Feb. 26, 1963 J. W. JACOBS ET AL 3,078,858

DISHWASHER CONTROL CIRCUIT

Original Filed Jan. 23, 1958 3 Sheets-Sheet 1

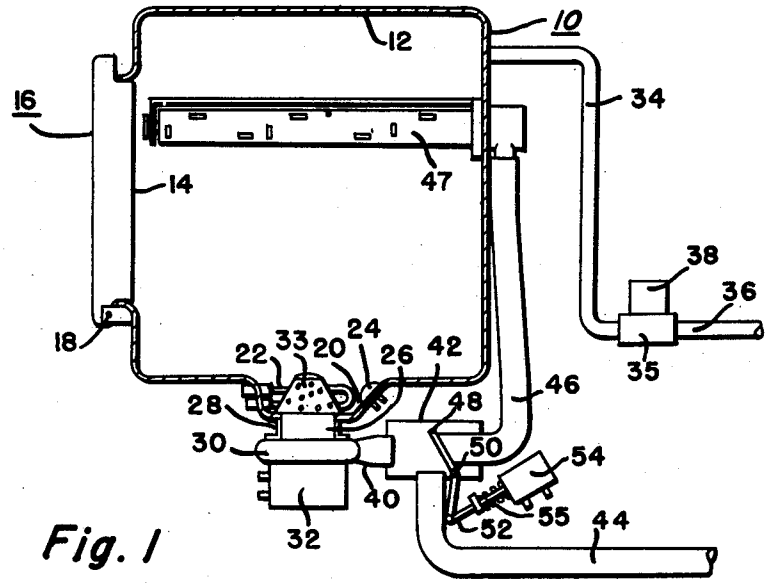


Fig. 1

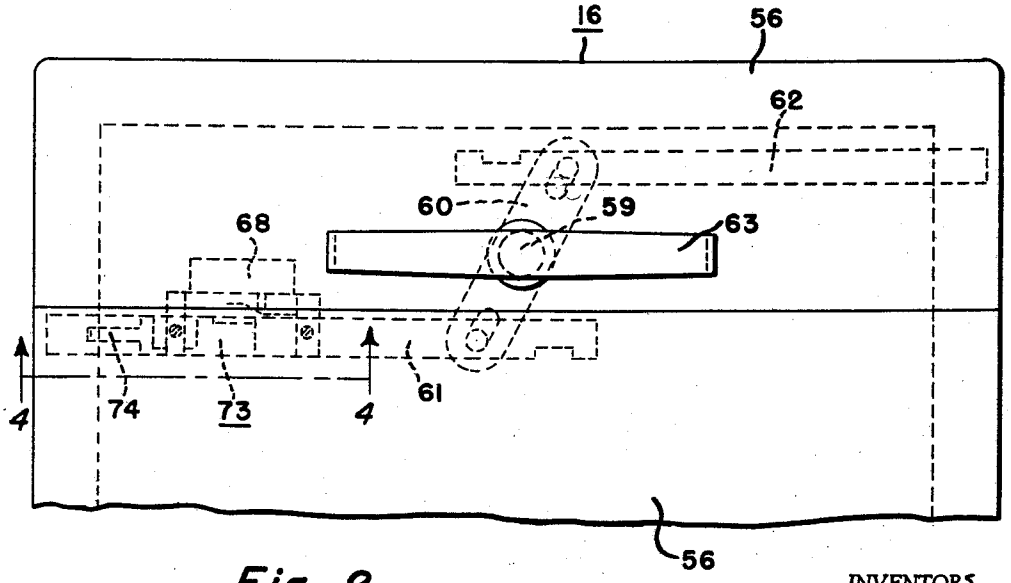


Fig. 2

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DISHWASHER CONTROL CIRCUIT

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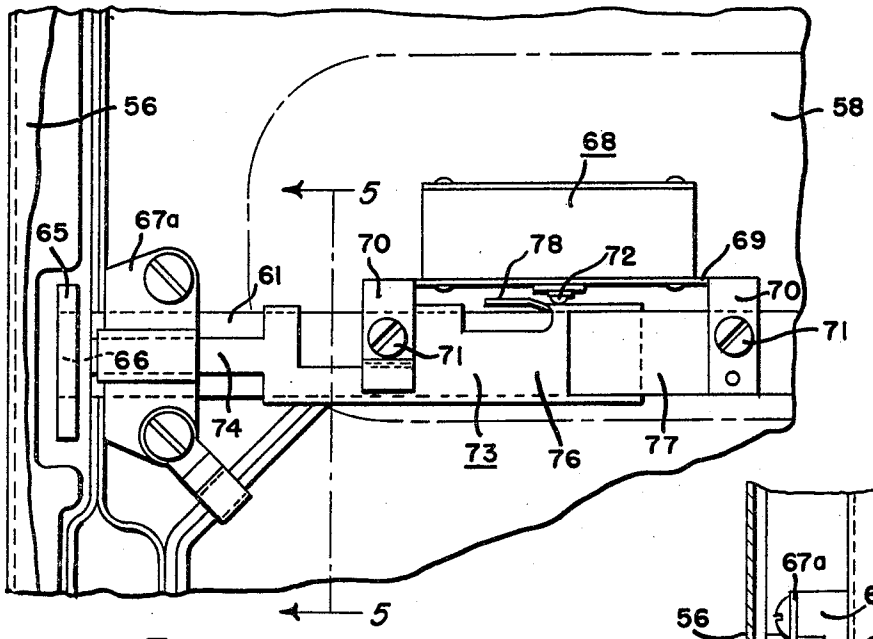


