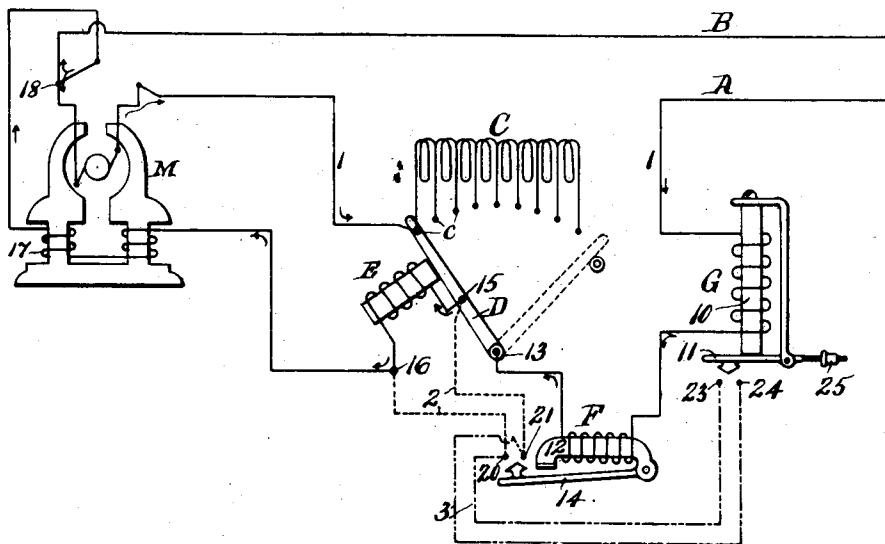


No. 870,946.

PATENTED NOV. 12, 1907.

T. T. FOGEL,
CONTROLLING MECHANISM FOR ELECTRIC CIRCUITS.
APPLICATION FILED MAY 1, 1907.



Witnesses

D. M. Howard
Staple Holme

Thos. T. Fogel Inventor

by

D. M. Howard

Attorney

UNITED STATES PATENT OFFICE.

TAYLOR T. FOGEL, OF READING, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS TO ALFRED J. MASON, OF READING, PENNSYLVANIA.

CONTROLLING MECHANISM FOR ELECTRIC CIRCUITS.

No. 870,946.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed May 1, 1907. Serial No. 371,261.

To all whom it may concern:

Be it known that I, TAYLOR T. FOGEL, a citizen of the United States, and a resident of the city of Reading, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Controlling Mechanism for Electric Circuits, of which the following is a specification.

My invention relates to controlling mechanism for electric circuits and particularly to automatic rheostats or starting boxes most commonly used in connection with electric motors. Such devices have heretofore been arranged so that they will open the circuit either in case of a determined "overload" or of a determined "underload." In the latter case the purpose is to prevent the abrupt throwing on of the service current to the motor after the latter has been stopped or its speed much diminished by a temporary stoppage or material reduction of such current. To this end an electro magnet has heretofore been provided in the circuit, which magnet is normally energized by the passing current sufficiently to hold in closed position a switch arm employed to gradually start the motor by successively cutting out the coils of a resistance; said magnet however being adapted to release the switch when it is deenergized, so that the switch will be automatically retracted by a spring and the circuit opened, thereby insuring its being gradually restarted as desired. It has been found in practice however that the deenergizing of this electro magnet so as to release the switch, is not effected by the fall of the service current with sufficient promptness to certainly secure the desired result of cutting out the motor before the full current is restored. This I have found is due to the fact that the counter electromotive current resulting from the momentum of the motor, continues to energize the electro magnet for a period of time after the service current is cut off or reduced, thereby in some cases holding the switch in closed position until the service current is restored and the motor thereby suddenly operated again at full potential; the dangerous effects of which are the same in character as when no automatic circuit opener is provided. The object of my invention is to avoid this danger by insuring the immediate deenergizing of the electro magnet when the service current is cut off or unduly reduced, so as to immediately release the switch. And it consists broadly in providing in connection with a short circuit, an underload magnetic shunting device for closing the same, whereby the current is cut off from the switch-retaining electro magnet and the deenergizing of the latter thereby made certain immediately upon failure of the service current; this "underload" magnetic shunting device and short circuit, being preferably employed in connection with an "overload" shunting device and short circuit such as has heretofore been provided, all as particularly described

hereafter in connection with the accompanying drawing.

