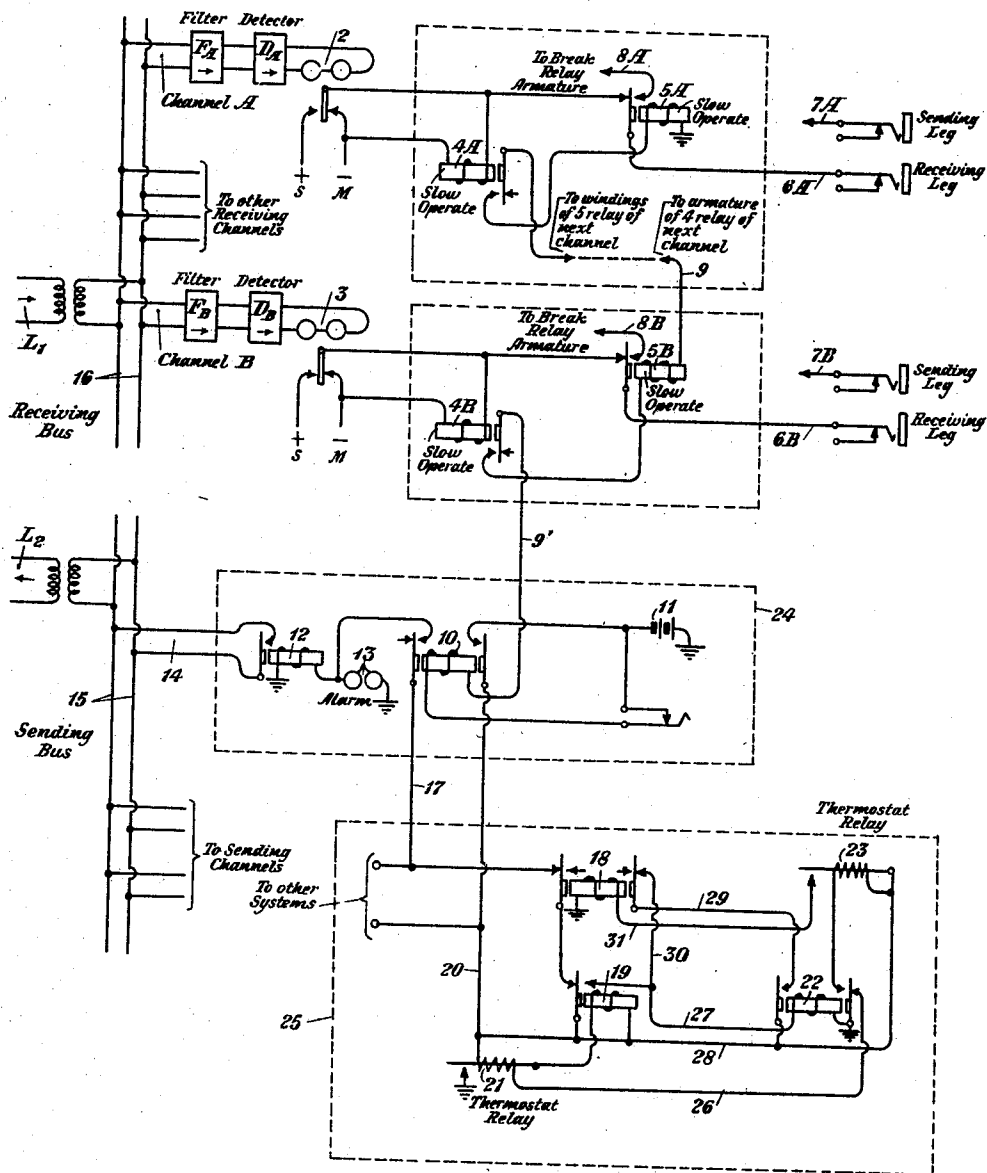


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V. P. THORP ET AL
CARRIER TELEGRAPH ALARM SYSTEM

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CARRIER-TELEGRAPH ALARM SYSTEM

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This invention relates to carrier telegraph circuits and more particularly to an improved alarm system for use with circuits of this type.

5 The alarm system of the invention is designed to operate whenever a carrier telegraph circuit becomes open, grounded, or short circuited. The arrangements of the invention will notify the repeater attendants and also the subscribers connected to such a circuit whenever the line fails so that an operator will not continue to send after the line is in trouble, not knowing that his signals are not being received. The arrangements of the invention will also automatically disable the sending apparatus at a station when the telegraph circuit fails. A further feature of the arrangements of the invention consists in the provision of restoring apparatus whereby after line failure, current will be intermittently applied to the circuit until the fault thereon is repaired, whereupon the telegraph apparatus and the alarm arrangements will be restored to normal. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the figure of which is illustrated a circuit diagram embodying a preferred form of the invention.

