Oct. 5, 1971 N. L. PELLERIN 3,610,001

WASHING MACHINE WITH SLOW COOLDOWN FEATURE

Filed May 5, 1969 2 Sheets-Sheet 1

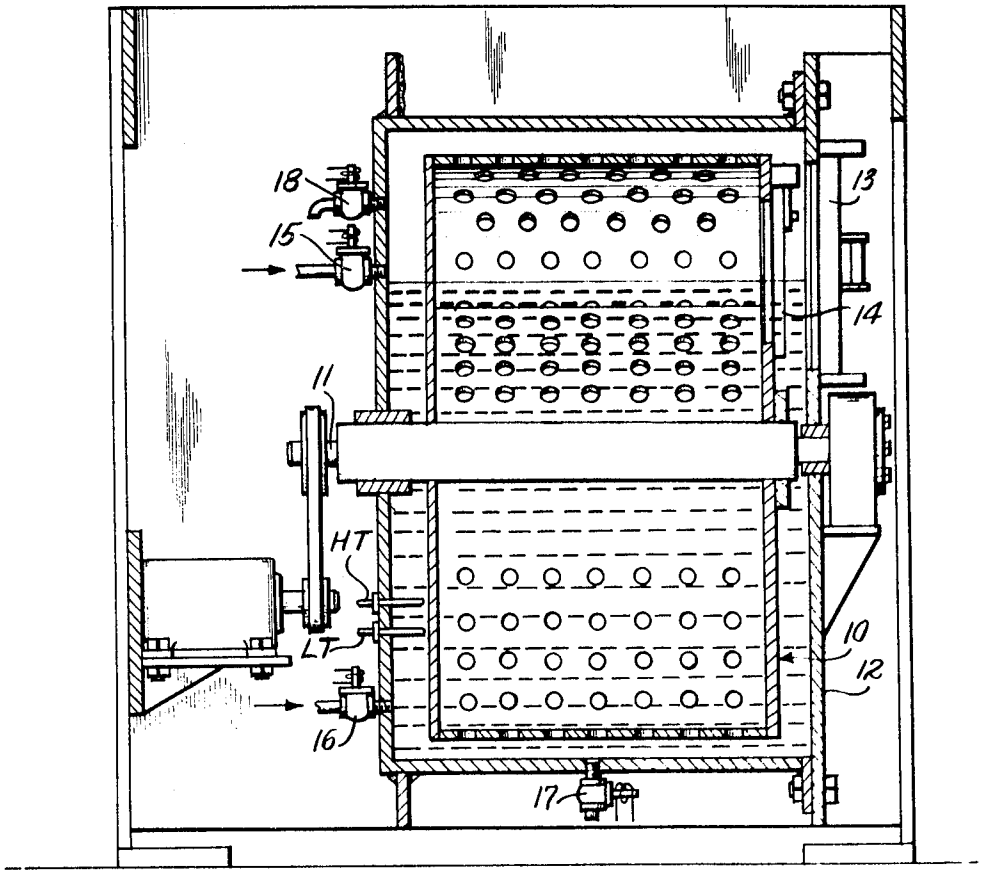

Fig. 1.

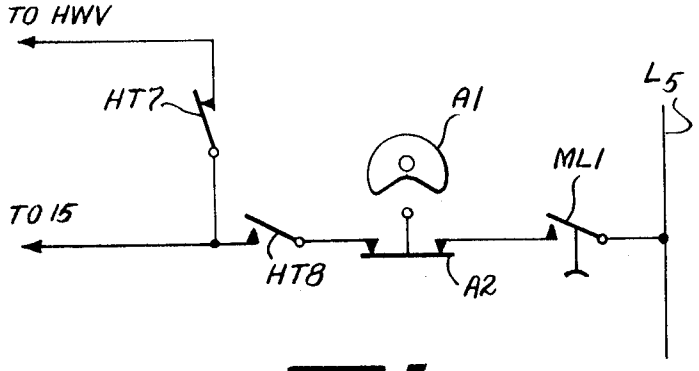

Fig. 3.

