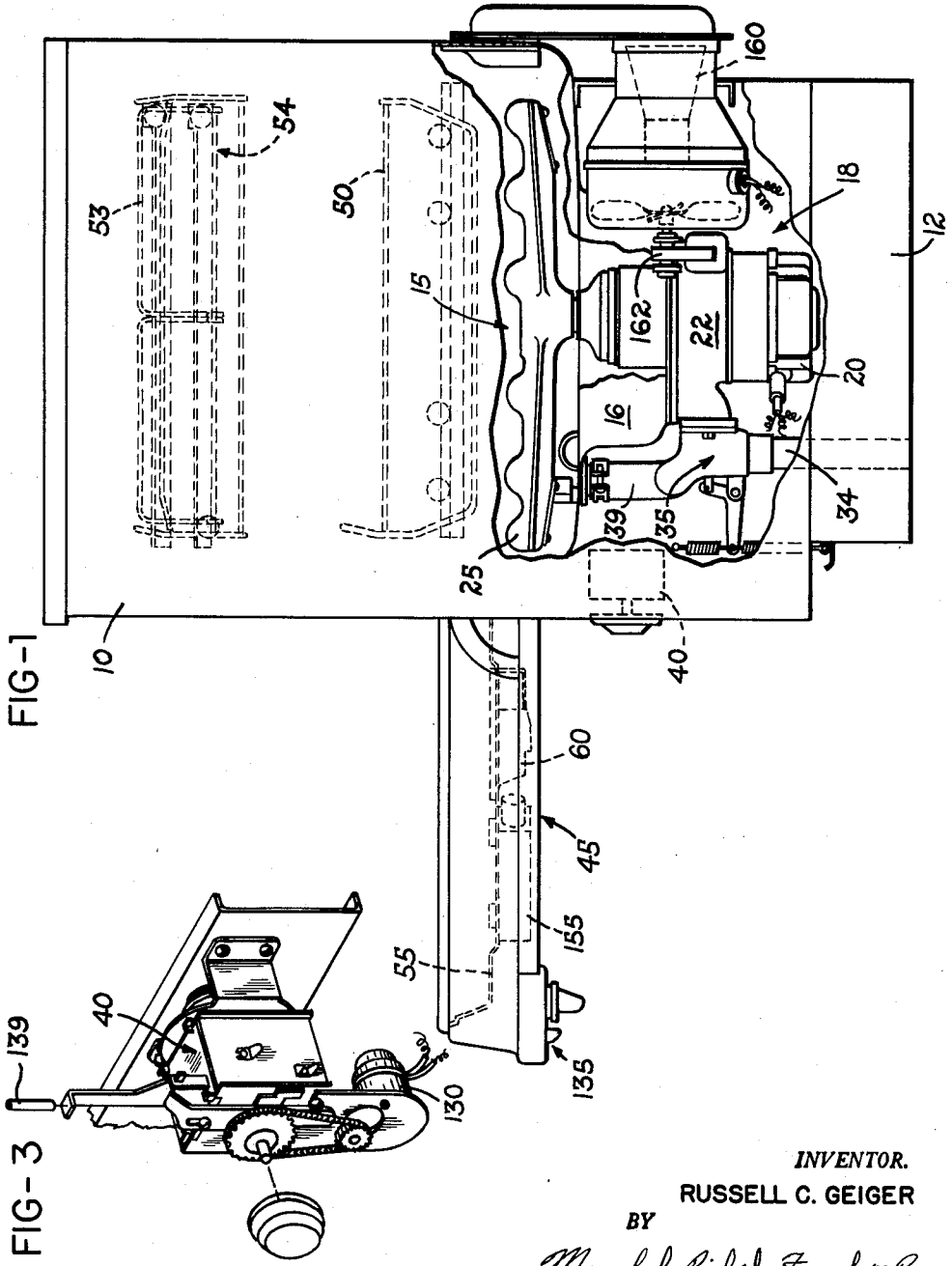
March 17, 1964 R. C. GEIGER 3,125,105

TIMER CONTROL FOR DISHWASHING APPARATUS

Filed Nov. 20, 1961 2 Sheets-Sheet 1



INVENTOR.
RUSSELL C. GEIGER
BY
Marechal, Biebel, French & Bugg