The drawing is a diagrammatic view illustrating my invention in simple form and arrangement.

A and B indicate the service mains, C a resistance with cut-out contacts *c c c*. D a spring-retracted switch-arm, E a switch-retaining electro magnet, F an overload magnetic shunting device, and M an electric motor or equivalent mechanism to which the service current is supplied; all substantially as commonly employed heretofore.

G represents an underload magnetic shunting device as heretofore referred to, whereby the improved result which is the object of my invention, is attained.

Following the normal operating current 1 as indicated in full lines, with the direction of current indicated by arrows, I will briefly describe the elements and their operation.

As shown the current first passes around the underload magnet 10 energizing the same so as to retain its armature 11 in the position indicated in full lines; thus holding open the short circuit 3 hereafter referred to, and passing the current to the overload shunting device F, the same as though the device G were omitted and as heretofore commonly done. In like manner the current passes around the overload magnet 12 to the switch-arm D at 13, the overload armature 14 remaining in the lowered position indicated excepting when attracted to the magnet by an overload current; thence to contact 15 (the switch arm being in closed position as indicated in full lines), and around the magnet E, energizing the latter so that it retains the switch arm, to point 16. From this point, as shown, it flows through the field coils 17 to point 18 where one branch passes to the main B and the other through the motor to the switch arm D as indicated.

So long as the current is normal the circuit 1 is maintained as described. In case of overload the magnet 12 attracts its armature 14 and closes a short circuit 2 at points 20, 21; said short-circuit tapping the main circuit 1 at points 15 and 16 so as to cut out the electro magnet E, thus deenergizing the latter and thereby releasing the switch D to open the circuit. This provision for overload is old and well known. In case of underload, the fall of the current will tend to correspondingly deenergize the switch-retaining magnet E; and this tendency has heretofore been relied upon to effect the release of the switch D and the opening of the circuit.

My improvement, as already stated, provides for cutting out the switch-retaining electro magnet E when the current falls, so as to immediately and positively deenergize it; this action being in my opinion essential to the securing of such a prompt release of the

switch D upon a fall of the current as will insure against damage if the latter should be quickly restored. This cutting out of electro magnet E is effected by the magnetic shunting device G in connection with the short circuit 3, which latter in the preferred arrangement shown forms an extension of the short circuit 2; the magnetic shunting devices F and G operating independently to respectively close the circuit 2 at the points 20, 21, and the circuit 2—3 at the points 23, 24. The armature 11 is arranged to bridge the points 23, 24 when it is released by its magnet 10; and such release takes place as soon as a determined minimum current occurs, which minimum may be nicely regulated by an adjustable weight 25 as indicated. Immediately upon thus closing the short circuit 3, the switch-retaining magnet E is entirely cut out of circuit both of the operating current and of the counter current from the machine M, either of which currents, as the case may be, will follow the short circuit 2—3 from the point 15 back to the point 16. This insures the immediate de-energizing of the magnet E and the automatic opening of the main circuit, thus protecting the motor against a possible quick return to the full potential. So far as I know such provision has not heretofore been made and I desire to make broad claim thereto.

What I claim is:—

1. In combination with a switch arm, and an electro magnet arranged to normally hold the same in circuit-closing position and to release the same when deenergized, a short circuit and an underload magnetic shunting device whereby said short circuit is closed upon fall of the service current to cut out said electro magnet. 30

2. An automatic rheostat for electric machinery, comprising a resistance with a switch for cutting the same out or in, an electro magnet for normally holding the switch in closed position and releasing the same when deenergized, a magnetic shunting device normally in circuit with said electro magnet, and a short circuit which is closed by said shunting device in case of underload. 35

3. An automatic rheostat for electric machinery, comprising a resistance with a switch for cutting the same out or in, an electro magnet for normally holding the switch in closed position and releasing the same when deenergized, an overload magnetic shunting device and an underload magnetic shunting device both normally in circuit with said electro magnet, a short circuit adapted to be closed by said overload shunting device, and a short circuit adapted to be closed by said underload shunting device. 40 45

In testimony whereof, I affix my signature, in the presence of two witnesses. 50

TAYLOR T. FOGEL.

Witnesses:

A. J. MASON,
D. M. STEWART.