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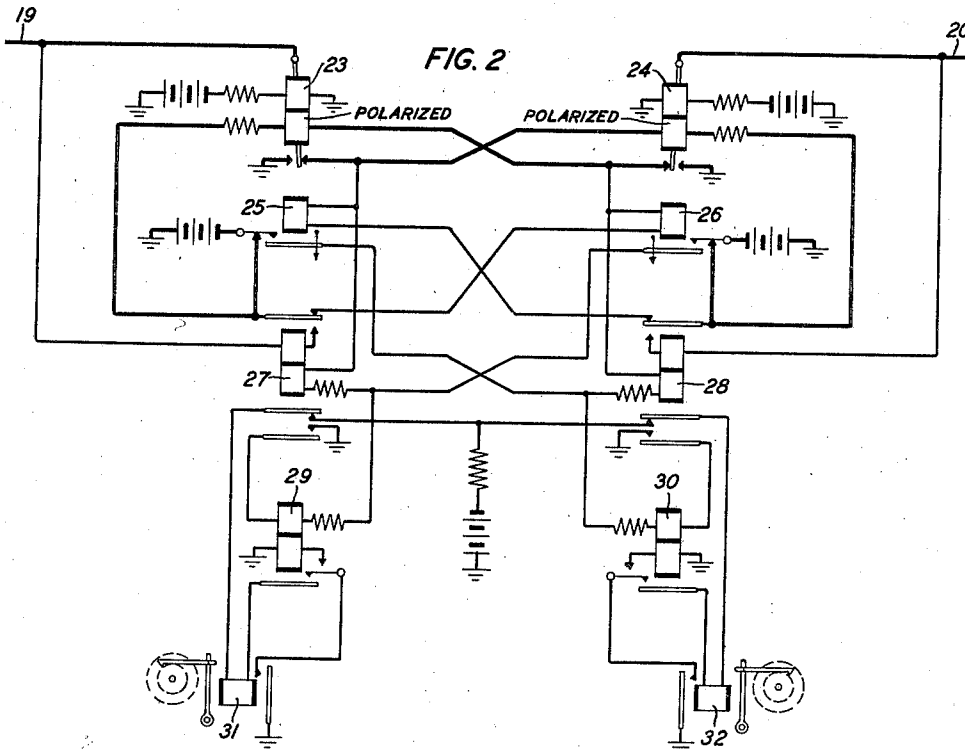
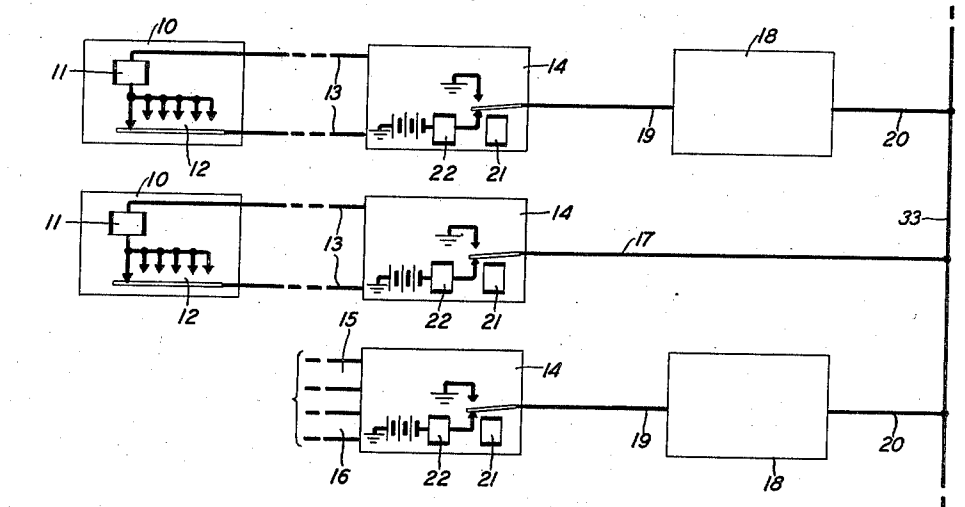
F. S. KINKEAD

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IMPULSE REPEATER

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FIG. 1



INVENTOR
F. S. KINKEAD
BY
J. W. Schmied
ATTORNEY

UNITED STATES PATENT OFFICE

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IMPULSE REPEATER

Fullerton S. Kinhead, Ridgefield Park, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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6 Claims. (Cl. 178—69)

This invention relates to impulse repeaters and more particularly to impulse repeaters for use in telegraph systems.

