ELECTRIC MOTOR OPERATED TIMER CONTROL SYSTEM

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His Attorney.
In control systems wherein an electric timer motor is used to effect actuation of switches for controlling a series of sequential operations and wherein the circuits for the timer motor are controlled by certain of such switches, difficulty may be experienced, especially where slow make and break switches are used, should a switch controlling a circuit for the timer motor dwell in open position and thus stop the timer motor, for should this occur, the mechanism being operated will continue to operate on the particular phase of the cycle through which it was passing at the time the switch opened. Such a situation may arise, for example, in connection with the operation of automatic clothes washing machines wherein there are successive filling, washing, and extracting operations, and it is in connection with a system for automatic clothes washing machines that I have elected to illustrate and describe my invention. It is to be understood, however, that this is only by way of example and that my invention may be used wherever found applicable.

The object of my invention is to provide an improved system for overcoming the above-referred to difficulties and for a consideration of what I believe to be novel and my invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing Fig. 1 is a diagrammatic view of a part of an automatic washing machine control system embodying my invention; and Fig. 2 is a similar view of another such system. Only so much of the control systems are shown as is needed for an understanding of my invention.

Referring to Fig. 1 of the drawing, I indicates an electric driving motor which in the case of an automatic washing machine may be utilized at one time for actuating the washing means and at another time for actuating the means for extracting water from the clothes. In a known type of automatic washing machine, motor 1 may operate an agitator positioned in a spin basket for effecting a washing operation, and upon completion of the washing operation rotate the basket to centrifugally extract water from the clothes. Two electric circuits are provided for the motor 1, one circuit for the washing operation and the other for the extracting operation. The circuit for the washing operation is from line A through conductor 15, contacts 3 of a two-position switch 16, and conductor 5, to line B. The circuit for the extracting operation is through conductor 2, contacts 7 of the two-position switch 4, conductor 5, contacts of a switch 8, and conductor 10, to line B. The sets of contacts 3 and 7 are shown as being bridged by a switch blade 11 actuated by a rod 12, with which is connected an overflow cup 13 provided with a leakage opening 12a. When overflow cup 13 is full of water, contacts 3 are bridged as shown in the drawing to close the washing circuit for motor 1. When cup 13 is empty, contacts 7 are bridged to close the circuit on motor 1 for the extracting operation. 14 indicates a spout through which water is supplied to cup 13. The particular control system illustrated is one for use in an automatic clothes washing machine wherein during the washing operation, a pump circulates water continuously from the bottom of the tub of the washing machine to the spin basket, from which it overflows back to the tub. With this arrangement, the washing operation is controlled by overflow of water from the spin basket. In the present drawing, the arrangement is indicated only diagrammatically, as the specific arrangement forms no part of my present invention. A washing machine construction of this type and one in connection with which my control system may be used is shown in the patent to Bariff 2,432,271, December 9, 1947. Liquid overflow control means for washing machines, which patent is assigned to the same assignee as the instant application.

Operation of mechanism to effect the extraction operation is controlled by a solenoid valve 15, the winding of which is in a circuit from line A through conductor 16, conductor 5, contacts of switch 9, and conductor 10, to line B. To change from a washing operation to an extracting operation, switch 9 is closed by its switch blade 17 to effect operation of solenoid valve 15, and switch 4 is actuated to move its switch blade 11 from engagement with contacts 3 to engagement with contacts 7. The mechanism control by valve 15 is not illustrated, as the specific arrangement forms no part of the present invention. It may be a mechanism such as that disclosed in the application of Thomas T. Woodson, Serial No. 639,817, filed January 8, 1946, and assigned to the same assignee as the instant application.

For an understanding of this invention, it is sufficient to have in mind that when switch blade 11 of two-position switch 4 engages contacts 3 and switch 9 is open, motor 1 and mechanism driven by it are actuated to perform one type of operation, for example, a washing operation, and that when switch blade 11 engages contacts 7 and switch 9 is closed, motor 1 and mechanism
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driven by it are actuated to perform another type of operation, for example, an extracting operation, which
indicates an electric timer motor. During a washing operation, a circuit is closed through the timer motor by way of conductor 18, winding of the timer motor, conductor 20, contacts 21 of a two-position switch 22, conductor 23, contacts 3 of switch 4, and conductor 5 to line B. During an extraction operation, a circuit is closed through timer motor 18 by way of conductor 18, conductor 20, contacts 24 of switch 22, and conductor 25 to line B.

In Fig. 1, the switches are shown as being positioned for a washing operation. To change from washing to extracting, switch 22 is actuated to open contacts 21 and close contacts 24, and switch 5 is moved to closed position. During this change, the circuit through motor 1 is initially closed through contacts 2, but as soon as the extraction operation starts, so that water is no longer supplied to cup 12, the water in the cup leaks from it, whereupon the circuit for motor 1 is transferred from contacts 3 to contacts 1.

