

June 12, 1945.

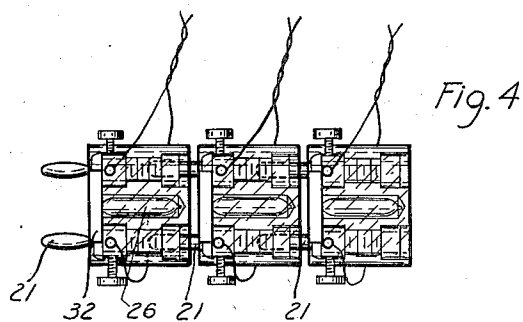
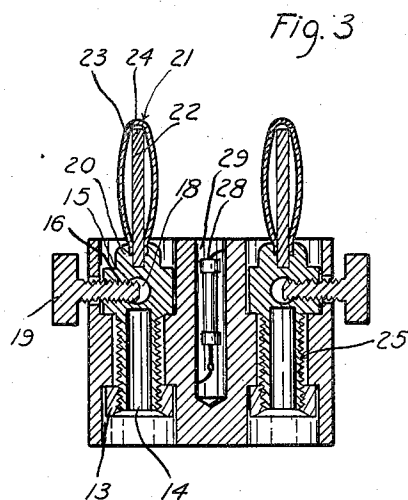
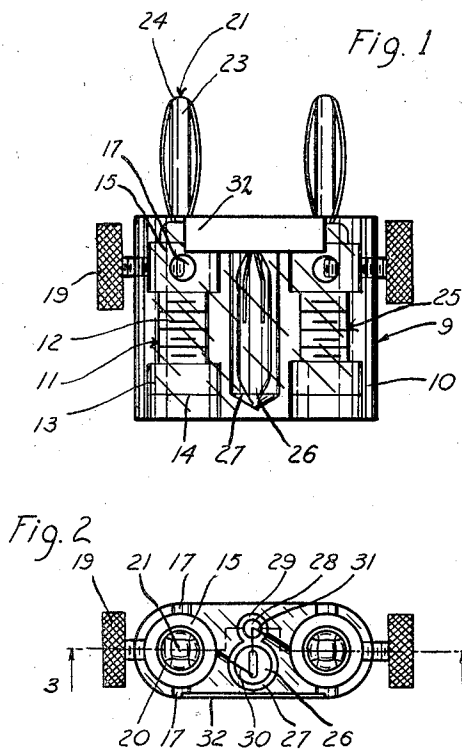
K. J. WAY