Fig. 3

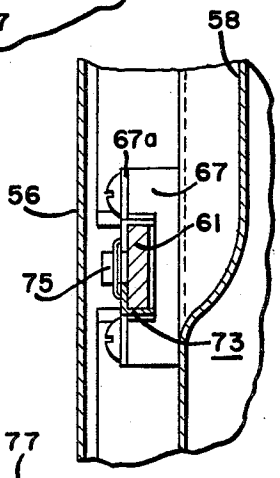


Fig. 5

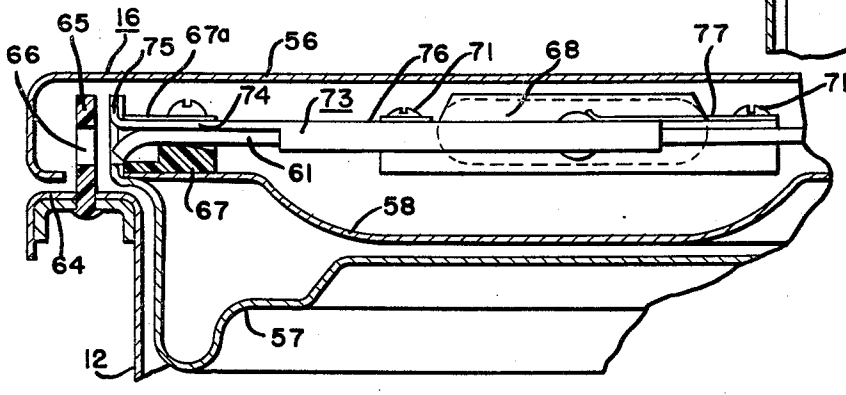


Fig. 4

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DISHWASHER CONTROL CIRCUIT

Original Filed Jan. 23, 1958 3 Sheets-Sheet 3

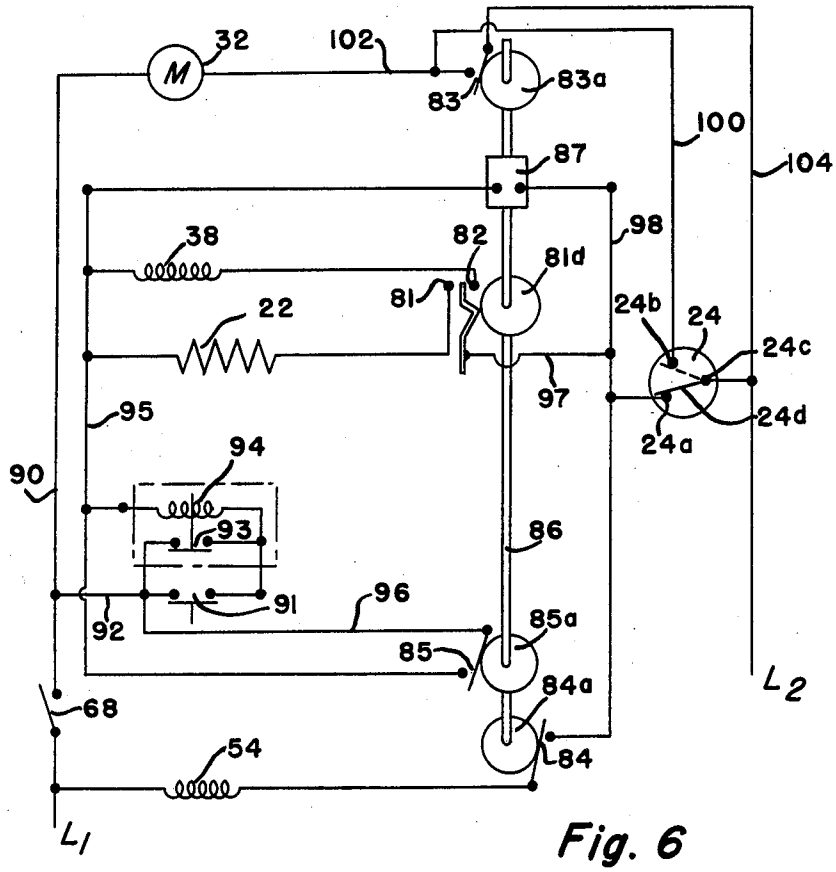


Fig. 6

Switch	Circuit	Timer Interval 0 6 12 18 24 30 36 42 48 54 60
81	Heater	
82	Fill Solenoid	
83	Motor	
84	Drain Solenoid	
85	Timer	

Fig. 7

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DISHWASHER CONTROL CIRCUIT

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Original application Jan. 23, 1958, Ser. No. 710,715, now Patent No. 3,007,479, dated Nov. 7, 1961. Divided and this application Nov. 18, 1959, Ser. No. 853,748

6 Claims. (Cl. 134—57)

This invention relates to a domestic appliance, and more particularly to a machine for washing dishes and the like. This is a divisional application of our copending application Serial No. 710,715, now Patent No. 3,007,479, filed January 23, 1958.

