

Aug. 25, 1942.

A. E. DODD

2,293,809

REMOTE CONTROL APPARATUS

Filed Jan. 31, 1940

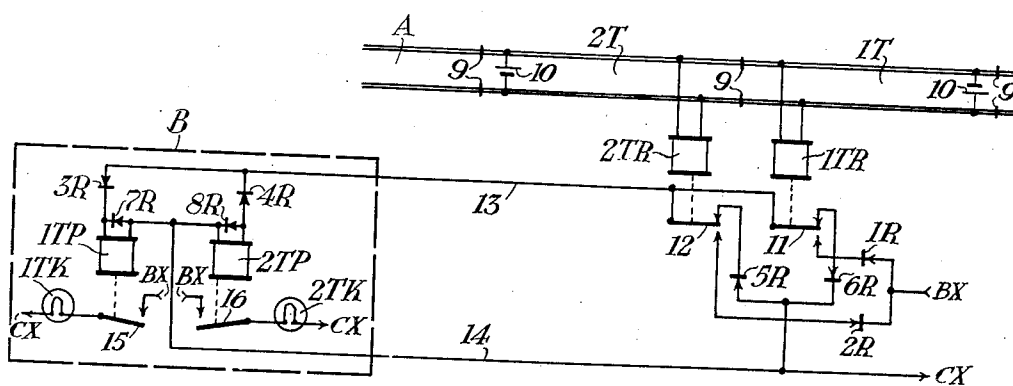


Fig. 1.

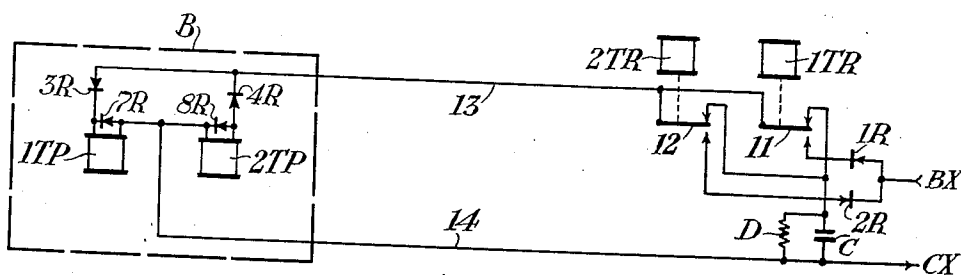


Fig. 2.

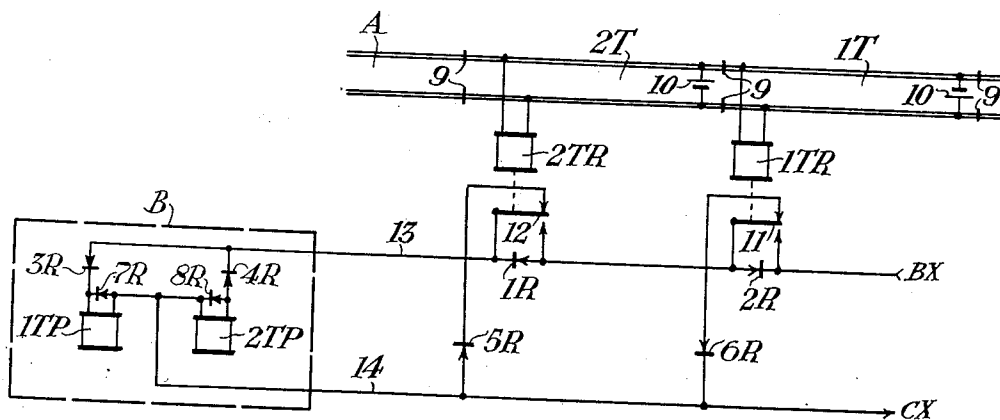


Fig. 3.

INVENTOR
Arthur H. Dodd.
BY *K. E. Wood*
HIS ATTORNEY

UNITED STATES PATENT OFFICE

2,293,809

REMOTE CONTROL APPARATUS

Arthur E. Dodd, Edgewood, Pa., assignor to The
Union Switch & Signal Company, Swissvale,
Pa., a corporation of Pennsylvania

Application January 31, 1940, Serial No. 316,607

10 Claims. (Cl. 175—320)

My invention relates to remote control apparatus, and particularly to apparatus for controlling electroresponsive devices such as indication devices from a remote point.

One form of apparatus which has been used for this purpose involves polarity responsive apparatus supplied with current of normal or reverse polarity from a source of alternating current through reversely connected asymmetric units wherein one unit or the other is interposed between the source and the electroresponsive apparatus so that the electroresponsive apparatus is energized in normal or reverse direction.