In the drawing is shown a portion of a carrier telegraph system comprising the incoming line section L_1 and the outgoing line section L_2 . Line section L_1 would be connected to a receiving bus circuit 16 and line section L_2 would be connected to a sending bus circuit 15. Connected to the receiving circuit 16 would be a plurality of carrier receiving channels. Channels A and B and associated apparatus have been illustrated. Connections for other channels have also been shown. The receiving carrier channel A would include a filter F_A , a detector D_A and a receiving relay 2. Similar apparatus would be included in the other receiving channels. Connected to the armature of the receiving relay 2 would be a receiving leg 6A for channel A. A portion of a sending leg 7A for this chan-

nel is indicated. Connected to the armature and the marking contact of the receiving relay of each channel would be a slow operate relay, such as the relay 4A and 4B. Connected to the contacts and armatures of all of the series 4 relays, such as 4A and 4B, is a circuit 9 which will have included therein the windings of a series of slow operate relays 5A and 5B. One of such relays will be provided for each channel. There is shown associated with the sending bus 15 a plurality of connections whereby different sending channels may be connected to line section L_2 . Bridged across the sending bus 15 is a normally open short circuit 14 controlled by the disabling apparatus 24. The disabling apparatus 24 is controlled by the restoring arrangements 25, which will be described in more detail hereinafter.

The arrangements of the invention operate in the following manner. When the line section L_1 of the carrier telegraph system is functioning properly, carrier frequencies transmitted thereover will hold the receiving relays of the carrier channels operated and their armatures will be held against their marking contacts. Under such conditions the series of slow operate relays, such as 4A and 4B will not operate. It is pointed out that these series 4 relays are sufficiently slow in operation so that they will not be affected by the ordinary incoming signals. However, if trouble occurs on the line section L_1 , such as a ground, open, or short circuit, the failure of the carrier frequencies will cause all of the receiving relays to release and to move their armatures to their spacing contacts. Under such conditions, batteries of a different polarity will be applied to the armatures of the receiving relays and the slow operate series 4 relays will be operated. When all of the series 4 relays operate, due to the line failure, the circuit 9 will be completed. It is pointed out that circuit 9 has included therein in series the armatures and contacts of all of the series 4 relays and hence it will not be completed unless all of the series 4 relays are operated. The circuit 9 will extend from ground, winding of slow operate relay 5A, contact and armature of relay 4A, and thence

through the winding of the series 5 relays of other channels and contacts and armatures of series 4 relays of other channels, as, for example, through winding of relay 5B and over contact and armature of relay 4B, and thence to conductor 9'. From conductor 9' this circuit will be extended through the winding of relay 10, to battery 11, and ground. The completion of this circuit will cause all of the series 5 relays, such as 5A and 5B to operate. The operation of relay 5A will disconnect the receiving leg from the armature of the receiving relay 2 and will connect the receiving leg over a conductor 8A to the armature of the break relay (not shown). Under such conditions, if the subscriber on channel A is sending, he will now receive his signals back again reversed. This will indicate to him that the line is in trouble. In a similar manner the other series 5 relays will connect the receiving leg of each channel to the break relay armature of that channel to inform each operator of trouble on the line.

The aforementioned completion of circuit 9 will also operate the relay 10. This will close the following circuit: from ground, winding of relay 12, contact and armature of relay 10, conductor 17, contacts and armatures of relays 18 and 19, conductor 20, armature and contact of relay 10, to battery 11 and ground. This will operate the alarm bell 13 and the relay 12. The operation of relay 12 will close a short circuit 14 across the sending bus 15 and prevent current from being sent over line L_2 from the station. This will cause apparatus at the distant station similar to that already described to operate to notify each operator that the line is in trouble and to disable the sending apparatus thereat.

In order to prevent the apparatus at both stations from becoming locked up and also in order to automatically restore all the arrangements to normal when the line is repaired, the operating circuit for relay 12 is controlled by the restoring apparatus 25 in the following manner. The operating circuit for relay 12 was originally closed upon the operation of relay 10 and was completed over the contacts of relays 18 and 19 as previously pointed out. The operation of relay 10 also closes the following circuit: from battery 11, contact and armature of relay 10, conductor 20, winding of thermostat relay 21, conductor 26, contact and armature of relay 22, to ground. This will start to heat up the winding of thermostat relay 21 and, after an interval of approximately 40 seconds, it will operate and connect ground over its armature, through the winding of relay 19 to conductors 28 and 20, armature and contact of relay 10, and thence to battery, thereby operating relay 19. It is pointed out that the thermostat relay 21 will have a certain slow release feature and will not release for