ATTORNEYS

March 17, 1964 R. C. GEIGER 3,125,105

TIMER CONTROL FOR DISHWASHING APPARATUS

Filed Nov. 20, 1961 2 Sheets-Sheet 2

FIG-2A

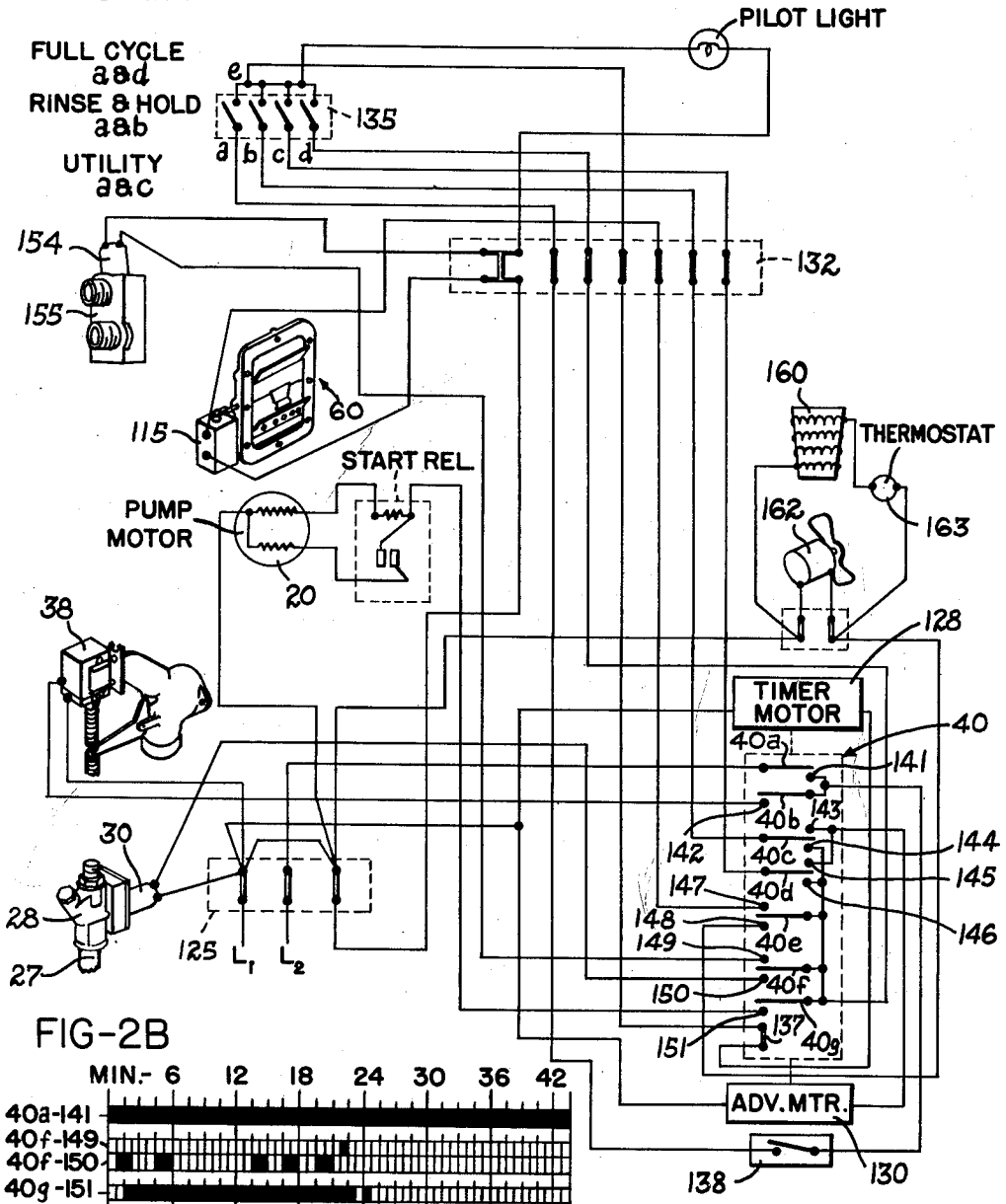
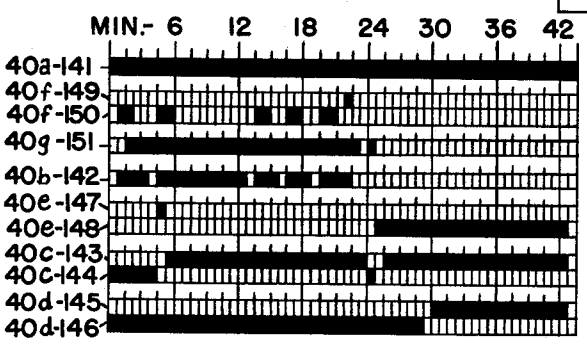


