M. W. DAY.

MOTOR CONTROLLING DEVICE.

APPLICATION FILED JULY 16, 1909.

1,011,757. Patented Dec. 12, 1911.

Fig. 1.

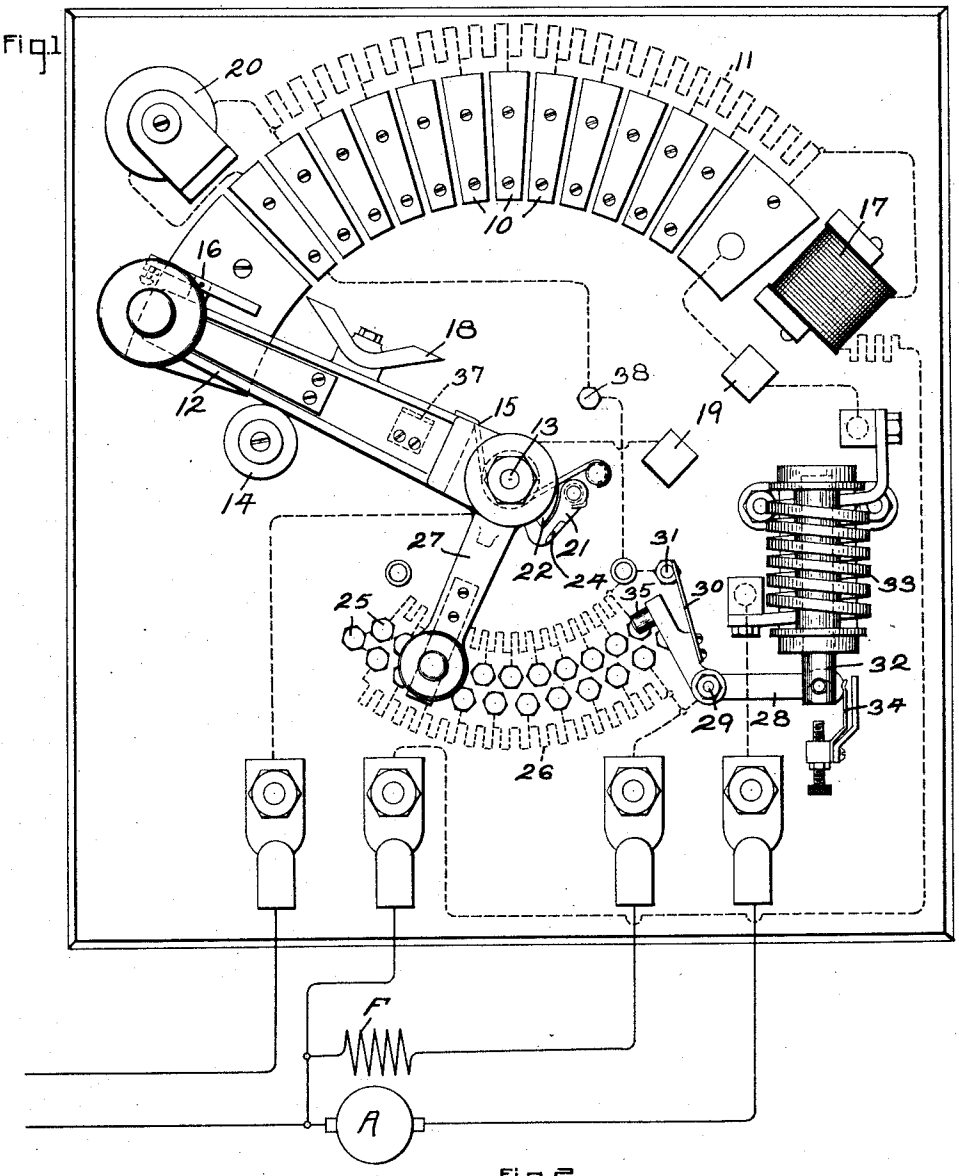
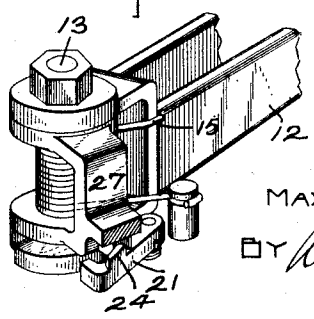


Fig. 2.



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UNITED STATES PATENT OFFICE.

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MOTOR-CONTROLLING DEVICE.

1,011,757. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed July 16, 1909. Serial No. 507,953.

