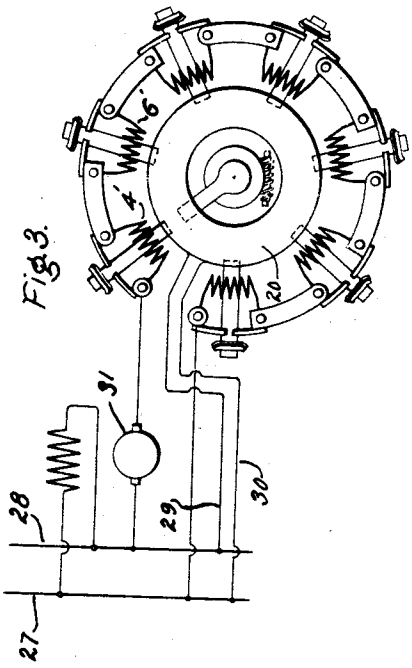
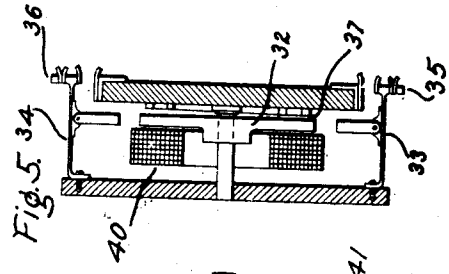
No. 867,475. PATENTED OCT. 1, 1907.

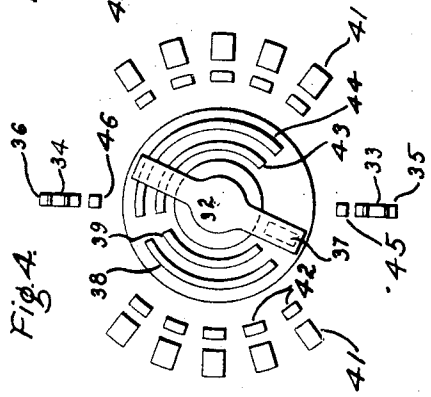
E. R. CARICHOFF.

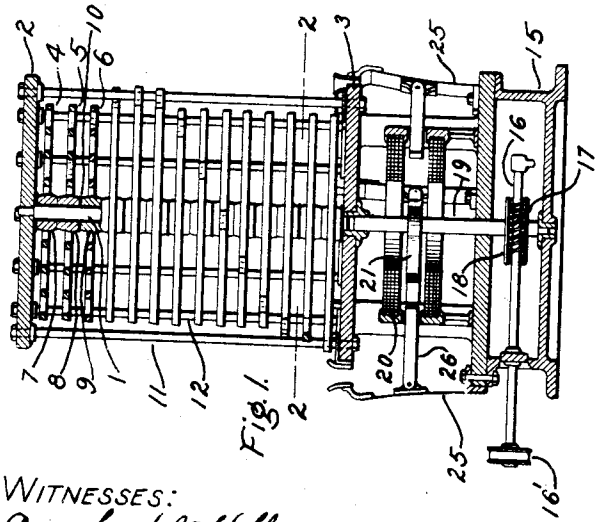
MOTOR STARTING RHEOSTAT.

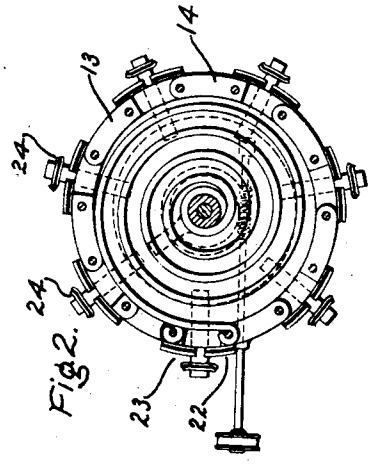
APPLICATION FILED MAY 25, 1905.











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UNITED STATES PATENT OFFICE.

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MOTOR-STARTING RHEOSTAT.

No. 867,475. Specification of Letters Patent. Patented Oct. 1, 1907.

Application filed May 25, 1905. Serial No. 262,172.

To all whom it may concern:

Be it known that I, EUGENE R. CARICHOFF, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Motor-Starting Rheostats, of which the following is a specification.

