

Aug. 16, 1932.

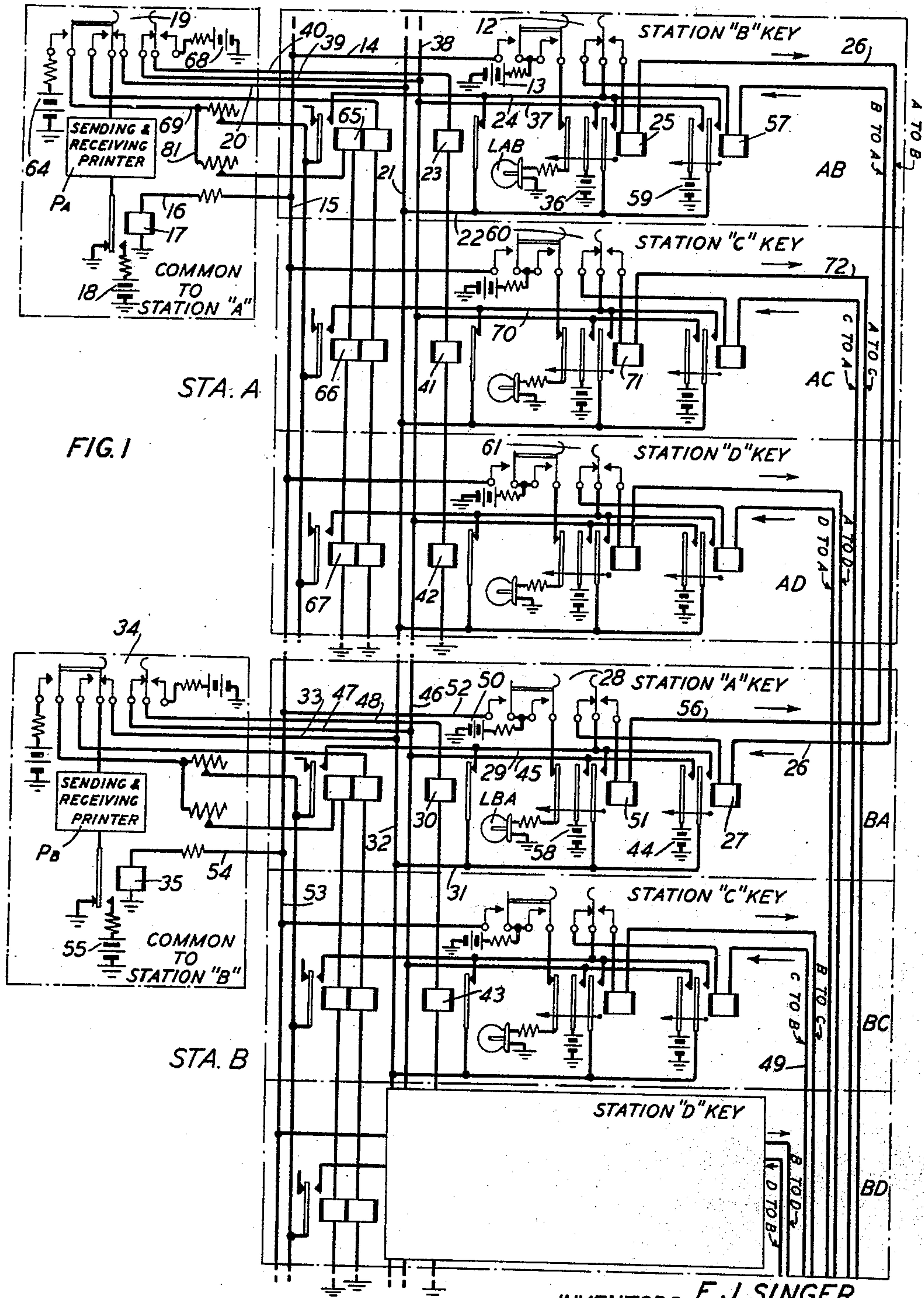
F. J. SINGER ET AL

1,871,923

PRINTING TELEGRAPH SYSTEM

Filed Sept. 22, 1931

2 Sheets-Sheet 1



INVENTORS: F. J. SINGER
L. A. GARDNER

BY

George
ATTORNEY

Aug. 16, 1932.

