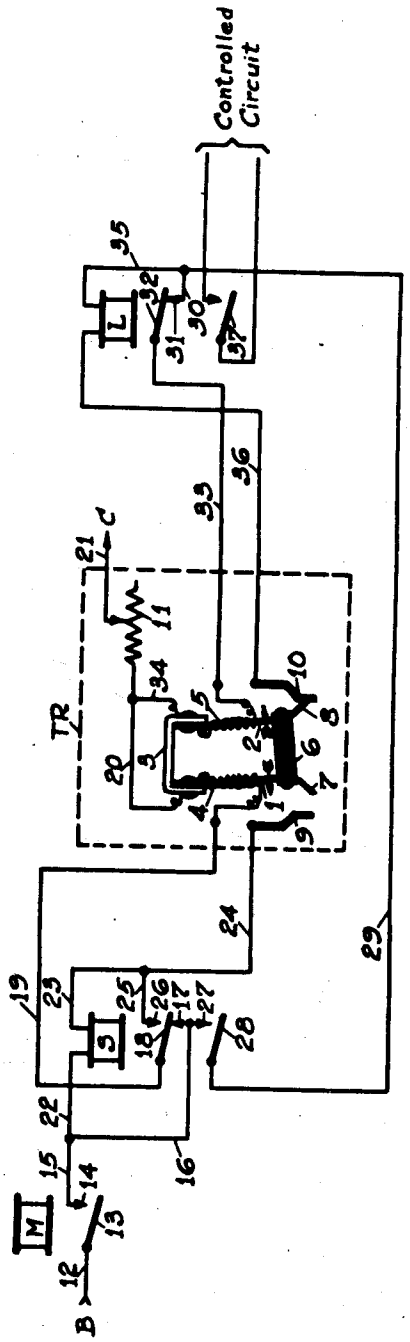
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TIME ELEMENT CIRCUIT FOR TRAFFIC CONTROLLING SYSTEMS

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TIME ELEMENT CIRCUIT FOR TRAFFIC CONTROLLING SYSTEMS

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This invention relates to time element circuits and more particularly to a means for definitely conditioning a railway signalling circuit after a predetermined lapse of time.

In certain railway signalling practices, a track switch and a signal governing movements over this switch are controlled by an operator which obviously necessitates employing means to prevent the operator's moving the track switch while the aforesaid signal is clear. It is also necessary to prevent the operator after having operated the signal to stop from immediately moving the track switch as such successive operations might create a dangerous condition for an oncoming train.

To obviate this condition, a time interval is usually interposed which enforces that a definite time elapse between the operating of the signal to stop and the moving of its associate track switch, which time is adequate for an oncoming train to either stop clear of the switch or pass onto a track section including the switch and thereby effect by other means to prevent a movement thereof.

In view of the above and other considerations, it is proposed in accordance with this invention to provide a circuit means whereby a thermal time element is employed to enforce a lapse of time between the operating of a signal to stop and the moving of an associated track switch. It is also proposed to arrange such thermal means in a circuit whereby a power operated movement thereof to one position and a power operated movement back to its starting position is required to measure the time interval, thus leaving the thermal means in a condition for substantially the same time measurement immediately after each operation.

Other objects, purposes and characteristic features of the invention will appear as the description thereof progresses, during which references will be made to the accompanying figure of drawing. In the drawing:—

The single figure of drawing shows in a very diagrammatic manner a time element and circuit according to this invention.

The time element circuit shown in the accompanying figure of drawing is particularly applicable to a railway traffic controlling system such as is fully described in an application to R. M. Phinney filed June 26, 1930, Ser. No. 463,940.

A thermal relay TR is diagrammatically shown in the dotted rectangle and consists essentially of two bi-metallic elements 1 and 2, such, for example as in the application of J. E. Willing, Serial No. 463,903 filed June 26, 1930 which are oppositely mounted at one end on a suitable support, such as the member 3. These elements 1 and 2 each carry electrical heating units 4 and 5 respectively, which elements tend to deform in a direction indicated by the respective small arrows thereon when heated above a normal temperaure. The lower free ends of the elements 1 and 2 are rigidly connected by a member 6, preferably of insulating material, and these ends carry suitable contacts 7 and 8 which are respectively engagable with fixed resilient contacts 9 and 10. An adjustable resistance 11 may also be included in the common energizing circuit of the units 4 and 5 to vary the heating time of the elements.

A relay M is also shown which may be either manually or automatically controlled in accordance with traffic conditions as is clearly described in application above referred to. A stick relay S is provided to register a half cycle of operation of the thermal relay TR and a lock relay L is arranged to register the full cycle of operation thereof or, in other words, its energization represents the lapse of time consumed by an over and back operation of the relay TR, all accomplished in a manner which will now be fully described.

