

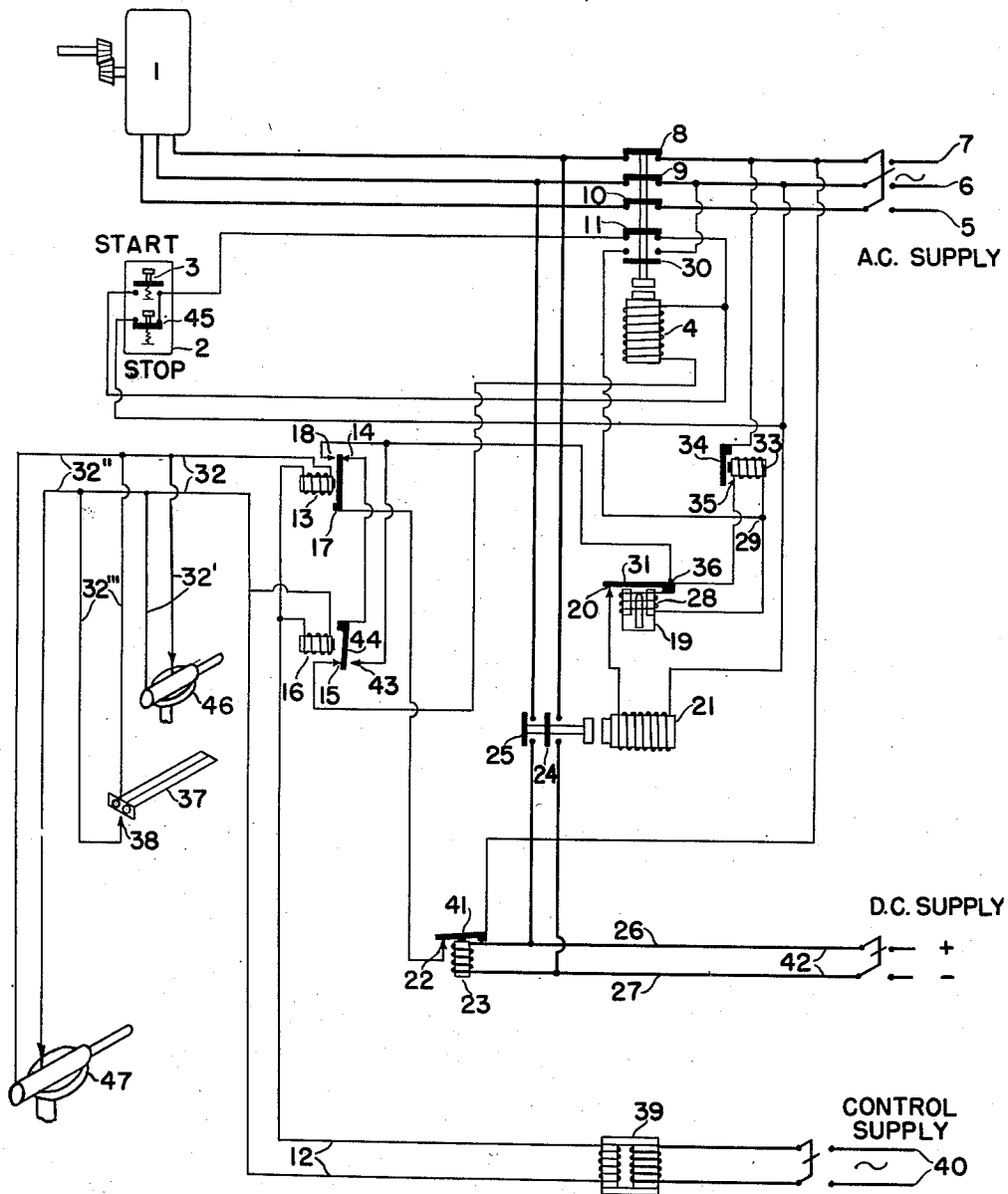
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MOTOR CONTROL SYSTEM FOR KNITTING MACHINES

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MOTOR CONTROL SYSTEM FOR KNITTING MACHINES

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1

This invention relates to a motor control system, and more particularly to a motor control system for knitting machines and the like.

An object of this invention is to provide an electrical motor control system for knitting machines which will replace mechanical equipment that was formerly used to start, brake and stop such machines.

Another object of my invention is to provide an electrical control system which will brake and stop a knitting machine in response to the breaking of a thread, the breaking of a needle, the breaking of a control circuit, the failure of power supply, or the fabric becoming too loose on the machine, and other similar emergencies.

Another object of my invention is to provide a motor control system in which braking action is applied momentarily to stop the motor in response to trouble indicated in a control circuit and in which system the braking action is released promptly after the motor stops and is held inoperative while the trouble is being removed from the control circuit, thus allowing completely free movement of the working parts of the machine so that the machine can be easily operated by hand manipulation to facilitate rapid correction of the trouble involved.

Another object of my invention is to provide a motor control system which is simple in design, efficient in operation, inexpensive to manufacture and rugged in construction.