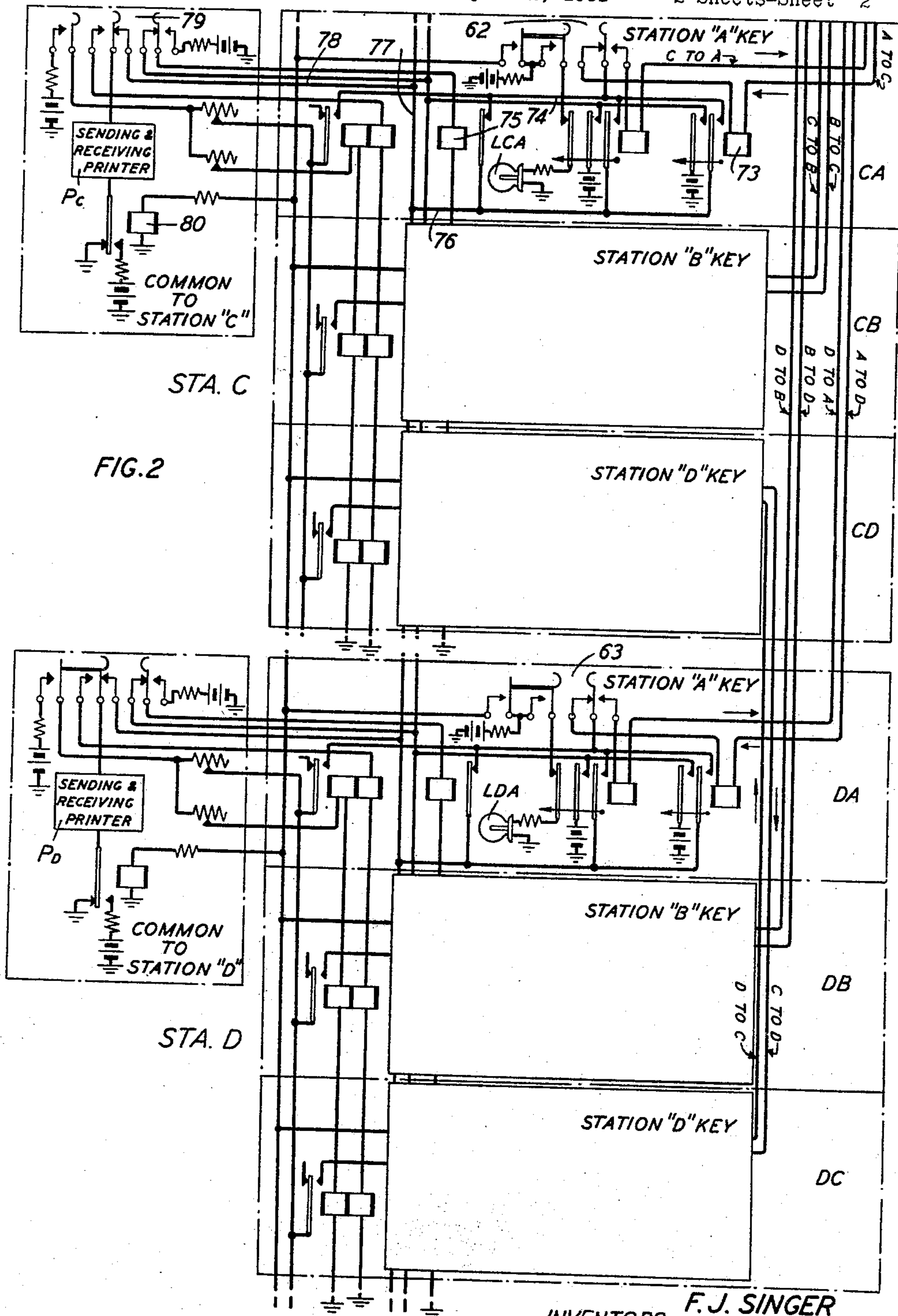
F. J. SINGER ET AL

1,871,923

PRINTING TELEGRAPH SYSTEM

Filed Sept. 22, 1931

2 Sheets-Sheet 2



INVENTORS: F. J. SINGER
L. A. GARDNER
BY *ge 404c*
ATTORNEY

UNITED STATES PATENT OFFICE

FRED J. SINGER, OF ROCKVILLE CENTER, NEW YORK, AND LELAND A. GARDNER, OF MAPLEWOOD, NEW JERSEY, ASSIGNORS TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

PRINTING TELEGRAPH SYSTEM

Application filed September 22, 1931. Serial No. 564,436.

