March 16, 1965 H. H. DRONBERGER 3,173,432

WASHING MACHINE

Filed Dec. 14, 1961

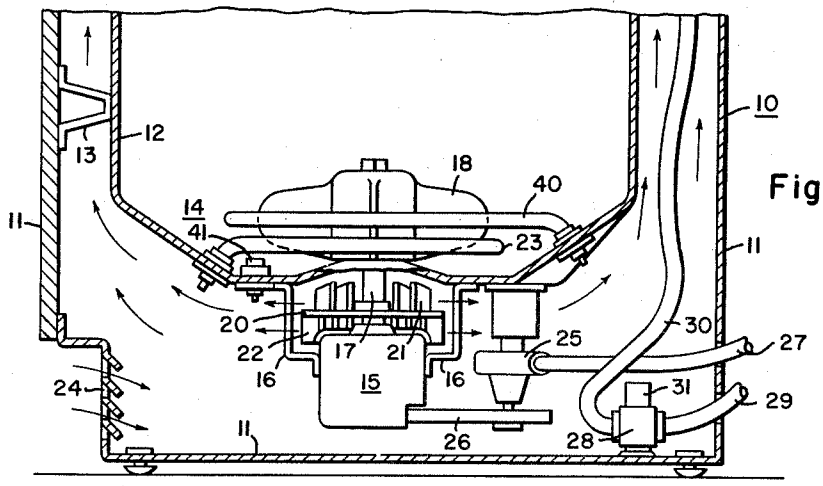


Fig. 1

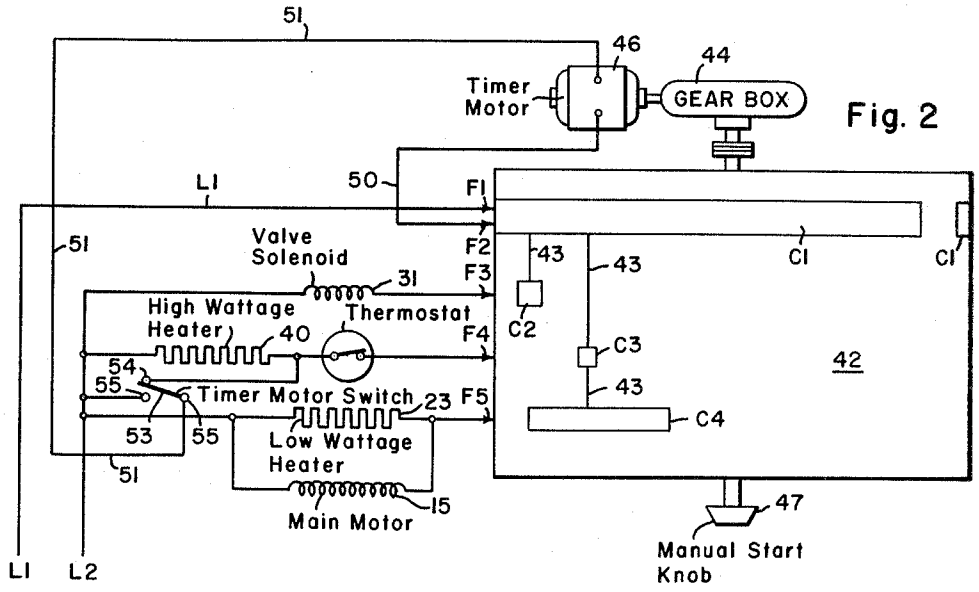


Fig. 2

INVENTOR
Hal H. Dronberger
BY
Ralph T. French
ATTORNEY

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WASHING MACHINE

Hal H. Dronberger, Columbus, Ohio, assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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This invention relates to washing machines, and relates more particularly to domestic dishwashers.