It is an object of this invention to provide a safety antiflood system for a dishwasher wherein the level of water in the tub of the dishwasher is not permitted to exceed a predetermined level, thus eliminating the possibility of the flooding of the area in which the dishwasher is used. This object is preferably accomplished by controlling the electrically-operable fill and drain devices of the dishwasher in such a fashion that the drain mechanism is energized to start emptying the tub while the fill mechanism is controlled to prevent the entry of water into the tub when the level of water in the tub exceeds some predetermined level.

It is another object of this invention to provide control mechanism for a dishwasher that is connected to provide a pumping-out cycle for the dishwasher during predetermined time intervals of operation of the dishwasher, and wherein mechanism is provided to provide a pause in the operation of the dishwasher of a predetermined length of time that immediately precedes the pumping-out-interval. During the pause period, the water-impelling means of the dishwasher is shut down and this permits water in the connecting hoses and other parts of the dishwasher to drain to a sump wherein the water is pumped out by the immediately following pumping-out interval.

Another object of this invention is to provide a dishwasher including a tub with electrically-controlled water supply and water-impelling means that are connected with an energizing circuit through an electric switch, and wherein the operation of the electric switch is controlled by the movement of a latch bolt that is associated with the door of the dishwasher and which is movable between a latched and unlatched position. The electric switch is preferably carried by the latch bolt and means are provided for actuating the switch to a closed position when the latch bolt is being moved to a latched position and for actuating the switch to an open position when the latch bolt is being moved to an unlatched position. With this arrangement the door of the dishwasher cannot be opened until the switch is actuated to an open position to shut down the water-impelling means.

Still another object of this invention is to provide control mechanism for a dishwasher that is operative to provide a cycle of operation wherein the dishwashing cycle is initiated by a flush interval. During the flush interval the water inlet means of the dishwasher, which is connected to a hot water line, is actuated to supply water to the tub of the dishwasher and the drain means of the dishwasher is positioned to drain this water from the dishwasher. This arrangement not only provides for an initial flush of the dishwasher tub but also clears the hot water line of any cold water that it may initially contain.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein

preferred embodiments of the present invention are clearly shown.

In the drawings:

FIG. 1 is a diagrammatic side view of a dishwasher made in accordance with this invention showing the water supply, drain, and impelling means of the dishwasher.

FIG. 2 is a fragmentary front view of a door of a dishwasher made in accordance with this invention and showing the latch bolt apparatus that is carried by the door.

FIG. 3 is an enlarged fragmentary plan view with parts broken away of a portion of the door and latch bolt apparatus shown in FIG. 1.

FIG. 4 is an enlarged fragmentary sectional view of the same portion of the door and latch bolt apparatus as that shown in FIG. 3 and taken along line 4—4 of FIG. 1.

FIG. 5 is a sectional view taken along line 5—5 of FIG. 3.

FIG. 6 is a circuit diagram of the dishwasher control circuit of this invention.

FIG. 7 is a sequence chart showing the times when the timer-operated switches of FIG. 6 are closed and open.

Referring now to the drawings and more particularly to FIG. 1, a dishwasher generally designated by reference numeral 10 is shown. The dishwasher has a tub 12 which is generally box-shaped and which has a front access opening 14. A door generally designated by reference numeral 16 is pivoted to the tub 12 at 18 in order that the door may swing from its vertical closed position to a horizontally-disposed open position. The tub 12 is preferably enclosed by a cabinet structure (not shown) which may be of the type shown in the patent to Abresch, et al., No. 2,734,520 issued February 14, 1956. The door 16 fits within the cabinet structure in a manner illustrated in the Abresch patent and its structure is more fully described hereinafter.

The lower end of tub 12 is formed with a sump 20 in which is positioned a heating element 22 and an electric pressure switch 24. The pressure switch 24 may be of any conventional single-pole, double-throw type that responds to the head or level of water in tub 12, and preferably includes a resilient diaphragm cover that is located within the sump to contact the water collecting in the sump. An opening 26 is formed in the lower end of tub 12 and is in communication with the lower end of sump 20. The tub 12 has a sheet metal conduit or housing 28 that supports a conventional vane-type centrifugal pump 30 that is driven by electric motor 32. The inlet side of the pump is connected with the interior of housing 28 and is thus connected with the sump 20. A suitable strainer 33 is positioned within the sump to strain food particles and the like from water passing from sump 20 to pump 30. The pump 30 is of the centrifugal type that will permit flow therethrough by gravity flow when it is not in operation.

