ABSTRACT
An arrangement for achieving a short recovery time in a time lag relay, composed of static components in which the delay is determined by the charging time of a capacitor, includes two programmable unijunction transistors with the anode-cathode path in parallel with the capacitor and the control electrodes connected each to one voltage divider between the poles of the feeding voltage source. The voltage dividers are so designed and the control electrodes so connected to their voltage dividers that, during the charging of the capacitor, the voltage on the control electrode of the first transistor is higher than the voltage on the control electrode of the second transistor. If the charging process is interrupted before the relay has operated, the voltage on the control electrode of the first transistor falls more quickly than the voltage on the control electrode of the second transistor.

5 Claims, 1 Drawing Figure
TIME LAG RELAY WITH A SHORT RECOVERY TIME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a means for achieving a short recovery time in time lag relays of the kind in which the time circuit is built up of static components and in which the delay is determined by the charging time of a capacitor.

2. The Prior Art

Such relays often have a relatively long time or recovery, especially if the relay resets before tripping. This is due to the difficulty in achieving a quick discharging of the time-determining capacitor in such cases.

SUMMARY OF THE INVENTION

According to the invention, an arrangement is provided for achieving a short recovery time in such time lag relays. This includes first and second programmable unijunction transistors each having an anode, a cathode and a control electrode. The anode-cathode paths are arranged in parallel with the capacitor and the control electrodes are connected each to one voltage divider. Means are provided connecting the two voltage dividers and the control electrodes for making the voltage on the control electrode of the first transistor higher than the voltage on the control electrode of the second transistor during the charging of the capacitor, and means are provided responsive to interruption of the charging process to cause the voltage on the control electrode of the first transistor to fall more quickly than the voltage on the control electrode of the second transistor.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be described with the help of the enclosed drawing showing a wiring diagram of a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The time-determining capacitor C1 has a low-ohmic and a high-ohmic charging circuit. The low-ohmic circuit consists of the resistors R2, R3, the potentiometer R4 with its movable contact 1 and two diodes V3 and V4. The diode V4 prevents the capacitor C1 from discharging through the circuit and the diode V3 compensates for the forward voltage drop in V4. The high-ohmic charging circuit comprises the high-ohmic resistor R1.

When a voltage is applied between the terminals 9 and 10, the capacitor C1 will first be charged mainly through the low-ohmic charging circuit to a voltage which corresponds to the setting of the movable contact 1. After this, the charging is performed through the high-ohmic charging circuit. The adjusting of the two charging circuits is accomplished by trimming the resistors R1 and R2.

For the discharging of the capacitor C1 there are two programmable unijunction transistors V1 and V2 in the embodiment of the invention, shown herein, and these will be referred to hereinafter as the first and the second transistors. The first transistor V1 has an anode 2, a cathode 3 and a control electrode 4. The second transistor V2 has an anode 5, a cathode 6 and a control electrode 7. A transistor of the kind mentioned is blocked as long as the voltage of the control electrode exceeds the voltage of the anode, but it becomes conducting when the voltage of the anode exceeds the voltage of the control electrode by at least the transistor voltage drop, which is of the order of magnitude of 0.5 - 1 volt. The two anodes 2 and 5 are connected at one point 8 to the two charging circuits and to one side of the capacitor C1. The other side of the capacitor is connected to the minus-pole 10 of the feeding voltage source. Instead of the said programmable unijunction transistors also normal unijunction transistors may be used.

The control electrode 4 of the transistor V1 is connected to a voltage divider, consisting of two diodes V5 and V6 and a resistor R5. The connection is made between the diodes and the resistor. An interference-protecting capacitor C2 is connected between a point between the two diodes V5 and V6 and the negative terminal 10. The cathode 3 of the transistor V1 is connected to the negative terminal 10 by way of a resistor R6. In the same way, the control electrode 7 of the second transistor V2 is connected to a high-ohmic voltage divider consisting of resistors R7 and R8 and a diode V7. The connection between the control electrode and a point between the two resistors contains a diode V8.