2,377,912

COMMUNICATION SYSTEM

Filed Jan. 14, 1943

2 Sheets-Sheet 1



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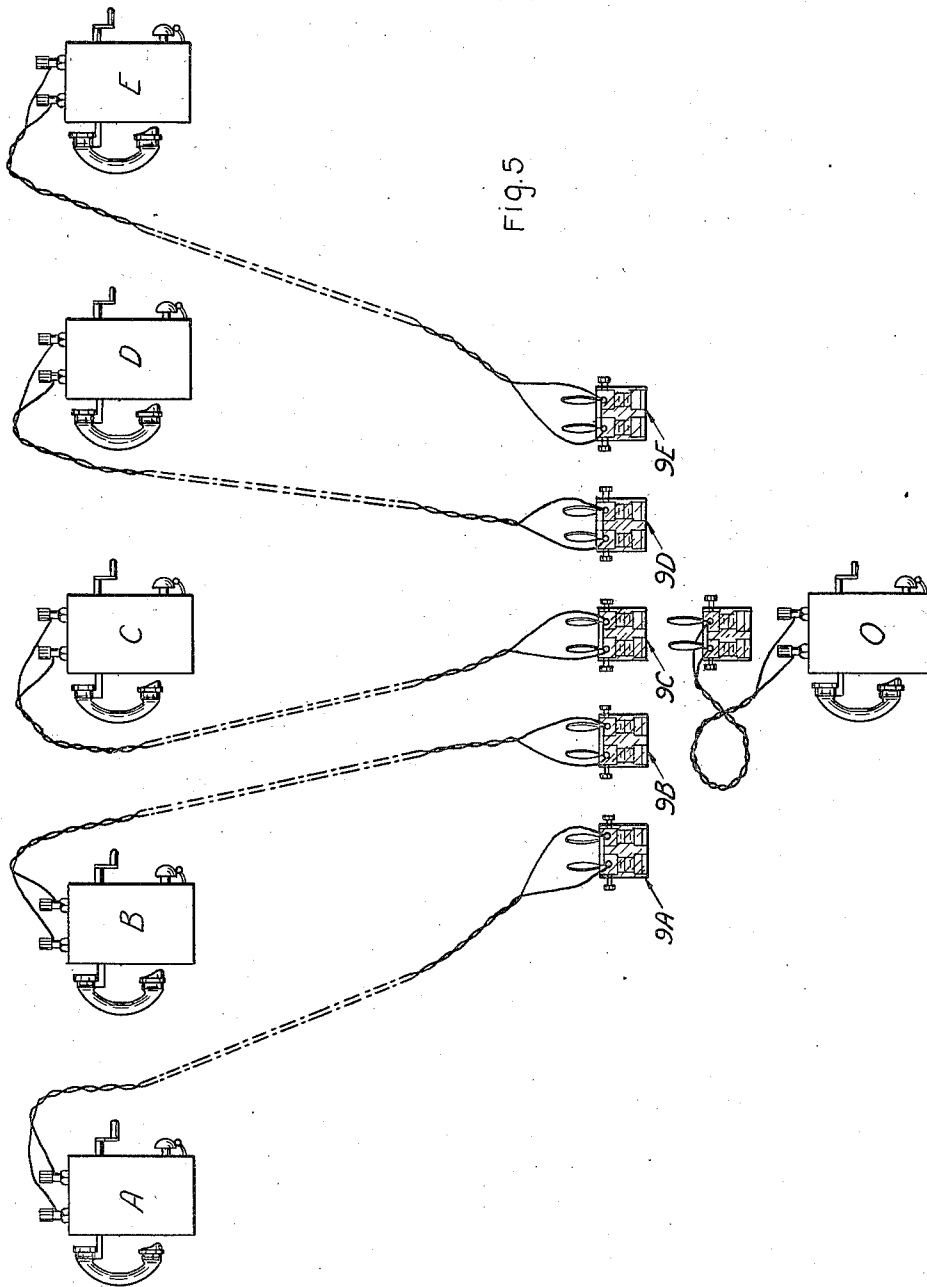
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UNITED STATES PATENT OFFICE

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COMMUNICATION SYSTEM

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18 Claims. (Cl. 179—1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to a communication system and more particularly to a telephone arrangement designed for field use where three or more portable stations are arranged for intercommunication and have a portable central switching station.

In order to maintain such a system of intercommunication between stations, it is ordinarily necessary to have a central switchboard by means of which connections can be made when it is required to bring any two stations into communication. Such a switchboard usually comprises a unitary assemblage of switching and signaling elements and is transported to its intended site or carried until its use becomes necessary. Where such a switchboard is serving in the field, it might be conceivably damaged or destroyed by accident, by military action, or there may be failure in the functioning thereof for various reasons. It is obvious that the intercommunications of lines depending upon such a switchboard would be interrupted should such failure occur. While the emergency may be met by replacement of the damaged equipment, this solution is usually not feasible since such a field telephone arrangement should not be burdened by unessential quantities of apparatus. In view thereof, it is not always possible to have available a replacement or substitute switchboard and the present invention provides means whereby a simple emergency telephone system may be set up for use when the switchboard is no longer usable for the above, or any other reasons.

To further illustrate the problems to which the present invention is directed, the conventional switchboard is designed to handle a predetermined maximum amount of traffic. Should a special installation require less traffic to be handled than the switchboard is designed for, and if, therefore, less number of lines is required, a specific switchboard nevertheless embodies the unused lines. In field situations requiring a minimum amount of apparatus, such a limitation is manifestly disadvantageous. The ordinary switchboard might be unduly complex and cumbersome for a particular occasion and would represent added and unnecessary weight. The present invention, is, therefore, designed to provide means whereby a central switching station may be set up with a minimum of time

and apparatus and to accommodate only as many lines as are required.