FIG-2B



INVENTOR.
RUSSELL C. GEIGER
BY
Marechal, Biebel, French & Bugg
ATTORNEYS

United States Patent Office 3,125,105 Patented Mar. 17, 1964

3,125,105

TIMER CONTROL FOR DISHWASHING APPARATUS

Russell C. Geiger, Troy, Ohio, assignor to The Hobart Manufacturing Company, Troy, Ohio, a corporation of Ohio

Filed Nov. 20, 1961, Ser. No. 153,388
3 Claims. (Cl. 134—58)

This invention relates to dishwashing apparatus, particularly to dishwashing machines of the front loading type, wherein a door is mounted in the front of the machine, hinged to pivot adjacent its lower edge, to afford access to the interior or cleansing chamber of the machine, and also functioning when in such lowered or open position as a rest for a rack which may be moved outwardly thereonto from the interior of the machine.

The present invention also relates to a dishwashing machine wherein the cycle of operations may be varied under control of the operator to accommodate the cleansing operation of the machine to various circumstances. For example, it may be desirable to place a partial load in the machine and to rinse the gross soil from the articles to be cleansed, but not to operate through a complete cleansing cycle until a larger or full load is ready. Similarly, it is desirable in many cases, in the complete cleansing cycle, to rinse the soiled articles with water prior to the actual washing with a cleansing compound, in order to remove a certain amount of the gross soil and have this soil drained away prior to the action of the cleansing compound. On the other hand, the main washing or cleansing operation, in which a detergent or like cleansing agent is mixed with water to form the cleansing compound sprayed over the soiled articles, necessarily follows the initial rinse, and it is therefore desirable to maintain such detergent ready within the machine for release during the main cleansing portion of the operating cycle, but apart from the water used during the initial rinse, since this permits a continuous unattended full operating cycle.

Also, in some instances it may be desirable to employ instead of the initial water rinse, an additional spray of cleansing solution, and for this purpose an additional charge of detergent or the like should be made available for mixing with the initial rinse water spray. All of these various operations should be at the same time available to the operator with a minimum amount of attention or manipulation, in order to simplify the operation of the machine for domestic use, and to provide at all times a full cleansing cycle in normal operation.

Therefore, the primary object of this invention is to provide a novel dishwashing machine which can be operated in a number of different cycles at the option of the operator, but with little change in manipulation of the machine by the operator, and without foreshortening the regular cleansing operation cycle.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

FIG. 1 is a side elevational view, with some parts broken away, showing the general arrangement of the dishwashing machine in accordance with the invention;

FIG. 2A is a schematic wiring diagram illustrating the controls for the machine;

FIG. 2B is a chart illustrating the sequence of operations of the timer shown in FIG. 2A; and

FIG. 3 is a perspective view of the novel timer apparatus.

