Feb. 7, 1967 F. K. H. NALLINGER 3,302,433

AUTOMATIC WASHING MACHINE

Filed Jan. 11, 1965 3 Sheets-Sheet 1

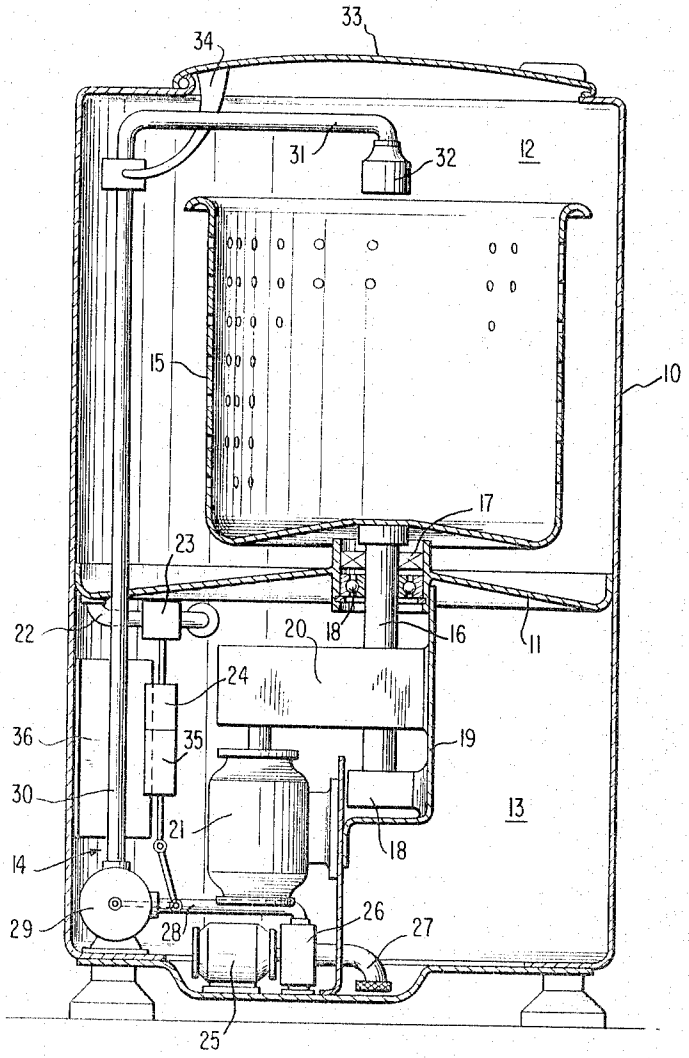


FIG. 1

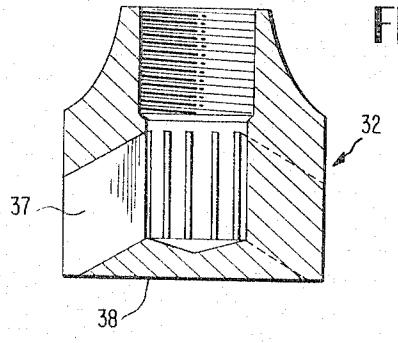


FIG. 3

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AUTOMATIC WASHING MACHINE

