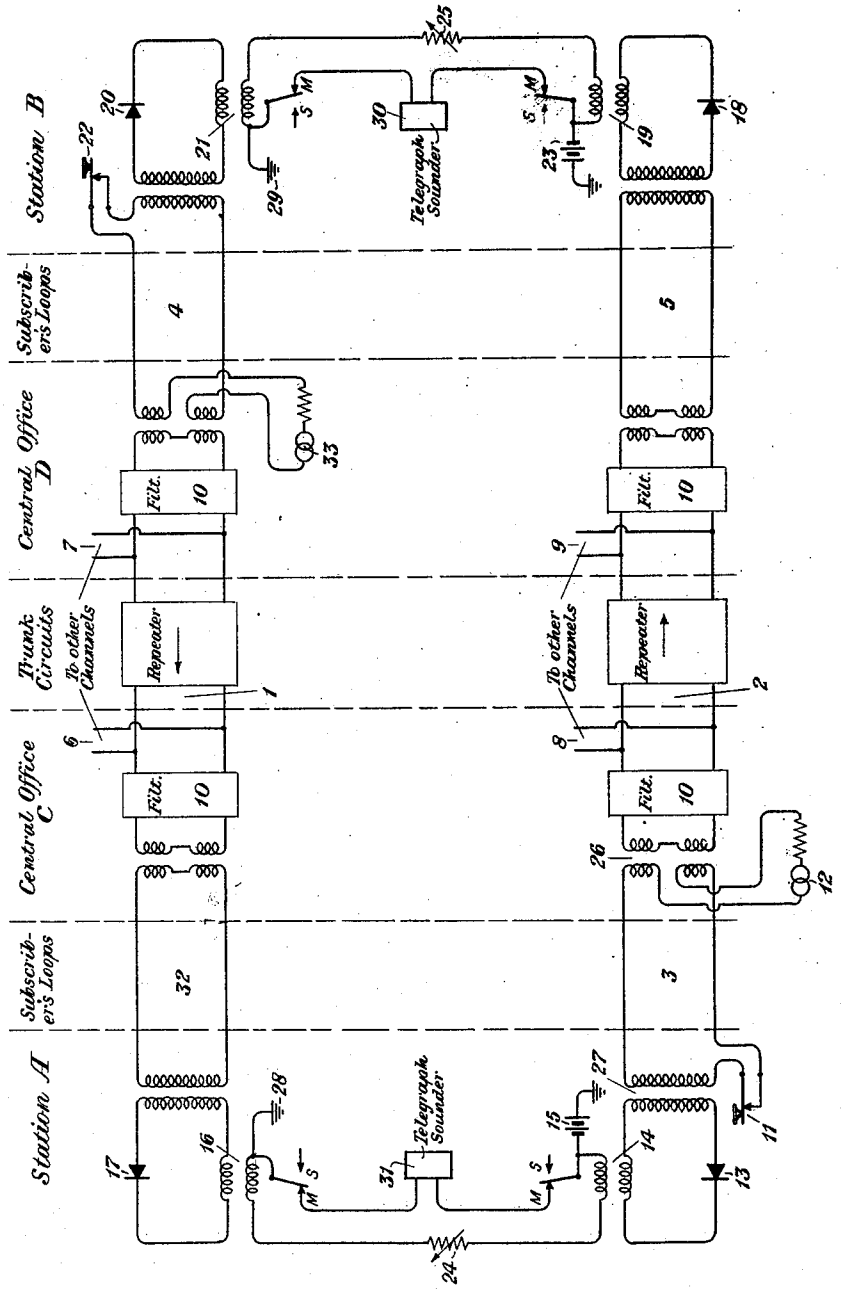
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SUBSTATION RECTIFICATION OF CARRIER TELEGRAPH CURRENTS

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SUBSTATION RECTIFICATION OF CARRIER TELEGRAPH CURRENTS

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This invention relates to the art of telegraph communication and discloses an improved system for carrier current telegraphy whereby rectification of the carrier current is accomplished at the subscriber's station instead of at the central office. The use of the improved method thus eliminates the necessity for mechanical repeaters at the central office to repeat signals over the loop circuit to the telegraph sounder at the subscriber's station.

In carrier current telegraph systems in general, each telegraph station is connected to a local central office over a loop circuit. Distant stations are connected over a trunk circuit extending between the respective central offices. The carrier current is transmitted over the trunk circuit only, the signaling between a central office and the local station being accomplished by direct current telegraph means operating over the loop circuit. The carrier current is thus rectified at the central office and caused to operate a mechanical repeater which repeats the signals to the telegraph sounder at the local station.