Referring to the drawings, which illustrate a preferred embodiment of the invention, FIG. 1 shows the general arrangement of a dishwashing machine incorporating the features of the present invention. The machine includes

an outer cabinet 10, mounted on a base 12, and having formed therein a cleansing or washing chamber 15 including a sump portion 16, such cleansing chamber occupying a major portion of the interior of the cabinet. The area 18 below the chamber and sump provides enclosure for the drive motor 20 and the motor driven pump 22 which recirculates water from the sump 16 through the rotary mounted spray device or head 25. Plumbing connections include a supply line 27 (FIG. 2) having a fill valve 28 connected therein and controlled by the fill solenoid 30. This valve is preferably of the type which is normally closed and opens when solenoid 30 is energized.

The drain line 34 is provided with a drain valve 35 which is in turn controlled by a solenoid 38. This valve is normally open, but will be closed when solenoid 38 is energized. Preferably, the chamber also is provided with an overflow pipe 39 extending into the drain line downstream of the valve 35 from the sump, thus establishing the level at which liquid can rise within the chamber. The machine also incorporates a timer 40 (FIGS. 2 and 3) operation of which is initiated to start a cycle of operation of the machine, and the timer mechanism is also housed within the bottom area of the cabinet 10. It controls the energization of the fill and drain valve solenoids and of the main pump drive motor to establish the desired sequence of operations. Details of the timer control and of the sequence of operations are explained in further detail in a latter portion of this specification.

The present invention is particularly suitable to use with a dishwashing machine of the type shown, and having a door 45 hinged adjacent its lower edge, to swing forward and downward providing access to the cleansing chamber. However, while the invention is of particular utility with respect to such a construction of machine, it is also useful in other dishwashing machines, for example those of the top loading type, and it should be understood that the invention is not limited to the particular construction of machine illustrated and described herein.

In the front loading and unloading construction disclosed, the machine includes a lower rack 50 mounted to move from its position within the cleansing chamber outward onto the surface of the lowered door 45, which in turn provides a convenient support for the rack for placement or removal of soiled articles therein or therefrom. The rack of course is of the open mesh type which permits sprays of cleansing liquid from the spray device 25 to pass through the rack and distribute effectively over the surfaces of the soiled articles. There is also an upper rack 53 which is provided with suitable mounting 54 accommodating movement of the rack through the opening provided by the open door to facilitate loading and unloading of the upper rack. When the rack is pulled outward, it is supported by the mounting 54.

The dispenser 60 is preferably mounted in door 45, such that it is exposed for easy charging prior to use of the machine, and thus, the dispenser is mounted on the inner panel 55 of door 45, in the space between such panel and the front or outer panel of the door which forms the exterior of the door and blends with the exterior of the cabinet when the door is closed.

FIG. 2A is a schematic diagram of the control circuit for the machine. Power supply is through the lines marked L1 and L2 to the terminal block 125. The timer 40 is shown in schematic fashion, with the various switches and contacts thereof illustrated in an open position, and with the main timer motor 128 and the special timer advance motor 130, which is a feature of this invention, shown in schematic fashion. It will be understood by those skilled in the art that the main motor 128 operates to turn a plurality of cams (not shown) inside the timer which function to open or close the various

switches of the timer in predetermined sequence. The advance motor 130, when energized, operates to advance or rotate these cams rapidly from a predetermined point to the end of a cycle, as will be more fully described. The sequence of operation of the timer contacts is shown in FIG. 2B.

The circuits also include a terminal board 132 which functions to connect the main wiring harness from beneath the cleansing chamber of the machine to those parts which are mounted in the door 45. Further description of the circuit will be understood from the following review of the function of the machine.

A push button operated switch 135, of conventional construction, is mounted in door 45, preferably near the top thereof as shown in FIG. 1. This switch includes four separate switch blades which are labeled in FIGS. 2A as 135*a*, 135*b*, 135*c* and 135*d*. The common or input line to this switch, labeled 135*e*, which applies to all contacts shown open, is connected to the power line L1 through terminal block 125 and through the timer motor 128 and the jumper 137 in the timer, thence through the terminal board 132.