Since one of the principal purposes for which the present invention is designed is to eliminate cumbersome equipment, the subject invention proposes a virtual switchboard which does not take any conventional form but which consists essentially of only the terminal ends of the specific station line wires, which are mutually arranged for intercommunication. Inasmuch as some form of terminal ends of the lines are necessary in any event, the production of the switchboard entails merely the direct interconnection of these terminal ends. The invention contemplates the use of specially constructed terminal units, each of which may be likened to a combined plug and jack portion of a switchboard. By analogy, it might be considered, therefore, that the switchboard has been separated into distinct terminal units which form the terminal plugs of the lines and in addition comprise the jacks. The plugs and jacks of the respective lines are designed to mate in any combination and it is apparent, therefore, that any number of these terminal units may be utilized to construct, on the moment, a switchboard having only as many line accommodations as are required for a particular occasion. A further advantage of such a system resides in the fact that before the central station is set up for operation, each user may carry his particular terminal unit so that no one person is burdened by a complex or cumbersome switchboard.

A further feature of the instant invention is the provision of a terminal unit for each station which embodies signaling means to be used when a station wishes to contact the central operator for the usual reasons. It can be seen, therefore, that the switchboard analogy previously referred to is further carried out since the plurality of terminal units utilized will supply the virtual switchboard with a like number of signaling means, a necessary feature in central switching stations. Specifically, the signaling means provided in the instant invention comprises a visual indicator which is housed within the terminal unit itself, the preferred embodiment employing a gas discharge tube such as a neon tube or any type of incandescent lamp which can serve as a visual indicator. In view of the fact that the invention is directed to somewhat of a makeshift switchboard the elements of which are handled prior to their interconnection, and in view of the proposed nature of its use, it is

manifest that a visual indicator such as above described might be subjected to rough handling and consequent injury thereto, were it not disposed within and protected by the housing of the terminal unit.

The invention further provides a signal indicator in combination with a terminal unit, which is visually accessible from any angle. This is desirable in that the terminal units may, in the absence of supporting equipment, be haphazardly disposed and the signal might, therefore, be obscured from the eye of the central operator. In view, thereof, the terminal of the instant invention is such as to diffuse the illumination of the signal indicator over its surface so as to present a relatively large area of signal light which is visible from any angle. Specifically, transparent plastic material of the type hereinafter mentioned, have unusually excellent properties of light diffusion, and the terminal unit, which may be fabricated thereof, will render the signal visible irrespective of the position which the terminal unit assumes in relation to the operator.

The invention is preferably used in combination with a plurality of telephone lines each of which is provided with a portable magneto telephone unit well known in the art. Each station will be equipped with one of these telephone units which comprises a telephone handset as well as means to transmit or to receive, and a hand generator for signaling purposes. The conductors of each station will be terminated at the central switching station by means of such a terminal unit as will be hereinafter described with particularity.

The invention, both as to its organization, system or operation, and detailed description of essential features will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which

Figure 1 is an elevational view of a terminal unit constructed according to the present invention.

Figure 2 is a bottom end view thereof.

Figure 3 is a section along the line 3—3 of Figure 2.

Figure 4 is a partially schematic view illustrating the interconnection of the terminal units to effect intercommunication between their respective stations.

Figure 5 is a schematic view illustrating the communication system of the instant invention.

The terminal unit 9 comprises the case or housing 10 which is of electrically insulating material and preferably light diffusible. Pursuant thereto, it may be formed of transparent material such as ordinary glass or of a plastic material such as Amphenol, Lucite, or similar plastics. Disposed within the housing 10 is the terminal element 11 comprising an integral plug and jack combination. The terminal element 11 may be formed of a hollow, cylindrical, externally threaded rod 12, having an end nut 13 applied thereto. The end nut 13 surrounds the outer end of the hollow rod 12, which end serves as the jack portion 14 of the terminal element. The nut 13 may have its outer face beveled so as to facilitate the entry of a plug into the jack 14 when a connection between two conductors is to be effected. The rod 12 has an enlarged portion or boss 15 integral therewith and oppositely disposed on the rod 12 in relation to said end nut 13. The boss 15 is formed with an internally threaded partial bore

16 and at right angles thereto, a bore 17 which traverses the terminal unit. Said bores 16 and 17 cooperate to form a chamber 18 which communicates with each of said bores. A threaded bolt 19, having a knurled head, is received in the internally threaded bore 16. The line conductor terminal end is introduced into the chamber 18 through the bore 17 and the threaded bolt 19 serves to clamp, and thereby effect electrical contact between, said terminal end and the corresponding terminal element 11.