Switches 3 and 22 are actuated by cams 26 and 27. At the position switch 16 (1); in this connection, it is to be noted that the switch 22 which controls the timer circuits is actuated by a cam driven by the timer motor. In transferring from one circuit to another, where several switches are to be operated, it is difficult to time the switches so they operate at exactly the same instant. For this reason, it is desirable to operate certain of the switches in advance of others. In the present instance, the switch 22 which controls the timer motor circuits is operated in advance of switch 3, as is indicated by the cam positions in the drawing. With this arrangement, it will be clear that if, when operated, the switch blade of switch 22 should move from engagement with the one set of contacts and should for some reason dwell in an intermediate position between contacts 21 and 24, the timing motor 18 might stop, before it had moved cam 27 far enough to complete the switch movement. As a result, the circuits would remain in the same condition which, in this particular instance, would mean that the washing operation would continue indefinitely.

According to my invention, I overcome this difficulty by utilizing a timer motor which, when rung, will continue to operate at a voltage lower than that of the line (i.e., its normal rated voltage) and which may be capable of starting when such a lower voltage is applied to it and then placing a resistance 28 parallel to switch 22.

Resistance 28 is normally short-circuited by switch 22 and is of sufficiently high value that normally but very little current passes through it. However, when switch 22 is in open position, sufficient current will pass through it to keep the timer motor 18 operating for a time at least sufficient to effect complete actuation of switch 22 so as to insure continued operation of the mechanism; also, the timer motor may be such that with partial voltage applied to it, it will start operating. In the case of the usual 115 volt household circuit, I have found the use of a timer motor which will operate or start on voltages of the order of 60 to 80 volts satisfactory. Timer motors are known and are available on the open market. Because of the high value of resistance 28, however, the motor 1 will not operate through the circuit including contacts 24 and said resistance.

Assume now a circuit condition wherein switch 22 is closed on contacts 1 and switch 9 is open, whereby the circuits of both motors 1 and 18 are open, a condition in which the automatic washing machine, may obtain during a fill period. When the machine is filled for operation, switch 4 will be actuated by cup 13 to bring switch blade 11 into engagement with contacts 3. This closes the one circuit on motor 1 and closes the timer motor circuit through contacts 24 to switch 22. However, should it happen that at this time switch 22 is not closed on contacts 21, a circuit will be closed on timer motor 18 through resistance 28, thus applying to motor 18 voltage sufficient to start it and effect actuation of switch 28 to close it on contacts 3.

In Fig. 2 is shown another control system embodying my invention. In Fig. 2, reference numerals the same as those of Fig. 1 have been applied to corresponding parts. One circuit for motor 1 for example the wash circuit) is through a float switch 26 and one side of switch 31 controlled by a 32; and another circuit (for example the extractor circuit) is through switch 3 controlled by cam 26. The circuit for valve 15 is through the other side of switch 31. One circuit for motor 3 is through one side of the twin motor circuit 22, float switch 32, and one side of switch 31; and another circuit is through the other side of switch 22. As in the arrangement of Fig. 1, resistance 23 is connected in parallel to switch 22 and functions in the manner already described in connection with Fig. 1.

A control system as shown in Fig. 2 is well adapted for use in controlling an automatic clothes washing machine of the type described in connection with Fig. 1, except that instead of the driving motor circuit for washing being under control of water overflow, it is under control of the float switch 30 which closes when the water level in the machine has reached the desired value and opens when the level falls below such value.

In Figs. 1 and 2 the several switches are shown diagrammatically. Any suitable type of switch may be used. For cam-actuated switches for use in a system of this type, I prefer to use snap action switches of the column spring type, such as those described in the application of Heber L. Newell, Serial No. 665,501, filed April 27, 1946, and assigned to the same assignee as the instant application.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In a control system for an automatic clothes washing machine or the like, an electric timer motor which will operate when its rated voltage or a voltage substantially lower than its rated voltage is applied to it, the first circuit control for the timer motor, a second control circuit for the timer motor, a two-position switch means which in one position closes one of said timer motor circuits and in another position closes the other of said timer motor circuits, switch actuating means driven by the timer motor for actuating said switch means, and a resistance in parallel to said switch means through which a circuit is maintained through the timer motor whereby when said switch means is in open position limited voltage will be maintained on the timer motor to keep it in operation.

2. In a control system for an automatic clothes washing machine or the like, an electric driving motor, a control circuit for the driving motor, a switch in said circuit, an electric timer motor
which will operate when its rated voltage or a voltage substantially lower than its rated voltage is applied thereto, a first control circuit for the timer motor, a second control circuit for the timer motor, a two-position switch means which in one position closes one of said timer motor circuits and in another position closes the other of said timer motor circuits, switch actuating means driven by the timer motor for actuating said switch and said switch means, and a resistance in parallel to said switch means through which a circuit is maintained through the timer motor whereby when said switch means is in open position limited voltage will be maintained on the timer motor to keep it in operation.

3. In a control system for an automatic clothes washing machine or the like, an electric driving motor, a first control circuit for the driving motor, a second control circuit for the driving motor, switches in each of said circuits, an electric timer motor which will operate when its rated voltage or a voltage substantially lower than its rated voltage is applied thereto, a first control circuit for the timer motor, a second control circuit for the timer motor, a two-position switch means which in one position closes one of said timer motor circuits and in another position closes the other of said timer motor circuits, switch actuating means driven by the timer motor for actuating said switches and said switch means, and a resistance in parallel to said switch means through which a circuit is maintained through the timer motor whereby when said switch means is in open position limited voltage will be maintained on the timer motor to keep it in operation.

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