

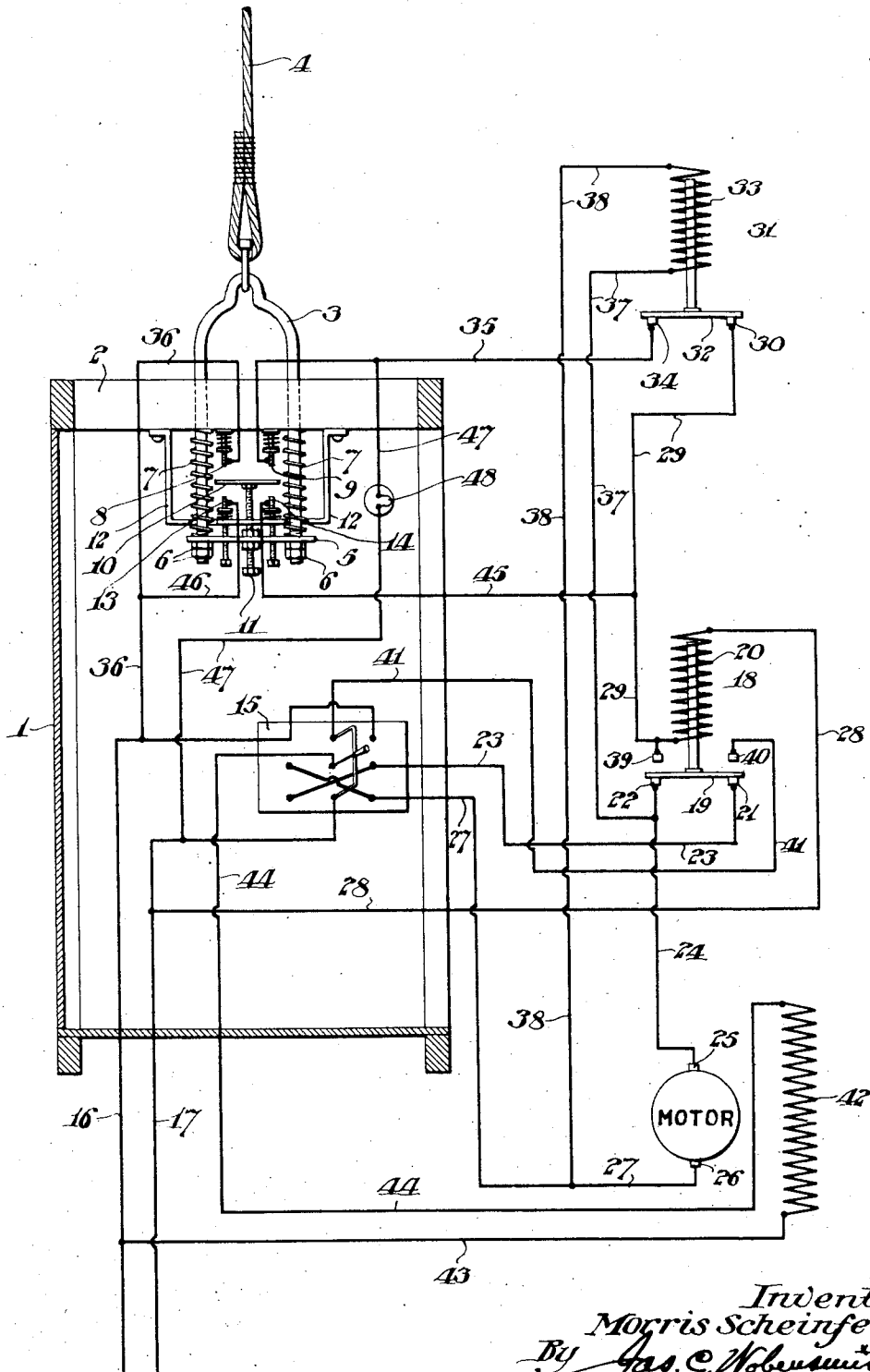
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SAFETY DEVICE FOR ELEVATORS

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SAFETY DEVICE FOR ELEVATORS

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My invention relates to safety devices for elevators, and it has particular relation to means for preventing the operation of electrically operated elevators in the event that the same are overloaded, or the suspending cables are slack.

The principal object of my present invention is to provide a safety device for electrically operated elevators which is so constructed and arranged as to prevent the operation of the elevator motor in the event that the elevator car is overloaded or the cable is slack.

With the foregoing object in view, my invention contemplates the provision, in apparatus of the type shown in my previous Letters Patent No. 1,640,673, granted August 30, 1927, of means for opening the motor circuit and for maintaining the same open in the event that the elevator cable becomes slack from any cause.

