

May 18, 1948.

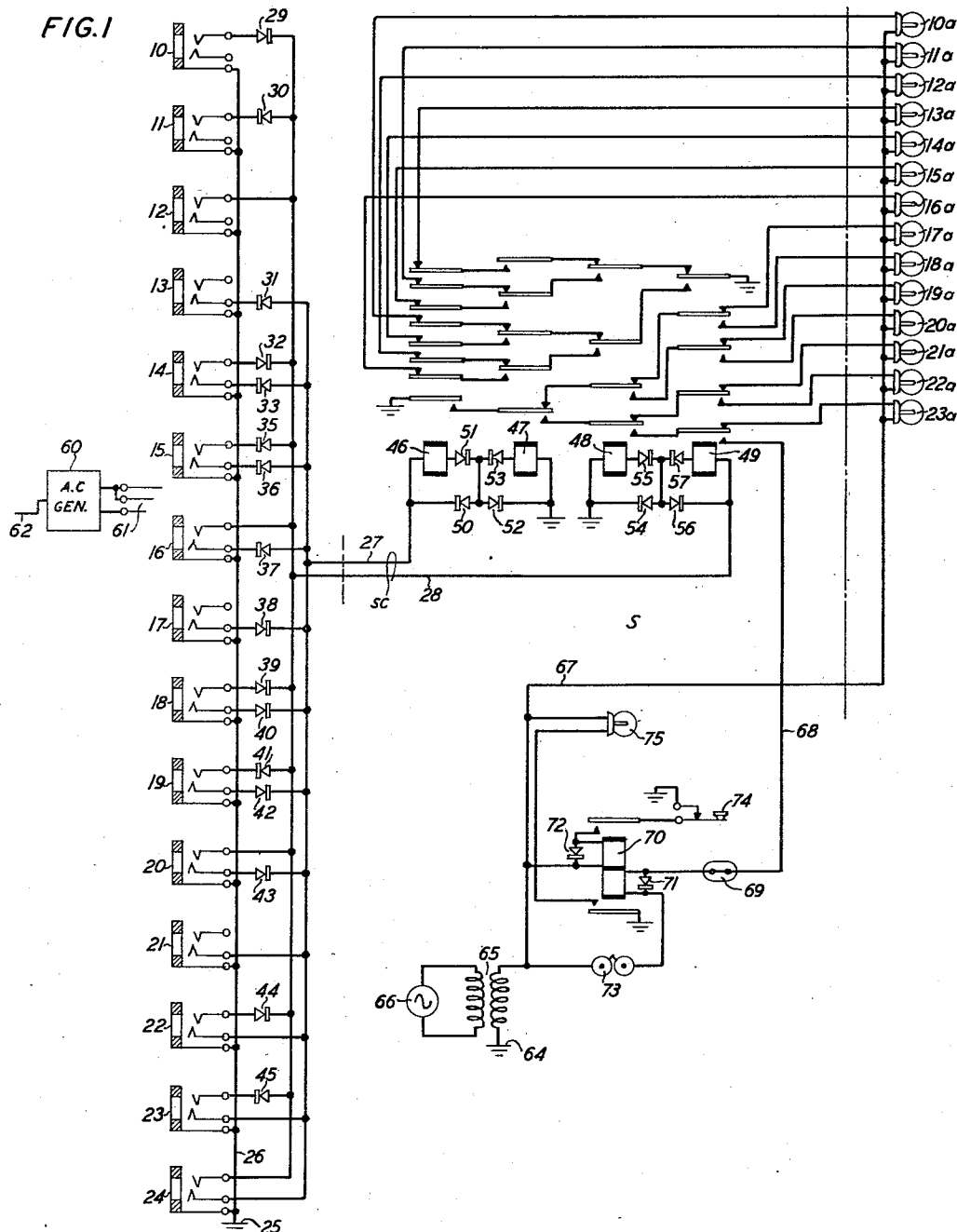
L. J. BOWNE

2,441,557

SELECTIVE SIGNALING SYSTEM

Filed Feb. 8, 1945

2 Sheets-Sheet 1



INVENTOR
L. J. BOWNE

BY *G. F. Kane*

ATTORNEY

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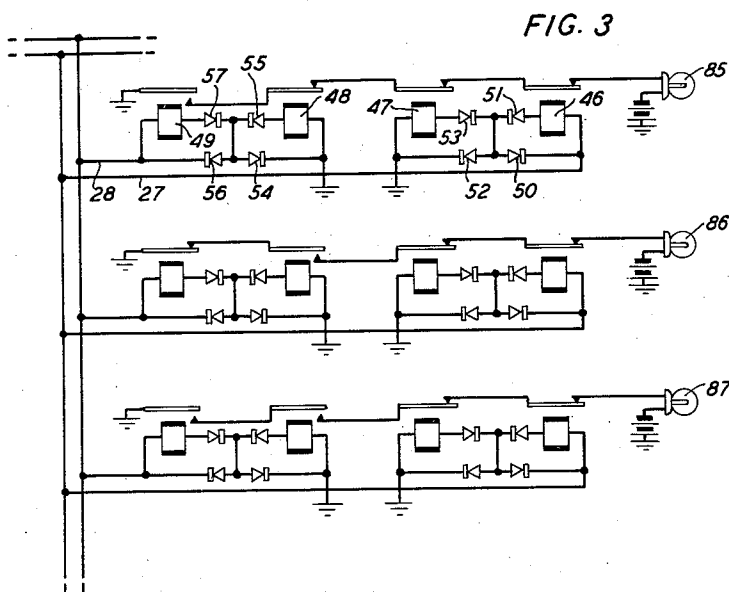
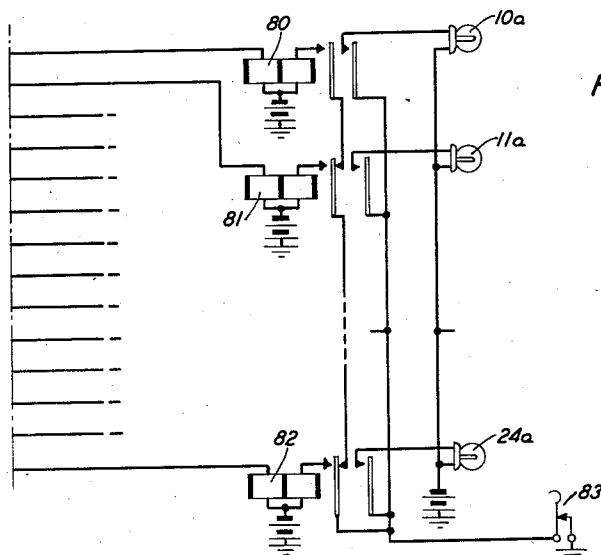
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INVENTOR
L. J. BOWNE

BY *A. J. Kane*

ATTORNEY

UNITED STATES PATENT OFFICE

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SELECTIVE SIGNALING SYSTEM

Langford J. Bowne, Howard Beach, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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1

This invention relates to signaling systems and particularly to a selective signaling system in which a common control circuit is operable in a plurality of different manners from a plurality of remote points to identify the points from which signals are transmitted.

The object of the invention is to simplify the transmission of station-identifying signals over a single pair of conductors to a central point, and to otherwise provide an improved system of signaling which is particularly applicable to multiparty line telephone systems and to a watchman's reporting system.

In accordance with one feature of the invention each of a multiplicity of stations having access to a common two-conductor signaling channel is distinctively characterized at the station by means which functions to determine the character of the signaling current, derived from a source of alternating current, which is transmitted to a common point incident to the connection of the alternating current source to the channel at the particular station. More particularly, one or both conductors of the two-conductor signaling channel is, or are connected to corresponding connecting terminals at each station either directly or by way of similarly and/or oppositely poled dry rectifiers so as to distinctively identify the signaling channel at each station and to thereby determine the character of the signaling current transmitted over either or both conductors of the channel incident to the connection of the alternating current source to the channel appearances at the stations.

Another feature of the invention resides in a common signal receiving circuit, located at a central point, which responds selectively to the signals transmitted from each station in a manner corresponding to the particular characterization of the channel appearance at the station from which the signals are transmitted, and to selectively control the operation of a signal device which identifies the station from which the signals are transmitted.

A further feature of the invention resides in the use of means for successively operating each station-identifying signal device at a central point and maintaining each signal device operated until automatically erased by the subsequent transmission of a signal from another station. This feature finds particular application to a watchman's reporting system in that the progress of the watchman over his post may be clearly supervised and his whereabouts at any particular time may be readily determined.

