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CENTRALIZED TRAFFIC CONTROLLING SYSTEM

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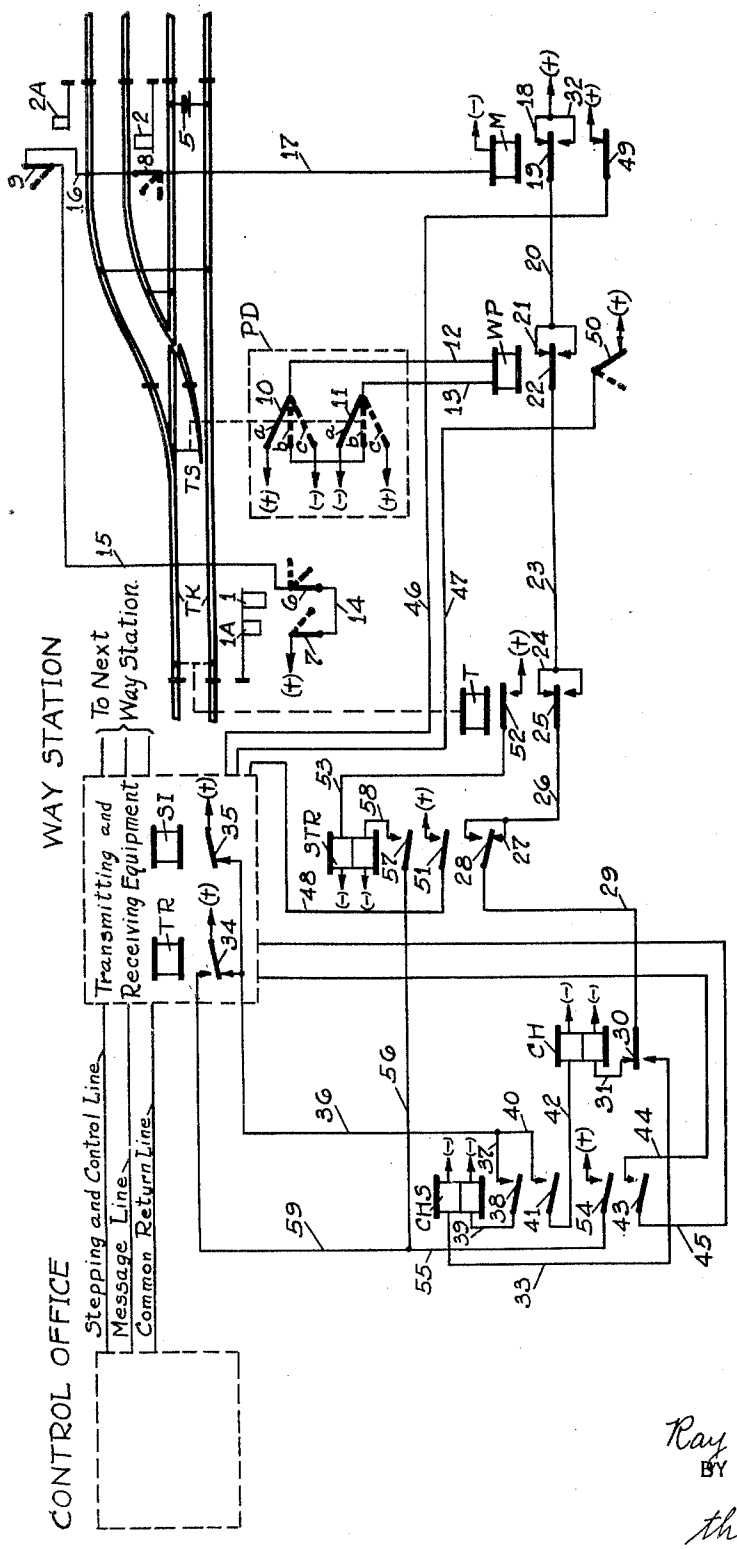

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CENTRALIZED TRAFFIC CONTROLLING SYSTEM

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This invention relates to centralized traffic controlling systems for railroads, and more particularly pertains to means employed for interrelating the operation of a plurality of traffic controlling devices with the operation of the communication part of such a system.

