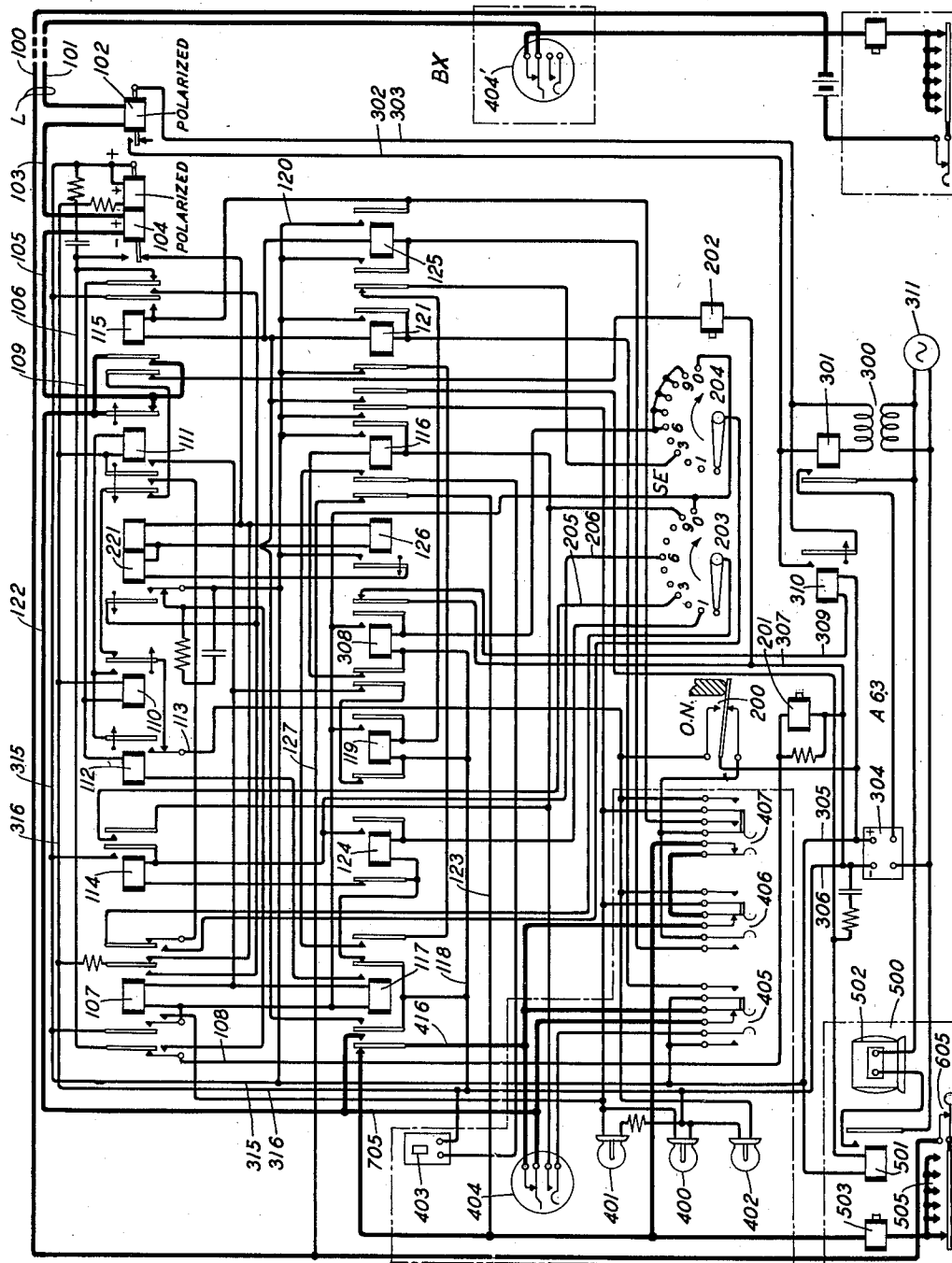


2,058,605

Filed May 28, 1935



BY

BY
J. H. Schried
ATTORNEY

UNITED STATES PATENT OFFICE

2,058,605

PRINTING TELEGRAPH SYSTEM

Cuthbert C. Lane, Little Neck, N. Y., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

Application May 28, 1935, Serial No. 23,835

8 Claims. (Cl. 178—2)

This invention relates to the art of telegraph communication and particularly to selective calling and remote control circuit arrangements at each of a plurality of stations connected in series in a normally closed loop circuit of a printing telegraph system.

