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ELECTRICAL SWITCHING DEVICE

Filed April 15, 1931

Fig. 1

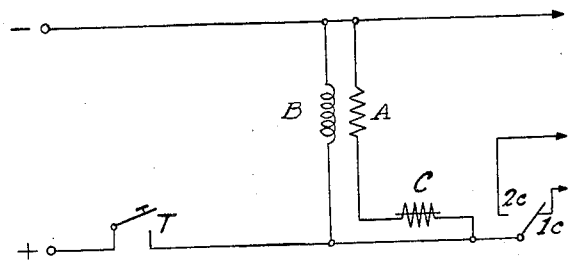
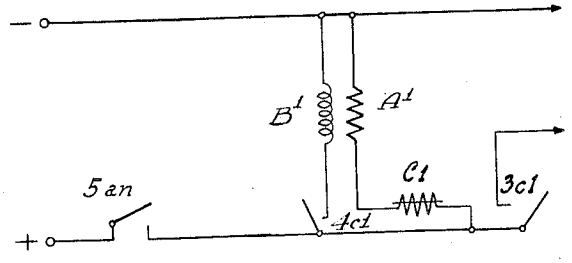



Fig. 2




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## ELECTRICAL SWITCHING DEVICE

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4 Claims. (Cl. 175—320)

The present invention relates in general to arrangements for introducing an element of time into the operation of electrical switching devices and is concerned primarily with circuit arrangements for the retardation of the switching operations of such devices.

Arrangements are already known for the retardation of switching operations in which the influence of heat on metal is utilized, such as in the case of, for example, thermo relays. The object of the present invention is to take advantage of the fact, in order to effect a retardation of switching operations, that the resistance in conductors increases when heat in applied; and this is achieved by connecting up a resistance having a high temperature resistance coefficient in the circuit of the switching means which effect the switching operations, whereby this resistance, owing to the influence of a source of heat, gradually causes the current for the switching means tc be reduced or increased by alteration of its electrical resistance.

The arrangement, according to the invention, can be used with great advantage for slow interrupters used in telephone systems as shown by the embodiment in Fig. 2.

An embodiment of the subject of the invention is shown in the drawing. Fig. 1 shows an arrangement for deenergizing a relay after a predetermined interval. Fig. 2 shows an interrupter or impulse generator. Only the switching elements necessary for a complete understanding of the invention have been shown. The invention is not limited to the embodiments hereindisclosed.

A retardation arrangement for relay C is shown in Fig. 1. In this circuit the relay releases with slow action accounted for by the winding A, located in the circuit for relay C. Winding A consists of a conducting lead with the highest possible temperature resistance coefficient, and is arranged so that it can be heated by the heating winding B, whereby the resistance of winding A is increased.

When the key T in this arrangement is closed, the following circuit is completed: Positive pole of battery, key T, winding of relay C, winding A, negative pole of battery; and, further, a circuit is completed for the heating coil B, which is thermally connected to A. In the described circuit the relay C is energized whereupon it opens its contact 1c and closes contact 2c. The heating element B warms up and transmits heat to the winding A, which warms up also. The resistance of this effect is increased due to the heating winding, with the result that, if the correct resistance has been selected, relay C releases with slow action due to the gradual warming up. Contact 2c is thereby opened and contact 1c closed.

Fig. 2 shows the use of the arrangement according to the invention in connection with a slow interrupter. When in this circuit arrangement a contact 5*an*, dependent upon any relay, is closed, the relay C1, which is connected up in series with a resistance A1, is energized in the following circuit. Positive pole of battery, contact 5*an*, winding of relay C1, resistance A1, negative pole of battery. The relay C1 closes its contacts 4c1 and 3c1. Over contact 4c1 a heating coil B1 is connected up which warms up gradually and heats the resistance A1 by degrees. When the resistance in winding A1 has risen to a certain value the relay C1 again releases. The inter-action continues as long as 5*an* is closed so that a circuit in which various switching devices can be located, (i. e. stepping switches) is opened and closed at definite periods of time by the contact 3c1.

What is claimed is:

1. A circuit controlling device comprising two conductors connected respectively to the two poles of a current generator, a relay connected across said two conductors, a resistance having a positive temperature resistance coefficient connected in series with said relay, and a heating element connected across said conductors for regulating the value of said resistance.

2. A circuit controlling device comprising two conductors, means for connecting the conductors to the two poles of a current generator, a relay and a variable resistance connected across said two conductors, a heating element for regulating the value of said resistance, and circuit connections controlled by said relay for connecting and disconnecting said heating element and said two conductors to effect the alternate energization and deenergization of the relay as long as the conductors remain connected to the generator.

3. In a circuit controlling device, two conductors, a relay and a temperature regulated variable resistance connected across said conductors, a source of current and means for connecting the same across said conductors to operate said relay provided said resistance is at normal temperature, a heating element for raising the temperature of said resistance to a point at which said relay deenergizes, and contacts controlled by said relay for connecting said heating element across said conductors.

4. The combination comprising a closed elec-

trical circuit including a relay, a source of current, a temperature regulated variable resistance adapted when at normal temperature to pass sufficient current from said source to operate said relay, a heating element effective to increase the temperature of said resistance and thereby decrease the current flow in the circuit to deenergize said relay, and means controlled by the relay on deenergizing for disabling said heating element thereby permitting said resistance to return to normal temperature and permit the reenergization of the relay.

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