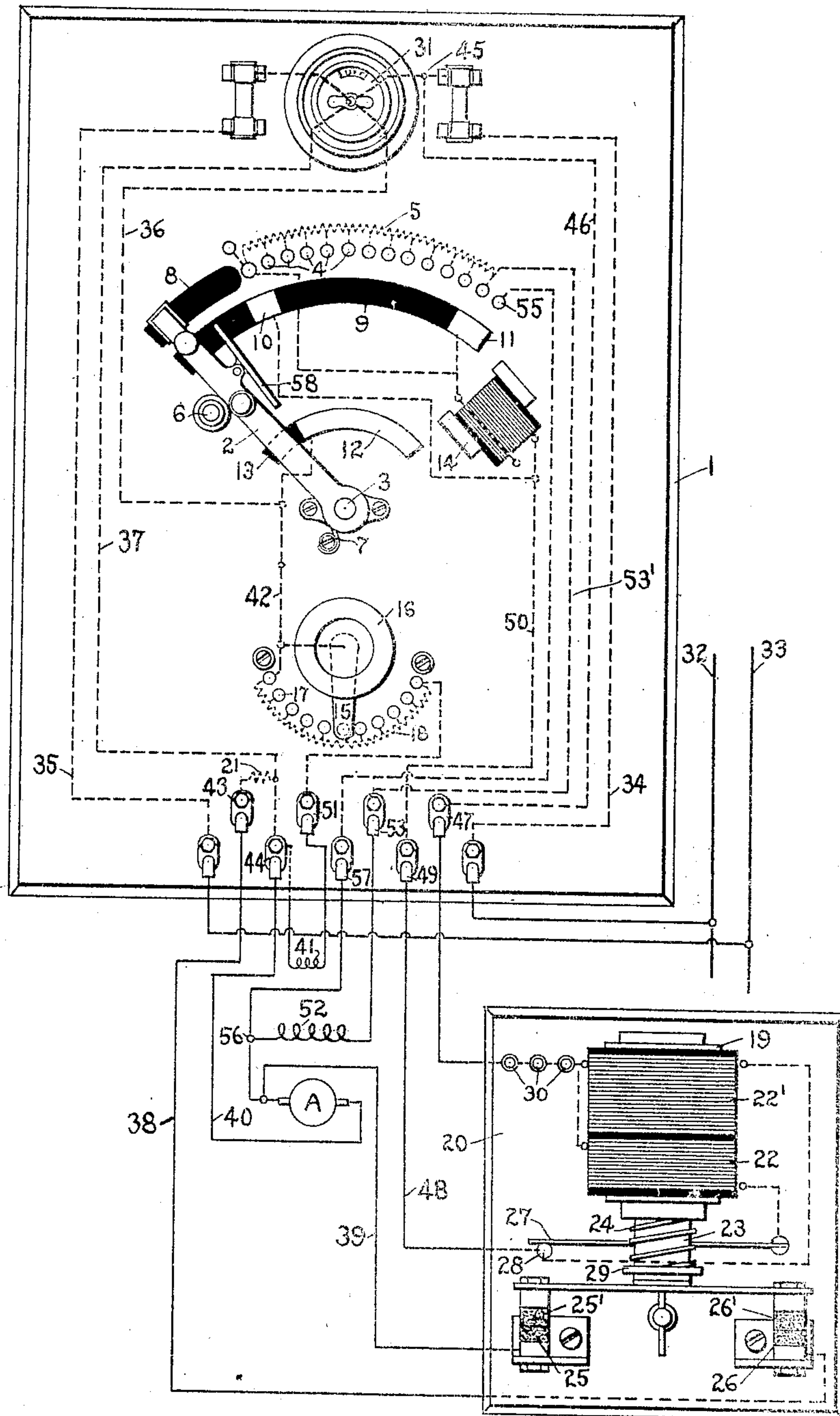


No. 854,727.

PATENTED MAY 28, 1907.