One feature of my invention is the provision, in apparatus of the type referred to above, of means for preventing false energization of the polarity responsive apparatus by current flowing through one unit or the other in the high resistance direction. In certain forms of my invention, I accomplish this by additional asymmetric units connected in such manner as to provide low resistance shunts across said polarity responsive apparatus for currents which might otherwise be falsely supplied to the apparatus through one or the other of the controlling units in the high resistance direction. In another form of my invention, I provide a condenser which becomes charged by the currents supplied to the apparatus through the first two asymmetric units in their low resistance directions and which condenser then opposes any current which tends to flow to the electroresponsive apparatus through the controlling units in their high resistance directions.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention, and Figs. 2 and 3 are diagrammatic views showing modifications of the apparatus shown in Fig. 1 and also embodying my invention.

Similar reference characters refer to similar parts in each of the views.

Referring first to Fig. 1, the reference character B designates indication apparatus which is controlled from a remote point. As here shown this apparatus is controlled by track relays associated with a stretch of railway track A. This stretch of track is divided by insulated joints 9 into two sections 1T and 2T. Each section is provided with the usual track circuit comprising a battery 10 and a track relay 1TR or 2TR. The indication apparatus B is responsive to the po-

larity of the current supplied thereto, and comprises, in the form here shown, a relay 1TP designed to repeat the operations of track relay 1TR, and another relay 2TP designed to repeat the operations of track relay 2TR. As here shown, each of the repeater relays is of the neutral type and is connected across a pair of conductors 13 and 14, an asymmetric unit 3R being interposed between conductor 13 and the relay 1TP while another asymmetric unit 4R is interposed between the conductor 13 and the relay 2TP. The units 3R and 4R are poled in such directions that relay 1TP or relay 2TP will become effectively energized according as current of one polarity or the other is supplied to the conductors 13 and 14. The usual shunting asymmetric units 7R and 8R are connected across the terminals of relays 1TP and 2TP, respectively, and poled in such directions as to shunt away from each relay current of the polarity to which the other relay is intended to respond. The units 3R, 4R, 7R and 8R may, for example, be rectifiers of the copper oxide type.

An indication lamp 1TK is controlled by a front contact 15 of relay 1TP through a circuit which is obvious from the drawing. Another indication lamp 2TK is controlled by a front contact of relay 2TP in a similar manner.

The supply of current to the conductors 13 and 14 is controlled by the track relays 1TR and 2TR and this current is furnished from a source of alternating current the terminals of which are designated BX and CX, respectively. The polarity of such current is controlled by two asymmetric units 1R and 2R, each of which may, for example, be a rectifier of the copper oxide type.

When both of the track relays are energized, no current is supplied to the conductors 13 and 14 and so the indication relays 1TP and 2TP are both deenergized. When track relay 1TR becomes deenergized, pulsating current of what I will term normal polarity flows from terminal BX through unit 1R in its low resistance direction, back point of contact 11 of relay 1TR, conductor 13, the indication apparatus B and conductor 14 to terminal CX. This current will energize relay 1TP whereupon contact 15 of this relay closes the circuit for indication lamp 1TK. When track relay 2TR becomes deenergized, pulsating current of reverse polarity will flow from terminal CX through conductor 14, the indication apparatus B, conductor 13, back point of contact 12 of relay 2TR, and asymmetric unit 2R in its low resistance direction to terminal BX. This current will energize relay 2TP whereupon con-

tact 16 of this relay will close the circuit for indication lamp 2TK. If both track relays are deenergized at the same time, currents of both polarities will be supplied to the indication apparatus B so that both lamps 1TK and 2TK will be energized.

When track relay 1TR is deenergized, a small amount of current will flow through asymmetric unit 1R in its high resistance direction. In order to prevent such current from being supplied to the polarity responsive apparatus B and so to prevent any possibility of false energization of relay 2TP by such current, I provide an additional asymmetric unit 5R which is connected across the conductors 13 and 14 through a front point of contact 12 of relay 2TR and poled in such direction as to freely conduct any reverse current which may be flowing through unit 1R. Similarly, when relay 2TR is deenergized, a small amount of current will flow through unit 2R in its high resistance direction. To prevent such current from reaching apparatus B and so to prevent any possible false energization of relay 1TP by such current, I provide a shunt path across the conductors 13 and 14 including the front point of contact 11 of relay 1TR and an asymmetric unit 6R poled in such direction as to freely conduct any current which may pass through unit 2R in its high resistance direction. When both track relays 1TR and 2TR are deenergized, the protective units 5R and 6R are disconnected from conductor 13 at contacts 12 and 11, respectively, so that these units are not functioning. They are not required at such time because it is desirable that both repeater relays 1TP and 2TP be energized.

