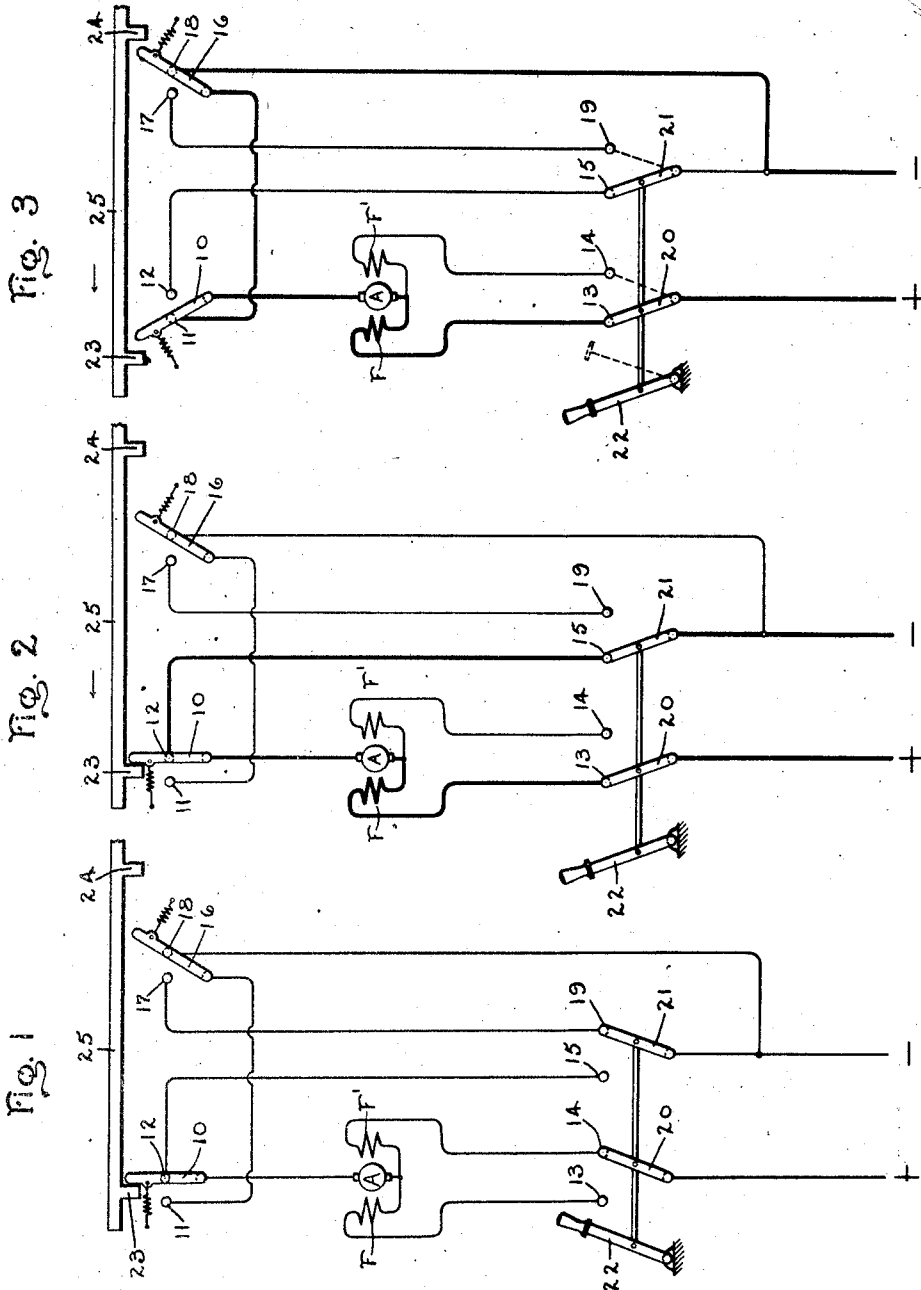


C. E. ZIX.
MOTOR CONTROLLING DEVICE.
APPLICATION FILED MAR. 27, 1908.

996,388.