H. B. EMERSON & G. H. DORGELOH.
DEVICE FOR CONTROLLING ELECTRIC CURRENTS.
APPLICATION FILED OCT. 3, 1906.



WITNESSES
Irving E. Steers
J. M. Allen.

INVENTORS
HENRY B. EMERSON
GEORGE H. DORGELOH
by *Albush Davis*
Att'y

UNITED STATES PATENT OFFICE.

HENRY B. EMERSON AND GEORGE H. DORGELOH, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DEVICE FOR CONTROLLING ELECTRIC CURRENTS.

No. 854,727.

Specification of Letters Patent.

Patented May 28, 1907.

Application filed October 3, 1906. Serial No. 337,204.

To all whom it may concern:

Be it known that we, HENRY B. EMERSON, a citizen of the United States, and GEORGE H. DORGELOH, a subject of the Emperor of Germany, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Devices for Controlling Electric Circuits, of which the following is a specification.

This invention relates to devices for controlling electric circuits and has for its object the provision of a device of this character which will bring the motor up to running speed as well as quickly stop the same in a reliable, safe and efficient manner.

Our invention relates more specifically to starting devices for motors which, it is desired, shall be stopped very quickly and by a very simple operation, for instance as the push of a button. As a means for stopping the motor armature quickly, we employ a brake resistance which when suddenly thrown across the armature terminals with the motor field still on, will quickly bring the motor to rest.

In carrying out our invention, we provide in connection with a motor starter having the usual controlling arm biased to the starting position and a retaining magnet for holding same in running position, a brake resistance which is applied simultaneously with the release of the controlling arm. The brake resistance is normally applied to the motor armature, that is, it is "on" when the controlling arm is in the "off" or open circuit position. When the arm is moved so as to close the armature circuit, the latter is relieved of the brake resistance by a solenoid switch which keeps the circuit of the brake open until the push button is operated to stop the motor. The retaining magnet is likewise in circuit with the solenoid switch so that at the same time the resistance is applied the arm returns to the "off" position, the motor shunt field being on as the arm returns. We also preferably employ a motor having both a series and shunt field and so arrange the connections that when the arm is moved to running position, the series field is cut out of circuit. The provision of a series field in starting will make up for any weakening of the shunt field, so that it is not

necessary to interlock the field and armature controlling arms.

Various other objects of our invention and features of novelty will appear in the course of the following specification in which in connection with the drawing, we have shown a preferred embodiment of our invention.

Referring to the drawing, 1 represents an insulating base of slate, soap-stone or the like having mounted thereon a controlling arm 2 pivoted at 3 and having its outer end adapted to successively pass over and engage the contacts 4, forming terminals for the starting resistance 5. The arm is biased to the "off" position against the stop 6 by the spring 7, in which position the end of the arm rests on the insulating segment 8, forming a continuation of the studs 4. The brushes on the arm 2 are insulated therefrom so as to render the arm dead but they are electrically connected to each other in the usual way. A second insulating segment 9 having therein the metallic contacts 10 and 11, is arranged concentric with the studs 4, and the contacts 10 and 11 are situated so as to be radially in line with the first and last of the studs 4 respectively. A third conducting segment 12 is arranged concentric with the studs and the segment 9 which is engaged by the controlling arm, is provided with an insulating portion 13 which is engaged by the arm in the "off" position. A no-voltage magnet 14 is provided in the usual manner to retain the controlling arm in its running position. A second controlling arm 15 provided with an operating handle 16 is arranged to engage the studs 17 of the resistance 18. This resistance is preferably in series with the shunt field and is adapted to regulate the speed of the motor.

As a means for quickly stopping and otherwise controlling the motor, we provide a solenoid switch 19 mounted upon a separate base 20, although of course it is not essential that this switch be mounted independently of the rheostat. This solenoid switch controls the circuit of a brake resistance 21 which is normally connected across the armature terminals, and which is cut out of the armature circuit so as to relieve the latter by means of the switch. This solenoid switch comprises two coils or windings, the

lower coil 22 being the actuating coil and the upper one 22' the holding coil. When both coils are energized, they are sufficient to pull up the core 23 against the tension of a spring 24 so as to separate the fixed contacts 25 and 26 from the movable contacts 25' and 26' and open the circuit of the brake resistance.

