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CONTROL FOR ELECTRIC MOTORS

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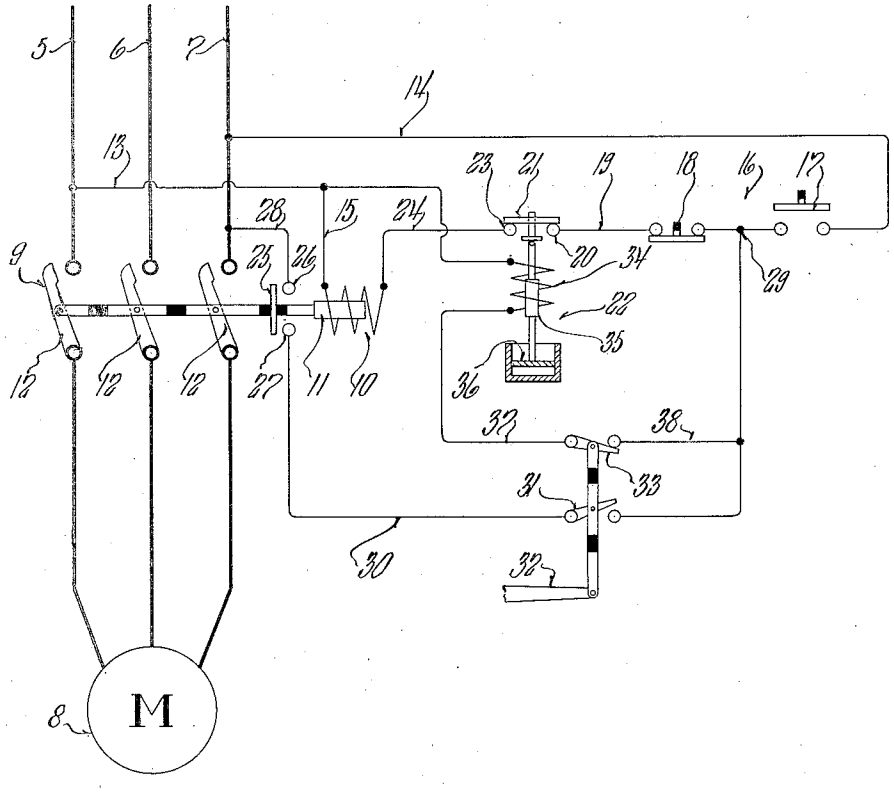

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CONTROL FOR ELECTRIC MOTORS

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This invention relates to certain new and useful improvements in controls for electric motors.

In certain motor driven devices especially in dough mixers, printing presses and the like it is desirable that means be provided for jogging or inching the machine, and in the past this has been accomplished by manually holding a push button switch "in" for the desired period of time. However, this method has not proved satisfactory for use with high speed motors because of the possibility of the motor accelerating to full speed before the push button was released, which is very objectionable.

The present invention, therefore, has as one of its objects to provide a control by which the duration of each jogging or inching step is accurately timed.

Another object of this invention resides in the provision of a control of the character described which utilizes a time relay for opening the circuit of the driving motor at a predetermined time.

And a further object of this invention resides in the provision of a control of the character described having means normally at rest and which, through a mechanical connection with the driven machine, may be actively connected in the control circuit when the machine, or a portion thereof, is moved to a predetermined position.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawing, I have illustrated one complete example of the physical embodiment of my invention constructed according to the best mode I have so far devised for the practical application of the principles thereof, and in which:

The single figure is a diagrammatic view illustrating my invention.

Referring now more particularly to the accompanying drawing, the numerals 5, 6 and 7 designate main service lines which are adapted to be connected with a motor 8 by a switch 9. The switch 9 is magnetically actuated to closed, or circuit making position, upon the energization of a solenoid 10 to attract an armature 11 suitably connected with the movable contactors 12 of the switch.