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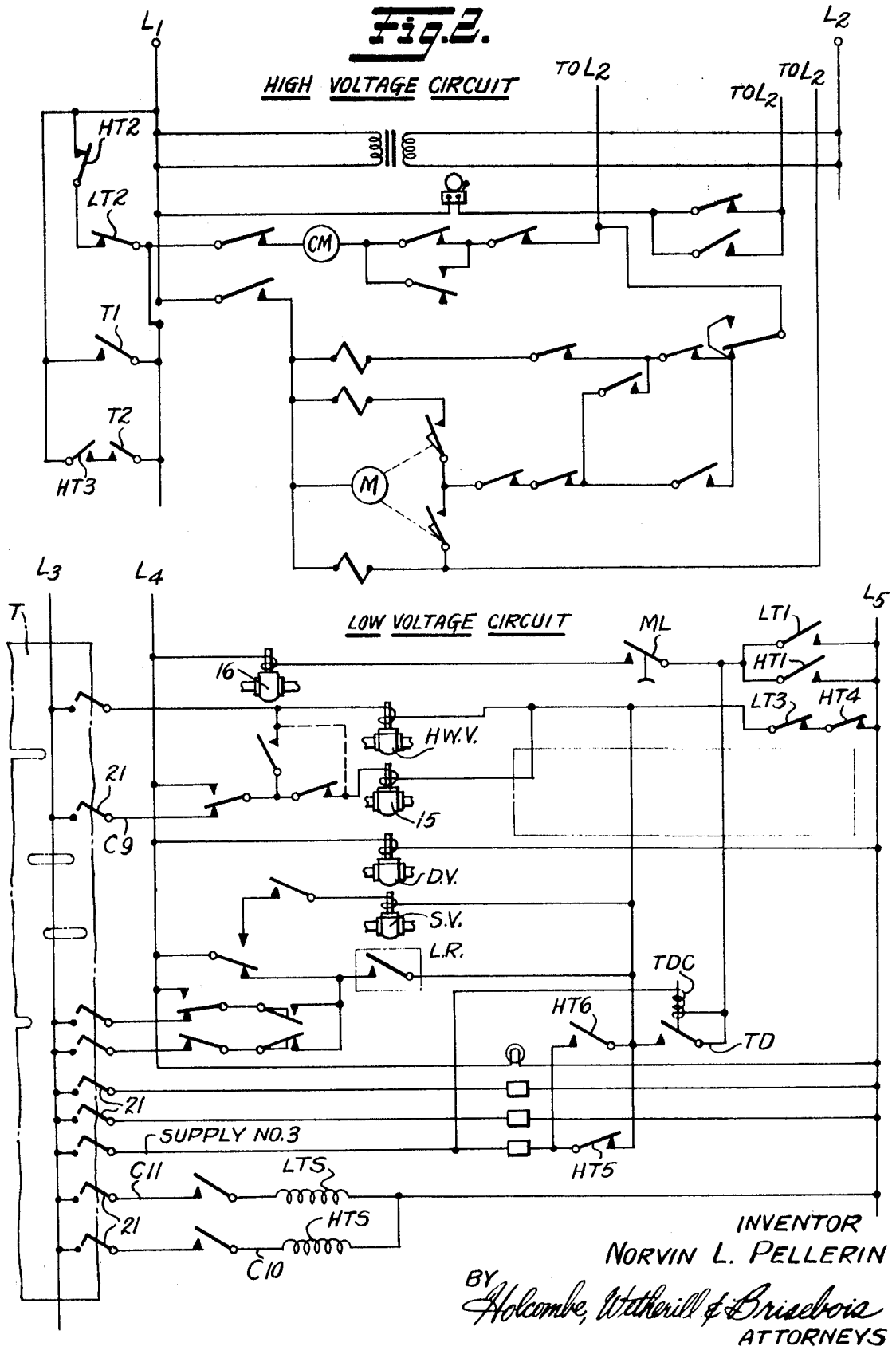
Fig. 2.



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WASHING MACHINE WITH SLOW COOLDOWN FEATURE

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ABSTRACT OF THE DISCLOSURE

The contents of a washing machine which are normally drained after a cycle using a hot liquid are instead cooled gradually by adding cold water from the bottom while the resulting mixture is withdrawn from the top.

SUMMARY OF THE INVENTION

This invention relates to an improvement in washing machines or combined washing and cleaning machines which renders them particularly suitable for use in connection with fabrics containing polyester fibers.

Such fabrics have "permanent press" properties, which enable them to retain, through repeated washings or cleanings, a shape or crease which has been initially imparted thereto at high temperatures. Yet in order to wash or clean these fabrics some heat must ordinarily be employed, and it has been found that if they are heated up to say 190° or 200° F., and then suddenly cooled, the quality of the permanent press which has been imparted thereto is impaired. On the other hand, if the fabric is cooled gradually, the permanent press is retained.

It is accordingly the object of this invention to provide a machine in which laundry which has been washed in a hot liquid may be cooled rapidly, if it contains no polyesters, but gradually if it does.