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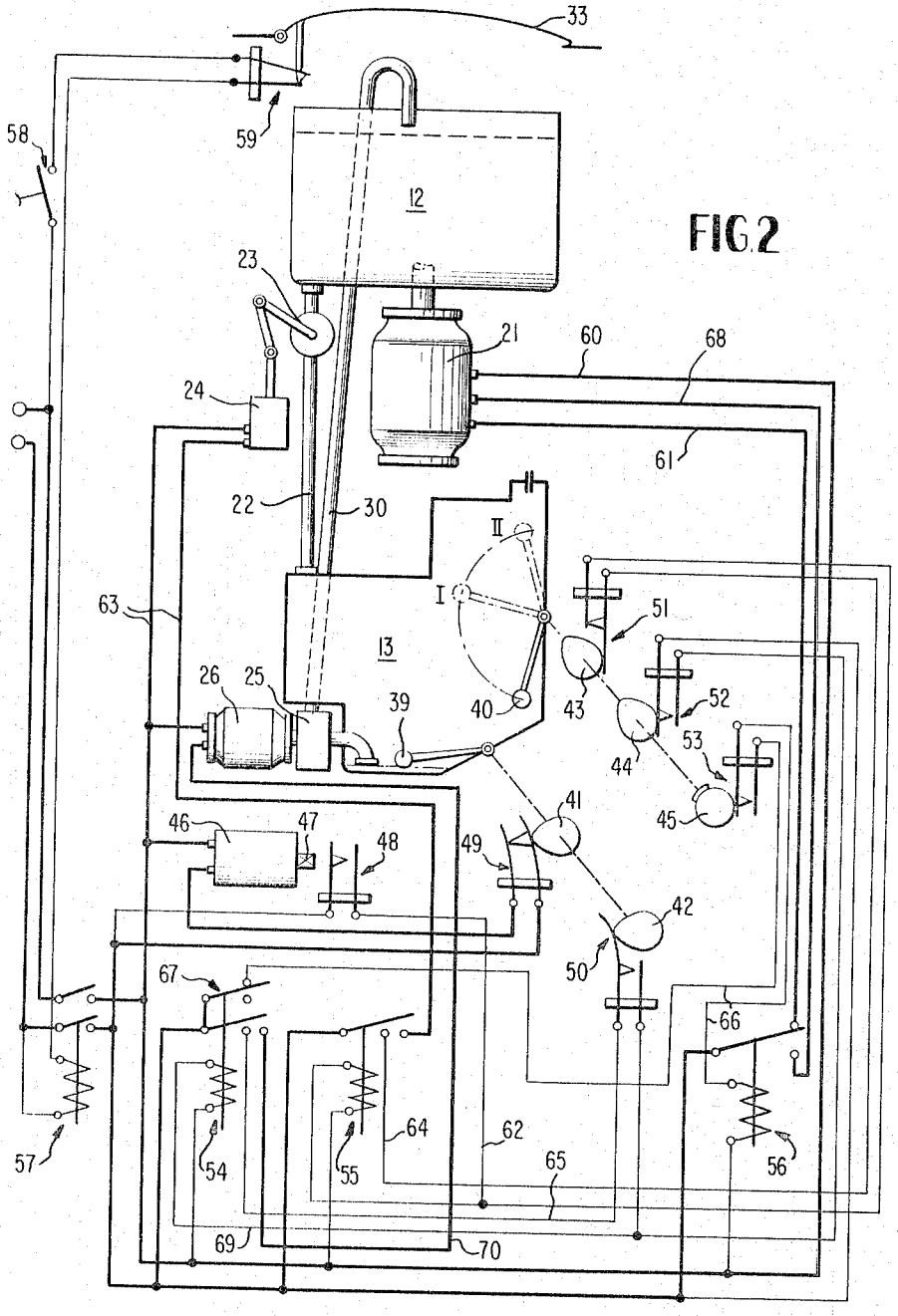


FIG. 2

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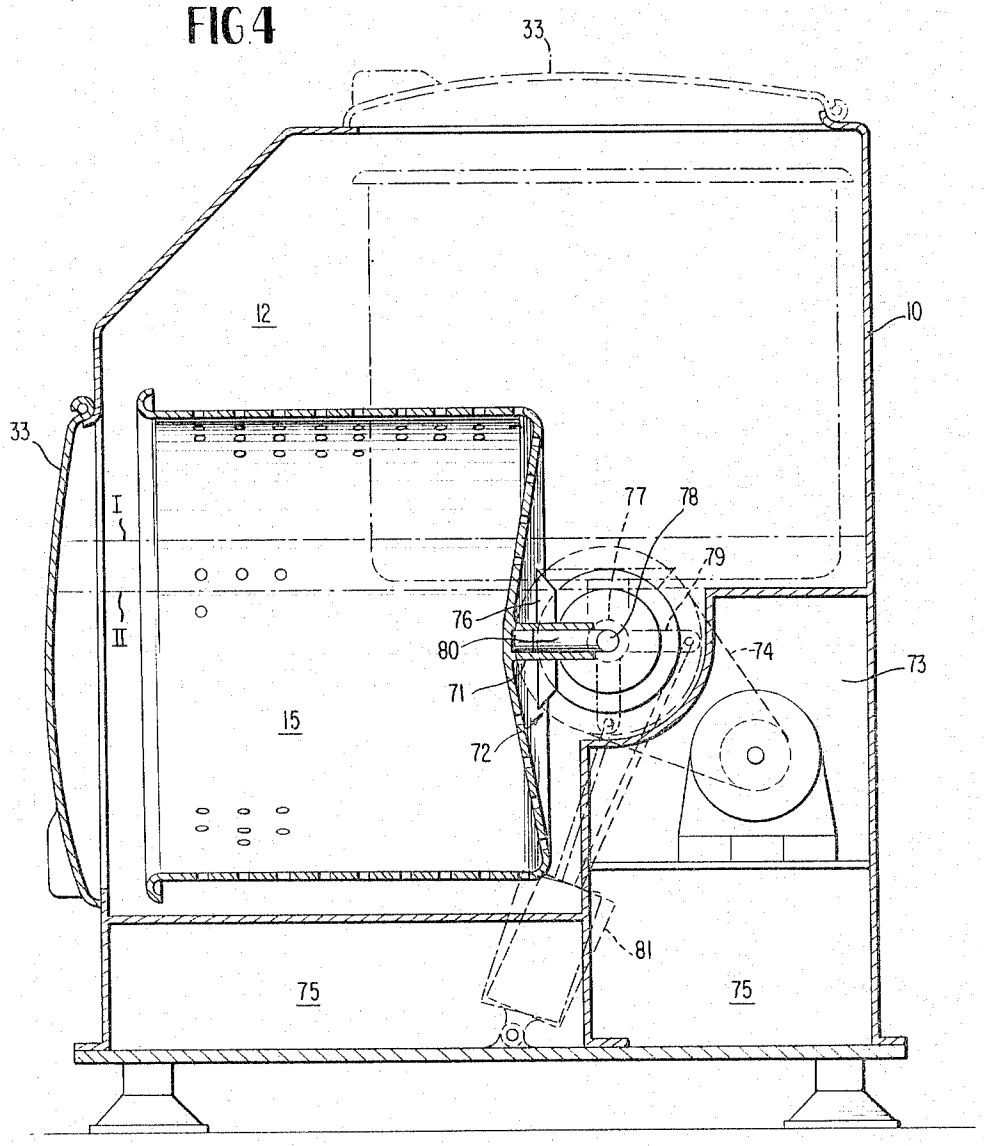
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AUTOMATIC WASHING MACHINE