The solenoid 10 is energized upon the completion of a control circuit receiving energy from the lines 5 and 7 through conductors 13 and 14. The conductor 13 is electrically connected with one end of the solenoid 10 through a conductor 15 and the conductor 14 is connected with a manual control switch 16 consisting of a push button starting switch 17 and a push button stop switch 18. From the control switch 16 a conductor 19 continues the circuit to one side 20 of a switch 21 actuated by a time delay relay 22, to be later described, and from the other side 23 of the switch 21 which is normally closed, the circuit extends through a conductor 24 to the other end of the solenoid 10, so that when the push button starting switch 17 is depressed the solenoid 10 is energized to close the switch 9.

Simultaneously with the closing of the switch 9 an auxiliary switch 25, movable with the movable contactors 12, bridges its contacts 26 and 27 to maintain the circuit of the solenoid 10 closed irrespective of the position of the starting switch 17. The contact 26 of the switch 25 is connected with the main line 7 through a conductor 28 and the contact 27 is connected with a common terminal 29 of the manual control switch 16, through a conductor 30, in which a mechanically operated switch 31 is interposed.

The switch 31 is mechanically connected with a portion of the driven machine (not shown) through a lever 32 or the like, and is normally closed permitting the functioning of the circuit as has been described. However, when the part of the machine with which the lever 32 is connected, is moved to a predetermined position, the switch 31 is opened and a switch 33, interlocked with the switch 31, is closed, which arranges the cir-

cuits as illustrated in the drawing; and with the parts in this position, the control is set to jog or inch the motor for short predetermined periods of time depending upon the setting of the time delay relay 22.

The time delay relay is of conventional design, having a solenoid 34, and an armature 35 movable upwardly against the retarding action of a dash pot 36 to open the switch 21. A degree of lost motion in the connection between the armature and the switch, delays the opening of the switch for a period of time depending upon the setting of the dashpot. One side of the solenoid 34 is connected with the main line 5 through the conductor 13, and its other side is connected with one side of the switch 33 through a conductor 37. From the other side of the switch 33 a conductor 38 connects the solenoid with the terminal 29 of the manual control switch 16 through the conductor 30.

Thus it will be seen that when the starting switch 17 is closed, the solenoid 10 will be energized in the manner hereinbefore described, but as the switch 25 is ineffective due to the open position of the switch 31 which is in series therewith, it is necessary to hold the switch 17 "in" to maintain the circuit of the solenoid 10. Simultaneously with the closing of the circuit of the solenoid 10, energization of the solenoid 34 of the time delay device 22 is effected, which tends to open the switch 21 and break the continuity of the circuit of the solenoid 10. This, however, does not take place immediately due to the retarding action of the dash pot 36, the duration of the delay, as stated depending upon the setting of the dash pot.

If the motor is of the high speed type, the duration of the delay is relatively short to prevent its acceleration to full speed. In some installations, where exceptionally short periods of operation are essential, the motor is started and stopped in about the time required to depress and release the starting switch, and to facilitate quick successive inching operations, the dashpot is preferably arranged to permit a quick unretarded return, but as this is a conventional structure, it has not been shown.

After the switch 21 has been actuated, it will remain open as long as the push button switch 17 is held "in" so that to again jog or inch the motor, it is necessary to release the switch 17 which opens the circuit of the relay solenoid. Depressing of the starting switch 17 repeats the operation, and when the machine being driven is again moved to its normal position the relation of the switches 31 and 33 will be reversed to permit the normal uninterrupted operation of the motor.

From the foregoing description, taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that I have provided an improved control for electric motors by which a short definite predetermined time interval for jogging and inching is accurately obtained.

I claim:

1. In combination with an electric motor and a line switch adapted to connect the motor with a source of electrical energy, a control for effecting inching of the motor including a circuit and a starting switch operable to close the circuit and start the motor, a normally closed switch within the circuit, and means becoming active upon actuation of the starting switch to open said normally closed switch and stop the motor at a predetermined time after its start by the actuation of the starting switch, the normally closed switch returning to closed position immediately after release of the starting switch whereby inching operations may follow each other in quick succession.