The rear wall of tub 12 has an opening that is connected with a water inlet pipe 34. The pipe 34 is connected with the outlet port of a valve block 35 of a conventional solenoid valve. The inlet port of the valve block is connected with a hot water line 36 that is adapted to be connected with any suitable hot water supply. A valve member (not shown) controls the flow of water between pipes 36 and 34 and is normally held in a closed position. A solenoid 38 moves the valve to an open position when it is energized. With the arrangement described, water is supplied to the tub 12 whenever solenoid 38 is energized and the connection between pipes 36 and 34 is closed when the solenoid 38 is not energized.

The outlet side of centrifugal pump 30 is connected with a pipe 40 that is, in turn, connected to the interior of a valve block 42. The interior of valve block 42 is connected with a pipe 44 that is adapted to be connected

to a suitable drain line. The interior of valve block 42 is also connected with a vertically-extending pipe 46 that is connected with a spray tube 48. The spray tube is of the type illustrated in the above-noted Abresch patent and is mounted for rotation within tub 12. The spray tube has openings as shown for spraying or impelling water within tub 12 and is rotatably driven by the impingement of water against vanes (not shown) formed internally of the spray tube which are of the type shown in the Abresch patent.

The valve block 42 contains a valve 48 that is connected to a crank rod 50 that is pivoted to block 42. The valve 48 is operated by linkage 52 that is connected between crank rod 50 and a solenoid 54. A spring 55 normally holds the valve 48 in a position shown in FIG. 1 to prevent flow between pipes 40 and 46 while permitting flow between pipe 40 and drain conduit 44. When solenoid 54 is energized, the valve 48 is moved against the force of spring 55 to a position wherein its blocks flow between pipe 40 and drain conduit 44 and permits flow between pipe 40 and pipe 46.

The pump 30, valve 42, solenoid operator 54, valve 35, and spray tube 48 are preferably all of the type shown in the above-identified Abresch patent, although it is apparent that they could take other forms.

Referring now more particularly to FIGS. 2, 3, 4 and 5, it is seen that the door 16 is formed of an outer panel 56, and inner dished panel 57 and a panel 58 all of which are suitably secured together. The door 16 rotatably supports a crank rod 59 in any suitable manner that is connected with actuating lever 60. The actuating lever 60 is connected at its opposite ends with latch bolts 61 and 62 that are moved horizontally when rod 59 and actuating lever 60 are rotated. The rod 59 is connected to a handle 63 which is grasped by the operator of the dishwasher when it is desired to shift latch bolts 61 and 62.

The tub 12, as is best illustrated in FIG. 4 has a flanged portion 64 having one edge that faces an edge of door 16. A keeper member 65 having a bolt receiving slot 66 is secured to flanged portion 64 of tub 12. When bolt 61 is projected into the slot 64, the door will be held in a closed position. When it is desired to open the door, the latch bolt is withdrawn from slot 64 to permit the door to be opened. The latch bolt 61 is guided in its movement by guide members 67 and 67*a*, the guide member 67 being attached to panel 58 and the guide member 67*a* being screwed or bolted to guide member 67. The opposite side of the door from the side shown in FIG. 4 is provided with suitable keeper means and bolt guiding means (not shown) for bolt 62 which are preferably the same as those used in connection with bolt 61.

The bolt 61 carries a conventional push-button electric switch generally designated by reference numeral 68. The switch is supported on a frame 69 having legs 70 that are fixed to bolt 61 by screws 71. The switch 68 has an actuator button 72 which, when depressed upwardly in FIG. 3, closes a pair of switch contacts (not shown). These contacts are normally held out of engagement with one another by a spring (not shown) so that the switch 68 is normally open. The switch may be of any well-known normally-open type which is closed by a depressible actuator.

The bolt 61 also carries a slide member generally designated by reference numeral 73. The slide member 73 has top wall portions engaging the top edge of bolt 61, and has lower wall and sidewall portions located adjacent the lower wall and sidewalls of bolt 61. The slide member has horizontally-extending arm portion 74 that fits between bolt 61 and guide member 67*a*. The end of arm portion 74 is formed as a lug or shoulder 75 as is best illustrated in FIG. 4. The sidewall 76 of slide 73 is frictionally held between a flat spring steel member 77 and bolt 61. The spring steel member is fixed to bolt 61 by one of the screws 71. The slide 73 has a switch actuating portion 78 that is struck up from the top edge of the slide and which at times depresses the switch actuating button 72.