An object of the invention is to convert upon the initiation of a call from any one of the plurality of stations, an alternating current source of power at each of said stations into a suitable rectified current for operating at each of the stations, a selective calling circuit whereby the desired station is connected for communication with the calling station.

Another object is to employ the source of alternating current only at such times as the system is in use for initiating a call and transmitting messages.

Heretofore, in systems of this character, that is, in systems wherein a plurality of stations are connected in series in a transmission line, a source of direct current was continuously connected at each of the stations for normally maintaining the calling and control arrangements at each of the stations in an operated condition, thereby increasing the expense of operation.

According to the present invention, the transmission line which is normally energized includes in series connection at each of the stations, two polarized relays, one of which is held in a normally operated position and the other in a normally unoperated position. In initiating a call, the line is momentarily opened at the calling station whereby the normally unoperated relays operate to prepare each of the selective calling circuit arrangements for the reception of the code signals of the desired station which are transmitted from the calling station subsequent to the opening of the line, and the normally operated relays release to close the circuits for connecting the rectified current sources for operating the selective calling circuits to the position where each is capable of responding to the code signal of the desired station. The printer set of the desired station only will be automatically connected, in response to its code signal, to the calling station. It is obvious that only one station in the system may establish a connection at any one time, there appearing at each of the stations a busy signal indicating that the line is engaged. However, the system is adapted to permit an operator to call more than one station by individual signal codes or all stations by a single code.

The invention disclosed herein is shown as being applied to a single loop circuit although it is

understood that it may readily be applied to a multi-party loop circuit operating through a special exchange provided with automatic switching devices or manually operated switchboards.

The invention as disclosed in the accompanying drawing is being applied to a party line in a printing telegraph system such as disclosed in U. S. Patent 1,946,216 granted to F. S. Kinkead on February 6, 1934. In that patent, a station A63 is shown on a line with one other station BX, it being understood that any number of stations within the limits hereinafter specified may be connected to the line. All the apparatus at the station A63 is diagrammatically indicated whereas only the principal essential elements at the station BX are shown. In the drawing the main line circuit in the normally idle condition is shown in continuous heavy lines and the remaining conductive connections are shown in lighter continuous lines.

The system disclosed in the Kinkead patent, supra, may be operated to perform the following functions:

1. One or more stations may be called by individual codes from any other station or all stations may be called by a single code.

2. Complete remote control of the teletypewriter motor circuit is provided.

3. Teletypewriter signals will not cause false selections of the station selecting apparatus.

4. A calling signal is operated at all called stations to indicate that the station is being called.

5. A lamp is lighted whenever the circuit is being employed to call stations to give a warning that calling operations are going on.

6. A busy signal is displayed at all stations when the telegraph circuit is in use for communication.

7. At any time during operation of the teletypewriters additional stations may be called in on the line without the necessity of redialing those originally called.

8. At the completion of any communication, any operator may stop all stations and restore the apparatus thereat to normal by a single operation.

9. Complete remote control for the current supply for the circuit is provided.

The principal apparatus at each station consists of the usual teletypewriter machine diagrammatically indicated within the rectangle 500, a calling dial 404, main line relays 102 and 104, step-by-step selector switch SE, busy and guard lamps 400 and 402, respectively, an alternating current supply 311, an alternating current recti-

fier 304, together with various relays and other equipment.

Considering the station A63, the main line circuit may be traced from conductor 101 of the line L, winding of relay 102, conductor 103, left-hand winding of relay 104, conductor 105, the right back contact of relay 111, conductor 122, the back contact of the dial and release key 405, the left back contact of relay 117, conductor 123, the left back contact of relay 116, conductor 127, to conductor 100 of line L.

Normally, all relays are released except relays 102 and 104.