2. In combination with an electric motor and a line switch adapted to connect the motor with a source of electrical energy, a control for effecting inching of the motor including a circuit and a starting switch operable to an "in" position to close the circuit and start the motor, a normally closed switch within the circuit, and means operable upon closing of the starting switch to open the normally closed switch to interrupt the circuit and stop the motor at a predetermined time after the starting switch has been operated, said normally closed switch remaining in open position as long as the starting switch is held in to prevent starting of the motor until the starting switch has been opened and again actuated to its "in" position.

3. In combination with an electric motor and a line switch adapted to connect the motor with a source of electrical energy, a control for effecting inching of the motor including a circuit and a starting switch operable to close the circuit and start the motor, normally inactive means within the circuit for interrupting the same to stop the motor, and mechanically actuated means for actively incorporating said first means in the circuit whereby actuation of the starting switch when said first means is actively incorporated in the switch, in addition to starting the motor, causes said first means to interrupt the circuit and stop the motor after a predetermined time interval.

4. In combination with an electric motor and a line switch adapted to connect the motor with a source of electrical energy, a control for effecting inching of the motor including a circuit and a starting switch operable to close the circuit and start the motor, a second switch included in the circuit and operable to open the same and stop the motor, a solenoid adapted upon energization to ac-

tuate the second switch, means retarding the action of the second switch upon energization of the solenoid, and mechanically actuated means for actively incorporating the solenoid in the circuit whereby actuation of the starting switch starts the motor and energizes the solenoid to tend to open the second switch, opening of the second switch to stop the motor being delayed by said retarding means.

5. The combination with an electric motor, a line switch adapted to connect the motor with a source of electrical energy and its control circuit including a starting switch adapted upon intermittent actuation to make and break the circuit to start and stop the motor and effect inching thereof, of means incorporated in the circuit to prevent the motor being brought to full speed during the inching of the motor.

6. The combination with an electric motor, a line switch adapted to connect the motor with a source of electrical energy and its control circuit including a starting switch adapted upon intermittent actuation to make and break the circuit to start and stop the motor and effect inching thereof, of means incorporated in the circuit to prevent the motor being brought to full speed by holding the starting switch in circuit closing position longer than a predetermined time.

7. The combination with an electric motor, a line switch adapted to connect the motor with a source of electrical energy and its control circuit including a starting switch adapted upon intermittent actuation to closed and opened position to make and break the circuit to start and stop the motor and effect inching thereof, of means incorporated in the circuit and adapted to open the same after a predetermined time in the event the starting switch is held in closed position, whereby acceleration of the motor to full speed during the inching is prevented.

8. In combination with an electric motor and a line switch adapted to connect the motor with a source of electrical energy, a control for the motor having a circuit including a starting switch operable to close the circuit and an auxiliary switch adapted to normally maintain the circuit closed, a mechanically actuated switch in the circuit, which when in one position makes the action of said auxiliary switch ineffective whereby the circuit is opened upon opening of the starting switch thereby permitting inching of the motor by intermittent actuation of the starting switch, and means incorporated in the circuit to prevent the motor being brought to full speed during the inching thereof.

9. In combination with a motor adapted to be run continuously or to be inched, a main switch interposed between the motor and its source of energy, means for controlling the operation of the main switch and including a running circuit, an inching circuit, interlocking switches included within the running and inching circuits adapted when in one position to complete one circuit and interrupt the other and vice versa, a starting switch common to both circuits and adapted upon being moved to closed position to make the circuit completed by the interlocking switches, the continuity of the running circuit remaining unbroken until manually interrupted, and means within the inching circuit to prevent its remaining closed longer than a predetermined period.

In testimony whereof I have hereunto affixed my signature.

FORREST C. McNICOL.