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TELEGRAPH REPEATER

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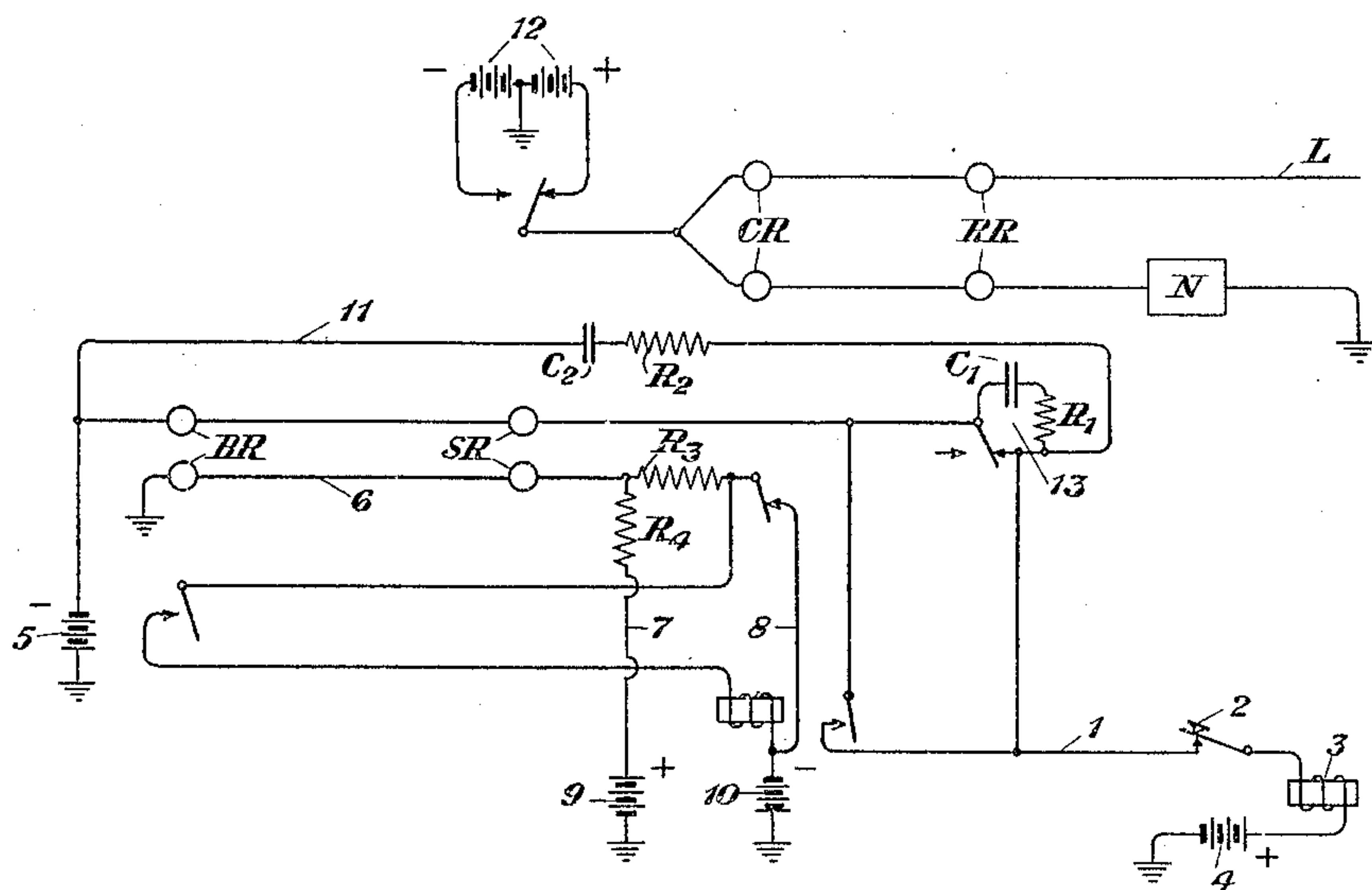