Patented June 27, 1911

2 SHEETS—SHEET 1.



WITNESSES:

Wm. H. Palmer.
J. Ellis Glen

INVENTOR
CARL EDUARD ZIX.

BY *Alfred H. Davis*
ATTY.

Patented June 27, 1911.

2 SHEETS-SHEET 2.

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Fig. 6

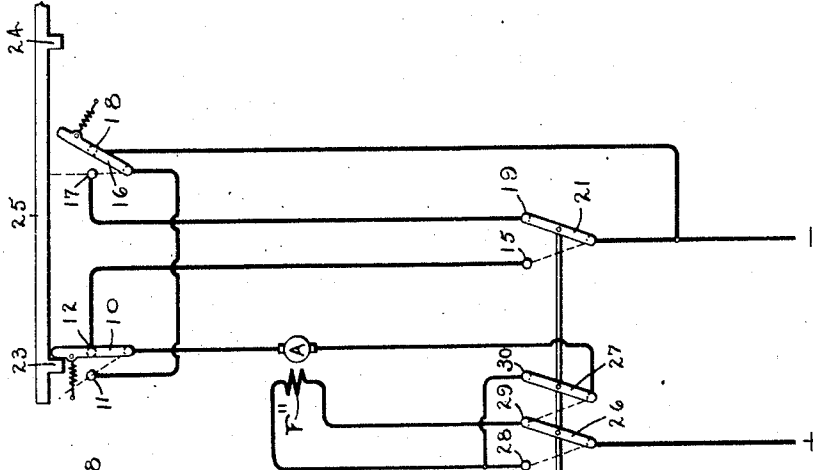


Fig. 5

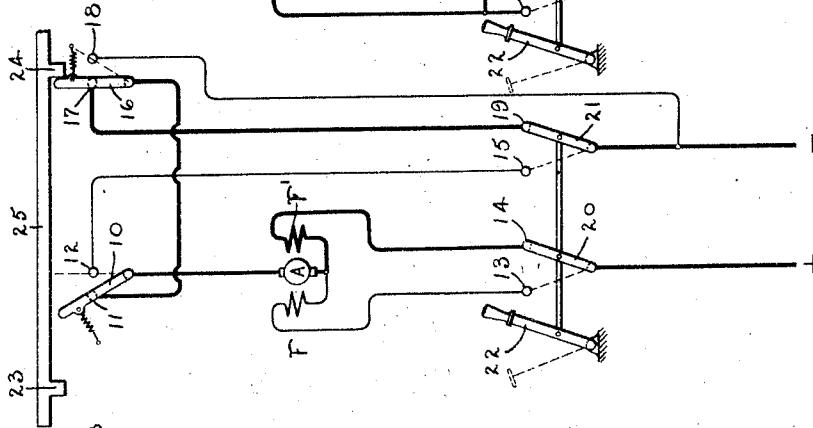
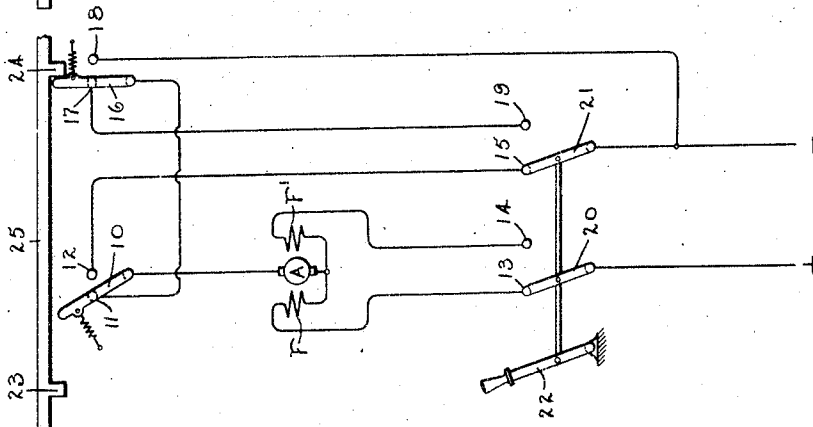


Fig. 4



WITNESSES:

Lester H. Palmer.
J. Ellis Allen.

