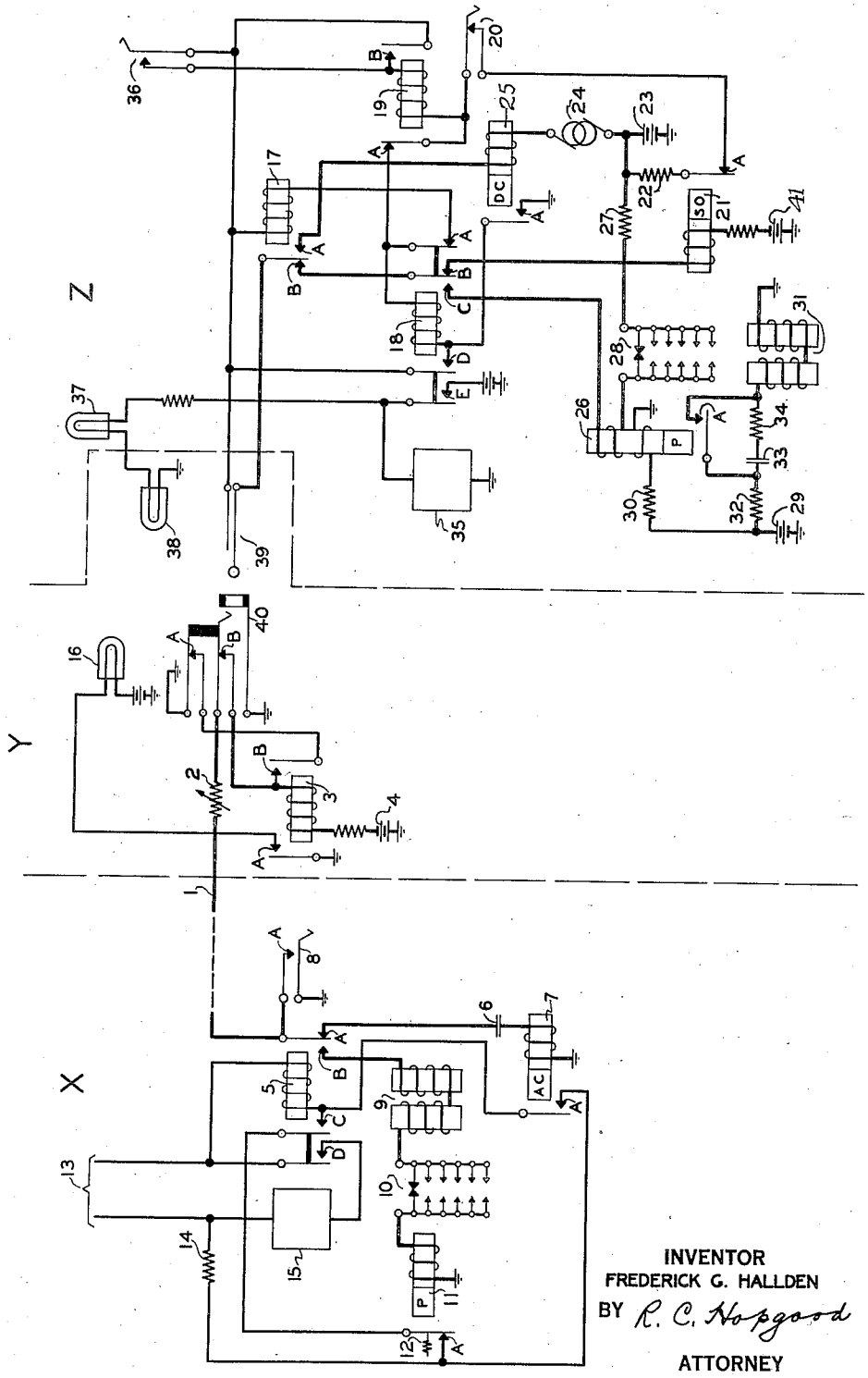
Jan. 26, 1937. F. G. HALLDEN 2,068,949

REMOTE CONTROL OF PRINTER MOTORS

Filed Feb. 25, 1931



INVENTOR
FREDERICK G. HALLDEN
BY R. C. Hopgood
ATTORNEY

Patented Jan. 26, 1937 2,068,949

UNITED STATES PATENT OFFICE

2,068,949

REMOTE CONTROL OF PRINTER MOTORS

Frederick G. Hallden, Bellerose, N. Y., assignor, by mesne assignments, to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware

Application February 25, 1931, Serial No. 518,123

12 Claims. (Cl. 178—4.1)

This invention relates to printing telegraph exchange systems, and more particularly to a method of motor control for use with said systems.