This invention relates to printing telegraph systems and more particularly to private intercommunication systems.

5 An object of the invention is to provide a simple, efficient, and economical private intercommunication system for transmitting telegraphic signals between printers at separated stations.

10 Another object of the invention is to start and stop the printer motor at a called station from the sending apparatus at the calling station.

15 Still another object is to selectively establish from any station in the system connections with two or more separated stations for broadcast purposes.

20 Another object is to make it impossible for a calling station to interrupt or cut in on a communication between two or more other stations.

25 Another object is to make a flexible intercommunication system whereby other stations may be added as desired without changing the design of the system.

30 Another object is to employ a normally opened transmission line in an intercommunication system operating on an automatic basis.

35 Heretofore in private intercommunication systems employing printing telegraph equipment and operating on an automatic basis, complicated switching mechanisms were required to establish connection between printers at separated stations. Considerable time was consumed in establishing the connection, particularly in the systems wherein selective rotary step-by-step switches were used. Furthermore, the auxiliary apparatus required for testing idle and busy conditions of a called station were equally complicated and expensive.

40 According to the present invention, no complicated or expensive apparatus is required other than a sending and receiving printer at each station as is required in the older systems over which the present system is an improvement. The present invention provides a system wherein a plurality of stations may be interconnected, as desired, automatically. Each station in the system is

provided with a calling key for each of the other stations and when the key associated with any one desired station is operated, a normally opened line extending to the desired station is immediately closed, provided, of course, the desired station is not busy at the time. The operation of the key momentarily lights a "busy" lamp at the calling station, but should the desired station be found busy, the lamp will remain lighted indicating to the attendant at the calling station that the called station is busy. The closing of one line circuit opens all the line circuits extending from the calling and called stations to all the other stations in the system so that a third station cannot complete a call to either of the interconnected stations. Separate line circuits are required for sending and for receiving at each station, to each of the other stations in the system. When the stations are idle the printer circuits are open but when a calling station operator calls another idle station by operating the called station key at his station, the printers at both stations are connected in series in a closed circuit. The printers are provided with control arrangements which permit starting on a closure after an open condition of the line. The operation of the called station key at the calling station closes the circuit through the two printers and will therefore start both printer motors. The printers are also provided with a mechanical control feature so that transmission of a special printer code signal stops the motors. Before disconnecting at the end of a message the operator at either station sends this code signal to stop the printer motors. Two or more stations may be selectively connected to a calling station in which event two or more busy lamps respectively associated with the called stations and located at the calling station are lighted when the calling keys are operated.

A feature of this invention is the arrangement whereby the lines connecting two or more stations are normally opened, thereby preventing current flowing in the lines except when signals are being transmitted.

Another feature is the provision of a lock-out arrangement whereby a calling station is

prevented from interrupting an established connection between two other stations.

Another feature is the selective broadcast arrangement wherein any station may broadcast to any or all stations in the system.

Another feature is the provision of a group lock-out arrangement whereby a calling station is prevented from interrupting another station which is engaged in a broadcast connection.

Another feature is the arrangement wherein a calling station is notified immediately upon operating a key individual to a called station as to whether or not the called station is idle.

Another feature is the provision of a lock-out arrangement whereby a calling station is prevented from establishing a connection to more than one other station except when a broadcast connection is desired.

A preferred embodiment will now be described with respect to the accompanying drawings which illustrate an intercommunicating system comprising four stations, each equipped with type printing telegraph apparatus.

