April 26, 1932. S. N. WIGHT 1,856,045

TIME ELEMENT DEVICE

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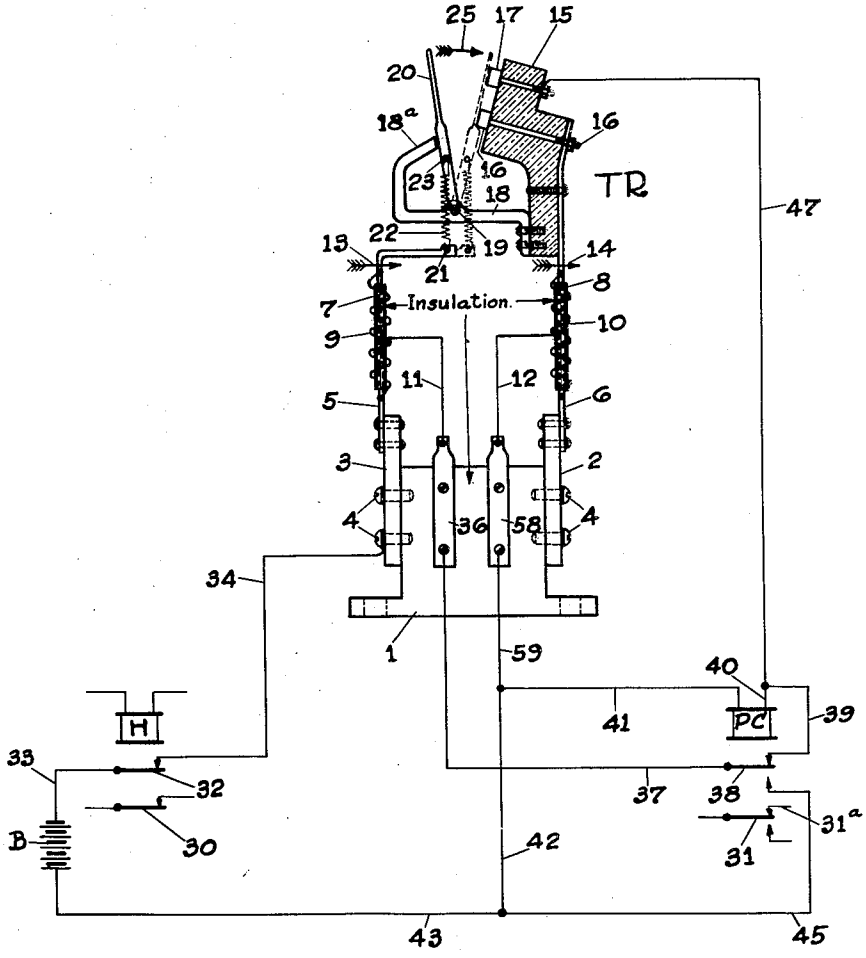

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TIME ELEMENT DEVICE

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This invention relates to time-element devices, and more particularly to time-element devices of the electrically actuated type.

In railway signalling systems, and more particularly in signalling systems of the absolute-permissive block type, it is found necessary to employ relays which are slow acting, and respond only after an interval of time after energization or de-energization thereof. Such slow acting devices are also useful in connection with approach locking and other phases of signalling and train dispatching.

A relay of the thermal type has been found quite useful for this purpose, but thermal relays are rather inefficient and their efficiency prohibits their use if used in the ordinary way. In my prior application Ser. No. 191,735 filed May 16, 1927, now matured into Patent Number 1,792,455, granted February 10, 1931, I have shown how a thermal relay may be used to obtain the desired delay and how this thermal relay may be cut out of the circuit and a more efficient relay used to carry out the function of the relay after the interval of time has elapsed. In some instances of use of time element relays it is found necessary to have these relays in condition for functioning a very short time after they have been used, and since a certain period of time after each operation is required for a thermal relay, as ordinarily used, to assume its normal condition, a thermal relay of the ordinary construction would not satisfy the requirements.

With the above and other important considerations in mind it is proposed in accordance with the present invention to employ a thermal relay to control a stick relay of the ordinary construction, and to provide means for reconditioning the thermal relay for use immediately after it has completed its time measuring function. More specifically, it is proposed to use a thermal relay of the compensated type in which a pair of bymetallic thermal relays strips are arranged in such a way that the ends thereof are, so long as they are of the same temperature, spaced apart the same irrespective of surrounding or room temperature, and to provide an actuating or heating element on each of these strips, one heating element of which is used for bringing the ends of the strips together and the other of which is used for again separating the elements and restoring the thermal relay to normal after it has been used to measure a time element.

Other objects, purposes and characteristic features of the invention will in part be pointed out hereinafter and in part be obvious from the accompanying drawing.

In describing the invention in detail reference will be made to the accompanying drawing, which shows conventionally a single embodiment of the invention.

Briefly stated the drawing shows a stick relay, a thermal relay for picking up such stick relay and a control relay for controlling said thermal relay and dropping said stick relay.

