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ELECTRICAL TRANSLATING APPARATUS

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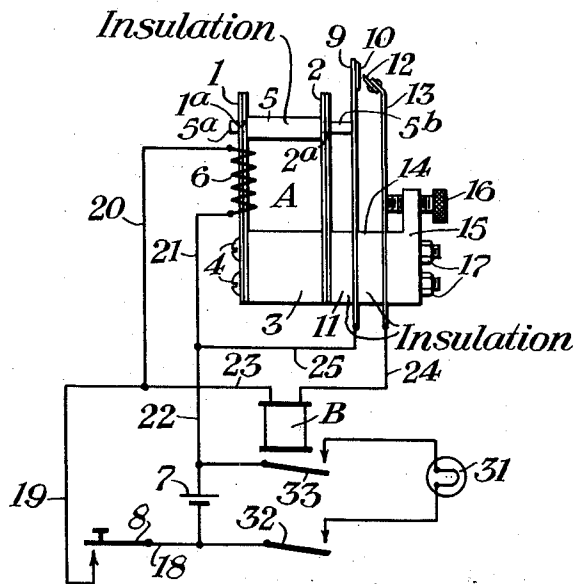


Fig. 1.

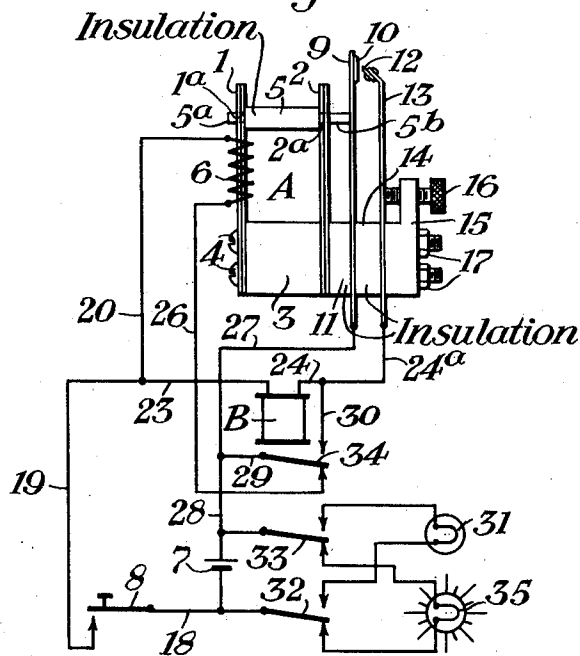


Fig. 2.

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ELECTRICAL TRANSLATING APPARATUS

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My invention relates to electrical translating apparatus.

I will describe two forms of apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a diagrammatic view illustrating one form of apparatus embodying my invention. Fig. 2 is a similar view, showing a modified form of a portion of the apparatus illustrated in Fig. 1, and also embodying my invention.

Similar reference characters refer to similar parts in both views.

Referring first to Fig. 1, the reference character A designates, in general, a thermal relay comprising two thermo-sensitive devices 1 and 2 which change their shape in response to changes in their temperature. In the form here shown, these thermo-sensitive devices are two similar bi-metallic strips each consisting of two laminae of metals having different temperature coefficients of expansion. The bi-metallic strips 1 and 2 are clamped at their lower ends to the opposite sides of a spacing block 3 by means of two bolts 4 passing through the strips and through the block, and the strips are disposed with the laminae having the lower coefficient of expansion facing each other, so that if the temperature of both strips rises, the upper ends of the strips will have a tendency to deflect toward each other. The spacing block 3 may or may not be of insulating material, but is preferably a good conductor of heat. The upper ends of the strips 1 and 2 are held in parallel spaced relation by means of an insulating rod having two ends 5^a and 5^b of reduced diameter which extend through holes 1^a and 2^a in the strips 1 and 2, respectively. The end 5^b of the rod 5 engages a resilient contact finger 9 carrying a contact button 10 of low resistance electrical conducting material such as silver. The contact finger 9 is mounted on the bolts 4, and is insulated from the bolts by insulating sleeves on the bolts (not shown), and from the strip 2 by an insulating block 11 interposed between the contact finger 9 and the strip 2. The contact button 10 co-acts with a contact tip 12 of low resistance electrical conducting material to

form a low resistance contact 10—12. The contact tip 12 is attached to a resilient contact finger 13 also mounted on the bolts 4. The contact finger 13 is insulated from the contact finger 9 by an insulating piece 14 interposed between the fingers on the bolts 4, and from the bolts 4 by the insulating sleeves referred to above. A bracket 15 also carried on bolts 4 adjacent finger 13 supports a thumb screw 16 having a knurled head. The end of the thumb screw 16 engages the contact finger 13 and it will be apparent that by screwing the thumb screw inwardly, the contact opening between the contact button 10 and the contact tip 12 will be decreased, so that the amount of deflection of the bi-metallic strips 1 and 2 necessary to close the contact 10—12 is decreased. Nuts 17, screwed on the ends of the bolts 4, hold the various parts in place.