General outline of operation

Let it be assumed that the apparatus is in normal position and it is desired to call another station. The operator at the calling station operates a dial and release key similar to key 405 at station A63, or what is assumed herein to be a called station, and the code of the desired station is dialed on a calling dial, such as dial 404' shown at station BX. When the key 405 is operated, the calling dial has its operating contacts included in the main line circuit. After the code of any desired station, the digit "1" is dialed except that in the case of the last station of several which are to be called in upon the line, the digit "0" is dialed. A guard lamp at the calling station BX, similar to lamp 402 shown at the called station, is lighted during the dialing of each code digit and extinguished during the intervals between dial operations. This occurs because whenever the selector switch at the calling station BX, similar to switch SE at the called station is off-normal, its off-normal contact 200 closes the circuit of the guard lamp 402 to positive potential. If the guard lamp remains lighted, it indicates an open signal line circuit because an open line will cause every selector SE upon the line to remain advanced one step and consequently the off-normal contacts 200 of every selector will furnish a positive potential and light every lamp 402. After the "0" is dialed, the busy lamp 400 and the auxiliary busy lamp 401 will light at all stations, indicating that the circuit is in use.

To call all stations upon the line, the code number "90" is dialed.

After the dialing operation is completed for any desired number of stations by dialing "0", the teletypewriter motors of the called and calling stations will start and an audible signal will be given at all called stations. This audible signal may be stopped by operating the key 405. Teletypewriter communication may now be carried on by any of the called stations or the calling station without any further effect on the selectors. Accidental operation of the dials at any of the stations will not interrupt the teletypewriter communication.

A recall key 407 is employed if it is desired to call additional stations without redialing those originally called. When operated, this key causes three break signals to be transmitted, all the teletypewriters stop and all of the busy lamps 400 will be extinguished. The means for causing three break signals to be transmitted is hereinafter described under caption "Calling in additional stations after communication has commenced." Additional stations may then be dialed in the usual manner of dialing an additional station. When the dialing of the additional stations is completed, the dialing of "0" starts the motors at all stations just called as well as the previously called

stations and the calling station. The audible signals 403 at the called stations will operate and the busy lamps 400 at all stations will light.

When the final message is completed, the operator at any station may stop all stations by operating the stop key 406 which causes the circuit to transmit five break signals as hereinafter described under caption "Stopping all stations". This causes all the teletypewriters to stop, all lamps to be extinguished and all the apparatus to return to normal.

Start of operation

Considering the station A63 (which typifies a station whose call designation is 63) to be called, it will be noted first that all relays are in their released positions except the relays 102 and 104. Relays 102 and 104 are polarized relays and are operated to their lower contacts by current flowing over the line L. When another operator on the line dials the first digit "6", the relays 102 and 104 follow the dial pulses. During each open period of the line, relay 102 in following the pulses closes its upper contact, thereby completing a circuit through conductor 303, the upper winding of the bell ringing transformer 300, winding of relay 301, conductor 302, thereby causing relay 301 to become energized. Operation of relay 301 closes the input circuit to a type of rectifier 304, such as referred to in U. S. Patent 1,867,638, granted to A. Weaver on July 19, 1932, and which will function to supply positive and negative potential to the apparatus at station A63. Positive potential is supplied to the station over conductor 305 and negative potential is supplied to the station A63 over conductor 306. Slow-to-release relay 310 operates from the output of the rectifier 304 in a circuit extending from the positive terminal of the rectifier 304 through the winding of relay 310, the right outer back contact of relay 308 to the negative terminal of rectifier 304. Operation of the relay 310 closes a locking circuit for relay 301 in series with the upper winding of transformer 300. Relay 310 being of the slow-to-release type remains operated during the train of pulses and as long as the relay 308 is not operated, thereby keeping relay 301 locked in the operated position to insure the functioning of rectifier 304 during the reception of the train of pulses. Relay 104, during the open period of the line, closes a circuit from conductor 305 through the upper contact of relay 104, conductor 106, the left back contact of relay 107, conductor 108, the winding of the rotary magnet 201 of selector switch SE to the negative terminal of rectifier 304. Closure of the upper contact of relay 104 also completes a circuit from positive potential on its armature to the right back contact of relay 115, conductor 109, winding of relay 110, to negative potential on conductor 306. The rotary magnet 201 operates and steps the wipers up one contact for each pulse. Relay 110, however, being slow-to-release remains operated during the train of pulses. When operated, relay 110 applies a positive potential to the winding of relay 111 and causes relay 111 to operate over a circuit extending from negative potential on conductor 306, winding of relay 111, the right front contact of relay 110, the right back contact of relay 112, conductor 113, the front contacts of off-normal springs 200 to the positive terminal of rectifier 304. After the last pulse, the relay 110 releases and applies a positive potential from conductor 113 through the right back contact of relay 112, the right back contact of relay 110, the left outer front contact 75

