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TIMER FOR DOMESTIC APPLIANCE

Filed Feb. 24, 1960

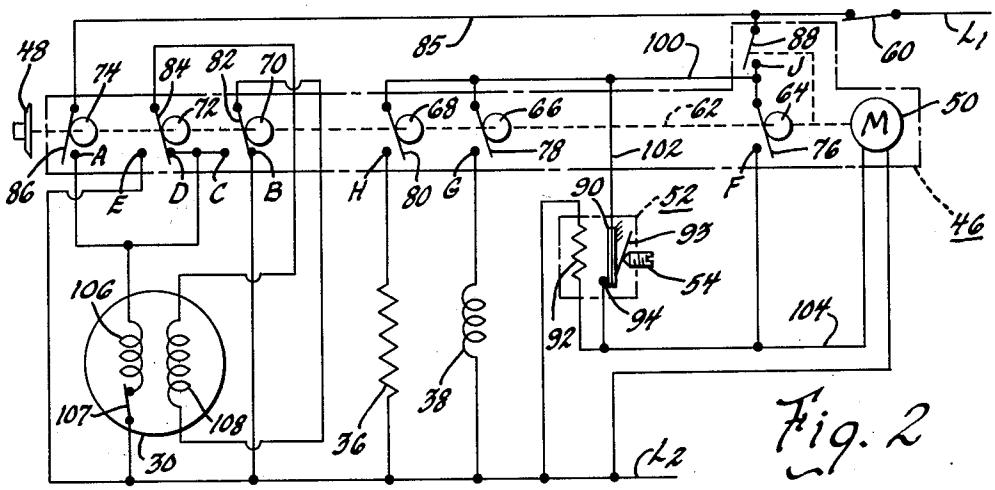


Fig. 2

TIMER INCREMENTS			0	6	12	18	24	30	36	42	48	54	60
CONTACT	CIRCUIT												
A		MOTOR											
B		PUMP OUT											
C		CIRCULATE											
D		PUMP OUT											
E		CIRCULATE											
F		SHUNT											
G		FILL											
H		HEATER											
J		LINE											

Fig. 3

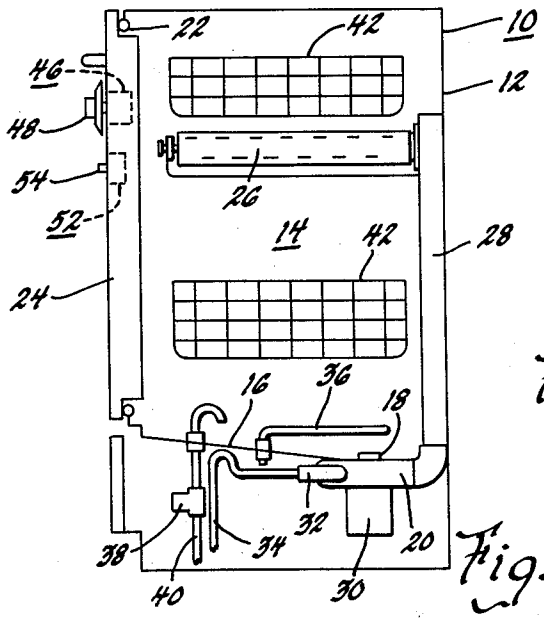


Fig. 1

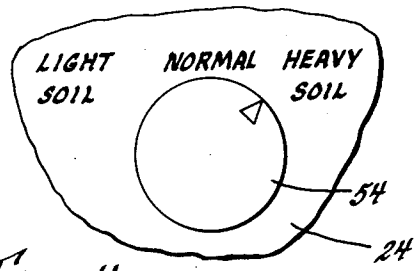


Fig. 4

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TIMER FOR DOMESTIC APPLIANCE

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This invention relates to a domestic appliance and more particularly to an improved timing device therefor.

In the control of domestic appliances, it has been found desirable to provide adjustable cycles in order to make the operation of the appliance more flexible. In a dishwasher, for instance, the appliance may be confronted with an extremely soiled set of dinner dishes, on the one hand, whereas the dishwasher might also be used to wash a load of lightly soiled glasses. Prior art devices have included shortened cycles for the latter situation. However, such prior art devices have used timing means which require several different and separate cycles designed into the timing device itself. A composite timing mechanism of this nature is complicated and expensive and it is to the simplification of this problem that the present invention is directed.