To all whom it may concern:

Be it known that I, MAXWELL W. DAY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Motor-Controlling Devices, of which the following is a specification.

This invention relates to means for controlling dynamo electric machines and has for its object the provision of a device of this character whereby the control may be effected and complete protection against abnormal circuit conditions provided in a very simple and efficient manner.

My invention relates more specifically to devices for controlling electric motors.

One of the objects of my invention is to provide means whereby the speed of the motor may be automatically reduced upon the occurrence of abnormal circuit conditions, as, for instance, upon the occurrence of overload, without actually shutting down the motor, the arrangement being such that in order to again bring the motor up to its full running speed the parts must be returned to a protective position. In carrying out my invention I provide a speed regulating resistance which may be used in connection with a starting rheostat. The speed regulating resistance is controlled in any well-known manner. An auxiliary switch is provided for short circuiting this regulating risistance upon the occurrence of abnormal circuit conditions, as for instance, upon overload; that is, upon overload this switch will be closed and short circuit the resistance. In order to open this short circuit it will be necessary to bring the speed controlling member back to the position of lowest running speed. In connection with this speed regulating device I also provide a starting rheostat having no-voltage release features. The starting mechanism and speed regulating mechanism are so interlocked that the starting arm is normally locked in the starting position and is only unlocked when the speed controlling mechanism is moved to the position giving the lowest running speed.

Other objects and purposes of my invention will appear in the course of the following specification in which I have shown my invention embodied in concrete form for purposes of illustration.

In the accompanying drawing, Figure 1 represents a plan view of a panel embodying my invention and showing the circuit connections; Fig. 2 is a detail of the interlocking mechanism between the starting and speed regulating arms.

Referring to the drawing, 10 represents a series of contact segments forming terminals for the starting resistance 11 and 12 represents a controlling arm or member pivoted at 13 and normally biased to the off position against the stop 14 by means of a spring 15. This arm is provided with an armature 16 adapted to be engaged by the no-voltage magnet 17 which holds the arm in running position in a well-known manner. The bridging contact 18 is mounted on the arm so as to bridge the contacts 19 when the arm is in running position. The blow-out magnet 20 is arranged in the starting position for extinguishing any arc which may occur upon the opening of the circuit at the first contact. This starting arm is normally locked in the starting position shown in the drawing by means of a pivoted pawl 21 which is spring pressed into engagement with the shoulder 22 on the hub of the arm. This pawl is provided with a projection 24 for forcing the pawl out of engagement with the hub in a manner hereinafter described.

The speed regulating mechanism comprises a series of studs 25 arranged in two concentric rows forming terminals for the regulating resistance 26. This regulating resistance is arranged in series with the shunt field of the motor, although it is obvious that my invention is not limited to this particular mode of speed regulation. The speed controlling arm 27 is pivoted concentrically with the arm 12, so that its free end engages the contact studs and the arm may be left in any position. In some cases, as for instance, in the control of motors for operating blowers, it is desirable to provide a means for reducing the speed of the motor without actually shutting it down. In order to accomplish this result I provide a short circuiting switch. This switch comprises a bell crank lever 28 pivoted at 29 and provided at one end with a spring strip 30 arranged to engage a stud 31 to short circuit the resistance. At the opposite end the bell crank lever is pivoted to the core 32 of overload coil 33 in such a

manner that when the core is drawn upward through the occurrence of overload, the spring strip 30 is moved into engagement with the stud 31 to short circuit the resistance. If desired, the core may be held in its raised position by means of a spring 34 having a V-shaped portion engaging a similarly shaped slot in the end of the bell crank arm, as shown. The bell crank arm is provided with a projection 35 arranged to be engaged by the arm 27 when the latter is moved to its extreme right position, which is the position of lowest running speed. This arm 27 is also arranged to engage the projection 24 on the pawl 22 to force the latter out of engagement with the lug on the hub of arm 12.

