

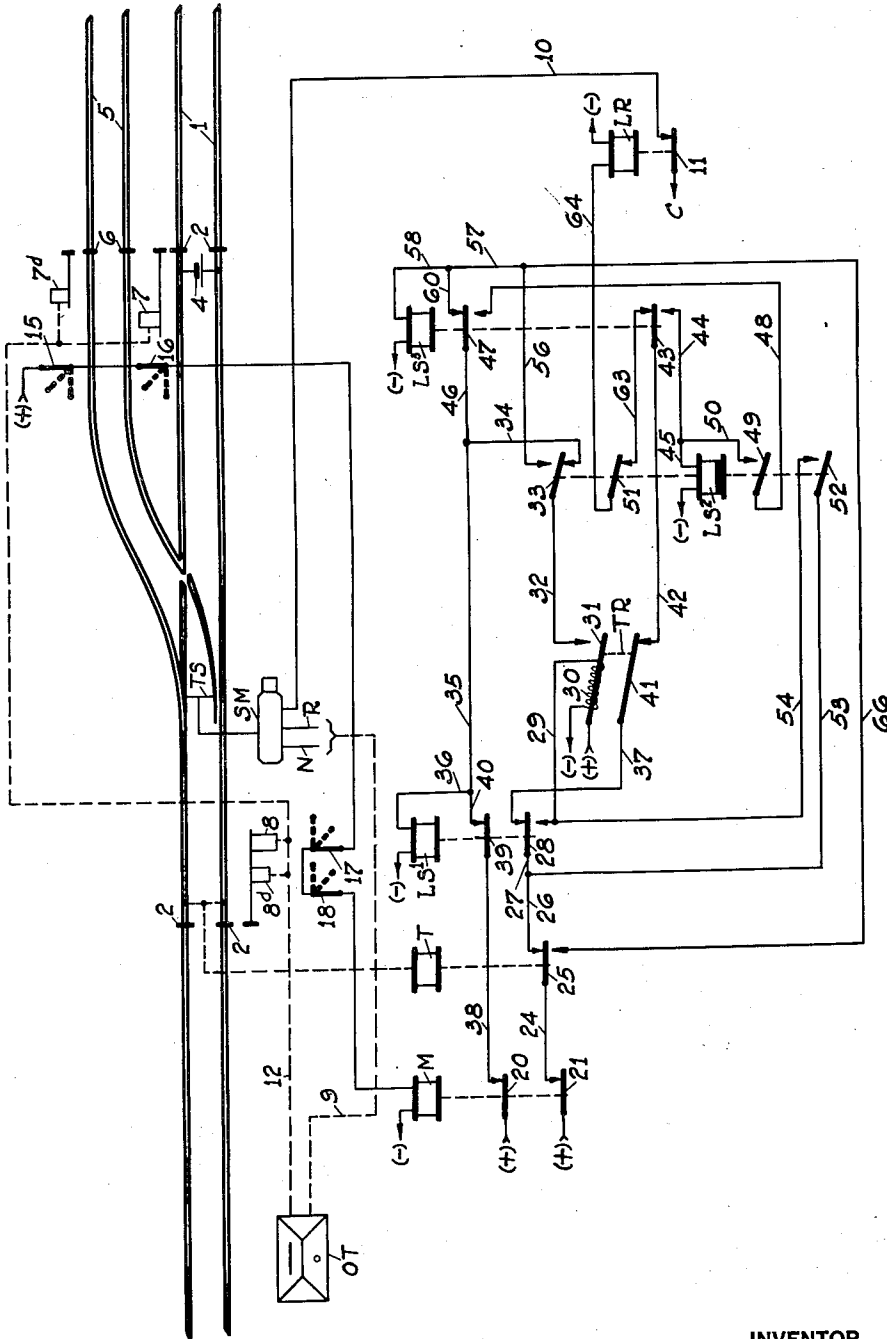
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TRAFFIC CONTROLLING SYSTEM FOR RAILROADS

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TRAFFIC CONTROLLING SYSTEM FOR
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20 Claims. (Cl. 246—160)

This invention relates to a power-operated switch control system, and more particularly to locking means for preventing operation of a switch machine for a predetermined period of time under certain traffic conditions.