In printing telegraph exchange practice, it has been found desirable to provide a method of automatic motor control that can be used with a system in which the subscribers' stations and the central station are connected by lines normally open to direct current. A method of motor control of this type is disclosed in a co-pending application, Serial Number 469,393 to J. C. Fricke. When such a method of motor control is used, the current drain that ordinarily takes place during idle periods over the lines connecting the subscribers' stations and the central station is eliminated.

According to the invention disclosed in the above-mentioned application, an alternating current relay at one station is operated by alternating current applied to the line at the other station. The operation of this relay closes the line to direct current, and a mechanical locking device associated with the relay then maintains the line closed while communication between the stations is being carried on. The line between the stations is re-opened to direct current, and the apparatus at each of the stations is restored to normal when communication has ended, only when the concentration board operator at the central station pulls down the central station cord circuit from the subscribers' jack at the concentration board.

The present invention is an improvement upon the above-mentioned system. It has been discovered that the alternating current relay, which is connected to the line during signal transmission, has a tendency to reduce the operating margin of the connected printers; that the mechanical locking device for maintaining the line circuit closed during communication is somewhat cumbersome; that it is desirable to enable the central station operator to stop the printer motors at both stations without the interposition of the concentration board operator; and that the addition of a positive recalling means, under control of either of the connected stations, will improve the efficiency of the system.

Accordingly, one of the chief objects of the present invention is to provide means for disconnecting the alternating current relay from the line when that line is first closed to direct current, and for reconnecting the alternating current relay to the line when communication between the stations has ended.

Another object is the provision of simplified means for locking the communication circuit at the subscriber's station after it has been closed.

A further object is the provision of means for restoring the printer apparatus at the connected stations to normal without waiting for the concentration board operator to break the connection.

An additional object is the provision of means whereby either the subscriber or the central station operator may recall the other station after the communication circuit has been broken and before the connection between the central cord circuit and the subscriber's line has been broken by the concentration board operator.

Other objects will appear from the drawing and the following description, as well as from the appended claims.

The invention may be more completely understood from the following description together with the accompanying drawing in the figure of which is illustrated one embodiment of the invention.

Referring now to the drawing, the invention is disclosed as applied to a manual printing telegraph exchange system. In the figure, X designates the subscriber's station; Y designates the concentration board at the central station; and Z designates the operating table at the central station.

In order to simplify the drawing, a single subscriber's station is shown associated with a single jack on the concentration board, and but a single central station operating table is shown adapted for connection with the concentration board. It is obvious, however, that each of these three elements of the system may be multiplied to produce a printing telegraph exchange system.

At the subscriber's station X is shown a line 1 connected through a variable resistance 2 at the central station to a contact B of a jack at the concentration board Y, and thence through line relay 3 to ground through a resistance and negative battery 4. The line 1 is extended in the other direction through an armature of the relay 5, contact A of this relay, condenser 6, winding of alternating current relay 7 to ground. A grounded calling key 8 is associated through its normally open contact A with the line 1. Another section of the line 1, which is open at contact B of relay 5, extends through the printer magnets 9, the contacts of the transmitter 10 through polar relay 11 to ground. The polar relay 11 is connected in such a way that it is not affected by the positive signalling current and

has a biasing spring 12, which holds the relay armature against its A contact during no current signalling intervals. This relay is adapted, however, to cooperate in response to negative potential. A relay 5, associated with the alternating current relay 7, has an operating circuit which is closed when the latter relay is operated. This circuit may be traced from one pole of a source of current 13 through winding of relay 5, contact A of relay 7, resistance 14 to the other pole of the source of current 13. Relay 5 is provided with a holding circuit which extends when closed from one pole of current source 13, through winding of relay 5, contact C of that relay, armature and contact 4 of polar relay 11, resistance 14 to the other pole of source of potential 13. A motor 15 for operating the subscriber's printer is adapted to be started when contact D of relay 5 is closed by the energization of that relay.

At the central station concentration board Y the line circuit l, as previously traced, extends through the line relay 3. A calling lamp 16 is in a circuit which is adapted to be closed at contact A of line relay 3 when that relay is operated. The line relay 3 is provided with a holding circuit, which may be traced through its own contact 3, through contact A of the concentration board jack to ground.

