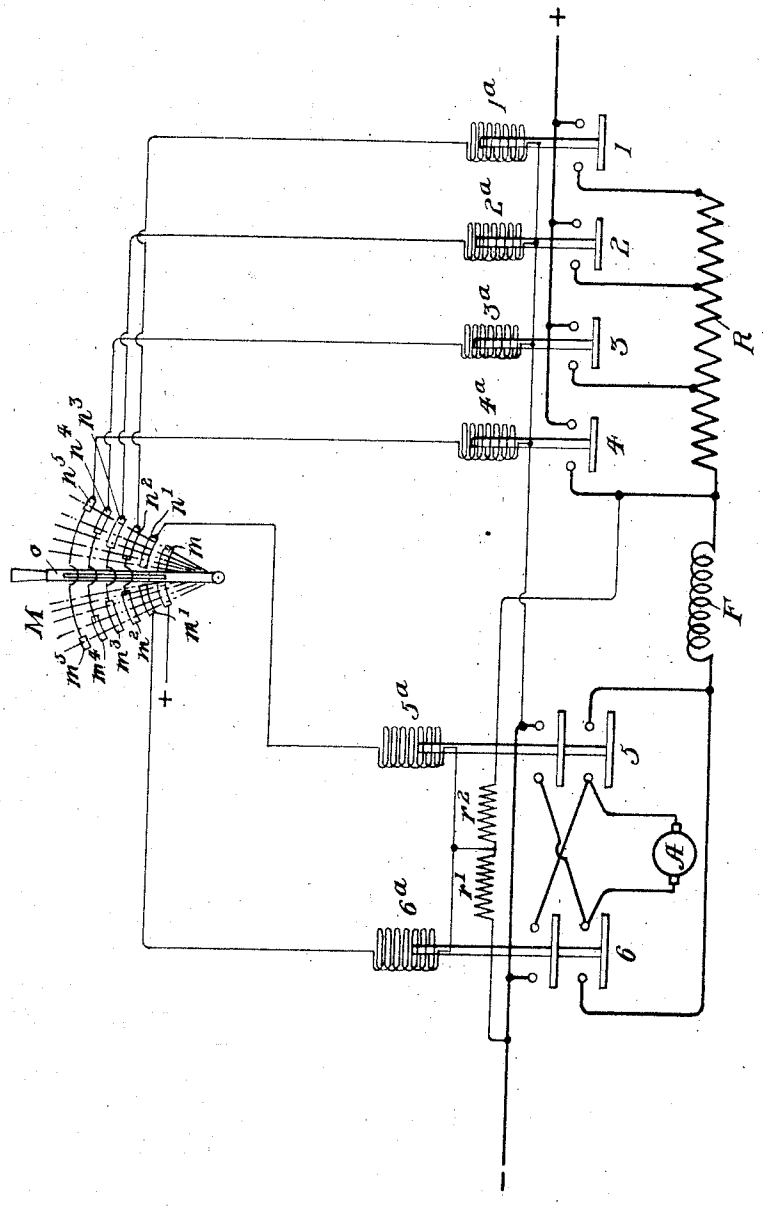
A. C. EASTWOOD.

ELECTRIC CONTROLLER.

APPLICATION FILED SEPT. 24, 1910.

981,848.

Patented Jan. 17, 1911.



WITNESSES

J. P. Lemon,

L. L. Mehard

INVENTOR

A. C. Eastwood

by F. N. Barber

attorney

UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO, ASSIGNOR TO THE ELECTRIC CONTROLLER AND MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ELECTRIC CONTROLLER.

981,848. Specification of Letters Patent. Patented Jan. 17, 1911.

Application filed September 24, 1910. Serial No. 583,535.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Electric Controllers, of which the following is a specification.

My invention relates to electric motor controllers of that type in which separately actuated magnetic switches are used to make the proper connections for starting the motor, operate it in different directions, and vary its speed. It sometimes occurs in the operation of such controllers that when the master controller is moved to the off position some one of the resistance cut-out switches may remain closed due to a heavy arc which has been formed at its contacts which welds them together.

The object of my invention is to provide a controller in which it will be impossible to operate the main switch or reverser in case any of the resistance cut-out switches is closed. This may be accomplished in a number of ways, one of which is shown diagrammatically in the accompanying drawing.

I have shown a system of motor control in which the reverser or main switches are interlocked or prevented from operation by the action of a pair of resistances r' and r^2 associated with the common return of the reverser-operating coils. These resistances are connected in series, one end being connected to the negative main; the other end, to the left hand or negative end of the starting resistance R; and a point between them, to a point between the negative terminals of the windings of reversing switches 5^a and 6^a, whose positive terminals are connected to the respective contact strips m' and n' on opposite sides of the controller handle o. The positive contact strip m being arranged to engage the controller arm on either side of its off-position, that is, when the said arm contacts with the strip m' or n'.

