

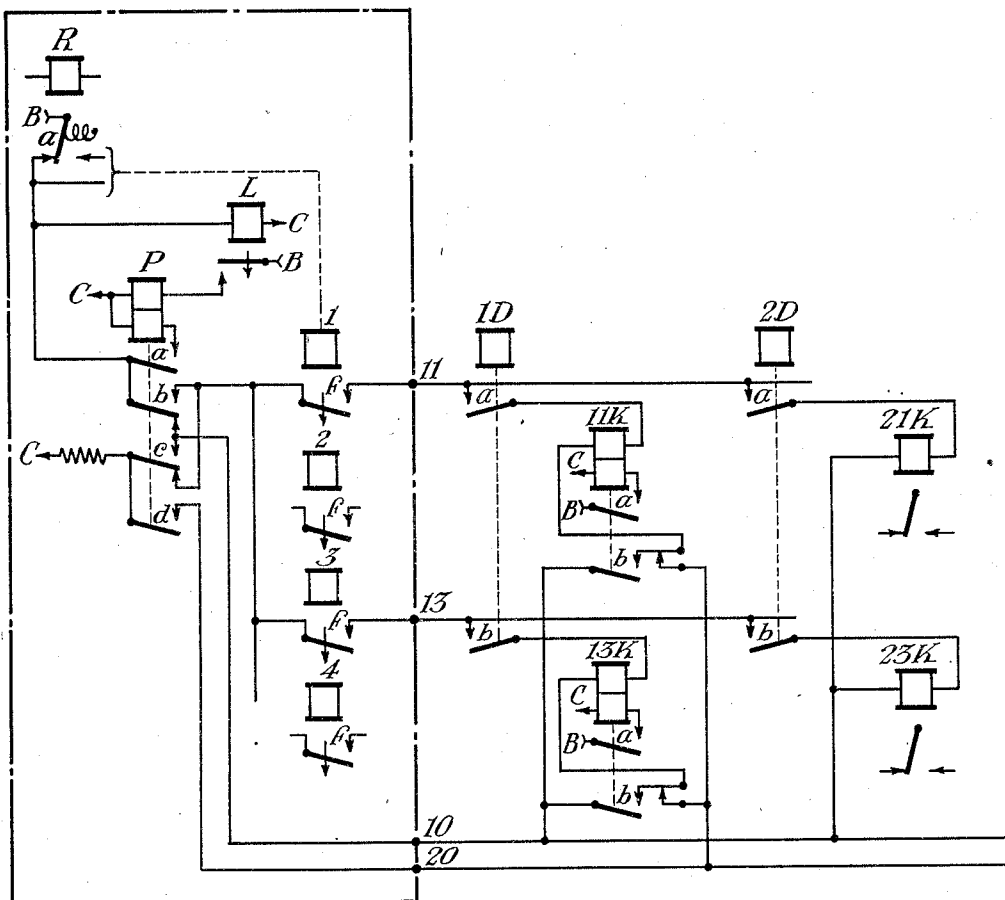
May 13, 1947.

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2,420,546

REMOTE CONTROL SYSTEM

Filed Feb. 20, 1945



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2,420,546

REMOTE CONTROL SYSTEM

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Application February 20, 1945, Serial No. 578,881

4 Claims. (Cl. 177—353)

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My invention relates to remote control systems of the code type, and more particularly to improved arrangements for use in such systems for operating a series of storage relays one at a time to positions corresponding to the character of successive elements of a received code.

Polar stick relays have been widely used as storage relays, even though they are larger and more expensive than the corresponding neutral relays, for the reason that they are readily operable to either of two positions by impulses of very brief duration and require only one control circuit per relay. Neutral stick relays as used heretofore usually require more complicated arrangements such as the provision of an intermediate relay to register the character of an impulse as received, which relay operates a storage relay at the end of the code, or the provision of two circuits for each storage relay one to energize the relay to close a stick circuit, and the other to short circuit the relay to cause it to release, but since a short circuited relay is inherently slow to release, the latter arrangement is limited to systems operating at a relatively slow speed, and requires twice as many control circuits as a polar relay.

One object of my invention is the provision of means for quickly operating each of a series of neutral storage relays to either of its two positions over a one-wire circuit with a common return, by supplying thereto brief impulses of opposite polarity, the relay being biased to one of its two positions and adapted to be held in its other position by the provision of an auxiliary stick circuit.