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FIG 4



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United States Patent Office

3,302,433

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3,302,433

AUTOMATIC WASHING MACHINE

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14 Claims. (Cl. 68—12)

The present invention relates to the mechanical washing of laundry or the like with the aid of a drum receiving the wash load and rotating in the washing liquid or solution which possibly serves simultaneously for the subsequent centrifuging of the wash load.

It is known in the prior art to load the laundry into a rotating drum for rolling off on a conical surface. The laundry is thereby immersed into the washing liquid and lifted therefrom again in continuous operation. This washing operation, however, cannot satisfy higher and stiffer requirements: for the washing liquid or solution cannot drain off properly and is not thoroughly removed from the inside of the laundry in such prior art system.

The present invention aims at eliminating these disadvantages. It aims at achieving with a mechanical washing operation, the same effect as is achieved by the housewife when she repeatedly squeezes out the laundry by hand during washing. In order to achieve this the same washing liquid or solution is removed out of the drum and/or the wash container or tank surrounding the same possibly into a separate receiving tank and subsequently brought back into the drum or wash container several times during one and the same washing cycle.

It may thereby be advantageous if the washing solution or liquid is returned from the receiving tank directly into the interior of the drum. The washing liquid thereby has to penetrate through the laundry from the inside thereof during the filling up of the washing container or tank which is further reinforced by the centrifugal force and has as consequence a forcible removal and carrying along of the dirt.

Preferred is a further development of the present invention which provides that after removal of the liquid or solution out of the drum or washing tank the drum is brought temporarily to the centrifuging or spin-drying rotational speed and the washing tank or drum is filled again with the same liquid or solution out of the tank only after shifting back the drum to the washing rotational speed thereof. The desired effect is achieved particularly well thereby because the liquid or solution is forcibly removed or pulled out of the fabric, so to speak of, and the dirt is thereby forcibly dragged out and taken along.

A washmachine with a program control is already known with which, for example, two or three washing cycles are sequentially engaged and centrifuging operations take place therebetween. However, this prior art washmachine involves completely different individual washing operations, each complete in itself, with fresh solution or liquid each time and with new and partially completely different washing agents. Hence, the entire washing operation lasts very long and necessitates above all a large quantity of washing agents and supplies, water, and electricity or gas. The present invention, in contradistinction thereto, provides within one and the same washing operation with the same liquid or solution, a relatively rapid emptying and filling of the laundry container or tank in constantly changing sequence. Hence, the present invention intensifies the washing action and at the same time renders the same more economical.

The present invention also relates to the construction of a washmachine for the realization of the proposed method. Known in the prior art are, for example, washmachines with a receiving tank outside the laundry tank or washing container and a connection between the two

which can be closed. The present invention proposes to arrange in this connection a pump. One can—with a corresponding construction of the pump, for instance, as rotary pump—utilize in principle the same line for filling and discharging the washing tank or laundry container. However, it is more appropriate if the receiving tank is disposed below the laundry tank and a connecting line is arranged between the two tanks adapted to be closed and if the pump adapted to be driven by a separate motor is disposed in a separate return-line from the receiving tank to the laundry tank.

