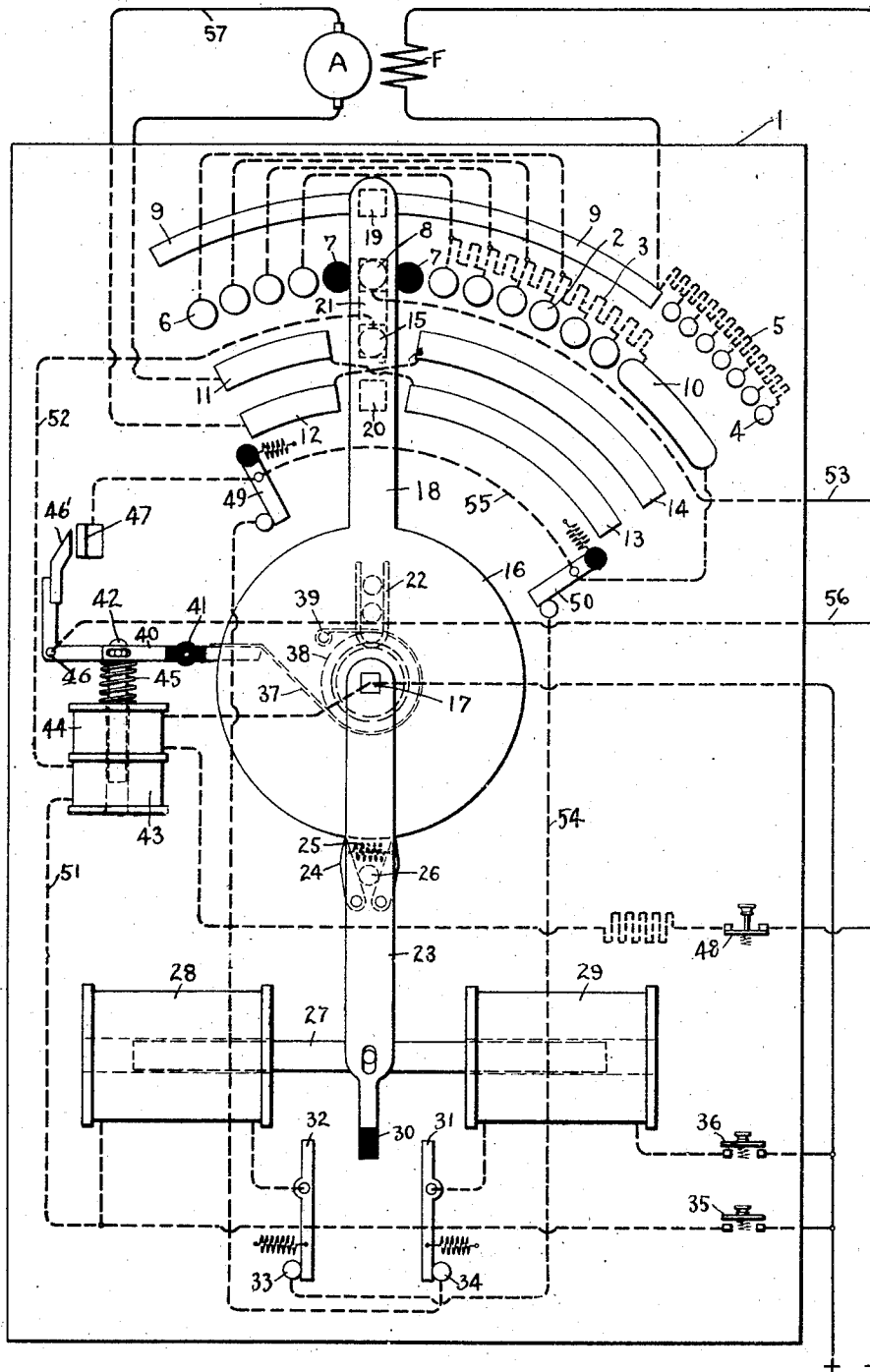


P. H. ZIMMER.
CONTROLLING DEVICE FOR ELECTRIC MOTORS.
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1,049,028.

Patented Dec. 31, 1912.



