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TIME LIMIT OVERLOAD RELAY FOR ELECTRIC CIRCUITS

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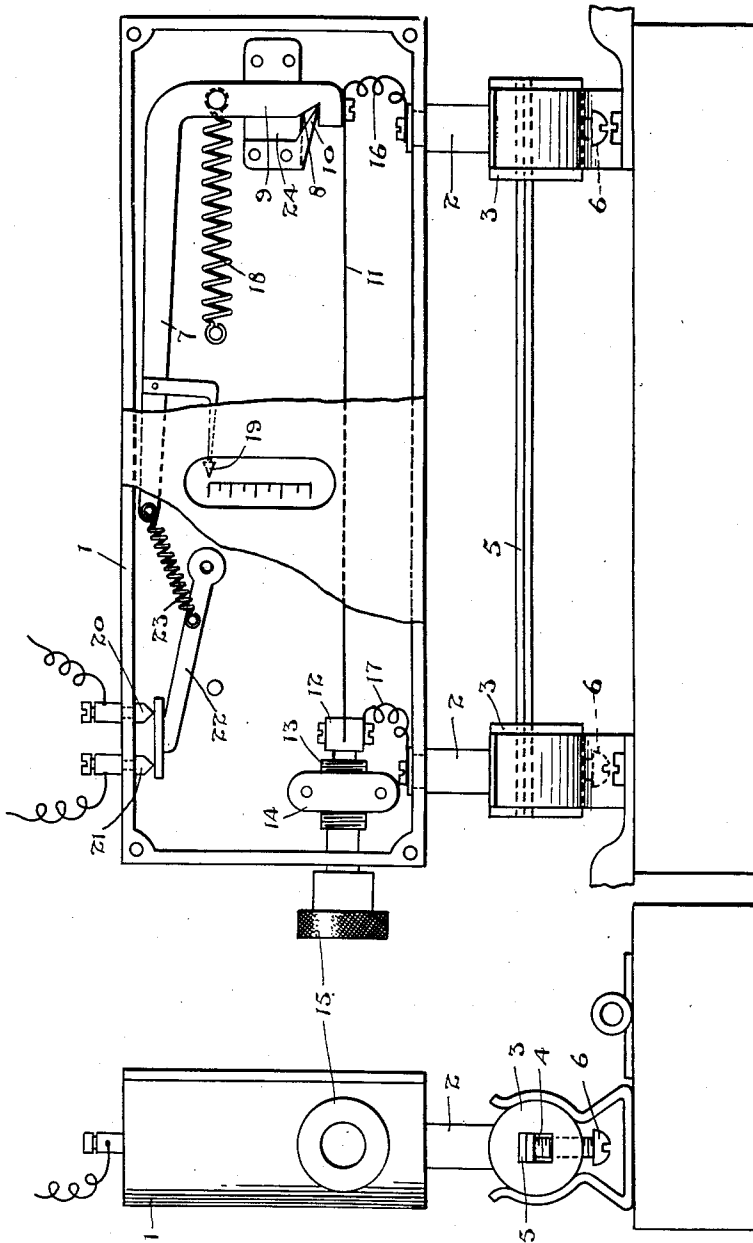


Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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TIME-LIMIT OVERLOAD RELAY FOR ELECTRIC CIRCUITS.

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To all whom it may concern:

Be it known that I, FREDERIC OSCAR ADAMS, a citizen of the United States of America, and resident of the city of Toronto, county of York, Province of Ontario, in the Dominion of Canada, have invented certain new and useful Improvements in a Time-Limit Overload Relay for Electric Circuits, described in the following specification and illustrated in the accompanying drawings, that form part of the same.

The principal objects of this invention are, to effectively protect electrical circuits against overload, and to protect polyphase alternating motors from injury due to a reversal of phase or phase failure, and further to devise a form of relay which may be readily placed in the ordinary standard fuse blocks.

Another and important object is to devise a very simple and inexpensive form of relay which may be readily adjusted to suit the service for which it is intended.

The principal features of the invention consist in the novel construction and arrangement of parts, whereby a thermal switch operating member is electrically connected to a pair of terminals and said terminals are bridged by a plurality of conductors which enable a ready adjustment of the capacity of the relay, and whereby the member for operating the circuit controlling switch is supported upon a compensating expansion member which operates in opposition to the expansion of the supporting casing when it becomes heated.

In the drawings, Figure 1 is a side elevational view of my improved structure showing the main contacts arranged in the terminals of a standard fuse block.

Figure 2 is an end elevational view.

Thermal relays have been in common use for some time but up to the present the constructions have been such as to render their use unsatisfactory.

The present invention produces a device which can be quickly altered to suit different conditions of service and a device is constructed which is adapted to co-operate with standard equipment.