of relay 111, the right outer back contact of relay 107 to the wiper of arc 203 of the selector SE. At the last pulse, the wiper is on the sixth contact and, therefore, positive potential will be applied to the winding of relay 114 and the circuit will be completed through the left back contact of relay 124, the right back contact of relay 117 to negative potential on conductors 118 and 306. The relay 114 operates and locks through a locking circuit closed over its right inner front contact to positive potential on conductor 305. The guard lamp 402 is lighted over a circuit extending from positive potential on the rectifier 304 through the front contacts of the off-normal springs 200, filament of lamp 402 to negative potential on conductor 306, while the selector SE is off-normal.

The operation of restoring the selector to normal after dialing of the first digit is as follows: The slow-to-release relay 110, upon releasing, removes positive potential from the winding of slow-to-release relay 111. When the relay 111 releases, it opens the circuit from positive potential to the first wiper and applies a positive potential from conductor 113, the right back contact of relay 112, the right back contact of relay 110, the left back contact of relay 111, the left outer back contact of relay 115, winding of release magnet 202 to negative potential on conductor 306. The release magnet 202 operates and the selector SE is restored to the normal position where the front contacts of the off-normal springs 200 open the energizing circuit for the release magnet 202 which is then deenergized.

When the second digit "3" is dialed, relays 110 and 111 function as outlined above in describing the operation following the dialing of digit "6". The selector SE steps up to the third position and positive potential is to be applied to the winding of relay 116 over a circuit extending from positive potential on conductor 113 through the right back contact of relay 112, the right back contact of relay 110, the left outer front contact of relay 111, the right outer back contact of relay 107, the wiper and the third bank terminal of arc 203, the right outer front contact of relay 114, the winding of relay 116, the left inner back contact of relay 308 to negative potential on conductor 306. Relay 116 operates and locks to positive potential through its right inner front contact. The selector SE will be restored to normal in the same manner as described above in connection with dialing of the digit "6". The relay 116 closes a circuit from negative potential on conductor 306 through the filament of busy lamp 400, the right middle front contact of relay 116 to positive potential on conductor 305. This causes busy lamp 400 to light. The auxiliary busy lamp 401 is connected in parallel with busy lamp 400 and is lighted over the same circuit. The closure of the left front contact of relay 116 partly completes a circuit to the audible signal 403 which will hereinafter further be described. Closure of the right outer front contact of relay 116 partly establishes a circuit to the power relay 501, which will also be hereinafter described.

When the digit "0" is dialed, relays 110 and 111 will function as heretofore described when the digit "6" is dialed and a positive potential will be applied to the relays 107 and 117 in a circuit extending from conductor 113 through the right back contact of relay 112, the right back contact of relay 110, the left outer front contact of relay 111, the right outer back contact of relay 107, the wiper and tenth bank terminal of arc 203, the windings of relays 107 and 117 connect-

ing in parallel, the left inner front contact of relay 111 to negative potential on conductor 306. The relays 107 and 117 are held operated through the left inner front contact of relay 107 supplying a positive potential from conductor 305. In operating, the relay 107 short-circuits the right middle front contact of relay 116 which controls the busy lamps 400 and 401. The rotary magnet 201 of the selector SE will be transferred from the upper contact of relay 104 to the left outer front contact of relay 107. The circuit through the left outer front contact of relay 111 is transferred from the wiper of the first arc 203 to the wiper of the second arc 204 by the operation of the right outer transfer springs of relay 107. The operation of relay 117 opens the holding circuit for relay 114 at the right back contact of relay 117 and the relay 117 also short-circuits the pulsing contacts of the dial 404 over a circuit extending through the left outer front contact of relay 117.

Relay 117 causes motor circuit to start

Relay 117, in operating, also completes a circuit to the audible alarm 403 from negative potential on conductor 306 through the winding of alarm 403, the left front contact of relay 116, the right outer front contact of relay 117, the left back contact of relay 121 to positive potential on conductor 305. Relay 117 also closes a circuit from negative potential on conductor 306 through the left inner front contact of relay 117, the right outer front contact of relay 116, winding of power control relay 501 to positive potential on conductor 305. Operation of relay 501 closes the circuit from the source of alternating current supply 311 to the teletypewriter motor 502 which operates and permits messages to be transmitted by operating the keys in the usual manner. The audible alarm 403 may be stopped by operating the dial and release key 405 which causes relay 124 to operate over a circuit established from positive potential on conductor 305, the right front contact of the dial and release key 405, winding of relay 121, the left front contact of relay 117 to negative potential on conductor 306. Relay 121 locks to positive potential through its right front contact from conductors 305 and 120. Opening the left back contact of relay 121 opens the circuit to the audible alarm 403.

