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TELEGRAPH SYSTEM

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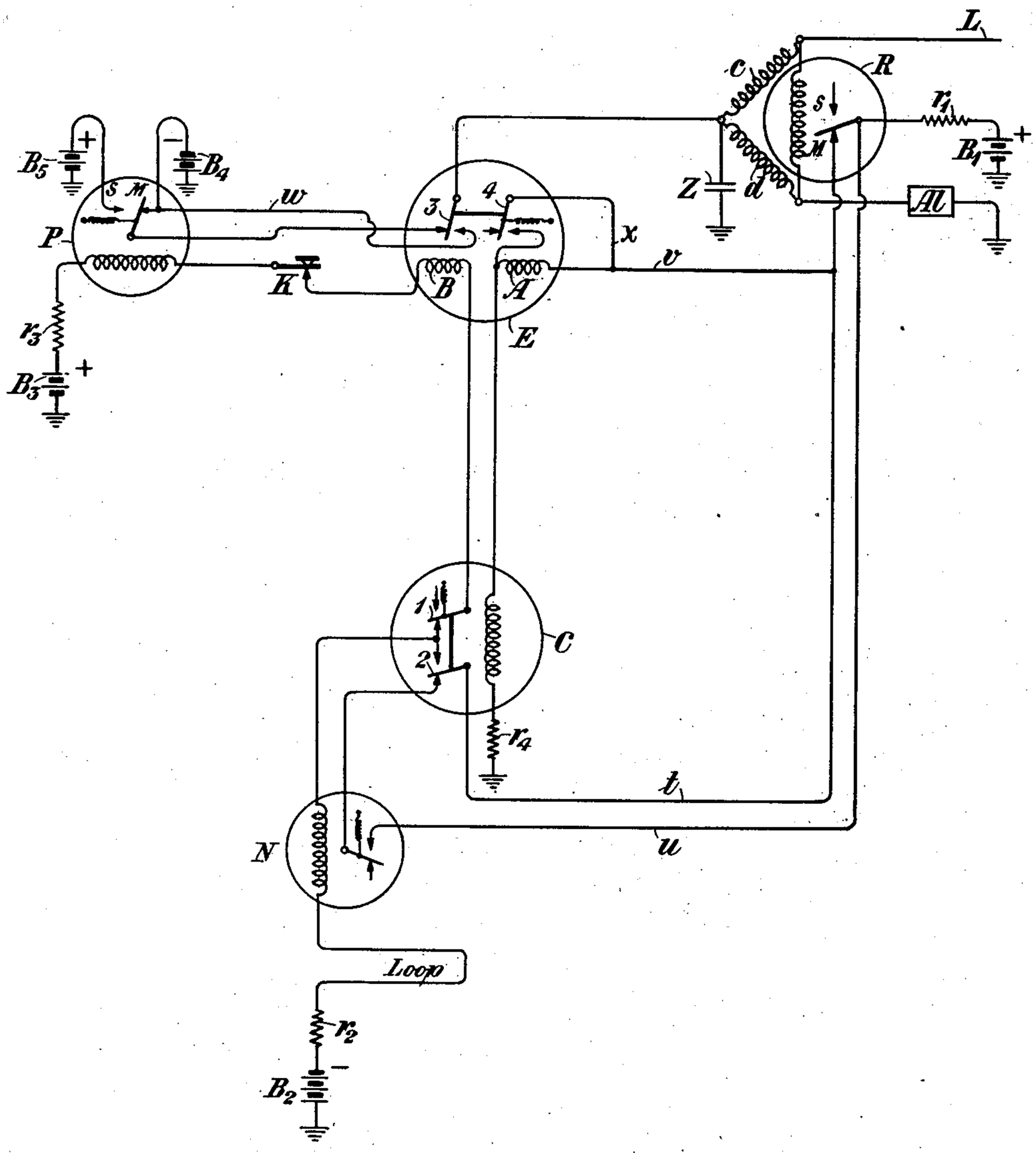

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TELEGRAPH SYSTEM.

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This invention relates to telegraph systems, and particularly to half-duplex telegraph systems.

In the former arrangements of half-duplex systems, a plurality of auxiliary circuits are used to connect up the main branches of the system which consist of the receiving polar relay circuit and the pole changing relay circuit for half-duplex operation. By the arrangements of this invention means are provided in the local circuits of repeaters to permit half-duplex operation without entailing the use of the auxiliary circuits of the former arrangements. The operating features are substantially the same as in the former arrangements, while the operating charges are greatly reduced, due to the elimination of the current drain in the auxiliary circuits.

