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TELEGRAPH REPEATER

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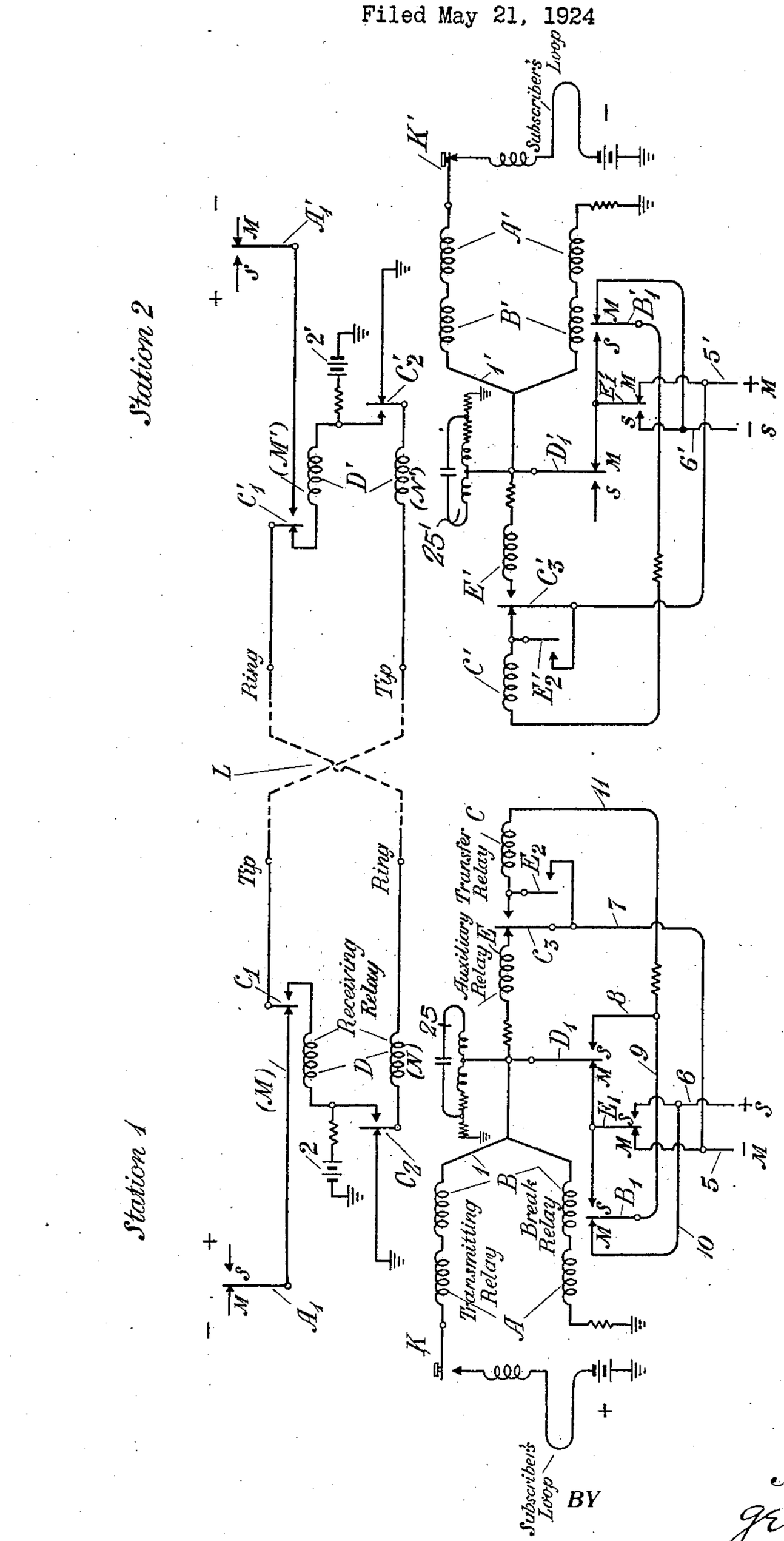

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TELEGRAPH REPEATER.

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This invention relates to improvements in metallic telegraph circuits and more particularly to improvements in the repeater sets utilized in such systems.

It is often desirable in telegraph systems for an operator to interrupt another operator sending at a distant station and thus get control of the line. This operation is known as "breaking". One of the objects of this invention is to provide improved forms of breaking arrangements. In accomplishing this in the arrangements of the invention, the two wires of the metallic circuit are utilized to form two one-way telegraph channels during the transmission of the break signal. Another feature of the invention consists in providing vibrating circuit windings for the various line relays so as to cause these relays to vibrate should the line be momentarily opened. This operates to prevent the locking up of the system due to accidental operation of the break relays. Another feature of the invention consists in the fact that with these arrangements no artificial line is needed and the usual adjustments for line balance may be obviated. Other features and objects of the invention will appear more fully from the detailed description hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing, in the figure of which the invention is illustrated.