Several embodiments of my invention will now be described, with reference to the accompanying drawings, in which:

FIG. 1 is an axial sectional view of an automatic washing machine, taken through the rotating basket which holds the clothes and the stationary casing therefor;

FIG. 2 is a circuit diagram showing the electrical control circuit for a first embodiment of the machine, insofar as it differs from the circuits of conventional machines; and

FIG. 3 is a circuit diagram for a second embodiment of my machine.

While a washing machine has been chosen as the embodiment to be described, it will be appreciated that a combined washing and dry cleaning machine could utilize the basic principle of the invention.

Turning now to FIG. 1, it will be seen that my machine comprises a perforate "basket" **10**, which will ordinarily be divided longitudinally into a plurality of compartments and is mounted to rotate about a horizontal shaft **11** within a stationary housing **12**. Access to the "basket" is provided through at least one door **13** in at least one end of the housing and a corresponding door **14** in said basket for each compartment in that basket.

A valve-controlled main water inlet **15** is provided in the wall of the housing and a vernier valve-controlled water inlet **16** for use during slow cooling, is provided near the bottom thereof. A valved outlet **17** is also provided near the bottom of the housing, and a constantly open overflow outlet **18** is provided near the top of the housing.

Two thermostats, HT and LT are responsive to the temperature of the water in the basket.

The electrical control system for an automatic washing machine, and particularly for a commercial washer-extractor, may be quite complex, and many suitable circuits for this purpose are in use. My invention is, however, directed solely to modifications in that portion of said circuits which controls the flow of water during rinsing, and consequently only that portion of a complete circuit is shown in detail in FIG. 2.

A representative machine of this type contains high and low voltage control circuits.

The high voltage circuit powers the motors, and drives a timer, which may comprise a tape T passing between a series of fingers **21**, and when a conductive aperture in the tape appears beneath a specific finger an electrical circuit between that finger and the conductive circuit is completed. Completion of a circuit through each finger initiates a specific step in the operation of the machine. The tape travels horizontally of the figure. These specific circuits are the "low voltage" circuits shown on the drawing. It will be appreciated that the particular functions of these circuits are to some extent a matter of choice, and since the functions of most of them form no part of this invention, they will not be described in detail. It will also be appreciated that the order in which these individual low voltage circuits appear in the drawing does not necessarily represent the order in which they are energized. This order is determined entirely by the position of the apertures in the control tape which passes between the conductive surface and the fingers.

Let it be assumed that the timer or program tape has energized all the circuits necessary to bring the clothes through the washing cycle, and rinsing and cooling is to commence. At this point in a normal cycle for clothing containing no polyester fibre, the control tape would ordinarily close circuit C9, to introduce cold water into the basket.

According to my invention, however, at this point the program tape instead closes circuit C10, by permitting the finger **21** in that circuit to contact the conductive surface therebeneath, which energizes the solenoid HTS of a high temperature relay. Energization of this solenoid:

(1) Closes normally open contacts HT1 thus completing a circuit which opens a vernier valve **16**, through which a carefully regulated flow of cold water is introduced into the "basket."

(2) Opens normally closed contacts HT2 in the high voltage circuit, thus interrupting the supply to the chart motor CM, which drives the tape.

(3) Closes normally open contacts HT3 in an alternative supply path for the motor CM, which leads through contacts T2 controlled by the high temperature thermostat **19**.

(4) Opens normally closed contacts HT4, thus breaking circuit C9 and preventing the supply of water through the main cold water valve **15**.

(5) Opens normally closed contacts HT5 and closes normally open contacts HT6, for a reason which will be hereinafter explained.

Cold water will then flow in through the adjustable vernier valve **16** until the temperature of the water falls to the level for which the thermostat HT is set. This thermostat will then close contacts T2, starting up chart motor CM, and the program tape will then advance.

In this preferred embodiment of applicant's invention the next low voltage circuit to be closed is "Supply No. 3." Closing of this circuit automatically introduces some type of supplies into the "basket," ordinarily, in this case, a bleach. It will be seen that because contacts HT5 have been opened, and contacts HT6 closed, as described above, the "Supply No. 3" circuit passes through the contacts of a timer, the control for which (TDC) is set for

two minutes, or some shorter period. At the end of this period the contacts TD are opened and no further supplies are introduced. The reason for this precaution is that the supplies are usually flushed in with hot water, and the introduction of too much such water might cause the temperature to rise above the valve for which the high temperature thermostat HT is set.