Stopping all stations—Operation station sending the stop signal

When it is desired to stop all stations and clear out all connections preparatory to making the next call, the stop key 406 is operated and held operated until the guard lamp 402 lights over the circuit established from negative potential on conductor 306, through the filament of guard lamp 402, the right front contact of stop key 406, the right middle front contact of relay 116 to positive potential on conductor 305. When the stop key 406 is operated, a circuit is established for energizing the relay 125 from negative potential on conductor 306 through the left inner front contact of relay 117, winding of relay 125, left front contact of stop key 406, the back contacts of off-normal springs 200 to positive potential on conductor 305. Relay 125 is energized and locks through its left front contact to positive potential on conductor 305, which is applied over conductor 120. Closure of the right front contact of relay 125 establishes a circuit from positive potential on conductor 120 to the winding of relay 115, the left inner front contact

of relay 117 to negative potential on conductor 306. Relay 115 is energized and locks through its right inner front contact to positive potential on conductor 305. Opening of the left outer back contact of relay 115 opens the circuit through the release magnet 202. Opening of the left inner back contact of relay 115 opens the short circuit around the right back contact of relay 111. Closure of the right outer front contact and opening of the right back contact of relay 115 transfers the circuit through the winding of relays 112 and 110 from the upper contact of the relay 104 to the left front contact of relay 221. As the relay 221 is operated at this time, the relays 112 and 110 operate. When the stop key 406 is operated, the line circuit is opened by the opening of the back contact of stop key 406 thereby permitting relays 102 and 104 to release. Release of relay 102 performs no function at this time as the alternating current supply is locked into the circuit by relay 301 which is held operated by relay 310 which in turn is held operated under control of the right back contact of the relay 308. When the relay 104 releases, the upper contact of relay 104 closes but performs no function at this time. The lower contact of relay 104 opens and permits relays 126 and 221 to become deenergized and release. Relay 221, in releasing, opens its left front contact and removes the positive potential from the windings of relays 112 and 110 which relays now release. Release of relay 221 also closes a circuit from negative potential on conductor 306 through the winding of rotary magnet 201, the left outer front contact of relay 107, the left back contact of relay 121 to positive potential on conductor 120. The rotary magnet 201 is energized and takes one step.

Operation of stop key 406 establishes a circuit from positive potential on conductor 120 through the right middle front contact of relay 116, right front contact of stop key 406, conductor 113, right front contact of relay 112, winding of relay 111 to negative potential on conductor 306. Relay 111 will operate and open the line circuit through its right back contact. The relays 112 and 110 are slow to release and hold operated for a sufficient time to permit positive potential at the off-normal springs 209 to operate the relay 111 if the stop key 406 is operated only momentarily. This same positive potential causes the guard lamp 402 to light in a circuit through the off-normal springs 209 as outlined heretofore. The lighting of the guard lamp 402 indicates that the stop key 406 may be released. The relay 111 will remain operated long enough to insure complete release of relay 221 and the operation of rotary magnet 201. When the relays 112 and 110 release, relay 111 closes the line circuit through its right back contact thereby causing relays 104 and 102 to operate to their lower contacts and cause relays 221 and 126 to operate. By this sequence, the line has been opened for a period equal to the sum of the release times of relays 104, 126, 221, 112 and 111 plus the operate time of relay 115 at the originating station. Subsequent breaks in the line will not include the operate time of relay 115. The closed period of the pulse is for the duration of the operating time of relays 104, 221, 112 and 111 at the originating station. In the following sequence, the relay 126 operates the relays 112 and 110 which again, in turn, operate the relay 111, which again opens the line L and permits relay 104 to close its upper contact. The relay 104 releases the re-