The arrangements of this invention may be applied to radio, carrier systems, and direct current grounded telegraph systems. For the purpose of illustration, however, this invention has been applied to a bridge polar duplex system.

The novel features which are characteristic of the invention are set forth in the appended claims. The invention itself, however, both as to its organization and method of operation, will be best understood by reference to the following description taken in connection with the accompanying drawing in which is indicated diagrammatically one way in which the invention may be carried into effect.

In describing the operation of the illustrated system, let it be assumed that the main line conductor L connects the terminal station represented in the diagram with another station at the distant end of said line. Opening and closing of the key K causes an opening and closing of the loop circuit consisting of grounded battery B_3, resistance r_3, the winding of the pole changer P, key K, the winding B of the neutral, non-polarized relay E, the armature 1 of the control relay C, the winding of the repeating sounder N, the loop, the resistance r_2 and battery B_2. Current through winding B of the neutral, non-polarized relay E will, of itself, be sufficient to hold the armatures 3 and 4 of said relay in their closed positions. The armatures 3 and 4, as well as the armatures 1 and 2 of the control relay C, move synchronously, being connected by a link of insulation. If the armatures of relay E are held in their closed positions, the opening and closing of the circuit just described will move the armature of the pole changer P between the spacing and marking contacts S and M to alternately connect the spacing battery B_5 and the marking battery B_4 to the apex of windings *c* and *d*. Current from batteries B_5 or B_4 accordingly divides, one portion traversing winding *d* and an artificial line A^1 to ground, while a like portion traverses winding *c* and the line L. As is well understood in the art, no difference of potential is set up by this current at the points on the line L and the artificial line A^1 at which the winding of the receiving relay R is connected. Therefore, these outgoing currents are non-effective in this relay.

When the armature of the receiving relay R moves between its fixed contacts S and M, as would be the case during the reception of marking and spacing signals over line L from the distant station, a receiving circuit is controlled by said armature consisting of grounded battery B_1, resistance r_1, the armature of relay R, conductor *v*, winding A of relay E, the winding of control relay C and resistance r_4. When the armatures of relay E are in their open positions, conductor *x* will short-circuit winding A in the circuit just described. As the circuit that includes the winding of control relay C is made and broken, the armatures of relay C are alternately moved from their closed to their open positions, producing signals in the repeating sounder N, said sounder being used for monitoring purposes.

The arrangements of this invention operate in the following manner: To send signals over line L, the key K, which is in series with the loop, is operated. For a marking signal, key K is depressed, and the armature of the pole changer P connects marking battery B_4 through armature 3 of relay E to the line L; and for a spacing signal, the spacing battery B_5 is connected to the line L. During the time that signals are being transmitted over line L, the armatures of relay E are held in their closed positions, because current is flowing through winding A in the circuit from battery B_1, resistance r_1, the armature of the receiving relay R, the winding A of relay E, the winding of control relay C and resistance r_4. Winding B is poled so as to assist winding A in holding

the armatures of relay E closed when current flows through said winding, and the armatures of relay E are thereby held in their closed positions during the transmission of signals over line L.

When receiving signals from the station at the distant end of line L, the operator keeps key K closed. When a spacing signal comes over line L, the armature of relay R moves to its spacing contact S. The circuit, extending from battery B_1, is opened, and no current flows through the winding of control relay C, and therefore the armatures of said relay are moved to their open positions. The circuit in series with the loop is therefore opened at armature 1, and the pole changer P is de-energized so that its armature moves to its spacing contact. The circuits through both windings A and B of relay E are thus opened, the one at the armature of receiving relay R and the other at armature 1 of relay C. Hence, the armatures of relay E are released. Armature 3 of relay E connects the marking battery B_4 to line L through the conductor *w*, so that the marking polarity at the pole changer P is not interrupted, except during the time it takes the armature 3 of relay E to reach its open position. During this armature travel time the condenser Z discharges and minimizes the effect upon the signals produced by the momentary opening of the circuit just mentioned. Armature 4 of relay E connects conductor *x* so as to short-circuit winding A for a purpose which will appear hereinafter.