Accordingly, its an object of this invention to provide an appliance cycle timing device with a power source which is periodically interrupted to vary the controlled cycle.

It is a more specific object of this invention to provide a dishwasher with means to vary the duration of the wash, rinse and drying portions of a dishwashing cycle.

A further object of this invention is the provision of a vibrating bimetal type thermostat or pulser in power supply relationship to a timing motor for periodically energizing and de-energizing said timer motor.

It is also an object of this invention to provide a timing device which will vary the duration of certain portions of a timed cycle while retaining the duration of other portions of the cycle constant.

A more specific object of this invention is the provision in a dishwasher having means for water filling, water circulating and heating of a timer power supply interrupting means for varying the periods of energization and de-energization of said circulating and said heating means without varying the periods of energization and deenergization of said filling means.

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

In the drawing:

FIGURE 1 is a schematic view of a dishwasher adapted for use with this invention;

FIGURE 2 is a schematic wiring diagram of this invention;

FIGURE 3 is a timer cycle chart showing the contact positions throughout a dishwashing cycle for the circuit of FIGURE 2; and

FIGURE 4 is a fragmentary elevational view of the cycle selector of this invention.

In accordance with this invention and with reference to FIGURE 1, a dishwasher 10 is comprised of a casing 12 enclosing a dishwashing chamber 14. The chamber 14 is defined at its lower portion by a sump forming wall 16 sloping toward an inlet 18 to a pump 20 and is closed by a horizontally pivoted door 24. Disposed centrally within the dishwashing chamber 14 is a rotatably mounted spray tube 26 which receives water from the pump 20 by means of an internal conduit 28. The pump 20 may be rotated in either a clockwise or counterclockwise direction by

means of a reversible motor 30. When rotated in a clockwise direction, the washing fluid is forced from the sump 16 through the conduit 28 to the spray tube 26. On the other hand, a reverse rotation of the pump 20 will force the water to drain by means of a pump outlet 32 and a drain conduit 34. Within the sump 16, a heating element 36 is disposed which is positioned just below the normal water level in the sump 16. Such water or washing fluid may be admitted to the dishwashing chamber 14 by means of a solenoid operated water supply valve 38 connected to a hot water supply line 40. Support baskets 42 are disposed as shown on opposite sides of the spray tube 26 to receive the jet action of the spray tube and for supporting dishes in the stream of said spray. The foregoing structural description of the dishwasher 10 is believed to suffice for the purposes of this invention. For further details pertaining to the reversible impeller pump 20, reference may be had to my copending application, Serial No. 792,158, filed February 9, 1959. With this reversible pump arrangement drain valves are eliminated and the mere direction of pump impeller rotation sets up either a water recirculation from the sump 16 to the spray tube 26 or a pumping action to drain.

For sequentially controlling the dishwasher 10 and the components thereof in accordance with the concepts of this invention, a timing device or timer 46 is disposed within the door 24 of the dishwasher. The timing mechanism 46 is provided with a conventional indicator knob 48 which is imprinted with indicia defining the dishwashing cycle. The knob 48 will rotate to indicate the progress of the dishwashing cycle and is rotated by a timing motor 50 disposed within the timer 46. Similarly located within the dishwasher door 24 is a vibrating bimetal thermostat or pulser 52 which may be used to vary selected portions of the dishwashing cycle. The control 52 is provided with a cycle selector knob 54 which may be manipulated between a Light Soil setting and a Heavy Soil setting to select the desired duration of the dishwashing cycle as will be described more fully hereinafter.

As shown in FIGURE 2, a power supply L_1, L_2 is provided for energizing the components of the control circuitry. In order to prevent operation of the dishwasher 10 with the door 24 open, a door switch 60 is included. The components of the timing device 46 are enclosed within a phantom line in FIGURE 2 and indicate merely one particular cycle for the dishwasher 10. It should be understood that many modifications and additions could be made to the timing device 46 in accordance with a desired dishwashing cycle without departing from the teachings of this invention.