The nature and characteristic features of my invention will be more readily understood from the following description, taken in connection with the accompanying drawing forming part hereof, wherein there is diagrammatically shown one form or embodiment of my invention.

In the drawing, the invention is shown as embodied in a device applied to an elevator operated by an electric motor supplied with current from a two wire, direct current system, although it will, of course, be understood that the invention is equally applicable in connection with various other systems of electric power distribution.

Referring to the drawing, 1 is an elevator car of any preferred construction. Associated with the top beam 2 of the elevator car is an inverted U-shaped suspending bolt 3, connected to the operating cable 4 in any preferred manner.

At the lower ends of the depending arms of the U-shaped bolt 3 is a plate 5, secured in place by means of nuts 6 which are threaded on the arms of the U-shaped bolt 3. Interposed between the plate 5 and the under side of the top beam 2 of the elevator car are heavy springs 7, which are adapted to be

compressed according to the load carried by the car.

Contact pins 8 and 9 are carried by the top beam of the car. These contact pins 8 and 9 are adapted to be engaged by a contact plate 10, which is supported from the plate 5 by means of a bolt 11, which also serves as a means of adjustment of the position of the plate 10 with respect to the plate 5.

The foregoing arrangement is such that when a predetermined load is placed in the elevator car, the springs 7 will be compressed sufficiently to cause the plate 10 to encounter the contact pins 8 and 9 and thereby close a circuit across the same.

The top beam 2 of the elevator car also carries a bracket 12, which serves to support additional contact pins 13 and 14, arranged below the contact plate 10. This arrangement is provided so that, in the event of the cable becoming slack, the plate 10 will establish an electrical connection with the contact pins 13 and 14, and thereby close a circuit across the same.

There is also provided a control switch 15, which may, if desired, be mounted in the elevator car 1. In the drawing, the control switch is shown as a simple form of three blade, double throw knife switch. Power leads 16 and 17 extend to connection terminals of the control switch 15.

There is also provided a main relay 18, the bar 19 of which is adapted, when the coil 20 of the relay is de-energized, to contact with terminals 21 and 22 to close a circuit across the same.

The terminal 21 of the relay 18 is connected by wire 23 to suitable terminal posts of the control switch 15, and the terminal 22 of the relay 18 is connected by means of wire 24 to one of the brushes 25 of the motor which operates the elevator. The other brush 26 of the motor is connected by wire 27 to suitable terminal posts of the control switch 15.

One end of the coil 20 of the relay 18 is connected by means of wire 28 to one of the power leads 17. The other end of the coil 20 of the relay 18 is connected by wire

29 to a terminal 30 of an auxiliary relay 31, the bar 32 of which is adapted, when the coil 33 of said relay 31 is de-energized, to close a circuit across the terminal 30 and another terminal 34.

The terminal 34 is connected by means of wire 35 to the contact pin 9, hereinbefore described. The contact pin 8, which is associated with contact pin 9, is connected by means of wire 36 to the power lead 16. One end of the coil 33 of the relay 31 is connected by means of wire 37 to wire 24, which extends to one of the brushes 25 of the motor. The other end of the coil 33 is connected by wire 38 to wire 27, which extends to the other brush 26 of the motor.

The main relay 18 is also provided with terminals 39 and 40, across which circuit is adapted to be closed when the coil 20 of the relay 18 is energized and the bar 19 raised. The terminal 39 is connected to the wire 29 which extends from the coil 20 to the terminal 30 of the auxiliary relay 31. The other terminal 40 is connected by wire 41 to one of the terminal posts of the control switch. The arrangement is such that the wire 41 is always supplied with current whenever the control switch 15 is closed to operate the elevator in either direction.

One end of the field windings 42 of the motor is connected by wire 43 to one of the power leads 16, and the other end of said field windings is connected by wire 44 to a suitable terminal post of the control switch 15.

A wire 45 extends from wire 29 to contact pin 14. The contact pin 13 which is associated with contact pin 14 is connected by wire 46 to wire 36, the arrangement being such that a shunt circuit is established when the contact plate 10 engages the contact pins 13 and 14, by reason of any slack existing in the elevator cable.

There is also provided a shunt line 47, extending from the power lead 17 to the wire 35. A signal lamp 48 is included in this line, so as to indicate when a circuit is established across the contact pins 8 and 9.

The operation of the device may now be explained. In the drawing, the various parts are shown in the positions assumed when the elevator is standing still and unloaded, and with the operating cable in its normal condition. It should be noted that the contact pins 8 and 9, and the contact pins 13 and 14, are respectively included in circuits which are connected to the main power leads in advance of the control switch.

Whenever a load in excess of the maximum is placed in the elevator car, the springs 7 will be compressed, whereupon the plate 10 will close the circuit across the contact pins 8 and 9. On the other hand, when for any reason the cable becomes slack, the plate 10 will be permitted to fall to a position where-

by the circuit across the contact pins 13 and 14 will be closed.