The control electrode 4 of the first transistor V1 is subjected to a considerably higher voltage level than the control electrode 7 of the second transistor V2. In addition to this, the voltage over the resistors R7 and R8, which determines the control voltage of the second transistor V2, is delayed in the case of a voltage drop on the feeding voltage source of the capacitor C3. The diode V7 forces the capacitor C3 to be discharged through the resistors R7 and R8, and because these resistors have high resistance the time of discharging of the capacitor C3 is extended and the voltage of the control electrode of the second transistor V2 drops much more slowly than the voltage of the control electrode of the first transistor in the event of a voltage drop of the feeding voltage source.

The trigger voltage of the first transistor V1 is higher than the trigger voltage of the second transistor V2 and this means that, when voltage remains between the clamps 9 and 10, the transistor V2 will ignite and give a tripping pulse to the electromagnetic auxiliary relay of the device, said auxiliary relay having a winding designated 11, as soon as the capacitor C1 has been charged to the trigger voltage of V2. On the other hand, if the voltage between the terminals 9, 10 disappears during the charging of the capacitor C1, the voltage of the control electrode 7 of the second transistor will be maintained for some time, because the capacitor C3 is to be discharged over the high-ohmic resistors R7 and R8. However, the voltage of the control electrode 4 of the first transistor falls quickly below the voltage of the capacitor C1, which causes the transistor V1 to become conducting and the capacitor to be discharged over the resistor R6 which has low resistance. Because the capacitor is discharged quickly when a voltage drop occurs and because the discharging is accomplished through the transistor V1, which has no connection to the tripping device for the electromagnetic auxiliary relay of the device, it is impossible to achieve instantaneous operation in the event of a short-lived voltage drop.
3

When the transistor V2 ignites because the capacitor C1 has reached the voltage which corresponds to the tripping time set, the capacitor is discharged over the resistors R9 and R10, and the transistor V9 becomes conducting. This means that also the transistor V10 becomes conducting and energized for holding through the resistor R11. As soon as the transistor V9 starts conducting, the current circuit through the relay winding 11 is closed so that the auxiliary relay operates and the contact 12 is closed. The resistor R12 and the diode V11 protect the transistor V10 which is of low-voltage type. The diode V12 is put into the current circuit of the auxiliary relay to protect the transistor V9 against voltage of the wrong polarity. The capacitor C4 is an interference-protecting device for the transistor V10. The resistor R13 and the diode V13 make up a discharging circuit for the energy in the relay winding 11. The capacitor C5 eliminates disturbance for the transistor V9 and also the capacitor C6 is disturbance-protecting. The voltage over the device is stabilized by means of the Zener-diode V14 and the resistor R14, and the capacitor C7 protects this diode against disturbance.

We claim:

1. A time lag relay in which the time circuit is constructed of static components and in which the delay is determined by the charging time of a capacitor (C1), having means for achieving a short recovery time comprising first and second programmable unijunction transistors (V1, V2), each having an anode (2, 5), a cathode (3, 6), and a control electrode (4, 7), anode-cathode connections for each of said transistors in parallel with the capacitor (C1), said relay having input terminals (9, 10), first and second voltage dividers (R5, V5, V6; R7, R8, V7) connected between said terminals, said voltage dividers each having connections with one of said control electrodes, means for maintaining the voltage on the control electrode of the first transistor higher than that on the control electrode of the second transistor during the charging of the capacitor, and means responsive to interruption of the charging before the relay has operated to cause the voltage on the control electrode of the first transistor to fall more quickly than the voltage of the control electrode of the second transistor.

2. In a time lag relay as claimed in claim 1, in which the relay has a movable contact, an electromagnetic auxiliary relay (11) for operating one of said contacts, and means responsive to the second transistor to control the current through the winding of said electromagnetic relay.

3. In a time lag relay as claimed in claim 1, the first transistor (V1) having a higher trigger voltage than the second transistor (V2).

4. In an electromagnetic relay as claimed in claim 1, the point of connection of the control electrode (4) of the first transistor (V1) to its voltage divider (V5, V6, R5) having a considerably higher potential than the point of connection of the control electrode (7) of the second transistor (V2) to the second voltage divider (V7, R7, R8).

5. A time delay relay as claimed in claim 1, in which the second voltage divider comprises resistors (R7, R8) connected in series and a diode (V7) connected in series with the resistors, said time delay relay including a capacitor (C3) connected in parallel with the resistors (R7, R8), said diode (V7) causing the capacitor to be discharged over the resistors (R7, R8) after a voltage drop.

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