2

In accordance with a modification of the signaling system of this invention a signal receiving circuit may be located at each of a plurality of locations and selectively operated from corresponding signaling stations to control the operation of a signal device corresponding to the signaling station.

These and other features of the invention will be readily understood from the following detailed description when read in connection with the accompanying drawings, in which:

Fig. 1 illustrates a common signaling channel terminating at each of fifteen different stations in a differently polarized line appearance; a common signal receiving circuit terminating the channel at a central location; a plurality of selectively operable station identifying signals; and supervisory signaling equipment;

Fig. 2 illustrates a modification of the signal control circuit at the central location; and

Fig. 3 illustrates a variation of the signal receiving circuit of Fig. 1 in which a separate signal receiving circuit is employed to individually control the station identifying signals.

Referring now to Fig. 1, the designation SC identifies a two-wire signaling channel extending from a central point or station S and terminating at each of fifteen stations in a jack, such as jacks, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24. It is intended that the jacks 10 to 24, inclusive, in the embodiment shown in Fig. 1, represent fifteen stations which a watchman, for example, must visit while making his rounds in a protected area and from which he must report or "signal in" to the supervisory station S. Each jack is equipped with the usual tip, ring, and sleeve terminals, the last of all of which are connected to ground potential at 25 by way of conductor 26.

The ring terminal of jack 10 is open-circuited while the tip terminal is connected to the conductor 28 of the signaling channel SC by way of a positively poled dry rectifier 29.

The terminals of jack 11 are connected in the same manner as are the terminals of jack 10 except that the negatively poled dry rectifier 30 is substituted for the positively poled rectifier 29.

The ring terminal of jack 12 is open-circuited and the tip terminal thereof is connected directly to the conductor 28 of the signaling channel SC.

The tip terminal of jack 13 is open-circuited and the ring terminal thereof is connected to the conductor 27 of the signaling channel by way of the negatively poled rectifier 31.

The tip terminal of jack 14 is connected to con-

3

ductor 23 of the signaling channel SC by way of the positively poled rectifier 32 while the ring terminal thereof is connected to conductor 27 of the signaling channel by way of the negatively poled rectifier 33.

The jack terminal connections of jack 15 are similar to those of jack 14 except that both rectifiers 35 and 36 are negatively poled.

The tip terminal of jack 16 is connected directly to conductor 23 of the signaling channel SC while the ring terminal is connected to conductor 27 by way of the negatively poled rectifier 37.

The tip terminal of jack 17 is open-circuited and the ring terminal is connected to conductor 27 of signaling channel SC by way of the positively poled rectifier 38.

The tip and ring terminals of jack 18 are connected to conductors 23 and 27, respectively, of the signaling channel by way of the positively poled rectifiers 39 and 40, respectively.

The tip and ring terminals of jack 19 are connected to conductors 23 and 27, respectively, of the signaling channel by way of the negatively poled rectifier 41 and the positively poled rectifier 42, respectively.

The tip terminal of jack 20 is connected directly to conductor 23 of the signaling channel while the ring terminal is connected to conductor 27 by way of the positively poled rectifier 43.

The tip terminal of jack 21 is open-circuited while the ring terminal is connected directly to the conductor 27 of the signaling channel SC.

The tip terminal of jack 22 is connected to the conductor 23 of the signaling channel SC by way of the positively poled rectifier 44 while the ring terminal thereof is connected directly to conductor 27.

The terminal connections of jack 23 to the signaling channel SC are the same as those of jack 22 except that the negatively poled rectifier 45 is substituted for the positively poled rectifier 44.

Both tip and ring terminals of jack 24 are connected directly to the conductors 23 and 27, respectively, of the signaling channel SC.

From the foregoing description of the various jack terminal connections it is apparent that the line appearance of the two-conductor line SC is characterized differently at each of the fifteen stations indicated.