Domestic dishwashers usually employ timers for controlling their wash and rinse cycles, and usually include relatively low wattage, electric heaters that are turned on when their main motors are turned on. Such a dishwasher is disclosed in the United States Patent No. 2,254,269 of Earl K. Clark et al., which issued on September 2, 1941. Such dishwashers are designed for use with pressurized hot water systems, and the lack of such systems or the lack of sufficient capacity in such systems in some areas has limited the use of such dishwashers in such areas.

This invention adds a relatively high wattage, electric heater to such a dishwasher for enabling it to be used with readily available, pressurized cold water systems. A thermostat exposed to heat from the usual low wattage heater performs two functions: if there is no water in the water chamber of the dishwasher, the thermostat prevents energization of the high wattage heater when the timer acts to turn it on, but if there is sufficient water in the water chamber, the thermostat causes the water to be quickly heated by energizing the high wattage heater and stopping the timer motor. When the water has been heated by the two heaters to the desired temperature, the thermostat turns the high wattage heater off and turns the timer motor back on, following which the timer continues to control the usual cycling. A switch is provided for preventing the timer motor from being turned off by the thermostat when the dishwasher is used with a pressurized hot water system.

An object of this invention is to provide a washing machine that can be used where pressurized hot water systems are not available.

Another object of this invention is to provide a washing machine that can be used with pressurized hot water systems and with pressurized cold water systems.

This invention will now be described with reference to the annexed drawings, of which:

FIG. 1 is a fragmentary side view, partially in section, showing the lower portion of a domestic dishwasher embodying this invention, and

FIG. 2 is a diagrammatic view of the timer and the controls used to operate the electrical components shown by FIG. 1, in the wash cycle only of the dishwasher.

Referring now to the drawings, on FIG. 1 there is shown the lower portion of a dishwasher **10** having an outer casing **11** and a smaller, generally concentric, inner casing **12**, the lower portion of which forms a water chamber **14**. An electric motor **15** is attached by struts **16** to the lower side of the chamber **14**, and has a shaft **17** which extends through the bottom of the chamber **14**, and which has attached thereto, within the chamber **14**, an impeller **18**. The shaft **17** has attached thereto between the motor **15** and the bottom of the chamber **14**, a fan rotor consisting of a center plate **20**, fan blades **21** above and

attached to the plate **20**, and fan blades **22** below and attached to the plate **20**. An electric heater **23** formed in an arc of a circle, extends centrally around the lower portion of the impeller **18** within the chamber **14**. The outer casing **11** has an air inlet opening **24** in its lower portion opposite the motor **15**.

A water pump **25** is attached to the bottom of the chamber **14** adjacent to the motor **15**, and is driven through a belt **26** by the motor. The pump **25** has an inlet extending through the bottom of the chamber **14**, and has an outlet connected to a hose **27**. A water valve **28** is connected by a hose **29** to a source of pressurized cold water which is not shown, and by a hose **30** to the upper portion which is not shown, of the dishwasher. An electric solenoid **31** opens and closes the valve **28**.

The construction described so far except for the connection of the hose **29** to a source of pressurized cold water, is conventional, and is described in more detail in the copending application of Olan L. Long, Serial No. 103,778, filed April 18, 1961, now Patent No. 3,103,227 and assigned to the assignee of the present application. As disclosed in said application, the electric heater **23** is provided for adding heat to the water supplied to the water chamber **14**, the impeller **18** is rotated by the motor **15** to agitate the water in the chamber **14** during the wash and rinse cycles, the shaft **17** has an opening for supplying air from the drained chamber **14** during the drying cycle, to the upper fan blades **21**, and the lower fan blades **22** draw air through the opening **24** and pass it over the motor **15** for cooling the latter. The air streams from the upper and lower blades mix and flow upwardly between the inner and outer casings as shown by the arrows on FIG. 1.

This invention adds a high wattage, electric heater **40** concentric with and above the heater **23** within the water chamber **14**, a thermostat **41** within the chamber **14** adjacent to the heater **23**, and the controls which will now be described with reference to FIG. 2 of the drawings.