In one type of centralized traffic control system, a communication system is employed to transmit controls from a central control office to any particular way station under the supervision of an operator in the central office by employing station selecting means; and similarly transmitting indications of the position of the various traffic controlling devices at each station to the control office from one station at a time. In such a centralized traffic control system, where only one way station may be in communication with the control office at one time, it is necessary to provide means for storing those indications or conditions at each station, which are of a temporary nature, until that station is permitted or caused to be in communication with the central control office.

It is further desirable, that a communication system of the selective type shall be normally at rest in order to eliminate wear on the various pieces of operating apparatus and to reduce the amount of power consumed. With such a communication system which is normally at rest, it is necessary to provide means at each way station which is effective to initiate the communication part of the system into operation for each new indication or condition present at the associated station in order to insure its transmission to the control office.

In view of the above and other considerations, the present invention proposes to provide means for storing temporary indications or conditions at the way stations of a selective type centralized traffic control system. It is further proposed to provide means for interrelating the operation of the traffic controlling devices at each station in a manner to be capable of initiating a selective system normally at rest for each new indication or condition at that station, regardless of the simultaneous or sequential operation of the various devices.

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

In describing the invention in detail, reference will be made to the accompanying drawing which illustrates in a diagrammatic manner the apparatus and circuits as employed at a single track switch in accordance with the present invention, with a communication system indicated as connecting the traffic controlling devices at that switch with a control office.

The traffic controlling devices located at a single track switch TS are grouped together as comprising a typical way station with a "transmitting and receiving equipment" of the communication system; but it is to be understood that the present invention is adaptable for use with any number of track switches, or any number of other devices which are desired to be grouped together as one way station from which indications are to be transmitted and at which controls may or may not be received.

With reference to the accompanying drawing, the railroad track switch TS is shown as connecting a diverging route to a main track. This track switch is provided with the usual detector track section TK having a track relay T and a track battery 5. The usual governing signals 1—1A and 2—2A are provided for controlling the traffic over the various routes made possible by the track switch TS. These signals are preferably controlled in part by traffic conditions and in part by an operator located at the central control office by means of the communication system associated therewith. The signals 1—1A have associated therewith contacts 6 and 7 respectively which are closed only when those signals are at stop. Similarly, the signals 2—2A have associated therewith contacts 8 and 9 respectively which are closed only when those signals are at stop. These contacts 6, 7, 8 and 9 are connected in series with a neutral relay designated M which is energized when all of the signals are at stop and which is deenergized when any one of the sig-

nals have been caused to give a clear indication in response to the control of the operator.

The track switch TS has associated therewith point detector contacts PD which may be operated by any suitable type mechanism, such for example as shown in the patent to C. S. Bushnell, Patent No. 1,517,236, dated November 25, 1924. Such point detector contacts have been illustrated by movable contacts 10 and 11 which are operable to either of three positions *a*, *b* and *c* in correspondence with the position of the track switch TS. In other words, the movable contacts 10 and 11 assume positions *a* when the track switch TS is in a normal locked position, positions *c* when the track switch TS is in a reverse locked position, or positions *b* whenever the track switch is not in such extreme positions and locked. These point detector contacts PD are employed to control a polar neutral relay designated WP for indicating the position of a track switch TS.

A stick relay STR is employed to store the deenergized condition of the track relay T. Such storing means is necessary as a train may pass over the detector track section TK before the communication part of the system is able to transmit indication of the occupied condition.

A change relay CH and a change storing relay CHS is provided to suitably store indication of the fact that one or all of the traffic controlling devices, such for example, as switch TS, any one of the signals 1—1A or 2—2A, or the occupancy of the detector track section, has changed conditions since the last transmission of the indications associated with those devices.

The communication part of the system has been indicated as including a control office designated by a dotted rectangle, transmitting and receiving equipment designated by a dotted rectangle at the typical way station, and suitable line wires including a stepping and control line, a message line and a common return line. The line wires may extend to as many other similar way stations as desired to be controlled over one such communication system. The communication system may be of any suitable type, such for example as shown in the pending application of N. D. Preston and F. B. Hitchcock, Ser. No. 455,304, filed May 24, 1930. It is to be understood, however, that the specific form of the communication system is not essential to the functioning of the means embodying the present invention, but rather the means embodying the present invention is an adjunct of and may be employed advantageously with any communication system which is of the selective type and is normally at rest.