Of course, it is within the purview of the present invention to combine with the structure of the washmachine described above still further, conventional control elements for the filling with fresh water and for the final discharge of the washing solution after the completed washing cycle. Thus, for example, the closing member can be constructed as conventional multi-way valve and a conventional shifting device may be provided in the return line for the selective connection with the pump or with the fresh water connection.

With the aforementioned prior art washmachine, the liquid is conducted during the rotation of the drum in an uninterrupted circuit from the laundry tank into the receiving tank and back from the latter into the laundry tank. The suction force of the rotating drum is utilized for the latter which presupposes, however, continuously a relatively high rotational speed and for that reason also high input power. The effect aimed at by the present invention cannot be achieved with this prior art washmachine because the laundry lies constantly in the liquid. The known machine has a certain similarity with the present invention only in some structural features.

Within the frame and scope of the present invention, the control of the operating cycle according to the present invention can take place by means of a conventional central program control. Preferred, however, is a construction in which the water level in the receiving tank serves as transmitter for the control pulses for controlling the closure member, the pump and the drum drive, and in which a timer mechanism is coordinated to or operatively associated with the closure member normally disposed in the closing position thereof, which is adapted to be engaged or turned on with an empty receiving tank and releases the closure member for movement into its opening position only after expiration of its possibly adjustable timing period. One of several float means are thereby appropriately arranged in the receiving tank which are operatively connected with control cams with which are operatively associated the switches for the release and generation of the control pulses.

In this connection a prior art washmachine should be mentioned, in which a float is arranged in the laundry container or washing tank which switches the driving motor for the drum with high water level to a slow speed and with low water level to a high rotational speed. This float control is effective in such prior art machine only during the filling and discharging of the water. However, nothing is mentioned in connection with this prior art machine as to the basic concept of the present invention and the washmachine, otherwise of completely different construction, does not permit a realization of the present invention.

It is further proposed according to the present invention to provide as closure member a valve held in its closing position by a spring force, which valve is adapted to be moved or displaced into the opening position thereof by a solenoid against the spring force, whereby the energizing circuit of the solenoid is adapted to be engaged or closed by the timer mechanism and is adapted to be opened by a switch responsive to the highest permissive water level in the receiving tank. Futhermore, an electric motor

serves for the drive of the pump in the return line, which is turned on or energized with the highest water level and is turned off or de-energized with the lowest water level. An electric motor also serves, as is customary, as driving motor for the drum which is adapted to be switched or shifted with a certain water level from the lower washing rotational speed to the high spin-drying or centrifuging rotational speed and which is adapted to be switched or shifted back with the highest water level again to the low washing rotational speed.

In particular the control takes place by electric control and working circuits which are controlled by relays. The control cams for the respective release switches are arranged separate from one another or may be combined into one or several cam discs. The coordination thereof to the floats as well as the number thereof depends on the overall arrangement provided in each case. The utilization of multi-switches is also possible which are actuated by the same cam.

Accordingly, it is an object of the present invention to provide apparatus for washing laundry and the like which obviates the aforementioned shortcomings and drawbacks encountered with the prior are constructions and produces a considerably improved cleaning effect compared to that realizable heretofore.

A further object of the present invention resides in apparatus for realizing a washing cycle which satisfies the highest requirements by enabling the washing liquid and therewith the dirt to drain correctly and completely from the inside of the laundry.

A still further object of the present invention resides in apparatus for achieving a washing operation analogous to the repeated squeezing action normally practiced by a housewife when washing manually.

A further object of the present invention resides in apparatus for washing laundry which intensifies the removal of dirt.

Still another object of the present invention resides in a washing apparatus for carrying out such method which greatly improves the cleaning and washing action without increasing the duration of the washing cycle while at the same time economizing the requirements for washing agents such as soap, detergents, or the like, water, and electric current or gas.

Another object of the present invention resides in a method for washing laundry by means of a washmachine which causes a continuous and rapid discharge and refilling of the laundry tank in constantly changing sequence during one and the same washing cycle and with the same liquid.

Still a further object of the present invention resides in the provision of a washmachine adapted to be automatically controlled by simple means to permit a realization of the aforementioned method according to the present invention.

These and other objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein:

FIGURE 1 is a schematic cross-sectional view through a first embodiment of a washmachine in accordance with the present invention,

FIGURE 2 is a schematic diagram for the control of a washmachine illustrated in FIGURE 1 with a preferred control system,

FIGURE 3 is a cross-sectional view, on an enlarged scale, through the nozzle arranged in the return line, and

FIGURE 4 is a schematic cross-sectional view through a modified embodiment of a washmachine in accordance with the present invention having a horizontal drum.