Witnesses:
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UNITED STATES PATENT OFFICE.

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CONTROLLING DEVICE FOR ELECTRIC MOTORS.

1,049,028.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PAUL H. ZIMMER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Controlling Devices for Electric Motors, of which the following is a specification.

This invention relates to means for controlling electric motor circuits and has for its object the provision of a device of this character whereby an electric motor may be stopped, started and generally controlled in a reliable and efficient manner.

My invention relates more specifically to devices for controlling motors from a remote point, as for instance by the operation of push buttons or switches located at convenient points. Starting devices of this type are of particular service in connection with the operation of printing presses.

One of the objects of my invention is to provide a controller of this type which may be operated step by step in either direction so as to either accelerate or retard the speed of the motor, the arrangement being such that the motor may be maintained at any desired speed. I also provide means whereby the motor may be instantly stopped and the controlling mechanism brought back to starting position.

In the accompanying drawing I have shown my invention embodied in concrete mechanism; the arrangement of circuits being likewise shown in the drawing.

Referring to the drawing, 1 is a base or panel board of insulating material, which is slate or soapstone, having mounted thereon a series of contact studs 2 forming terminals for armature resistance 3, and a series of studs 4 forming the terminals of field resistance 5. A plurality of reversing studs 6 are arranged concentrically with studs 2 and are cross-connected with the armature resistance as shown. These studs 6 are separated from the studs 2 by insulating studs 7 and a conducting stud 8. Contact segment 9 is arranged concentrically with the studs 5 and segment 10 is similarly arranged with reference to the studs 2. Conducting segments 11, 12, 13 and 14 are arranged as shown cross-connected for purposes hereinafter set forth, contact stud 15 being located between segments 11 and 14. An operating wheel or disk 16 pivoted at

17 has projecting therefrom a controlling arm or member 18 adapted to cooperate with the aforesaid contacts. This arm is provided with a contact 19 electrically connected therewith for engaging the segment 9 and studs 4, and a similarly arranged contact 20 for engaging the contact segments 12 and 13. A bridging contact 21 is mounted upon the arm, but insulated therefrom so as to bridge the studs, 6, 8 and 2, as well as the segment 10 with the segments 11 and 14 and stud 15. The disk 16 is biased to the position shown in the drawing by means of a double-acting spring 22. An actuating arm 23 is pivoted at 17 and has pivoted thereto pawls 24 having their free ends spring-pressed together by means of a spring 25. These pawls are normally spring-pressed against the pin 26 secured to the slate base. The free ends of the pawls are tapered as shown and arranged to engage the edge of the disk 16, the surface of which may be prepared in any desired way so as to offer a good gripping surface for the pawls. The arrangement is such that when the arm is moved in either direction the pawl arranged on the side of the arm toward which the arm is moved will engage the disk and move the same while the other pawl will be moved away from the disk by the pin 26 and the spring 25 placed under tension. The arm 23 has a pin and slot connection with the core 27 which cooperates at either end with the solenoids 28 and 29. The arm 23 has an insulating projection 30 adapted to engage the switch arms 31 and 32 which are spring-pressed to the position shown against the conducting pins 33 and 34 respectively. These switches control the circuits of the solenoids 28 and 29 so as to give the arm 23 a vibratory movement, which in turn advances the disk 16 step by step in either direction depending upon which one of the solenoids is energized. The solenoid 28 is controlled by a normally open switch or push button 35 while solenoid 29 is controlled by a similarly arranged push button 36.