Included in the dotted rectangle indicating the transmitting and receiving equipment at the way station are located a transfer relay TR and a station indicating relay SI, which relays are both energized when the associated way station is conditioned for communication with the control office to accomplish the transmission of the associated indications. Typical control circuits for these relays TR and SI and typical operations thereof may be had by reference to the above mentioned application Ser. No. 455,304, but for convenience and simplicity in disclosing the present invention have been omitted without in any way detracting from the clearness with which the functions and operations of the means embodying the present invention may be understood.

It is believed that the operation and usefulness of the present invention will be best understood by further description being set forth from the standpoint of operation when subjected to various conditions which may arise in practice.

Operation

With the communication part of the centralized traffic control system at rest, the relays TR and SI are deenergized. Also, with no train upon the detector track section TK the track relay T is energized.

With the track switch TS in a normal locked position, the movable point detector contacts 10 and 11 are in positions *a* completing a circuit for the relay WP from the positive terminal of a suitable source of electrical potential indicated as (+), through movable contact 10 in position *a*, wire 12, winding of relay WP, wire 13, movable contact 11 in position *a*, to the opposite terminal of the suitable source indicated as (−). Thus, the neutral contact of the relay WP is maintained in an energized position and the polar contact remains in a right hand extreme position.

With the signals 1—1A and 2—2A at stop, the relay M is energized from the positive terminal of a suitable source of electrical potential indicated as (+), through contact 7, wire 14, contact 6, wire 15, contact 9, wire 16, contact 8, wire 17, winding of relay M, to the opposite terminal of the suitable source indicated as (−).

At the end of the last operation, when the system completed the transmission of all indications associated with this way station, the change relay CH was left energized through a stick circuit completed from the positive terminal of a suitable source of electrical potential indicated as (+), through wire 18, front contact 19 of relay M, wires 20 and 21, front contact 22 of relay WP, wires 23 and 24, front contact 25 of track relay T, wires 26 and 27, back contact 28 of relay STR, wire 29, front contact 30 of relay CH, wire 31, lower winding of relay CH, to the opposite terminal of the suitable source indicated as (−).

Let us assume that the operator clears the signal 1 by the transmission of a suitable control over the communication system. This results in the deenergization of the relay M at open contact 6 as soon as the signal 1 moves from its stop position. The time consumed by the armature of the relay M in moving from an energized position to a deenergized position is sufficient to cause an appreciable elapse of time between the opening of front contact 19 of relay M and the closing of its back contact 19. This causes the stick circuit for the relay CH to be temporarily opened for a sufficient time to allow the contacts of the relay CH, which is quick acting, to assume deenergized positions before back contact 19 is closed. As the front contact 30 is included in the stick circuit (as heretofore traced), relay CH remains deenergized, until the fact that a change has occurred in the indications at this station, has been stored in the change storing relays CHS.

With the relays CH and M deenergized, a circuit is completed for energizing the change storing relay CHS from the positive terminal of a suitable source of electrical potential indicated as (+), through wire 32, back contact 19 of relay M, wires 20 and 21, front contact 22 of relay WP, wires 23 and 24, front contact 25 of relay T, wires 26 and 27, back contact 28 of relay STR, wire 29, back contact 30 of relay CH, wire 33, upper winding of change storing relay CHS, to the opposite terminal of the suitable source indicated as (−). The energization of relay CHS causes its contacts to be picked up completing its stick circuit from the positive terminal of a suitable source of electrical potential indicated as (+), through contacts 34 and 35 of relays TR and SI respectively connected in multiple, through wires 36 and 37, front contact 38 of relay CHS, wire 39, lower winding of relay CHS, to the opposite terminal of the suitable source indicated as (−). This stick circuit is completed until both of the relays TR and SI have been energized at the same time which is indicative of the fact that the transmitting equipment located at this station is conditioned for the transmission of the associated indications.