Figure 1 of the drawings shows the equipment at two stations, A and B, whereby one may be connected to the other or with either of two other stations;

Fig. 2 shows the equipment at two other stations, C and D, wherein one may be connected to the other or to either of stations A and B. Equipment is also shown at each station for providing facilities for broadcasting to the other station.

Only so much of the equipment as is necessary to give a clear understanding of the invention is shown.

Referring to Fig. 1, the upper half of the arrangement shows the equipment for station A and the lower half shows the equipment for station B. In the upper left hand corner of the upper half is shown a sending and receiving printer set for station A which is arranged to be connected through the circuit arrangements respectively shown in blocks AB, AC and AD, to stations B, C and D. In the upper left hand corner of the lower half is shown a sending and receiving printer set for station B which is arranged to be connected through the circuit arrangements respectively shown in blocks BA, BC and BD, to stations A, C and D.

The printer set at each station may preferably be of the start-stop type such as disclosed in United States Patent 1,745,633 granted to S. Morton et al. on February 4, 1930. This type of printer is equipped with a control arrangement for permitting it to start when the interconnecting line is closed and to stop in response to a special code signal.

The circuit arrangements shown in blocks, such as those designated AB, AC and AD at

station A and provided at each station for establishing connections to each of the other stations, each comprises a calling key to a particular station, a pair of line conductors, one for use when the station calls another particular station, and the other for use when the station is called by the other station, a pair of slow release relays respectively included in the pair of line conductors, a lamp for indicating whether or not the particular station is idle at the time a connection thereto is desired, a busy relay for preventing an established connection between two stations from being interrupted by a third station, and a broadcast relay. The calling keys at each station are of the two-position locking type. The slow release relays at each station are respectively connected in series with the slow release relays at another station to which their respectively associated line conductors extend. The busy relays at each station are connected in series to a common ground. The broadcast relays at each station are likewise connected in series to a common ground.

Assuming that it is desired to connect the printer set P_A at station A to printer set P_B at station B and that station B is not busy, the attendant at station A operates key 12 which is the calling key for station B, to its alternate position. Grounded battery 13 is connected to the inner left hand contact of key 12 to complete an operating circuit for lamp LAB and the lamp lights. Grounded battery 13 is also connected to the outer left hand contact of key 12 to complete a circuit extending over conductors 14, 15 and 16 in series, through the winding of relay 17 to ground. Relay 17 operates and connects the grounded battery 18 to a circuit extending over the front contact and armature of relay 17 through the printer set P_A , innermost left hand contact of broadcast key 19, conductors 20, 21 and 22 in series, armature and contact of busy relay 23, conductor 24, the operated outer right contact of key 12, through the winding of relay 25, conductor 26 of line A to B, through the winding of relay 27, inner right hand contact of key 28 (assuming that station B is not calling station A at the time), conductor 29, contact and armature of busy relay 30, conductors 31, 32 and 33 in series, innermost left hand contact of broadcast key 34, through printer set P_B , armature and back contact of relay 35 to ground. The interconnecting circuit between stations A and B extending over line A to B is now completed. Relays 25 and 27 operate and at the outermost armature and contact of relay 25 the operating circuit for bush lamp LAB is opened, causing the lighted lamp to go out, thereby indicating to the attendant at station A that the printer set P_B is prepared to receive the message from station A. The operation of relay 25 also connects grounded battery 36 to a

circuit extending over the middle contact and armature of relay 25, conductors 37, 38 and 39 in series, inner right hand contact of key 19, conductor 40, through the windings of busy relays 23, 41 and 42, in series, to ground.

Relays 23, 41 and 42 operate. Relay 23 upon operating opens at its armature and contact the line circuit A to B but this circuit is maintained closed over a shunt path extending over the innermost armature and contact of relay 25. Likewise at station B the operation of relay 27 closes an operating circuit for a chain of corresponding busy relays, such as relays 30, 43 etc. the operating circuit extending from grounded battery 44, outer armature and contact of relay 27, conductors 45, 46 and 47, in series, inner right contact of broadcast key 34, conductor 48, through the windings of relay 30, 43 and the corresponding relay in block BD, to ground. Relays 30, 43 and the corresponding relay in block BD operate. Relay 30 upon operating opens the line A to B but the circuit is maintained closed over a shunt path extending over the inner armature and contact of relay 27. Station B is now engaged to receive a message from station A and any other station, say station C for example, from which a call to station B is initiated, is prevented from interrupting the established connection because busy relay 43 at station B is operated and the line circuit C to B is opened at the armature and contact of the relay. Similarly the operation of busy relay 41 at station A prevents station C from closing its line circuit C to A. This arrangement provides the lock-out feature wherein a third station cannot interrupt an established connection between two other stations.