Referring now to the drawing wherein like reference numerals are used through the various views to designate like parts, the housing 10 of the washmachine illustrated

in FIGURE 1 is divided by a partition-wall bottom 11 into the upper washing container or tank 12 and into a lower part within which are disposed a receiving tank 13 and a space generally designated by reference numeral 14 for the drive and control elements. The washing drum 15 having a vertical shaft 16 is arranged in the washing tank 12. The shaft 16 is carried by means of a seal 16 and bearing 18 by partition walls 19 of the washmachine housing and is connected by way of a conventional transmission 20 with the driving electric motor 21. The receiving tank 13 has in plan view an approximately U-shaped configuration, that is, the space 14 is cut out, so to speak, from the full cross-section in approximately rectangular form. The receiving tank 13 is volumetrically at least as large as the washing container 12.

A connecting line with a closure valve 23 is arranged between the washing tank 12 and the receiving tank 13 which is adapted to be actuated by a solenoid 24. A pump 26 driven by a separate electric motor 25 is provided for the return of the washing liquid or solution from the receiving tank 13 into the washing tank 12. The pump 26 is constructed, for example, as rotary pump. The suction connection 27 of the pump 26 projects into the receiving tank 13 whereas the pressure connection 28 thereof is in communication by way of a multi-way valve 29 with a return line 30. The return line 30 has at the upper end a pivotal arm 31, at the end of which is arranged a nozzle 32. The arm 31 is disposed with closed washmachine above the drum 15. During opening of the lid 33, the arm 31 is automatically swung outwardly by a guide arm 34 so that the access to the drum 15 is open. The multi-way valve 29 is actuated by a solenoid 35. The control of the entire operating cycle takes place by a conventional central program control which consists of several cam discs and/or cam shafts and is accommodated in a box 36 or the like; since such program controls are known in the art, a detailed description thereof is dispensed with herein.

Operation

The present invention is carried out with the washmachine described in connection with FIGURE 1 as follows:

With a full washing tank 12, the drum 15 rotates in the usual manner with its slow rotational washing speed. With a corresponding construction of the transmission 20 this movement may also reverse its direction of rotation as is well known in the art. After a comparatively short time, which is determined by the construction of the program control, the closure valve 23 opens by reason of energization of the solenoid 24. The washing liquid now flows off through the connecting line 22 into the receiving tank 13. During the latter part of this discharge—again conditioned by the conventional program control—the drum 15 can be brought for a short period of time to the centrifuging rotational speed thereof so that the water is pressed out of the laundry. If the receiving tank 13 is full, then the pump 26 is automatically turned on, the closure valve 23 is closed and the multi-way valve 29 is brought into the opening position thereof. At the same time the drum drive is shifted back to the lower washing rotational speed. The pump 26 now presses the liquid out of the receiving tank 13 through the return line 30, 31 and the nozzle 32 back into the drum 15.

In order that the laundry is wetted as evenly and as intensively as possible, the nozzle 32 according to FIGURE 3 has several downwardly directed narrow slots 37. The nozzle 32 is closed at the bottom 38 thereof. The washing liquid now leaves through the slots 37—which have a comparatively small cross-section—under a certain pressure and sprays against the laundry still clinging to the circumference of the drum 15 after the short spin-drying or centrifuging operation. Since the drum 15 rotates, the laundry is uniformly and intensively wetted by the washing liquid and is completely penetrated thereby. The washing tank 12 now fills up again until the receiving

tank 13 is empty. Then the pump is automatically turned off again.

This operation repeats itself several times after relatively short periods of time. The laundry is thus in rapid sequence turned over in the washing liquid and then the washing liquid is pressed out of the same. A thorough and at the same time also economic washing action and cleansing effect is achieved thereby.

According to FIGURE 2 the control of the operating cycle, already described in principle, takes place no longer by a central program control, as mentioned in connection with FIGURE 1, but instead in dependence on the water level in the receiving tank 13, which for this purpose accommodates two floats 39 and 40. The first-mentioned float 39 thereby serves for sensing the lower water level and the last-mentioned float 40 for sensing the upper water level. In order to render the latter operation more sensitive, the receiving tank 13 may be constructed narrower in the upper part thereof in the manner illustrated in the drawing. Two control cams 41 and 42 are connected with the float 39 whereas three control cams 43, 44 and 45 are coordinated to the float device 40. Furthermore, this washmachine includes a timer mechanism 46 of conventional construction which upon energization thereof moves a spindle 47 after a predetermined lapse of time for the actuation of a switch 48, whereby the spindle 47 in the de-energized condition is returned instantaneously again by a spring force (not shown) to the initial position. The time may thereby be adjustable as is well known with conventional timers.

