Dec. 13, 1927.

1,652,230

E. BESAG

THERMAL TIME LAG RELAY

Filed Oct. 15, 1925

Fig. 1

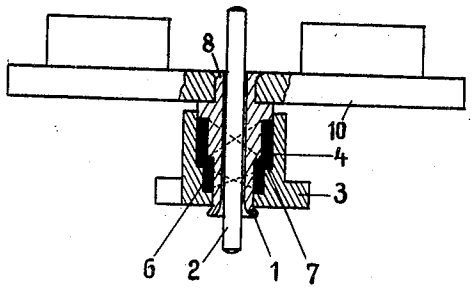


Fig. 2

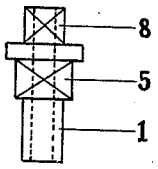
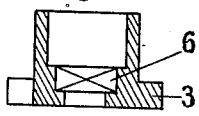


Fig. 3



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UNITED STATES PATENT OFFICE.

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THERMAL TIME-LAG RELAY.

Application filed October 15, 1925. Serial No. 62,626, and in Germany October 18, 1924.

This invention relates to a thermal time lag relay of the kind in which the parts of the relay are held together by a fusible body and the releasing or functioning of the relay is effected when the fusible body is heated by the electric current above a certain temperature and thereby softened. The new thermal time lag relay is exceedingly small and nevertheless it is far more reliable in its working than the relays hitherto known. Furthermore, no failure of the release occurs even after being switched on and off a great many times. The holding power of the relay is very great. The power consumption of the relay is very small and only amounts to about 1 to 1.5 watts. After the opening of the circuit has been effected, the fusible material immediately solidifies again so that the time switch is ready for work at once. The accuracy of the release is very great.

This and other advantages are obtained by the fact that the action is not based on the clinging or the friction of the fusible body upon the parts of the relay, the contacting surfaces of which have hitherto been constructed as bodies of revolution, but upon the fact that the surfaces of both parts of the relay that make contact with the fusible body are not constructed as solids of revolution, but are provided with quadrilateral surfaces, projections, vanes or the like, which have the result that, upon the fusible body softening, part of it is held fast on the quadrilateral surfaces or in the cavities or the like so that, upon the parts of the relay rotating relatively to one another, the fusible body itself divides.

The inner member of the relay is constructed as a hollow shaft and through the hollow shaft there passes a simple heating wire, which effects the heating of the relay from within.

The relay is in the shape of a stuffing box, in which the fusible body takes the place of the packing. The fusible body in consequence of this construction completely fills up the space between the relay members and when the softening takes place no fusible material can escape.

Since the action is based not upon the clinging or adhesion of the fusible body to the surfaces of the two relay members, soldering metal need no longer be employed for the fusible body. Soldering metal decomposes with time and changes its properties, but an absolutely constant eutectic alloy having a melting point of about 150° C. is employed as a fusible body, the fusing temperature and solidifying temperature of which remain absolutely unchangeable and in which decomposition is altogether precluded.

The new relay is illustrated in the accompanying drawings about six times its actual size.

Fig. 1 is a longitudinal section through the relay.

Fig. 2 is an elevation of the hollow shaft and

Fig. 3 is a section through the ratchet wheel.

The hollow shaft 1 is secured by the part 8 to the apparatus, an oil switch for example, the overheating of which is to be prevented. Through the bore of the shaft passes the heating wire 2, which is clamped between the terminals of the circuit. This clamped heating wire is readily exchangeable. Its thermal and electrical properties can readily be checked and can easily be reproduced at any time. Mechanically the wire has nothing to hold. 3 is a ratchet wheel in the teeth of which engages the releasing pawl of the apparatus to be controlled, a switch for example. Between the hollow shaft 1 and the ratchet wheel 3 is located the fusible mass 4. The hollow shaft has a squared part 5 and the ratchet wheel 3 is provided with a four-sided cavity 6. These rectangular parts have the result that the fusible body 4 cannot slide on the surface of the hollow shaft 1 and the ratchet wheel 3 cannot slide on the surface of the fusible body 4 and furthermore that a part of the fusible material always remains connected with the hollow shaft or the ratchet wheel as the case may be and in the event of a release the fusible body divides into two. This division takes place at the neck-like part 7 of the fusible body, which connects the angular parts 4 and 6.

Instead of the quadrilateral surfaces 5 and 6 any other means may be provided, which deprive the two members of the relay of the characteristics of solids of revolution. This may be done for example by means of cavities, raised portions, vanes or the like provided on the relay members.

The relay has the form of a stuffing box in which the fusible body 4 takes the place of the packing. The fusible body therefore

completely fills up the space allotted to it and cannot escape.

In consequence of its small dimensions the heating wire 2 is a thin filament of about 0.6 mm. in diameter and renders the new time lag relay particularly well adapted for use in quite small pieces of apparatus which do not generate any considerable amount of heat and which necessitate great releasing forces notwithstanding the smallness of their power consumption. In the case of the new relay the releasing force may therefore be very great because the fusible body itself must divide into two parts and the operation is not based upon the unreliable friction or adhesion of solids of revolution.

What I claim is:—

1. A thermal time lag relay comprising in combination two relay members, one of which is capable of turning relatively to the other, one of said members consisting of a hollow shaft, a fusible body arranged between the relay members for holding said members together, means for preventing rotation of the two relay members relatively to the fusible body and a heating wire passed through the hollow shaft and independent of the second relay member, said heating wire being intended to be heated by passing an electric current through it so as to enable it to soften the fusible body when the current becomes excessive.

2. A thermal time lag relay comprising in combination a relay member consisting of a hollow shaft, a second relay member surrounding said hollow shaft, said relay members being capable of turning relatively to one another, a fusible body arranged between said relay members for holding said members together, means for preventing rotation of the two relay members relatively to the fusible body and a heating wire passed through said hollow shaft, said heating wire being intended to be heated by passing an electric current through it so as to enable it to soften the fusible body when the current becomes excessive.

3. A thermal time lag relay comprising in combination a ratchet wheel having a cylindrical cavity, a hollow shaft having a squared portion inside said cavity, said ratchet wheel and hollow shaft being capable of turning relatively to one another, a fusible body in said cavity for holding said ratchet wheel and hollow shaft together and a heating wire passed through said hollow shaft, said heating wire being intended to be heated by passing an electric current through it so as to enable it to soften the fusible body when the current becomes excessive.

In testimony whereof I have signed my name to this specification.

ERNST BESAG.