When the attendant at station A operates key 12 and the circuit is closed between printers P_A and P_B the motor of printer P_B at station B and the motor of printer set P_A are started, and then the attendant at station A may begin transmitting to station B. Relays 25 and 27, which are of the slow-release type, are operated and remain operated during the transmission of message impulses from station A to station B. Likewise the attendant at station B may transmit to station A.

At the completion of the messages transmitted from station A to station B, or B to A, the attendant at either station transmits a special signal by depressing at the keyboard, a key reserved for this purpose. This special signal, known in the art as a stop signal, stops the motors at both stations. The attendant at station A then restores to normal the calling key 12. The return of key 12 to normal restores relay 17 whereby ground is substituted in place of battery 18 at the armature of relay 17, so that relay 17 may now be in condition for engagement by station B or any other station. The restoration

of key 12 also releases the relays 25 and 27. The release of relay 25 effects the release of relays 23, 41 and 42 and the release of relay 27 effects the release of relays 30, 43 and the corresponding busy relay provided in block BD. Therefore, all equipment is now restored to its normal condition.

Assuming that the attendant at station B desires to transmit to station A, key 28 at station B, which is the calling key of that station for station A, is operated. A circuit is closed extending from grounded battery 50, inner left contact of key 28, outermost contact of relay 51, through lamp LBA to ground, and the lamp lights. Key 28 also closes another circuit extending from grounded battery 50, outer left contact of the key, conductors 52, 53 and 54, through the winding of relay 35 to ground. Relay 35 operates and connects grounded battery 55 to a circuit extending over the relay armature, through printer set P_B , innermost left hand contact of broadcast key 34, conductors 33, 32 and 31, armature and contact of relay 30, conductor 29, outer right contact of key 28 (in operated position), through the winding of relay 51, conductor 56 of line B to A through the winding of relay 57, inner right contact of key 12 (in a normal position), conductor 24, armature and contact of relay 23, conductors 22, 21 and 20, innermost left contact of key 19, through the printer set P_A , to ground at the back contact of relay 17. Relays 51 and 57 which are of the slow-release type, operate. Relay 51 connects grounded battery 58 at its middle armature to a circuit extending over conductors 45, 46 and 47, inner right contact of key 34, conductor 48 through the windings of busy relays 30, 43 and the corresponding relay of block BD to ground. Relay 57 connects grounded battery 59 at its outer armature to a circuit extending over conductors 37, 38 and 39, inner right contact of key 19, conductor 40, through the windings of busy relays 23, 41 and 42 to ground. The busy relays at both stations B and A operate and the operation of relay 30 at station B and relay 23 at station A opens the line circuit B to A at two points, but this circuit is maintained closed over two shunt paths respectively extending over the innermost contact and armature of relay 51 and the inner armature and contact of relay 57.

By arranging to have all the busy relays operate simultaneously at stations between which connections or communications are established, the danger of engagement of these stations by any of the other idle stations by mistake is eliminated. Should the attendant at a transmitting station accidentally operate the calling key for any one of the other stations not engaged in the connection, no circuit to the other station would be established because of the "open condition" at the

calling station of the armature and contact of the busy relay associated with the calling key that was operated by mistake. Thus another lock-out feature is provided to guard against careless manipulation of the key-board.

The operation of relays 51 and 57 completes the line circuit B to A and the established connection also causes the printer motors at both stations to start.

In Fig. 2 is shown the essential equipment for stations C and D, the equipment being identical with that shown for stations A and B. At station C the circuit arrangements are shown for interconnecting stations A, B and D respectively with station C, the circuit arrangements being designated CA, CB and CD. At station D circuit arrangements are shown for interconnecting stations A, B and C respectively with station D, the circuit arrangements being designated DA, DB and DC.