approximately 5 seconds after its operating circuit is broken. The operation of relay 19 will open at its contact the operating circuit for relay 12. This will allow carrier current to be sent out over line L_2 temporarily. The operation of relay 19 will connect battery 11 over armature and contact of relay 10, conductor 20, armature and contact of relay 19, conductor 27, winding of relay 22 to ground thereby operating relay 22. The operation of relay 22 will close a locking circuit for itself, as follows: from battery 11, armature and contact of relay 10, conductors 20 and 28, left hand armature and contact of relay 22, conductor 29, right hand contact and armature of relay 18, conductors 30 and 27, winding of relay 22 to ground. Accordingly, the relay 22 will remain operated after the relays 21 and 19 release. Relay 21 will now start to release due to the fact that at its right hand armature the operation of relay 22 will open the previously traced circuit for the thermostat relay 21. Accordingly, after approximately 5 seconds, the thermostat relay 21 and then the relay 19 will release and again close the operating circuit for relay 12. This will stop the application of carrier current to line L_2 . The operation of relay 22 will in addition to closing the locking up circuit for itself, close the following circuit: from battery 11, right hand armature and contact of relay 10, conductors 20 and 28, winding of thermostat relay 23, contact and right hand armature of relay 22 to ground. This will start heating up the winding of thermostat relay 23 and after approximately 40 seconds, said relay will operate and connect battery 11 over armature and contact of relay 10, conductors 20 and 28, armature and contact of relay 23, conductor 31, to winding of relay 18 and ground, thereby operating relay 18. The operation of relay 18 will open at its left hand contact and armature the operating circuit for relay 12, thereby releasing relay 12 and allowing carrier current to be applied out over line L_2 temporarily. The operation of relay 18 will open at its right hand contact the previously traced locking circuit for relay 22 and will release relay 22. This will open the previously traced circuit for the thermostat relay 23. Due to the slow release operation of relay 23, it will not release for approximately 5 seconds. At the end of such time, it will release and open the circuit of relay 18. This will release relay 18 and allow the operating circuit of relay 12 to be completed again, thereby preventing the application of carrier current to line L_2 . The above described cycles of operations will then be repeated. Accordingly, it will be seen that when the carrier line is in trouble and the alarm apparatus operated, that carrier current will be intermittently applied to the line for approximately 5 seconds at intervals of 40 sec-

onds. When the line is repaired, this application of carrier current thereto at each end will release the alarm apparatus at the distant station which will disconnect the disabling and restoring apparatus thereat and insure the return of the system to normal.

While the arrangements of the invention have been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that they are capable of embodiment in many other forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A carrier telegraph system comprising a line circuit over which carrier currents are normally flowing, transmitting channels and receiving channels associated with said line circuit, an alarm circuit completed by the joint failure of all of said receiving channels due to an abnormal line circuit condition, and means controlled by the completion of said alarm circuit for intermittently disabling said transmitting channels.

2. A carrier telegraph system comprising a line circuit over which carrier currents are normally flowing, transmitting channels and receiving channels associated with said line circuit, an alarm circuit completed by the joint failure of all of said receiving channels due to an abnormal line circuit condition, means controlled by the completion of said alarm circuit for short circuiting the output of all of said transmitting channels, and an automatic device controlled by said last mentioned means for intermittently opening and closing said short circuit.

3. A carrier telegraph system comprising a line circuit over which carrier currents are normally flowing, transmitting channels and receiving channels associated with said line circuit, an alarm circuit completed by the joint failure of all of said receiving channels due to an abnormal line circuit condition, means controlled by the completion of said alarm circuit for disabling all of said transmitting channels, and an automatic device for periodically controlling said disabling apparatus controlled by the completion of said alarm circuit.

4. A carrier telegraph system comprising a line circuit over which carrier currents are normally flowing, transmitting channels and receiving channels associated with said line circuit, an alarm circuit completed by the joint failure of all of said receiving channels due to an abnormal line circuit condition, apparatus for disabling all of said transmitting channels, and an automatic device controlled by the completion of said alarm circuit for intermittently controlling said disabling apparatus, said automatic device comprising a circuit arrangement controlled by the operation of slow operate relays for de-

termining the period of said intermittency of control over said disabling apparatus.

5. A carrier telegraph system comprising a line circuit over which carrier currents are normally flowing, a plurality of sending channels and a plurality of receiving channels associated with said line circuit, slow operate relays associated with each of said receiving channels and operated thereby when an abnormal line circuit condition exists, an alarm circuit completed serially over the armatures and contacts of all of said relays, and means controlled by the completion of said alarm circuit for intermittently disabling said transmitting channels.

In testimony whereof, we have signed our names to this specification this 5th day of March, 1928.

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