In the figure are shown two stations at which are located terminal telegraph repeaters interconnected by the metallic circuit L. The repeater set at station 1 comprises a loop circuit 1 including a key K, a battery, a subscriber's loop, and windings of a transmitting relay A and a break relay B. The transmitting relay A controls its armature A_1 which has marking and spacing contacts whereby impulses of opposite polarity may be applied to the tip conductor of line L. The break relay B controls its armature B_1 which co-operates with marking and spacing contacts which are normally connected by conductors 5 and 6 to sources of opposite polarity. A receiving relay D is provided which has a plurality of windings. The winding N is serially included in the ring side of the line and the winding M is adapted to be connected across the line conductors. A battery 2 and a suitable resistance are connected to the midpoint of these windings. The receiving relay D controls its armature D_1. An auxiliary relay E is provided as shown which controls the armatures E_1 and E_2 and their associated contacts. A transfer relay C is also provided. This relay controls the armatures C_1, C_2 and C_3 and their associated contacts. The apparatus at station 2 is substantially similar to that at station 1 except that the armature of the transmitting relay is connected to the ring side of the line. Similar reference characters with the added designation prime have been utilized to denote like parts at both stations.

The arrangements of the invention operate in the following manner. Assume that station 1 is sending. In this case the armature A_1 of the transmittting relay A is connected to the tip side of line L. Signals from the transmitting relay A at station 1 will be sent out to station 2 along the tip conductor. At station 2 the windings M′ and N′ of the receiving relay D′ are connected directly across the two line wires as shown and the relay will be operated by the incoming signals. A battery 2′ in series with a suitable resistance is connected to the midpoint of these windings of the receiving relay D′ and causes a longitudinal current to flow along the two line wires to station 1. This current flows through the winding N of the receiving relay D to ground and is of such a nature that it will hold said relay on its marking contact, thereby permitting the operator in the local loop circuit 1 to continue to send. Under these conditions the auxiliary relay E and the transfer relay C at station 1 are both deenergized. Relay C is open circuited at the contacts associated with armatures E_2 and C_3 and relay E has the same battery polarity connected to both ends of its winding as long as the armature D_1 of the receiving relay remains on its marking contact.

If the operator at station 2 wishes to interrupt or break the operator at station 1, he opens his key K′ which causes the following sequence of operations to take place. Relays A′ and B′ cause their armatures A'_1 and B'_1 to move to their spacing contacts. This operation of armature B'_1 will connect negative or marking battery to both ends of the winding of relay C′ and cause it to become deenergized. The deenergization of relay C′ disconnects the battery 2′ at the

middle of the windings of relay D′ from the line and connects spacing battery from the armature A'_1 to the ring conductor of the line. This spacing battery is of an opposite potential to the potential applied to the ring conductor by battery 2′ and hence will flow through winding N of relay D at station 1 and cause relay D to operate its armature D_1 to its spacing contact. This will interrupt the operator at station 1 for it causes positive or spacing battery to be applied to both ends of the loop circuit upon the closure of key K. The operation of armature D_1 to its spacing contact will close the following circuit: from marking battery, conductors 5 and 7, armature C_3 and its left-hand contact, winding of relay E, armature D_1, conductors 8 and 9, armature B_1, conductors 10 and 6, to spacing battery. This will operate relay E which will cause the armature E_1 to move to its spacing contact and thus put spacing battery on both contacts of the receiving relay and will cause the armature E_2 to close its contact. This latter operation will close the following circuit: from marking battery, conductors 5 and 7, contact and armature E_2, winding of relay C, conductors 11 and 9, armature B_1, conductors 10 and 6 to spacing battery. This will operate the relay C which will operate its armature C_3 to close a locking circuit for itself and to open the previously traced circuit for relay E. This will deenergize relay E which will release its armature E_1 and restore the batteries on the receiving relay contacts to normal. Upon the operation of relay C the armatures C_1 and C_2 will operate and disconnect the transmitting branch of the repeater set from the line and connect the windings M and N of the receiving relay D across the line conductors. The holding battery 2 connected to the midpoint of these windings will cause a current to flow over the tip conductor and through the winding N′ to ground at station 2. This current will be such that it will cause the armature D'_1 of the receiving relay D′ and station 2 to remain on its marking contact.