When the circuit is closed across the contact pins 8 and 9, the current will flow from the power line 16 through wire 36 to contact pin 8, thence through plate 10 to contact pin 9, thence through wire 35 to terminal 34 of relay 31, thence across the bar 32 thereof to terminal 30, thence through wire 29 to the coil 20 of relay 18, thence by wire 28 to the other power line 17.

In this manner, the coil 18 will be energized, raising the solenoid core of the relay, and thus raising the bar 19 from the terminals 21 and 22. The armature circuit will thus be opened, and when the control switch is closed in either direction, the motor will not be started for the reason that no current will be permitted to flow through the armature.

When, however, the elevator is not overloaded, and the circuit in which the contacts 8 and 9 are included is open, the coil 20 of the relay 18 will be energized and the current will then flow from the control switch 15 through the lines 23 to terminal 21 of relay 18, thence across the bar 19 to terminal 22 of relay 18, thence through wire 24 to the brush 25 of the armature, thence through the armature and from brush 26 through wire 27 to the control switch 15.

When the elevator is carrying a load which is close to the maximum, it will be understood that, due to the inertia effect upon the starting of the elevator car, the plate 10 may be brought in contact with the pins 8 and 9, and thereby stop the motor through the energization of the coil 20 of the relay 18, and the raising of the bar 19 thereof from the terminals 21 and 22.

In order to prevent this improper stopping of the motor under such conditions, the auxiliary relay 31 is provided. It will be noted that the coil 33 thereof is connected by means of wires 37 and 38 in a shunt off the wires 24 and 27 which lead to the motor brushes, so that when the circuit has once been established through the armature, the coil 33 of the relay 31 will be energized, and the bar 32 will thus be raised from the terminals 30 and 34.

In this manner, the circuit in which the coil 20 of relay 18 is included will be opened as soon as the circuit to the motor armature is established, and the coil 20 of the relay 18 will be maintained in the de-energized condition notwithstanding that the plate 10 may thereafter be brought in contact with the pins 8 and 9 due to the inertia effect when the elevator car is carrying a load which is close to the maximum.

In the operation of the device as hereinbefore described, it is likely that the operator, having closed the control switch, and finding the car will not start by reason of its over-

loaded condition, may remove some of the load from the elevator car without first opening the control switch, which would result in the accidental starting of the car, and might cause serious injury.

To prevent the improper starting of the elevator car under the conditions aforesaid, the main relay 18 is provided with terminals 39 and 40, across which a circuit is adapted to be established by the bar 19 when the coil 20 is in the energized condition.

Consequently, when the coil 20 is once properly energized, and the control switch 15 is left closed, the current will flow through line 41 to terminal 40, thence across the bar 19 to terminal 39, thence through coil 20 to line 28, and thence to the main power lead 17. Thus the coil 20 will be maintained in the energized condition until the control switch 15 is opened, which will permit the parts to return to their initial positions.

When, through any cause, the elevator cable may become slack, the contact plate 10 will establish a circuit across the contact pins 13 and 14, whereupon the current will flow from power lead 16 through wire 36, thence through wire 46 to contact pin 13, thence through contact plate 10 to contact pin 14, thence by wire 45 to wire 29, passing through coil 20 of relay 18, and passing by wire 28 to the other power lead 17. When the relay 18 is energized in this manner, the bar 19 thereof will be raised, thus opening the armature circuit.

As the motor circuit is thus opened, the motor will not start when the control switch is closed, or if the motor is running, the same will be stopped by the opening of its circuit in this manner.

It will be noted that, by reason of the contact pins 13 and 14 being included in the circuit which is shunted off the lines running to the terminals of the auxiliary relay, the main relay will be caused to function to open the motor circuit whenever the cable is slack, without interference by the auxiliary relay, so that the motor will not operate whenever the cable becomes slack.

It will also be noted that, by reason of the provision of the shunt line 47 in which the signal lamp 48 is included, the signal lamp will be lighted whenever the device functions in its intended manner, and the operator may thereby be informed of existing trouble of the character described.

It will be seen that there is thus provided a simple and efficient device which will automatically prevent the starting of an elevator car in the event that the same is overloaded; which device, however, will not be caused to be improperly operated through inertia effects when the elevator is carrying a load close to the maximum; which is also provided with means for preventing the improper starting of the elevator in the event that the same is first overloaded and the load after-

ward reduced below the maximum while the controlling switch is left in the closed or operating condition.

It will also be seen that there is provided, in apparatus which will function in the manner above set forth, means for preventing the operation of the elevator in the event that the elevator cable is or becomes slack, and which is provided with means for indicating to the operator that the safety device is functioning.

