July 3, 1923. 1,460,562

C. W. YERGER

MOTOR CONTROLLER

Filed June 23, 1919

Fig. 1.

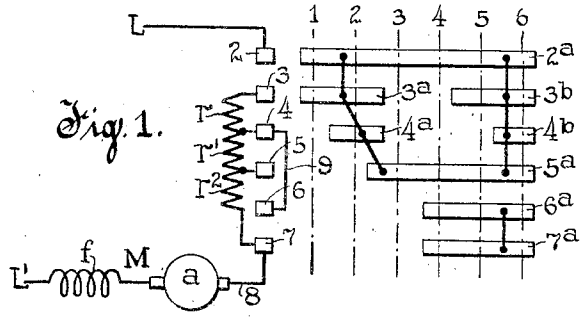


Fig. 2.

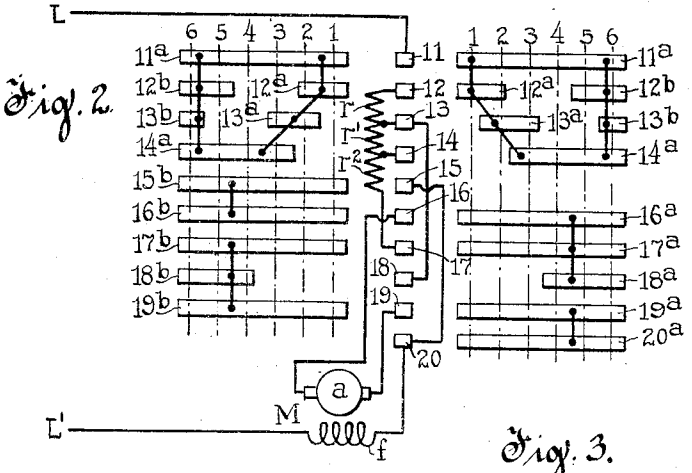
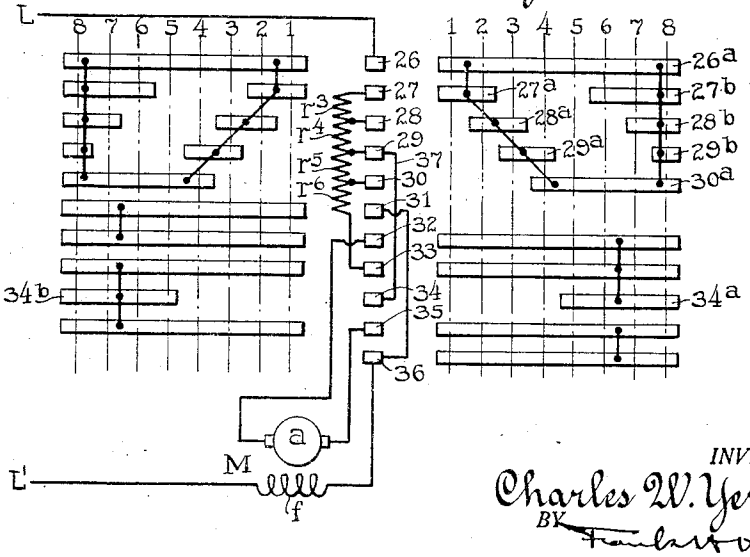


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MOTOR CONTROLLER.

Application filed June 23, 1919. Serial No. 305,966.

To all whom it may concern:

Be it known that I, CHARLES W. YERGER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Motor Controllers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to motor controllers and more particularly to those of the drum type.

One of the objects of the present invention is to provide a drum controller of simplified construction to afford a number of steps of control.

Another object is to provide a drum controller affording a given number of steps of control with a reduced number of sets of co-operating contacts and with a consequent saving of contact material and reduction in size of the controller.

Another object is to provide a drum controller of the aforesaid character wherein the co-operating contacts are of such number and arrangement as to minimize the required number of insulated drum sections and to otherwise simplify the construction of the drum.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates certain embodiments of the invention which will now be described, it being understood that the invention may be embodied in other forms without departing from the scope of the appended claims.

In the drawing,

Figure 1 diagrammatically illustrates a non-reversing controller;

Fig. 2 diagrammatically illustrates a reversing controller; and,

Fig. 3 diagrammatically illustrates a modified reversing controller affording an increased number of steps of control.

Referring to Fig. 1, the same diagrammatically illustrates a drum for controlling a motor M through the medium of three sections of resistances r, r' and r^2 and in a manner to afford six steps of control. The motor is shown as provided with a armature a and series field f although it is to be understood that the motor might be of any other preferred type.