Fig. 1

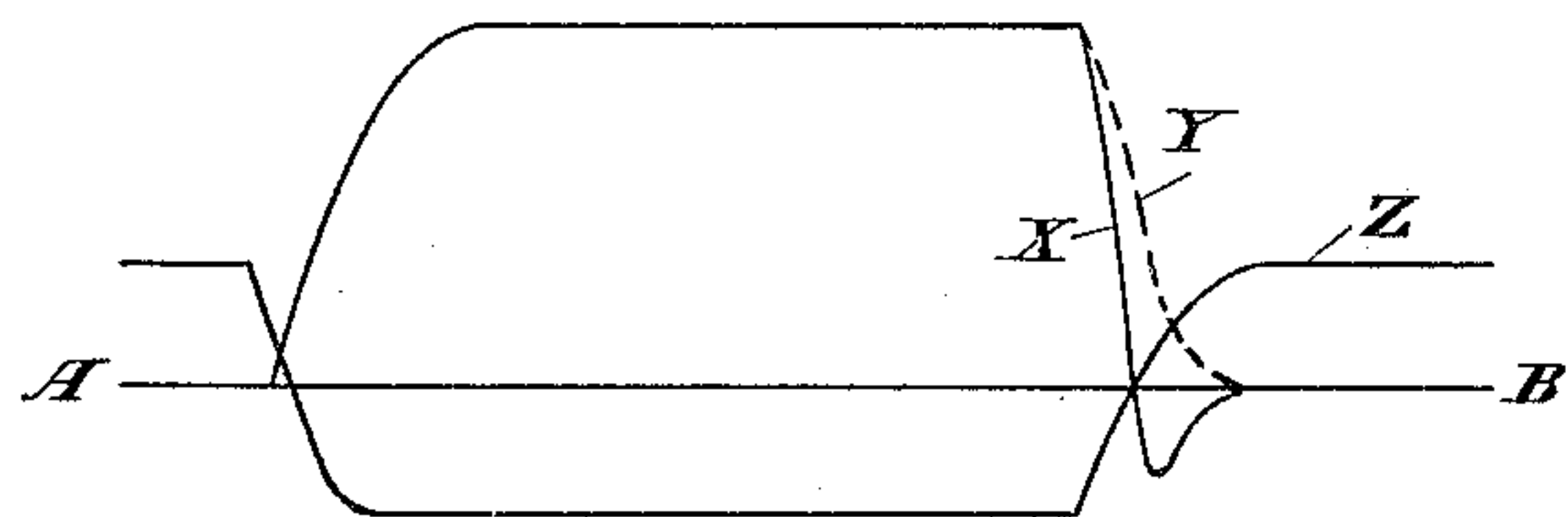


Fig. 2

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TELEGRAPH REPEATER

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This invention relates to telegraph systems and more particularly to improved arrangements for eliminating certain transient interfering currents in the loop circuits of repeaters utilized with such systems and thus preventing false operation of relay means therein.

The arrangements of the invention are particularly applicable to the loop circuits of differential duplex open wire repeater sets and may be utilized to prevent false operation of the sending relays of such sets. It has been found in practice that with the "open and closed" loop circuit of this type, which has a spark killer across the contacts of the receiving line relay, there is under certain conditions an oscillation effect in the loop circuit due to the resonating effect of the inductance of the subscriber's relays and the capacity in the spark killer. Under this condition, it is difficult to prevent the sending relays from "kicking off" when telegraph signals are being received from the line, due to the fact that this oscillation causes the current through the loop winding of the sending relay to reverse before the current through the holding winding of the relay builds up. In accordance with the arrangements of this invention, the connections of the spark killer are changed so that it will include the loop winding of the sending relay as well as the contacts of the receiving relay. Under such conditions the oscillation effect, if present, will not occur through the sending relay winding and there will be no tendency for the relay to kick off. Other objects and features of the invention may be more fully understood from the detailed description of its operation hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1 and 2 of which the invention is illustrated. Fig. 1 is a circuit diagram showing a telegraph repeater set illustrating the arrangements of the invention. In Fig. 2 is a diagram showing curves illustrating the current flow in the loop and holding circuits under different conditions.