When both track relays 1TR and 2TR are energized, conductors 13 and 14 are connected by units 5R and 6R poled in opposite directions so that these units tend to prevent any false energization of relays 1TP and 2TP due to capacity coupling of the line circuit for these relays with adjacent alternating current lines.

Referring now to Fig. 2, the apparatus shown in this view is the same as that shown in Fig. 1 except that the protective units 5R and 6R are replaced by a condenser C which is connected across conductors 13 and 14 through the front points of contacts 11 and 12 in multiple.

When relay 1TR becomes deenergized, repeater relay 1TP will become energized through asymmetric unit 1R as in Fig. 1 and at such time condenser C will become charged during each impulse of normal polarity through a path which passes from terminal BX through unit 1R, back point of contact 11, front point of contact 12 and condenser C to terminal CX. During the next succeeding half-wave, condenser C will tend to discharge into the circuit including conductors 13 and 14 and apparatus B, and this discharge will be of the polarity opposite to that which may be supplied to relay 2TP through unit 1R in the high resistance direction. The apparatus can be so proportioned that the discharge current through relay 2TP from condenser C will be equal to or larger than any current which might be supplied to this relay from the alternating source through asymmetric unit 1R in the high resistance direction.

Similarly, when relay 2TR is deenergized and relay 1TR is energized, repeater relay 2TP will be supplied with current of reverse polarity through unit 2R in the low resistance direction and condenser C will become charged upon each impulse of reverse polarity because it will be con-

nected from terminal CX through front point of contact 11, back point of contact 12, and unit 2R to terminal BX. During the succeeding impulse of normal polarity, condenser C will tend to discharge into the conductors 13 and 14 and such discharge current will be opposite in polarity to, and preferably equal to or greater than, the small current which may be supplied to these conductors through unit 2R in the high resistance direction so that the current discharged by condenser C will tend to prevent false energization of relay 1TP by current through unit 2R in its high resistance direction.

As shown in the drawing, a resistor D is connected in multiple with condenser C and when used it will preferably be of a high magnitude, the purpose of the resistor being to provide a discharge path for the condenser C when relays 1TR and 2TR are deenergized at the same time.

Referring now to Fig. 3, the track circuit for section 2T is the reverse of that shown in Fig. 1 in that the battery 10 is connected across the rails at the right-hand end of the section and track relay 2TR is connected across the rails at the left-hand end of the section. The result of this is that the track relays 1TR and 2TR are separated by the length of track section 2T instead of being closely adjacent each other as in Fig. 1. In Fig. 3, I have rearranged the asymmetric units to minimize the required number of line wires through section 2T when the track relays are thus separated. In Fig. 3, the back points of track relay contacts 11 and 12 are connected in series instead of in multiple and the protective units 6R and 5R are connected across the conductors 13 and 14 through front points of contacts 11 and 12, respectively.

When track relay 1TR becomes deenergized, current of normal polarity will flow from terminal BX through back point of contact 11, asymmetric unit 1R in the low resistance direction, and thence through the polarity responsive apparatus B to terminal CX, thereby energizing repeater relay 1TP. Any current which may flow through unit 1R in its high resistance direction will pass from terminal CX through unit 5R, front point of contact 12 of relay 2TR, unit 1R, and back point of contact 11 of relay 1TR to terminal BX. This will prevent the supply of current of reverse polarity through unit 1R in the high resistance direction to the polarity responsive apparatus B and so will prevent false energization of relay 2TP. When track relay 2TR is deenergized, current of reverse polarity will flow from terminal CX through the polarity responsive apparatus B, back point of contact 12 of relay 2TR and unit 2R to terminal BX, thereby causing repeater relay 2TP to become energized. Any current of normal polarity which then flows through unit 2R in the high resistance direction will pass from terminal BX through unit 2R, front point of contact 11 of relay 1TR and asymmetric unit 6R in the low resistance direction to terminal CX. This branch path will prevent the supply of current of normal polarity to the apparatus B through unit 2R in its high resistance direction, and, consequently, will prevent false energization of relay 1TP by such current.

Although I have herein shown and described only three forms 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 combination, a first and a second contact device each capable of being operated to a first or a second position, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit closed by said first contact device in its second position for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit closed by said second contact device in its second position for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, and branch circuit means connected with said first and second circuits and closed by said first and second contact devices in the first position and including means for preventing operation of said polarity responsive apparatus by current flowing through said first and second asymmetric units in the second direction.

2. In combination, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, and auxiliary circuit means connected with said first and second circuits and closed across said source only if one of said first and second circuits is closed and the other is open and including means for preventing operation of said polarity responsive apparatus by current flowing through said first or second asymmetric unit in the second direction.