In the accomplishment of this result the relay mechanism is arranged within a casing 1 to which is secured a pair of posts 2, the outer ends being provided with short

cylindrical shaped heads 3 which are formed with longitudinal slots 4. Within these slots and extending between the heads are a plurality of metal strips 5 which may be increased or decreased in number according to the current requirements of the circuit. These strips are secured in place by suitable set screws 6.

The cylindrical heads 3 are made in standard sizes to fit the contact members of the standard fuse blocks that would be used in services requiring such a device.

The mechanism contained within the casing 1 comprises a lever arm 7 here shown of substantially right angular form having a notch 8 in the short end 9 which receives the knife edge pivot 10 and swings thereon.

The thermal expansion element 11 is in the form of a strip of metal rigidly secured at one end to the short end 9 of the lever 7 and at the other end to a swivel block 12 secured in the adjustment screw 13 which is threaded in a stationary block 14 secured in the casing.

The adjusting screw 13 extends through the casing and a thumb nut 15 is arranged on the outer end for calibrating the device.

Flexible conductors 16 and 17 connect the posts 2 to the opposite ends of the expansion element 11 so that the said element is arranged in multiple with the strips 5.

A coil tension spring 18 is secured to the short end of the lever 7 to pull against the expansion element, the tension of same being regulated by the adjustment of the calibrating screw 13.

A suitable pointer 19 is arranged upon the lever 7 as an indicator to display the adjustment.

A pair of electrical contacts 20 and 21 are arranged in the wall of the casing 1 and are connected to the circuit which is to be controlled. A switch arm 22 is pivotally supported within the casing 1 and is adapted to close the circuits between the contacts 20 and 21.

The switch arm 22 is operatively connected with the lever 7 preferably by a coil spring 23 and the expansion element 11 holds the switch into engagement with the contacts 20 and 21 until by reason of a condition of overload in the circuit the element 11 expands. When such element does expand the spring 18 swings the lever 7 on

its pivot and the switch arm 22 is caused to operate and break the control circuit.

The heat generated in the expansion element 11 gradually heats the entire apparatus and unless special provision is made the delicacy of the instrument will be interfered with because the heat will cause an expansion in the length of the casing 1 and the relative position of the pivot of the lever with respect to the opposite end of the expansion element will alter. In order to overcome this difficulty the pivot 10 is supported upon a plate 24 which is secured to the casing at the end opposite to that carrying the pivot, said plate preferably extending beyond the short end of the lever 7.

The co-efficient of expansion of the plate 24 is much greater than that of the casing and in exact proportion to the relative length of the plate and said casing so that as the casing expands longitudinally carrying the plate with it the plate expands in the opposite direction to neutralize such expansion, consequently the pivot point remains in a fixed relation to the end of the expansion element connected to the adjusting screw 13.

A device such as described is extremely simple in its construction but is very effective and can be made in a very compact form and having the terminal connections in the form of the posts 2 with the cylindrical heads 3 to fit into the spring contacts of the standard fuse block enables the use of the device without the necessity of the installation of special blocks or posts.

The arrangement of adjustable plates forming element multipliers enables the device being almost instantaneously adjusted to accommodate any particular flow of current as any desired number of strips may be placed between the contacts.

What I claim is my invention is:—

1. In a time limit overload relay, the combination with a thermal expansion member, of a pair of contacts electrically connected with the thermal member, one end of said thermal member being adapted to move relative to the contacts upon the expansion

of the thermal member, and an electrical connection arranged between said contacts in multiple with the thermal member.

2. In a time limit overload relay, the combination with a thermal expansion member, of a pair of contacts flexibly electrically connected with the thermal member, cut-out means operatively connected with one end of said thermal member, a plurality of electrical conductors extending between said contacts, and means for removably securing said conductors.

3. In a time limit overload relay, the combination with a thermal expansion member, of a pair of contacts flexibly electrically connected with the thermal member and having cylindrical ends adapted to fit in a standard fuse block, said ends being slotted longitudinally, electrical connectors fitting in said slots and extending between said contacts, and means for securing said connectors in said slotted ends.

4. In a time limit overload relay, the combination with a thermal expansion member fixed at one end, an electric switch, a lever operating said switch connected with the expansion member, and a base supporting said member, of a pivot for said lever arranged upon an expansible member secured to said base and adapted to expand relatively to the base to maintain a fixed distance between the pivot of the lever and the fixed end of the expansion member.

5. In a time limit overload relay, the combination with a casing, an electrical switch in said casing, a lever operatively connected with said switch and an expansion member connected at one end to said lever and extending to and secured at the opposite end of the casing, of a plate secured to the casing at the end farthest from the fixed end of the expansion member and extending inwardly and forming a pivot support for the lever, said plate having a co-efficient of expansion greater than that of the casing and maintaining a fixed relation between the fixed end of the expansion member and the pivot of the lever.

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