In Fig. 1 is shown a differential duplex open wire repeater set comprising the open wire line L which will include the differentially arranged windings of a control relay CR and a receiving relay RR. A balancing artificial line N will also be provided. The armature of a sending relay SR will connect currents of opposite polarity from battery 12 to the apex of line L and the artificial line circuit for sending purposes. The loop circuit 1 will include a winding of break relay BR, a winding of sending relay SR, contacts of receiving relay RR, a key 2, a sounder 3 and a battery 4. A holding or biasing circuit 6 is also provided. This holding circuit 6 will include a winding of break relay BR and a winding of sending relay SR. The holding circuit may be completed through resistance R_3 , contact of control relay CR, conductor 8 to battery 10. The holding circuit may also be completed through resistance R_4 , conductor 7 to battery 9. Resistance R_4 is larger than resistance R_3 and hence when the contact of control relay CR is closed, the holding circuit will normally be completed to battery 10. When the loop circuit is closed, current may flow through the winding of the sending relay SR in a direction from right to left and for purposes of illustration, may be assumed to be of 60 mils. At the same time current in holding circuit 6 will flow through the other winding of the sending relay in the reverse direction or from left to right due to the polarity of battery 10, and the fact that the circuit will be completed through the small resistance R_3 . The stronger current through the loop winding of the sending relay will prevail and tend to hold its armature on its marking contact. When signals are being received over line L, the receiving relay RR may open loop circuit 1 at its contacts. The control relay CR would at the same time open one path of the holding circuit 6. The opening of loop 1 will eventually reduce the current therein to zero. The operation of control relay CR would allow the holding circuit 6 to be completed through the resistance R_4 , conductor 7, and battery 9. Due to the

polarity of battery 9 the current will flow through the winding of the sending relay from right to left and accordingly will maintain its armature on the marking contact. However, it has been found in practice with a spark killer connected across the contacts of the receiving relay RR (and with the circuit 11 omitted), that there would be an oscillation effect in the loop circuit, when opened, due to the inductance of the subscriber's relays, such as sounder 3, and the capacity in the spark killer. Accordingly, the current through the loop winding of the sending relay with considerable inductance in the loop would be as shown by curve X of Fig. 2. It will be seen that this current at the time the loop is opened may reverse to a considerable extent as shown by the portion thereof below line AB. At the same time the holding current through the holding of the sending relay SR would be as shown by curve Z. Accordingly, it will be seen that at the time the loop circuit is opened, the net effect on the sending relay may be in the reverse direction for an interval sufficiently long to cause the armature of the sending relay to leave the marking contact, or in other words, to "kick-off" and disturb the transmission.

In accordance with the arrangements of the invention the constants of spark killer 13 will be made so that the capacity C_1 is very small and resistance R_1 moderately large. An additional spark killer circuit 11 including capacity C_2 and resistance R_2 is provided which will include the loop winding of the sending relay SR and the contacts of the receiving relay. With such an arrangement, it has been found that upon the opening of the loop circuit, the current will be as shown by curve Y of Fig. 2. With this arrangement, it will be seen that the net effect of the current on the sending relay will at all times, be in the same direction and the tendency for the armature of the relay to "kick-off" or leave the marking contact will be eliminated.

While the invention has been disclosed in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A differential duplex open-wire telegraph repeater comprising a loop circuit including an operating winding of a sending relay and the contacts of a receiving relay, a holding circuit including another winding of said sending relay, and means to insure the net effect on the sending relay of the currents in both said circuits to be at all times in the same direction when signals are being received, said means compris-

ing a spark killer including the contacts of said receiving relay and the operating winding of said sending relay.

2. A differential duplex open-wire telegraph repeater comprising a loop circuit including an operating winding of a sending relay and the contacts of a receiving relay, a spark killer across the contacts of the receiving relay having its constants adjusted so that the capacity will be small and the resistance large, and another spark killer including the contacts of said receiving relay and the operating winding of said sending relay.

In testimony whereof, I have signed my name to this specification this 17th day of November 1927.

DAVID E. BRANSON.

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