A cord circuit is adapted to connect the operating table Z with the concentration board jack. Connected to the sleeve of the cord circuit is a relay 17. One terminal of the winding of this relay is connected through a contact A of relay 18, a contact A of relay 19, through a recall key 20, a contact A of a slow operating relay 21, through resistance 22 to positive pole of grounded battery 23. Connected in series with positive source of potential 23 is an alternator 24. Associated with this source of alternating current superimposed upon direct current is a relay 25 operable only by direct current. One terminal of the winding of this relay is connected to these sources, and the other terminal of this winding is connected to a contact A of the sleeve relay 17. The tip of the cord circuit is connected to the armature of relay 17 and in the idle condition of the circuit is extended through contact B of the relay 18, through the winding of slow operating relay 21, through resistance to the grounded source of negative potential 41. The transmitting circuit of the printer, which is normally disconnected from the tip of the cord circuit, extends from grounded source of positive potential 23 through resistance 27, transmitter contacts 28, winding of polar relay 26 to a contact C of relay 18. Polar relay 26 is provided with a biasing circuit which extends from a grounded source of positive potential 29, resistance 30, through biasing winding of relay 26 to ground. The printer magnets 31 are in a circuit which is adapted to be closed by polar relay 26. This circuit when closed includes grounded positive battery 29, resistance 32, armature and contact A of relay 26, printer magnets 31 and ground. A condenser 33 and a resistance 34 are connected in shunt to the contacts of polar relay 26 for the purpose of preventing sparking at the contacts of that relay. A motor 35 for operating the printer at the central station operating table is in a circuit controlled by contact E of relay 18. There is also provided for relay 18 a holding circuit which extends when closed through its D contact to the ground at the sleeve of the concentration board jack. A release key 36 is provided for energizing relay 19 over a circuit extending from the grounded sleeve of the concentration board jack, through the release key and relay 19, through the recall key 20, contact A of relay 21 to grounded source of positive potential 23. Relay 18 also controls an obvious circuit for energizing supervisory lamps 37 and 38.

A detailed description of the circuit arrangements and apparatus used in carrying out the present invention having been given, the operation of this system will now be explained.

If the subscriber's station X desires to call, the calling key 8 is momentarily depressed. This directly grounds line circuit l, causing line relay 3 to operate and lock up through its front contact B. The circuit controlling the calling lamp 16 is closed at contact A of relay 3. To answer the call, the concentration board operator inserts the plug 39 in the jack 40 thus connecting the cord circuit to line l extending to the subscriber's station. When the plug 39 is inserted in the jack, the contacts A and B of the jack 40 are opened, the line relay 3 is disconnected from the line and released, extinguishing the calling lamp 16, and the line l is extended to the armature of relay 17. Immediately upon the insertion of the plug, the relay 17 operates over a circuit extending from positive battery 23, contact A of slow operating relay 21, recall key 20, contact A of relay 19, contact A of relay 18, winding of relay 17, sleeve of the plug 39 to ground at the sleeve of the jack 40. The line l is thereupon extended through contact A of relay 17, winding of relay 25 to the source of alternating current 24 superimposed upon the grounded source of direct current 23. Relay 25 is not operated at this time. An impulse of alternating current is accordingly transmitted over the line l through the condenser 6 to operate the alternating current relay 7. Upon operating, relay 7 closes at its A contact a previously traced circuit for operating relay 5. Operation of this relay disconnects the line from the circuit including the condenser and alternating current relay 7 and connects it to the circuit including printer magnets 9, the transmitting contacts 10, the polar relay 11 to ground. At the same time, relay 5 closes at its D contact an obvious circuit for operating the motor 15, and at its C contact closes its own holding circuit which is controlled by the polar relay 11. As line l is now grounded through the subscriber's printer set, the relay 25, at the central station operating table, is operated by the direct current component 23 of the power supply. At its A contact relay 25 closes an operating circuit for relay 18. This circuit may be traced from ground, contact A of relay 25, winding of relay 18, contact A of the same relay, winding of relay 17 to ground at the sleeve of the jack 40. Upon operating, relay 18 closes its own locking circuit, which extends from battery 23 through contact A of relay 21, the recall key 20, contact A of relay 19, winding of relay 18, contact D of the same relay to ground at the sleeve of the concentration board jack 40. The energization of relay 18 opens at contact A the circuit of relay 17, which releases and removes the source of superimposed potential 23 and 24 from the line circuit l. The line l now extends from positive source of potential 23 through resistance 27, transmitter contacts 28, winding of polar relay 26, contact C of relay 18, contact B of relay 17, tip of the cord circuit, tip of the jack 40, line l, contact B of relay 5 through the subscriber's printer and polar relay 11 to

ground. The operation of relay 18 also closes the operating circuit for the motor 35 and closes the circuit of the supervisory lamps 37 and 38. Communication between the central and the subscriber's station may now be carried on.