The arrangement of circuits and mode of operation are as follows: Assuming the parts in the positions shown in Fig. 1 and it is desired to start the motor, it will be seen that the arm 12 is mechanically locked against movement. To unlock the arm the speed regulating arm 27 is moved to the right so as to throw out the pawl and at the same time open the short circuit on the resistance 26 at stud 31. With the arm 27 in the extreme right position, the starting arm may be moved over the segments 11 to start the motor in the regular way. The arm is held in running position by no-voltage magnet 17. In this position the circuit will be as follows: From the positive main to the pivotal point 13, across bridging contact 18 to the overload coil 33; thence through the armature A and back to the negative main, the no-voltage coil being connected across the line as shown. The motor is now running at its lowest running speed. To increase the speed of the motor, the arm 27 is moved to the left or in a clockwise direction. The short circuit on the resistance 26 is now opened since the core 32 is not drawn upward. The movement of the arm 27 to the left therefore cuts resistance in series with the shunt field and speeds up the motor. The circuit through the field F will now be from the positive main to the arm 12, contact 37, stud 38, through the resistance connected to the inner row of studs 25, insulated contact on controlling arm 27, thence through the resistance connected with the outer row of studs, through field F back to the negative main. The motor is now running at a speed dependent upon the position of the arm 27. If now the voltage should fail for any reason, the arm 12 will be returned to its position against the stop 14 and in this position will be locked by the pawl 22. In order to again start the motor, the arm 27 must be moved back to the full field position so that the motor can not be started upon a weakened field. If, however, while the motor is running at a speed above the lowest running speed, an overload occurs, the core 32 will be drawn up and the resistance in the field resistance short circuited by the spring contact 30 and stud 31. This will immediately reduce the speed to the lowest running speed. In order to again bring the motor up to the higher speed, it is necessary to turn the arm 27 to the full field position to open the short circuit. If the overload is no longer present, the short circuit will be left open and the speed can then be increased at will. When the overload disappears, however, the core does not drop to open the short circuit, since it is still held up by the magnetism of the core as well as by the spring 34. The short circuit is opened by returning the arm 27 to the full field position.

It will be seen that I have provided a very simple and efficient device for starting and regulating the speed of electric motors and providing protection against overload without actually shutting down. While I have described my invention as constructed in a specific manner and as operating in a definite manner, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. A controlling device for electric motors comprising a starting mechanism, a speed regulating rheostat functionally related thereto, electromagnetic means operating under abnormal circuit conditions for short circuiting the regulating resistance and means for opening said short circuit.

2. A controlling device for electric motors comprising a starting mechanism, a speed regulating rheostat functionally related thereto, electromagnetic means operating under abnormal circuit conditions for short circuiting the regulating resistance and means whereby said short circuit is opened by the movement of the controlling member to a predetermined position.

3. A rheostat comprising a resistance, a controlling member therefor, an electromagnetic device for short circuiting said resistance upon overload, means independent of said electromagnetic device for maintaining said short circuit, and means whereby said short circuit is opened by the movement of the controlling member to a predetermined position.

4. A controlling device for electric motors comprising a starting mechanism normally locked in starting position, a speed regulating resistance, a controlling member therefor, electromagnetic means operating under abnormal circuit conditions for short circuiting the resistance and means whereby

said short circuit is opened and the starting mechanism unlocked by the movement of the controlling member to a predetermined position.

5. A rheostat comprising a resistance, a controlling member therefor, an electromagnetic switch arranged to close upon the occurrence of overload to short circuit said resistance, means for locking said switch in closed position, and means whereby said switch is opened by the movement of the controlling member to a predetermined position.

6. A controlling device for electric motors comprising starting mechanism provided with no-voltage release features, a speed regulating rheostat functionally related thereto, an electromagnetic switch arranged to close upon the occurrence of overload to short circuit said resistance and means whereby said switch is opened by the movement of the controlling member to a predetermined position.

7. A controlling device for electric motors comprising starting mechanism provided with no-voltage release features and normally locked in starting position, a speed regulating rheostat functionally related thereto, an electromagnetic switch arranged to short circuit the regulating resistance upon the occurrence of overload and means whereby said switch is opened and the starting mechanism unlocked by movement of the rheostat in a predetermined position.

8. A controlling device for electric motors comprising starting mechanism provided with no-voltage release features, a field rheostat functionally related thereto, an electromagnetic switch arranged to close upon the occurrence of overload to short circuit the field resistance and means whereby said switch is opened by movement of the controlling member of the field rheostat to full field position.

9. A controlling device for electric motors comprising starting mechanism provided with no-voltage release features and normally locked in starting position, a field regulating rheostat, an electromagnetic switch arranged to short circuit the field resistance upon the occurrence of overload and means whereby said switch is opened and the starting mechanism unlocked by the movement of the controlling member of the field rheostat to full field position.

In witness whereof, I have hereunto set my hand this 14th day of July, 1909.

MAXWELL W. DAY.

Witnesses:
FRANK J. DORE,
HELEN ORFORD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."