Boss 15 is reduced to form a dome-shaped portion 20 having a centrally disposed cavity formed therein which serves to electrically connect a plug 21 to the rod 12. Plug 21 is illustrated as being of the so-called banana type wherein a central pin 22 is encompassed by a split outer covering 23 of a resilient metal. The outer covering 23 has its closed end 24 outwardly disposed in relation to the housing 10, while the splitting thereof forms spring fingers. The free ends of the spring fingers are retained together with pin 22 in the cavity formed in the dome-shaped portion 20 of boss 15. The walls of said cavity may be spun over to effect such retention. The plug is designed to be received in a jack such as jack 14 above described, the inner wall of the jack compressing the plug against the action of the spring fingers. The terminal element 25 duplicates the aforesaid parts of the terminal element 11 for the purpose of receiving the other conductor of a particular station.

Means are provided for signaling the central operator when communication with another station is desired. The signaling means comprises a visual indicator which may be in the form of a neon bulb 26 effectively shunted across the station line conductors by being connected to the terminals elements 11 and 25, which are electrically connected to the said conductors. A chamber 27, formed in the housing 10, serves to receive said neon bulb. In series with the neon bulb across the conductors, is a current limiting resistor 28 which serves to prevent the excessive flow of current through the neon bulb. A chamber 29, formed in the housing, receives said resistor 28. A neon bulb that was found suitable for the purpose was of the very small type, about 1 inch long, 1/4 inch in diameter, and rated at about 1/2 of a watt. The value of series resistor 28 was such as to limit the current to about one milliamper. Where 110 volts is supplied, the recommended value thereof is about 100,000 ohms and for 220 volts the recommended value is about 200,000 ohms. It is understood, of course, that any suitable variations of the values herein given may be employed, the above values being recommended when a visual indicator in the form of a neon bulb such as above described is employed. Any other bulb of small dimensions having in combination therewith a suitable current limiting resistor may be utilized. In addition, any signal responding to telephone ringing voltage, either visually or audibly or both, may be used if sufficient impedance is provided to prevent any appreciable shunting action on the telephone line. Suitable leads 30 and 31, disposed in conduits formed in the housing 10, respectively effect the necessary electrical contact between terminal element 11 and neon bulb 26, and between resistor 28 and terminal element 25.

The disposition of the neon bulb 26 within the housing 10 not only serves to protect it against injury but a more important result is achieved when the housing is of a transparent plastic or

diffusive material. In such embodiments, the housing 10 diffuses the light over its area, thereby providing a large surface area of signal light which is visible without regard to the position of the terminal unit in respect to the central operator, or without regard to the position of the neon bulb in respect to the central operator. A further advantage is the fact that the diffused light, while conveniently visible to the operator, is not visible for as great distance as would be the bulb itself were its light not diffused in the housing 10 so that secrecy of the proceedings, if necessary, is accomplished. Beneficial results are also obtainable with housings of colored plastics or even glass materials. Suitable plastic materials include the urea formaldehyde group, the acrylate plastics such as Lucite, above-mentioned, or other well-known equivalents. It is apparent, however, that glass or any other light diffusible material may be advantageously used with comparable results.

A terminal unit of the type hereinabove described serves to terminate each pair of conductors extending from the field station to its terminal at the central switching station. The system of intercommunication is illustrated in Figure 5 hereof wherein 5 field stations and a central switch station O are accommodated, although, of course, more or less than this number may be employed. Each field station is equipped with a portable telephone unit having a telephone handset, means to transmit and receive, a hand-operated magneto for signaling purposes, batteries for supplying power to the unit and a bell serving as a signal from the central operator to each field station. Each field station A, B, C, D, and E is provided with a terminal unit 9A, 9B, 9C, 9D and 9E at the central end of its line conductors. The operation of the system is as follows:

Assuming that field station A wishes to establish communication with field station D, he operates the hand generator on his field telephone unit, and the neon bulb in the terminal unit 9A corresponding to field station A flashes. Any suitable means enabling the central operator to identify the terminal units with respect to their field stations may be employed. For example, in Fig. 1 is shown a white opaque plate 32 secured, as by adhesive, to the housing 10. Indicia may be inscribed on the plate 32 to identify each terminal unit with its field station or, alternatively differently colored transparent plastic may be employed for the housings 10, each color serving to identify a particular field station. By using differently colored plastic, the identification of each terminal unit is made possible even during the night when the indicia may not be distinguishable. When the light appears on terminal unit 9A, the central operator directly inserts the plugs of his terminal unit into the jacks 14 of terminal unit 9A thereby closing the circuit by establishing a connection, or alternatively, he may prefer to insert the plugs of terminal unit 9A into the jacks of his own terminal unit. Upon establishing communication and being apprised by field station A of the field station to which the call is to be connected, he removes his plugs from terminal unit 9A and inserts it in terminal unit 9D. He then operates his hand generator, ringing thereby the bell on the field station D telephone unit. When field station D answers, the operator then establishes connection between terminal units 9A and 9D by inserting either pair of plugs into the other pair of jacks. Thus intercommunication between field station A

and field station D is effected and the operator is then free to handle other calls. When the conversation between station A and station D is completed, they will restore their hand sets and either one or both will operate the hand generator, which, upon lighting the respective neon bulb, will inform the operator that either the conversation is ended or the field station desires another connection. The central operator may then plug in and ask whether another number is desired. If no answer is received, he can break the connection.

If a conference connection is desired wherein one field station wishes to be connected to more than one other station so that a plurality of field stations may engage in a conference call, the operator, when receiving such a request from one of the field stations, will call every other field station separately and advise them of this intention. Thereupon each of the desired field station terminal units may be plugged in to each other as partly illustrated in Figure 4 and the connected field stations will be in mutual communication.

The apparatus above described eliminates the necessity of a conventional switchboard with its attendant disadvantages for particular occasions as hereinabove described, while securing the functional results provided by such a switchboard. While a simple rack might be provided for hanging the terminal units in some order, such an expedient has been dispensed with in order to reduce to a minimum the apparatus required for efficient operation.

The advantages of the present system are numerous as above described. To further illustrate the utility of the invention, the above-mentioned example of a particular intercommunication system utilizing a conventional switchboard is again referred to. Should the aforesaid disruption or destruction of the switchboard as by accident or by military action occur, the central operator, if he is equipped with a few of these terminal units 9, can with dispatch secure these to the conductors of the field stations he is serving. In this way, by having merely a handful of these devices, he can install the system of the present invention and thereby provide for such a serious emergency as might arise through the interruption of communication through the destruction of the switchboard. The term "central switching station" when used in the claims is not intended to refer only to the operator's switchboard but to the site, including the immediate surroundings of the switchboard. It is apparent that the terminal units are disposed at the central switching station so as to be within the reach of the central operator.

While certain preferred embodiments of the invention have been illustrated and described herein, it is understood that the invention is not limited thereby, but is susceptible of changes in form and detail within the scope of the appended claims.

I claim:

1. A telephone communication system comprising a plurality of field telephone stations having line conductors, a terminal unit terminating the line conductors of each field telephone station, a central switching station, each of said terminal units being disposed at said central switching station, and plug and jack elements formed on each of said terminal units, whereby said terminal units may be interconnected to bring their field telephone stations into mutual communication.

2. A telephone communication system compris-

ing a plurality of field telephone stations having line conductors, a terminal unit terminating the line conductors of each said field telephone station, a central switching station, each of said terminal units being disposed at said central switching station, two connector elements on each of said terminal units, each line conductor of a field telephone station being connected to one of said connector elements, and plug and jack means on each of said connector elements, said plug and jack means being electrically connected together whereby the plugs of one terminal unit may be inserted into the jacks of any other terminal unit to bring their respective field telephone stations into mutual communication.

3. A telephone communication system comprising a plurality of field telephone stations having line conductors, a terminal unit terminating the conductors of each field station telephone station, a central switching station, each of said terminal units being disposed at said central switching station, plug and jack elements on each of said terminal units whereby selected terminal units may be directly interconnected to bring their respective field stations into mutual communication, and signaling means whereby each said field telephone station may signal said central switching station when a connection is desired.

4. A telephone communication system comprising a plurality of field telephone stations having line conductors, a terminal unit terminating the conductors of each said field telephone station, a central switching station, each of said terminal units disposed at said central switching station, each of said terminal units comprising a light diffusible housing, and visually accessible signaling means disposed within said housing whereby each said field telephone station may signal said central switching station when a connection is desired.