lays 126 and 221 and the relay 221 energizes the rotary magnet 201 and steps the selector to the second bank terminals. This sequence of operations continues until the selector reaches the fifth bank terminal to which relay 308 is connected. When the wiper of the selector SE makes contact with the fifth bank terminal of arc 204, the relays 112 and 110 release and establish an operating circuit for relay 308 from positive potential on conductor 113 through the right back contact of relay 112, the right back contact of relay 110, the left outer front contact of relay 111, the right outer front contact of relay 107, the wiper and fifth terminal of arc 204, winding of relay 308 to negative potential on conductor 118 which connects to conductor 306. When the relay 308 operates, it opens the holding circuit through its left inner back contact to relay 116 which releases and opens the circuit to the power control relay 501 which releases in turn and opens the circuit to the typewriter motor 592. The relay 308 also opens one side of the parallel holding circuit of relays 107 and 117. When the slow-to-release relay 111 releases, it closes the signal line through its right back contact but opens the other side of the holding circuit which releases the relays 107 and 117 which in turn cause the release of relays 125, 115 and 308. Relay 111 also prepares a circuit to the release magnet 202 of selector SE which is completed when the left outer back contact of relay 115 is closed, thus operating the release magnet 202 and returning the selector to normal. The release of relay 115 short-circuits the right back contacts of relay 111. The release of relay 115 also releases relay 125 and transfers the operating circuit for relays 112 and 110 to the upper contacts of relay 104. The relay 308 also opens the locking circuit through the winding of relay 310, thereby permitting it to release and open the locking circuit for relay 301 which now releases. Release of relay 301 opens the alternating current supply circuit to the rectifier 304, thereby permitting all relays and the magnet 202 to become deenergized. The entire selector circuit is now restored to normal and ready for the next call.

Calling in additional stations after communication has commenced

If, after one or more stations have been called in upon the line and communication has commenced, it is desired to call additional stations, use is made of the recall key 407. The recall key 407 functions differently from the stop key 406 in that the recall key 407 does not operate the relay 125 and thus when the selector wiper of the bank 204 reaches the third terminal, a circuit is closed through the relay 119 which causes that relay to operate. This circuit is from negative potential on conductor 118, through the winding of relay 119, the left back contact of relay 125, the third bank terminal and the brush of arc 204, the right outer front contact of relay 107, the left outer front contact of relay 111, the right back contact of relay 110, the right back contact of relay 112 to positive potential on conductor 113. The relay 119, in operating, opens the holding circuit of the relays 107 and 117. When the relay 117 releases its left inner front contact opens and releases the relay 115 which prepares a circuit through the release magnet 202 from positive potential on conductor 113, the right back contact of relay 112, the right back contact of relay 110, the left back con-

tact of relay 111, the left outer back contact of relay 115, winding of release magnet 202, conductor 307 to negative potential on conductor 306 so that, when relays 112 and 110 release, the release magnet 202 operates and the selector SE returns to normal. When the relay 107 releases, as described hereinbefore, it transfers the circuit to the rotary magnet 201 from the contact of slow-to-release relay 115 to the upper contact of relay 104. This makes the circuit responsive to dial pulses so that additional stations may now be called in. When the final digit "0" is dialed, the teletypewriter motors at the additional stations as well as those originally called start and messages may be transmitted in the manner outlined heretofore. The audible signal 403 also is operated.

Operation at stations being stopped

As the stop signal consists of opening and closing the signal line five consecutive times, the duration of the open pulse being determined by the sum of the release times of the relays 104, 126, 221, 112 and 111 at the originating station and the closed pulse is determined by the sum of the operate times of the relays 104, 221, 112 and 111. When the signal line circuit at any station is opened by operation of the stop key 406, the operation at all the other stations connected to the circuit will be as follows: When the line circuit is opened the relay 104 releases and opens its lower contact, thereby opening the holding circuit for the relays 221 and 126 and closes its upper contact thereby closing the circuit to the relays 112 and 110. When the relay 121 releases, it closes the circuit through its left back contact and the left outer front contact of relay 107 to the winding of the rotary magnet 201 which energizes and steps the selector SE to the first bank terminal. The off-normal contact springs 200 are then closed and establish a circuit from positive potential on conductor 305 through the front contacts of off-normal springs 200, conductor 113, the right front contact of relay 112, the winding of relay 111 to negative potential on conductor 306 thereby causing relay 111 to become energized. When the signal line is again closed, the relay 104 operates to its lower contact and closes the circuit for the operation of the relays 121 and 126 and opens the circuit through the windings of relays 112 and 110 as outlined heretofore. Relay 112 is of the slow release type and holds operated during the short closed period of the line. After this short closure, the line is again opened at the station sending the stop signal and the above sequence of operations is reproduced. After the last open pulse the line remains closed, thus allowing the relays 112 and 110 to release and open the holding circuit to relay 111. The relay 111, being of the slow-to-release type, remains operated a short period of time after the relay 112 opens its circuit and thus provides a temporary path from positive potential at the selector off-normal contacts 200, through conductor 113, the right back contact of relay 112, the right back contact of relay 110, the left outer front contact of relay 111, the right outer front contact of relay 107, the wiper and fifth bank terminal of arc 204, winding of relay 308, conductor 113, to negative potential on conductor 306, thereby operating the relay 308. The relay 308 operates, releases the relay 116, and locks through its own right front contact and the left inner front contacts of relay 107 to posi-