As soon as the change storing relay CHS is energized, a pick-up circuit is completed for the change relay CH from the positive terminal of a suitable source of electrical potential indicated as (+), through either the contact 34 or 35 or both in multiple, through wires 36 and 40, front contact 41 of relay CHS, wire 42, upper winding of change relay CH, to the opposite terminal of the suitable source indicated as (−).

The energization of the change storing relay CHS causes the communication system to be initiated into operation by reason of the closing of front contact 43 which completes a circuit through wires 44 and 45 resulting in the initiation of the transmitting equipment.

When the communication system is operated to select or condition this way station for the transmission of its indications, the relay TR and SI are both energized opening the stick circuit of the relay CHS and the pick-up circuit of the relay CH at back contacts 34 and 35. The change storing relay CHS is deenergized by reason of the fact that its pick-up circuit is opened at back contact 30 of the relay CH; but the change relay CH remains energized as its stick circuit is now completed including front contact 30 and back contact 19 of relay M. Thus, the change relay CH is resensitized, that is, it is conditioned to again be deenergized and result in another initiation of the system for another selection of this way station.

Considering that the communication system has selected this station for the transmission of its indications, suitable impulses are transmitted to the control office in accordance with the contacts of the indicating relays M, WP and STR through wires 46, 47 and 48 respectively in a manner distinctive of the particular communication system employed. With contact 49 of relay M in a deenergized position, an indication is transmitted informing the operator at the control office that one of the signals at this station is giving a clear indication. Similarly, with the polar contact 50 of the relay WP in a right hand position, indication is transmitted that the track switch TS is in a normal extreme position, while indication of the unoccupied condition of the detector track section TK is transmitted by reason of open front contact 51 of relay STR. After these indications have been transmitted and such others as may be included with such a way station in accordance with the demands of practice, the communication system returns to its normal at rest condition and the relays TR and SI assume deenergized positions.

With the signal 1 cleared, we may assume that a train passes onto the detector track section TK deenergizing the track relay T. The deenergization of the track relay T opens front contact 25 and closes back contact 25 which momentarily opens the stick circuit of the change relay CH for a sufficient time to cause its contacts to assume deenergized positions. The deenergization of the change relay CH results in the energization of the change storing relay CHS which in turn results in its own energization, all in a manner as heretofore explained.

The deenergization of the track relay T causes the storing track relay STR to be energized from the positive terminal of a suitable source of electrical potential indicated as (+), through back contact 52 of track relay T, wire 53, upper winding of relay STR, to the opposite terminal of the suitable source indicated as (−). With the

change storing relay CHS energized, a stick circuit is completed for the relay STR as soon as its contacts assume energized positions. This stick circuit is completed from the positive terminal of a suitable source of electrical potential indicated as (+), through front contact 54 of relay CHS, wires 55 and 56, front contact 57 of relay STR, wire 58, lower winding of relay STR, to the opposite terminal of the suitable source indicated as (−).

The energization of the relay STR opens back contact 28 and closes front contact 28, but this does not affect the relay CH as it is now energized through its pick-up circuit as heretofore pointed out. Should the train pass off of the detector track section TK prior to the selection of this way station and the transmission of the associated indications, indication of the occupied condition of the track circuit TK is insured of transmission as front contact 51 of relay STR is maintained closed with the relay STR energized through its stick circuit including front contact 54 of the change storing relay CHS. In this connection, it is noted that although the change storing relay CHS is deenergized as soon as the station is conditioned for transmitting (relays TR and SI energized), the relay STR is maintained energized due to the closing of front contact 34 of relay TR which completes a second stick circuit for relay STR from the positive terminal of a suitable source of electrical potential indicated as (+), through front contact 34 of the relay TR, wires 59 and 56, front contact 57 of relay STR, wire 58, lower winding of relay STR, to the opposite terminal of the suitable source indicated as (−).

When the communication system has completed the transmission of the associated indications, the relays TR and SI are deenergized and the system returns to its normal at rest condition.