Considering now that the relay M is energized by the means above described, a circuit energizing the heating unit 4 is completed from a terminal B of a source of energy, wire 12, contact 13 of relay M, front point 14, wires 15 and 16, back point 17 and contact 18 of relay S de-energized wire 19, heating unit 4, wire 20, variable resistance unit 11, wire 21 to the opposite terminal C of the source of energy. The heating unit 4 being thus energized raises the temperature of the element 1 higher than that of 2 thereby bending both elements 1 and 2 to a left hand position until contact 7 engages contact 9.

The thermal relay TR in this left hand position now energizes relay S over the following circuit:—beginning at a terminal B of a source of energy, wire 12, contact 13 and front point 14 of relay M energized, wires 15 and 22, winding of relay S, wires 23 and 24, contacts 9 and 7, through the element 1, wire 20, variable resistance unit 11, wire 21 back to the opposite terminal C of the source of energy. Relay S now being energized interrupts the above traced energizing circuit for the heating unit 4 at its contact 18 and completes a stick circuit, for relay S, from the terminal B, wires 12, contact 13

and front point 14 of relay M energized, wires 15 and 22, winding of relay S, wires 23 and 25, front point 26 and contact 18 of relay S energized, wire 19, heating unit 4, wire 20, variable resistance unit 11, wire 21 to the opposite terminal C.

It will be noted that the holding or stick circuit for the relay S, just traced, includes the heating unit 4 in series with the windings of the relay S and consequently the resistance of the windings of the relay is made sufficiently high to limit the current in this circuit to a value which is sufficient to hold up the armature of the relay S but not sufficient to produce appreciable heating of the unit 4.

With the stick relay S held in this energized position, an energizing circuit for the heating unit, 5 is completed over the following circuit:— beginning at the terminal B wire 12, contact 13 and front point 14 of relay M energized, wires 15 and 16, front point 27 and contact 28 of relay S energized, wires 29 and 30, back point 31 and contact 32 of relay L deenergized, wire 33, heating unit 5, wire 34, variable resistance unit 11, wire 21 to the opposite terminal C.

The heating unit 5 being thus energized raises the temperature of the element 2 higher than that of 1 thereby bending both elements back to their right hand starting position or to a position in which contact 8 engages contact 10 thereby energizing relay L over the following circuit:—beginning at the terminal B wire 12, contact 13 and front point 14 of relay M energized, wires 15 and 16, front point 27 and contact 28 of relay S energized, wires 29 and 35, windings of relay L, wire 36, contacts 10 and 8, through element 2, wire 34, variable resistance unit 11, wire 21 to the opposite terminal C.

It will be noted that, with the relay L energized, the energizing circuit for the heating unit 5 is interrupted at contact 32, and in as much as the normal de-energized position of the thermal relay TR holds the contact 8 engaging contact 10, the relay L is now maintained energized as long as relay M is energized. Other contacts may be included in relay L, such as 37, which may function to close or open circuits a predetermined time after the energization of the relay M. For example, this controlled circuit may be a common operating circuit for a switch machine such as shown in the previously mentioned application.

It will now be seen that a thermal relay has been provided in a circuit arrangement whereby contact means may be operated a predetermined time after the closing of an initiating circuit and such circuit arrangement measures this time interval by a cycle of operation which leaves the thermal relay in a condition for substantially the same time measurement during an immediate successive operation.

It will also be seen that the thermal relay employed in this invention is actuated by electrical power to both its operated position and back to its normal position, which coincidently compensates for atmospheric temperature variations and also provides a wider range of operating times in as much as both operating motions are adjustable by a variable resistance unit.

In describing the present invention, no attempt has been made to point out the various alternate or optional features thereof or the different organizations or combinations that may be employed. For example, individual variable resistance units may be employed in the energizing circuits of the heating units 4 and 5 thereby obtain a vernier adjustment on the operating time by individually adjusting its over and its back operating times. Also the initiating relay M can, of course be any device either automatic or manual in operation and a part of any system for which the time element is adapted, as in centralized traffic control systems, etc.

In other words, the particular embodiment of the present invention has been selected to facilitate in the disclosure thereof rather than to limit the number of forms which it may assume, and, it is to be further understood that various modifications, adaptations and alterations may be applied to the specific form shown to meet the requirements of practice, without in any manner departing from the spirit or scope of the present invention except as limited by the appended claims.

Having thus described my invention, what I claim is:—

1. In a time element circuit, a thermal relay having bi-metallic means operable to a normal and to reverse position, a first heating unit arranged to operate said bi-metallic means to said reverse position, a second heating unit arranged to operate said bi-metallic means to said normal position, a stick relay, an energizing circuit for said first heating element including a contact of said stick relay, an energizing circuit for said stick relay including contact means of said thermal relay made in said reverse position, a control relay, an energizing circuit for said second heating element including a contact of said stick relay and a contact of said control relay, and an energizing circuit for said control relay including a contact of said stick relay and contact means of said thermal relay made in said normal position.

2. In a time element circuit for railway signalling, a time measuring device comprising two spaced thermo-responsive strips secured to a holding member at one end and anchored together at the other end, heating elements associated with each of said thermal responsive strips so as to cause the strips to distinctively actuate contact means according to differential temperatures between the strips, and circuit means arranged to successively energize said heating elements during a single operating cycle of said time measuring device.

