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SELECTIVE TELEGRAPH SYSTEM

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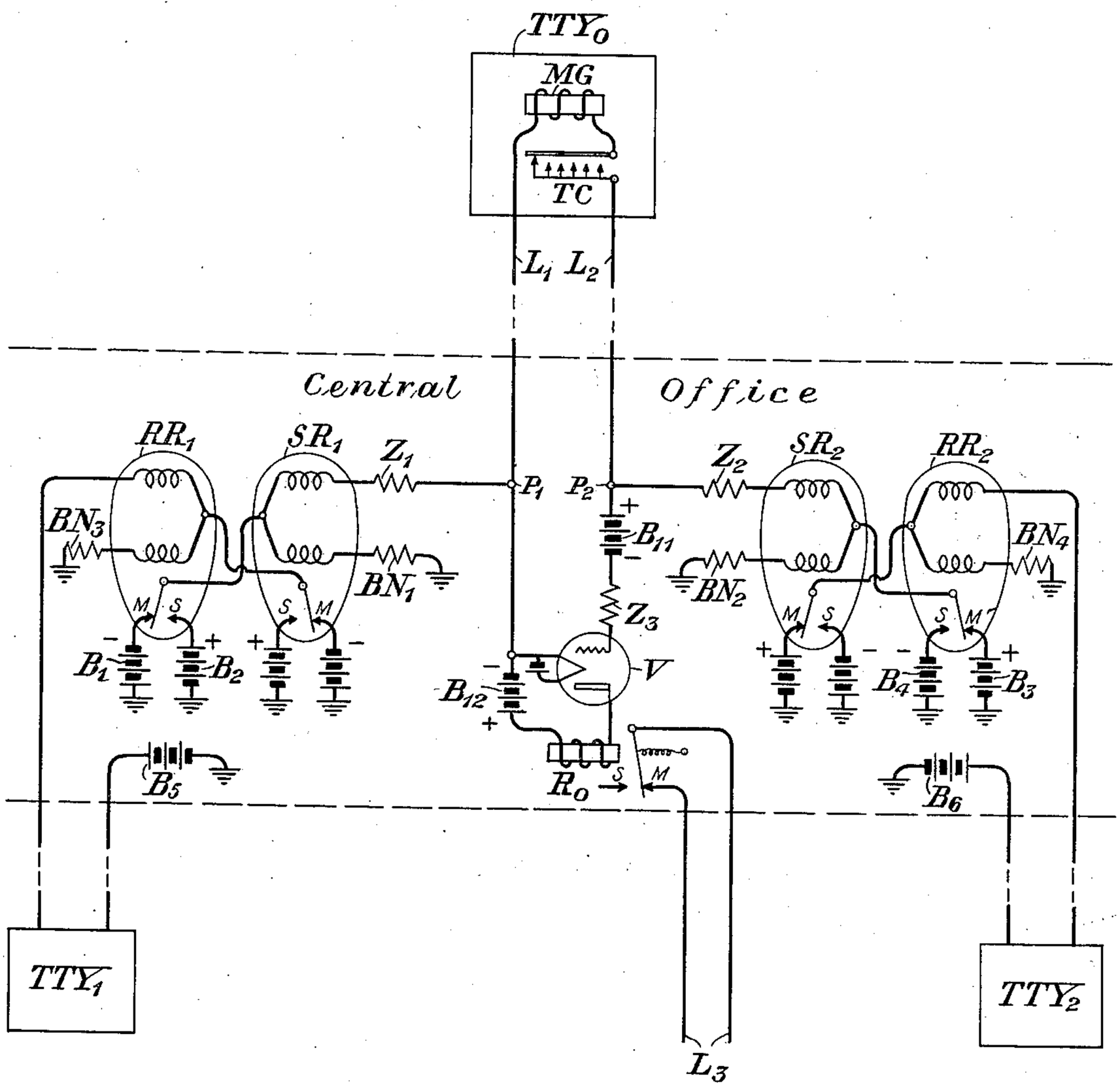

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SELECTIVE TELEGRAPH SYSTEM

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This invention relates to telegraph and teletypewriter systems. This invention also relates to repeaters for telegraph and teletypewriter systems. Moreover, this invention relates to telegraph and teletypewriter systems arranged for the selective transmission of signals.

In telegraph systems in which repeaters are employed to interconnect two main stations it is sometimes necessary to connect a telegraph loop of the usual type at an intermediate point in the circuit between the loop terminals of the repeaters at that point so that all of the signals transmitted between the two main stations through the repeaters will also be received in the loop circuit and all signals emanating from the loop circuit will be transmitted through the repeaters to the two main stations. It is sometimes necessary to receive all signals emanating from the loop circuit to the exclusion of all signals transmitted between the two main stations through the repeaters. A simple arrangement to permit the reception of signals emanating from the loop circuit is the subject of the present invention, and the arrangement is intended to be non-responsive to all signals transmitted in either direction between the two main stations.