With the timer 46 a timing motor 50 is adapted to rotate a cam shaft 62 on which cams 64, 66, 68, 70, 72 and 74 are mounted. A shunt or bypass switch 76 is sequentially actuated by the cam 64 to close a bypass contact F. Similarly, a fill valve solenoid switch 78 is manipulated by the cam 66 to open and close the contact G for energizing the fill valve. The heating element 36 is energized from a heating element contact H which is opened and closed by a heater switch blade 80 actuated by the cam 68. Cam actuated switches 82 and 84 are merely reversing switches for the motor 30 and thus are moved simultaneously to effect either clockwise or counter clockwise rotation for the motor. Lastly, a cam actuated motor switch blade 86 is interposed between the power line L_1 and the motor 30 to energize the motor 30 for rotation in accordance with the positoning of reversing switches 82 and 84. The control knob 48 and shaft 62 are designed for longitudinal reciprocation so that the rotatable timing shaft 62 may be pushed inwardly to close a line switch 88—the line switch 88 being opened to terminate the cycle when the shaft 62 is cammed outwardly in accordance with conventional

practice at the completion of the dishwashing cycle. Thus the cycle is started when the operator pushes the knob 48 to close the line switch 88 and is terminated when the knob 48 is cammed outwardly to open the line switch 88.

The vibrating bimetal pulser or interrupter 52 includes a bimetal 90 fixed at one end and a heater 92 in heat transfer relationship to the bimetal. A leaf spring is affixed to the free end thereof for biasing the bimetal in accordance with the positioning of the cycle adjusting knob 54. When the bimetal 90 is closed on a contact 94, current flows to the timer motor 50 and to the heater element 92. As the heat is transmitted from the heater element 92 to the bimetal, the bimetal will flex and open the contact 94. By threadedly adjusting the knob 54, the bias on the leaf spring 93 is changed. When the bias is increased, the bimetal 90 will need more heat before it overcomes the increased bias; hence the contacts will be closed longer and the timer motor 50 operates for a longer period of time without interruption. Also the increased bias will return the bimetal 90 to the closed contact position. Note that the pulser 52, shown schematically in FIGURE 2, is a simplified method of accomplishing the interrupted timer motor concepts of this invention. Other more complicated interrupting devices may be used without departing from the teachings of this invention.

With reference to FIGURE 3, the dishwashing cycle of this invention has multiple periods or functions and includes a period of fill wherein the valve solenoid 38 is engized to admit a predetermined quantity of water to sump 16. Next, an extended wash period is involved wherein the motor is operated in a manner to circulate water from the sump to the spray tube 26. Following this wash period, the soiled water is drained from the sump 16 by reversing the motor 30. Next the dishwashing cycle includes a second fill period wherein the first rinse water is admitted to the sump. The pump 20 is then operated to circulate this first rinse water throughout the dishwashing chamber 14 to cleanse the dishes of the soiled, soapy water from the wash period. The particular cycle shown in the FIGURE 3 includes three rinse periods which start with a period of fill and which are followed by a period of draining the rinse water from the dishwasher. It should be recognized that the number of rinses required may be determined in accordance with the needs of a particullar dishwashing application. Lastly, the dishwashing cycle is concluded with a drying period wherein the heater 36 is energized to evaporate the water droplets remaining on the utensils. The cycle terminates as the line switch 88 is opened, the timer shaft 62 being cammed outwardly in the direction of control knob 48. Note that the heater 36 is energized intermittently throughout the entire cycle. Since the heater 36 is submerged in the sump water, it is effective to act as a booster heater to the water throughout the wash and rinse portions of the dishwashing cycle in addition to its drying function.

Then operation of the dishwasher 10 will be explained more particularly in connection with FIGURES 1, 2, and 3. FIGURE 3 includes the contacts A, B, C, D, E, F, G, H, and J which are selectively closed by their respective cam-actuated switches to energize selected components of the dishwasher throughout the dishwashing cycle. The shaded incremental areas of the cycle chart in FIGURE 3 indicate a closed contact position, while the unshaded incremental areas on the cycle chart indicate that the contact is open and disengaged from its associated cam actuated switch.