The thermal relay illustrated in the embodiment of the invention shown, comprises a base 1 of suitable insulating material, having metal blocks 2 and 3 secured to the sides thereof by screws 4, to which blocks are riveted bi-metallic thermal strips 5 and 6. On these thermal strips 5 and 6 are contained insulating sleeves 7 and 8 on which are wound coils 9 and 10. The ends of these coils 9 and 10 are electrically connected to the thermal strips 5 and 6, and the mid point of these coils 9 and 10 are connected to wires 11 and 12. This construction affords securing means for firmly securing the coils to the strips and also enables the end turns of the coils to be fastened to prevent their unwinding. It is, of course, noted that the current flow in wires 11 and 12 will be divided and flow through the two halves of each of the coils 9 or 10. The thermal strips 5 and 6 are constructed to move in the direction of the arrows 13 and 14 upon increase of temperature. To the thermal strip 6 is fastened an insulating block 15 having contacts 16 and 17. To the insulating block 15 is connected a contact support 18 to which is pivotally fastened as by a pin 19 an armature 20. The contact strip 5 is of such shape that the cross pin 21 thereof is slightly to the left of the pin 19, so that the tension spring 22

connected between the pin 21 and the pin 23 will normally cause the contact 20 to assume its left-hand position against the stop 18a. From this brief description it readily appears that if the thermal strip 5 is moved from left to right in the direction of the arrow 13, as it will upon heating of the strip 5 in response to current flowing in the coil 9, the pin 21 will pass the dead center point or alinement of pins 19 and 23 and will cause the spring 22 to very quickly operate the contact 20 in the direction of the arrow 25. Also, if either the contact strip is bent to the right or the strip 5 is bent to the left, the contact 20 will be returned by snap action to its normal position. This thermal relay TR is controlled by a control relay H and in turn may pick up a stick relay PC. This control relay H may be the usual home relay in an absolute-permissive block signalling system as in the patent to S. N. Wight 1,792,455 granted February 10, 1931) in which event the PC is the usual pole changer relay of such system; but since the invention is applicable to many other types of systems this home relay H and pole changer PC will hereinafter be called control relay and stick relay respectively. It is believed that the invention can be most readily understood by a brief description of the operation of the apparatus shown.

The entire apparatus may be considered as a unitary device comprising relay mechanism having a quick-acting contact, such as the contact 30 for instance, and having a slow-closing contact, such as the contact 31—31a. The apparatus has been shown in its energized condition in which the stick relay PC is energized through a front contact 32 of the control relay H through the following stick circuit:—starting at the positive terminal battery B, wire 33, front contact 32 of the control relay H, wire 34, thermal strip 5, the two halves of the coil 9 in multiple, wire 11, connector 36, wire 37, stick contact 38, of the relay PC, wires 39 and 40, winding of the stick relay PC, wires 41, 42, and 43 back to the negative terminal of the battery B. The stick relay PC is a rather efficient device and the current flowing in the coil is so small as not to produce material heating in the coil 9. It is readily understood that dropping of the control contact finger 32 of relay H will cause dropping of the stick contact 38 of the relay PC, and this stick relay PC can be made slow or quick acting upon de-energization as desired. It should be kept in mind that the present invention is primarily intended to provide means for delaying the picking up of a relay rather than delaying the dropping of the same, and that the same underlying principles may be used for delaying dropping of the stick relay.

Let us now assume that the control relay H is de-energized, and let us observe how a delay is obtained in the energization of the stick relay PC in response to energization of the control relay H. With the control relay H energized and the stick relay PC de-energized the following circuit for the coil 9 of the thermal relay TR is closed:—beginning at the battery B, wire 33, contact 32, wire 34, strip 5, coil 9, wire 11, connector 36, wire 37, contact 38 of the stick relay in its retracted position, wires 45 and 43 back to the battery B. It will be noted that this circuit does not include anything except wires and contacts in series with the coil 9 and for this reason the current flowing therein is comparatively large and the coil 9 will heat the thermal strip 5 appreciably. After an interval of time, depending upon the various constants, the thermal strip 5 will have been bent in the direction of the arrow 13 to the dotted position in which event the spring 22 will by snap action operate the contact 20 to its dotted position. When this occurs a pick-up circuit for the stick relay is completed which may be traced as follows:—starting at the battery B, wires 33, contact 32, wire 34, thermal strip 5, spring 22, contacts 20 and 17, wires 47 and 40, winding of the stick relay PC, wires 41, 42, and 43 back to the battery B. With this pick-up circuit completed the stick relay PC is actuated to its energized position, thereby completing the stick circuit heretofore traced.

With the contact 20 in its right-hand position a circuit is completed for heating the coil 10 to cause the contact 20 to be restored to its normal position comparatively quickly. This circuit may be traced as follows:—starting at the battery B, wire 33, contact 32, wire 34 metal thermal strip 5, spring 22, contact 20, contacts 16, thermal strip 6 the two halves of the coil 10 in multiple, wire 12, connector 58, wires 59, 42, and 43, back to the battery B. The completion of this circuit causes the coil 10 to heat the thermal element of strip 6, and causes it to be bent in the direction of the arrow 14, thereby bringing the operating spring 22 to the left of the pivot 19 and causing the contact 20 to be operated by snap action back to its normal position.

