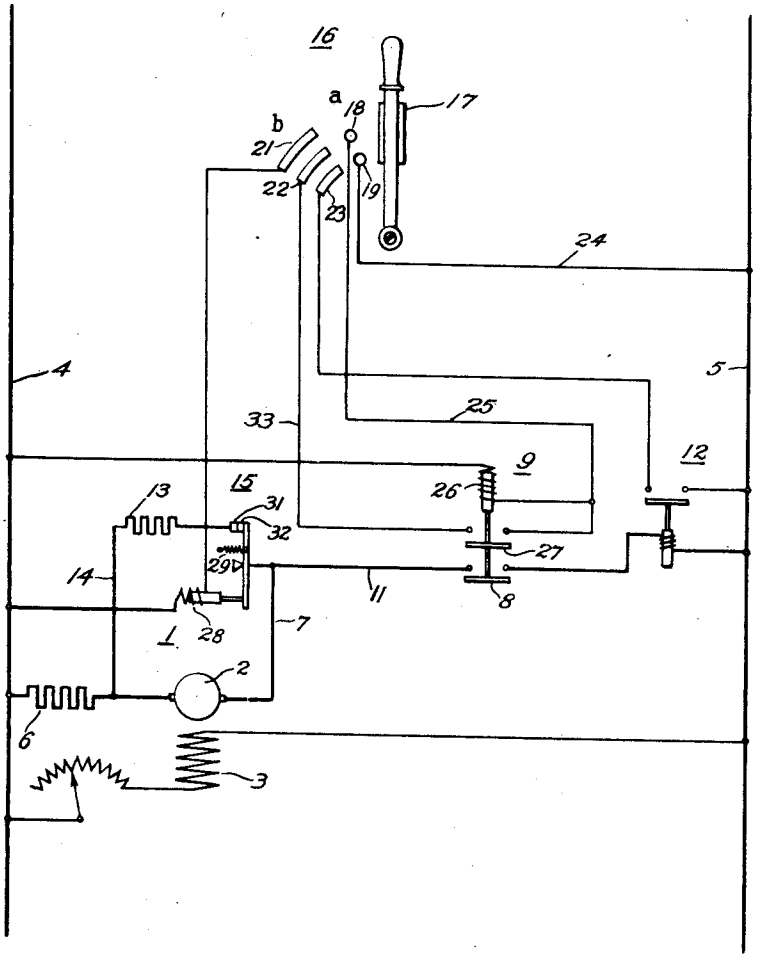
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MOTOR CONTROL SYSTEM

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UNITED STATES PATENT OFFICE

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MOTOR-CONTROL SYSTEM

Application filed April 30, 1926. Serial No. 105,695.

My invention relates to motor-control systems and more particularly to such systems wherein means is provided for stopping the motor under predetermined conditions.

In certain motor applications, such, for example, as in driving a number of wire drawing machines by a plurality of individual electric motors, one attendant has charge of a number of machines. The attendant cannot, therefore, watch each machine closely at all times. If the motor is not stopped when no load conditions arise, because of breaking of the drawn wire, or when the end of the drawn wire has passed through the disc, the free end of the wire on the reel, which continues to revolve, may cause damage to the machine or attendant.

An object of my invention is, therefore, to provide means for shutting down the motor in case the load is reduced beyond a predetermined value.

My invention will be understood by reference to the accompanying drawing in which the single figure is a diagrammatic view of circuits and apparatus employing my invention.

Referring to the drawing, a motor is illustrated, having an armature 2 and a field winding 3 that may be connected to a suitable source of direct current, such as the supply conductors 4 and 5. A starting resistor 6 is illustrated as being connected in series relation with the motor armature 2 which may be connected by conductor 7, interlock 8 of contactor 9, and winding 11 of the no-load relay 12 to the supply conductor 5. The resistor 6 is illustrated as a single block of resistance, but may be divided into sections, and cut-out in steps, by any suitable accelerating means (not shown).

A dynamic braking resistor 13 is provided, and is connected by means of conductor 14, contactor 15 and conductor 7 in shunt relation to the motor armature 2.

A master switch 16 is provided, having a movable contact member 17 that is adapted to engage the fixed contact members 18 and 19 in one operative position, *a*, and to engage the contact members 21, 22 and 23 in a second operative position, *b*.