The switch 68 as shown in the circuit diagram of FIG. 6 is a line switch and will be closed when bolt 61 is moved to a latched position. The switch 68 is open whenever the bolt 61 is in an unlatched position. This operation of switch 68 is due to the cooperation of slide 73 with the switch. When the bolt is in the unlatched position of FIGS. 3 and 4, the switch actuator 78 is positioned to the left of button 72 so that switch 68 is in its normal open position. When the latch bolt 61 is projected into keeper slot 66 by a rotation of handle 63, the switch 68, bolt 61, and slide 73 move together leftwardly in FIGS. 3 and 4. The slide moves with the bolt because of spring 77. From an inspection of FIG. 4 it can be seen that at the time the nose of bolt 61 enters slot 66, the lug 75 contacts keeper 65 to prevent further leftward movement of slide member 73. The bolt is not impeded in its movement however, and its nose moves into a latched position within slot 66. During this movement of the nose of bolt 61 into slot 66 the switch 68 moves with the bolt and relative to the stopped slide to a position wherein the button 72 rides up on actuator 78 and is depressed thereby to a closed position.

If a bolt 61 is now moved toward an unlatched position, the bolt, switch, and slide once more move together toward the right in FIGS. 3 and 4. The switch will remain closed during the initial part of this movement as there is no relative movement between slide 73 and bolt 61. When the slide reaches the position wherein lug 75 engages an edge of guide member 67*a*, the slide is stopped from further rightward movement. The bolt 61 and switch 68 continue to move to the right in FIGS. 3 and 4 and the button 72 is thus moved off from actuator 78 to a position where it is no longer depressed which corresponds to the open position of the switch. The apparatus described is so designed that lug 75 contacts guide 67*a* before the nose of bolt 61 leaves slot 66, thus insuring that switch 68 will open just before the nose of the bolt leaves slot 66. This insures that switch 68 will be in an open position before the door is completely unlatched, so that switch 68 will always be in an open position before it is possible to open door 16.

When the bolt is in the unlatched position of FIGS. 3 and 4 and the door is an open position, it is impossible to close switch 68 through slide 73 because the slide cannot abut keeper 65. It is thus seen that switch 68 cannot be closed by movement of bolt 61 when the door is in an open position. It is also apparent that switch 68 will only be actuated to a closed position when the door is closed and when the nose of bolt 61 is projected into slot 66. The switch 68, as will be more fully described hereinafter, controls the operation of motor 32 to prevent spraying of water in tub 12 of the dishwasher when the bolt 61 is being moved toward its unlatched position. This insures shutting down of the spraying apparatus of the dishwasher prior to the opening of door 16 so that the operator of the dishwasher will not be sprayed when the door is opened.

Referring now more particularly to FIG. 6, a circuit diagram of the dishwasher hereinbefore described is shown. The circuit components include timer operated switches 81, 82, 83, 84 and 85 that are operated by cams 81*a*, 83*a*, 84*a* and 85*a*. The cams are carried by a shaft 86 this is rotatably driven by an electric timer motor 87. The relation of timer shaft position and the closure or opening of switches 81 through 85 is depicted in the sequence chart of FIG. 7 wherein the dark areas of the chart indicate the times when a particular switch is closed. Where no dark area is present, the particular switch being considered is opened. The second column of the chart shows what electrical energizable element of the dishwasher is energized by the closure of a particular switch. The numbers above the darkened areas of the

chart indicate time intervals of a predetermined amount.

The power input lines of the circuit shown in FIG. 6 are designated respectively by letters L_1 and L_2, and are adapted to be connected in any suitable manner with the power supply mains available where the dishwasher is being used. The line L_1 is connected directly to one side of solenoid 54 and to one side of line switch 68 that is carried by bolt 61. The opposite side of switch 68 is connected with a lead 90 that is in turn connected to one side of motor 32 and to one side of a manually operable push-button switch 91 by a lead 92. The switch 91 is of any well-known pushbutton type that is normally open but which may be closed manually and which returns to open position upon removal of manual pressure. The opposite side of switch 91 is connected to a conventional relay-operated switch 93 that is operated to a closed position whenever relay coil 94 is energized. One side of the relay coil is connected to one side of switches 91 and 93 while the other side of the coil is connected with a lead 95. The lead 92 is connected by a lead 96 with one side of timer-operated switch 85.

The lead 95 is connected to one side of timer motor 87, solenoid 38, electric heater 22, and timer-operated switch 85. The opposite side of solenoid 38 is connected to one side of a timer-operated switch 82 and the opposite side of heater 22 is connected to one side of a timer-operated switch 81. The opposite sides of switches 81 and 82 are connected to a lead 97 that is connected with lead 98. The lead 98 is connected with timer motor 87, timer-operated switch 84 and with contact 24*a* of pressure switch 24. The opposite side of timer-operated switch 84 is connected to drain solenoid 54.

The terminal 24*b* of pressure switch 24 is connected with a lead 100 that is, in turn, connected with motor 32 and with timer-operated switch 83. The opposite side of timer- operated switch 83 is connected to a lead 104 that is, in turn, connected to terminal 24*c* of pressure switch 24 and to input line L_2. The pressure switch 24 has a movable contactor 24*d* that connects terminals 24*a* and 24*c* or terminals 24*b* and 24*c* depending upon the level of water in tub 12. When the level of water in tub 12 exceeds some predetermined level the contactor 24*d* assumes the dotted line position in FIG. 6 to connect terminals 24*b* and 24*c*. When the water lever in tub 12 is at or below this predetermined level, the contactor 24*d* assumes the full line position of FIG. 6 to connect terminals 24*a* and 24*c*.