This invention relates to circuit-controlling devices and has for its object the provision of a new and improved controller which is simple and inexpensive but which at the same time is thoroughly reliable and efficient, and which is capable of withstanding the careless handling to which this type of apparatus is frequently subjected.

Heretofore it has been the practice in the design of devices for controlling motors to arrange resistance units in series having a controlling arm mounted for movement in a predetermined direction to successively cut out the resistance. There being only one position of the arm in which all of the resistance is in circuit, it is always necessary in starting a motor to have the arm in this predetermined position when the circuit is closed. I have found that in certain classes of work it is desirable to have a controller in which it is not necessary to move the arm to a predetermined position before starting, and in carrying out my invention I have provided a controller of this type, in which any position which the arm happens to occupy when the motor circuit is closed, will have all of the resistance in circuit and movement in either direction from this point will cut out resistance. I have also provided an improved resistance unit of the spiral-grid type, the arrangement being such that no flexible conductors are necessary. Moreover, my arrangement of resistances provides a controller which is thoroughly ventilated without sacrificing any of the desirable or essential features of this type of apparatus.

My invention further consists in the details of construction and in the combination and arrangement of elements hereinafter set forth and particularly pointed out in the claims appended to and forming a part of this application.

In the drawings, Figure 1 is a sectional elevation of a device embodying my improvements; Fig. 2 is a sectional view taken on line 2 2 of Fig. 1; Fig. 3 is a diagrammatic representation of the device showing the circuits; Fig. 4 shows in a conventional manner my improvement applied to a series-parallel controller; and Fig. 5 is a section of a controller of this character.

Referring to the drawing, 1 represents a shaft fixedly mounted between the plates 2, 3. A series of resistances 4 5 6, etc., are mounted upon this shaft but insulated therefrom. These units are resistance conductors, cast or otherwise formed into a spiral. I prefer, however, to have them cast into what are commonly known as grids, having enlarged hubs 7 8 9, etc., at their inner ends. These grids are arranged in pairs, the hubs of each pair being in electric contact while the pairs themselves are insulated from each other as at 10. A series of rods 11, 12, etc., are also secured between and insulated from the plates 2, 3 and serve as an additional support for the same. A rod is provided for each grid. The outer extremity of each spiral is supported by and in electrical contact with one of these rods which are also connected in pairs by means of brackets 13, 14, etc., forming fixed connections between the pairs of grids.

The mechanism whereby the pairs of grids are successively short-circuited is as follows: On the base 15 is mounted a shaft 16 provided with a worm 17 engaging a worm-wheel 18 upon a shaft 19. A circular magnet coil 20 is mounted upon the top of the base 15, concentrically with shaft 19, and an armature 21 is mounted upon shaft 19 to rotate within coil 20. The rods 11 and 12 are provided with contacts 22, 23, etc., and a series of contactors 24 upon spring-arms 25 secured to the base 15 are arranged opposite these contacts but normally out of engagement therewith. An iron core 26 is pivoted to each spring-arm 25 so as to enter the coil 20. As this core 26 is drawn within the coil, contactor 24 is drawn up and bridges the contacts 22, 23, thereby short-circuiting the pair of grids, having terminals at these contacts. The coil 20 is normally energized and has sufficient strength to hold the contactor 24 in a short-circuiting position when it has once been drawn in. As the armature 21 is moved around within the coil 20 by means of pulley 16′, the magnetic circuit in the neighborhood of the armature is so improved as to be able to attract the core opposite thereto and draw in the contactor, which, having once been drawn in, remains in this position until the circuit of the magnet is broken.

Referring to the diagram of circuits in Fig. 3, 27 and 28 represent the mains leading from a generator. Coil 20 is connected in parallel with the motor armature 31 through wires 29 and 30. When the motor-circuit is closed the current passes from main 28 to armature 31, through resistance units 4′, 6′, etc., back to the line, the coil 20 being simultaneously energized. When now the armature 21 is moved opposite to one of the contactors, the resistance having terminals at the contacts opposite the same will be short-circuited or cut out of circuit and by turning the armature around on its axis the resistances will be successively cut out. By this arrangement it will be seen that it is not necessary to move the armature to a starting point before closing the motor-circuit since normally all the resistance is in when the circuit is open. Moreover, as the contacts merely short-circuit the resistances, any one may be closed first upon starting the motor and no off position is necessary.