When a marking signal arrives at the station, the armature of the receiving relay R closes, and the control relay C operates due to current from battery B_1. Consequently, the circuit in series with the loop is closed. Current through the winding of the pole changer P will move the armature to the marking contact M. Up to this time winding A of relay E has been short-circuited due to the parallel path through conductor *x*, and the armature 4 of relay E. However, relay E will now operate due to the flow of current through the winding B. The purpose of short-circuiting winding A is to delay the operation of relay E until after the control relay C and the pole changer P have operated. If relay E operated before the pole changer P, there would be a short period of time during which a spacing impulse would be transmitted to line L.

If, when the operator at the station is transmitting and the distant operator attempts to break, the key K is open, the incoming breaking signal will move the armature of the receiving relay R to its spacing contact S but will not open up the circuit including the winding of the control relay C and battery B_1. This is accomplished by providing parallel paths from battery B_1 to the winding of the control relay C, one path through the armature of relay R to conductor *v*, and the other through conductor *u*, the armature of the sounder N, armature 2 of the control relay C, conductor *t* to conductor *v*. Consequently, when the armature of relay R is opened due to a breaking signal, if the loop circuit is open at key K, the sounder N will be released, and the winding of the control relay C will still receive current from battery B_1 due to the parallel path established by conductors *u* and *t*, as just explained. But just as soon as key K is closed the sounder N will be re-energized, opening the parallel path through relay C, so the relay C releases its armature and opens the loop circuit. Consequently, the operator will realize that a breaking signal is being transmitted as the further opening and closing of the key K is ineffective to transmit signals.

Although one embodiment of the invention has been described, it is to be understood that the invention is not limited to any specific construction but might be embodied in various systems without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In a telegraph system, in combination, a main line, an artificial line, a sending leg, a receiving leg, a subscriber's loop, a relay interlocking said sending and receiving legs and said subscriber's loop, said relay having two armatures and two windings, one winding being serially arranged in said sending leg and the other winding being serially arranged in said receiving leg, one armature shunting a winding of said relay serially arranged in said receiving leg and the other armature connecting batteries of opposite polarity to the main line, a control relay having two armatures, one armature controlling the sending leg and the other armature also shunting the winding of the interlocking relay serially arranged in said receiving leg, and a repeating sounder actuated by signals both transmitted and received.

2. A telegraph system comprising a main line, an artificial line, a polar relay responsive to incoming and non-responsive to outgoing signals in said main line, a pole changing relay alternately connecting oppositely poled batteries to said main line, a loop, a key controlling the sending circuit, a neutral non-polarized relay having two windings and two armatures, said windings being serially arranged in the sending and receiving circuits respectively, said armatures being moved synchronously, one of said armatures short-circuiting one winding of said relay in the receiving circuit, the other armature connecting the armature of the pole changing relay with the main line,

a control relay having its winding serially arranged in the receiving circuit, one armature of the control relay controlling the sending circuit, the other armature of the control relay moving synchronously therewith and forming a path so as to short-circuit the armature of the polar relay, and a repeating sounder operated by incoming and outgoing signals.

3. A telegraph system comprising a main line, an artificial line, a receiving relay actuated by signals from the distant station and controlling the receiving circuit of said main line, a pole changing relay alternately connecting oppositely poled batteries to said main line, a key controlling the sending circuit, a loop, a neutral, non-polarized relay having two windings, one of said windings being serially arranged in said sending circuit and the other serially arranged in said receiving circuit, a control relay having the winding thereof serially arranged in said receiving circuit, one armature controlling the sending circuit, and the other moving synchronously therewith and forming a path so as to short-circuit the armature of said receiving relay, and a repeating sounder actuated by signals both transmitted and received.

4. A telegraph system comprising a main line, an artificial line, a polar relay responsive to incoming and non-responsive to outgoing signals in said main line, a pole changing relay, the armature of said relay alternately connecting to said main line batteries of equal potential and opposite polarity, a loop, a key operating the sending circuit, a neutral non-polarized relay having two windings and two synchronously moving armatures, one of the windings being serially arranged in the sending circuit and the other winding being serially arranged in the receiving circuit, one of the armatures short-circuiting the winding of the neutral non-polarized relay serially arranged in the receiving circuit, the other armature connecting the armature of the pole changing relay to the main line, a control relay having two synchronously moving armatures, one armature controlling the sending circuit, the other armature forming a path so as to short-circuit the armature of the polar relay, and a grounded condenser connected to the main line.

In testimony whereof, I have signed my name to this specification this 7th day of October, 1924.

SAMUEL I. CORY.