W. C. YATES.

RHEOSTAT.

APPLICATION FILED JULY 18, 1907.

958,457. Patented May 17, 1910.

Fig. 2.

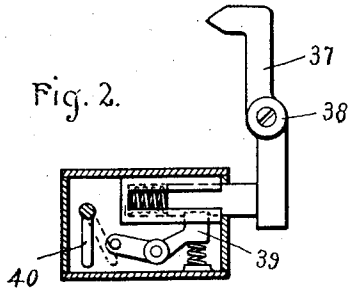
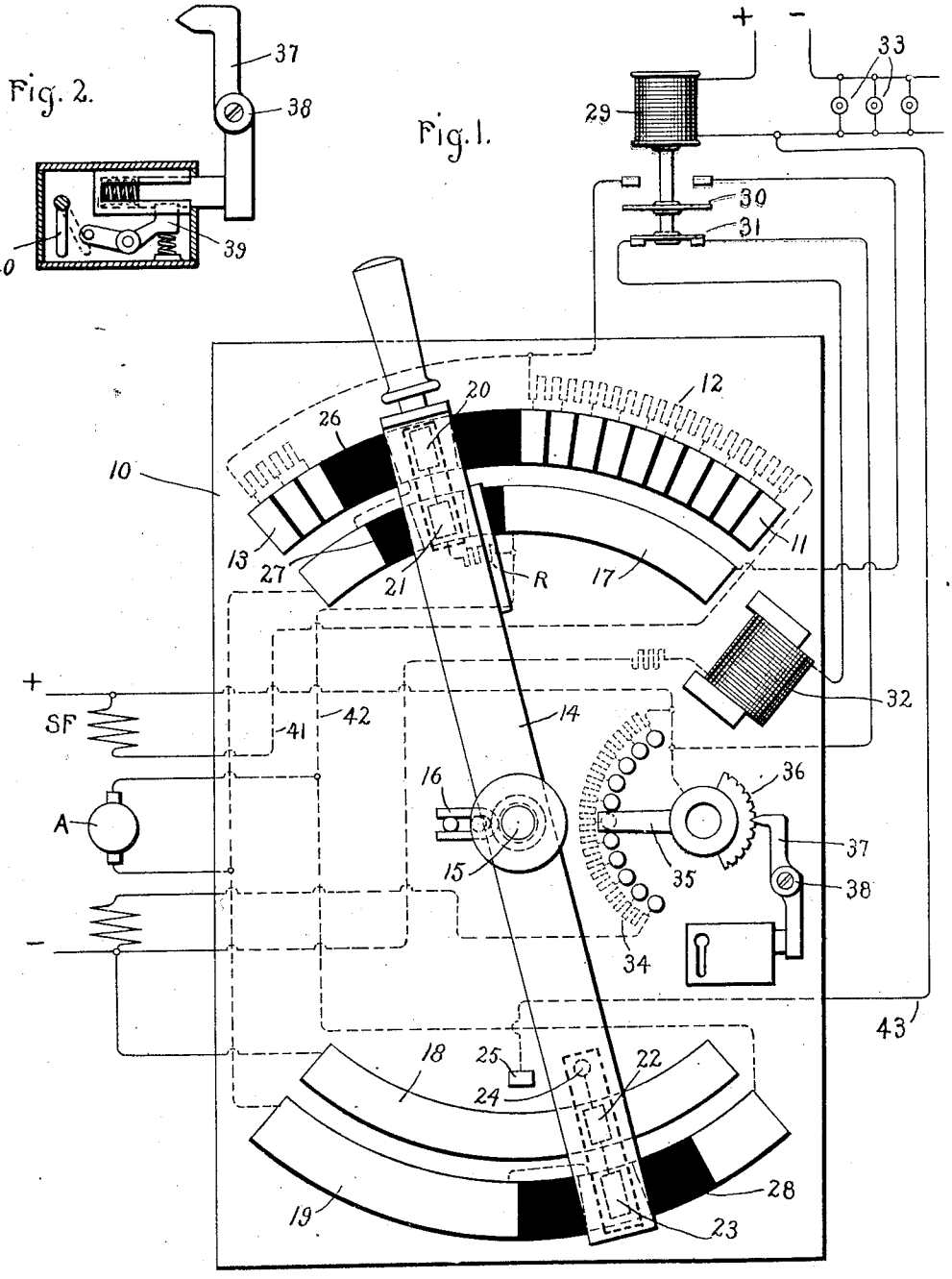


Fig. 1.



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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

959,457. Specification of Letters Patent. Patented May 17, 1910.

Application filed July 18, 1907. Serial No. 384,422.

To all whom it may concern:

Be it known that I, WILLIAM C. YATES, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Rheostats, of which the following is a specification.