If the master-switch arm o be moved to the left to the first position indicated by the first diagonal line on the controller M, it connects the contact strips or segments m and m' and closes a circuit from the positive strip m through the arm o, the segment m', the reverser-operating coil 6^a and the resistance r' to the negative main. The current in this circuit causes the switch 6 to close its upper and lower contacts, but no current flows through the motor circuit as the arm o has not engaged any of the segments m^2 to m^5, which are connected, respectively, to the operating coils 1^a to 4^a of the resistance-controlling switches 1 to 4. If now the arm o be moved so as to be in the second position to the left, it will engage the segment m^2 and close a circuit from the segment m, the arm o, the segment m^2, and the coil 1^a to the negative main, causing the switch 1 to close the motor circuit which is as follows: from the positive main through the switch 1, the entire resistance R, the field F, the lower contacts of the switch 6, the armature A, and the upper contacts of the switch 6 to the negative main. If the arm o be moved step by step so as to engage the segments m^3, m^4, and m^5, the coils 2^a, 2^b, and 2^c will be successively energized, whereupon the switches 2, 3, and 4 will successively close, successively short-circuiting the sections of the resistance R in an obvious manner. If the arm o be moved to its off-position, which is that shown on the drawing, all the coils 1^a, 2^a, 3^a, 4^a, and 6^a are de-energized, and the resistance switches 1 to 4 and the reversing switch 6 should open their contacts; but in case one of the resistance switches, as 3, should remain closed and the arm o be moved so as to engage the segment m' or n', a current would be set up from the positive segment m of the master controller M through the reverser coil 5^a or 6^a and the resistance r' to the negative. A current also passes from the positive main through the closed resistance switch 3, the third or left-hand section of the resistance R, and the resistances r^2 and r' in series to the negative main. The coil 5^a or 6^a which is energized is thus connected in parallel with the resistance r^2, the two parallel paths being in series with the resistance r'. The resistance r' is proportioned so as to permit sufficient current to pass through one of the reversing coils to operate its switch when all the switches 1 to 4 are open. Since the total amount of current is limited by the resistance r', the amount of current in the coil 5^a or 5^b is reduced when the said circuit including the resistance R remains closed. The resistances r' and r^2 should be so proportioned that, when the circuit through the resistance r^2 is established, the current in the reverser coil 5^a or 5^b is not sufficient to close

its switch, but sufficient therein to hold this switch closed after it has closed, it requiring, as is well known, a smaller current to maintain a magnetic switch closed than it requires to close the same. It is thus seen that, in case any of the switches 1 to 4 should remain closed after the reverser coils have been deënergized and the switches 5 and 6 have opened, any current in the said coils caused by the subsequent movement of the arm o to the segment m' or n' could not close the reversing switch 5 or 6, because a part of the total current which the resistance r' can carry and which is necessary for the proper energization of either coil, is supplied through the closed switch and the resistance r^2, thereby reducing the current in the energized reverser coil below a value necessary for closing its switch 5 or 6. It is impossible for either switch 5 or 6 to be closed while any one or more of the switches 1 to 4 are closed, but either switch 5 or 6 may be closed if all the switches 1 to 4 are open. Besides securing this electrical interlock, my invention has the advantage of reducing the amount of current in the coil 5 or 6 of the reverser as soon as the first resistance switch is closed, which is desirable to prevent the over-heating of the said coil. The electrical interlock is secured without the use of auxiliary contacts and the reduction of current in the reverser coil is secured after the operation of the first resistance switch without the use of auxiliary contacts.

I claim—

1. In a circuit controlling system, a circuit, a resistance for governing the current in said circuit, one or more switches for controlling said resistance, one terminal of each of said switches connected to one side of a source of supply, the other terminal being connected to said resistance, a second resistance, one end of which is connected to said first resistance, the other end being connected to the other side of said source, a main switch for said circuit having an operating winding, one terminal of which is connected at an intermediate point on said second resistance, and means for connecting the other terminal of said winding to a source of supply.

2. In a circuit controlling system, a switch having an energizing winding, means for connecting said winding to a source of current supply, a resistance in series with said winding, a second resistance which if connected in shunt with said winding will prevent the operation of said switch, and means for connecting said second resistance as a shunt around said winding when a second switch in said circuit is closed.

3. The combination of a reverser, and a current varying controller, operating windings for said reverser, and a shunt around said windings for preventing the operation of said reverser, said shunt being closed whenever the current varying controller is in any position other than the off position.

4. In a motor control system, a motor, a circuit therefor, a resistance in said circuit, one or more resistance switches for controlling said resistance, a reverser in said circuit, operating windings therefor, and a shunt around said windings which when energized prevents either winding from operating the reverser, said shunt being so connected as to be operative whenever any of said resistance switches is closed.

5. An electric controller embracing a resistance, a series of switches for short-circuiting or reducing said resistance, an initial switch adapted to be closed by an electromagnet for closing the circuit through said resistance, and means acting automatically, when any of said resistance controlling switches is closed, for reducing the voltage applied to the operating electromagnet of said initial switch to a voltage which will be insufficient to cause said initial switch to close.

6. An electric controller embracing a resistance, a series of switches for short-circuiting or reducing said resistance, an initial switch adapted to be closed by an electromagnet for closing the circuit through said resistance, and means acting automatically, when any of said resistance controlling switches is closed, for reducing the voltage applied to the operating electro-magnet of said initial switch to a voltage which will be insufficient to cause said initial switch to close, said reduced voltage being sufficient to maintain said initial switch closed after it has closed.

7. In a motor control system, a motor, a circuit therefor, a resistance in said circuit, one or more resistance switches for controlling said resistance, a main switch or reverser in said circuit, operating windings therefor, a shunt around said windings closed whenever any of said resistance switches is closed so that the closure of any of said resistance switches serves to reduce the current which may flow through said winding.

8. In a circuit controller, a magnetically-operated switch for connecting an electric circuit to one side of a source of current supply, and means for automatically reducing the voltage which may be applied to the winding of said switch to prevent its operation whenever the circuit is connected at any point to the other side of the source of supply.

Signed at Cleveland, Ohio, this 19th day of September, A. D. 1910.

ARTHUR C. EASTWOOD.

Witnesses:

J. H. HALL,

H. M. DIEMER.