The cycle of operation of the dishwasher will now be described. The operator of the dishwasher desiring to wash a load of dishes places the dishes in a rack (not shown) that is located within tub 12 and which may be of the type shown in the above noted Abresch patent. The operator then closes door 16 and projects bolt 61 into its keeper to close line switch 68. With bolt 61 projected, the operator closes push-button switch 91 for an instant of time. The closure of switch 91 completes a circuit for relay coil 94 which closes relay switch 93. With relay switch 93 closed, a holding circuit is completed for relay coil 94 and the push-button switch 91 may therefore be released.

When switch 93 is closed, a circuit is complete for timer motor 87 that may be traced via line L_1, switch 68, line 92, switch 93, relay coil 94, line 95, timer motor 87, line 98, and through pressure switch 24 to line L_2. When timer 87 is energized, it rotates shaft 86 to immediately close switches 82, 83 and 85 as is evident from the sequence chart of FIG. 7. The closure of switch 85 short circuits coil 94 so that the relay coil is now de-energized to open switch 93 and the circuit for timer motor 87 is made through switch 85. The closure of timer-operated switches 82 and 83 completes a circuit for solenoid 38 and motor 32. With the solenoid 38 energized, valve 35 is opened to permit water flow from hot water line 36 into tub 12. With motor 32 running, this water is pumped through valve 54 to drain 44. This portion of the cycle insures that the hot water line will be cleared of cold water at the very beginning of the dishwasher cycle and also provides an initial flush for the dishes contained in tube 12. This "flush cycle" continues for one interval of time as is evident from the sequence chart of FIG. 7.

Following the initial flush is a "fill cycle" wherein switches 82 and 84 are closed and switch 83 opened. The closure of switch 82 continues the supply of water to tub 12 via pipe 34, while the closure of switch 84 closes a circuit for drain solenoid 54 which operates to move valve member 48 to a position wherein the connection between pipes 40 and 44 is blocked off. The "fill cycle" continues for one interval of time, and during this time the sump 20 fills with a quantity of water as do the pipes 40 and 46, the water passing by gravity through centrifugal pump 30 and seeking the same level in pipe 46 and sump 20.

The "fill cycle" is followed by a "wash cycle" wherein switches 83 and 84 are closed and switch 82 opened. The opening of switch 82 closes valve 35 to cut off the water supply to tub 12. The continuing closure of switch 84 keeps solenoid 54 energized to hold valve member 48 in a position blocking flow to drain pipe 44 and permitting flow to pipe 46. The closure of switch 83 closes a circuit for motor 32. With motor 32 operating and solenoid 54 energized, water is circulated from sump 20, through pump 30, valve 42, pipe 46, spray tube 48 and thence back into sump 20 where the water is again circulated through the path just described. This recirculation of water provides a very efficient washing action as the spray tube 48 rotates to impel water over the interior of tub 12 and against any dishes contained therein during the recirculation.

The "wash cycle" continues until time interval 6 whereupon a "pause cycle" begins. During the "pause cycle" the switches 82 and 83 are opened and switch 84 remains closed. With switches 82 and 83 in an open position no water is supplied to the tub and the motor 32 is de-energized. With switch 84 closed, solenoid 54 is energized to hold valve member 48 in a position wherein flow to drain 44 is blocked but wherein flow between pipes 40 and 46 is permitted. With this positioning of valve member 48 and with motor 32 de-energized, the water in spray tube 46 is permitted to flow by gravity from pipe 46, through valve 42, and through pump 32 up into sump 20, the water seeking the same level in sump 20 as in pipe 46. During the "pause cycle" the spray tube 48 is cleared of water by gravity flow therefrom. It will be apparent from the sequence chart that this "pause cycle" continues for one interval of time and during this time the spray tube and its connecting pipes are cleared of dirty water which is pumped out by the immediately-following "pump-out cycle." This prevents contamination of the rinse water that is used during the "rinse cycle" that follows the "pump-out cycle."

Immediately following the "pause cycle" just described, is a "pump-out cycle" wherein switch 83 is closed and switch 84 opened. This cycle beings as time interval 7. During the "pump-out cycle" the valve member 48 is moved by spring 55 to its position shown in FIG. 1 and pump 30 is operated to pump water from tub 12 directly to drain pipe 44.

