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ELECTROMAGNETIC SELF-INTERRUPTER

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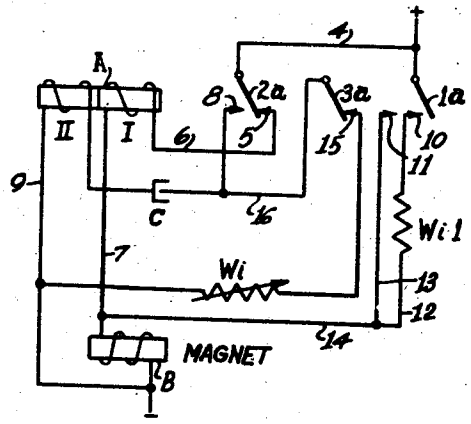

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ELECTROMAGNETIC SELF-INTERRUPTER

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7 Claims. (Cl. 175—373)

This invention relates to an electromagnetic self-interrupter for carrying out switch operations in predetermined time intervals wherein charging and discharging of condensers are used in conjunction with relays.

Arrangements wherein the charging and discharging currents of condensers are used for providing slow action periods, for example for obtaining the slow-action operation and release of relays, are, as such, not new. Thus, arrangements, are known, for example, in which a relay is connected in series with a high resistance and a condenser and in which these elements are connected in series with a further high resistance. The charging period of the condenser depends on its size and on the magnitude of the two resistances. For the discharge the second resistance is cut out and the discharge period depends then on the magnitude of the resistance arranged in series with the condenser and the relay. In this manner a delayed operation and a delayed release of the relay is obtained which, by its contacts, controls an auxiliary relay which for its part controls over its contacts a local circuit for carrying out the desired switch operation.

This invention, however, is concerned with a device acting as a self-interrupter and adapted to control switch operations to be effected in predetermined time-intervals, for example the actuation of the stepping magnet of a selector and the like. The object of the invention is to provide a make-and-break mechanism of very cheap construction permitting variation of the break periods within certain limits, as desired, so that the arrangement may be used for a variety of purposes in combination with the usual simple switching and delaying means, such as relays and condensers.

This object is attained by the provision of a single relay, one winding of which is connected in the operating circuit of the device to be controlled, and the other winding of which is connected in the charging and discharging circuit of the condenser and which, by its contacts, directly controls the operating circuit of the device to be controlled as well as controlling the charging and discharging circuit of the condenser.

The invention offers various advantages over known arrangements. It provides a very simple and yet a precisely operating arrangement and is a substitute for the expensive time switch mechanisms hitherto in use for the purpose referred to.

Compared with arrangements where use is made of a plurality of condensers and relays, in order to obtain slow action periods of operation and release, the invention offers the advantage of requiring only one relay provided with two windings and controlling directly, by its own contacts and without the use of auxiliary relays, not only the charging and discharging circuit of the condenser, but also the operating circuit of the device to be actuated.

The invention, moreover, permits the fixing of the resistance and time values in the charging and discharging circuit of the condenser in mutual independence. The charging period of the condenser is merely determined by its capacity value and the value of the resistance of the series-connected relay winding, whereas the discharging period is substantially determined by the value of the resistance inserted in the circuit for discharge. This permits the determination of the length of the switch pauses on the one hand and of the switch periods on the other hand in mutual independence or, in other words, by suitably fixing the charging period and by sufficiently extending the operating period the device to be controlled can be protected against overloading, irrespective of the determination of the discharge period.

Since the resistance is variable the further advantage is obtained, that the length of the switch pauses can be altered conveniently and quickly, so that it is possible to use the interrupter for various purposes or for different switching speeds. In order to permit a quick adjustment, the resistance values may be transformed into time values that is to say the resistance may be marked in time units.

The resistance may be connected to the relay as a fixed or as a variable resistance whereby a further simplification of the arrangement is obtained.

When first switched on the interrupter operates without any delay which, in many cases, is also a substantial advantage.

An embodiment of the invention is hereafter described with reference to the accompanying drawing. Only those parts which are necessary for the understanding of the invention are illustrated and described. The opposite terminals of a battery or other current source have been indicated by + and —.

In the drawing I have shown the magnet B which represents the operating or stepping magnet of a selector switch such as used in automatic telephony, and the control relay A having two

windings and a set of contacts controlled by the relay to open and close the operating circuit for the magnet B. There is also shown a condenser C and a pair of resistances Wil and Wi the latter of which is adjustable.