In large extended telegraph systems, such as used in police networks, news networks, etc., it is necessary to connect a large number of stations by means of lines of different types together and to arrange the various circuits so that the signal impulses transmitted from any station will be received at all the other stations connected to the network. In addition, it is necessary at times to temporarily add to the system various lines of different types.

In order to fulfill these requirements a repeating system has been developed in which the relay equipment is associated with each line for transmitting signal impulses between the respective lines and a common impulse circuit. Repeater systems of this type have been disclosed in Patent 2,056,277, granted Oct. 6, 1936, to F. S. Kinhead and G. A. Locke, Serial No. 32,866 filed July 24, 1935.

In repeater systems of this type, stray impulses arising in any of the lines will disturb the transmission to and from all the other stations and lines of the system.

The object of this invention is to provide an auxiliary circuit which may be inserted between the common circuit and the repeating relays individual to each line circuit for preventing the transmission of momentary stray impulses during the transmission of signal impulses in the opposite direction and for recording the number of these stray impulses received from each line.

A feature of the invention relates to the transmission of long break signal impulses in all directions through the repeating system at all times without recording these break signals as momentary stray impulses.

In accordance with the preferred embodiment of this invention, one or more auxiliary relay circuits or repeaters are connected between the common circuit and the individual line circuits for repeating impulses between the common circuit and equipment connected to the line circuit. This auxiliary circuit is provided with slow-acting relays which prevent the transmission of momentary short stray impulses through the circuit in a direction opposite to the direction of transmission of signal impulses. Recording devices are provided to record the number of these short stray impulses received from the line during the time impulses are being transmitted to the line. Additional circuit arrangements permit the transmission of long break signal im-

pulses through the circuit in both directions at all times and prevent the recording of these long break signal impulses as momentary stray impulses.

These and other objects and features of this invention may be more fully understood from the following description when read with reference to the attached drawing in which:

Fig. 1 shows a general form of a repeating system to which the invention is applicable; and

Fig. 2 shows details of one specific form of the auxiliary repeating equipment which may be connected between the individual relays associated with any line and common impulse circuit.

Referring now to Fig. 1, a plurality of subscribers' stations 10 are shown each provided with a receiving device 11 such as the printing magnet or line relay and a transmitting device such as contacts 12. These telegraph stations 10 may be of any suitable type or class which are connected by means of loops or lines 13 to a central repeater point where relay and other equipment 14 is located. At the central repeater point, a plurality of relay equipments 14 are provided, one of the said equipments being associated with and individual to each of the loop circuits 13 incoming from telegraph stations 10. These equipments 14 and lines 13 may be of any suitable type, such as represented by loop 13 which transmits signals in either direction or by loops or lines, such as illustrated by lines 15 and 16, which are adapted to transmit signals in only one direction, one of the lines serving to transmit signals in one direction while the other transmits signals in the reverse direction. These loop circuits may be arranged to transmit any desired type of signal impulses such as carrier current signal impulses or low frequency telegraph signal impulses. The equipment at each telegraph station 10, as well as the relay and associated equipment 14 associated with the individual lines, is adapted to transmit and receive the type of signal impulses which are transmitted over the interconnecting loop or line circuits. The relay equipments 14 are each provided with a transmitting relay 21 and a receiving relay 22, in addition to the other relays and equipment cooperating with the incoming lines 13 from the telegraph stations 10. Relay 21 is provided to repeat signals received from the connected telegraph station 10 over the associated line 13 to common circuit 33 while receiving relay 22 is adapted to receive signal impulses from the common circuit 33 and repeat these signals to the associated telegraph station 10 through the re-

lated equipment and line 13. Thus, when relay 21 is released by a spacing signal received from telegraph station 10, which spacing signal may be a carrier current spacing signal, a spacing signal in a positive and negative current impulse system, or a spacing signal in a current and no-current system, it connects ground to the common circuit 33 which, in turn, causes the receiving relays 22 of the other relay equipments 14 to operate and thus repeat the spacing signal to the other telegraph stations 10 connected to the other relay equipments 14.

It is thus quite apparent that any impulses originating at any of the telegraph stations 10 connected to the system, or in any of the lines connecting the stations to their associated equipments 14 will be repeated to all the other telegraph stations 10 connected to the system. Also, in case any stray or momentary signal impulses arise in any line of the system, these impulses will be transmitted to and interfere with the transmission between all the other stations connected to the system. In accordance with this invention, an additional relay equipment 18 is connected between the common circuit 33 and the relay equipment 14 individual to the lines connected into the system which are subjected to these disturbances. This additional equipment prevents momentary stray impulses arising in the line associated with this auxiliary equipment 18 from interfering with the transmission between all the other telegraph stations connected to the particular telegraph system.