5. A telephone communication system comprising a plurality of field telephone stations having line conductors, a terminal unit terminating the conductors of each said field telephone station, a central switching station, each of said terminal units disposed at said switching station, said terminal units comprising means for effecting telephone connections between selected field telephone stations, a transparent housing for each of said terminal units, and signaling means disposed within said transparent housing.

6. In a telephone communication system comprising a plurality of field telephone stations having line conductors and means to produce both audio and signaling voltages, a terminal unit terminating the conductors of each said field telephone stations, a central switching station, each of said terminal units being disposed at said central switching station, connector elements formed on each of said terminal units whereby selected terminal units may be connected to bring their respective field stations into communication and signaling means effectively shunted across said line conductors of said field stations at said terminal units, said signaling means normally being substantially non-responsive to audio voltages in said line conductors.

7. In a telephone communication system comprising a plurality of field telephone stations having line conductors and means to produce both audio and signaling voltages, a terminal unit terminating the conductors of each said field telephone stations, a central switching station, each of said terminal units being disposed at said central switching station, plug and jack elements

formed on each of said terminal units whereby selected terminal units may be connected to bring their respective field stations into communication and signaling means effectively shunted across said line conductors of said field stations at said terminal units, said signaling means normally being substantially non-responsive to audio voltages in said line conductors.

8. A telephone communication system according to claim 7, wherein said signaling means comprises a gaseous glow lamp and a current limiting resistor in series therewith.

9. A telephone communication system comprising a plurality of field telephone stations having line conductors, a terminal unit terminating the conductors of each said telephone stations, a central switching station, each of said terminal units being disposed at said central switching station, connecting means in said terminal units for effecting connections between the respective field stations of said terminal units, a light diffusible housing for each said terminal unit, and illuminable signal means disposed within said housing and visually accessible therethrough.

10. A telephone terminal unit for terminating a pair of conductors in a communication system, said terminal unit comprising a housing, electrically connected plug and jack elements in said housing, and signaling means in said housing substantially non-responsive to audio voltages in said system.

11. A terminal unit for terminating a pair of conductors in a communication system, said terminal unit comprising a housing, plug and jack elements supported by said housing, and signaling means in said housing effectively disposed across said conductors and substantially non-responsive to any audio voltages in said system.

12. A terminal unit for terminating a pair of conductors in a communication system, said terminal unit comprising a housing, plug and jack elements supported by said housing and signaling means effectively shunted across said conductors, said signaling means comprising a visual indicator and a current limiting resistor in series therewith.

13. A terminal unit for terminating a pair of line conductors in a communication system having a plurality of lines, said terminal unit comprising a light diffusible housing, connector elements supported by said housing for electrically connecting said pair of conductors to a load and illuminable signal means disposed within said light permeable housing and visually accessible therethrough.

14. A terminal unit for terminating a pair of line conductors in a communication system, said terminal unit comprising a light diffusible housing, electrically connected plug and jack elements disposed within said housing for connecting said pair of conductors to a load, and signaling means effectively shunted across said conductors, said signaling means comprising a visual indicator perceptible through said housing, and a current limiting resistor in series with said visual indicator.

15. A terminal unit for terminating a pair of line conductors in a communication system said terminal unit comprising a housing of translucent and diffusive material, connector elements supported by said housing for electrically connecting said pair of conductors to a load and illuminable signal means disposed within said housing, whereby the light thereof is diffused over the area

of said housing when said signal means is illuminated.

16. A terminal unit for terminating a pair of line conductors in a communication system, said terminal unit comprising a housing of translucent and diffusive material, a pair of connector elements disposed within said housing, plug and jack means on each of said connector elements, the respective plug and jack means being electrically connected together, and illuminable signal means disposed within said housing whereby the light thereof is diffused over the area of said housing when said signal means is illuminate.

17. A terminal unit according to claim 16 wherein said signal means comprises an ionizable

gas filled glow lamp and a current limiting resistor in series therewith.

18. A terminal unit for terminating a pair of line conductors in a communication system, said terminal unit comprising a light permeable housing, a pair of electrically connected plug and jack elements disposed within said housing for connecting said pair of conductors to a load, signaling means disposed within said housing, said signaling means comprising a neon lamp and a current limiting resistor, said neon lamp and resistor being connected in series across said pair of plug and jack elements.

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