3. In a time element circuit for railway signalling, a time measuring device comprising thermo-responsive means arranged to distinctively actuate contacts according to differential temperatures in said thermo-responsive means, heating elements arranged to produce a distinctive temperature differences in said thermo-responsive means and controlled means dependant for operation on a reciprocatory movement of said thermo-responsive means.

4. In a time element circuit, a thermal relay having a normal initial position and having oppositely arranged thermo-sensitive actuating means, heating elements for the actuating means, means to successively energize the heating elements to thereby cause successive movements of said thermo-sensitive actuating means in reciprocatory manner, and controlled means arranged to be dependent upon, and to respond only after, the completion of said successive movements.

5. In a time element circuit, a thermal relay having thermal means operable to a normal and

to reverse position, a first heating unit arranged to operate said thermal means to said reverse position, a second heating unit arranged to operate said thermal means to said normal position, a stick relay, an energizing circuit for said first heating element including a contact of said stick relay, an energizing circuit for said stick relay including contact means of said thermal relay made in said reverse position, a control relay, an energizing circuit for said second heating element including a contact of said stick relay and a contact of said control relay, and an energizing circuit for said control relay including a contact of said stick relay and contact means of said thermal relay made in said normal position.

6. In a timing circuit, a thermal relay having oppositely arranged thermal elements, a heating unit for each element, a stick relay having an energizing circuit including a reverse contact of the thermal relay, and a control relay having an energizing circuit including a front point of the stick relay, and a normal contact of the thermal relay.

7. In a time element circuit, a thermal relay having thermal means operable to a normal and to reverse position, a first heating unit arranged to operate said thermal means to said reverse position, a second heating unit arranged to operate said thermal means to said normal position, a stick relay, an energizing circuit for said first heating element including a back contact of said stick relay, an energizing circuit for said stick relay including contact means of said thermal relay made in said reverse position, a control relay, an energizing circuit for said second heating element including a front contact of said stick relay and a back contact of said control relay, and an energizing circuit for said control relay including a front contact of said stick relay and contact means of said thermal relay made in said normal position.

8. In a time element circuit employing a thermal relay having opposed bi-metallic elements, operating units on each of said elements, energizing means for one of said operating units whereby said bi-metallic elements are operated to one position, a stick relay arranged to assume a position to register said position, energizing means for the other of said operating units whereby said bi-metallic elements are operated back to normal position, a control relay, and means whereby said control relay assumes a position to register said normal position and said stick relay position.

9. In a time element circuit for railway signalling, a thermal relay comprising spaced oppositely arranged bi-metallic arms anchored at one end to a supporting member and rigidly interconnected at their free ends, contact means on said arms normally engaging a fixed back point to constitute an initial position and operable to engage a fixed front point, a heating unit on each of said arms, individual energizing circuits for each of said heating units arranged to cause the thermal relay to operate through one cycle only and return to its initial position, means in said energizing circuits for adjusting the electrical resistance thereof, control means, and means to control said control means only after operation through said cycle has occurred.

10. In a time element circuit employing a thermal relay having oppositely arranged bi-metallic elements, a heating unit on each of said elements for causing the thermal relay to assume reverse and normal positions, individual energizing circuits for said heating units including a variable resistance unit, a stick relay energized by a reverse position of said thermal relay, a control relay, and means for energizing said control relay when said stick relay is energized and said thermal relay is in a normal position.

11. In a time element circuit, a thermal relay having oppositely arranged thermo-sensitive elements, heating units on said elements, an energizing circuit for each unit, means to cause said circuits to successively energize said heating units, and means, responsive to the successive energizations of said heating units, to condition said time element circuit after a lapse of time.

12. In a short time element circuit, a thermal relay having oppositely arranged thermo-sensitive elements which, when actuated cause the relay to make an over and back movement, heating units on said elements for actuating them, and energizing circuits arranged to successively energize said heating units and means to definitely and distinctively condition said time element circuit after a predetermined lapse of time equal to the time required for an over and back movement of said elements.

13. In a time element circuit, a thermal relay having oppositely arranged thermo-sensitive elements, heating units on said elements, energizing circuits for the elements, a stick relay at times in circuit with one of said units, a controlled relay dependent for its condition upon the stick relay condition and in turn controlling the time element circuit, means to cause said energizing circuits to successively energize said heating units, to thereby definitely condition said time element circuit by means of the controlled relay after a predetermined lapse of time.

14. In a time element circuit, a thermal relay having oppositely arranged thermo-sensitive elements, heating units on said elements, energizing circuits for the said elements for successively energizing the elements, a stick relay controlling one of said circuits, another relay arranged to control the other circuit and in turn controlled by the thermal relay and the stick relay and means whereby the other relay definitely conditions said time element circuit after a lapse of time dependent upon the operation of the thermal relay.

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