In accordance with the present invention, it is proposed to delay the operation of a switch machine following the placing of signals at stop for governing traffic over the track switch controlled by such switch machine by a thermal responsive relay. Thermal responsive devices are fairly accurate for measuring time if the energy applied thereto is fairly high as compared with the rate of dissipation of energy, but it is found to be somewhat inaccurate if the applied energy is very small, this on account of the variation in radiation, and the like. In view of these facts, it is proposed to not only require the thermal relay to be heated and cooled back to its original temperature, but it is proposed to operate the thermal relay through two such cycles, before the release to be accomplished takes place. Not only can the time be measured more accurately by this expedient, but the total period of time may be increased. Another feature of the present invention resides in the provision of means whereby the function of the timing feature may be eliminated in the event a train has passed over the track switch after the associated signals have been put to stop.

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

In describing the invention in detail, reference will be made to the accompanying drawing, showing a system employing one embodiment of the present invention.

Referring to the drawing, the rails 1 of the main track have been shown divided into sections by insulating joints 2, of which the detector track section including the track relay T and the track battery 4 is associated with a track switch TS for diverting traffic onto a siding. This siding comprises track rails 5 separated from the detector track circuit by insulating joints 6. West-bound traffic may be controlled through the medium of the signals 7 and 7^a, whereas east-bound traffic is governed through the medium of signals 8 and 8^a.

The track switch TS has been shown operable by a power-operated switch machine SM, which may be controlled through the medium of the normal wire N and the reverse wire R from a

distant operator's tower OT as shown conventionally by the dotted line 9. This switch machine SM cannot, however, be operated unless the lock relay LR is energized, this because the common return connection 10 is connected to the common return wire C through the medium of a front contact 11 of the lock relay LR. The relay M may for convenience be called a signal-at-stop relay because this relay M is only energized if the four signals associated with the track switch TS all assume the stop position. The system shown includes a thermal relay TR, which has been shown in its normal cooled condition, and three lock stick relays LS¹, LS² and LS³, the functions of which will be pointed out hereinafter.

It is believed expedient to consider the operation of the system in order to get a more clear understanding of the various functions accomplished by the various relays and devices.

Operation

Let us assume that the operator at the distant tower OT clears the signal 8 through the medium of a suitable circuit conventionally shown by the dotted line 12. Clearing of this signal 8 will open the semaphore contact 17, thereby deenergizing the signal-at-stop relay M, this relay M being normally energized through the semaphore contacts 15, 16, 17 and 18. Deenergization of the relay M will result in deenergization of the lock stick relays LS¹ and LS³ and also in the deenergization of the lock relay LR, this because these relays are energized through one or the other of the front contacts 20 or 21 of the relay M.

Let us now assume that the operator wishes to operate the switch machine SM, and in order to do so places the signal 8 again in the stop position. Closure of the semaphore contact 17, associated with the signal 8, will result in energization of the relay M, but closure of the contacts 20 and 21 of the relay M will not result in the immediate energization of the lock relay LR, because the lock stick relays LS¹ and LS³ are still deenergized.

Closure of the contact 21 of the relay M will, however, result in energization of the thermal relay TR through the following circuit:—beginning at the terminal (+) of a suitable battery, front contact 21 of the relay M, wire 24, front contact 25 of the track relay T, wires 26 and 27, back contact 28 of the relay LS¹, wire 29, heating coil 30 of the thermal relay TR

to the other terminal (-). After a predetermined interval of time, the thermal relay TR will have become heated to a temperature that will close its front contact 31, thereby closing the following pick-up circuit for the lock stick relay LS¹:—beginning at the terminal (+) of said battery, front contact 31 of the thermal relay TR, wire 32, back contact 33 of the relay LS², wires 34, 35 and 36, winding of the lock relay LS¹ to the other terminal (-) of said battery. With this relay LS¹ once picked up, it will be held up through the following holding stick circuit:—beginning at the terminal (+) of said battery, front contact 20 of the relay M, wire 38, stick contact 39 of relay LS¹, wires 40 and 36, winding of the relay LS¹ and to the other terminal (-).