With a system whereby the carrier current is transmitted from the central office at the sending end through the central office at the receiving end and directly to the local telegraph station there, the mechanical repeater equipment could be eliminated from the central offices at a considerable economy. Rectification of the carrier currents in such a system would be accomplished at the telegraph station, and the rectified currents caused to operate a telegraph sounder through the medium of suitable relay means located there.

The present invention discloses a system of this type which is best explained in detail by reference to the drawing, which shows in schematic form one channel of a carrier telegraph system embodying the invention.

The drawing discloses a so-called "four-wire" trunk circuit consisting of circuits 1 and 2 extending between central offices C and D distant from each other. Circuit 1 transmits in the direction from right to left on the drawing, while circuit 2 transmits from left to right. Subscriber's telegraph station A is connected to trunk circuits 1 and 2 over loops 32 and 3, respectively. Similarly station B is connected to the opposite ends of trunks 1 and 2 over loops 4 and 5, respectively. The equipment at station A comprises polar relays 14 and 16, rectifying means 13 and 17, variable resistance 24, a sending key 11 and a telegraph sounder 31 connected, as shown. Similar equipment connected in a corresponding manner is shown at station B.

Key 11 is connected in series with loop 3 and controls a source of oscillating current 12 also connected in series with loop 3 at central office C. With key 11 depressed, as shown, current from source 12 is transmitted to stations A and B by means of transformer 26. At station A, this current is applied to the circuit containing rectifying means 13 by means of transformer 27. Any type of rectifying device may be used for either half or full wave rectification. It is suggested, however, that the recently developed copper oxide rectifier is best adapted for this purpose since it is compact, economical and requires no attention after installation. The rectifying means 13 causes a fluctuating direct current to flow through the line winding of polar relay 14. This winding is so poled that the rectified current causes the armature of the relay to move against its marking contact M. In a similar manner, current from source 12 is rectified by device 18 at station B, causing rectified current to flow through the line winding of polar relay 19, thus holding the armature of this relay against its marking contact M.

With relay 14 thus in its marking position, current from battery 15 flows through the armature of relay 14, through the telegraph sounder 31, and the armature of relay 16, which as explained below, is normally also in its marking position, to ground at 28. This current holds sounder 31 also in its marking position. In a similar manner, current from battery 23 through sounder 30 to ground at 29, holds the sounder at station B in its marking position.

When key 11 is released, it opens the series circuit containing the carrier current 12 and prevents the further transmission thereof to the subscriber's stations. Immediately there-

upon, the armatures of relays 14 and 19 are caused to move against their spacing contacts S. This is accomplished through electrical biasing means. It will be noted that at station A, current from battery 15 flows continuously through the auxiliary winding of relay 14, through resistance 24 and the auxiliary winding of relay 16, to ground. This current is such that it tends to move the armatures of both said relays against their spacing contacts. The current is adjusted by means of variable resistance 24 so that with rectified current in the line winding of the relay operative, the relay is held against its marking contact, but with no current flowing in the line winding, the biasing current holds the armature against the spacing contact.

When relay 14 thus moves against its spacing contact upon release of key 11, it opens the direct current path from battery 15, through sounder 31 causing the latter also to move against its spacing contact with the customary click. Similarly, at station B, sounder 30 moves against its spacing contact with a click. It will be seen, therefore, that sounders 31 and 30 follow the operations of the sending key 11 in accordance with the signals transmitted.

Polar relays 16 and 21 are controlled by sending key 22, through the medium of the oscillator 33 located at central office D. While no signals are being transmitted key 22, as well as key 11, is normally closed. The operation of key 22 operates relays 16 and 21 in the manner described above in connection with transmission from station A. The operation of these relays alternately opens and closes, at the respective relay contacts, the circuits containing sounders 30 and 31, thus causing the sounders to operate in accordance with the signals transmitted from station B.

If during the transmission of signals, say from station A, the operator at station B wishes to interrupt or "break" the message, he merely opens key 22. This causes relay 16 at station A to move against its spacing contact, opening the circuit containing sounder 31. The operator at station A, upon noting that sounder 31 no longer follows the operations of key 11, is thus made aware of the "break".

Stations A and B, of course, constitute only one of a plurality of distinct channels operating over the trunk circuits 1 and 2. Other channels identical in wiring with station A, are connected to leads 6 and 8, while at the distant end, stations similar to station B are connected to leads 7 and 9.