Further movement of the tape next closes circuit C11, thus energizing the solenoid LTS of the low temperature relay, and thereby:

(1) Closes contacts LT1, again introducing water into the basket through the relatively low volume of flow vernier valve **16**.

(2) Opens normally closed contacts LT2 in the high voltage circuit supplying the chart motor CM, thus stopping the tape.

(3) Opens normally closed contacts LT3, thus preventing the introduction of water into the basket through the normal inlet valve **15**.

The tape advances no further, and consequently no further steps in the cycle are initiated until the temperature of the water falls to that for which the low temperature thermostat LT is set. This closes contacts T1, the chart motor starts up, and the balance of whatever cycle the machine is set to perform is completed.

It will be noted that a switch ML is shown in series between the vernier valve **16** and contacts LT1 and HT1, which are in parallel. This switch is responsive to a rise in the water level in the basket beyond a predetermined acceptable maximum. If this should occur, the switch ML opens and no additional water can be introduced through the vernier valve **16**.

It will be appreciated that when it is not considered necessary to introduce supplies at a midway point during the slow cooling, all circuits specific to the relay LTS, the thermostat LT, and the contacts controlled thereby can be eliminated, and the thermostat HT and relay HTS simply set to operate at the lower end of the slow cooling range.

It will also be appreciated that instead of providing a main cold water valve **15** through which water can be introduced rapidly, and a separate and smaller vernier valve **16** for slower flow, a timer can be introduced into the circuit controlling the main cold water valve, and the thermostatically controlled relay or relays can be connected to actuate this timer to periodically interrupt the flow through the main valve, thus diminishing the volume of flow therethrough to whatever extent may be required.

This embodiment is illustrated in FIG. 3, which shows only the circuitry which must be substituted for the circuitry within the box shown in broken lines in FIG. 2 in order to accomplish this purpose. (The valve **16** and contacts LT1, HT1 are, of course, eliminated.)

In this embodiment the solenoid HTS, when energized, opens normally closed contacts HT7, and closes normally open contacts HT8. Contact through the finger **21** energizing HTS also starts a timer A1 which intermittently opens and closes contacts A2 controlling the circuit to the cold water valve **15**. The switch ML1 in FIG. 3 is a pressure-responsive switch which breaks the circuit to the supply valve whenever a maximum water level is exceeded.

In yet another embodiment, the valve **16** controls a water outlet instead of a water inlet.

What is claimed is:

1. In a machine for removing soil from fabric articles by applying a heated liquid thereto, said machine being of the type comprising a rotating basket within which said articles are enclosed, and a control system for automatically rotating said basket, introducing water at different temperatures into said basket, and for draining water from the bottom of said basket, said control system including a timer means adapted to initiate a draining step after a first operation in which said basket contains heated water, the improvement which comprises

(a) means in said control system for automatically stopping the advance of said timer after completion of said first operation to the point at which said timer is about to initiate said draining step,

(b) means for slowly decreasing the temperature of the water in said basket, beginning when said timer is stopped,

(c) means for automatically introducing a supply of treating material into said water when the temperature thereof has fallen to a first predetermined temperature below that which prevailed when the timer was stopped, and

(d) means for causing said timer to resume its advance after said water temperature has reached a second predetermined temperature below that at which said treating material was introduced.

2. A machine as claimed in claim **1** in which said means for automatically introducing a supply of material comprises means to deactivate said temperature decreasing means and cause said timer to temporarily resume its advance when the temperature of said water has decreased to a selected value higher than said predetermined value, means actuated by said timer after the resumption of its advance for physically introducing said supply of treating material into said water, means for again stopping the advance of said timer and actuating said means for decreasing the temperature of said water, and means for causing said timer to again resume its advance and de-activating said temperature decreasing means after said water has reached said predetermined temperatures.

3. A machine as claimed in claim **1** in which said means for reducing the temperature of said water comprises means for introducing cold water into the bottom of said basket while said bottom draining means is closed, and an overflow outlet which permits water to flow out of said machine when the level in said basket exceeds a predetermined maximum.

4. A machine as claimed in claim **3** in which the means for introducing cold water while said bottom draining means is closed is a cold water inlet other than the main cold water inlet used at other times during the cycle of the machine and is adapted to deliver a smaller flow of water.

5. A machine as claimed in claim **3** in which there is a single cold water inlet to said machine, and comprising means for cyclically interrupting the flow through said inlet while said timer is stopped and said draining means is closed.

6. A machine as claimed in claim **1** in which said means for decreasing the temperature of said water comprises valve means controlling the flow of water leaving said machine.

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