Other and further objects and advantages of my invention will be apparent from the following description taken in connection with the accompanying drawing in which there appears a layout diagram of a system embodying my invention.

In the embodiment chosen for illustration, motor 1 is connected to operate the knitting machine by direct drive. Motor 1 is put into motion by pressing start button 3 of start-stop switch 2. Pressing button 3 energizes magnetic switch 4 by closing a circuit to lines 6 and 7. When magnetic switch 4 is energized by pressing button 3, contacts 8, 9, 10 and 11 are closed, allowing current from lines 5, 6, and 7 to flow through contacts 8, 9, and 10, thus putting motor 1 into motion. When start button 3 is released, magnetic switch 4 is kept energized by flow of current from lines 6 and 7 through contact 11. Should a thread break after motor 1 is in motion, or if a needle should jam or break, or if the fabric should become too loose in the machine, means are provided to cause it to stop by closing of contacts in the stop motion circuit 32. Con-

2

trol circuit 32' is connected to the customary arrangement, illustrated schematically at 46, for closing electrical contacts upon breakage of a thread or the thread running out of place in a knitting machine of known construction. Control circuit 32'' is connected to the customary arrangement, illustrated schematically at 47, for closing of electrical contacts upon the jamming or breaking of a needle in a knitting machine of known construction. Control circuit 32''' is connected to an arrangement for closing electrical contacts when the fabric runs too loose in a knitting machine of known construction. Closing of any one or more of these controls completes circuit 12 and energizes the coil of relay 13. Contacts 8, 9, 10 and 11 are kept closed by current flowing through contact point 14 of relay 13 and contact point 15 of relay 16 to energize the coil of magnetic switch 4. When the coil of relay 13 is energized, contact arm 17 of relay 13 breaks from point 14 and stops current flow into magnetic switch 4 and causes contacts 8, 9, 10 and 11 to open and motor 1 to stop. Due to inertia, motor 1 will not stop instantaneously when the flow of current ceases when contacts 8, 9 and 10 are opened unless braking action is applied. To cause motor 1 to stop quickly when contacts 8, 9 and 10 are thrown open, means are provided to cause direct current to flow instantly through a winding of motor 1 when contacts 8, 9 and 10 are opened. When the coil of relay 13 is energized and contact arm 17 breaks from point 14 it closes on point 18, causing current from lines 6 and 7 to flow through contact point 22 of relay 23, contact point 18 of relay 13 and contact point 20 of relay timer 19 to energize magnetic switch 21 causing contacts 24 and 25 to close allowing direct current from lines 26 and 27 to flow to motor 1 causing it to come to an instantaneous stop by the braking action of the direct current. When current flows from line 7 through contact points 22, 18 and 36, to flow through point 20 it also energizes coil 28 of timer 19 by flowing through the coil to connection 29 and through interlock 30 onto line 6. Interlock 30 was closed when contacts 8, 9, 10 and 11 were opened by magnetic switch 4 throwing out. When timer 19 becomes energized, its core is delayed from rising for approximately one-half to one second or other predetermined time, due to the vacuum caused by the oil surrounding the core, or other known delayed action construction. One-half to one second after timer 19 is energized its core rises to break contact arm 31 from contact point 20. This throws

3

magnetic switch 21 out and stops the flow of direct current through motor 1.

If other means were not provided, opening or clearing contacts in the stop motion circuit 32 would break contact arm 17 from point 16, de-energize timer 19 and close contact arm 31 on point 20. This would reset the complete mechanism to cause direct current to flow through motor 1 should contacts of stop motion circuit 32 again be closed by manipulation in efforts to correct trouble which had caused the machine to stop. To prevent off and on flow of direct current through motor 1 by manipulation of the stop motion mechanism while motor 1 is at rest, relay 33 keeps timer 19 energized so that magnetic switch 21 is kept open by breaking of contact arm 31 from point 20. When relay 13 is energized by closing of any contacts in stop motion circuit 32 (by thread breakage, etc.) contact arm 17 closes on point 18 and current flows from point 36 through relay 33 to connection 29, through interlock 30 and to line 6. When relay 33 is energized, contact 34 closes on contact point 35, thus closing the circuit between lines 6 and 7 and allowing a continued flow of current through timer 19 to keep contact arm 31 open from contact point 20. Therefore, when contacts of the stop motion mechanism are closed and direct current is caused to flow through motor 1, after one-half to one second magnetic switch 21 is thrown open and due to relay 33 direct current will not be caused to flow through motor 1 again, regardless of manipulation of the stop motion circuit controls, until start button 3 of start-stop switch 2 is pressed to energize magnetic switch 4 to open interlock 30.