Picking up of the stick relay LS¹ will break the energizing circuit for the heating coil 30 of the thermal relay TR at the back contact 28 of this relay LS¹. This will result in the cooling of the thermal relay TR and when it reaches its normal temperature condition its back contact 41 will again close, and since the front contact 28 of relay LS¹ is now closed, this will result in the closing of the following pick-up circuit for the relay LS²:—beginning at the terminal (+) of said battery, front contact 21 of the relay M, wire 24, front contact 25 of the relay T, wires 26 and 27, front contact 28 of the relay LS¹, wire 37, back contact 41 of the relay TR, wire 42, front contact 43 of the relay LS³, wire 63, back contact 51 of the relay LS², wire 64, winding of the relay LR to the other terminal (-).

With the relay LS² once picked up, it will be stuck up through the following stick circuit:—beginning at the terminal (+) of said battery, front contact 20 of the relay M, wire 38, front contact 39 of the relay LS¹, wires 40, 35 and 46, back contact 47 of the relay LS³, wire 48, stick contact 49 of the relay LS², wires 50 and 45, winding of the relay LS² to the other terminal (-). With the relay LS² now energized, its contacts 33, 51, 49 and 52 will be lifted, thereby again applying current to the heating coil 30 of the thermal relay TR through the contact 52 of this relay, through an energizing circuit which may be traced as follows:—beginning at the terminal (+) of said battery, front contact 21 of the relay M, wire 24, front contact 25 of the relay T, wires 26 and 53, front contact 52 of the relay LS², wires 54 and 29, heating coil 30 of the relay TR and to the other terminal (-).

After an interval of time, the thermal relay TR will again be heated to a temperature that will close its front contact 31. When this occurs, the following energizing circuit for the lock stick relay LS³ is closed:—beginning at the terminal (+) of said battery, front contact 31 of the thermal relay TR, wire 32, front contact 33 of the relay LS², wires 56, 57 and 58, winding of the relay LS³ to the other terminal (-). With the relay LS³ once picked up, it is stuck up through the following stick circuit:—beginning at the terminal (+) of said battery, front contact 20 of the relay M, wire 38, front contact 39 of the relay LS¹, wires 40, 35 and 46, stick contact 47 of the relay LS¹, wires 60 and 58, winding of the relay LS³ and to the other terminal (-) of said battery. Picking up of the relay LS³ will break the stick circuit for the relay LS², thereby causing the relay LS² to be deenergized, as a result of which its contact 52 opens and breaks the energizing circuit for the thermal relay TR, so

that this thermal relay TR gradually cools and ultimately returns to its normal condition in which its contact 41 is closed.

It is noted that the pick up circuit of relay LS³ includes a front contact of the relay LS², while the pick up and stick circuits of the relay LS² include back contacts of the relay LS³. In order that the relay LS³ shall be provided with sufficient time in which to pick up and then stick up, the relay LS² has been made slightly slow acting with respect to its drop away time. This prolonged releasing time for the relay LS² need be only long enough to allow for the front contact 47 of relay LS³ to be closed upon the picking up of this relay LS³, but such releasing time may be made longer for providing a greater margin, if desired.

With the relays LS¹ and LS³ picked up with the relay LS² dropped away, then upon the closure of back contact 41 of the thermal relay TR, the following energizing circuit for the lock relay LR is completed; beginning at the terminal (+) of said battery, front contact 21 of the relay M, wire 24, front contact 25 of the relay T, wires 26 and 27, front contact 28 of the relay LS¹, wire 37, back contact 41 of the relay TR, wire 42, front contact 43 of the relay LS³, wire 63, back contact 51 of the relay LS², wire 64, winding of the relay LR to the other terminal (-).