The drum comprises six contact fingers 2, 3, 4, 5, 6 and 7 and co-operating segments 2^a, 3^a, 3^b, 4^a, 4^b, 5^a, 6^a and 7^a. All but the last two mentioned segments are electrically connected and said last two mentioned segments are interconnected whereby only two insulated drum sections are required and the arrangement of the segments is such as to render said sections of simple construction. The arrangement of segments is such that in the first operative position of the drum segments 2^a and 3^a engage fingers 2 and 3, while upon movement of the drum to its second and third positions segments 4^a and 5^a successively engage fingers 4 and 5, segments 3^a and 4^a disengaging their respective fingers in the third position. Then upon movement of the drum to its fourth position segments 6^a and 7^a engage fingers 6 and 7 while upon movement of the drum to its fifth and sixth positions segments 3^b and 4^b successively engage fingers 3 and 4.

The circuit connections are such that the drum in its first position completes circuit from line L through finger 2, segment 2^a, segment 3^a and finger 3 to and through resistances r, r' and r^2 in series to finger 7, by conductor 8 through the motor armature a and series field f to line L'. Then when the drum is moved to its second position it short circuits resistance r through finger 3, segment 3^a, segment 4^a and finger 4, whereas said drum when moved to its third position completes circuit from finger 2 through segments 2^a and 5^a to finger 5 and thence to and through resistance r^2, while resistances r and r' are disconnected from the line. This provides for gradually increasing the current supplied to the motor and when the drum is moved to its fourth position an additional circuit is completed from finger 5 through resistance r' to finger 4, by conductor 9 to finger 6 and thence through segments 6^a and 7^a to finger 7, thus paralleling resistance r' with resistance r^2 to further increase the current supplied to the motor. Then when the drum is moved to its fifth position an additional circuit is established from line L through finger 2, segment 2^a, segment 3^b and finger 3 to and through resistance r to contact finger 4 by conductor 9 to finger 6 and thence to finger 7, thus paralleling all three resistances r, r' and r^2 to further increase the current supplied to the motor. Finally when the drum is moved to

its sixth position circuit is completed from line L through finger 2, segment 2^a, segment 4^b and finger 4 by conductor 9 to finger 6 and thence through segments 6^a and 7^a to finger 7, thus throwing the motor directly on the line for maximum current.

Referring to Fig. 2, the same illustrates a drum for controlling the motor M through the medium of resistances r, r' and r^2 in precisely the same manner as that above described, but also providing for reversal of said motor. This controller is provided with contact fingers 11, 12, 13 and 14 and two opposed sets of co-operating segments, each of said sets including segments 11^a, 12^a, 12^b, 13^a, 13^b and 14^a and being identical with the set of segments shown in Fig. 1 to provide for establishment of the above described connections upon reverse operations of the drum. Further, the drum includes contact fingers 15 to 20 and two opposed sets of co-operating segments, one set including segments 16^a to 20^a and the other set including segments 15^b to 19^b. The former set of segments engage fingers 16 to 20 when the drum is moved in one direction while the latter set of segments engage fingers 15 to 19 when the drum is moved in a reverse direction, the segments 18^a and 18^b however being arranged to engage finger 18 only in the fourth, fifth and sixth positions of the drum. The segments 16^a, 17^a and 18^a are interconnected but are electrically independent of segments 19^a and 20^a which are interconnected, while the segments 15^b and 16^b are interconnected but are electrically independent of segments 17^b, 18^b and 19^b which are interconnected. Here it may be noted that a lesser number of fingers and segments might be employed to effect the desired circuit changes but a drum of the construction illustrated is advantageous in that only three insulated drum sections are required and said drum sections are of simple construction.

The circuit connections are such that the segments 16^a, 17^a, 19^a and 20^a co-operate with fingers 16, 17, 19 and 20 to establish forward running connections for the motor while segments 15^b, 16^b, 17^b and 19^b co-operate with fingers 15, 16, 17 and 19 to establish reverse running connections for the motor, reversals being effected by reversing the direction of flow of current through the motor armature. More specifically, segments 16^a and 17^a when in engagement with fingers 16 and 17 complete circuit from the resistance r^2 to the left hand terminal of the motor armature, while segment 19^a and 20^a when in engagement with fingers 19 and 20 connect the right hand terminal of the motor armature to the series field. On the other hand segments 15^b and 16^b when in engagement with fingers 15 and 16 connect the left hand terminal of the motor armature to the series field while segments 17^b and 19^b when in engagement with fingers 17 and 19 connect the right hand terminal of the armature to resistance r^2 thus reversing the flow of current through the armature. Further, the circuit connections are such that the right hand set of segments 11^a, etc., together with the segments 17^a and 18^a co-operate with contact fingers 11, 12, 13, 14, 17 and 18 to afford precisely the same control as described in connection with Fig. 1, while the left hand set of segments 11^a, etc., together with segments 17^b and 18^b, co-operate with the same fingers to effect like control upon reverse operation of the drum.