In code systems employed for the control of railway traffic, the storage relays employed at the field stations usually control traffic governing devices and are made relatively large to conform with the safety requirements of the circuits they control, in which case polar stick relays are preferred because of their quicker action. On the other hand, at the control office the principal use of the storage relays is for the control of indication lamps and neutral relays of a smaller type closely spaced in racks are preferred on account of space limitations. In view of these considerations, a further object of my invention is the provision of coding apparatus which is adapted to control storage relays of either the polar or neutral type, whereby similar coding units may be provided at the office and at the stations in systems of this character, eliminating the need for different types of space units for maintenance purposes.

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I shall describe one form of apparatus embodying my invention, and shall then point out the novel features thereof in claims.

In the accompanying drawing, I have shown the apparatus of my invention applied to a specific remote control system comprising a modification of the systems shown in my Letters Patent of the United States No. 2,229,249, issued January 21, 1941, and in my pending application for Letters Patent of the United States, Serial No. 478,252, filed March 6, 1943, now U. S. Letters Patent 2,409,696, granted Oct. 22, 1946. In the drawing, the parts enclosed in dot and dash lines at the left are the portions of the coding unit of the system, to which my invention relates, while the relays 11K and 13K are two neutral storage relays in a group of such relays which may be selected upon the energization of a delivery relay 1D, for operation successively by the coding unit. The relays 21K and 23K are two storage relays of the stick polar type in another group which is selected upon the energization of another delivery relay 2D, for operation by the same or by another similar coding unit.

In the coding unit, relay R is a line relay of the biased polar type which is normally energized to close its contact *a*, and which responds to a code of relatively short and long interruptions of its circuit and operates a chain of counting relays 1, 2, 3, and 4 as in my prior patent. It is to be understood that relay 1 is operated when relay R releases in response to a first code step in a group of steps assigned to the control of the storage relays K. When relay R picks up to begin the second step of the group, relay 2 becomes energized and relay 1 releases, while the next release of relay R energizes relay 3 and releases relay 2, and so on. Relay L is a slow release relay having an energizing circuit which extends from the positive or supply terminal B of a suitable local source of current at the normal contact *a* of relay R, through the winding of relay L to the other terminal C of the same source. Relay P is a stick relay which is operated whenever relay L releases. Although relay L is de-energized for the duration of each odd-numbered code step, its release is retarded so that it does not release if the step is short, in which case relay P is not operated. When a long odd-numbered step is received, relay L releases and energizes the upper winding of relay P, and relay P picks up and is then held energized by relay R for the duration of the next even-numbered step over a stick circuit including its own front contact *a* and lower winding, and extending to terminal B at

contact *a* of relay R. Relay P therefore serves as a register relay to register the long or short character of each of the odd-numbered steps of the code.

Assuming first that relay 2D is energized, it will be seen that the closing of contact *a* of relay R connects terminal B to circuits including the pole changer contacts *b* and *c* of relay P by which the polar stick relays 21K, 23K, etc. are successively energized by brief impulses of normal or reverse polarity on the even-numbered steps, each in accordance with the short or long character of the next preceding odd-numbered step.

If the first step of the group is short, for example, the closing of contact *a* of relay R on the second step connects terminal B over back contact *b* of relay P and wire 10 to the left-hand terminals of relays 21K and 23K. It is understood that relay 1 controls relay 2 and therefore remains picked up for a short time at the beginning of the second step sufficient to enable relay 2 to assume its energized position, during which time the left-hand terminal of relay 21K is connected over contact *a* of relay 2D, wire 11, contact *f* of relay 1 and back contact *c* of relay P to terminal C, whereby relay 21K is momentarily energized in the normal direction. On the other hand, if the first step is long, terminal C is connected over front contact *c* of relay P to wire 10, and terminal B is connected over front contact *b* of relay P, contact *f* of relay 1 to wire 11, so that the impulse supplied by relays R and 1 energizes relay 21K in the reverse direction.

Considering now the neutral stick relays 11K, 13K, etc., of my invention and assuming that relay 1D is picked up in place of relay 2D, if relay 11K occupies its released position and a code is received in which the first step of the group assigned to the control of relays K is long, a circuit is closed on the next step by relay R, from terminal B over front contact *b* of relay P, contact *f* of relay 1, wire 11, contact *a* of relay 1D, the upper winding of relay 11K and its back contact *b* to wire 20, thence to terminal C over contact *d* of relay P. As relay 11K picks up, its contact *b* transfers the common return portion of the circuit from wire 20 to wire 10, which at the time is connected to terminal C at front contact *c* of relay P. The upper winding of relay 11K has a relatively low impedance and the circuit has a small time constant due to the series resistance in the connection to terminal C whereby relay 11K is made responsive to impulses of very brief duration. The circuit for the upper winding of relay 11K is opened upon the release of relay 1, but relay 11K remains energized due to the closing of a local stick circuit including its lower winding, the latter being of relatively high impedance.