In order to economize current and also simplify the control of the switch, we provide for the cutting out of the coil 22 when the switch is open, so that it is held open by the coil 22'. This is done by means of the spring arm 27 which engages the contact 28 to close the circuit of coil 22, but when the core 23 is moved upward a flange 29 of the core engages the spring 27 to open the circuit of the actuating coil, leaving only the holding coil in circuit which is sufficient to maintain the switch open. The circuit of the coil 22' is controlled by series of push buttons 30 arranged in series so that by pushing one of these buttons, the circuit is opened and the contacts 25' and 26' will drop into engagement with the corresponding contacts 25 and 26. These buttons likewise control the circuit of the retaining magnet 14 so that when any one of the buttons is pushed, the magnets 14 and 22' will be simultaneously de-energized.

The arrangement of circuits and the mode of operation is as follows: when the snap switch 31 is closed, the circuit is completed from the mains 32 and 33 through the conductors 34 and 35 respectively to the conductors 37 and 36 completing the circuit from conductor 37 to terminal 44 thence through shunt field 41 to terminal 51 through the regulating resistance 18, arm 15 and conductor 42 back to conductor 36. The brake resistance 21 is connected across the armature from terminal 43 and conductor 38 across contacts 25 and 26, conductor 39, armature A and conductor 40, thereby acting as a brake with the shunt field energized, to retard the movement of the armature. When, however, the arm 2 is moved to the right, it first engages the contact segment 12 and upon further movement engages the contact 10 and the first of the series of studs 4, closing the armature circuit. This also closes circuit through the two coils 22 and 22' of the solenoid switch 19 as follows: from the lead 34 at 45 to the conductor 46 and terminal 47 thence through push buttons 30, coils 22 and 22' in multiple to contact 28 thence through conductor 48, terminal 49, conductor 50, contact 10, arm 2, contact 12, conductor 36, conductor 35 and back to line. The switch 19 being energized, the circuit of the brake resistance is opened at contacts 25 and 26 and the circuit of coil 22 is opened at 28, and as the arm is moved to the right, cutting out resistance, the motor starts to rotate and gradually comes up to running speed. The direction

of current through the armature when the arm is moved on to the studs 4 is as follows: from conductor 37 to terminal 44, conductor 40, armature A, series field 52, terminal 53, conductor 53', resistance 5, arm 2, segment 12 and back to the line through conductor 36. The series field and shunt field are thus both energized, but when the arm 2 leaves the last one of the studs 4 and moves on to the stud 55, the series field is cut out so that the armature current instead of passing from the point 56 through the series field 52 to the last of the studs 4, it passes to terminal 57 and stud 55 thence to the arm 2. The series field is thus cut out and only the shunt field energized. The arm 2 will then be retained in running position in the usual way by the retaining magnet 14 and armature 58. When it is desired to stop the motor quickly, one of the buttons 30, which may be distributed at different points around the machine to be controlled, is pressed. This as before stated, simultaneously de-energizes the retaining magnet 14 and the holding coil 22', the former allowing the arm to return to the "off" position, while the latter closes the circuit of the resistance 21 and applies a brake to the armature, which will bring it to rest very quickly, the shunt field being all the time energized.

I have found that a device of this character is very convenient in controlling machines which must be stopped quickly from remote points, as for instance, a silk-loom or machines of a similar nature. The series field makes it unnecessary to always bring the field control arm back to the full-field position at starting so that the field control arm may be set for a certain position and left there. The applying of the brake resistance by means of a push button and at the same time de-energizing the retaining magnet makes a very desirable and convenient method of quickly stopping the motor.

It will be understood, of course, that many modifications of the above described arrangement will suggest themselves to those skilled in the art but it must be understood that we do not confine our invention to the specific construction and arrangement herein shown, except in so far as it is limited by the scope of the claims annexed hereto.