With the relays CHS and TR deenergized, the stick circuit of the relay STR is completely opened, which results in its deenergization if the train has passed off detector track section TK and the track relay T is energized. This deenergization of the relay STR causes the contact 28 to move from an energized to a deenergized position momentarily deenergizing the stick circuit of the change relay CH. The deenergization of the change relay CH causes another selection of this way station to accomplish the transmission of suitable indications indicative of the fact that the train has passed off the track section TK. Such operation will not be described in detail as it is obviously similar to the operations already described and will be readily understood by analogy thereto. The only distinctive condition to be noted is that of open front contact 51 of relay STR, which accomplishes the transmission of the suitable indication.

The various operations incurred by the returning of signal 1 to a danger or stop position will be readily understood by analogy to those operations already pointed out. In a similar manner the operation of the track switch TS causes the energization of the change storing relay CHS and transmission of its associated indication by reason of the position assumed by contact 50.

It is evident from the above description that regardless of the number of traffic controlling devices, or the associated indicating devices, that assume new positions at the same time, the change relay CH is deenergized and the change storing relay CHS is energized resulting in transmission of the associated new indications. In other words, the functioning of the change relay CH is dependent upon the momentary opening of its stick circuit, which momentary opening is only prolonged by sequential operation of the indicating devices; and the simultaneous operation of the indicating devices momentarily opens the stick circuit equal to the time period consumed by the slowest operating indicating device. In this connection, it should be noted that the relay CH is a quick acting relay, while the indicating devices STR, WP and M are comparatively slow, that is, the relay CH is capable of opening its front contact 30 (when deenergized) before the contacts of the indicating devices can move to opposite positions.

Thus, a system has been provided for storing temporary indication conditions and for storing or indicating the fact that a change in indication conditions has occurred which changed condition is registered regardless of the simultaneous or sequential operation of the various associated traffic controlling devices.

Having described a system for interrelating the operations of the various traffic controlling devices at a particular station of a selective type centralized traffic control system, it is to be understood that this form is selected to facilitate in the disclosure of the invention 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 described our invention, we now claim:—

1. In a centralized traffic control system for railroads, a plurality of traffic controlling devices at a particular location, and means for registering a change in condition of any one or all of said plurality of devices, said means comprising a stick relay, a stick circuit normally closed for energizing said stick relay, and means momentarily opening said

stick circuit upon a change in condition of any one or all of said plurality of devices.

2. In a centralized traffic control system for railroads, a plurality of traffic controlling devices each of said devices having associated therewith a contact momentarily opened upon a change in the condition of the respective device, a stick relay, a stick circuit for said stick relay which includes said momentarily opened contacts in series, whereby said stick relay is deenergized upon a change in the condition of any one of said plurality of devices, means for registering the deenergized condition of said stick relay, a pick-up circuit for said stick relay, and means automatically closing said pick-up circuit upon the actuation of said registering means.

3. In a centralized traffic control system for railroads, a plurality of traffic controlling devices, an indicating relay associated with each of said devices for indicating the conditions thereof, each of said relays having energized and deenergized contacts, a stick relay, and a stick circuit for said stick relay, said stick circuit being normally closed through either the energized or the deenergized contacts of each of said indicating relays, whereby said stick relay is deenergized when any one of said indicating relays is energized or deenergized, and whereby said stick relay is deenergized regardless of the simultaneous or successive energizations and deenergizations of said indicating relays.

4. In a centralized traffic control system for railroads, a railroad track switch having a detector track section and signals governing traffic thereover, means indicating the occupancy of said detector track section, means indicating the position of said track switch, means indicating the clear or stop condition of said signals, a communication system for transmitting the condition of said indicating means when initiated into operation, and means for initiating said communication system comprising a stick relay, a stick circuit for said stick relay, and means momentarily opening said stick circuit upon a change in condition of said indicating means.

5. In a centralized traffic control system for railroads, a plurality of traffic controlling devices, a control office, a communication system for transmitting indications of the conditions of said traffic controlling devices to said control office, initiating means for causing said communication system to operate, a change relay having a stick circuit normally closed, contact means for momentarily opening said stick circuit upon a change in condition of any one or all of said traffic controlling devices to thereby deenergize said change relay, a change storing relay, a pick-up circuit for said change storing relay closed when said change relay is deenergized, a stick circuit completed for said change storing relay when it is picked up only if said communication system is not transmitting indications from said plurality of traffic controlling devices, means causing said initiating means to be effective when said change storing relay is picked up, and a pick-up circuit for said change relay closed when said change storing relay is picked up if said communication system is not transmitting indications from said plurality of devices, whereby said change storing relay is deenergized upon transmission of the indication from said plurality of traffic controlling devices thereby resensitizing said change relay.