Switches 49 to 53 are coordinated to or operatively associated with the control cams 41 to 45 whose operation will be described in greater detail hereinafter. The control system further includes two self-holding relays 54 and 55 which are effective as on-off switches whereas a third relay 56 is constructed as shifting switch. A relay 57 serves as main switch.

Operation

The control arrangement described in connection with FIGURE 2 operates—under the assumption that the wash tank 12 is full of liquid, filled by appropriate control means, and the receiving tank 13 is empty—as follows:

Upon closing the main switch 58, the relay 57 is energized with current and the installation is thereby turned on. In order to prevent a starting of the drum drive with an open lid 33, there is provided in series with the main switch 58 an interlock switch 59 which is closed only with completely closed lid 33. The drive motor 21 for the drum, the latter not illustrated in FIGURE 2 for sake of clarity, is energized with current by way of the lines 60 and 61 and rotates with its lower washing rotational speed. At the same time the timer mechanism 46 is turned on since the switch 49 is closed by the control cam 41 thereof.

After elapse of the adjusted time, the timer mechanism 46 actuates with its plunger 47 the switch 48 closes the same. As a result thereof, the energizing circuit 62 of the self-holding relay 55 is closed, the latter attracts its armature and closes the working circuit 63 for the solenoid 24 of the closure valve 23, which heretofore was held under spring force in its closing position. Simultaneously therewith the self-holding current circuit 64 of the relay 55 closes so that the latter continues to remain in its closed position also with the directly following opening of the switch 48.

The solenoid 24 now receives current and actuates the closure valve 23 into its open position. The liquid discharges out of the washing tank 12 through the connecting line 22 into the receiving tank 13. During the filling of the latter, at first the float 39 responds and opens with its control cam 41 the switch 49, that is, the timer mechanism 46 is effectively turned off or de-energized and the switch 48 is opened. Nevertheless, the solenoid 24 remains energized since the self-holding relay 55—as already described— holds itself closed.

During the rise of the water level in the receiving tank 13, the rising float 39 closes by means of the control cam 42 the switch 50 which is arranged in the holding circuit 65 of the self-holding relay 54 and whose function will become more clear hereinafter. Subsequent thereto, also the float 40 becomes responsive. As soon as the float 40 reaches the position designated in FIGURE 2 by reference numeral I—which is the case when only a slight amount of liquid remains in the washing tank 12 —it closes with its control cam 45 the switch 53, which is arranged in the energizing circuit 66 of the relay 56. A switch 67 is disposed in series with the switch 53 which is coordinated to or operatively associated with the self-holding relay 54. Since the latter is closed in this condition, the relay 56 is now energized and attracts its armature. As a result thereof, the motor 21 is now fed with electric current by way of the line 68 and passes over to its high centrifuging rotational speed. The laundry is centrifuged and the centrifuged water brings the float 40 into the position designated by reference numeral II, that is the washing tank 12 is now empty and the receiving tank 13 is full.

In this position, at first the switch 51 interrupts the holding circuit 64 of the relay 55. The latter therefore becomes de-energized and drops off, and as a result thereof, the solenoid 24 is also de-energized so that the closure valve 23 again returns into its closing position. Simultaneously therewith, the float 40 closes with its cam 44 the switch 52, which is arranged in the energizing circuit 69 of the relay 54. The latter therefore attracts its armature, opens the switch 67 and closes at the same time the working circuit 70 for the driving motor 25 of the pump 26. The opening of the switch 67 is necessary in order that the energizing circuit 66 of the relay 56 is de-energized even though the cam 45 still holds closed at first the switch 53 also with a dropping water level. Consequently, the relay 56 falls back or returns to the illustrated position and the motor 21 again is fed with current by way of line 61 and therewith is switched back to its slow washing rotational speed.

The pump now pumps back the water in the manner already described into the washing tank 12. As soon as the receiving tank 13 is empty, the float 39 opens up with its cam 42 the switch 50 and the self-holding energizing circuit 65 of the relay 54 is interrupted. The latter is de-energized and drops off, therewith turns off the pump 26 and closes the switch 67 so that the energizing circuit for the switching relay 56 is therewith readied for the next cycle. At the same time, the switch 49 again responds with an empty receiving tank 13 and sets into operation the timer mechanism 46 in the manner described above.