In operation, the door 24 of the dishwasher 10 is opened and the racks 42 slidably removed for receiving the dishes or utensils to be washed. After replacing the loaded baskets 42 within the dishwashing chamber 14, the door 24 is closed and latched. This door closing action will in turn close the door switch 60. The operator may then rotate the timer knob 48 to the particular start position of the control cycle in accordance with conventional practice. At the same time the operator will adjust the pulser or vibrating bimetal interrupter 52 with the knob 54 in accordance with the cycle desired. Normally the standard opening and closing rate of the bimetal determines the average or Normal Soil cycle time. However, if the vibration rate is changed to provide longer periods of energization for the timer motor 50, the total cycle time is decreased to accommodate a Light Soil cycle. Shorter periods of energization set up a longer Heavy Soil cycle. For instance, if the load to be washed consists primarily of lightly soiled glasses, the knob 54 may be rotated counter clockwise to the Light Soil position. In so doing the control knob shaft will threadedly move to increase the bias on the bimetal 90 through the leaf spring 93 to permit the timer motor 50 to be energized for a longer period before the heater 92 causes the bimetal 90 to warp open the contact 94. In other words, the bimetal 90 is flexed by the heat transmitted from the heater 92 and the adjusting means 54 determines the length of time that the bimetal 90 remains engaged with the contact 94. In this way, the timer motor 50 is energized and de-energized for variable periods in accordance with the soil setting of knob 54.

With the dishwasher 10 prepared for a dishwashing cycle, the operator may rotate the cam shaft 62 to close the contacts shown at the zero increment position in FIGURE 3 and then may push the knob 48 inwardly to close the line switch 88. Just prior to start all of the contacts A, B, C, D, E, F, G, H, and J are open as shown at the 60 increment mark on the cycle chart of FIGURE 3. One of the important concepts of this invention includes the manner of operation of pulser 52 during the fill period when the fill valve solenoid 38 is energized. Thus as the cycle is initiated by the closing of switch 88, the timer motor 50 will be energized by way of L_1, door switch 60, line switch 88, cam switch 76, line 104, timer motor 50 to L_2. With the first manual incremental advance of the timer shaft 62, contacts A, B, D, F, G, and J will be closed. As soon as the timer motor 50 is energized, however, the timer shaft 62 will be intermittently or incrementally rotated to selectively open and close the cam actuated switches in accordance with the designed cycle. The initial function of the timer will be to energize the fill valve solenoid 38 from L_1, switches 60 and 88, line 100, timer switch blade 78, contact G, the fill valve solenoid 38 to L_2. At the same time the motor 30 is energized from L_1, line 85, cam actuated timer switch 86 and contact A to the reversing contacts B and D. This, of course, sets up a flow of current through the start winding 106, the start winding cut-out switch 107 and run winding 108 to operate the motor 30 for one increment to pump fluid from the sump 16. This initial pump-out is to rid the sump of the relatively cool water which stands in the house plumbing supply line 40. After one increment, the reversing contacts C and E are closed to reverse the motor 30 in a manner which will permit circulation of water from the sump 16 to the spray tube 26. Note, however, that during each water fill period a bypass or shunt circuit including the timer switch 76 and the shunt contact F is closed. This is to prevent the pulser 52 from varying the amount of water placed within the sump 16. In other words, regardless of the shortened or lengthened cycle desired by the positioning of the knob 54, it is desired to have the same quantity of water fill within the dishwasher sump 16. Thus, it is necessary to bypass the pulser 52 during all periods of water fill. This occurs approximately during the first and second timer increment, the 21st increment, the 27th and 28th timer increment, and the 35th and 36th timer increment.

At the conclusion of the second interval, the fill period is terminated and the motor 30 energized through contacts C and E to cause the water to circulate to the spray tube 26. This sets up a washing period from approximately the 3rd to the 17th timer increment. During this time, detergent and water is circulated and sprayed over the

dishes to be washed. At the conclusion of the wash period, the motor 30 is reversed and the soiled water pumped from the sump 16 by way of drain conduit 34. A one increment fill period follows the first pump out or drain and the motor 30 is again energized with the reversing switches closed upon contacts C and E to recirculate the first rinse water throughout the dishwashing chamber 14. A second drain follows the first rinse and a second fill period follows the second drain. It may be noted that three rinse periods are used in this dishwashing cycle during the 23rd and 24th timer increment, the 30th and 31st timer increment, and the 37th, 38th and 39th timer increment. All of the rinse periods are preceded by a fill period and are followed by a drain period.

The last rinse period ends at the end of the 39th timer increment and a pause follows in which the motor 30 is reversed to pump out all water remaining in the sump 16. This pump-out will terminate at the end of the 45th timer increment and the drying cycle will continue from this point to the end of the 59th timer increment.