The "pump-out cycle" is followed by a second "fill cycle" of the type described hereinbefore as is evident from the sequence chart of FIG. 7. This "fill cycle" is followed by a "rinse cycle" wherein water is recirculated through the tub 12 in a manner identical with the above-described "wash cycle." The "rinse cycle" is followed by a "pause cycle," then a "pump-out cycle," a "fill cycle" and then a second "wash cycle." The second "wash cycle" is followed by another "pause cycle," then a "pump-out cycle" and then another "fill cycle." This "fill cycle" is followed by a second "rinse cycle," a "pause cycle," a "pump-out cycle" and another "pause cycle" to clear the

spray tube and its connecting hoses of water. Following this final "pause cycle" are four "pump-out cycles" each of one time interval in duration to pump out all the water from sump 20. During the above-noted cycle of operation, the heater 22 is periodically energized by the closure of switch 81 as is evident from the sequence chart. The switch 85 remains closed during the entire cycle to complete a circuit for timer motor 87. The entire dishwasher cycle ends when time-operated switch 85 is opened.

As noted above, the dishwasher described is provided with a safety antiflood system. If the water level in tub 12 exceeds a predetermined level, the pressure switch 24 is actuated by the weight of water overlying it to connect terminals 24c and 24b of the switch. This switching action completes a direct circuit for motor 32 via lines 100 and 102. The motor 32 will thus be energized irrespective of whether timer-operated switch 83 is in a closed position. This switching action also opens a circuit between line L_2 and line 98 so that the timer motor 87, solenoid 38, heater 22, and drain solenoid 54 can no longer be energized through the timer-operated switches. With such a switching action the valve member 48 will be held by spring 55 in the position shown in FIG. 1 to connect pipes 40 and 44, and pump 30 will be driven by motor 32 to empty the tub 12 of water. This pumping of water to drain will continue until the level of water is brought down to a predetermined safe level whereupon switch contactor 24d will move to connect terminals 24a and 24c and the normal dishwasher cycle may then proceed. It should be noted that this pumping-out action will continue as long as the water in the tub is above a predetermined level and irrespective of the cause of the abnormal level. Thus, if fill valve 35 should become stuck in an open position, the pumping-out safety cycle will continue so that the dishwasher will not flood the area in which it is being used.

The latch bolt carried switch 68, as noted above, is closed when the bolt is in a latched position and is open when the bolt is in an unlatched position. This switch, when in an open position, breaks the circuit for all the electrically-operable components of the dishwasher except the drain solenoid 54. With this arrangement the spraying apparatus of the dishwasher is shut down prior to opening of the door 16 to insure that the operator of the dishwasher will not be sprayed when the door is opened. The drain solenoid may still be energized with switch 68 open, if timer operated contact 84 is closed at the time of unlatching of bolt 61. With this arrangement, the valve member 48 is maintained in a position blocking flow to drain pipe 44 and thus prevents flow to the drain pipe by gravity from sump 20 where the door is opened and switch 68 opened.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a dishwasher having a tub, a spray tube within said tub, a water inlet pipe connected with said tub, a solenoid-operated valve including a first solenoid having an outlet connected with said water inlet pipe and having an inlet that is adapted to be connected with a water supply pipe, a pump having an inlet connected with said tub and a pump outlet, an electric motor for driving said pump, a valve member having an inlet port connected to said pump outlet and first and second outlet ports, a movable valve part in said valve member having a first position blocking flow between said inlet port and said first outlet port and having a second position blocking flow between said inlet port and said second outlet port, a second solenoid for operating said valve part, said valve part normally being in said second position when said second solenoid is de-energized and moving said valve part to said first position when said second solenoid is energized, means connecting said second outlet port with said spray tube, means connecting said first outlet port to a drain conduit, a pressure-responsive switch associated with said tub responsive to the level of water in said tub, said switch having first, second, and third terminals with said first and second terminals being connected when said level of water is above a predetermined level and with said first and third terminals benig connected when said level of water is at or below said predetermined level, a first power input line, means connecting one side of said solenoids and one side of said electric motor with said first power input line, means connecting the opposite side of said electric motor with said second terminal of said pressure switch, means connecting the opposite sides of said solenoids with the third terminal of said pressure switch, a second power input line, and means connecting said first terminal of said pressure switch with said second power input line.

2. In combination, a dishwasher having a tub and a door for closing said tub, means for impelling water within said tub or to drain and including a motor, a door switch having an open position when said door is open for deenergizing said impelling means, a valve member, a drain conduit connected with said tub through said valve member, said valve member having an inlet connected with said impelling means and an outlet connected with said drain conduit, a movable valve part in said valve member, means for normally holding said valve part in an open position for connecting said tub to drain through said impelling means, electrically-energizable means for moving said valve part to a closed position when said means is energized, pressure switch means responsive to the level of water in said tub having an open position when the water in said tub is above a predetermined level and a closed position when the water in said tub is at said predetermined level, an electrical energizing circuit including said door switch, said motor and said pressure switch means in said open position, and switch means connected with said energizing circuit in parallel with said door switch and said motor and in series with said electrically-energizable means and said pressure switch means for completing a circuit for said electrically-energizable means when said pressure switch means is in said closed position, said pressure switch means preventing energization of said electrically-energizable means when in said open position and completing a circuit for said motor to impel said water to drain only until said pressure switch means returns to said closed position.