This interplay repeats itself for such length of time in uninterrupted sequence until the switch 58 is opened and therewith the current supply stops. Opening of switch 58 may take place by any conventional means either manually or automatically.

In connection with all of the foregoing descriptions, reference is made always to a washmachine with a vertical drum and to a system in which the washing liquid was thought of as being drained off and filled back again. Both of these features are not necessary to the present invention. At first, it is obvious that the method of the present invention as well as the basic principles of the construction described above may also be utilized with and applied to washmachines having horizontal or inclined drum axes. Furthermore, the proposed removal of the liquid out of the drum and/or the described alternating cycle can also be realized in that one lifts the drum out of the washing solution or liquid and lowers the same back into the solution or liquid which can take place, for example, by pivoting of the drum from its horizontal into a vertical position thereof. In contradistinction to

the known arrangement described above, the entire drum is thereby taken out of the washing solution or liquid which—especially with the interim centrifuging proposed by the present invention—has as consequence a thorough removal of the liquid out of the laundry.

FIGURE 4 illustrates schematically the construction of a washmachine according to the last-mentioned proposal of the present invention. The drum **15** of this embodiment is arranged in the horizontal position within the housing **10** and is driven by means of a hollow shaft **71** by way of a bevel-gear drive **72** from the motor. The motor is arranged in a chamber **73** and is connected with the bevel-gear drive by a belt drive **74**. Further chambers **75** serve for the accommodation of control and/or actuating elements (not shown) of conventional construction. Also in this case a conventional central program control may be used, or in lieu thereof, the pivoted position of the drum **15** may be utilized as control magnitude similarly as with the water level control described in connection with the embodiment of FIGURE 2.

The bevel-gear drive **72** consists of bevel gears **76** one of which is secured on the hollow shaft **71** of the drum **15** and the other of which is secured on a second hollow shaft **77**. The hollow shaft **77** projects laterally out of the washing tank **12** and receives thereat a wheel for the belt drive **74**. The hollow shaft **77** is supported in a conventional manner, not illustrated in detail, on a shaft **78** and is guided thereon by suitable means. The shaft **78** is arranged transversely to the drum axis within the housing of the washmachine and is provided outside of the washing tank **12** on one side thereof with a lever **79**. The shaft **78** is provided in the center with an axle stub **80** extending at right angle thereto on which is supported the hollow shaft **71**. A piston rod of a hydraulic adjusting mechanism **81** of conventional construction engages with the lever **79**. It can be readily recognized from FIGURE 4 of the drawing that the drum **15** can be pivoted from the horizontal position thereof illustrated in full lines into the upright position thereof indicated in dash and dot lines by the adjusting mechanism **81** whereby not even an interruption of the drum drive is necessary.

During the upward pivoting movement of the drum **15**, the liquid level in the tank **12** drops from the position I to the position II so that the drum **15** can rotate completely freely. The lid **33** may be disposed at the housing **10** either laterally or on top thereof. The return pivot movement of the drum **15** also takes place automatically by the adjusting mechanism **81** which, for this purpose, may be constructed as double-acting or actuating mechanism. Furthermore, the drum **15** may be automatically locked in both end positions thereof by conventional locking means so that the pivoting elements do not need to absorb possible vibrations.

Otherwise, as mentioned above, the embodiment of FIGURE 4 may be controlled either by a conventional central program control means, like FIGURE 1, or by means of a control system responsive to the water level and/or position of the drum as described in FIGURE 2, with the difference that no control is necessary for the embodiment of FIGURE 4 for draining the water from the washing tank into the receiving tank and pumping the same back from the receiving tank into the washing tank since this is effectively brought about by the pivot movement of the drum **15**.

While I have shown and described several embodiments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art and I therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A wash machine, comprising:
wash tank means,
rotating drum means within said wash tank means,
receiving tank means,
and line means operable to be selectively closed and disposed between said wash and receiving tank means including pump means in said line means, said receiving tank means being disposed below said wash tank means, and said line means including a connecting line having closure valve means and a return line between said two tank means,
drive means for said drum means,
and separate drive means for driving said pump means, said pump means being connected in said separate return line from said receiving tank means to said wash tank means,
and program means for controlling said closure valve means, said pump means and the drive means for said drum means including in predetermined sequence including control means for producing the shifting pulses for the control of the closure valve means, of said pump means and of the drum drive means in dependence on the water level in said receiving tank means, and timer means operatively connected with said closure valve means, said closure valve means being normally in the closing position thereof, means for turning on said timer means with said receiving tank means substantially empty, and means operatively connecting said timer means with said closure valve means in such a manner that only after lapse of the adjusted time thereof, said closure valve means is freed for movement to its opening position.