3. In combination, a first and a second electroresponsive device, a first and a second asymmetric unit, a source of alternating current, a first circuit for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said first electroresponsive device, a second circuit for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said second electroresponsive device, and branch circuit means connected with said first and second circuits and closed only if one of said first and second circuits is open and including means for preventing operation of said first electroresponsive device by current flowing through said second asymmetric unit in the second direction and for preventing operation of said second electroresponsive device by current flowing through said first asymmetric unit in the second direction.

4. In combination, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, and branch circuit means for each of said first and second circuits closed only if the other of said first and second circuits is open and comprising low resistance shunt means around said

polarity responsive apparatus for current flowing through said first or second asymmetric unit respectively in the reverse direction.

5. In combination, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, and branch circuit means for each of said first and second circuits closed only if the other of said first and second circuits is open and including other asymmetric units for providing shunt means around said polarity responsive apparatus for current flowing through said first or second asymmetric unit respectively in the reverse direction.

6. In combination, a first and a second contact element each capable of being open or closed, a third and a fourth contact element each capable of being closed when the first and second contact elements respectively are open and which are open when the first and second contact elements respectively are closed, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit including said first contact element in the closed condition for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit including said second contact element in the closed condition for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, a shunt path including said fourth contact element in the closed condition connected with said first circuit around said polarity responsive apparatus and including asymmetric means for passing only current which flows through said first asymmetric unit in the second direction, and a second shunt path including said third contact element in the closed condition connected with said second circuit around said polarity responsive apparatus and including asymmetric means for passing only current which flows through said second asymmetric unit in the second direction.

7. In combination, a first and a second contact element each capable of being open or closed, a third and a fourth contact element each capable of being closed when the first and second contact elements respectively are open and which are open when the first and second contact elements respectively are closed, polarity responsive apparatus, a first and a second as well as a third and a fourth asymmetric unit, a source of alternating current, a first circuit including said first contact element in the closed condition for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit including said second contact element in the closed condition for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, a third circuit including said first and fourth contact elements in the closed condition and including said third asymmetric unit in the first direction for passing current around said polarity responsive apparatus through said first asym-

metric unit in the second direction, and a fourth circuit including said second and third contact elements in the closed condition and including said fourth asymmetric unit in the first direction for passing current around said polarity responsive apparatus through said second asymmetric unit in the second direction.

8. In combination, a first and a second contact element each capable of being open or closed, a third and a fourth contact element each capable of being closed when the first and second contact elements respectively are open and which are open when the first and second contact elements respectively are closed, polarity responsive apparatus, a first and a second as well as a third and a fourth asymmetric unit, a source of alternating current, a first circuit including in multiple said first contact element in the closed condition and said second asymmetric unit in the second direction for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit including in multiple said second contact element in the closed condition and said first asymmetric unit in the second direction for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, a third circuit including said fourth contact element in the closed condition and including said third asymmetric unit in the first direction for passing current around said polarity responsive apparatus through said first asymmetric unit in the second direction, and a fourth circuit including said third contact element in the closed condition and including said fourth asymmetric unit in the first direction for passing current around said polarity responsive apparatus through said second asymmetric unit in the second direction.

9. In combination, a first and a second contact element each capable of being open or closed, a third and a fourth contact element capable of being closed when the first and second contact elements respectively are open and which are open

when the first and second contact elements respectively are closed, polarity responsive apparatus, a first and a second asymmetric unit, a source of alternating current, a first circuit including said first contact element in the closed condition for supplying current of a given polarity from said source through said first asymmetric unit in the first direction to said polarity responsive apparatus, a second circuit including said second contact element in the closed condition for supplying current of the opposite polarity from said source through said second asymmetric unit in the first direction to said polarity responsive apparatus, a condenser, a third circuit including said first asymmetric unit in the first direction and including said first and fourth contact elements in the closed condition for charging said condenser, a fourth circuit including said condenser and said fourth contact element in the closed condition and also including said polarity responsive apparatus, a fifth circuit including said second asymmetric unit in the first direction and including said second and third contact elements in the closed condition for charging said condenser, and a sixth circuit including said condenser and said third contact element in the closed condition and also including said polarity responsive apparatus.

10. In combination, polarity responsive apparatus, a source of alternating current, two asymmetric units, means for at times supplying current of one polarity to said apparatus from said source through one of said units and for at other times supplying current of the other polarity to said apparatus from said source through the other of said units, and circuit means closed when current of either polarity is being supplied to said apparatus from said source through either of said units to shunt away from said apparatus current which might otherwise be supplied to the apparatus through such unit in its high resistance direction but said circuit means open when current of the opposite polarity is being supplied to said apparatus from said source.

ARTHUR E. DODD.