In order that the controlling arm 18 may be left in any intermediate position during normal operation I provide means whereby the arm may be relieved of the spring tension or bias. This is done by counteracting the effect of the spring by means of a band brake 37 engaging a brake wheel 38 se-

cured to the under side of the disk 16. This band brake has one end secured to the base at 39 and its opposite end is secured to a bell-crank lever 40 pivoted at 41. This lever is actuated by means of a core 42 operated by a solenoid having an actuating coil 43 and a holding coil 44. The core 42 is likewise connected with a bell crank lever pivoted at 46 and having a contact 46' at its free end cooperating with the fixed contact 47 to close the armature circuit. The lever 40 is pressed to the position shown by means of the spring 45. The holding coil 44 is controlled by a normally closed switch or push button 48, and a pair of limit switches 49 and 50 are arranged at the limit of travel of the arm 18 in either direction so as to automatically interrupt the circuit of the solenoids.

The arrangement of circuits and mode of operation are as follows: When it is desired to start the motor in either direction, push button 35 is pressed whereupon the arm 18 is given a step by step motion in a clockwise direction over the studs 2. When the switch 35 is closed the actuating coil 43 is energized through the conductors 51 and 52, stud 15, bridging contact 21, stud 8 and conductor 53 back to the negative main. The holding coil 44 is connected across the line through button 48 as shown. Coils 43 and 44 being energized the lever 40 is actuated whereupon the band brake 37 is applied to the brake wheel 38, the tension being just sufficient to overcome the tension of the spring 22. At the same time the circuit of solenoid 28 is closed at the contacts 46' and 47, the circuit of the solenoids being as follows: from the positive main, solenoid 28, switch arm 32, conductor 54, limit switch 50, conductor 55, contacts 46' and 47, conductor 56 and back to the negative main. The arm 18 is thus moved step by step in a clockwise direction, the circuit of the solenoid 28 being opened and closed as above described at pin 33 each time the arm 23 is moved far enough for the projection 30 to engage switch 32. When the arm 18 is moved so that the contact 20 engages the segment 13, the armature circuit is closed as follows: from the positive main to the pivotal point 17, segment 13, segment 11 through armature A, conductor 57, segments 12 and 14, bridging contact 21, resistance 3, conductor 55, contacts 46' and 47, conductor 56 and back to the negative main. As long as the push button 35 is closed the arm 18 will continue to move over the studs 2 to cut out armature resistance and thereby speed up the motor. When the switch 35 is opened the arm will remain where it is left so that the motor can be run at any speed desired. To operate the arm 18 in a counter-clockwise direction in a step by step movement, push button 36 is pressed where-

upon solenoid 29 is energized and the mechanism operates as above described. If the arm is moved in a counter-clockwise direction on to the studs 6, the motor will be reversed but in order to reverse from the "off" position of the controlling arm the push button 35 which combines the function of a "starting" button with that of a "forward" button, must first be pressed and then released. If the arm 18 is moved beyond the studs 2, it will engage the studs 4 of the field resistance and by cutting resistance into the field F the speed of the motor will be further increased. If the arm be in any position on either side of the central or normal position, the motor may be quickly stopped and the arm brought to the normal position by pressing button 48. This will deenergize the holding coil 44 which will open the armature circuit at 46 and 47, and at the same time release the band brake from the disk 16, which will immediately return in response to the spring tension to its normal position. When the arm is moved to the limit of its travel in either direction, the circuit will be opened at the limit switches 49 and 50 and the arm will remain in this position until one of the other buttons is operated to return it.

It will thus be seen that I have provided a simple and efficient mechanism whereby the speed of the motor in either direction may be controlled throughout a wide range by simply operating push buttons arranged at a distance from the controlling mechanism. The arm may be moved in either direction step by step and when it is desired will be returned quickly in response to the spring to starting position. Furthermore the armature circuit cannot be closed until the controlling arm is in the starting position.

While I have described my invention in connection with a specific structure and mode of operation, it should be understood that I do not limit my invention in these particulars except in so far as it is limited by the scope of the claims annexed hereto.