To start the motor 1, the handle of the master switch 16 is moved to position *a*, wherein the contact member 17 bridges the contact members 18 and 19, thus closing a circuit from the supply conductor 5, through conductors 24 and 25, and the operating coil 26 of the magnetic contactor 9 to the supply conductor 4, thus causing the magnetic contactor to be operated upwardly to close contact members 8 and 27. Closing the contact member 8 causes a circuit to be established from the supply conductor 4 through the starting resistor 6, the motor armature 2, and the operating winding 11 of the no-load relay 12, to supply conductor 5. The no-load relay 12 is caused to operate upwardly, thus connecting the contact member 23 to the supply conductor 5. The operation of the magnetic contactor 9, to its upward position, closes the contact member 27 and completes a circut from the supply conductor 5 through the conductor 24, contact members 17, 18 and 19 and conductor 25 to the contact member 22.

As the master switch 16 is moved to its second operative position *b*, causing the contact member 17 to engage the contact members 21, 22 and 23, a circuit is established through the interlock 27 in parallel circuit relation to the operating coil 26 of the magnetic contactor 9, through the contact members 21 and 22, and the operating winding 28 of the magnetic contactor 15 to the supply conductor 4. The magnetic contactor 15 is normally in its illustrated position completing a dynamic braking circuit through the resistor 13. Upon the energization of the winding 28 the contactor 15 operates against the pull of the spring 29, causing the contact members 31 and 32 to become disengaged, thus interrupting the circuit through the resistor 13 and permitting high speed operation of the motor.

In operating the master switch 16, from its first to its second described position, the contact member 17 engages the contact members 21, 22 and 23 prior to disengaging the contact members 18 and 19. The circuit through the operating coil 26 of the magnetic contactor 9 is thus maintained through the contact members 18 and 19, until after the no-load relay

12 has operated to connect the contact member 23 to the supply conductor 5. Upon disengagement of the contact member 17 from the contact members 18 and 19, the winding 26 is maintained energized by the circuit from the supply conductor 5 through the no-load relay 12, contact members 23 and 22, conductors 33, interlock 27, and the winding 26 to the supply conductor 4.

As long as the master switch 16 remains in its last described position, and as long as normal load is maintained upon the motor 2, the magnetic contactor 9 and the no-load relay 12 will remain in their upper or closed positions, and the magnetic contactor 15 will remain in its open position.

Should the load on the motor 1 decrease below a predetermined minimum, such as would be the case should a wire break, the no-load relay 12 opens, thus interrupting the circuit through the operating winding 28 of the magnetic contactor 15. The contactor 9 is then also deenergized, and drops to its open position, disconnecting the motor armature 2 from the supply conductor 5. Upon the deenergization of the winding 28, the magnetic contactor 15 is operated to its closing position by the spring 29, thus establishing a dynamic braking circuit through the resistor 13, causing the motor to stop.

Many modifications may be made in the circuits and apparatus described without departing from the spirit of my invention and I do not wish to be limited other than by the scope of the appended claims.

I claim as my invention:

1. In a system for controlling direct current motors, an electric motor, a circuit therefor, an electromagnetic contactor for closing the circuit, an underload relay having its operating winding in the said circuit, and a master controller having in the running position contacts in the circuit of the contacts of the relay and in the circuit of the winding of the contactor, and having in starting position contacts short-circuiting the contacts of the relay and including the winding of the contactor.

2. In a system for controlling direct current motors, an electric motor, a circuit therefor, an electromagnetic contactor for closing the circuit, an underload relay having its operating winding in the said circuit, a master controller having in the running position contacts in the circuit of the contacts of the relay and in the circuit of the winding of the contactor, and having in starting position contacts short-circuiting the contacts of the relay and including the winding of the contactor, and means maintaining the said winding energized when the master controller passes from the starting to the running position.

3. In a system for controlling direct current motors, an electric motor, a circuit therefor, a dynamic braking circuit including a switch therefor biased to closed position, an electromagnet for opening the switch, a master controller having contacts in running position for energizing the winding of the magnet, and an electromagnetic underload switch having the contacts in circuit with the winding of the magnet.

4. In a system for controlling direct-current motors, an electric motor, a circuit therefor, an electromagnetic contactor for closing the circuit, means for actuating said contactor comprising two control circuits, a manual switch for controlling said circuits, and a relay energized from said motor circuit and having contact members in one of said control circuits.

5. In a system for controlling direct-current motors, an electric motor, a circuit therefor, an electromagnetic contactor for closing the circuit, means for actuating said contactor comprising two control circuits, a manual switch for controlling said circuits, an interlock on said contactor, and a relay energized from said motor circuit, one of said control circuits including the contact members of said interlock and the contact members of said relay.

In testimony whereof, I have hereunto subscribed my name this 27th day of April, 1926.

CYRUS S. DAULER.