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

My invention relates more particularly to means for controlling motors of the type adapted to be run at a low speed in addition to the normal running speed, and which it is desired shall be started and stopped quickly when running at full speed. This type of control is commonly used in connection with printing-presses in which it is desirable that means be provided whereby the motor may be "jogged" along at a low speed. This jogging is preferably and usually accomplished by having switches arranged at definite points around the press. In my Patent No. 857,142 I have disclosed a controlling device of this type in which the motor may be jogged along from points around the press with the starting arm in the off position. I have found, however, that the operator frequently will not take the trouble of going to one of the control switches or buttons in order to jog the motor along but will use the controlling handle. The result is that the starting contact segments are frequently injured by arcing.

In carrying out my invention I provide in connection with a controlling device of the type above described, an electromagnetic switch which is so arranged that the motor circuit is broken upon its contacts. This switch is energized as the controlling arm is moved toward running position before the starting resistance is substantially varied. This switch is in parallel with the controlling arm so that it closes the armature circuit just before the resistance controlling arm closes it. Upon its return therefore it will again be in parallel and will open the circuit last. This electromagnetic switch likewise controls the circuit of the no-voltage retaining magnet and is controlled by push buttons so that the latter in addition to jogging the press along will operate to de-energize the no-voltage magnet and stop the motor at any time. I also provide means in connection with the speed control of the motor whereby the mechanism may be locked against movement and the key removed so that the limits of speed at which the motor is run are not under immediate control of the operator.

In the accompanying drawing in which I have shown my invention embodied in a concrete form, Figure 1 is a plan view of the device showing the circuit connections; and Fig. 2 is a detailed view of the locking mechanism.

Referring to the drawing, 10 is a supporting base preferably of some insulating material, such as slate or soapstone, upon which are mounted in the arc of a circle starting segments 11 forming the terminals of starting resistance 12 and the reversing segments 13 similarly arranged. The resistance varying arm 14 pivoted at 15 is spring-pressed to the position shown in the drawing by means of the double actuated spring 16.

Segments 17, 18 and 19 are arranged as shown for purposes hereinafter described, and brushes 20 and 21 on one end of the arm and insulated therefrom and brushes 22 and 23 similarly mounted on the opposite end of the arm engage these segments. Brushes 20 and 21 are electrically connected together as likewise are brushes 22 and 23, the latter being also connected with a brush 24 arranged to engage a contact 25 when the arm is moved toward running position. When the controlling arm 14 is in the normal or off position, shown in the drawing, the brushes 20, 21, 22 and 23 are in engagement with the conducting portions of the segments. Brushes 20, 21 and 23, when moved in either direction, pass on to insulating portions 26, 27 and 28, respectively, before again passing on to the conducting portions.

An electromagnetic switch comprising a solenoid 29 operating bridging contacts 30 and 31 is located at any desired point. Contact 30 controls the main armature circuit and the circuits are so arranged that it is in parallel with the resistance controlling switch or arm. The contact 31 controls the circuit of retaining magnet 32 so that when the solenoid 29 is energized the circuit of the retaining magnet is opened and the motor circuit closed. A plurality of normally-open switches or push buttons 33 control the

circuit of the solenoid 29, which solenoid is likewise controlled through the brush 24 and contact 25. The speed-controlling resistance 34, which is preferably in the shunt field circuit, is varied by means of a contact arm 35. In order to lock this arm in any desired position, I provide a toothed segment 36 which is engaged by a pawl or latch 37 pivoted at 38. This latch is locked in place by means of a spring-pressed detent 39 engaging a slot in the latch, and a key 40 is arranged to move the detent and release the latch so that the resistance arm may be turned to vary the speed as desired.

The arrangement of circuits and the mode of operation are as follows: With the parts in the position shown in the drawing, the motor can be jogged along by closing any one of the switches 33. This will energize solenoid 29 which lifts contact 30 and the motor circuit will be closed through resistance 12 as follows: from the positive main through series field SF, conductor 41, resistance 12, contact 30 to conducting segment 17 thence through conductor 42, armature A, to brush 23 across to segment 18 and back to the negative main. At the same time the resistance R is connected in shunt to the motor armature to cause a quick stopping and a slow running of the armature. By opening and closing the switches 33 the motor may be stopped and started through starting resistance 12 and will thus run at a slow speed. When it is desired to bring the motor up to normal running speed, the arm 14 is moved to the right. As soon as the brush 21 engages segment 17, brush 24 will engage contact 25, and the solenoid will be energized as follows: from the positive main, solenoid 29, conductor 43, brush 24, segment 18 back to the negative main. This will attract bridging contact 30 so that the main armature circuit will be closed in the same manner as if one of the switches 33 had been pressed, all of the resistance 12 being in circuit. By moving the arm farther, the brush 20 engages the first of segments 11 and the two brushes 20 and 21 will thus be in parallel with the contact 30. The brush 24, however, passes off of contact 25 immediately and deënergizes solenoid 29, allowing the contact 30 to drop. The armature circuit is now closed from the contact segments 11 across to the contact segment 17 through the connection on the controlling arm instead of across the bridging contact 30. By continuing the movement the arm is brought to running position in engagement with the magnet 32, and the motor reaches normal running speed. To stop the motor quickly, one of the switches 33 may be closed to open the circuit of retaining magnet 32. The controlling arm will thereupon return to the off position. By then again opening the switch 33, the circuit will be broken on the contact 30. If, however, the switch 33 should be opened immediately after the retaining magnet is deënergized and before the controlling arm reaches the off position, the solenoid 29 will again be energized just before the arm reaches the off position by the engagement of the brush 24 with the contact 25. This will pull up bridging contact 30 and again let it drop so as to open the circuit on this contact. It is not, however, essential that the circuit opens on the contact 30 when the motor is stopped from full running speed or upon failure of voltage. The particular function of this bridging contact is to make and break the circuit when the motor is jogged along by means of a controlling arm. The running speed of the motor may be varied by unlocking the latch 37 and shifting the controlling arm so as to vary the field resistance. The key will be in the hands of the foreman or superintendent and the operator must therefore always run the motor at the speed at which it has been set.