Station A may be connected to station C by operating key 60 and to station D by operating key 61, these keys being the calling keys at station A for stations C and D respectively. Station C may be connected to station A by operating calling key 62 at station C and station D may be connected to station A by operating calling key 63 at station D. Thus, at each station there is provided a calling key for all other stations in the system.

Broadcast operation

In case it is desired to simultaneously send to two or more stations from any one station, the broadcast key at the sending station will be operated in addition to the calling keys of the desired stations. For example, if it is desired to broadcast a message from station A to both stations B and C, the calling keys 12 and 60 and the broadcast key 19 at station A are operated. Battery 13 is connected at the inner left contact of key 12 to light lamp LAB. Battery 13 is also connected at the outer left contact of key 12 to operate relay 17 thereby connecting battery 18 to the printer set P_A. The operation of key 19 connects grounded battery 64 at the outermost left contact of key 19 to the armatures of broadcast relays 65, 66 and 67. Grounded battery 68 is connected at the outer right contact of key 19 to the winding of busy relays 23, 41 and 42 in series. Busy relays operate and thereby prevent another station from interrupting the connections being established by station A. Grounded battery 18 and the printer set B_A are connected at the middle left contact of key 19 through the right hand windings of broadcast relays 65, 66 and 67, in series to ground, and the broadcast relays operate. Another circuit is established which extends from grounded battery 64, outermost left contact of key 19, conductor 69 to two parallel paths, one including the armature and contact of relay 65 and the other including the

armature and contact of relay 66. A third circuit is established which extends from grounded battery 64, outermost left contact of key 19, conductor 81 and through the biasing or left hand windings of relays 65, 66 and 67 to ground, the current flowing through the left hand windings in a direction opposite to that flowing in the right hand windings. Inasmuch as key 61, which is the calling key for station D, is not in an operated position, the path including the armature and contact of relay 67 is opened at the outer right contact of key 61 at station A and therefore this path is not complete. The path including the armature of relay 65 extends over conductor 24, outer right contact of key 12 (in an operated position) through the winding of relay 25, conductor 26 of the line A to B, through the winding of relay 27, inner right contact of key 28, conductor 29, contact and armature of relay 30, conductors 31, 32 and 33, innermost left contact of key 34, printer set P_B to ground at the back contact of relay 35. The path including the armature of relay 66 extends over conductor 70, outer right contact of key 60 (in an operated position) through the winding of relay 71, conductor 72 of the line A to C through the winding of relay 73, inner right contact of key 62, conductor 74, contact and armature of busy relay 75, conductors 76, 77 and 78, innermost left contact of key 79, printer set P_C, to ground at the back contact of relay 80. In the first broadcast circuit the slow-release relays 25 and 27 and the busy relays 23 and 30 operate in the manner described above for completing an individual connection between stations A and B. In the second broadcast circuit slow-release relays 71 and 73 and busy relays 41 and 75 operate to open the line C to A at one point and to close it at another point whereby the connection between A and C cannot be interrupted by a third station. Broadcast relays 65 and 66 which are included in the two parallel broadcast paths operate in response to each impulse on the message transmitted by printer set P_A and impulses of "current" and "no current" are transmitted from grounded battery 64 by the vibrating armatures of broadcast relays 65 and 66. These impulses are transmitted over the line circuits A to B and A to C through the printer set P_B at station B and printer set P_C at station C.

The biasing current flowing in the left hand windings of the broadcast relays is about one half of the signaling current flowing in the right hand windings and serves to operate the relays to their "spacing" positions when a "spacing" or "no current" impulse is transmitted.

At the completion of the broadcast message the printer stop signal is sent from station A, keys 19, 12 and 60 are released and then the apparatus at stations A, B and C

returns to normal. Station D may be included in this broadcast by operating key 61, which is the calling key for station D.

It is to be understood that as many stations as may be desirable may be added to the system disclosed herein, provided that a corresponding number of calling keys with their respectively associated circuit arrangements be added at each station. Inasmuch as the equipment at all stations is identical, the addition of new stations will not affect the design of the system.

