

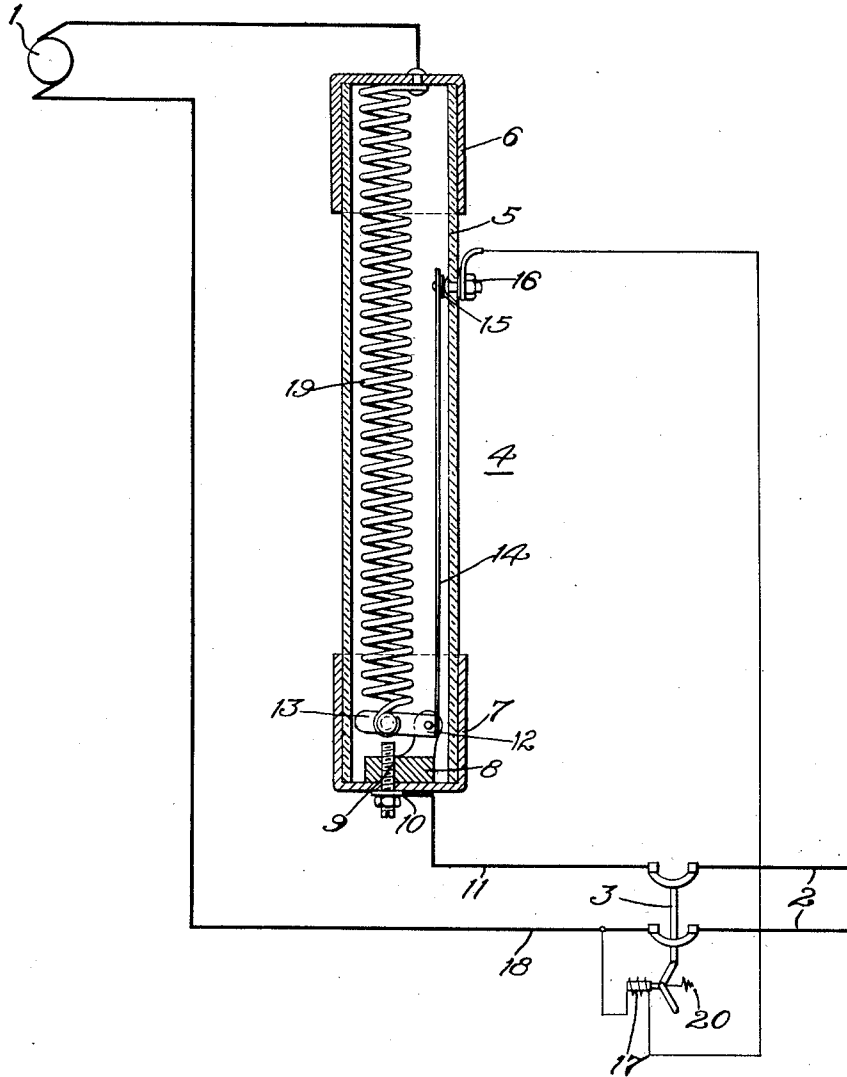
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RELAY

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WITNESSES:

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RELAY.

Application filed December 22, 1919. Serial No. 346,591.

My invention relates to electrical protective devices and particularly to thermal relays.

One object of my invention is to provide a thermal relay that shall have a sufficient time interval in the operation thereof to effect protection of electrical apparatus against overloads.

Another object of my invention is to provide a thermal relay, of the above indicated character, that shall not require the use of a separate heat-storage member.

A further object of my invention is to provide a helical spring that shall have sufficient heat-storage capacity and torque to constitute a thermal relay of the above indicated character.

A further object of my invention is to provide a relay, of the above indicated character, that shall be adapted to be used in ordinary standard cartridge-fuse clips, and be reliable and effective in its operation.

Heretofore, thermal relays having such characteristics that they conform to the heating characteristics of the device to be protected have been constructed without the use of a heating winding. These relays were for use in protecting devices of large current-carrying capacity where sufficient torque and heat-storage capacity in a relay are easily obtained. Where thermal relays were employed in the protection of devices of low current capacity it was, however, difficult to obtain sufficient torque and heat-storage capacity in a relay without the use of auxiliary heating means.

In view of the above, I provide a relay comprising a helical spring that is of such high resistance and of such mechanical strength that sufficient heat-storage is obtained with the required operating torque. The spring is adapted to expand to open a contact device when an overload obtains for a predetermined time on the device to be protected. In other words, the spring has a heating characteristic corresponding to the device to be protected, and no auxiliary heating coil or heat-storage member need be employed.

The single figure of the accompanying drawing is a diagrammatic view of an electric circuit embodying my invention.

A motor 1 is connected to an electric cir-

cuit 2 and is provided with a circuit interrupter 3 that is controlled by a thermal relay 4 for the purpose of disconnecting the motor 1 from the circuit 2, under predetermined conditions.

