switch (22), said switch (22) acting on the motor (26) of the pump (2) by way of a circuit branch (25).

5. A device as claimed in claim 4, characterised in that the read-only memory (18) of the microprocessor (15) is programmed such that when it acts on the microprocessor (15) this latter generates for short time periods a signal (V_4) which is fed through a circuit branch (19) to the amplifier means.

6. A device as claimed in claim 5, characterised in that the duration of the time periods for which the microprocessor (15) generates the signal (V_4) fed to the amplifier means (20) is advantageously between 25/100 and 35/100 of a second.

7. A device as claimed in claim 3, characterised by comprising on the output shaft (52) of the motor (51) of a timer (50), provided for select-

ing the operation of the washing machine (60), a cam (53) which during the rotation of the shaft (52) and for particular angular positions of said shaft (52) cooperates with a terminal (54) of a circuit branch (55) of the motor (26) of the pump (2), said cooperation resulting in the operation of said pump (2).

8. A device as claimed in claim 3, characterised by comprising at least one pushbutton positioned on the washing machine and acting on the power supply to the motor (26) of the pump (2) to allow manual pulse-operation of said pump (2).

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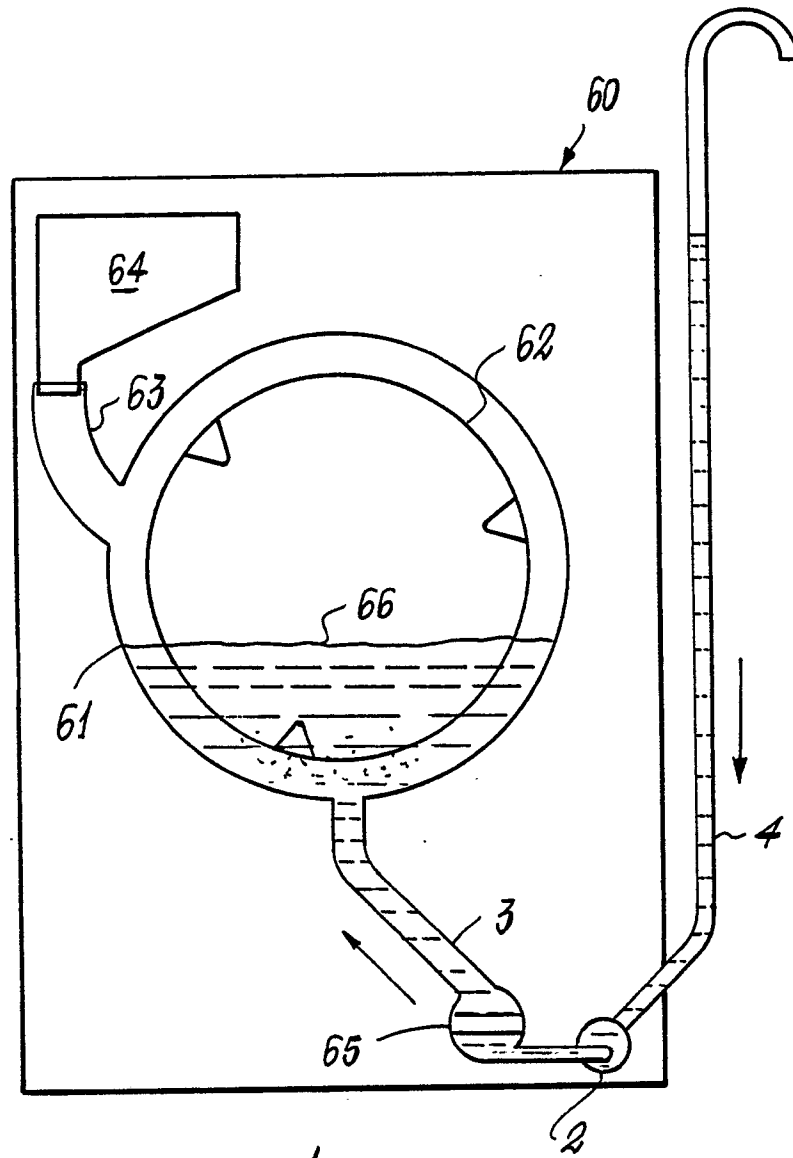


Fig. 1

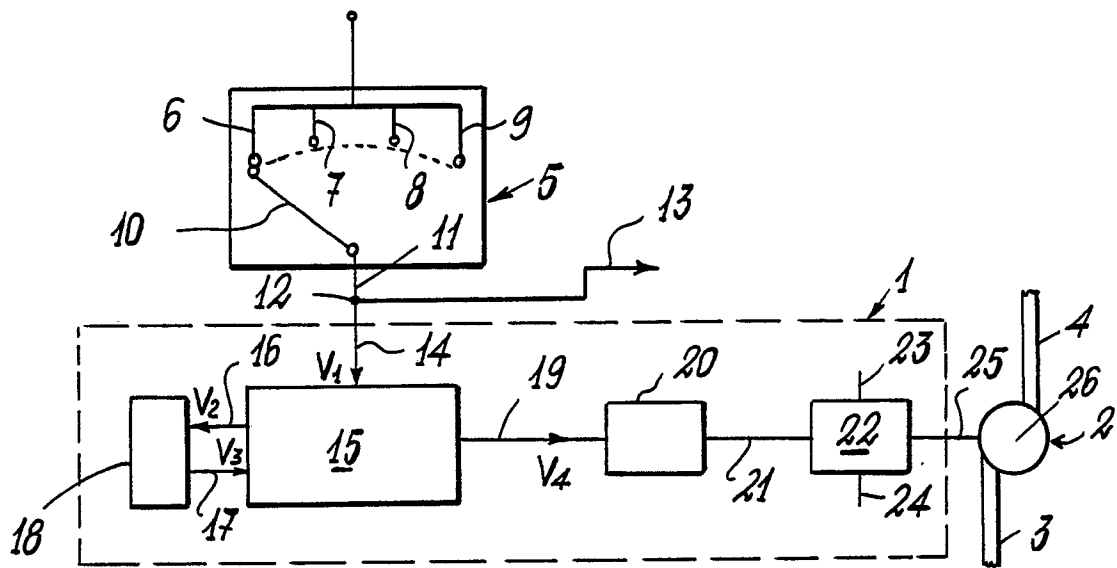


Fig. 2

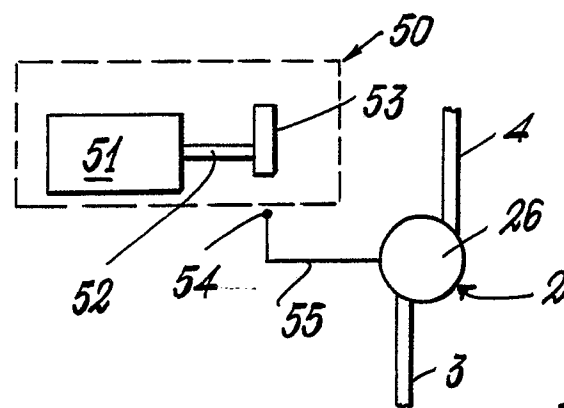


Fig. 3