6. In a centralized traffic control system for railroads, a detector track section, a track relay indicating the occupancy of said detector track section, a change storing relay picked up upon a change in condition of said track relay, and means storing the condition of said track relay until said change storing relay is deenergized, whereby said change storing relay is again picked up.

7. In a centralized traffic control system for railroads, a track section having a track relay indicating the occupancy thereof, a selective communication system for transmitting, when initiated, indication of the occupancy of said track section in accordance with said track relay, means for initiating said communication system, means for actuating said initiating means upon a change in the position of said track relay, whereby indication of either the occupied or unoccupied condition of said track section will be transmitted, means storing the condition of said track relay when said track section is occupied until said communication system is conditioned for transmitting an indication thereof regardless of vacancy of said track section prior to the time when said communication system is conditioned, and means operated by said storing means for actuating said initiating means upon the restoring to normal of said storing means, whereby indication of the unoccupied condition of said track section will be transmitted.

8. In a centralized traffic control system for railroads, a selective communication system, a plurality of traffic controlling devices, a change relay storing a change in the condition of said traffic controlling devices, a condition storing relay conditioned by said traffic controlling devices until said selective communication system has been effectively operated to transmit indications of said devices, means cancelling said change storing relay and said condition storing relay when said communication system is conditioned to transmit, and means actuating said change storing relay upon the cancelling of said condition storing relay.

9. In combination, a quick acting relay having a stick circuit, a plurality of devices, and means momentarily opening said stick

circuit upon a change in condition of any one of said devices or all of said devices simultaneously.

10. In a centralized traffic control system for railroads, a selective communication system, a traffic controlling device, a change relay actuated by a change in the condition of said traffic controlling device for causing said communication system to transmit indications, a condition storing relay being energized by said traffic controlling device and maintained energized until said selective communication system has been effectively operated to transmit indications of said traffic controlling device, means cancelling said change relay when said communication system is conditioned to transmit indications of said traffic controlling device, means deenergizing said condition storing relay when said communication system has operated to transmit indications of said traffic controlling device, and means actuating said change relay upon the cancelling of said condition storing relay.

11. In a centralized traffic control system for railroads, a control office, a field station having a track section, a selective communication system connecting said control office and said field station said system being capable of operating through cycles of operation for transmitting indications to said control office from said field station, a track relay indicating the occupancy of said track section, a storing relay for storing the occupied condition of said track section, initiating means for said communication system capable of being actuated either by said track relay or by said storing means said initiating means operating to initiate said communication system into a cycle of operation, and means including said communication system for transmitting indication of the occupancy of said track section as repeated by said storing relay.

12. In a centralized traffic control system for railroads, a communication system connecting a control office with a field station, a traffic controlling device at said field station, means storing the condition of said traffic controlling device, means for transmitting indications over said communication system in accordance with said storing means when said communication system is initiated into operation, and means independently actuated either by said traffic controlling device or said storing means for initiating said communication system.

13. In a centralized traffic control system for railroads, a communication system connecting a control office and a field station, a traffic relay at said field station, a storing relay having a pick-up circuit closed when said track relay is deenergized, a stick circuit for said storing relay closed until said communication system has transmitted indication of the energized condition of said storing relay, means causing said communication system to transmit indication of the energized or deenergized condition of said storing relay upon a change in the condition of either or both said track relay and said storing relay.

14. In a centralized traffic control system for railroads, a normally at rest selective communication system connecting a control office and a plurality of field stations, station selecting means indicating at each field station when said control office is in communication with that particular field station, means at each field station for initiating said system when actuated, at least one traffic controlling device at each station, means for actuating said initiating means at a particular station upon a change in condition of the traffic controlling device at that station, and means at each station in part controlled by said traffic controlling device and in part by said station selecting means at that station for actuating said initiating means at that station.

In testimony whereof we affix our signatures.

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