At the central or supervisory station S, the signaling channel terminates in two sets of signal receiving relays 46, 47 and 48, 49. Each relay winding is shunted by a dry rectifier and is serially connected to another rectifier, the two rectifiers being oppositely poled. Relay 46 is shunted by the negatively poled rectifier 50, while the positively poled rectifier 51 is connected in series with its winding; relay 47 is shunted by the positively poled rectifier 52, while the negatively poled rectifier 53 is connected in series with its winding. The rectifiers 54, 55, 56 and 57 bear the same circuit relations to relays 48 and 49 as do the rectifiers 50, 51, 52 and 53, respectively, to the relays 46 and 47, as just described. The relays 46 and 47 are connected to the conductor 27 of the signaling channel SC and therefore respond selectively, to signals transmitted over conductor 27 from any of the stations 10 to 24, inclusive, while relays 48 and 49 are connected to conductor 23 of signaling channel SC and therefore respond selectively to signals transmitted over conductor 23 from any

4

of the stations 10 to 24, inclusive. Each relay controls a plurality of armatures and contacts which are interconnected in such manners that when the relays are operated in fifteen different combinations, fifteen different operating circuits are completed to the signal lamps shown in the upper right portion of Fig. 1.

As a means for transmitting the signals, the watchman may be provided with a portable hand generator or magneto 60 which is plug-ended as indicated by the plug 61. One terminal of the output coil of the generator 60 is connected to the tip and ring contacts of the plug 61 which are shown strapped together while the other output coil terminal is connected to the sleeve contact of the plug 61. Thus, when the hand crank 62 is actuated in the well-known manner, the generator output is impressed across the tip and sleeve, and ring and sleeve terminals of the plug 61.

It will now be assumed that the watchman in starting his rounds first visits the station indicated by the jack 10. He inserts the plug 61 of his portable generator into the jack 10 and operates the crank 62. As illustrated, the ring terminal of jack 10 is open-circuited so that in signaling from station 10 only conductor 23 of the signaling channel SC is utilized. With plug 61 inserted in jack 10 the following circuit is completed: from ground at 25, sleeve terminals of jack 10 and plug 61, output coil of generator 60, tip terminals of plug 61 and jack 10, rectifier 29, conductor 23, winding of relay 49, rectifiers 57 and 54 to ground. Only the positive half cycles traverse this circuit. Relay 49 operates in this circuit and at its outermost armature and front contact completes an energizing circuit for lamp signal 10a which may be traced from ground at 64, through the secondary winding of transformer 65, whose primary winding is connected across the alternating current source 66, conductor 67, filament of lamp 10a, back contact and fifth armature of relay 46, back contact and third armature of relay 47, back contact and third armature of relay 48, front contact and fifth armature of relay 49, to ground. The lamp 10a is lighted in this circuit to indicate to a supervisor located at station S that the watchman has reported in at station 10. As will be described hereinafter, the lighted lamp signal may be locked operated if conditions warrant.

As the watchman progresses through the area assigned to him, he visits the remaining stations 11 to 24, inclusive, inserts the plug 61 of the generator 60 in the jack at each station, and actuates the generator crank 62. It is deemed unnecessary to describe in detail the signaling circuits developed as a result of the signaling operation at each station which results in the operation of a corresponding lamp signal at station S. These circuits, however, will now be briefly indicated.

At station 11 the negative half cycles traverse the conductor 23, rectifiers 56 and 55, and the winding of relay 48. Relay 48 operates and its fourth armature cooperates with the fifth armature of relay 49, the fourth armature of relay 47, and the seventh armature of relay 46 in completing an operating circuit for lamp 11a.

From station 12 both half cycles traverse conductor 23 causing both relays 48 and 49 to operate and complete an operating circuit for lamp signal 12a. From station 13 negative half cycles traverse conductor 27 to cause relay 47 to operate and complete an operating circuit for lamp sig-

5

nal 13a. From station 14 the positive half cycles traverse conductor 28 and the negative half cycles traverse conductor 27 causing relays 49 and 47 to operate and complete an operating circuit for lamp signal 14a. The polarity at station 15 on the tip conductor is the reverse of that at station 14 so that relays 48 and 47 operate and complete an operating circuit for lamp signal 15a. From station 16 both half waves traverse conductor 28 and the negative half waves traverse conductor 27 causing relays 49, 48 and 47 to operate and complete an operating circuit for lamp signal 16a. From station 17 the positive half waves traverse conductor 27 to cause relay 46 to operate and complete an operating circuit for lamp signal 17a. From station 18 the positive half cycles traverse both conductors 27 and 28 causing relays 46 and 49 to operate and complete an operating circuit for lamp signal 18a. From station 19, the negative half cycles traverse conductor 28 and the positive half cycles traverse conductor 27 causing relays 48 and 46 to operate and complete an operating circuit for lamp signal 19a. From station 20 both half cycles traverse conductor 28 and the positive half cycles traverse conductor 27 causing relays 49, 48 and 46 to operate and complete an operating circuit for lamp signal 20a. From station 21 both half cycles traverse conductor 27 causing relays 46 and 47 to operate and complete an operating circuit for lamp signal 21a. From station 22 the positive half cycles traverse conductor 28 and both half waves traverse conductor 27 causing relays 49, 47 and 46 to operate and complete an operating circuit for lamp signal 22a. From station 23 the negative half cycles traverse conductor 28 and both half cycles traverse conductor 27 causing relays 48, 47 and 46 to operate and complete an operating circuit for lamp signal 23a.