It is thus noted that provision has been made for returning the thermal relay TR to its normal condition very shortly after it has been operated from such normal position, so that if the relay H is immediately de-energized and again re-energized the relay PC will be re-energized only after a period of delay.

If desired the coil 10 may be of larger heating capacity than the coil 9 so that the contact 20 is returned to its normal condition almost instantly upon its operation to its dotted position. It may be pointed out that the snap action switch is preferably employed so as to bring the bi-metallic thermal strips

substantially back to their normal position before the circuit through the coil 10 is broken during the restoration operation.

Putting it briefly, upon heating of the coil 9 the element 5 is moved to the right to close contacts 20—16, whereupon coil 10 is heated moving element 6 to the right to open contacts 20—16, the two elements 5 and 6 then gradually move back to normal without operating contacts 20—16.

Having thus shown and described one rather specific embodiment of the invention employing, among other things, a snap action switch and a stick relay with its specific circuit arrangements, it is desired to be understood the particular illustration has been selected for the purpose of disclosing the underlying principles of the invention rather than its scope or the specific construction of the devices for carrying out the same, and that the snap acting switch may be of any suitable construction or may be omitted and the stick relay may be controlled in any suitable way, and that other changes and modifications may be made to adapt the invention to the particular problem it is called upon to solve, all without departing from the spirit or scope of the invention except as demanded by the scope of the following claims.

What I claim is:—

1. In combination, a thermal relay including a normally open contact, a bi-metallic thermal member for quickly operating the contact, a stick relay, a pick-up circuit for said stick relay including said normally open contact, a control relay, and a stick circuit including a contact of the control relay.

2. In combination, a thermal relay including a normally open contact, means for quickly operating the contact in response to forces set up in bi-metallic thermal metal, a stick relay, a control relay, a pick-up circuit for said stick relay including a front contact of the control relay and said normally open contact, and a stick circuit including said front contact of said control relay.

3. In combination, a pair of bi-metallic thermal elements, a snap switch, means causing actuation of the switch in response to a change in the spaced relation of said elements, a stick relay picked up in response to closure of said snap switch due to heating one of said thermal elements, and means for temporarily heating the other thermal element after closure of said snap switch so as to restore to normal the spaced relation of said elements.

4. In combination, a relay of the stick type having a stick circuit including its own front contact closed only when it assumes its energized condition and having a pick-up circuit, and a slow acting electro-responsive device, snap action contacts on the device, means for closing said contacts only after said electro-responsive device has been energized for a predetermined period of time, said pick-up circuit including the contacts of said electro-responsive device, and the energizing circuit of said electro-responsive device including a back contact of said stick relay.

5. In combination, a relay of the stick type having a stick circuit including its own front contact closed only when it assumes its energized condition and having a pick-up circuit, and a slow acting thermal device, contacts thereon operated by single action, means for closing the contact only after the device has been electrically energized for a predetermined period of time, said pick-up circuit including the contacts of said thermal device and the energizing circuit of said thermal device including a back contact of said stick relay, and control contacts in said pick-up said stick circuit of said stick relay and the energizing circuit for said thermal device for determining the condition of energization of said stick relay.

6. Electro-responsive mechanism comprising, a contact, electro-responsive means for holding said contact closed if once closed, electro-heat-responsive means for closing said contact, and means for quickly restoring said electro-heat-responsive means to normal, upon closure of said contact.

7. In combination, a relay of the stick type having a stick circuit including its own front contact closed only when it assumes its energized condition and having a pick-up circuit, a slow acting thermal device, contacts thereon, snap action means for operating the contacts only after the device has been electrically energized for a predetermined period of time, said pick-up circuit including the contacts of said thermal device, and the energizing circuit of said thermal device including a back contact of said stick relay, and control contacts in said pick-up and energizing circuit for controlling said relays.

8. In combination, a stick relay having a pick-up and a stick circuit, said stick circuit including a front contact of said stick relay, normally inactive thermal responsive means for picking up said stick relay, said thermal responsive means having an energizing circuit including a back contact of said stick relay, and a second circuit controlled when said thermal responsive means returns to its normal inactive condition.

9. In combination, a stick relay having a pick-up and a stick circuit, said stick circuit including a front contact of said stick relay, normally inactive thermal responsive means for picking up said stick relay, said thermal responsive means having an energizing circuit including a back contact of said stick relay, and a second circuit including a contact of said thermal responsive means and another electrically operated contact.

10. In electro-responsive mechanism, in

combination, a contact, electro-responsive means for holding said contact closed after once closed, electro-heat-responsive means for closing said contact, and means for quickly restoring said electro-heat-responsive means to normal upon the operation of said electro-heat-responsive means.

11. In electro-responsive mechanism, in combination, a contact, electro-responsive means for holding said contact closed after once closed, electro-heat-responsive means for closing said contact, and means, which includes a second electro-heat-responsive means, for quickly restoring said electro-heat-responsive means to normal, upon operation of said electro-heat-responsive means.

In testimony whereof I affix my signature.

SEDGWICK N. WIGHT.