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 resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member in two directions to vary the resistance, and electrically controlled means whereby the effect of said bias is counteracted and the member left movable in either direction.

2. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member in two directions to vary the resistance, and an electromagnetic device ar-

ranged to counteract the effect of the bias of said member and simultaneously energize said operating means.

3. A controlling device for electric motors comprising a resistance, a controlling member therefor, electromagnetic means for operating said member in two directions to vary the resistance, and an electromagnetic device arranged to close the motor circuit through said resistance and simultaneously counteract the effect of the bias on said member.

4. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member in two directions to vary the resistance, and an electromagnetic device arranged to counteract the effect of the bias on said member and simultaneously close the motor circuit through the resistance and energize the operating means.

5. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member to vary the resistance and an electromagnetic device arranged to counteract the effect of the bias on said member and simultaneously close the motor circuit through the resistance and energize the operating means.

6. A controlling device for electric motors comprising a resistance, a controlling member therefor having a bias to an initial position, electromagnetic means for operating said member in two directions to vary the resistance, an electromagnetic device arranged to close the motor circuit through said resistance and simultaneously counteract the effect of the bias on said member, and a normally-closed switch for controlling said device.

7. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member in two directions to vary the resistance, an electromagnetic device arranged to counteract the effect of the bias on said member and simultaneously energize said operating means, and a normally-open switch controlling said device.

8. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetic means for operating said member to vary the resistance, an electromagnetic device arranged to counteract the effect of the bias on said member, and a normally-open switch controlling said device and said operating means.

9. A controlling device for electric motors comprising a resistance, a controlling member therefor, electromagnetic means for

operating said member in two directions to vary the resistance, an electromagnetic switch arranged to close the motor circuit through said resistance having an actuating coil and a holding coil, and a normally-open switch controlling said actuating coil and the operating means.

10. A controlling device for electric motors comprising a resistance, a controlling member therefor having a bias to an initial position, electromagnetic means for operating said member to vary the resistance, an electromagnetic device having an actuating coil and a holding coil arranged to close the motor circuit through said resistance and simultaneously counteract the effect of the bias on said member, and a normally-open switch controlling said actuating coil and said operating means.

11. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetically-actuated mechanism for operating said member step by step in two directions to vary the resistance, an electromagnetic device arranged to counteract the effect of the bias on said member, and a switch for controlling said device and said operating means.

12. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetically-actuated mechanism for operating said member step by step to vary the resistance, an electromagnetic device arranged to counteract the effect of the bias on said member and simultaneously close the motor circuit through said resistance, and a switch for controlling said device and said operating means.

13. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetically-actuated mechanism for operating said member step by step to vary the resistance, an electromagnetic device having an actuating coil and a holding coil arranged to counteract the effect of the bias on said member and simultaneously close the motor circuit through said resistance, and a normally-open switch for controlling said operating means and said actuating coil.

14. A controlling device for electric motors comprising a resistance, a controlling member therefor biased to an initial position, electromagnetically-actuated mechanism for operating said member step by step in two directions to vary the resistance, an electromagnetic device having an actuating coil and a holding coil arranged to counteract the effect of the bias on said member and simultaneously close the motor circuit through said resistance, a normally-open switch for controlling said operating means

and said actuating coil, and a normally-closed switch for controlling the holding coil.

5 15. A controlling device for electric motors comprising a resistance controlling member, electromagnetic means for operating the same in two directions, a switch for energizing said means in each direction, and
10 a stopping switch for returning the member to initial position independently of the other switches.

16. A controlling device for electric motors comprising a resistance controlling member, electromagnetic means for operat-

ing the same in two directions, a switch for 15 energizing said means in each direction, and a stopping switch for returning the member to initial position independently of the other switches, said switch after it has once
20 been operated having no further control over the member.

In witness whereof, I have hereunto set my hand this 8th day of April, 1908.

PAUL H. ZIMMER.

Witnesses:

HELEN ORFORD,

BENJAMIN B. HULL.

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