In the arrangement shown in Figs. 4 and 5, the armature 32 is pivoted at its center and mounted so as to simultaneously attract two contactors 33 and 34. Normally, the contactors will be in the position shown in the drawing, making contact at 35 and 36, and the motors and resistances will be in series as in the well-known series-parallel system of control. As the armature 32 is moved in clockwise direction, the brush 37 bridges the rings 38 and 39 to energize the coil 40. The successive sections of resistance are then cut out as the armature moves around to the right, in the manner described above with reference to Figs. 1 to 3, the contactors 41 being drawn to make contact at 42. When the armature passes the last of the contacts 42, the brush passes off of the rings 38 and 39, the coil is demagnetized and the resistance is again thrown into circuit. The brush now passes on to the rings 43, 44 and again energizes the coil, and as it passes opposite the contactors 33 and 34, the latter are drawn in and contact is made at 45 and 46, which throws the machines into parallel arrangement. As the arm continues its movement, resistance is again cut out until the motors are finally in parallel with no resistance in circuit.

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

1. A controller for electric motors, comprising a plurality of resistance units and contacts for varying the circuit arrangements thereof, a movable element coöperating with said contacts, and means whereby the said contacts may be successively operated to start the motor by moving said element from any position as a starting point.

2. A circuit controller, comprising a plurality of resistance units arranged in series, a short-circuiting device for each of said units, a movable controlling element, and means whereby said devices may be successively operated to cut out said resistance units by moving said element from any position as a starting point.

3. A circuit controller, comprising a plurality of resistance units arranged in series, circuit-closers for independently short-circuiting each of said units, a movable controlling element for electro-magnetically operating said closers successively to cut out said units, and electromagnetic means for maintaining the same in a closed position independently of said element.

4. A circuit controller, comprising a plurality of resistance units arranged in series, a normally open short-circuiting device for each of said units, an electromagnet arranged to maintain said devices in a closed position, and an armature coöperating therewith mounted for movement into operative relation with said devices to electromagnetically close the same.

5. A circuit controller, comprising a series of resistances and short-circuiting switches therefor, means for successively operating the same comprising an electromagnet arranged to hold the switches closed, and an armature within the field thereof mounted for movement to electromagnetically influence said switches to operate the same.

6. A controller for electric circuits comprising a plurality of resistance units arranged in series, each composed of spirals electrically connected at their inner ends, a short-circuiting device for each of said units, and electrical connections between said short-circuiting devices and the outer ends of said spirals.

7. A controller for electric circuits comprising a plurality of resistance spirals electrically connected in pairs at their inner ends, a short-circuiting device for each of said pairs, and electrical connections between said short-circuiting devices and the outer ends of said pairs.

8. A controller for electric circuits comprising a shaft, a series of spiral resistance grids supported thereon at their inner ends, and a conducting rod in electrical connection with each grid at its outer end, the successive grids being in electrical connection alternately through the inner ends and the rods.

9. A controller for electric circuits comprising a series of spiral resistance grids, a shaft for centrally supporting the same, and a series of conducting rods supporting said grids at their outer ends and in electrical connection therewith, the successive grids being in electrical connection alternately through the inner and outer ends.

10. A controller for electric motors, comprising a plurality of superposed resistance spirals arranged in pairs, the spirals of each pair being electrically connected at their inner ends, and a supporting terminal conductor for each spiral at its outer end, said conductors having a circular arrangement and means for successively cutting the terminals out of circuit.

11. A controller for electric circuits, comprising a supporting shaft, a series of spiral resistance grids electrically connected in pairs and supported thereon at their inner ends, a series of conducting rods supporting said grids at their outer ends and in electrical connection therewith, a short-circuiting switch for each pair of grids, and means for successively actuating the same comprising a normally energized magnet coil and an armature coöperating therewith and mounted for movement to influence said switches to operate the same.

In witness whereof, I have hereunto set my hand this twenty third day of May, 1905.

EUGENE R. CARICHOFF.

Witnesses:
EDGAR E. CAFFALL,
LEO C. FOSS.