Associated with the strip 1 is a heating element 6. The heating element 6 is included in a control circuit for relay A which, as here shown, passes from a battery 7 through wire 18, a switch 8, wires 19 and 20, heating element 6, and wires 21 and 22 back to battery 7. When this circuit is closed, current is supplied to the heating element 6, and after a time interval, the strip 1 becomes heated and deflects toward the right, thereby closing the contact 10—12. This contact then remains closed until the supply of current to the heating element 6 is interrupted and the strip 1 allowed to cool. One function of the block 3 is to conduct the heat away from the bi-metallic strip 1 rapidly so that the strip 1 will return quickly to its normal position after the supply of current to the heating element 6 is interrupted.

The time interval which elapses between the closing of the contact 10—12 and the closing of the control circuit for relay A depends upon the rate at which heat is supplied to the strip 1, and the distance through which the strip 1 has to move to close the contact 10—12. The rate at which heat is supplied to the strip 1, however, is dependent upon the amount of the current flowing in the heating element 6; and the distance through which the strip 1 has to move depends upon

the contact opening between the contact button 10 and the contact tip 12. It follows, therefore, that by varying the amount of current supplied to the heating element 6, or by adjusting the thumb screw 16 to vary the opening between the contact button 10 and the contact tip 12, or both, the time interval which elapses between the closing of the control circuit, and the closing of contact 10—12 may be conveniently regulated.

It should be pointed out that, since the bimetallic strips 1 and 2 are similar, and are arranged in the manner described, changes in ambient temperature will have no effect on the operation of the relay A. This is true because, if the ambient temperature rises, so that the strip 1 tends to deflect toward the right due to this rise, the strip 2 will tend to deflect toward the left an equal amount due to this rise, so that the rod 5, and hence finger 9, are substantially unmoved.

As shown in Fig. 1, the thermal relay A controls an electromagnetic relay B which is provided with a pick-up circuit passing from battery 7, through wire 18, switch 8, wires 19 and 23, winding of relay B, wire 24, contact finger 13, contact 10—12, contact finger 9, and wires 25 and 22, back to battery 7. Relay B, in turn may control any suitable apparatus. As here shown, relay B controls an electric lamp 31 which is connected with the battery 7 over an electric circuit including front contacts 32 and 33 of relay B.

The operation of the apparatus shown in Fig. 1 is as follows: If switch 8 is operated to close the control circuit for relay A, current is supplied to the heating element 6, and after a time interval has elapsed, the length of which may be adjusted in the manner previously described, the contact button 10 is moved into engagement with the contact tip 12, thereby closing the contact 10—12. The pick-up circuit for relay B is then closed, and relay B picks up, closing its front contacts 32 and 33, and completing the circuit for lamp 31. The lamp 31 then becomes lighted. If, now, the control circuit for heating element 6 is opened, at switch 8, relay B immediately becomes de-energized, and opens its contacts so that the circuit for lamp 31 is interrupted, and the lamp is extinguished.

In the modified form of apparatus shown in Fig. 2, the control circuit for relay A passes from battery 7 through wire 18, switch 8, wires 19 and 20, heating element 6, wire 26, back contact 34 of relay B, and wires 29 and 28 back to battery 7. The pick-up circuit for relay B passes from battery 7 through wire 18, switch 8, wires 19 and 23, winding of relay B, wires 24 and 24^a, contact finger 13, contact 10—12, contact finger 9, and wires 27 and 28 back to battery 7. The relay B is also provided with a stick circuit which passes from battery 7 through wire 18, switch 8, wires 19 and 23, winding of relay B, wires

24 and 30, front contact 34 of relay B, and wires 29 and 28 back to battery 7. The remainder of the apparatus is similar to that described in connection with Fig. 1.

The operation of the apparatus shown in Fig. 2 is as follows: If switch 8 is closed, current is supplied to heating element 6 over the control circuit for relay A and, after the expiration of a time interval, contact button 10 moves into engagement with contact tip 12. The pick-up circuit for relay B is then closed and this relay becomes energized. As soon as relay B picks up, the supply of current to the heating element 6 is interrupted at back contact 34 of relay B, and strip 1 cools and returns to its normal position. Furthermore, the pick-up circuit for relay B is interrupted, but relay B is now held up over its stick circuit including front contact 34 of relay B. When relay B is picked up, lamp 31 is connected with battery 7 over front contacts 32 and 33 of the relay, and this lamp is lighted. If, now, switch 8 is opened, the stick circuit for relay B immediately becomes de-energized to open the circuit for lamp 31 and extinguishes the lamp.

If desired, a second lamp 35 may be connected with battery 7 over back contacts of relay B as shown in Fig. 2. A predetermined adjustable time interval will then elapse between the closing of the switch 8 and the extinguishing of the lamp 35, but the lamp 35 will become lighted immediately upon the opening of the switch 8.

One advantage of the apparatus shown in Fig. 2 is that current is supplied to heating element 6 only for the interval of time necessary to close contact 10—12 and a considerable saving in power over the apparatus shown in Fig. 1 therefore results.