The switch 135 has three separate and independently movable push buttons, each of which causes a different combination of the contacts of that switch to be closed. For normal operation, hereinafter termed "full cycle" operation, the appropriate button, which is suitably labeled, is depressed and this closes the switch contacts 135*a* and 135*d*. Switch 135*a* applies power through the interlock microswitch 138, and this switch is closed whenever the door 45 is closed, by any suitable mechanism. With switch 135*a* closed, a circuit is completed from L1 through timer motor 128, through jumper 137 in the timer, and through microswitch 138, presumed to be closed, to the contact 141 of the timer.

When door 45 is closed and locked, microswitch 128 is closed, as mentioned, and a mechanical starting connection to the timer is actuated to advance the timer a sufficient amount to close the timer switch 40*a* onto the timer contact 141. A suitable apparatus for performing this function is shown in United States Patent No. 2,707,-961, and forms no direct part of this invention. A rod 139, a portion of which is shown in FIG. 3, is depressed by this mechanism for that purpose. Suffice to say, that the act of closing and locking the door, together with depressing the proper button of switch 135, will cause timer motor 138 to be energized.

Timer 40 is shown as having seven switches or movable blades 40*a*–40*g*. Switch 40*a* opens or closes upon contact 141, and as mentioned is in the circuit between L2 and interlock microswitch 138. Switch 40*b* cooperates with contact 142 and controls energizing of the drain valve solenoid 38. Switch 40*c* is connected through the terminal board 132 to switch 135*b*. When closed on timer contact 143, switch 40*c* is in the circuit of the timer advance motor 130. When 40*c* is closed on contact 144 it is connected through the terminal board to switch 135*d*. Timer switch 40*d* is connected through the terminal board to switch 135*c* when closed on timer contact 145, which controls a circuit through advance motor 130, and when closed on contact 146 it is connected to switch 135*d*. Timer switch 40*e* can close on contact 147 and is thence connected to the dispenser solenoid 115, and when 40*e* engages contact 148 it completes a circuit energizing the heater 160 and the fan motor 162. A thermostat 163 is in series with the heater unit to avoid overheating thereof. Hot air is circulated by the fan through the interior of the cleansing chamber to dry articles therein.

Timer switch 40*f*, when engaging contact 149, will complete a circuit through a solenoid 154 to actuate the rinse agent dispenser 155 which is also mounted in the door 45, as shown in FIG. 1. This will add a charge of liquid rinsing agent to the rinse water at a predetermined time, to assist in thorough rinsing of the articles and particularly to prevent spotting of the articles during the subsequent drying process.

When switch 40*f* engages contact 150 it will complete a circuit through the solenoid 30 of the fill valve. Timer switch 40*g* cooperates with contact 151 to complete a circuit through pump motor 20 and its starting relay.

Full Cycle

In the full cycle of operations, as previously mentioned, that button of switch 145 is depressed which closes the blades 135*a* and 135*d*. FIG. 2B illustrates the operating sequence of the timer 40 once it has been started, with the individual marks being equivalent in time to forty-five seconds. Preferably, the timer has a ratchet type drive which advances its cams or operating members once each forty-five seconds, although of course any equivalent arrangement can be employed. Of course, in order to start the timer motor must be energized, and it must continue to run. This is illustrated by the solid bar in the first horizontal section of FIG. 2B, illustrating that switch 40*a* is made to engage contact 141. Next, switch 40*f* engages contact 150 and completes a circuit through solenoid 30 for ninety seconds, filling the sump of the machine. Halfway through the filling operation switch 40*g* engages contact 151 and completes a circuit through the pump motor to operate the pump, causing the liquid to circulate through the spray head and be sprayed over the articles in the machine. Note that the pump continues to operate after the fill valve has closed by deenergization of solenoid 30 when 40*f* returns to its open position.

During this time, commencing with opening of the fill valve, the drain valve solenoid 38 is energized to close the drain valve and it is held closed for three minutes, as shown in the cycle diagram, the circuit being completed through switch 40*b* to contact 142. The drain valve solenoid is then deenergized for forty-five seconds, while the pump continues to operate, and the liquid is drained out, after which the drain valve is again closed and the fill valve is again opened. The sump is refilled, by holding the fill valve open for ninety seconds, and the pump continues to operate with the drain valve now closed for a period of eight minutes, in other words until forty-five seconds past the twelve minute mark. At the beginning of this fill, switch 40*e* engages contact 147 for a forty-five second period completing a circuit through the dispenser solenoid 115, and causing it to discharge detergent from its upper or closed compartment, as previously described.

