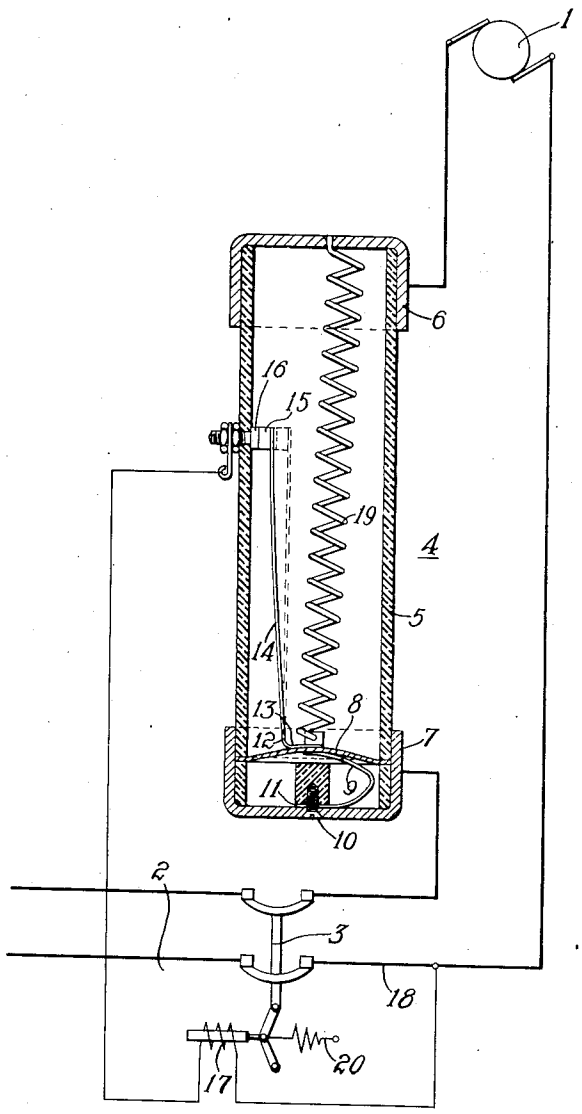
Jan. 13, 1925.

1,522,786

J. B. MacNEILL

THERMAL RELAY

Filed June 9, 1920



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN B. MACNEILL, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

THERMAL RELAY.

Application filed June 9, 1920. Serial No. 387,570.

To all whom it may concern:

Be it known that I, JOHN B. MACNEILL, a subject of the King of Great Britain, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Thermal Relays, of which the following is a specification.

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 means for effecting quick operation of the relay.

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 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. However, these were for protective devices of large current-carrying capacity because it was difficult to obtain sufficient torque in the relay and, at the same time, sufficient heat storage for protecting devices of low current-carrying capacity 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 member 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. In order to prevent arcing at the contact when it is actuated by the spring, I provide a biased leaf spring that is actuated by the helical spring to control the movement of the contact member.

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

A motor 1 is connected to an electric circuit 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 biased leaf spring 8 is disposed in the casing 5 near one end thereof and is maintained in its biased position by means of a bent spring 9 that is secured at one end 11 thereof to the ferrule 7 by means of a screw 10. A contact-supporting member 12 is mounted on the biased leaf spring 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 a 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 to the ferrule 6 and is disposed between the ferrule 6 and the leaf spring 8, thus occupying substantially the total length of the relay casing and being of such resistance as to constitute a heat-storage member which, when sufficient heat is stored therein, will expand to cause the spring 8 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 spring 8 and, thus, no external means need be employed to so heat the spring 19 as to cause the same to have a heating characteristic of the motor 1. While it may be desirable to cause the member 19 to have a heating characteristic cor-

responding 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 circuit through the interrupter 3. When the motor 1 and, consequently, the spring 19 have cooled to a predetermined degree, the contact members 15 and 16 will be again closed and the circuit interrupter 3 may be reclosed to thereby connect the motor 1 to the circuit 2. By employing the biased leaf spring 8, quick disengagement of the contact members 15 and 16 is obtained and dangerous arcing at the contact surfaces thereof is precluded.

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.

I claim as my invention:

1. A protective device for opening an electric circuit containing electric apparatus upon a predetermined temperature rise above a predetermined value in said circuit comprising a helical spring connected in circuit with said apparatus and adapted to have a heating characteristic corresponding to the heating characteristic of the apparatus, a contact member and means actuated by the spring for controlling the contact member.

2. A thermal relay for an electric circuit containing electric apparatus comprising a helical spring in circuit with the apparatus, a biased leaf spring controlled thereby and a contact member controlled by the leaf spring to effect quick movement thereof.

3. A thermal relay adapted for insertion in fuse-type clips, comprising a tubular member provided with end ferrules, a biased leaf spring disposed within the tubular member adjacent one end thereof, means for electrically connecting the leaf spring to the adjacent ferrule, a helical spring disposed between the leaf spring and the opposite ferrule, and a movable contact-supporting member controlled by the leaf spring.

4. A thermal relay adapted for insertion in fuse-type clips, comprising a tubular member provided with end ferrules, a biased leaf spring disposed within the tubular member adjacent one end thereof, means for electrically connecting the leaf spring to the adjacent ferrule, a helical spring disposed between the leaf spring and the opposite ferrule, and a contact member controlled by the leaf spring.

5. A thermal relay adapted for insertion in fuse-type clips, comprising a tubular member provided with end ferrules, a leaf spring disposed within the tubular member adjacent one end thereof, means normally biasing the spring in one direction, a thermally-responsive element connected between the ferrules and operative to bias the spring in another direction and a contact member controlled by the spring.

6. A thermal relay comprising a cylindrical casing, a movable contact member therein, a thermal-responsive member for actuating the contact member and means simultaneously actuated by the thermal-responsive member for causing the actuation of the contact member to be effected with a snap action.

7. A thermal relay comprising a cartridge casing, an expansible spring disposed therein, a biased leaf spring controlled by the expansible spring and a contact member mounted on, and controlled by, the biased spring to actuate said contact member with a snap action.

In testimony whereof, I have hereunto subscribed my name this 3rd day of June, 1920.

JOHN B. MACNEILL.