According to the present invention the loop circuit connected between two telegraph repeaters is bridged by a circuit including a vacuum tube, the grid and cathode of which are connected across the telegraph loop circuit in series with a source of biasing voltage of suitable magnitude. The plate circuit of the vacuum tube is connected through the operating winding of a relay of, for example, the neutral type. The arrangement is set up so that as signals are transmitted through the repeaters from either of the two main stations, these signals will be received by the telegraph loop circuit, but the voltage across the grid and cathode of the tube will be insufficient to permit a flow of current in the plate circuit of the vacuum tube. However, when signals are emanating from the loop circuit they will not only be transmitted to the two main stations above referred to, but those signals will produce voltages across the grid and cathode of the vacuum tube sufficient to overcome the biasing voltage, thus permitting current to flow in the plate circuit of the vacuum tube. These signals will then be reproduced in the plate circuit of the vacuum tube, thus causing the neutral relay to follow the telegraph signals. These signals may be repeated over any form of circuit. The circuit controlled by the polar relay is thus selectively responsive only to the signals arriving from the loop circuit.

This invention will be better understood from the more detailed description hereinafter following when read in connection with the accompanying drawing showing one embodiment of the invention merely for the purpose of illustration.

Referring to the drawing, central office telegraph repeaters are shown which include two equal sending relays SR_1 and SR_2 and two equal receiving relays RR_1 and RR_2. The sending relays SR_1 and SR_2 include two windings, the upper or main windings of which are connected to a telegraph loop L_1—L_2 through resistors Z_1 and Z_2, respectively. The lower windings of relays SR_1 and SR_2 are connected to ground through the usual balancing networks BN_1 and BN_2, respectively, which are of well-known type. The apex of the windings of the relays SR_1 and SR_2 are connected to the armatures of relays RR_1 and RR_2, respectively. The armatures of relays SR_1 and SR_2 are connected to the apexes of relays RR_1 and RR_2 respectively. The lower winding of relays RR_1 and RR_2 are connected through the balancing networks BN_3 and BN_4 to ground in the usual manner. The armature of relay RR_1 may be caused to move between its marking and spacing contacts M and S to connect oppositely poled batteries B_1 and B_2 to the apex of the windings of relay SR_1. Similarly the armature of relay RR_2 may be caused to move between its marking and spacing contacts M and S to connect oppositely poled batteries B_3 and B_4 to the apex of the windings of relay SR_2.

The upper or main winding of relay RR_1 is connected in series with the teletypewriter TTY_1 and the battery B_5 and the upper or main winding of relay RR_2 is connected in series with the teletypewriter TTY_2 and the battery B_5. The telegraph loop circuit L_1—L_2 may include a teletypewriter TTY_0 which may be the same as teletypewriters TTY_1 and TTY_2, including, for example, a magnet MG for recording all signals traversing the loop circuit L_1—L_2 in a well-known manner and a contact apparatus TC for transmitting signals in a well-known manner from the teletypewriter TTY_0 through the two branches of the telegraph repeater to the main stations having the teletypewriters TTY_1 and TTY_2.

The circuit so far described is of well-known type. The present invention resides in connecting across the points P_1—P_2 a vacuum tube system for receiving signals coming from the loop

circuit teletypewriter TTY_0, said receiving circuit being non-responsive to all signals transmitted between the main stations having teletypewriters TTY_1 and TTY_2. The receiving circuit will constitute a one-way repeater for repeating signals from the loop L_1—L_2 to the exclusion of all other signals.

The vacuum tube V may be of the three-electrode type, as shown, with its grid and cathode electrodes connected to the points P_1 and P_2 of the telegraph repeater. The circuit between point P_2 and the grid of tube V includes a bias battery B_{11} and a resistor Z_3 arranged in series relationship, the battery B_{11} being poled so that the negative terminal thereof is connected to the grid electrode. The plate circuit of the tube V includes the usual plate battery B_{12} and the winding of a neutral relay R_0 arranged in series relationship, the armature of the relay R_0 being connected to a telegraph circuit L_3 which will receive signals that actuate the winding of relay R_0.

In the idle condition of the system the armatures of relays RR_1 and RR_2 are connected to their marking contacts M so that a substantial current will flow through the upper or main windings of relays SR_1 and SR_2, this circuit including battery B_1, the marking contact M and armature of relay RR_1, the upper winding of relay SR_1, resistor Z_1, loop conductor L_1, the teletypewriter TTY_0, loop conductor L_2, resistor Z_2, the upper winding of relay SR_2, the armature and marking contact M of relay RR_2, battery B_3 and ground. The armature of relay R_0 may be biased by a spring to its marking contact M as shown.