Another advantage of the apparatus shown in Fig. 2 is that, since the supply of current to heating element 6 is interrupted as soon as relay B picks up, strip 1 cools and returns to its normal position a short while after switch 8 has been closed; and if switch 8 is then opened, it may be closed as soon as relay B becomes de-energized, and the same time interval will elapse between the completion of the circuit for lamp 31 and the closing of the switch 8 as would elapse if the switch 8 was closed after the switch had been open for some time. With the apparatus shown in Fig. 1, the heating element 6 remains heated as long as switch 8 is closed. If this switch has been closed for some time, and is then opened, strip 1 must be allowed to cool before the switch is closed again, in order to have the apparatus function in the normal manner.

It will be apparent therefore that I have provided apparatus which will close an electric circuit upon the expiration of an adjustable predetermined time interval after the closing of the control switch for the ap-

paratus but which will open the electric circuit immediately upon the opening of the control switch for the apparatus.

Although I have herein shown and described only two forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination; a thermal relay comprising a thermo-sensitive device which changes its shape in response to changes in its temperature, a heating element for heating said device, and a first contact controlled by said device, means for at times supplying current to said heating element, an electromagnetic relay, means including said first contact for connecting such electromagnetic relay in multiple with said heating element, and a stick circuit for said electromagnetic relay including a front contact of said electromagnetic relay but excluding all parts of said thermal relay.

2. In combination; a thermal relay comprising a bi-metallic strip, a heating element for heating said strip, and a first contact controlled by said bi-metallic strip; an electromagnetic relay, a manually controlled switch, a circuit for said heating element including said switch and a back contact of said electromagnetic relay, a pick-up circuit for said electromagnetic relay including said first contact and said switch, and a stick circuit for said electromagnetic relay including a front contact of said electromagnetic relay and said switch but excluding all parts of said thermal relay.

3. In combination, a thermal relay comprising a heating element and a first contact controlled by said heating element, a manually operable switch, an electromagnetic relay controlled by said switch and said first contact, means controlled by said switch and a back contact of said relay for supplying said heating element with current, and a stick circuit for said electromagnetic relay including said switch and a front contact of said electromagnetic relay but excluding all parts of said thermal relay.

4. In combination; a thermal relay comprising two oppositely disposed bi-metallic strips connected together at one end by an insulating rod and having their other ends fixed, a first contact operated by said rod, and a heating element for heating one of said strips; an electromagnetic relay, a control circuit for said thermal relay including said heating element and a back contact of said electromagnetic relay, a pick-up circuit for said electromagnetic relay including said first contact, and a stick circuit for said electromagnetic relay including a front contact

of said electromagnetic relay but excluding all parts of said thermal relay.

5. In combination, a thermo-sensitive device which changes its shape in response to changes in its temperature, a heating element for heating said device, a first contact controlled by said thermo-sensitive device, an electromagnetic relay, means including a back contact of said electromagnetic relay for at times supplying said heating element with current, means including said first contact for at times supplying said electromagnetic relay with current, and a stick circuit for said electromagnetic relay including a front contact of said electromagnetic relay but excluding all parts of said thermal relay.

6. In combination; a thermal relay comprising two oppositely disposed bi-metallic strips connected together at one end by an insulating rod, a contact operated by said rod, and a heating element for heating one of said strips; an electromagnetic relay connected in multiple with said heating element over said contact and over its back contact, a stick circuit for said electromagnetic relay including a front contact of said electromagnetic relay but excluding all parts of said thermal relay, and a control circuit for said thermal relay including said heating element and said back contact of said electromagnetic relay.

7. In combination, a thermal relay comprising two oppositely disposed bi-metallic strips each consisting of two laminae of metal having different coefficient, of expansion upon temperature change and each provided with a hole, a spacing block of material which is a good conductor of heat interposed between the strips at one end of the strips, an insulating rod interposed between the strip at the other end of the strips and having ends of reduced diameter one of which extends through the hole in each said strip, a first resilient contact finger in engagement with one end of said rod, an insulating member between said finger and the adjacent bi-metallic strip, a contact button of low resistance electric conducting material attached to said first contact finger, a second contact finger insulated from said first contact finger, a low resistance contact tip attached to said second contact finger and cooperating with said contact button to form a low resistance contact, a bracket abutting said second contact finger, an adjustable thumb screw supported by said bracket and engaging said second contact finger, means for clamping said strips, said spacing block, said insulating member, said contact fingers, and said bracket in place, a heating element for heating one of said strips; an electromagnetic relay, a control circuit for said thermal relay including said heating element and a back contact of said electromagnetic relay, a pick-up circuit for said electromagnetic relay including the low resistance contact of said

thermal relay and receiving energy from said
control circuit, and a stick circuit for said
electromagnetic relay including a front con-
tact of said electromagnetic relay but exclud-
ing all parts of said thermal relay and re-
ceiving energy from said control circuit.

In testimony whereof I affix my signature.

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