From station 24, which is the last station on the watchman's post, both half waves traverse both conductors 28 and 27 causing all four relays 49, 48, 47 and 46 to operate. A circuit is thus completed from ground over the innermost armatures and front contacts of relays 46, 47, 48 and 49, conductor 68, thermistor 69, lower winding of relay 70 and positively poled rectifier 71, ringer 73, to ground through the secondary winding of transformer 65. After an interval of time required to heat the thermistor 69, relay 70 operates on the negative half cycles traversing its lower winding and locks to ground at the back contact of key 74 by way of its upper winding and the shunting rectifier 72. At its lower armature and front contact, relay 70 completes an obvious operating circuit for lamp signal 75. Thus, when the watchman signals in from the last station 24, the ringer 73 and lamp 75 are operated to furnish both audible and visual signals indicating the "signaling in" operation from station 24. These signals will persist until the attendant at the station S actuates key 74 to open the locking circuit for relay 70.

If desirable, a lamp signal corresponding to any station may be maintained operated until the watchman signals in from the next station. This may be accomplished in the manner illustrated in Fig. 2. Instead of the lamp signals 10a, 11a, etc., being controlled directly from the signal receiving relays 46, 47, 48, and 49, they are indirectly controlled by these relays through an individual, double wound, locking relay such as relays 80, 81 and 82. Such relays operate by way of their left-hand windings, and lock by way of

6

their right-hand windings and their inner front contacts and armatures to ground at key 83. It is noted that the locking circuits for relays 80, 81 and 82, comprise a series chain including the armatures and back contacts of all succeeding relays in the chain. Thus, when relay 80 operates to light lamp signal 10a, it will lock to maintain the lamp lighted until relay 81 is operated. The locking circuit for relay 80 is then opened and lamp 10a is extinguished. Similarly, relay 81 will be held operated to maintain lamp 11a lighted until some other relay such as relay 82, for example, is operated. In this manner the lighted signal lamp serves to indicate the last station from which the watchman has reported and the attendant is thus continuously apprised of the whereabouts of the watchman.

In Fig. 3 there are illustrated three stations indicated by the signal lamps 85, 86 and 87. These lamps may constitute call signals for stations on a multiparty telephone line or of an intercommunicating system. This figure also depicts a variation of the system shown in Fig. 1, where it may be found desirable to control each lamp signal by means of its own individual signal receiving circuit. The relays and rectifiers of this figure bear the same identification numerals as the corresponding relays and rectifiers of Fig. 1 and it is to be understood that they function in the same manner. It will be observed that the uppermost group of relays requires the transmission of the positive half cycles over conductor 28 to operate relay 49 and thus complete an operating circuit for the lamp signal 85. Thus, the lamp signal 85 would be operated by a signal transmitted from station 10 of Fig. 1. Similarly, lamp signal 86 would operate to indicate the transmission of a signal from station 11, of Fig. 1, and lamp signal 87 would be operated in response to a signal transmitted from station 12. In the use of this arrangement in a multiparty line telephone system, each calling station would be equipped with a key for each called station which would function to polarize the line in the manner in which it is permanently polarized by the rectifier-jack combinations shown in Fig. 1.