tive potential on conductor 305. Relay 308 opens the locking circuit for the relays 107 and 117 and holds operated only until the relay 111 releases and causes the release of the relay 107 which opens the locking circuit for relays 107, 117 and 308. The release of the relay 116 opens the circuit to the busy lamp 400 and also the circuit to the relay 121 and the relay 501 thereby stopping the teletypewriter motor. Operation of relay 308 also opens its right back contact thereby opening the locking circuit for the relay 310 which releases and opens the locking circuit for the relay 301. Relay 301, in releasing, disconnects the alternating current supply from the rectifier 304 and restores the selector circuit to normal ready for the next call.

Operation at other station in recalling

In case the recall key 407 is operated, the operation of relays 104, 126, 221, 112, 110 and 111 is the same as for sending the stop signal. As the recall signal consists of only three pulses the selector wiper will be stepped to the third bank terminal to which the relay 119 is connected when the relays 112 and 110 release. When the relays 112 and 110 release, the relay 111 is slow to release and a circuit is closed from negative potential on conductor 118 through the winding of relay 119, the left back contact of relay 125, the third bank terminal and the brush of arc 204, the right outer front contact of relay 107, the left outer front contact of relay 111, the right back contact of relay 110, the right back contact of relay 112, conductor 113, the off-normal springs 200 to positive potential on conductor 305. The relay 119 operates and unlocks and releases relays 107 and 117, thus rearranging the circuit so that additional stations may be dialed in upon the line. However, the stations already dialed remain connected.

Operation at uncalled station

If any code other than "63" is dialed by another station, the relay 116 at the station A63 will not be operated which thus prevents operation of the audible signal 403 and the teletypewriter motor 502 when the "0" is dialed.

The digit "1" must be dialed between individual station codes to clear out partial selections. After "1" is dialed, the relay 124 will operate and in turn release the relay 114 at all stations, if it happens to be operated.

After dialing "0" the relays 107 and 117 will be operated at all stations. At all uncalled stations these relays will be released when a series of three or five pulses are transmitted as the result of the operation of the stop key 406 or the recall key 407 as hereinbefore described.

Operation at a calling station

When the calling operator moves the dial 404 off normal, positive potential will be supplied to the relay 116 which operates and locks. When "0" is dialed, the relays 107 and 117 operate and the relay 117 closes a circuit to the motor control relay 501 which starts the teletypewriter motor 502. When the dial and release key 405 is operated, a circuit will be closed from positive potential on conductor 305, through the left front contact of the dial and release key 405, the off-normal contacts of the dial 404, winding of the relay 116, the left inner back contact of relay 308, conductor 113 to negative potential on conductor 306 thus causing relay 116 to operate. A circuit

will also be closed through the right front contact of the dial and release key 405 through the winding of relay 121, left inner front contact of relay 117, conductor 118 to negative potential on conductor 306. Relay 121 operates and opens the circuit to the audible signal 403, thereby preventing the operation of this signal at the calling station.

Broadcasting

When "90" is dialed, the relays 116 at all stations will operate because their windings are connected to the 9th contacts of the first bank of selectors. Thus, all stations may be dialed in for broadcasting by dialing one single code call.

Any number from 2 to 8, inclusive, may be used for the first digit of station codes.

Any number from 2 to 8, inclusive, may be used for the second digit of the station codes except the one which has been used for the first digit. The code to which the selector circuit of a station will respond is determined by segments to which the leads 205 and 206 are connected.