Marking and spacing signals coming from teletypewriter TTY_1 will cause current to flow alternately through the upper winding of relay RR_1. As the armature of relay RR_1 moves between its marking and spacing contacts M and S in response to these signals, it will connect oppositely poled batteries to the circuit of the upper or main windings of relays SR_1 and SR_2 and to the teletypewriter TTY_0 above described. Inasmuch as these signals are received by the magnet MG of the teletypewriter TTY_0, they will be printed by the teletypewriter TTY_0 in the usual manner. As these currents traverse the upper winding of relay SR_2, they will cause the armature of relay SR_2 to move between its marking and spacing contacts M and S so as to repeat the signals to the teletypewriter TTY_2. Similarly marking and spacing signals coming from teletypewriter TTY_2 will be transmitted to the teletypewriter TTY_0 connected to the loop L_1—L_2 and to the teletypewriter TTY_1.

It will be observed that the circuit interconnecting the upper or main windings of relays SR_1 and SR_2 above described includes two impedances Z_1 and Z_2 each of which may be, for example, of 1,500 ohms, and the loop circuit L_1—L_2 which may be, for example, of 1,000 ohms. These are the primary impedances included in this circuit, all other impedances being of relatively insignificant magnitudes. It will also be observed that the voltage between points P_1 and P_2 of this circuit will vary from a zero magnitude to a magnitude which is equal to the sum of the voltages of two of the batteries B_1 to B_4, as will now be explained.

The voltage across points P_1 and P_2 will be of zero magnitude when a spacing signal is being transmitted from one of the teletypewriters such as TTY_1 through the repeaters to the teletypewriter TTY_2, in which case the batteries B_2 and B_3—which are of equal potential and of the same polarity—are connected to the points P_1 and P_2 and to the circuit of the main windings of relays SR_1 and SR_2. The voltage across points P_1 and P_2 will be of a large magnitude when the circuit is idle or when a marking signal is being transmitted from, for example, teletypewriter TTY_1 through the repeaters to the teletypewriter TTY_2. Of course, the voltage at points P_1 and P_2 will be equal to the voltage across the loop L_1—L_2. If the voltages of batteries B_1 to B_4 are all 130 volts each, for example, then the voltage between points P_1 and P_2 due to signaling between teletypewriters TTY_1 and TTY_2 will vary from zero to approximately 65 volts. The potential at point P_2 will be positive with respect to the potential at point P_1. The voltage between points P_1 and P_2 due to the transmission of signals between the teletypewriters TTY_1 and TTY_2 will be insufficient to overcome the biasing voltage of battery B_{11}, which may be, for example, of 100 volts. Hence substantially no current will flow through the plate circuit of tube V and, therefore, the neutral relay R_0 will remain unoperated. In other words, no signals will be transmitted to circuit L_3 when signals are transmitted between teletypewriters TTY_1 and TTY_2 through the repeaters.

It has just been shown that the neutral relay R_0 will be non-responsive to signals transmitted between the teletypewriters TTY_1 and TTY_2 through the repeaters. A different situation exists when teletypewriter TTY_0 is transmitting signals over its loop L_1—L_2 and through the repeaters to the teletypewriters TTY_1 and TTY_2. These signals will actuate the relay R_0 to repeat these signals to the circuit L_3 where they may be recorded in any well-known manner, as will now be described.

When a spacing signal is being transmitted from teletypewriter TTY_0 through the repeaters to the teletypewriters TTY_1 and TTY_2, the transmitting contacts TC of the teletypewriter will be opened in the usual manner in which case a voltage equal to the additive value of the voltages of batteries B_1 and B_3 will appear across the points P_1 and P_2. In the case assumed hereinabove for illustrative purposes the potential applied between the points P_1 and P_2 will be approximately 260 volts, point P_2 being positive with respect to point P_1. This large potential will overcome the biasing potential of battery B_{11} and will therefore render the grid electrode of tube V positive with respect to its cathode. Consequently a substantial current will flow through the plate circuit of tube V and, therefore, operate the relay R_0 so as to close its spacing contact S. This spacing signal will then be transmitted to the circuit L_3.

When a marking signal is being transmitted from teletypewriter TTY_0 to the main station teletypewriters TTY_1 and TTY_2, the voltage between points P_1 and P_2 will have a substantial value of, for example, 65 volts in the case assumed hereinabove. The grid of tube V will, however, again be negative with respect to its cathode because the voltage of battery B_{11} will exceed the voltage between points P_1 and P_2. The relay R_0 will then be released so that the armature will close its marking contact M. The marking signal will, therefore, be repeated to the circuit L_3.