If the interrupted operator at station 1 keeps his key K closed, the operator at station 2 can begin to send for relay C will remain operated as long as the armature B_1 of the break relay remains on its marking contact. Should the operator at station 1 now open his key, the break relay will cause its armature B_1 to move to spacing and cause relay C to release. This will transmit a break signal back to the operator at station 2 in a similar manner to that already described.

It is pointed out that the vibrating circuits 25 and 25′ of a well-known type are connected to the receiving relays D and D′ of both sets. This arrangement prevents the locking up of the system due to the accidental operation of a break relay. Such operation, which may be due to accidental opening of the line at the switchboard or the introduction of foreign currents upon the line wires, connects a receiving relay winding across each end of the line. Under this condition the line current is zero and the circuit would be locked up if both receiving relays should happen to remain on spacing. This latter condition is prevented by the provision of the vibrating circuits which, under such conditions, would cause both receiving relays to vibrate until the key is opened at either end of the line, after which the circuit is again in normal operating condition. The same condition may occur when the line is opened. In that case, however, the relays will continue to vibrate until the circuit is restored.

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 other widely varied forms without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A metallic telegraph circuit interconnecting two stations, repeater sets at each of said stations, receiving relays at each of said sets, each of said relays having two windings, the relay at one station having a winding adapted to be connected across said telegraph circuit and another winding adapted to be included serially in the ring conductor of the circuit, the relay at the other station having a winding adapted to be connected across said telegraph circuit and another winding adapted to be included serially in the tip conductor of the circuit, means controlled from one station over the tip conductor of the circuit for controlling the association with the circuit of the relay windings at the distant station therefrom, and means controlled from the other station over the ring conductor of the circuit for controlling the association with the circuit of the relay windings at the distant station therefrom.

2. A metallic telegraph circuit comprising tip and ring conductors for interconnecting two stations, repeater sets at each of said stations, each of said repeater sets including transmitting and receiving apparatus, means at each of said repeater sets for controlling the association of said transmitting and receiving apparatus with said telegraph circuit, and means for controlling one of said last mentioned means from a distant station over the tip conductor of the circuit and for controlling the other of said last mentioned means from the other station over the ring conductor of said circuit.

3. A metallic telegraph circuit comprising tip and ring conductors for interconnecting two stations, repeater sets at each of said sta-

tions, means at one of said sets for transmitting a break signal to the other set over the tip conductor of said circuit, and means at the other set for transmitting a break signal to said first mentioned set over the ring conductor of said circuit.

4. A metallic telegraph circuit interconnecting two stations, a receiving relay at one station having two windings, said receiving relay being so associated with the circuit that when signals are being transmittel from said station one of said windings will be disconnected from said circuit and the other winding will be included serially in one of the line conductors, means at the other station for transmitting a signal over said line conductor and through said last mentioned winding to operate said relay, an auxiliary relay controlled by the operation of said receiving relay, a transfer relay controlled by the operation of said auxiliary relay, and means controlled by said transfer relay for connecting both of said receiving relay windings across said telegraph circuit.

5. A metallic telegraph circuit interconnecting two stations, a receiving relay at one station having two windings, said receiving relay being so associated with the circuit that when signals are being transmitted from said station one of said windings will be disconnected from said circuit and the other winding will be included serially in one of the line conductors, means at the other station for transmitting a signal over said line conductor and through said last mentioned winding to operate said relay, an auxiliary relay controlled by the operation of said receiving relay, a transfer relay for connecting both of said receiving relay windings across said telegraph circuit, and a break relay for controlling said transfer relay.

6. A metallic telegraph circuit interconnecting two stations, receiving relays at each of said stations, said relays each having two windings, the first winding of each relay being included serially in different ones of the line conductors of said circuit and the second winding of each relay being adapted to be disconnected from said circuit or to be connected across said circuit with the first winding, and holding batteries connected to the midpoint of the windings of each relay, and operating through the first mentioned windings of the relay at the distant station to maintain said relay in a predetermined position.

7. A metallic telegraph circuit interconnecting two stations, receiving relays at each of said stations, said relays each having two windings, the first winding of each relay being included serially in different ones of the line conductors of said circuit and the second winding of each relay being adapted to be disconnected from said circuit or to be connected across said circuit with the first winding, holding batteries connected to the midpoint of the windings of each relay and operating through the first mentioned windings of the relay at the distant station to maintain said relay in a predetermined position, and vibrating circuit windings associated with each of said receiving relays.

In testimony whereof, I have signed my name to this specification this 19th day of May, 1924.

JOSEPH HERMAN.