What is claimed is:

1. The combination in a signaling system of a two-conductor line, signal transmitting stations, an outlet for said line at each station, each consisting of a grounded terminal and one or more line terminals whereby one of the conductors of said line terminates at certain of said outlets and both of the conductors of said line terminate at certain other of said outlets, means connecting one or both conductors of said line directly to their corresponding terminals at certain of said outlets, means comprising similarly poled unidirectional current conducting devices connecting one or both conductors of said line to their corresponding terminals at certain other of said outlets, means comprising differently poled unidirectional current conducting devices connecting the conductors of said line to their corresponding terminals at still certain other of said outlets, whereby each of said outlets constitutes a differently permanently polarized termination for said line, a source of alternating current, and means for connecting said source to said line by way of the line and grounded terminals of any of said line terminations whereby signaling current of a character determined by the polarization of the particular line termination to which said source is connected is transmitted over said line.

7

2. The combination in a signaling system of a two-conductor line, a plurality of independent and remotely located signal transmitting stations, an outlet for said line at each of said stations, a jack connector identifying each of said outlets having a contact spring for each conductor of said line and a grounded jack spring, means comprising rectifiers and direct wire connections permanently and differently connecting one, or the other or both conductors of said line to their corresponding jack springs at each of said stations to effect a single distinctive permanent polarization of said line at each of said stations, a source of alternating current, and a plug associated therewith having a pair of contacts connected to one terminal of said source and a third contact connected to the other terminal of said source, said plug adapted to be inserted in any of said outlets to cause engagement of each of said pair of plug contacts with a different one of said line conductor jack springs and of the third contact thereof with the said grounded jack spring to thereby complete a signaling circuit from ground through said source over either of the conductors of said line or from ground through said source over both conductors in parallel depending upon the manner in which said line conductors are associated with their corresponding jack springs at each of said outlets.

3. The combination in a signaling system of a plurality of signal transmitting stations, a two-conductor line, an outlet for said line at each of said stations comprising a jack spring for each conductor of said line and a third grounded jack spring, the conductor jack springs of each of said outlets being permanently connected directly or by way of a positively or negatively poled rectifier to their corresponding line conductors so that the combination of direct and rectifier connections between the individual conductors of said line and their corresponding jack springs at any one station is different from that of any other station, a portable source of alternating current, and a plug connector therefor having a pair of contacts each corresponding to a different one of the line conductor jack springs and both connected to one terminal of said source of current and a third contact corresponding to the grounded jack springs of said outlets and connected to the other terminal of said source, said plug being insertable in any of said outlets to cause each of said pair of plug contacts to engage its corresponding jack spring and the third plug contact to engage the grounded jack springs of said outlets whereby said source of current is effectively connected to either one or both conductors of said line depending upon the manner in which said line conductors are connected to their corresponding jack springs at said outlets.

4. In combination in a signaling system, a two-conductor line having a plurality of independent outlets at which access to said line may be had for the transmission of signals, each outlet characterized by a jack spring for each conductor of the line and a third grounded jack spring, a source of alternating current, a plug for insertion

8

in said outlets having a contact for each of said line conductor jack springs connected to one terminal of said source and a third contact for the grounded jack spring of said outlets connected to the other terminal of said source, and means comprising a different combination of direct wires and positively and negatively poled rectifiers connected between one or the other or both of said line conductors and their corresponding jack springs at each of said outlets, whereby signals of a plurality of different characters may be derived from said source incident to the insertion of said plug into said outlets and transmitted over said line by way of said grounded jack spring and one or the other or both of said line conductors depending upon the manner in which the line conductors are connected to their corresponding jack springs at each outlet.

5. The combination in a signaling system of a plurality of stations, a two-conductor line, an outlet for said line at each of said stations comprising a fixed connector having a terminal for each conductor of said line and a grounded terminal, the conductor terminals of each of said connectors being permanently connected directly or by way of a positively or negatively poled rectifier to their corresponding line conductors so that the combination of direct and/or rectifier connections between the line conductors and their corresponding connector terminals is different at each station, a source of alternating current, and connector means therefor having a pair of contacts each corresponding to a different one of the conductor terminals of said fixed connectors and both connected to one terminal of said source, and a third contact connected to the other terminal of said source, said connector means being engageable with any of the fixed connectors of said outlets to cause the pair of contacts thereof to engage its corresponding conductor terminal of the fixed connector and the third contact thereof to engage the grounded terminal of the fixed connector whereby said source of current is connected to either one or both conductors of said line depending upon the manner in which said line conductors are connected to their corresponding fixed connector terminals at said outlets.

LANGFORD J. BOWNE.

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