If the code including a long first step is repeated and finds relay 11K already picked up, the upper winding of relay 11K is energized momentarily over the circuit including wires 11 and 10, but since at the time its lower winding is energized in the same direction, relay 11K remains picked up.

If the code which finds relay 11K picked up includes a short first step, relay P is not operated and the closing of contact *a* of relay R on the second step connects terminal B over wire 10 and contact *b* of relay 11K to the left-hand terminal of the upper winding of that relay and since the right-hand terminal of that winding is connected over contact *f* of relay 1 to terminal C at back contact *c* of relay P, the resulting momentary energization of the upper winding opposes that of

the lower winding and quickly releases relay 11K, whereupon the circuit for the upper winding is opened at its contact *b* and that for the lower winding is opened at its contact *a*, so that relay 11K remains released.

Finally, if the code which includes the short first step finds relay 11K released, relay P is not operated, and since the pick-up circuit for relay 11K is open at contact *d* of relay P, relay 11K remains released.

It will be seen therefore that relay 11K behaves like the polar stick relay 21K and in one position is capable of responding only to an impulse of one polarity and in the other position only to an impulse of the other polarity and that the circuits described permit the control of neutral storage relays over individual one-wire circuits such as those including wires 11 and 13 having a return path over wire 10 or 20 common to all such relays.

It will be understood that in practice the system usually includes another pair of relays L and P similar to those shown but controlled over the right-hand contact *a* of the relay, by means of which other storage relays are controlled over contacts *f* of relays 2, 4, etc., in accordance with the character of the even-numbered code steps in the manner described.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In a remote control system, a series of neutral storage relays, means for preparing operating circuits including windings of said relays to effect their energization or release one at a time in order, each in response to a different element of a code, a register relay, means for causing said register relay to assume one position or another in accordance with the character of each of said code elements, means including a back contact of each storage relay which is in its released position when its operating circuit is prepared for supplying the operating circuit for such relay with a brief impulse of current of one polarity only if the register relay is then in said one position, means including a front contact of each storage relay which is in its energized position when its operating circuit is prepared for supplying the operating circuit for such relay with a brief impulse of either said one polarity or of the opposite polarity depending upon whether said register relay then occupies said one position or its other position, and a holding circuit for each storage relay for supplying current of said one polarity thereto as long as such relay occupies its energized position.

2. In a remote control system, a series of neutral storage relays, means for preparing operating circuits including windings of said relays to effect their energization or release one at a time in order, each in response to a different element of a code, a register relay, means for causing said register relay to assume one position or another in accordance with the character of each of said code elements, means including a back contact of each storage relay which is in its released position when its operating circuit is prepared for supplying the operating circuit for such relay with a brief impulse of current of one polarity only if the register relay is then in said one position, a

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holding circuit for each storage relay including a second winding thereof, means for supplying the holding circuit for each storage relay with current of said one polarity when the relay assumes its energized position, and means including a front contact of each storage relay which is in its energized position when its operating circuit is prepared for supplying the operating circuit for such relay with a brief impulse of the opposite polarity of a value sufficient to neutralize the energization of its holding circuit, only if the register relay is then in said other position.

3. In combination with a series of neutral storage relays each biased to one position and having a local holding winding which is energized when the relay is in its other position, operating circuits for said relays comprising individual portions each including a second winding of the relay and one of a series of contacts operable one at a time in order for selecting only one relay at a time for operation, said operating circuits having two return portions common to all the relays, means including contacts of each relay closed only when such relay is in said one or said other position respectively for connecting the operating circuit for such relay to one or the other of said common return portions in accordance with the position of such relay, a register relay, means including a contact of said register relay connected to one of said common return portions for supplying impulses of a given polarity to the operating circuit for each storage relay which is in its one position or for maintaining such circuit open, depending upon the position of the register relay when such storage relay is selected for op-

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eration, and means including pole changer contacts of said register relay connected to the other of said common return portions for supplying impulses of either said given polarity or of the opposite polarity to the operating circuit for each storage relay which is in its other position when selected for operation.

4. In a remote control system, a coding unit, a series of neutral storage relays each biased to one position and having a high resistance winding which is energized by current of a given polarity when the relay is in its other position, a series of operating circuits including one for each relay of the series each including a low resistance winding of the relay and contacts which connect said winding to one return portion common to all the relays when the relay is in said one position and to another return portion common to all the relays when such relay is in its other position, and means in said coding unit for supplying impulses of a given polarity to selected ones of the operating circuits which include said one return portion and impulses of either said given polarity or of the opposite polarity to each of said circuits which include said other return portion.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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