It will thus be observed that signals coming from the loop circuit teletypewriter TTY_0 will apply a voltage between points P_1 and P_2 varying between a relatively small magnitude and a mag-

nitude which overcomes the biasing voltage of battery B_{11}. This biasing voltage is overcome only for signals arriving from teletypewriter TTY_0. Thus the circuit L_3 will be selectively responsive to signals emanating from the teletypewriter TTY_0, the circuit L_3 being non-responsive to all other signals transmitted between the two repeaters.

The arrangement shown in the drawing and described hereinabove is of special value where it is desired to monitor one of the circuits such as the telegraph loop circuit L_1—L_2 connected to a two-way telegraph repeater circuit carrying signals between two or more main stations. The arrangement permits the monitoring circuit which includes the tube V and circuit L_3 to observe all signals coming from the loop circuit teletypewriter TTY_0 to the exclusion of all other signals. This monitoring arrangement may be employed for observing conditions in the loop circuit L_1—L_2, as well as the character of the transmission from that loop circuit to the rest of the system.

The impedance Z_3 is employed in the circuit described hereinabove for the purpose of reducing the flow of current between the grid and cathode electrodes of tube V in response to the large positive potential applied to point P_2 with respect to point P_1. Without such an impedance the life of the tube might be reduced and its operation might be impaired.

The teletypewriters TTY_0, TTY_1 and TTY_2 are given merely for illustration, and it will be understood that they may be replaced by telegraph keys and sounders of well-known type for transmitting ordinary telegraph signals. In other words, the invention may be used not alone for teletypewriter character transmission, but also for telegraph signaling generally.

The values assigned to the various elements which may be employed in this invention are given, of course, for illustrative purposes only, and other values of widely different magnitudes from those assumed and in different ratios may be used in practice without departing from the spirit of the invention.

While this invention has been shown and described in certain particular embodiments merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. The combination of a plurality of two-way telegraph repeaters interconnecting a plurality of stations, a telegraph loop connected to said repeaters so that signals traversing said repeaters from any of said stations may be received by said loop and signals emanating from said loop may traverse said repeaters and be received by said stations, a receiving circuit connected across said loop, and means to prevent said receiving circuit from receiving all signals traversing said repeaters except those emanating from said loop.

2. The combination of two main telegraph stations, a telegraph loop circuit, two repeaters interconnecting said main stations and said loop, said repeaters including means for relaying signals between the main stations to the loop circuit and from the loop circuit to the main stations, a telegraph circuit bridged across the loop circuit, and means included in said bridging telegraph circuit to prevent the reception of all signals except those coming from the telegraph loop circuit.

3. In a telegraph system, the combination of two main telegraph stations, a telegraph loop circuit, two repeaters interconnecting said main telegraph stations and said telegraph loop circuit so that signals originating in one of the main stations will be repeated to the other main station and to the telegraph loop circuit, and so that signals coming from the telegraph loop circuit will be repeated to both main stations, a telegraph receiving circuit bridged across said loop circuit, and means to prevent all signals except those coming from the telegraph loop circuit from being repeated in said telegraph receiving circuit, said means including a source of voltage and means to overcome the said voltage of said source only when signals are coming from said telegraph loop circuit.

4. In a telegraph system, the combination of a plurality of main telegraph stations, an auxiliary station, telegraph repeaters interconnecting said main stations and said auxiliary station, said repeaters repeating signals originating in any one of the stations to all of the other stations, a monitoring station bridged across said auxiliary station, and means to relay to said monitoring station all signals originating at said auxiliary station and to prevent the repetition of signals originating in all other stations connected to the system.

5. In a telegraph system employing pulses of direct current for the transmission of signals, the combination of a plurality of telegraph stations, repeaters interconnecting the circuits of all of said stations, a telegraph receiving circuit connected to said repeater, said telegraph receiving circuit being bridged across the circuit of but one of said telegraph stations, said telegraph receiving circuit including means to operate said telegraph receiving circuit only in response to telegraph signals coming from the station across which said telegraph receiving circuit is bridged, to the exclusion of all signals coming from all other stations.

6. In a telegraph system employing pulses of direct current for the transmission of signals, the combination of two main telegraph stations, an auxiliary telegraph station, repeaters interconnecting all of said stations so that signals originating in any one of said stations will be repeated to the other stations, a telegraph receiving circuit bridged across said auxiliary station, means including a source of blocking voltage connected in said telegraph receiving circuit to prevent all signals except those originating at said auxiliary station from being transmitted to said telegraph receiving circuit, said means including means to overcome the blocking voltage only in response to signals which originate at said auxiliary station.

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