The drain valve is then opened for forty-five seconds and again closed as the sump is filled again by opening the fill valve solenoid 30, and this process is repeated three times, with the pump motor continuing to run, thus providing three fresh water rinses of the articles. After the third rinse fill, switch 40*f* engages contact 149 for an interval to complete a circuit through solenoid 154, discharging a quantity of rinsing agent into the last rinse water which is continuously sprayed over the articles. Immediately thereafter, as solenoid 154 is deenergized, the drain valve solenoid 38 is also deenergized by opening of switch 40*b* and the last rinse water drains from the machine. The pump is also stopped by opening switch 40*g* from contact 151 for one interval, and then this contact is again made for one following interval to expel any liquid that may remain in the pump or spray head. The pump motor is then stopped and switch 40*e* engages contact 148 completing the circuit through heater 160 and the fan motor 162, and this circuit is maintained for eighteen minutes, during which the articles are dried by a forced flow of hot air. Immediately after the fan is stopped and the heater shut off, switch 40*a* opens to stop the timer motor and the full cycle is completed.

Rinse and Hold Cycle

It is sometimes desirable to place a partial load of

soiled articles in the chamber, and to keep them there until additional articles are ready without running the machine through a full cycle. On the other hand, it is desirable to rinse the articles initially in order to remove most of the soil which might otherwise harden on the articles. For this purpose the invention provides a rinse-hold cycle which operates as follows.

A separate button, appropriately labeled, is depressed in the switch **135** closing switch blades **135***a* and **135***b*. This of course completes a circuit through timer motor **128** so long as the interlock switch **138** is closed, and the timer begins to run. The sump is filled since circuits are completed through **40***f*—**150** and **40***b*—**142** to energize the fill valve and drain valve solenoids, and the pump motor is then started by closing the switch **40***g* on contact **151**. All circuits but the timer motor circuit are completed through switch **40***c* and contact **144**, and this is interrupted at the end of four and one-half minutes, as shown in the ninth bar of FIG. 2B, labeled **40***c*—**144**. Then, after a forty-five second interval switch **40***c* engages **143**, completing a circuit through the advance motor **130** which upon being energized drives the timer forward at a much faster rate, requiring only approximately twenty seconds to reach a position equivalent to the twenty-four minute position.

At this time the advance motor circuit is momentarily interrupted and **40***c*—**144** is completed for forty-five seconds, and of course it will be seen that the only circuit which is completed at this time is through **40***g*—**151** to the pump motor, causing the pump to expel from itself and the rinse head whatever liquid may be retained therein, while the drain valve of course is open since solenoid **38** is deenergized. After a forty-five second pause, **40***c* again contacts **143** and the advance motor again operates to move the timer forward at a fast rate, requiring only about an additional twenty seconds to move the timer to within one interval of its completion. Then, **40***c*—**143** opens and the timer advances normally through the last forty-five second interval until **40***a*—**141** opens to end the cycle.

Therefore, when the rinse-hold button is depressed the machine follows this abbreviated cycle, rinsing the articles once and then draining itself, but it should be noted that the timer is advanced completely to the end of its operating cycle and if the machine is again energized this rinse-hold cycle can be repeated, or the full cycle can be used subsequently without subtracting any part of the operation of the full cycle.

Utility Cycle

The third button of switch **135** will set into operation a utility cycle, and the button is so designated. The purpose is to provide a double wash and triple rinse of food preparing utensils such as pots and pans, spatulas, etc., in other words articles from which heavier food soils may have to be removed. When this button is depressed switch blades **135***a* and **135***c* are closed.

The operation of this cycle, for the most part, is identical to the full cycle. However, instructions are given to the user, and it is optional with him, to place a charge of detergent in both pockets **70** and **72** of the dispenser. Thus, the first or pre-rinse operation can become a first washing cycle, since detergent will be added to the water circulated at this time.