It has been previously pointed out that the polar relay 11 at the subscriber's station is connected in such a way that it is unaffected by printer signals. To disconnect, the operator at the central station momentarily depresses the release key 36 which closes an operating circuit for relay 19. This circuit may be traced from ground at the sleeve of jack 40, sleeve of the cord circuit, release key 36, winding of relay 19, recall key 20, contact A of slow operating relay 21, resistance 22 of grounded source of positive potential 23. Upon operating, relay 19 closes a holding circuit through its B contact to the sleeve of the jack 40. Relay 19 at its A contact opens the circuit of relay 18, which releases opening the circuit of the printer motor 35, extinguishing supervisory lamps 37 and 38, and transferring the line 1 to a circuit that includes the winding of slow operating relay 21 and grounded source of negative potential 41. This reversal of the current in the line 1 operates the polar relay 11 at the subscriber's station. This relay upon operating opens the holding circuit for relay 5, which thereupon releases, opening the circuit of the printer motor 15, disconnecting the subscriber's printer and the polar relay 11 from the line 1 and re-connecting the circuit, including condenser 6 and alternating current relay 7, to the line circuit. Relay 21, which requires a comparatively long impulse to operate it, does not operate on the brief impulse necessary to operate the polar relay 11.

If the central station operator desires to recall a subscriber's station the recall key 20 can be depressed. This releases relay 19 which was previously locked and closes a circuit, previously traced, for energizing relay 17. Upon energizing, this relay re-applies the superimposed current to the line 1, again operating the alternating current relay 17 and thereby re-establishing the communication circuit between the two stations and starting the printer motors at these stations. It is also apparent that by closing the calling key 8, the subscriber may energize slow-operating relay 21, thereby opening the circuit of relay 19 and re-establishing the communication circuit in the same way as was done by the opening at the central station of the recall key 20. Until the connection at the concentration board has been pulled down, therefore, either the central station operator or the subscriber may recall and re-establish communication.

The establishment of a connection between the central station and the subscriber's station is effected when the concentration board operator inserts the plug 39 in the jack 40 of the concentration board. It is unnecessary to describe the sequence of operations which occur in this case, as they are identical with those that occur when the concentration board operator responds to a call from a subscriber's station.

After a call in either direction between the stations has been ended, the concentration board operator, upon observing that the supervisory lamp 38 has been extinguished, pulls down the plug 39, thereby releasing relay 19 and restoring the central station cord circuit to normal.

While the foregoing description discloses a preferred embodiment of the invention, illustrating its use with a manual printing telegraph exchange system, it is to be understood that the invention can be embodied in other forms without departing from the spirit of the appended claims.

What is claimed is:

1. In a communication system, a first station, a source of alternating current at said station, a second station, a printer and a printer motor at said station, a two conductor line normally open to direct current connecting said stations, an alternating current relay at said second station responsive to current from said source when the latter is connected to said line, and a relay in a local circuit at said second station, responsive to the operation of said alternating current relay, for closing said line to direct current over a circuit including said printer and for starting said printer motor, both the alternating current circuit and the direct current circuit including both sides of said two conductor line.

2. In a communication system, a first station, a source of alternating current superimposed upon a source of direct current at said station, a second station, a line normally open to direct current connecting said stations, means at said second station, responsive to the connection of said sources to said line, for closing said line to direct current, and means at said first station responsive to said closure for disconnecting said sources from said line, for connecting a printer and a source of signalling current at said station to said line, and for starting a printer motor at said station.

3. In a communication system, a first station, a source of alternating current and a source of direct current, a printer and a printer motor at said station, a second station, a line open to direct current connecting said stations, means at said second station, responsive to the connection of said alternating current source to said line, for closing said line to direct current, a first relay at said first station operated by said direct current over said closed line circuit, a second relay responsive to the operation of said first relay for starting said printer motor, and a third relay released by the operation of said second relay for disconnecting said sources from said line and for connecting said printer and a source of signalling current to said line.