2. A wash machine according to claim **1**, wherein said control means includes at least one float means in said receiving tank means operatively connected with control cam means forming part of said control means, and switch means operatively associated with said control cam means for the production of the control pulses.

3. A wash machine according to claim **2**, wherein said closure valve means is constituted by a valve held in the closing position by a spring force, and solenoid means for moving said valve into the opening position thereof against said spring force, energizing circuit means for said solenoid means, means for closing said last-mentioned energizing circuit means by said timer means, and means including switch means responsive to the highest water level in said receiving tank means for opening said last-mentioned energizing circuit means.

4. A wash machine according to claim **3**, further comprising self-holding relay means in said last-mentioned energizing circuit means including switch means operable to close after run-out of said timing means, and holding circuit means for said self-holding relay means having switch means opening only with highest water level in said receiving tank means.

5. A wash machine according to claim **4**, further comprising means for turning on the electric motor constituting the drive means for said pump means with the highest water level in said receiving container means and for turning off said electric motor with the lowest water level in said receiving container means.

6. A wash machine according to claim **5**, further comprising feed circuit means for said last-mentioned electric motor having self-holding relay means provided with energizing circuit means and holding circuit means, a switch in said last-mentioned energizing circuit means closing with maximum water level in said receiving tank means and a further switch in said last-mentioned holding circuit means opening with the lowest water level in said receiving tank means.

7. A wash machine according to claim **6**, wherein the drive means for the drum means including an electric motor and means for shifting said electric motor with a

predetermined water level in said receiving tank means from the lower washing rotational speed to the high centrifuging rotational speed and for shifting said electric motor back to the lower washing rotational speed with highest water level in said receiving tank means.

8. A wash machine according to claim 7, further comprising shifting relay means operatively connected with said last-mentioned motor, and means operatively connecting said shifting relay means with the energizing circuit of said last-mentioned electric motor in such a manner as to hold the energizing circuit of said last-mentioned electric motor closed with said shifting relay means de-energized to produce the lower rotational speed and to shift upon energization of said shifting relay means the energization circuit of the last-mentioned electric motor to the higher rotational speed, and a plurality of series connected switch means in the energization circuit of said shifting relay means, one of said last-mentioned switch means closing with a predetermined water level in said receiving tank means and a second switch means opening with maximum water level in said receiving tank means.

9. A wash machine according to claim 8, wherein said first switch means is held closed by a float-actuated cam means from a predetermined water level up to the highest water level and the second switch means is constructed as switch opening under energized conditions and is operatively connected with the self-holding relay means for the drive means of the pump means.

10. A wash machine according to claim 1, further comprising means for turning on the electric motor constituting the drive means for said pump means with the highest water level in said receiving container means and for turning off said electric motor with the lowest water level in said receiving container means.

11. A wash machine according to claim 10, further comprising feed circuit means for said last-mentioned electric motor having self-holding relay means provided with energizing circuit means and holding circuit means, a switch in said last-mentioned energizing circuit means closing with maximum water level in said receiving tank means and a further switch in said last-mentioned holding circuit means opening with the lowest water level in said receiving tank means.

12. A wash machine according to claim 1, wherein the drive means for the drum means including an electric motor and means for shifting said electric motor with a

predetermined water level in said receiving tank means from the lower washing rotational speed to the high centrifuging rotational speed and for shifting said electric motor back to the lower washing rotational speed with highest water level in said receiving tank means.

13. A wash machine according to claim 12, further comprising shifting relay means operatively connected with said last-mentioned motor, and means operatively connecting said shifting relay means with the energizing circuit of said last-mentioned electric motor in such a manner as to hold the energizing circuit of said last-mentioned electric motor closed with said shifting relay means de-energized to produce the lower rotational speed and to shift upon energization of said shifting relay means the energization circuit of the last-mentioned electric motor to the higher rotational speed, and a plurality of series connected switch means in the energization circuit of said shifting relay means, one of said last-mentioned switch means closing with a predetermined water level in said receiving tank means and a second switch means opening with maximum water level in said receiving tank means.

14. A wash machine according to claim 13, wherein said first switch means is held closed by a float-actuated cam means from a predetermined water level up to the highest water level and the second switch means is constructed as switch opening under energized conditions and is operatively connected with the self-holding relay means for the drive means of the pump means.

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WILLIAM I. PRICE, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,302,433 February 7, 1967

Friedrich K. H. Nallinger

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, between lines 5 and 6, insert -- Claims priority, application Germany, Jan. 15, 1964, N 24,290 --.

Signed and sealed this 21st day of April 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents