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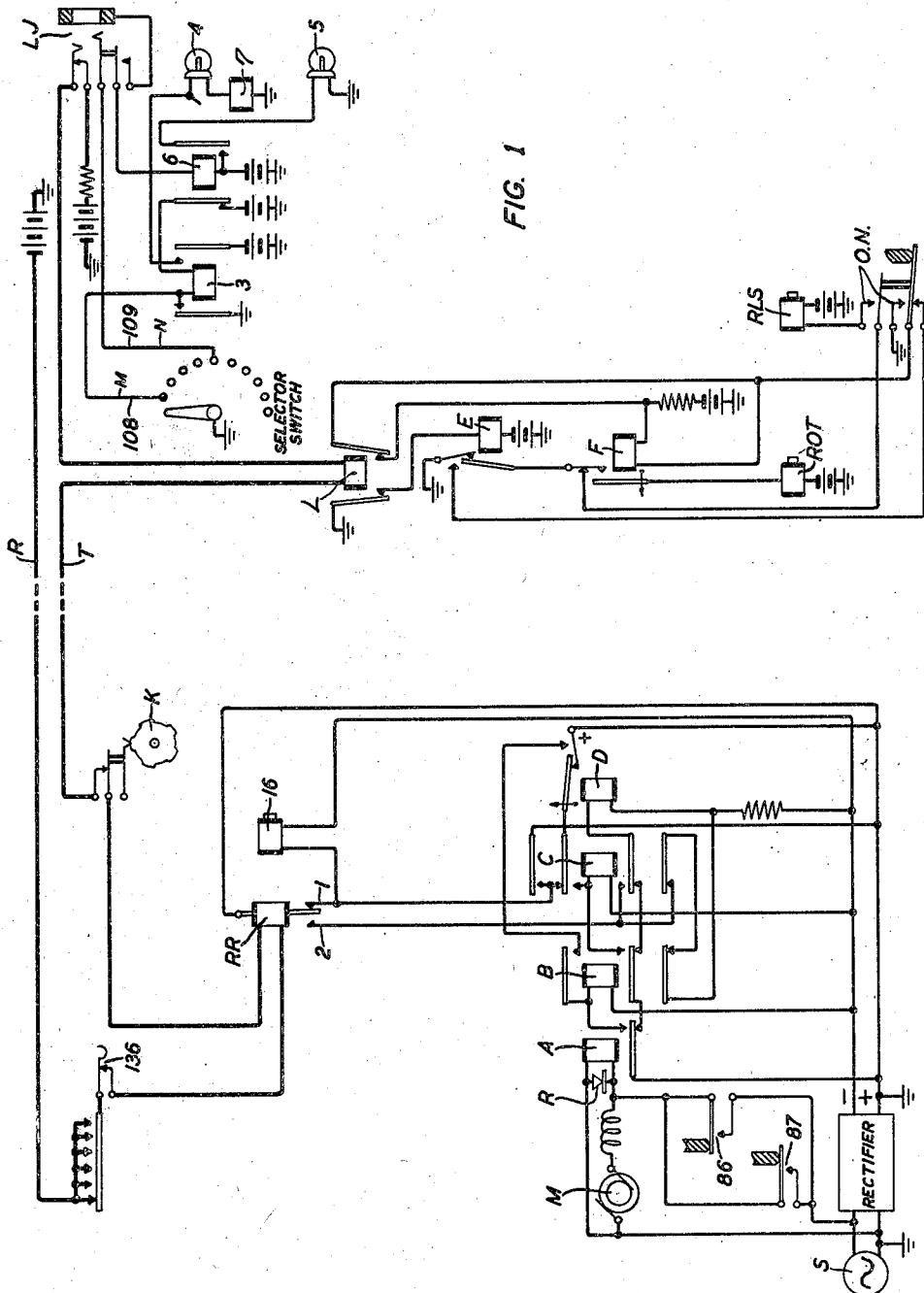
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TELEGRAPH EXCHANGE SYSTEM

Filed Aug. 30, 1935

2 Sheets-Sheet 1



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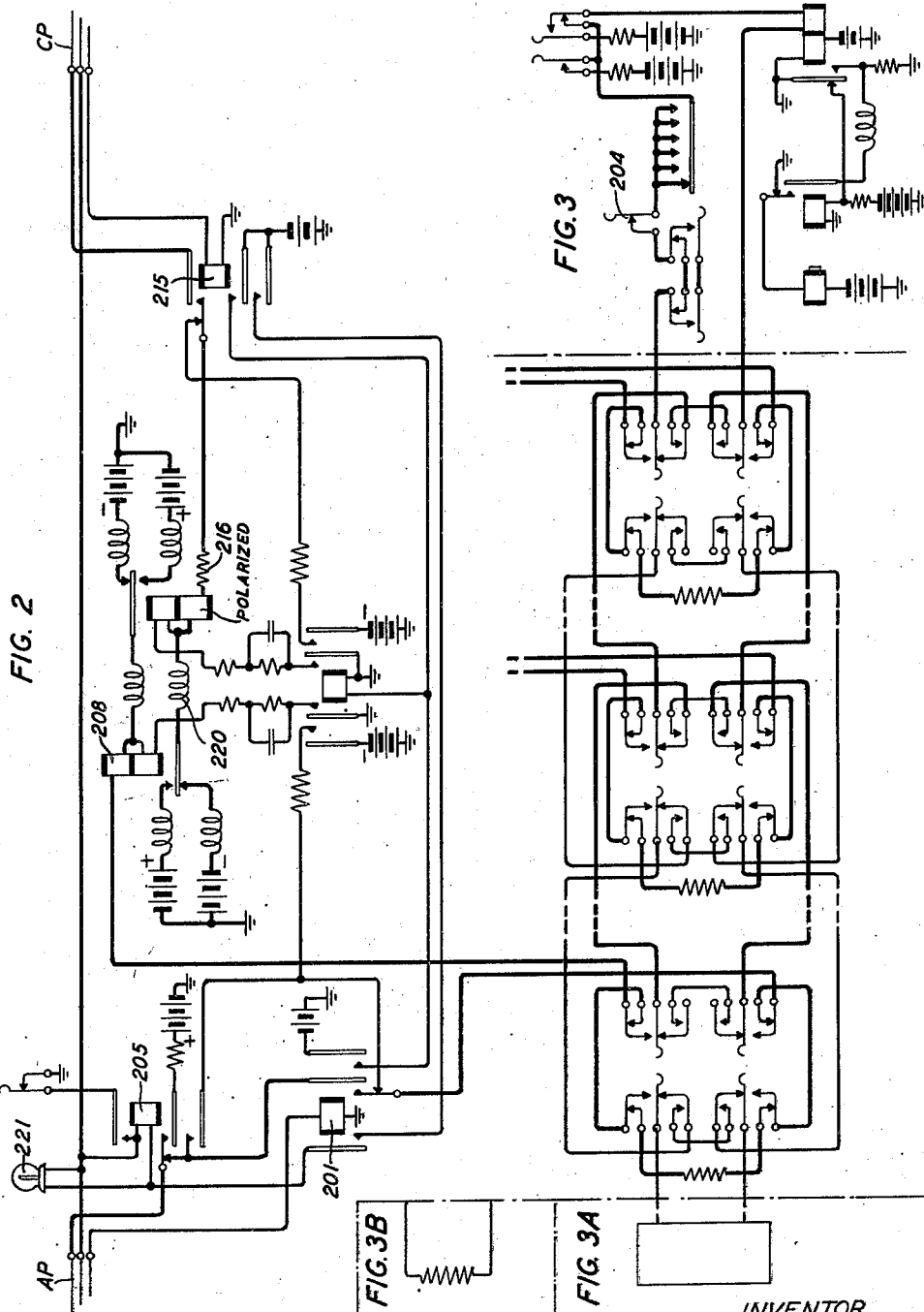
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TELEGRAPH EXCHANGE SYSTEM

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Application August 30, 1935, Serial No. 38,503

9 Claims. (Cl. 178—23)

The present invention relates to line and subscriber circuits for teletypewriter switching systems of the type adapted to give service to subscribers.

5 An object of the invention is to provide subscriber station and line circuit equipment by means of which subscribers may be given unattended service, i. e., the subscriber's station may be rendered operative from the central office for the reception of a message and after the termination of the message, the apparatus may be restored to the normal idle condition suitable for the reception of another call or the making of a call when the subscriber returns. A more particular object is to provide equipment whereby unattended service may be given the subscriber through a central office equipped with certain types of apparatus now in use.

15 A feature of the invention consists of equipment whereby upon connection of a subscriber's line through a central office to a distant subscriber upon a multi-party line, the supervisory operations normally performed by the subscriber's operator upon the multi-party line to stop the motor at his station and produce a disconnect signal at the central office, will not leave running the motor of the subscriber's station which has been connected to said multi-party line.

20 A general object is to improve the supervisory signal arrangements of teletypewriter switching systems so that unattended service may be given and the necessary supervisory signals produced at the central office with greater celerity and efficiency.

25 In a preferred embodiment of the invention, the line supervisory equipment is so arranged that a recall or disconnect signal at the central office will be produced at the termination of a communication or at such other time as desired upon the transmission of a special code combination adapted to operate a pull bar contact followed by a series of five break signals with relatively short closed periods between the break signals. The subscriber's station is provided with a special key either normally connected in or connectable in the line for the purpose of sending five break signals. The five break signals are not necessary for restoring the subscriber's station to the idle condition but it is so arranged that upon the transmission of such break signals the circuit is restored to the idle condition. The necessity for this arises from the fact that certain multi-station lines with which the line may be connected for communication require a pull-

bar operating combination signal followed by five break signals for supervisory purposes.

It will be noted that the arrangements of Figs. 2, 3, 3A and 3B are essentially those of Figs. 4, 5, 5A and 5B of Lane-Locke Patent 1,979,273, granted November 6, 1934. These circuits are fully described in said patent, both as to elements and as to mode of operation and the details of those circuits will not be discussed in the present specification.

10 The subscriber's circuit at the left of Fig. 1 comprises a station capable of receiving unattended service for reception of messages over a normally closed telegraph line to a central office. It may also transmit and receive when attended. The motor M may be driven by a public utility power supply or other suitable alternating current source S and it may be started by a break signal impulse of about one second duration, but not less than $\frac{1}{10}$ second duration. The motor may be stopped and the circuit restored to normal by an otherwise idle upper case code combination as upper case H.

15 Circuit arrangements of the preferred embodiment are shown in the accompanying drawings wherein,

20 Fig. 1 discloses, at the left of the figure, a subscriber's station equipment and at the right-hand end the line terminating equipment at the central office;

25 Fig. 2 discloses the general organization of cord circuit equipment at a central office at which the subscriber's line terminates and by which it may be connected to other subscribers' lines, and

30 Fig. 3 shows diagrammatically the operator's teletypewriter circuit connectable to any cord circuit, Fig. 3A indicates a second operator's equipment which may be provided, and Fig. 3B a maintaining circuit used when Fig. 3A is not employed.

35 Assume that the subscriber's circuit is idle. The line T, R is closed. Relays A, B and C are released. Relay D is operated by current flowing from the rectifier REC over back contacts of certain armatures of relays A, B and C in series. The receiving magnet 16 of the teletypewriter will be energized over a path from negative REC through its winding and thence to ground over the contact of receiving relay RR and also over the inner upper back contact of relay C and the make contact of relay D. Opening of right-hand contact 1 of the receiving relay RR will not release magnet 16 so long as relay D is operated. However, when the contact 2 of relay RR is

closed, the winding of relay D will be short-circuited, but relay D is a slow-release relay and it will not release during short line interruptions and consequently magnet 16 will not release.

Subscriber calls

To start the motor of his station the operator will open break key 136 (corresponding to break key 136 of Morton et al. Patent 1,931,672, October 24, 1933) for one second. This will operate relay RR to contact 2 for a time sufficient to allow relay D to release. When key 136 is closed, the line will be closed again and cause contacts 86 and 87 (similarly identified in Patent 1,931,672) to close the circuit of the teletypewriter motor M and to winding of relay A through rectifier R. The rectifier R conducts in one direction only and thus short-circuits the winding of relay A during each one-half cycle of sixty cycle alternating current. Relay A does not operate on sixty cycle alternating current but operates without chattering on the pulsating current. Upon operating, relay A closes the winding of relay B and opens the operating path of relay D. The relay B, upon operating, opens the short-circuiting path and the operating path of relay D and prepares its own locking path. When relay D releases a locking path will be closed for relay B from negative rectifier REC, winding of relay B, upper make contact of relay B and back contact of relay D. Relays A and B are now operated and relays C and D released.

At the central office, slow-release relay E will release when relay L releases and apply ground over the normally closed contacts of selector SEL to the winding of slow-release relay F. When relay F operates, a path is prepared for operation of the selector rotor magnet ROT. When the line is closed, relay L will reoperate and close the operating path of relay E. The winding of relay F is then short-circuited. It does not release immediately and before releasing, a circuit will be closed over the left-hand contact of relay E and make contact of relay F to rotor magnet ROT. The wipers of the selector SEL will advance one step and close the off-normal contacts ON of the selector. Closure of lead 108 establishes a circuit for relay 3 which locks up and lights lamp 4 and energizes relay 7 which may be the usual night alarm relay. When relay F releases, the connection of the upper off-normal contact will close a path through the release magnet RLS to the normal make on release contact of relay F and the make contact of the energized relay E. This causes the selector to release.

The central office operator answers the call by placing plug AP in jack LJ to deenergize lamp 4 and then connecting the calling subscriber to a called subscriber by means of the cord circuit of Fig. 2.

Operator calls a subscriber

Now let us examine the operation when the central office operator calls a subscriber after placing the calling plug CP in the line jack LJ. By means of the operator's break key 208, the line circuit is interrupted for one second or more. Under this condition, the operator's break key causes the actuation of relay 208, causing it to move its armature from plus battery to negative battery. When the armature is thus moved, the line circuit begins at negative battery in the repeater, passes over coil 220, resistance 216, upper make contact of relay 215, tip of plug CP, tip of

jack LJ, relay L, line conductor T, relay RR, teletypewriter contacts, and conductor R to negative battery. The circuit is thus terminated at each end in negative battery and is effectively opened. The opening of the line causes exactly the same sequence of operations at the subscriber's station as when the subscriber was assumed to open key 136. The central office operator may now send bell signals (code combinations operating a bell pull-bar on the subscriber's teletypewriter machine). If the subscriber is present, he may answer by typing one or more characters in reply; if absent, a message may be sent and recorded on his machine.

During communication of the central office operator or of a distant station with the subscriber, the relays A and B will remain operated, relays C and D released and the receiving magnet 16 will operate under control of the receiving relay.

Cooperation with party line station

In the application of Kinkead, Serial No. 13,859, filed March 30, 1935, is disclosed a teletypewriter exchange system in which a central office operator may select a station on a multi-party line for communication through an exchange with another party on a single or a multi-party line. In said system, the operation of stopping all stations and clearing a call involves the sending to or from the central office or the sending to or from the party line station a series of five break impulses. It was found that when a subscriber's station of the previously known unattended type was connected for communication (over one or more exchanges or through none or one or more trunks) with a party line station of the specific type of said Kinkead application or a slightly modified type adapted to connect to switchboards with closed lines, an operating difficulty arose. This difficulty comprised, in part, the fact that a disconnect signal from the party line station to his switchboard left the connected unattended station's motor running. To prevent such an occurrence, among other reasons, the present system described herein was evolved.

Disconnect operation

The operation of the apparatus at the subscriber's station will be the same whether the disconnect signal originates in a connected station or is sent by the subscriber himself. In either case, it will consist of a motor stopping code combination such as shift-shift (see Patent 1,931,672), followed by five spacing impulses. If the subscriber of Fig. 1 disconnects, the five impulses are sent by a single rotation of the rotary pulse sending key K. The operation at the station shown or any similar connected station will be as follows: Upon the shift-shift code combination, the motor control contacts 86, 87 will open to stop the motor M and release the relay A. Upon releasing, the back contact of relay A will extend the direct current circuit from the rectifier REC to the lower inner back contact of relay B and the winding of relay C. In operating, relay C will close a path through its upper outer make contact to hold the magnet 16 operated. Relay C will prepare a path to the winding of relay D as follows: Negative side of rectifier REC, winding of relay D, lower inner make contact of relay C to contact 2. Relay C will also prepare its own locking path from negative rectifier REC, through winding of relay C and inner upper make contact to open armature contact of relay D. Thus the relays B and C will remain operated and

relays A and D released until the line is next opened. When the line is opened, the relay RR will operate to contact 2 and relay D will operate. This will close the locking path of relay C and open the locking path of relay B. Relay B will release and open the operating path of relay C which will remain locked over the contacts of relay D. Since relay D is of the slow-release type, it will remain operated until the line is closed and the relay RR operated to contact 1. Relay C remains operated and relay D remains operated and consequently magnet 16 remains energized during the five break pulses. Relay D will remain operated since the closed periods of the line between five break pulses will be of short duration. After the last pulse and the line is closed, the relay D will finally release and open the locking circuit of the relay C. When relay C releases, the receiving relay armature will be on contact 1 owing to the previous closure of the line T, R and the magnet 16 will not be released. It is necessary that the local or distant station operator or the switchboard operator send at least one break signal pulse or a series of five break signals following the motor stop combination. Otherwise, the motor can not be started again by a single break impulse.

If the local power source S used to operate the motor M fails, the motor may be started when the power comes on again. In such case the motor may be stopped locally or from the central office by the usual procedure.

The central office line terminating equipment in the case of a disconnect signal from the subscriber operates as follows: Lamp 5, which is a "busy" lamp will be lighted under control of operated relay 6; relay 3 will be released and lamp 4 dark. When key K is operated to send five break pulses, each subsequent short closure following the first four pulses will step the selector SEL up one contact by the operation of relay E following each break. Following the fifth open pulse, the selector SEL will step to the fifth contact, the lead N will be closed to ground to actuate relay 205 in the cord circuit which locks up. The operating path for relay 205 is from ground, brush arm of selector SEL, lead N, ring of jack LJ, ring of plug AP or CP, winding of relay 205, left make contact of relay 201 or make contact of relay 215 to battery. The locking circuit of relay 205 by which it locks up and holds lamp 221 lighted is obvious as is the breaking of this locking circuit when the plugs AP and CP are pulled down from their associated jacks.

When the relay F releases after the fifth pulse, the selector will be restored to normal by the connection of the release magnet RLS to ground over the off-normal contacts and the contact of energized relay E.

During communication, the relay L will follow line pulses but the slow-release relay E will remain operated on all except break impulses of greater than character pulse length. When the line is closed after a break signal pulse, the selector will be advanced one step but will cause no harmful result because relay 6 is actuated and the selector will release each time the line is closed.

It will be seen that a system in accordance with the present invention is well adapted to work with systems in which a station requires five (or some other predetermined number) pulses to effect a disconnect operation and that two or more local stations of the present type may work with each other, or with systems requiring five dis-

connect pulses, or with systems in which disconnect is accomplished by a shift-shift motor stop combination followed by a single break signal pulse. An advantageous feature of the system is that short line interruptions will not result in starting the motor of the subscriber station.

What is claimed is:

1. A subscriber station arrangement for printing telegraph communication systems comprising a relay arrangement whereby the motor of the subscriber station may be set into operation by a break signal, in combination with a pull-bar contact for stopping the motor, and means including a combination of relays including a slow-release relay and fast operating relays whereby a plurality of break signals with short intervening line closures of the line after the operation of the pull-bar contact leaves the motor of the subscriber station in stop condition, said slow-acting relay being connected to prevent one of said fast operating relays from assuming motor starting position.

2. A printing telegraph station comprising a line connected to a teletypewriter machine having a motor, means for stopping said motor comprising elements responsive to a chosen code combination, a magnet associated with said machine actuatable to a position to restart said motor upon the first operation of said magnet to said position after reception of said code combination, and means comprising a combination of relays including a slow-release relay operable under the control of any indefinite plurality of break signal pulses with short intervening closures of said line following the receipt of said combination to prevent operation of said relay to motor starting position as a result of transmission over said line of said plurality of break signal pulses.

3. A subscriber station for teletypewriter communication through exchanges provided with a relay arrangement controlling contacts for starting the motor upon reception of a break signal of more than a definite duration, and a pull-bar contact for stopping the motor upon reception of a definite code combination characterized by the inclusion of instrumentalities comprising relay equipment including fast and slow-acting relays controlling the relay arrangement for starting the motor whereby a plurality of line interruptions with short intervening line closures following the transmission or reception of the special code combination leaves the subscriber station in normal idle condition with the motor thereof stopped.

4. A teletypewriter communication system comprising a central office for interconnecting lines, lines to be interconnected, a teletypewriter of the Baudot code type including a driving motor operatively connected to each line for communication thereover, automatic motor start and stop mechanism connected to the teletypewriter of one of said lines for starting said motor from said central office on open and closure of said line and stopping said motor by a code combination, and means including a slow operating device connected to the teletypewriter of said line for preventing the starting of said motor upon the receipt, with the motor stopped, of a series of line interruptions separated by less than a predetermined time.

5. A system according to claim 4 wherein said means includes a relay for placing said motor in condition to be started upon line closure of a predetermined time following said line interruption.

6. In a system in accordance with claim 4, a device at the outlying terminus of said line for sending a predetermined number of line interruptions independently of said teletypewriter and regardless of whether the motor thereof be operating or idle.

7. A system according to claim 4 including a device at the outlying terminus of said line for sending a predetermined number of line interruptions, a link circuit and a disconnect signal device at said central office, and means operative when said link circuit is connected to said line to operate said signal device in response to said series of line interruptions.

8. A station for printing telegraph communication comprising a receiving relay and a tele-

typewriter control magnet, an energizing path for said magnet operatively opened and closed under control of said relay and a separate energizing path for said magnet closed by an operated slow-release device and an unoperated relay.

9. A station for printing telegraph communication comprising a receiving relay and a teletypewriter control magnet, an energizing path for said magnet operatively opened and closed under control of said relay, a separate energizing path closed by a relay when operated, and a third energizing path closed by said relay when unoperated provided another relay is operated, said other relay being slow-release and controlled by said first-named relay.

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