What we claim as new and desire to secure by Letters Patent of the United States, is,—

1. A starting rheostat comprising a controlling arm biased to the starting position, a no-voltage magnet for maintaining said arm in running position, a brake resistance, and means whereby said brake resistance is applied simultaneously with the de-energizing of the no-voltage magnet.

2. A starting rheostat comprising a controlling arm biased to the starting position, a no-voltage magnet for maintaining said arm in running position, a brake resistance and a

switch arranged to de-energize the no-voltage magnet and simultaneously apply the brake resistance.

3. A starting rheostat comprising a controlling arm biased to the starting position, a no-voltage magnet for maintaining said arm in running position, a brake resistance and a plurality of switches in series arranged to de-energize the no-voltage magnet and simultaneously apply the brake resistance.

4. A starting rheostat comprising a controlling arm biased to the starting position, a brake resistance normally applied to the motor armature, means for relieving the armature of said brake when the controlling arm is moved to close the motor circuit, a no-voltage magnet for retaining the arm in running position, and means for again applying the brake and simultaneously de-energizing the no-voltage magnet.

5. A starting rheostat comprising a controlling arm biased to the starting position, a brake resistance normally applied to the motor armature, means for relieving the armature of said brake when the controlling arm is moved to close the motor circuit, a no-voltage magnet for retaining the arm in running position, and a switch arranged to apply the brake and simultaneously de-energize the no-voltage magnet.

6. A starting rheostat comprising a controlling arm biased to the starting position, a brake resistance normally applied to the motor armature, means for relieving the armature of said brake when the controlling arm is moved to close the motor circuit, a no-voltage magnet for retaining the arm in running position, and a plurality of switches in series arranged to apply the brake and simultaneously de-energize the no-voltage magnet.

7. A starting rheostat comprising a controlling arm biased to starting position, a no-voltage magnet for maintaining said arm in running position, a brake resistance, an electromagnetic device controlling said resistance, and a series of switches each arranged to actuate said device and simultaneously de-energize the retaining magnet.

8. A starting rheostat comprising a controlling arm biased to starting position, a no-voltage magnet for retaining said arm in running position, a brake resistance, an electromagnetic device controlling said resistance having an actuating coil and a holding coil, means for de-energizing the actuating coil upon the movement of said device, and a switch arranged to de-energize the retaining magnet and the holding coil simultaneously.

9. The combination with an electric motor having series and shunt field windings, of means for starting the same comprising a controlling arm biased to the starting position, means for cutting out the series field winding when the arm reaches running position, and a no-voltage magnet for retaining the arm in running position.

10. The combination with an electric motor having series and shunt field windings, of means for starting the same comprising a controlling arm biased to the starting position, a no-voltage magnet for retaining the arm in running position, means for cutting out the series field winding when the arm reaches running position, a brake resistance and a switch arranged to de-energize the retaining magnet and simultaneously apply the brake resistance.

11. The combination with an electric motor having series and shunt field windings, of means for starting the same comprising a controlling arm biased to starting position, a no-voltage magnet for retaining the arm in running position, means for cutting out the series field winding when the arm reaches running position, a brake resistance normally applied to the motor armature, means for relieving the armature of said brake when the controlling arm is moved to close the motor circuit, and a switch arranged to de-energize the retaining magnet and simultaneously apply the brake resistance.

12. The combination with an electric motor having series and shunt field windings, of means for starting the same comprising a controlling arm biased to the starting position, means for cutting out the series field winding when the arm reaches running position, a no-voltage magnet for retaining the arm in running position, a brake resistance normally applied to the motor armature, means for relieving the armature of said brake when the controlling arm is moved to close the motor circuit, an electromagnetic device for controlling said resistance, having an actuating coil and a holding coil, means for de-energizing the actuating coil upon movement of said device, and a switch arranged to de-energize the retaining magnet and the holding coil simultaneously.

In witness whereof, we have hereunto set our hands this 2nd day of October, 1906.

HENRY B. EMERSON.

GEORGE H. DORGELOH.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.