4. In a communication system, a first and a second station, a printer and a printer motor at each of said stations, a source of alternating current and a source of direct current at said first station, a line normally open to direct current connecting said stations, means at said first station for connecting said sources to said line, means at said second station, responsive to current from said alternating current source, for closing said line to direct current over a circuit including said printer and for starting the printer motor at said station, means at said first station, responsive to current from said direct current source and operable when said line circuit has been closed, for establishing a communication circuit between said printers and for starting the printer motor at said first station.

5. In a communication system, a first station, a source of alternating current and a source of direct current at said station, a second station, a printer and a printer motor at said station, a two conductor line normally open to direct current connecting said stations, means at said second station, responsive to current from said alternating current source when the latter is connected to said line, for closing said line to direct cur-

rent over a circuit including said printer and for starting said printer motor, both the alternating current circuit and the direct current circuit including both sides of said two conductor line, means at said first station for thereafter substituting said direct signalling current for said alternating current, means at said first station for reversing the direction of said line current, and means at said second station responsive to said current reversal for re-opening said line to direct current and for stopping said printer motors.

6. In a communication system, a first station, a source of alternating current and a source of direct current at said station, a second station, a polar relay, a printer and a printer motor at said station, a two conductor line open to direct current connecting said stations, means at said second station, responsive to current from said alternating current source when the latter is connected to said line, for closing said line to direct current over a circuit including said printer and said polar relay, for starting said printer motor and for locking said line and printer motor circuit by means under control of said polar relay, both the alternating current circuit and the direct current circuit including both sides of said two conductor line.

7. In a communication system, a first station, a source of direct current and a source of alternating current at said station, a second station, a printer and a printer motor at each of said stations, a line normally open to direct current connecting said stations, means responsive to the successive application of said alternating current source and said direct current source to said line for establishing a communication circuit between said printers and for starting said printer motors, and means under control of the printer operator at said first station for breaking said communication circuit, for stopping said printer motors and for re-opening said line to direct current.

8. In a communication system, a first station, a source of alternating current and a source of direct current at said station, a second station, a printer and a printer motor at each of said stations, a line normally open to direct current connecting said stations, means, responsive to the connection of said current sources to said line, for establishing a communication circuit between said printers and for starting said printer motors, and means under control of the printer operator at said first station for breaking said communication circuit, for stopping the printer motor at said station, and for reversing the line current, and means at said second station responsive to said current reversal for re-opening said line to direct current for stopping the printer motor at said second station.

9. In a communication system, a first station, a source of alternating current, a source of direct current, a printer and a printer motor at said station, a second station, a printer at said station, a line open to direct current connecting said stations, means at said first station responsive to the successive application of said sources to said line for establishing a communication circuit between the printers at said stations, and for starting the printer motor at said first station, and means under control of the printer operator at said first station for dis-establishing said communication circuit and for stopping said printer motor.

10. In a communication system, a first station, a second station, a printer and a printer motor at each of said stations, a line open to direct current connecting said stations, means for establishing a communication circuit between said printer and for starting said printer motors, means under control of the printer operator at said first station for dis-establishing said communication circuit, for stopping said printer motors and for re-opening said line to direct current, and means under control of either station for recalling the other station and for re-establishing said communication circuit and for starting said printer motors.

11. In a communication system, a first station, a second station, a printer and a printer motor at each of said stations, a line open to direct current connecting said stations, means for establishing a communication circuit between said printers and for starting said printer motors, means under control of the printer operator at said first station for dis-establishing said communication circuit, for stopping said printer motors, and for re-opening said line to direct current, a relay at said first station adapted to be released from either the first or second station, and means responsive to the release of said relay for re-establishing said communication circuit and for re-starting said printer motors.

12. In a communication system, a first station, a source of alternating current, a source of direct current, and a printer having suitable driving means therefor at said station, a second station, a printer and driving means therefor at said station, a line normally open to direct current connecting said stations, means at the second station responsive to current from said A. C. source when the latter is connected to said line for closing said line to direct current and for starting the driving means at said second station, means at said first station responsive to the closure of said line for starting the driving means at said first station, and means at said second station responsive to a reversal of current on said line for stopping the driving means at each of said stations and for reopening said line to direct current.

FREDERICK G. HALLDEN.