What is claimed is:

1. A switching system for printing telegraph circuits comprising a first and a second station each provided with a printer normally open-circuited when not in use, circuit arrangements controlled at each station whereby the two printers may be connected together in a closed circuit, said arrangements being characterized by two parallel communicating paths extending between the stations, one of said paths being normally connected to the printer at the first station and open-circuited at the second station, and the other of said paths being normally connected to the printer at the second station and open-circuited at the first station, and a single switching key at each station for controlling the circuit arrangements at both the first and second stations and for connecting the local printer to the path normally open-circuited at the local station.

2. A switching system as defined in claim 1 which comprises further, motors for said printers, and means responsive to current in either of said communicating paths between stations for starting and stopping said motors.

3. A switching system as defined in claim 1 which comprises further, a third station, a third path extending from the printer at said first station to a printer at said third station and normally open-circuited at the first station, a single switching key at said third station for interconnecting the printers at the first and third stations over said third path, and means responsive to a closure of either of the paths between printers at the first and second stations for preventing a simultaneous connection between the printer at the third station and either of the printers at the first or second station when the latter stations are interconnected in a closed path.

4. A switching system for printing telegraph circuits comprising a plurality of stations each provided with a printer normally open-circuited when not in use, circuit arrangements controlled at each station whereby any two printers may be connected together in a closed circuit, said arrangements including two parallel communicating paths extending between every two stations, one of said paths being normally connected to the printer at a first station and open-cir-

cued at a second station, and the other of said paths being normally connected to the printer at the second station and open-circuited at the first station, a switching device at each of said stations for controlling each of said circuit arrangements and for connecting the local printer to one of said paths normally open-circuited at the local station, circuit breaking members terminating each path of said parallel paths, and relaying means connected at opposite ends of each parallel path for conditioning the circuit breaking members at opposite ends of a closed path to prevent interruptions by a switching device at another station in the system.

5. A switching system, according to claim 4, wherein the switching devices are manually-operated, two-position switches of the locking type.

6. A switching system, according to claim 4, wherein said relaying devices are electromagnetic relays of the slow release type.

7. A switching system for printing telegraph circuits comprising a plurality of stations each provided with a motor driven printer normally open-circuited when not in use, a plurality of circuit arrangements at each of said stations, a single selecting switching key for controlling each circuit arrangement at any one of said stations and a circuit arrangement at each of the other of said stations whereby the printers at said one and another of said other stations may be interconnected in a closed circuit for secret communication, the circuit arrangements controlled by any one of said selecting switching keys being interconnected by two parallel communicating paths, one of said paths being normally connected to the printer at the local station and open-circuited at the distant station and the other of said paths being normally connected to the printer at the distant station and open-circuited at the local station, and another switching key at each station operable in conjunction with at least two selecting keys at its respective station for controlling one circuit arrangement at each of three or more stations whereby the printer at its station is simultaneously connected to the printers at two or more distant stations for broadcasting purposes.

8. A switching system according to claim 7 further comprising relaying devices connected in each of said parallel paths for preventing two or more of said paths when closed between one station and two or more other stations from being interrupted by another switching device at any station in the system, and other relaying devices respectively connected in each of said parallel paths and collectively responsive to the operation of said second switching device for repeating message impulses from the printer at a local station to two or more printers at different stations simultaneously.

9. A switching system according to claim
7 wherein the driving motors of the printers
at three or more stations interconnected by
closed paths for broadcasting purposes are
5 controlled by two or more selecting keys at the
originating station.

10. A switching system according to claim
7 wherein the keys for controlling the switch-
ing arrangements at a station are arranged
10 to be selectively operated and to effect selec-
tive broadcasting when the switching key for
simultaneously connecting a printer at said
station to two or more printers at different
stations, is operated.

15 11. A switching system according to claim
7, wherein the closed paths between one sta-
tion and two or more other stations, respec-
tively extend directly from the first men-
tioned station to each of said other stations.

20 In testimony whereof, we have signed our
names to this specification this 21st day of
September 1931.

FRED J. SINGER.
LELAND A. GARDNER.

25

30

35

40

45

50

55

60

65