A timer cam cylinder **42** shown in developed form, has cam surfaces C1, C2, C3 and C4 of metal having good electrical conductivity, and which are electrically connected together by wires **43**. The cylinder **42** is driven through the usual slippable clutch **45** and a speed reducing gear box **44** by a synchronous timer motor **46**. A manually operated, start knob **47** is connected to the shaft of the cylinder **42** for initially rotating the cylinder **42** in the counter-clockwise direction as viewed in FIG. 2 for starting the dishwasher. When the knob **47** is so rotated, it rotates the cylinder **42** sufficiently for the leading edge of the cam surface C1 to touch its aligned brush F1 which is connected to supply line L1, and to touch its aligned brush F2 which is connected by wire **50** to one side of the timer motor **46**. The other side of the motor **46** is connected by wire **51** to single-pole, double-throw switch 53 which normally is on contact 54 which is connected through the high wattage heater **40** to supply line L2. The impedance of the timer motor **46** is relatively large, and the resistance of the heater **40** is relatively low so that while the two are connected in series to supply lines L1 and L2 at this time, the motor **46** is started while insufficient current flows through the heater **40** to cause it to heat.

The valve solenoid **31** is connected directly to the supply line L2 and to brush F3 aligned with the cam surface

C2. When the cam cylinder 42 has been rotated by the timer motor sufficiently for the cam surface C2 to touch the brush F3, the solenoid is connected through the brush F3, the cam C2, a wire 43, the cam C1 and the brush F1 to the other supply line L1.

The side of the high wattage heater 40 which is connected to the switch contact 54 is also connected in series with the thermostat 41 to brush F4 aligned with the cam surface C3. When the cam cylinder 42 has been rotated sufficiently for the cam surface C3 to touch the brush F4, the heater 40 and the thermostat 41 are connected in series to lines L1 and L2, one end of the heater 40 being directly connected to the supply line L2, and the thermostat 41 being connected to the supply line L1 through the brush F4, the cam C3, a wire 43, the cam C1 and the brush F1.

The low wattage heater 23 and the main motor 15 which it is shunted across, are directly connected to L2 and to brush F5 which is aligned with the cam surface C4. When the cam cylinder 42 has been rotated sufficiently for the cam surface C4 to touch the brush F5, the motor 15 and the heater 23 are connected to the supply lines L1 and L2, they being directly connected to the line L2, and being connected through the brush F5, the cam surface C4, a wire 43, the cam surface C3, a wire 43, the cam surface C1 and the brush F1 to the supply line L1.

The timer motor switch 53 has another contact 55 which is connected to the supply line L2. When the switch 53 is on this contact 55, the timer motor 46 is connected through the switch 53 and the contact 55 to the supply line L2, instead of being connected through the heater 40 to the supply line L2 as it is when the switch 53 is on the contact 54.

In operation, the knob 47 is manually rotated in the counter-clockwise direction to place the leading edge of the cam surface C1 in contact with the brushes F1 and F2. This applies power to the timer motor 46 and starts it. The motor 46 continues the rotation of the cam cylinder, and shortly after the timer motor is started, the cam surface C2 is moved against the brush F3, energizing the valve solenoid 31, opening the valve 28 which supplies cold water into the water chamber 14. Before the chamber 14 is filled with water, the cam surface C4 is moved against the brush F5, energizing the low wattage heater 23 and the main motor 15, starting the wash cycle. Shortly thereafter, the cam surface C2 runs off the brush F3, deenergizing the valve solenoid 31, and closing the water supply valve 28. Next, the cam surface C3 is moved against the brush F4, connecting the series-connected thermostat 41 and the high wattage heater 40 to the supply line L1. Since the contacts of the thermostat are closed at this time, the high wattage heater is energized. The brush F4 on touching the cam surface C3 connects the thermostat 41 across the timer motor 46, shorting it out and stopping it and the timer cylinder 42. The brush F4 is connected to one side of the thermostat, and is connected through the cam surfaces C3 and C1 and the brush F2 to one side of the timer motor 46, thus connecting the said one side of the thermostat to said one side of the timer motor. The other side of the thermostat is connected through the switch 53, its contact 54 and the wire 51 to the other side of the motor 46. The dishwasher continues to wash and the high wattage heater 40 continues to heat the water in the water chamber 14 until the thermostat 41 is satisfied and opens its contacts. When this happens, the heater 40 is deenergized and the short across the timer motor is removed so that it again starts the timer cylinder 42 rotating. The wash cycle continues until the cam surface C4 runs off the brush F5.