Details of this auxiliary relay equipment are shown in Fig. 2. Relays 23 and 24 are preferably polar relays and are normally maintained in the position shown in Fig. 2 by a biasing current flowing through the upper windings. Relays 25 and 26 are made slow-acting in any suitable way, such as, for example, by providing them with a copper sleeve. The remaining relays are ordinarily neutral electromagnet relays.

As shown in Figs. 1 and 2, a lead 20 is connected to the common circuit 33 while lead 19 is connected to the relay equipment 14 associated with the individual lines 13 connected to the telegraph stations 10. When signals are being transmitted from the common circuit 33 through auxiliary equipment 18 and relay equipment 14 over a telegraph line 13 to a station 10, ground is connected to the common circuit 33 by a transmitting relay 21 under control of another telegraph station which is transmitting. The ground thus connected to lead 20 of Fig. 2 through the common circuit 33 causes a current to flow through the armature and left-hand contact of relay 24, the lower winding of relay 23 from the battery connected to the break contact of relay 25. The current flowing through the lower winding of relay 23 is sufficient to overcome the biasing current and to operate relay 23 to its left-hand contact. This grounds line 19 and repeats the signal impulse to the relay equipment 14 connected thereto.

The ground connected to line 20 also causes a current to flow through the armature and left-hand contact of relay 24, the winding of relay 26 and the break contacts of relays 27 and 25 from battery which operates relay 26. Relay 26 in operating disconnects battery from the lower winding of relay 24 and the winding of relay 25. Relay 26 is slow in releasing so that it does not follow the signal impulses, but rather keeps the battery disconnected from the windings of relays 24 and 25 during the time signal impulses are

being received from lead 20 and retransmitted to lead 19. Thus, if during this time, ground is connected to lead 19, by the relay equipment 14 connected thereto, due to some extraneous disturbance arising on the line 13 to which lead 19 is connected, relays 24 and 25 will not be operated to repeat this ground to lead 20 and thus to the common circuit 33. This prevents momentary disturbances arising in the line associated with lead 19 of Fig. 2 from being repeated to and interfering with all of the other telegraph stations and lines connected to the system.

Relay 26, in operating, also connects the battery from its make contact through the lower winding of relay 27 and the right-hand contact of relay 23 to line 19. Now, if during the time relay 26 is operated, due to transmission of signals from lead 20 to lead 19, a ground is connected to lead 19 by the associated relay equipment 14 due to some momentary disturbance arising in the line connected to the associated relay equipment 14, then a circuit will be completed from this ground connected to lead 19 through the armature and right-hand contact of relay 23 and lower winding of relay 27 to battery through the make contacts of relay 26. Current flowing in this circuit causes relay 27 to be operated. Relay 27, in operating, opens the circuit of relay 26 through its upper break contact and locks itself operated through its upper make contacts by means of a circuit from the battery through the break contacts of relay 25 and the upper make contacts and winding of relay 27 to ground connected to lead 19 in the associated relay equipment 14 to which lead 19 is connected. Relay 27 also closes the operating circuit for relay 29 from battery through the operated make contact of relay 26, upper winding of relay 29 to ground on the lower make contacts of relay 27. In addition, relay 27 in operating opens the upper break contacts of its lower set of contacts. This opens the operating circuit of message register 31 and the locking circuit of relay 29 so that message register 31 cannot operate at this time. In case the ground connected to lead 19 in the connected relay equipment 14 is due to a momentary condition such as stray interference and the like, relay 27 will release at the end of the disturbance during the next marking interval of relay 23 before relay 26 releases. When relay 27 thus releases before relay 26, it again completes the operating circuit of relay 26 through its upper break contact and also the operating circuit of message register 31 and holding circuit of relay 29 thus holding relay 29 operated and operating message register 31 to record a momentary disturbance originating in the line to which lead 19 is connected. When message register 31 operates, ground will be connected to both terminals of the lower winding of relay 29 thus shunting the holding circuit of this relay and allowing the relay to release which in turn allows message register 31 to release so that relays 27 and 29 and message register 31 are now returned to the original position and ready to respond to and record further momentary disturbances arising in the line to which lead 19 is connected.