The relay 4 comprises a casing 5 constructed of insulating material and having connecting ferrules 6 and 7 at the ends thereof to be received by standard fuse clips, if desired. A pivot supporting member 8 is secured to the ferrule 7 by a screw 9 which also constitutes a terminal 10 for the conductor 11 of the circuit 2. A member 12 is pivotally mounted on the member 8 and comprises a laterally disposed arm 13 and a longitudinally disposed arm 14. A contact member 15 is secured to the arm 14 and is adapted to engage a stationary contact member 16 that is connected to one terminal of the holding coil 17 of the interrupter 3, the other terminal of which is connected to the conductor 18 of the circuit 2. A helical spring 19 is connected at one end thereof to the ferrule 6 and at the other end thereof to the arm 13, thus occupying substantially the total length of the casing 5 and being of such resistance as to constitute a heat-storage member which, when sufficient heat is stored therein, will expand to disengage the contact members 15 and 16 through the arms 13 and 14.

Since the resistance of the spring 19 is relatively large, the spring may be of sufficient size, structurally, to obtain positive action in the operation of the member 12 and, thus, no external means need be employed to so heat the spring 19 as to cause the same to have a heating characteristic corresponding to the heating characteristic of the motor 1. While it may be desirable to cause the member 19 to have a heating characteristic corresponding to the heating characteristic of the motor 1, for ordinary protective purposes, it is only necessary that a sufficient time interval be obtained in the device to ensure that the circuit interrupter 3 will be opened by its spring 20 before the temperature of the motor 1 reaches a destructive value.

When sufficient current has traversed the spring 19, which would destroy the motor 1 if permitted to continue for longer than a predetermined interval of time, the spring

19 will expand to open the circuit through the winding 17 and thus permit the spring 20 to open the interrupter 3. When the motor 1 and, consequently, the spring 19 have cooled to a predetermined degree, the contact members 15 will re-engage the contact member 16, and the circuit interrupter 3 may be reclosed to thereby connect the motor 1 to the circuit 2.

19 My invention is not limited to the specific structure illustrated, as it may be variously modified without departing from the spirit and scope thereof, as set forth in the appended claims.

15 I claim as my invention:

1. A protective device for opening an electric circuit containing electric apparatus upon a temperature rise above a predetermined value in said apparatus comprising a helical spring connected in circuit with said apparatus and having a heating characteristic corresponding to the heating characteristic of the apparatus and circuit-interrupting means controlled thereby.

25 2. A thermal relay for electrical apparatus comprising an enclosing casing, connecting ferrules at the ends thereof, and a helical spring within the casing connected in circuit with the apparatus and adapted to have such temperature characteristics that it will expand a predetermined amount only when the apparatus has been overloaded for a predetermined period of time.

30 3. A relay comprising a cylindrical cartridge casing, a relatively long helical spring therein, a pivotally mounted member having arms of different lengths, one end of the spring being connected to the shorter arm to actuate the same under predetermined thermal conditions, and a contact member mounted on the other arm of the member.

45 4. A thermal relay comprising a cylindrical casing, a movable contact member therein and a relatively long helical spring having a large heat-storage capacity for actuating the contact member.

50 5. A thermal relay comprising an enclosing cylindrical casing, a member pivotally mounted in one end of the casing and having an arm extending longitudinally of the casing and an arm extending laterally of the casing, and a heat-responsive member disposed between the other end of the casing and the laterally extending arm to actuate the pivoted member when heated to a predetermined degree.

60 6. A thermal relay comprising an enclosing cylindrical casing, a member pivotally mounted in one end of the casing and having an arm extending longitudinally of the

casing and an arm extending laterally of the casing, and resilient means disposed between the other end of the casing and the laterally extending arm to actuate the pivoted member when heated to a predetermined degree. 65

7. A thermal relay comprising an enclosing cylindrical casing, a member pivotally mounted in one end of the casing and having an arm extending longitudinally of the casing and an arm extending laterally of the casing, and a relatively long helical spring disposed between the other end of the casing and the laterally extending arm to actuate the pivoted member when heated to a predetermined degree. 75

8. A thermal relay comprising a cartridge casing, a pivotally mounted member therein having a laterally and a longitudinally extending arm; and a spring disposed in the casing for engaging the laterally extending arm to actuate the same when heated to a predetermined degree and having a relatively large heat-storage capacity. 80

9. A thermal relay comprising a cartridge casing, a pivotally mounted member in one end thereof having two arms, a contact member mounted on one arm, and an expansible spring disposed between the other end of the casing and the other arm to actuate the same when heated to a predetermined degree. 90

10. A relay for protecting an electrical translating device comprising a casing, a pivotally mounted member in one end of the casing having two arms, a contact member mounted on one arm for controlling the circuit of the translating device, and a spring mounted between the other end of the casing and the other arm and being adapted to have the same time temperature characteristic as the translating device to be protected and to actuate the pivotally-mounted member when heated to a predetermined degree. 100

11. A relay for protecting an electrical translating device comprising an enclosing casing, a pivotally mounted member therein at one end of the casing having a laterally and a longitudinally extending arm, a contact member mounted on the longitudinally extending arm to control the circuit of the translating device, and a helical spring disposed between the other end of the casing and the laterally extending arm, said spring being adapted to actuate the laterally-extending arm when heated to a predetermined degree and having sufficient heat-storage capacity to obtain a relatively long time element in the operation of the contact member. 115

In testimony whereof, I have hereunto subscribed my name this 28th day of November 1919. 120

HENRY D. JAMES.