Knitting machines are ordinarily provided with take-off rolls, indicated at 37, to keep the knitted fabric under the proper tension as it is fed from the needles. The take-off rolls feed the fabric downward by rotation of the rolls inward. Often these rolls fail to keep the proper tension allowing the fabric to loosen. When the fabric becomes too loose it will drop out of the needles. To prevent this, contact point 38, which is connected to one side of circuit 12, is placed so that the rolls, connected to the other side of circuit 12 through relay 13, will close on contact point 38 when the fabric loosens and thereby energize relay 13. Circuit 12 is a 12 volt A. C. control circuit fed from transformer 39 by 110 or 220 volt circuit 40. Closing of contact 33 closes control circuit 12 in the same manner as would the closing of any other contact in stop motion circuit 32, so that relay 13 is energized and contact arm 17 breaks from contact point 14 and closes on point 18 causing the same action as described above. By this action current to motor 1 is interrupted and motor 1 is braked by the direct current as before.

Should the D. C. supply 42 become interrupted or discontinued, relay 23 would release contact arm 41 from point 22. When the coil of relay 23 ceases to be energized, breaking of contact arm 41 from point 22 would stop flow of current from line 7 causing magnetic switch 4 to release, thus throwing contacts 8, 9 and 10 out and causing motor 1 to stop.

Should the control current circuit 12 become interrupted or discontinued, relay 16 is provided to stop motor 1 and to brake motor 1 with direct current to insure instant stopping of the machine. The coil of relay 16 is energized from control current circuit 12. While relay 16 is energized, contact arm 44 is closed on point 15

4

to allow current from line 7 to flow through magnetic switch 4 to keep contacts 8, 9 and 10 closed to operate motor 1. Should circuit 12 become interrupted or discontinued, relay 16 will release contact arm 44 from contact point 15 and allow it to close on contact point 43. Breaking of contact arm 44 from point 15 will stop the flow of current from line 7 through magnetic switch 4. This would cause magnetic switch 4 to release, opening contacts 8, 9 and 10 causing motor 1 to stop. Closing of contact arm 44 on contact point 43 would cause current from line 7 to flow through contact arm 31 and contact point 20 to energize magnetic switch 21 and close contacts 24 and 25. Closing of contacts 24 and 25 causes direct current from D. C. supply line 42 to flow into motor 1 and instantly cause it to stop. Current from line 7 would then flow through point 36 to energize timer 19 and one-half to one second after magnetic switch 21 caused braking current to flow through motor 1, contact arm 31 would be caused to break from contact point 20, thus stopping flow of current through magnetic switch 21 and releasing contacts 24 and 25 and causing the direct current to cease flowing into motor 1. Therefore, interruption of circuit 12 would cause motor 1 to be disconnected from its current supply and to be instantly stopped by the braking action of the direct current, but within one-half to one second thereafter the direct current would be prevented from further flow through motor 1. Relay 33 performs in the same manner as described above to keep timer 19 energized until start button 3 is pressed. With the operation of relay 33, direct current is kept out of motor 1 when relay 16 is energized by restoration of circuit 12.

When motor 1 is in motion by supply of current from lines 5, 6, and 7 through contacts 8, 9 and 10 and it is desirable to bring the motor to a stop, stop button 45 may be pressed. When stop button 45 is pressed, current from line 6 through switch 2 and interlock 11 to magnetic switch 4 is interrupted causing magnetic switch 4 to release contacts 8, 9, and 10 to stop the motor.

It will be obvious to those skilled in the art that many modifications and changes can be made without departing from the scope of my invention as defined in the appended claims.

I claim:

1. In a motor control system for knitting machines and the like, the combination of an electric motor arranged and connected to drive a knitting machine, an alternating current power supply, electrically operated means for connecting said motor to said power supply, a direct current supply, a control circuit having means connected thereto responsive to a faulty needle in said knitting machine and means connected thereto responsive to a broken thread in said knitting machine and means connected thereto responsive to failure of said alternating current supply and means responsive to failure of said direct current supply, all of said means being operatively arranged to effect the disconnection of said motor from said alternating current power supply and the connection of said motor to said direct current supply, electrically operated means for disconnecting said direct current supply from said motor after a predetermined time, and electrically operated means for maintaining said direct current supply disconnected from said

5

motor until after said motor has been again connected to said alternating current power supply.

2. In a motor control system, the combination of an electric motor, an alternating current power supply, a direct current supply, a normally open starting switch, one side of said switch being connected through the excitation coil of a magnetic switch and through the normally closed contact of a stop motion relay to one wire of said alternating current power supply, a power supply circuit for said stop motion relay, normally open contacts in said power supply circuit arranged to energize said stop motion relay when closed to open said normally closed contact, the other side of said starting switch being connected to one side of a normally closed stopping switch, the other side of said stopping switch being connected to a second wire of said alternating current power supply and also through the excitation coil of a second magnetic switch and through the contact arm of a relay timer and through the excitation coil of said relay timer to one side of an interlock which is closed when said first mentioned magnetic switch is

6

opened, the other side of said interlock being connected to a wire of said alternating current power supply to complete a circuit with said first mentioned wire, said first mentioned magnetic switch being arranged to connect said electric motor to said alternating current power supply when said starting switch is closed, said second mentioned magnetic switch being arranged to connect said electric motor to said direct current supply, and means operated by said first mentioned magnetic switch for holding the connection of said electric motor to said alternating current power supply.

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