Referring to Fig. 3, the same illustrates a drum for controlling motor M through the medium of four resistance sections r^3, r^4, r^5 and r^6 to afford eight steps of control. The drum in this instance comprises eleven contact fingers 26 to 36, inclusive, two opposed sets of segments identical with those shown in Fig. 2 for co-operating with fingers 31 to 36 to effect reversals of the current through the motor armature and for assisting in the resistance control and with two opposed sets of segments to co-operate with contact fingers 26 to 30 for resistance control. The last two mentioned sets of segments are identical, each comprising segments 26^a, 27^a, 27^b, 28^a, 28^b, 29^a, 29^b and 30^a. These segments are so arranged that when the drum is moved in either direction to its first operative position, segments 26^a and 27^a of one set engage contact fingers 26 and 27 while continued movement to the second, third and fourth positions causes segments 28^a, 29^a and 30^a to successively engage fingers 28, 29 and 30 respectively. Then when the drum is moved to its fifth position, segment 29^a is disengaged from finger 29, while segment 34^a, or segment 34^b, as the case may be, is engaged with finger 34, and continued movement of the drum to its sixth, seventh and eighth positions causes segments 27^b, 28^b and 29^b to successively engage segments 27, 28 and 29.

The circuit connections are such that when the drum is in its first operative position circuit is completed from line L to finger 26, by segments 26^a and 27^a of one set to finger 27 and thence through resistances r^3, r^4 and r^5 and r^6 in series to and through the motor as described in connection with Fig. 2. Then when the drum is moved to its second position, segment 28^a engages finger 28 to short circuit resistance r^3 and upon movement of the drum to its third position segment 29^a engages finger 29 to short circuit resistance r^4 while upon movement of the drum to its fourth position segment 30^a engages finger 30 to short circuit resistance r^5. This provides for gradually increasing the current supplied to the motor and when the drum is moved to its fifth position an additional

circuit is established from contact finger 30 through resistance r^5 by conductor 37 to finger 34 and thence through segment 34^a or 34^b to the motor as previously described, thus paralleling resistances r^5 and r^6 for a further increase in the current supplied to the motor. Then when the drum is moved to its sixth position an additional circuit is established from line L to and through finger 26, segments 26^a and 27^b to finger 27 and thence through resistances r^3 and r^4 in series to finger 29, thus placing the series connected resistances r^3 and r^4 in parallel with the resistances r^5 and r^6 for further increasing the motor current, while movement of the drum to its seventh position short circuits resistance r^3 by engagement of segments 27^b and 28^b with fingers 27 and 28. This places resistances r^4, r^5 and r^6 in parallel for a further increase in the current supplied to the motor and finally in the eighth position of the drum circuit is completed from line L to finger 26, thence through segments 26^a and 29^b to finger 29 by conductor 37 to finger 34 and thence directly to the motor as previously traced, which throws the motor directly on the line.

What I claim as new and desire to secure by Letters Patent is:

1. In a motor controller, in combination, a plurality of resistance sections and a contact drum for progressively excluding certain of said resistance sections when connected in series, then progressively connecting certain of said resistance sections in parallel and finally excluding all of said resistance sections from circuit, said drum having contact fingers and co-operating segments, the latter divided into but two electrically independent groups spaced axially of the drum for arrangement thereof in a non-overlapping relation.

2. In a motor controller, in combination, a plurality of series connected resistance sections and a contact drum having contact fingers and segments, certain of said fingers and segments co-operating to control continuity of the motor circuit and other of said fingers and segments co-operating to exclude certain of said resistance sections from circuit, then parallel certain of said resistance sections and finally to exclude all of said resistance sections from circuit the segments being divided into electrically independent groups spaced axially of the drum and the number of said latter contact fingers being not in excess of the number of said resistance sections by more than two.

3. In a motor controller, in combination, a plurality of series connected resistance sections and a contact drum having co-operating contacts to effect reversals of the motor, to exclude certain of said resistance sections from circuit, and to thereafter parallel certain of said resistance sections, certain of said contacts functioning both for motor reversals and resistance control.

4. In a motor controller, in combination, a plurality of series connected resistance sections and a contact drum having co-operating contact fingers and segments to effect reversals of the motor, to exclude certain of said resistance sections from circuit and to thereafter parallel certain of said resistance sections, said segments being divided into but three electrically independent groups.

5. In a motor controller, in combination, a plurality of series connected resistance sections and a contact drum having co-operating contact fingers and segments to effect reversals of the motor, to exclude certain of said resistance sections from circuit and to thereafter parallel certain of said resistance sections, said segments being divided into but three electrically independent groups and certain of said fingers and segments functioning both for motor reversals and resistance control.

In witness whereof, I have hereunto subscribed my name.

CHARLES W. YERGER.