It is thus seen that the thermal relay TR had to be heated and cooled twice in succession in order to effect energization of the lock relay LR. In other words, it was necessary for the thermal relay TR to go through two complete cycles of heating and cooling, which movements of the thermal relay TR require the lapse of a predetermined period of time, this because the energy of application is fairly constant, and the radiation of heat from the thermal relay is fairly constant. In this connection, it may be pointed out that the thermal relay TR is one of the compensated type, in which two opposing thermal elements are employed, only one of which is heated so that the relay is substantially immune to a variation in atmospheric temperature, insofar as its operating characteristics are concerned.

It should be noted that the stick relays LS¹ and LS³ must be up and the stick relay LS² must be down in order to energize the lock relay LR. This arrangement is primarily used in order to afford deenergization of the heating coil of the thermal relay TR during its second cycle by the opening of contact 52 of relay LS². There is, however, a second reason for this construction, namely, that a certain amount of energy is saved in that it normally requires only two of the three stick relays to be energized, and furthermore, this construction simplifies the manner in which track occupancy of the detector track circuit may result in energization of the lock relay LR. This latter function is accomplished by picking up the stick relays LS³ and LS¹ through the following pick-up circuits:—beginning at the terminal (+) of said battery, front contact 21 of the relay M, wire 24, back contact 25 of the relay T, wires 66, 57 and 58, winding of the relay LS³ thus resulting in picking up of the relay LS³, and (2) continuing from the wire 57 through wire 60, front contact 47 of the relay LS³, wires 46, 35 and 36, winding of the relay LS¹ to the other terminal (-).

With these relays LS¹ and LS³ once ener-

gized they are stuck up through the stick circuits heretofore traced, and as soon as the train occupying the detector track circuit leaves this detector track circuit the contact 25 of the track relay T is lifted, and the energizing circuit for the lock relay LR, heretofore traced, is completed. It is thus seen that the operator is not required to wait his time if a train has just passed over the track switch. This is safe because the train in question has through the medium of its axles and the automatic control of the wayside signals protected the track switch against a fast approaching second train. It is of course understood that the signals 7, 7^d, 8 and 8^d are controlled in accordance with traffic conditions upon which control is superimposed manual control as conventionally shown by the dotted line 12.

Having thus shown and described one particular embodiment of the present invention, namely, one particular circuit arrangement whereby a slow acting or thermal relay is required to go through two complete cycles of operation before the lock releasing function may be carried out, it is desired to be understood that various other circuit arrangements may be employed to perform the same function, and it is desired to be understood that various changes and modifications may be made to adapt the invention to the particular problem encountered in practicing the same, all without departing from the spirit or scope thereof, except as demanded by the scope of the following claims.

What I claim as new is:—

1. Time measuring means for controlling the locking of a traffic controlling device comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, and two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay.

2. Time measuring means for controlling the locking of a switch machine comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, a stick circuit for said second stick relay including a back contact of said third stick relay, and two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay.

3. Time measuring means for controlling the locking of a switch machine comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of

said second stick relay and a front contact of said slow acting relay, two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay.

4. Time measuring means for controlling the locking of a switch machine, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay.

5. Time measuring means for controlling the locking of a switch machine comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay and a back contact of said second stick relay.

6. Time measuring means for controlling the locking of a switch machine comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay a back contact of said second stick relay and a front contact of said first stick relay.

7. Time measuring means for controlling the locking of a switch machine comprising, a slow acting relay, a first stick relay having a pick-up circuit including a front contact of said slow acting relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said slow acting relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said slow acting relay, two energizing circuits for said slow acting relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control

circuit for said switch machine including a front contact of said third stick relay a back contact of said second stick relay a front contact of said first stick relay and a back contact of said slow acting relay.

8. Time measuring means for controlling the locking of a traffic controlling device comprising, a thermal relay, a first stick relay having a pick-up circuit including a front contact of said thermal relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, and two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay.

9. Time measuring means for controlling the locking of a switch machine comprising, a thermal relay, a first stick relay having a pick-up circuit including a front contact of said thermal relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay.