Having thus described the nature and characteristic features of my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, electro-magnetic means for opening said motor circuit, and means carried by the elevator car for automatically operating said means for opening the motor circuit when the elevator is overloaded or the cable is slack.

2. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, electro-magnetic means for opening said motor circuit, means carried by the elevator car for automatically operating said means for opening the motor circuit when the elevator is overloaded or the cable is slack, means for maintaining the motor circuit open when the cable is slack, and means for rendering inoperative under other conditions the means for opening the motor circuit.

3. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, means for opening said motor circuit when the car is overloaded or the cable is slack, means for maintaining the motor circuit open when an overload is removed from the elevator with the control switch closed, and means for maintaining the motor circuit open when the cable is slack.

4. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, a relay adapted when energized to open the motor circuit, a relay circuit adapted when closed to energize said relay, said relay circuit being normally open, means adapted to close said relay circuit when the elevator is overloaded, a shunt circuit extending from said relay circuit, said shunt circuit being normally open, and means adapted to close said shunt circuit to energize the relay when the elevator cable is slack.

5. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, a relay adapted when energized to open the motor circuit, a relay circuit adapted when closed to energize said relay, said relay circuit being normally open, means adapted to close said relay circuit when the elevator is overloaded, means adapted to open the relay circuit when the motor circuit is closed, a shunt circuit extending from the relay circuit,

said shunt circuit being normally open, and means adapted to close said shunt circuit to energize the relay when the elevator cable is slack.

5 6. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, a main relay adapted when energized to open the motor circuit, a main relay circuit adapted when closed to energize said
10 relay, said main relay circuit being normally open, means adapted to close said main relay circuit when the elevator is overloaded, an auxiliary relay adapted when energized to open the main relay circuit, means for energizing said auxiliary relay when the motor
15 circuit is closed, a shunt circuit extending from the main relay circuit, said shunt circuit being normally open, and means adapted to close said shunt circuit to energize the main
20 relay when the elevator cable is slack.

7. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, a main relay adapted when energized to open the motor circuit, a main relay circuit adapted when closed to energize said
25 relay, said main relay circuit being normally open, means adapted to close said main relay circuit when the elevator is overloaded, an auxiliary relay adapted when energized to open the main relay circuit, a shunt circuit
30 adapted when closed to energize said auxiliary relay, a shunt circuit extending from the main relay circuit, said shunt circuit being normally open, and means adapted to close
35 said shunt circuit to energize the main relay when the elevator cable is slack.

8. A safety device for elevators comprising, in combination with an elevator car, a motor circuit, a main relay adapted when energized to open the motor circuit, a main relay circuit
40 adapted when closed to energize said relay, said main relay circuit being normally open, means adapted to close said main relay circuit when the elevator is overloaded, an auxiliary
45 relay adapted when energized to open the main relay circuit, a shunt circuit extending from the motor circuit beyond the main relay adapted when closed to energize said auxiliary
50 relay, a shunt circuit extending from the main relay circuit, said shunt circuit being normally open, and means adapted to close said
shunt circuit to energize the main relay when the elevator cable is slack.

9. A safety device for elevators comprising, in combination with an elevator car, a control switch, a motor circuit extending from the control switch, a main relay adapted when energized to open the motor circuit, a main relay circuit adapted when closed to energize
60 said relay, said main relay circuit being normally open, means adapted to close said main relay circuit when the elevator is overloaded, an auxiliary relay adapted when energized to open the main relay circuit, a shunt circuit
65 extending from the motor circuit beyond the

main relay adapted when closed to energize said auxiliary relay, means adapted to maintain the main relay energized when the control switch is closed and the main relay circuit is opened after having been closed, a shunt circuit extending from the main relay circuit, said shunt circuit being normally open, and means adapted to close said shunt circuit to energize the main relay when the elevator cable is slack.

10. A safety device for elevators comprising, in combination with an elevator car, a control switch, a motor circuit extending from the control switch, a main relay adapted when energized to open the motor circuit, a main relay circuit adapted when closed to energize said relay, said main relay circuit being normally open, means carried by the elevator car adapted to close said main relay circuit when the elevator is overloaded, an auxiliary relay adapted when energized to open the main relay circuit, a shunt circuit extending from the motor circuit beyond the main relay adapted when closed to energize said auxiliary relay, a shunt circuit adapted to be closed when the main relay is energized and the auxiliary relay is de-energized, said last mentioned shunt circuit being adapted to maintain the main relay energized when the control switch is closed and the main relay circuit is opened after having been closed, a shunt circuit extending from the main relay circuit, said shunt circuit being normally open, and means carried by the elevator car adapted to close said shunt circuit to energize the main relay when the elevator cable is slack.

In testimony whereof, I have hereunto signed my name.

MORRIS SCHEINFELD.