INVENTOR
CARL EDUARD ZIX.

BY *Alfred H. Davis*

ATTY.

UNITED STATES PATENT OFFICE.

CARL EDUARD ZIX, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MOTOR-CONTROLLING DEVICE.

996,388.

Specification of Letters Patent. Patented June 27, 1911.

Application filed March 27, 1908. Serial No. 423,785.

To all whom it may concern:

Be it known that I, CARL EDUARD ZIX, a subject of the King of Prussia, residing at Berlin, Germany, have invented certain new and useful Improvements in Motor-Controlling Devices, of which the following is a specification.

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

My invention relates more specifically to the reversing of electric motors which are provided with automatic circuit interrupting means.

In the driving of such devices as hoists and the like it is usual to provide limit switches for opening the circuit after a predetermined travel and also provide means for reversing the mechanism after the interruption.

One of the objects of my invention is to provide means whereby after the movement in any direction has been started the mechanism may be reversed at any time, in addition to limit switches which will interrupt the circuit at the desired point.

In the accompanying drawings in which I have shown diagrammatically my invention embodied in concrete form, Figure 1 shows the arrangement of circuits and switches when the moving element has moved throughout its range to the right and stops the motor; Fig. 2 shows the arrangement when the reversing switch has been shifted but before the driving mechanism has started; Fig. 3 shows the arrangement when the mechanism has started to the left; Fig. 4 shows the arrangement when the movement to the left is completed; Fig. 5 shows the arrangement when movement to the left is completed and the reversing switch is shifted; and Fig. 6 shows a modification in which there is only a single field winding.

Referring to the drawings, A represents

the armature and F F' the two fields of the motor, one for forward movement and the other for reverse movement. These two fields of the motor are joined together and connected with one terminal of the armature while the other armature terminal is connected with the pivotal point of an interrupting or limit switch 10 adapted to cooperate with the two contacts 11 and 12 and spring-pressed toward the former. The other two terminals of the fields are connected respectively with studs 13 and 14 while stud 12 is connected with stud 15. Another limit switch 16 has its pivotal point connected with stud 11 and is adapted to engage the two studs 17 and 18 being spring-pressed toward the latter while stud 17 is connected with stud 19. Stud 13, 14, 15 and 19 are adjacently arranged in line with each other and adapted to be engaged by two blades or elements 20 and 21 of a double-pole switch operated by means of a handle 22. The pivotal point of the switch 20 is connected with the positive main while the pivotal point of switch 21 is connected with the negative main as well as with stud 18. The two switch arms 10 and 16 project into the path of the moving element of a hoist or the like driven by the motor. As herein shown the switches 10 and 16 are engaged respectively by lugs 23 and 24 so that when the shifting rod 25 carrying these lugs reaches the limit of its movement to the right it engages the switch arm 10 and moves it against the tension of its spring onto contact 12. In a similar manner when the rod is moved to the left the lug 24 engages the switch arm 16 to move it onto stud 17.