Each channel operates on a carrier frequency distinct from the other channel and filters 10 are inserted in each channel to prevent interference between channels.

What is claimed is:

1. In a carrier telegraph system comprising a line extending from a first subscriber's station through a certain point to a second subscriber's station, and having associated therewith at said point a source of carrier current, with control means at said first station for controlling the same, the method of signaling which consists in operating said control means, causing the resultant pulses of carrier current to be transmitted to both said stations, rectifying the received pulses of carrier current at said stations, utilizing the pulses of rectified current for signaling.

2. In a carrier telegraph system comprising a line extending from a first subscriber's station through an intermediate office to a second subscriber's station, and having associated therewith at said office a source of carrier current, the method of signaling which consists in controlling from said first station the output of said carrier current source, transmitting the resultant pulses of carrier current to both said stations, rectifying said currents thereat, and utilizing the rectified currents for signaling.

3. In a carrier telegraph system comprising a line extending from a first subscriber's station through intermediate offices to a second subscriber's station, and having associated therewith at the office adjacent each said station a source of carrier current, the method of signaling which consists in controlling the output of either carrier current source from the station adjacent thereto, transmitting the resultant current pulses from a given source to both stations, rectifying said current pulses at said stations, and utilizing said rectified currents for signaling thereat.

4. A carrier telegraph system comprising a sending and a receiving subscriber's station, a line connecting said stations through intermediate offices, a source of carrier current at the office adjacent the sending station, control means at the sending station for transmitting pulses of said current to both stations, means at said stations for rectifying said current pulses, and telegraph sounder means thereat operable in accordance with said pulses of rectified current.

5. A carrier telegraph system comprising two subscribers' stations, a pair of oppositely transmitting lines connecting the same through intermediate offices, a source of carrier current at the office adjacent each station associated with the line transmitting therefrom, control means at each station for transmitting pulses of carrier current from the adjacent office to both stations over the circuit transmitting therefrom, means at each station individual to said lines for rectifying received pulses of carrier current, means to operate a sounder at each station in accordance with said pulses of rectified current received over either line.

6. A carrier telegraph system comprising a

pair of subscribers' telegraph stations connected by a line extending through intermediate offices, a source of carrier current at the office adjacent each station, control means at each station for causing the transmission of carrier current pulses to both stations from the adjacent office, means at each station for rectifying said current pulses, telegraph sounder means at each station operable in accordance with said pulses of rectified current.

7. A carrier telegraph system comprising a line extending between two subscribers' stations through intermediate offices, a source of carrier current at the office adjacent each station, control means at each station for causing the transmission of carrier current pulses from said adjacent office to the distant station, means at each station to rectify received pulses of carrier current, telegraph sounder means at each station operable in accordance with said pulses of rectified current.

8. A carrier telegraph system comprising two subscribers' stations, a pair of oppositely transmitting lines connecting the same through intermediate offices, a source of carrier current at the office adjacent each station associated with the line transmitting therefrom, control means at each station for transmitting pulses of carrier current from the adjacent office to both stations over the circuit transmitting therefrom, means at each station individual to said lines for rectifying received pulses of carrier current, means to operate a sounder at each station in accordance with said pulses of rectified current received over either line, means for either station to transmit a break signal to the distant station while said distant station is sending.

9. A carrier telegraph system comprising a pair of subscribers' telegraph stations connected by a line extending through intermediate offices, a source of carrier current at the office adjacent each station, control means at each station for causing the transmission of carrier current pulses to both stations from the adjacent office, means at each station for rectifying said current pulses, telegraph sounder means at each station operable in accordance with said pulses of rectified current, means for either station to transmit a break signal to the distant station while said distant station is sending.

10. In a carrier telegraph system in combination, a line extending from a first subscriber's station through intermediate offices to a second subscriber's station and having associated therewith at the office adjacent each said station a source of carrier current, control means at each station for causing pulses of carrier current from the source at the adjacent office to be transmitted to both stations in accordance with the operation thereof, means at each office to rectify received pulses of said carrier current, a telegraph sounder at each office, means at each office to operate said sounders in accordance with the pulses of rectified current.

11. A carrier telegraph system comprising a sending and a receiving subscriber's station, a line connecting said stations through intermediate offices, a source of carrier current at the office adjacent the sending station, control means at the sending station for transmitting pulses of said current to both stations, copper oxide rectifying means at said stations for rectifying said current pulses, and telegraph sounder means thereat operable in accordance with said pulses of rectified current.

In testimony whereof, I have signed my name to this specification this 6th day of July, 1928.

LELAND C. ROBERTS.