It will be seen that I have provided a very simple and efficient means for operating motors at different speeds and at the same time protecting the contacts from being burned because of the careless handling of the operator. The motor may also be stopped from remote points irrespective of the position of the controlling arm and it may be started from remote points when the controlling arm is in the off position so as to run the motor at a low speed.

It will be understood, of course, that various modifications of my invention 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 starting rheostat comprising a resistance varying switch, an electromagnetic switch in parallel therewith, and means whereby said latter switch is closed when the resistance switch is moved toward running position.

2. A starting rheostat comprising an electromagnetic circuit closing switch, a resistance varying switch arranged to vary the resistance independently of the electromagnetic switch, and means whereby the electromagnetic switch may be closed and opened by a continuous movement of the resistance varying switch without substantially varying the resistance.

3. A starting rheostat comprising a resistance varying switch, an electromagnetic switch in parallel circuit therewith, and means whereby said latter switch may be opened and closed by the movement of the resistance switch without substantially varying the resistance.

4. A starting rheostat comprising a resistance varying switch, an electromagnetic switch in parallel therewith, and means whereby said latter switch is closed by the initial movement of the resistance switch without substantially varying the resistance and opened by the further movement of said switch.

5. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in parallel circuit with said resistance switch and controlling the circuit of the no-voltage magnet, and connections whereby the movement of the resistance switch controls the electromagnetic switch.

6. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in circuit with said resistance switch, and means whereby said magnetic switch is closed and the no-voltage magnet deënergized by the movement of the resistance switch toward running position.

7. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in parallel circuit with said resistance switch, and means whereby said magnetic switch is closed and the no-voltage magnet deënergized by the movement of the resistance switch toward running position.

8. A starting rheostat comprising a resistance varying switch, an electromagnetic switch in parallel circuit therewith, means whereby said latter switch is closed when the resistance switch is moved toward running position, and means independent of the resistance switch for controlling the electromagnetic switch.

9. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in circuit with said resistance switch, means whereby said magnetic switch is closed and the no-voltage magnet deënergized by the movement of the resistance switch toward running position, and means independent of the resistance switch for controlling the magnetic switch.

10. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in parallel circuit with said resistance switch controlling the circuit of the no-voltage magnet, connections whereby the movement of the resistance switch controls the electromagnetic switch, and means independent of the resistance switch for controlling the electromagnetic switch.

11. A starting rheostat comprising a resistance varying switch biased to the starting position, a no-voltage magnet for retaining the same in running position, an electromagnetic switch in parallel circuit with said resistance switch controlling the circuit of the no-voltage magnet, connections whereby the movement of the resistance switch controls the electromagnetic switch, and a normally-open switch for controlling the electromagnetic switch independently of the resistance switch.

12. The combination with a motor, of a starting rheostat therefor, an electromagnetic switch arranged to control the motor through the starting resistance with the starting arm in the off position, and connections whereby said switch is actuated to close the motor circuit when the arm is moved toward running position.

13. The combination with a motor, of a starting rheostat therefor, an electromagnetic switch arranged to control the motor through the starting resistance independently of the starting arm, a no-voltage magnet controlled by said electromagnetic switch, and connections whereby said switch may be opened and closed by a movement of the starting arm which does not substantially vary the resistance.

14. The combination with a motor, of a starting switch therefor, an electromagnetic switch arranged to control the motor through the starting resistance with the starting arm in the off position, connections whereby said switch may be opened and closed by moving the starting arm without substantially varying the resistance, and a switch for controlling the electromagnetic switch independently of the resistance switch.

In witness whereof, I have hereunto set my hand this 17th day of July, 1907.

WILLIAM C. YATES.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.