Assume now that station 10 connected to line 19 of Fig. 2 through the corresponding equipment 14 desires to transmit a break signal during the time that it is receiving signals from some other station 10 through the common circuit 33. Under this condition, as before, relay 23 repeats the sig-

nals received from the line 20 to line 19 and thus to the station 10 connected to line 19 through the equipment 14 as shown in Fig. 1. Relay 26 is also operated so that it has connected battery through the lower winding of relay 27 to the right-hand contact of relay 23 and has disconnected battery through the windings of relays 24 and 25 from this contact. Then, when station 10 receiving repeated message signals transmits a break signal to the relay equipment 14 connected to its line, this equipment 14 grounds conductor 19. As before, relay 27 operates opening the circuit of relay 26 and locking to the ground on conductor 19. Relay 27 also operates relay 29 and opens the operating circuit of message register 31 as before. In this case, the break signal transmitted from station 10 is sufficiently long to allow relay 26 to release at which time relay 29 is released without operating message register 31 because relay 26 removes the battery which operates and holds relay 29 operated. Relay 26, in releasing also connects battery to the windings of relays 24 and 25 causing these relays to operate. Relay 24, in operating, connects ground to lead 20 and thus repeats the break signal received over lead 19 from the associated station 10 to all the other stations of the system.

Thus, message register 31 records all the momentary circuit disturbances arising in the line associated with lead 19 during the time that signals are being transmitted to this lead and line, but does not record a long break signal transmitted from this line over line 19 to the remainder of the stations of the system. In addition, the relays prevent the transmission of these short stray interfering impulses to the remainder of the system, but do not prevent transmission of long break signal impulses.

A similar set of relays is shown associated with lead 20 which operate in a manner similar to those described with reference to lead 19. In case it is desired to use more than one of these protection units in a given system, certain of these relays may be omitted in all but one of the auxiliary equipments since it is unnecessary to record more than once all the momentary circuit disturbances of the common circuit.

The foregoing specific embodiment of this invention is for the purpose of clearly describing and illustrating this invention, the novel features of which are set forth in the appended claims.

What is claimed is:

1. An impulse repeater comprising a first circuit, a second circuit, relays for repeating impulses from one of said circuits to the other of said circuits, auxiliary relays for preventing certain of said repeating relays from repeating momentary stray impulses during the time the other of said repeating relays are repeating impulses, a recording mechanism for recording the number of momentary stray impulses received by said repeating relays during the repetition of signal impulses by the other of said repeating relays, and circuit connections between said recording mechanism, auxiliary relays and repeating relays for repeating the long impulses received by any of said repeating relays during the reception of signal impulses by any other of said receiving relays, and additional circuit connections for preventing the recording of long impulses as momentary stray impulses.

2. A repeating system comprising more than two line circuits, a relay circuit connected to each of said line circuits, an impulse transmitting circuit common to all of said relay circuits for receiving signal impulses from any of said line circuits and transmitting the received impulses to all the other line circuits, another relay circuit connected between said common circuit and one of said relay circuits which comprises means for preventing the transmission of momentary stray impulses between said common circuit and said relay circuit in a direction opposite to the direction of the transmission of signal impulses, and means for recording the number of such momentary stray impulses received by the respective circuits.

3. A telegraph repeating system for repeating telegraph signal impulses between a plurality of different types of telegraph systems comprising a common impulse transmitting circuit, relay equipments connected to each of said telegraph systems for transmitting impulses between said systems and said common circuit, one of said relay equipments connected between each of said telegraph systems and said common impulse circuit, an auxiliary relay equipment comprising a plurality of slow-acting relays for preventing the transmission of momentary disturbances through said auxiliary equipment during the time signal impulses are being transmitted in the reverse direction, other means for recording the number of said momentary disturbances, and further circuit means for transmitting long break signal impulses through said auxiliary relay equipment in both directions at all times and circuit means for preventing the recording of said long signal impulses as momentary circuit disturbances.

4. An impulse repeater comprising a first circuit, a second circuit, relays for repeating impulses from either of said circuits to the other of said circuits, additional relay equipment for counting and recording only the number of momentary circuit disturbances arising in one of said circuits during the transmission of signals to that circuit from the other of said circuits, and circuit means including said additional relay equipment for preventing said means from counting and recording long signal impulses as momentary circuit disturbances.

5. An impulse repeater comprising a first circuit, a second circuit, relays for repeating impulses from either of said circuits to the other of said circuits, auxiliary relays for preventing the repetition of momentary circuit disturbances from either of said circuits during the transmission of signal impulses to that circuit from the other of said circuits, and additional circuit means including slow-acting relays for preventing the recording of long signal impulses as momentary circuit disturbances.

6. An impulse repeater comprising a first circuit, a second circuit, relays for repeating impulses from either of said circuits to the other of said circuits, additional relay equipment responsive solely to momentary circuit disturbances arising in one of said circuits during the repeating of impulses to that circuit from the other of said circuits, and means for counting and recording the number of said momentary circuit disturbances.

FULLERTON S. KINKEAD.