It will be noted that a very convenient party line teletypewriter circuit is provided by the system in which only desired stations are called in upon the line. Disconnection is accomplished by a single operation on the part of the operator and likewise a single operation suffices to prepare the circuit for calling in additional stations without redialing those originally called.

What is claimed is:

1. In a signaling system, a combination of a normally closed transmission line, normally operated means in said transmission line, normally unoperated means associated with said transmission line, other means for momentarily opening said line whereby said normally operated means is released, a source of alternating current, driving means and a normally open operating circuit therefor directly connected to said source, a plurality of electromagnetic elements connected to said source and arranged to be energized in response to the movement of the normally operated means to an unoperated position, a locking member for said electromagnetic elements, a device controlled by said electromagnetic elements for converting the current from said alternating current source to a direct current, said electromagnetic elements in their energized condition being arranged to maintain the continuous flow of direct current from said current converting device and to thereby cause the operation of said normally unoperated and said driving means, and manually operated switching means for causing the release of said locking member whereby the plurality of electromagnetic elements are deenergized, said current converting device ceases as a current supply and said driving means ceases to operate.

2. In a signaling system according to claim 1, wherein the normally unoperated means comprises an electromagnetic device controlled by said current converting device for maintaining the operating circuit for said driving means closed until the manually operated switching means is operated.

3. In a signaling system, a transmission line, a station associated therewith, a source of alternating current at said station, normally unenergized means for rectifying the current from said source, means at said station responsive to a signal received over said transmission line to energize said normally unenergized means to thereby furnish rectified current, and other means at

said station responsive to a special signal received over said transmission line to energize said normally unenergized means to thereby furnish rectified current.

4. In a signaling system, a transmission line, a plurality of stations associated therewith, a source of alternating current at each of said stations, normally inert means for rectifying the current from said source, means at each of said stations and responsive to a signal received over said transmission line to render said normally inert means effective to furnish rectified current, and other means at each of said stations and responsive to a special signal received over said transmission line to render said normally inert means ineffective to furnish rectified current.

5. In a signaling system, a combination of a transmission line, a plurality of stations associated therewith, a selector switch at each of said stations, a source of alternating current at each of said stations, normally inert means for rectifying the current from said source, means at each of said stations responsive to a signal received over said transmission line to render said normally inert means effective to furnish rectified currents for preparing said selector switch for operation, other means at each of said stations responsive to special signal of different character received over said transmission line to permit said rectified currents to be used for operating to a predetermined position and for restoring to normal position, respectively, said selector switches.

6. In a signaling system, a combination of a transmission circuit, a source of signals of varying character accessible to said transmission circuit, a plurality of stations associated with said circuit, a signaling device at each of said stations, a selector switch at each of said stations, a source of alternating current at each of said stations, normally inert means for rectifying the current from said source, means in each of said stations responsive to a signal of one character received over said transmission line to render said normally inert means effective to furnish rectified current for preparing said selector switch for operation, and other means at each of said stations selectively responsive to a certain group of varying signals received from said signal source to connect the signaling device at a desired station with the signal device at the station originating the connection whereby said transmission circuit may be completed through said plurality of stations for signaling purposes between any two of said stations.

7. In a signaling system, in accordance with claim 6, wherein said other means at two or more stations comprise arrangements controlled by the rectified current from said normally inert means and selectively and respectively responsive to a plurality of groups of varying signals received from said signal source to connect the signal devices at said two or more stations with the signaling device at the station originating the connection whereby said transmission circuit may be completed through said plurality of stations for signaling purposes between three or more of said stations.

8. In a signaling system, a combination of a transmission line, a source of open and closed signals connected to said transmission line, a plurality of stations associated with said lines, each of said stations being associated with said lines over a plurality of paths, a signaling device at each of said stations, a selector switch at each of said

stations, a source of alternating current at each of said stations, normally inert means for rectifying the current from said source, means in each of said stations responsive to an open signal
5 received over said transmission line to render said normally inert means effective to furnish rectified current for preparing said selector switch for operation, means at each of said stations selectively responsive to different groups of open and
10 closed signals received from said signal source for

completing any desired path of said plurality of paths at one of said stations to select the signaling device at said one of said stations whereby said transmission line may be completed between the signaling device at said one of said stations and
5 the selected signal device at another of said stations through said plurality of stations.

CUTHBERT C. LANE.