10. Time measuring means for controlling the locking of a switch machine comprising, a thermal relay, a first stick relay having a pick-up circuit including a front contact of said thermal relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay.

11. Time measuring means for controlling the locking of a switch machine comprising, a thermal relay, a first stick relay having a pick-up circuit including a front contact of said thermal relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay and a back contact of said second stick relay.

12. Time measuring means for controlling the locking of a switch machine comprising, a thermal relay, a first stick relay having a pick-up circuit

including a front contact of said thermal relay, a second stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay, a back contact of said second stick relay and a front contact of said first stick relay.

13. Time measuring means for controlling the locking of a switch machine comprising, a thermal relay, a first stick relay having a pick-up circuit including a front contact of said thermal relay, a second slow acting stick relay having a pick-up circuit including a front contact of said first stick relay and a back contact of said thermal relay, a third stick relay having a pick-up circuit including a front contact of said second stick relay and a front contact of said thermal relay, a stick circuit for said second stick relay including a back contact of said third stick relay, two energizing circuits for said thermal relay one including a back contact of said first stick relay and the other including a front contact of said second stick relay, and a control circuit for said switch machine including a front contact of said third stick relay and a back contact of said second slow acting stick relay.

14. In a track switch control system, the combination with a switch machine for operating said track switch, of a lock relay which if deenergized prevents control of said switch machine, a thermal relay, signals for governing traffic over said track switch, and means whereby if said signals are put to stop said thermal relay is repeatedly energized and deenergized for a plurality of times and said lock relay is energized when said thermal relay assumes its deenergized condition for the last time.

15. In a track switch control system, the combination with a switch machine for operating said track switch, of a lock relay which if deenergized prevents control of said switch machine, a thermal relay, signals for governing traffic over said track switch, a detector track circuit associated with said track switch, and means whereby if said signals are put to stop said thermal relay is repeatedly energized and deenergized and said lock relay is energized when said thermal relay assumes its deenergized condition for the second time unless said detector track circuit is occupied in which event said lock relay is energized as soon as said detector track circuit is again unoccupied.

16. In a track switch control system, the combination with a switch machine for operating said track switch, of a lock relay which if deenergized prevents control of said switch machine, a thermal relay, signals for governing traffic over said track switch, and means whereby if said signals are put to stop said thermal relay is repeatedly energized and deenergized for a predetermined number of times and said lock relay is energized when said thermal relay assumes its deenergized condition after such repeated operation.

17. In a track switch control system, the combination with a switch machine for operating

said track switch, of a lock relay which if de-energized prevents control of said switch machine, a thermal relay, signals for governing traffic over said track switch, a detector track circuit associated with said track switch, means whereby if said signals are put to stop said thermal relay is repeatedly energized and deenergized and said lock relay is energized when said thermal relay assumes its deenergized condition after such repeated operation, and means preventing operation of said thermal relay when said detector track circuit is occupied and in which event said lock relay is energized as soon as said detector track circuit is again unoccupied.

18. In combination, a circuit to be controlled, a control contact, a single thermal relay, governing means for causing a predetermined number of a plurality of both heating and cooling operations of said thermal relay upon the closure of said control contact, and means including said thermal relay and said governing means for rendering said circuit responsive to control by said contact only after said predetermined number of operations of said thermal relay.

19. In combination, a circuit to be controlled, a control contact, a thermal relay, governing means both for causing and registering a plurality of cycles of operation of said thermal relay upon the closure of said control contact, each of said cycles comprising a heating and cooling operation, and means effecting control of said circuit only a predetermined time after the closure of said control contact, said time being measured by the plurality of cycles of operation of said thermal relay.

20. In combination, a circuit to be controlled, a control contact, a thermal relay, a plurality of neutral relays both for causing and registering a plurality of cycles of operation of said thermal relay upon the closure of said control contact, each of said cycles comprising a heating and cooling operation, and means effecting control of said circuit only a predetermined time after the closure of said control contact, said time being measured by the plurality of cycles of operation of said thermal relay.

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