3. In combination, a washing machine having a tub, water inlet pipe means connected with said tub, a solenoid valve having an actuating solenoid connected with said pipe means, said valve being in a closed position when said solenoid is de-energized and being moved to an open position when said solenoid is energized, a pump having an inlet connected with said tub and having an outlet that is adapted to be connected with a drain conduit, an electric motor for periodically driving said pump, a timer, an electrical-energizing circuit, switch means operated by said timer for connecting said motor and said solenoid with said energizing circuit at predetermined times, and means responsive to the water level in said tub for disconnecting said solenoid from said energizing circuit and for simultaneously connecting said motor with said energizing circuit to pump said water to said drain conduit for only so long as the said water level is above a predetermined level.

4. In combination, a dishwasher having a tub, water inlet means connected with said tub for supplying water to said tub for washing dishes, a spray tube in said tub, a pump having an inlet connected with said tub and having an outlet, a valve member having a first port connected with the outlet of said pump and having second and third ports, means connecting said second port with a drain conduit, upwardly-extending, free flowing non-obstructed pipe means having one end connected to said third port and its other end connected to said spray tube for conveying said water being pumped, a valve part in

said valve member having a first position wherein said first and third ports are in communication with each other and wherein flow is blocked between said first and second ports, and having a second position wherein said first and second ports are in communication with each other and wherein flow is blocked between said first and third ports, means normally holding said valve part in said second position, a solenoid for moving said valve part to said first position when energized, an electric motor for driving said pump to pump said water from said tub to said spray tube, a timer, an electrical energizing circuit, and switch means operated by said timer for at times connecting said motor and solenoid with said energizing circuit for circulating said water in a forward direction from said tub through said pump and said pipe means to said spray tube and back into said tub whereby a portion of said water is continuously contained by said pipe means, and for at other times connecting said motor only with said energizing circuit to effect a pumping out of said water from said tub to said drain conduit, said timer operating said switch means to connect said solenoid with said energizing circuit for moving said valve part to said first position and to disconnect said motor from said energizing circuit for a predetermined period of time just prior to the pumping out cycle of said machine whereby said portion of said water contained by said upwardly-extending pipe means at the termination of circulation of said water is permitted to flow in a reverse direction back through said pipe means toward said pump.

5. In combination, a dishwasher having a tub, water inlet means connected with said tub for supplying water to said tube for washing dishes, a spray tube in said tub, a pump having an inlet connected with said tub and having an outlet, an electric motor for operating said pump to pump said water from said tub to said spray tube, electrically-energizable valve means connected with the outlet of said pump having a port that is adapted to be connected to a drain conduit and having a second port, a substantially vertically-extending, free flowing, non-obstructed pipe having one end connected to said second port and its other end connected to said spray tube for conveying said water being pumped, a timer, switch means operated by said timer for controlling the operation of said motor and elecrically-energizable valve means, said timer during one interval of time operating said switch means to cause energization of said motor and operation of said valve means to a position wherein the outlet of said pump is connected with the inlet of said spray tube to cause a recirculation of said water in a forward direction from said pump through said pipe to said spray tube whereby a portion of said water is continuously contained by said pipe, and operating said switch during another interval of time to cause energization of said motor and operation of said valve means to a position wherein the outlet of said pump is connected to drain to cause a pumping out of said water from said tub, said timer operating said switch means during still another interval of time just preceding said pumping out interval to cause de-energization of said motor and movement of said valve means to a position connecting the substantially vertically-extending pipe to the outlet of said pump wherein said portion of said water contained in such substantially vertically-extending pipe at the termination of said recirculation of said water is permitted to flow in a reverse direction back through said pipe toward the outlet of said pump.

6. In combination, dishwasher having a tub, a spray means for said tub, a water inlet pipe connected with said tub, a solenoid-operated valve including a first solenoid having an outlet connected with said water inlet pipe and having an inlet that is adapted to be connected with a water supply pipe, a pump having an inlet connected with said tub and a pump outlet, an electric motor for driving said pump, a valve member having an inlet port and first and second outlet ports connected to said pump outlet, valve means for said valve member having a first position blocking flow between said inlet port and said first outlet port and having a second position blocking flow between said inlet port and said second outlet port, a second solenoid for operating said valve means, said valve means normally being in said second position when said second solenoid is de-energized and moving said valve means to said first position when said second solenoid is energized, means connecting said second outlet port with said spray means, means connecting said first outlet port to a drain conduit, a switch operatively associated with said tub responsive to the level of water in said tub, said switch having first, second, and third terminals with said first and second terminals being connected when said level of water is above a predetermined level and with said first and third terminals being connected when said level of water is at or below said predetermined level, a first power input line, means connecting one side of said solenoids and one side of said electric motor with said first power input line, means connecting the opposite side of said electric motor with said second terminal of said switch, means connecting the opposite sides of said solenoids with the third terminal of said switch, a second power input line, and means connecting said first terminal of said switch with said second power input line.

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