The arrangement of circuits and mode of operation are as follows: in Fig. 1 the parts are shown in the position in which the mechanism has reached the limit of its travel to the right and the motor circuit has been opened. To start the motor backward to the left the reversing lever 22 is shifted as shown in Fig. 2 whereupon the motor circuit will be completed from the positive

main to switch-blade 20, field F, armature A, switch-blade 10, stud 15 and switch-blade 21 back to the negative main. The motor thereupon starts to shift the rod 25 to the left. As soon as the motor is started the switch-blade 10 is released and returns into contact with stud 11 so that the parts will be in the position shown in Fig. 3, the motor circuit being as shown in the heavy lines in this figure. This is the normal running condition of the motor and it will be seen that the armature current instead of returning from switch 10 through stud 12 back to line, it returns through stud 11 and switch 16, the two switches 10 and 16 now being in series. The motor may now be operated in either direction since by shifting the switch arm 22, as shown in dotted lines in Fig. 3, the field F' will be energized instead of field F thereby reversing the motor. This feature of my device I regard as important since it has heretofore been impossible in control systems of this character to reverse the mechanism without operating the limit switch. In Fig. 4 the shifting rod has reached the limit of its travel to the left and has opened the motor circuit. There will, however, be no reversal of the motor until the reversing switch is shifted as shown in Fig. 5 whereupon the motor circuits will be as shown in this figure, the field F' being energized in this case.

In Fig. 6 is shown a modification of my invention in which one single field F'' is used. In this case instead of a single switch element for changing the field windings, a double-pole arrangement composed of blades 26 and 27 cooperating with studs 28, 29 and 30 is provided. It will be seen that with this arrangement when the switch-blades are in the position shown in full lines, *i. e.* in contact with studs 29 and 30, the direction of current through the field winding and armature will be in one direction while when shifted so as to engage studs 28 and 29 the current through the motor will be reversed. Aside from this distinction the arrangement shown in Fig. 6 is identical with that shown in Figs. 1 to 5 and operates in the same manner.

It will be seen that I have provided a very simple arrangement whereby a motor may be automatically stopped at predetermined times and may at the same time be reversed at any time during the operation.

While I have shown and described a specific mechanism and arrangement of circuits whereby my invention may be carried out, it should be understood that I do not limit my invention in these particulars since various modifications 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. The combination with a reversible motor, of means for controlling the same comprising a plurality of switches normally in series with each other and having two operative positions, means whereby one of said switches is moved from its normal position to its second operative position to open the motor circuit after a predetermined movement in each direction, a reversing switch, and connections whereby the switch may be operated to drive the motor in either direction with the controlling switch in normal position.

2. The combination with a reversible motor, of means for controlling the same comprising a reversing switch, a plurality of interrupting switches normally in series with each other, means whereby one of said switches is operated to interrupt the operation of the motor after a predetermined movement in each direction and simultaneously connect with the reversing switch in its position for opposite rotation.

3. The combination with a reversible motor, of means for controlling the same comprising a plurality of two position interrupting switches normally in series with each other, a double-pole reversing switch having one element controlling the direction of rotation of the motor and the other element arranged to alternately connect with the shifted positions of said interrupting switches.

4. The combination with a motor having a field winding for each direction of rotation, of means for controlling the same comprising a plurality of two position interrupting switches normally in series with each other, and a double-pole reversing switch one element of which is connected with said fields alternately and the other element connected alternately with the shifted positions of said interrupting switches.

5. The combination with a motor having a field winding for each direction of rotation, of means for controlling the same comprising a plurality of two position interrupting switches normally in series with each other, means whereby one of said switches is operated to interrupt the motor circuit after a predetermined movement in each direction, a double-pole reversing switch one element of which is connected with said fields alternately and the other element connected alternately with the shifted positions of said interrupting switches.

6. The combination with a reversible motor, of means for controlling the same comprising a plurality of two position interrupting switches normally in series with each other, means whereby one of said switches is operated to interrupt the motor

circuit after a predetermined movement in each direction, a double-pole reversing switch having one element controlling the direction of rotation of the motor and the
5 other element arranged to alternately connect with the interrupting positions of said switches.

In witness whereof, I have hereunto set my hand this seventh day of March, 1908.

CARL EDUARD ZIX.

Witnesses:

FALUS RUMLAND,
KARL GRICKEBEN.