It will be obvious from inspection of those parts in FIG. 2B, labeled **140***d*—**146** and **40***d*—**145** that the normal or full cycle is maintained by closing switch **40***d* on contact **146** to complete a circuit from switch **135***c* and the power source through the various contacts of the timer during the pre-rinse or first washing operation, the second or main wash, and the three rinsing operations, including injection of rinsing agent during the last rinse.

However, after twenty-nine and one-quarter minutes of operation, in other words after the heater and circulating fan have been energized for a short time (approximately four and one-half minutes) switch **40***d* opens from contact **146**, and then at the thirtieth minute switch **40***d* engages contact **145** to complete a circuit through the advance motor **130**. This motor immediately advances the timer at a faster rate, requiring about twenty seconds to run the timer to the end of its cycle, at which the machine stops.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of the invention, which is defined in the appended claims.

What is claimed is:

1. In a dishwashing machine having a washing chamber, power driven spray means arranged to spray cleansing liquid over soiled dishes and like articles supported in said chamber, fill control means connected to admit liquid to said chamber, drain control means connected to drain liquid from said chamber, and an electric power driven timer connected to all of said aforementioned means for controlling the sequence of operation thereof to produce a normal cleansing cycle of operation, the improvement comprising a timer advance motor connected to said timer for driving said timer at a speed substantially faster than its normal rate of operation, and manually selectable control circuits including said timer and said advance motor producing an abbreviated cycle of operation in which soiled articles are rinsed preparatory to subsequent cleansing and to return said timer to its starting position thereby making available a full cycle of operation immediately subsequent to said abbreviated cycle.

2. In a dishwashing machine having a washing chamber, power driven spray means arranged to spray cleansing liquid over dishes and like articles supported in said chamber, fill control means connected to admit liquid to said chamber, drain control means connected to drain liquid from said chamber, heater means for heating drying air to be passed over articles in said chamber, an electric power driven timer, and circuits connecting said timer to all of said aforementioned means controlling the sequence of operation thereof providing a normal cleansing cycle including an initial period of rinsing with cleansing liquid, a main washing period with fresh cleansing liquid, at least one rinsing period with fresh cleansing liquid, and a drying period in which heated air is passed over the articles; the improvement comprising a power operated timer advance means connected to drive said timer at a speed substantially faster than its normal rate of operation, and manually selectable control circuits including said timer and said timer advance means altering the normal cycle of operation produced by said timer and producing selected abbreviated cycles of operation in which said timer is advanced rapidly through portions of its normal cycle and is returned to its starting position thereby making available a normal full cycle of operation immediately subsequent to an abbreviated cycle.

3. In a dishwashing machine having walls defining a washing chamber, an electrically controlled fill valve connected to admit cleansing liquid into said chamber, an electrically controlled drain valve for draining liquid from said chamber, motor driven spraying means including a pump connected to recirculate liquid from said chamber and a spray head receiving liquid from said pump and directing the liquid over articles placed in said chamber for cleansing, an electrically controlled dispenser for cleansing agent adapted to be mixed with the cleansing liquid during a predetermined portion of the operation of said machine, a motor driven timer having contacts connected in circuit with both said valves and with said motor driven spraying means and with said dispenser to provide a predetermined sequential operation thereof, an advancing drive for said timer connected in circuit therewith, and a manually selectable control included in circuit with said timer advance drive and said timer for

circuit with said timer advance drive and said timer for producing an abbreviated operating cycle of said timer and returning said timer to its starting position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,678,051	Stoddard	May 11, 1954
2,707,961	Geiger et al.	May 10, 1955
2,709,536	Yeager	May 31, 1955
2,711,178	Sharp et al.	June 21, 1955
2,825,348	Low	Mar. 4, 1958
2,872,076	Bloom	Feb. 3, 1959
2,973,769	Jacobs et al.	Mar. 7, 1961
3,012,565	Lines	Dec. 12, 1961
3,034,519	Jacobs	May 15, 1962
3,063,459	Jacobs	Nov. 13, 1962