The cam cylinder would be provided with other cam surfaces, and the timer provided with other brushes where needed to operate the dishwasher in the usual rinse and drying cycles. The water used for rinsing would be heated by the high wattage heater 40 as described in the foregoing.

Since the low wattage heater 23 s energized before the cam surface C3 touches the brush F4 for energizing the high wattage heater 40, if there is no water in the water chamber 14, radiant heat from the heater 23 would cause the thermostat to open its contacts, preventing the high wattage heater from being energized, and preventing the dishwasher from being damaged by heat from the heater 40. When there is water in the chamber 14, heat from the heater 23 cannot cause the thermostat contacts to open.

Since one having a dishwater with the high wattage heater might move to an area where a pressurized hot water system is available, the switch 53 and its contact 55 are provided for connecting the timer motor 46 to the supply line L2 so that it is not shorted out when the cam surface C3 touches the brush F4. The high wattage heater 40 would be turned on when the cam surface C3 touches the brush F4, but only for a short time since the cam surface C3 is so short that it is in contact with the brush F4 for only a short time.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. A washing machine having a water chamber, a first electric heater in said chamber, electric supply connections, a timer having a timer motor, means for connecting said motor to said connections, a first circuit closed by said timer for connecting said heater to said connections, a second electric heater in said chamber, a thermostat in said chamber, a second circuit closed by said timer for connecting said thermostat and said second heater in series to said connections, and means including said thermostat for interrupting operation of said timer motor when the contacts of said thermostat are closed.

2. A washing machine having a water chamber, a first electric heater in said chamber, electric supply connections, a timer having a timer motor, a two position switch, means including said switch in one of its positions for connecting said motor to said connections, a first circuit closed by said timer for connecting said heater to said connections, a second electric heater in said chamber, a thermostat in said chamber, a second circuit closed by said timer for connecting said thermostat and said second heater in series to said connections, and means including said thermostat and said switch in its other position for shorting out said motor when the contacts of said thermostat are closed.

3. A washing machine having a water chamber, a relatively low wattage, electric heater in said chamber, electric supply connections, a timer having a timer motor, means for connecting said motor to said connections, a first circuit closed by said timer for connecting said heater to said connections, a relatively high wattage, electric heater in said chamber, a thermostat in said chamber, a second circuit closed by said timer for connecting said thermostat and said high wattage heater in series to said connections, and a third circuit closed by said thermostat when its contacts are closed for connecting said thermostat across said motor.

4. A washing machine having a water chamber, a relatively low wattage, electric heater in said chamber, electric supply connections, a timer having a timer motor, a two position switch, means including said switch in one of its positions for connecting said motor to said connections, a first circuit closed by said timer for connecting said heater to said connections, a relatively high wattage, electric heater in said chamber, a thermostat in said chamber, a second circuit closed by said timer for

connecting said thermostat and said high wattage heater in series to said connections, and a third circuit including said switch in its other position and said thermostat, when its contacts are closed for connecting said thermostat across said motor.

5. A washing machine having a water chamber, electric supply connections, a timer having a timer motor, a two position switch, means including said switch in one of its two positions for connecting said motor to said connections, an electric heater in said chamber, a thermostat in said chamber, a circuit closed by said timer for connecting said thermostat and said heater in series to said connections, and means including said thermostat and said switch in its other position for rendering said motor inoperative when the contacts of said thermostat are closed.

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RICHARD M. WOOD, *Primary Examiner.*