Note that the heater 36 is energized periodically by the closed heater contact H throughout the wash portion of the cycle, the rinse portions of the cycle and the drying portion of the cycle. This permits the heater 36 to act substantially as a booster for the water within the sump to prevent the circulating fluid from cooling off during the dishwashing cycle.

Throughout the aforementioned complete dishwashing cycle, with the exception of those periods of fill, the timer motor 50 is energized through the pulser or circuit interrupter 52. As current flows to the motor 50, it flows also to the bimetal heater 92 causing the bimetal 90 to flex and open the contact 94, thereby to deenergize the timer motor. After a cool-off period, the bimetal 90 will again close on the contact 94 to reenergize the motor 50. It should therefore be seen that the total length of the dishwashing cycle will depend on the percent overall time which the contact 94 is closed. The greater the bias that the adjusting shaft of control knob 54 imparts to the bimetal 90 through the leaf spring 93, the shorter the total duration of the dishwashing cycle.

It should now be seen that an improved dishwashing cycle has been provided with adjustable timer motor circuit interrupting means for adjusting the duration of selected portions of a complete dishwashing cycle.

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 with a power supply, an electrical multiple function cycle timing device for an electrical circuit comprising, a power supply line switch in said circuit manually actuatable for energizing said circuit to initiate said cycle, first and second cycle function switch means, means for actuating said power supply line switch for de-energizing said circuit to terminate said cycle and for actuating said first and second cycle function switch means for controlling respectively first and second cycle functions, and adjustable power supply interrupting means connected directly to said power supply line switch in independent continuously repeated power supply interrupting relationship to said actuating means for varying the periods of power supply interruption to control the duration of each of said first and second cycle functions.

2. In combination with a power supply, a multiple function cycle timing device for an electrical circuit comprising, a power supply line switch in said circuit manually actuatable for initiating said cycle and energizing said circuit for the duration of said cycle, first and second cycle function switch means, means for actuating said line switch to de-energize said circuit for terminating said cycle and for actuating said first and second cycle function switch means for controlling respectively first and second cycle functions, and power supply interrupting means connected directly to said line switch in independent continuously repeated power supply interrupting relationship to said actuating means for altering the duration of each of said first and second cycle functions.

3. In combination, an electrical multiple function cycle timing arrangement for an appliance circuit having a manually closable power supply switch for initiating said cycle and continuously energizing said circuit and comprising, prime mover means for actuating said switch to de-energize said appliance circuit for terminating said cycle, a power supply for said prime mover means connected to said power supply switch, and power supply pulsing means connected directly and solely to said power supply switch for changing the duration of each of the functions throughout said multiple function cycle by continuously repeatedly pulsing the power supply to said prime mover means during each of said functions.

4. In combination with a power supply, an electrical timing device comprising a constant speed motor for sequentially operating a plurality of electrical contacts to selectively control the multiple functions of a complete cycle, bimetal means connected directly to said power supply and interposed solely between said motor and said power supply for repeatedly pulsatingly energizing and deenergizing a fixed contact for said motor continuously throughout all of said multiple functions of said complete cycle, said bimetal means being adjustably biased against said fixed contact to alter the periods of energization and deenergization of said fixed contact for said motor to vary the duration of said complete cycle, and by-pass means including one of said electrical contacts interposed between said motor and said power supply in parallel circuit relationship with said bimetal means, said one of said electrical contacts sequentially operated by said motor to by-pass said bimetal means simultaneously and coextensively with the operation of another of said electrical contacts by said motor to control one of said multiple functions, thereby to energize said motor continuously during said ne of said multiple functions irrespective of the repeated pulsations of said bimetal means.

5. In combination with a power supply, an electrical timing device comprising a timer motor for sequentially energizing and deenergizing a plurality of electrical contacts to selectively control the multiple functions of a complete cycle, bimetal means connected directly to said power supply and interposed solely between said motor and said power supply for repeatedly pulsatingly energizing and deenergizing a fixed contact for said motor continuously throughout all of said multiple functions of said complete cycle, and by-pass means including one of said electrical contacts interposed between said motor and said power supply in parallel circuit relationship with said bimetal means, said one of said electrical contacts sequentially energized by said motor to by-pass said bimetal means substantially simultaneously and coextensively with the energization of another of said electrical contacts by said motor to control one of said multiple functions, thereby to energize said motor continuously during said one of said multiple functions irrespective of the repeated pulsations of said bimetal means.

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