In describing the operation of the circuit it is assumed that positive battery is connected to the terminal marked + to start operations. As soon as this occurs a circuit is completed from + over lead 4, spring 2a and its normally closed back contact 5, lead 6, right hand winding I of relay A, lead 7, and over the winding of magnet B to negative battery —. The relay A is energized over this circuit, but the magnet B is adjusted so that it does not receive sufficient current to energize in series with the winding I of relay A. Relay A now attracts its armature to cause springs 1a, 2a and 3a to open their normally engaged contacts and engage their front contacts. The original energizing circuit of winding I of relay A is broken by the spring 2a leaving its back contact 5 and a new circuit is closed from + over lead 4, spring 2a, front contact 8, condenser C, left hand winding II of relay A, and over lead 9 to —. During the charging of the condenser C over this circuit, sufficient current will flow over winding II of relay A to maintain the relay energized even though the circuit of winding I has been opened. At springs 3a another circuit was opened when relay A energized which will be described and at spring 1a and its front contact 10 a circuit is first closed over low resistance Wil, lead 12, and through magnet B to — to start energization of the magnet. As soon as spring 1a engages with its second front contact 11, that is when 1a, 10 and 11 are all in contact, then resistance Wil is short-circuited in the circuit of magnet B and direct battery is supplied from + over spring 1a, contacts 10 and 11, lead 13, lead 14, and winding of magnet B to —. Magnet B is now fully energized to perform its function of stepping the switch which it controls.

As soon as the condenser C becomes fully charged current will no longer flow in winding II of relay A and through condenser C and therefore relay A will deenergize and open its front contacts and again close its normal contacts. When spring 1a disengages contacts 10 and 11 the energizing circuit of magnet B is opened and the magnet deenergizes. When spring 2a disengages its front contact 8, the circuit through winding II of relay A and the condenser C is opened. As soon as spring 2a engages its normal contact 5 the first traced energizing circuit through winding I of relay A and magnet B is again closed but is ineffective at this time due to the closure of spring 3a and its normal contact 15. The closure of spring 3a and contact 15 completes a discharging circuit for the now charged condenser C extending from the right hand terminal thereof over lead 16, spring 3a, contact 15, adjustable resistance Wi, lead 9, winding II of relay A, and back to the other terminal of condenser C. It will be seen that condenser C will discharge over this circuit and that the current flow in this circuit is in the opposite direction through winding II of relay A to that of the current flowing therein while C was being charged. Windings I and II of relay A are now differentially energized and the armature of the relay is not attracted. Thus the winding I of relay A is prevented from energizing the relay as long as current flows in this circuit or until condenser C is discharged. The resistance Wi as indicated may be adjusted to control the discharge time of condenser C over this circuit. The resistance Wi may be marked off in accordance with time units if desired, the various markings corresponding to resistance values which will give different discharge times to condenser C.

As soon as condenser C is discharged the original circuit again becomes effective to energize relay A. This circuit as previously described extends from + over spring 2a, contact 5, lead 6, winding I of relay A, lead 7, and winding of magnet B to —. The same sequence of operations again occurs as described, that is, relay A energizes to complete the circuit of magnet B at 1a and its front contacts, the original circuit of winding I of relay A is opened and the charging circuit for condenser C and winding II of relay A holds relay A energized for an interval to prolong the energized time of magnet B which is held energized until C is completely charged. Also the relay A will not be reenergized to again close the circuit of magnet B until condenser C has discharged. Thus it will be seen that relay A operates intermittently to open and close the circuit of magnet B and that the timing of the circuit control may be varied by adjusting the resistance Wi.

I claim:

1. An electromagnetic interrupter device for controlling the circuit of a device comprising a relay and a condenser, contacts on said relay directly controlling the circuit of the device to operate it intermittently, other contacts on the relay for closing charging and discharging circuits for the condenser and causing the charge and discharge thereof to control the energization and deenergization time of the relay.

2. An interrupter device as claimed in claim 1 having an adjustable device in one of the condenser circuits for varying the time characteristics of the device.

3. An interrupter for intermittently operating a device comprising a relay and a condenser, contacts on the relay for directly controlling the circuit of the device, contacts on the relay for closing a charging circuit for the condenser and causing the charging thereof to control the energized time of the relay, other contacts on the relay for controlling a discharge circuit for the condenser and causing said discharge to control the period of deenergization of said relay.

4. An interrupter arrangement comprising a relay and a condenser for controlling a circuit to intermittently operate a device, said relay having a pair of windings, an energizing circuit for the relay including one of said windings, contacts on said relay for opening its energizing circuit and closing a charging circuit for the condenser including the other winding, other contacts on the relay for controlling the circuit of the device and for closing a discharge circuit for the condenser also including said other winding.

5. An interrupter relay for controlling the intermittent operation of a device, a pair of windings for said relay, a condenser, a circuit including one of said windings for energizing the relay, contacts operated by the energization of the relay for closing a charging circuit for the condenser through the other winding of the relay to hold the relay energized, contacts closed by the energization of the relay for operating the device, and other contacts controlled by the deenergization of the relay after the condenser is charged for closing a discharge circuit for the

condenser through said other winding to delay the energization of the relay.

6. An interrupter relay as claimed in claim 5 having an adjustable resistance connected only in the discharge circuit of the condenser to vary the time of deenergization of the relay.

7. An interrupter comprising a single relay and a condenser for controlling the energization and deenergization of a device, said relay having contacts thereon for directly controlling the circuit of the device and for connecting the condenser in charging and discharging circuits including the winding of the relay to delay both the energization and deenergization of the relay.

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