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T. R. COTTRELL

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LINE CONNECTOR

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FIG. 1.

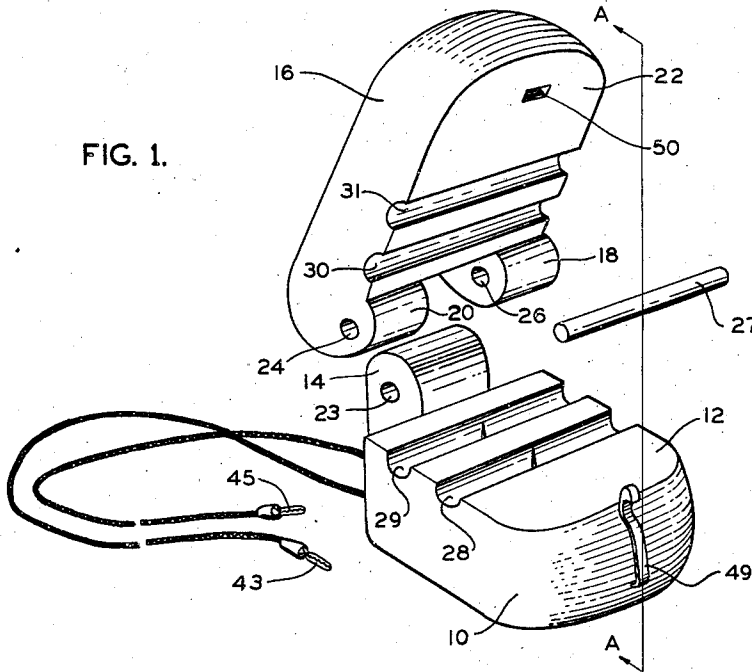


FIG. 2.

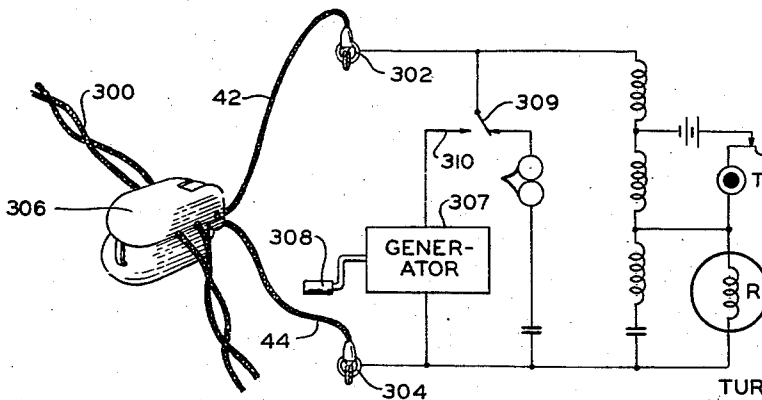
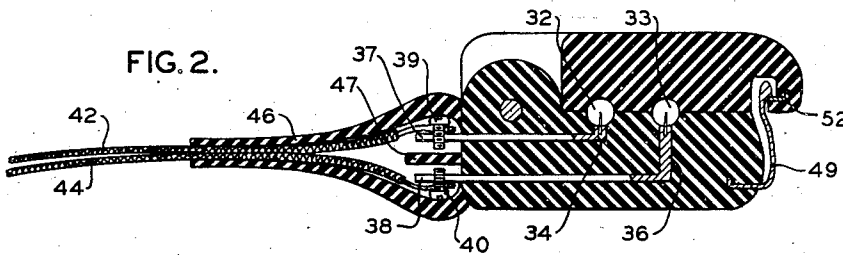


FIG. 3.

INVENTOR.
TURNER R. COTTRELL

BY
William D. Hall,
ATTORNEY

UNITED STATES PATENT OFFICE

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LINE CONNECTOR

Turner R. Cottrell, Neptune, N. J.

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1 Claim. (Cl. 173—340)

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

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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.

This invention relates to an electrical line connector and more particularly to that type of line connector which is especially suitable for testing the condition of the telephone lines using insulated conductors.

The invention will be described in connection with field-type telephone sub-station circuit and twisted pair stranded conductors covered with cotton and rubber insulation connecting telephone-telegraph and buzzer phone stations where the connector of this type may have its widest application. From the illustrated use it will be obvious to those skilled in the art that the invention may have numerous other applications where it is desired to establish electrical connections between the insulated wires and the testing apparatus.

It is a very well known fact among telephone maintenance crews, who are especially concerned with the maintenance of the telephone communication lines used by the armies in the field, that the telephone lines must be under constant surveillance since their interruption because of severance of wires or grounding is a very common occurrence. Testing of the telephone wires of this type, where a twisted pair of cotton and rubber covered wire is used for establishing the connections between the field stations, ordinarily involves numerous tests over the entire length of the line, and when this is the case, it becomes necessary to establish the connections with the stranded conductor within the insulated conductor. In the past, special clips, provided with the needle connectors, were used for establishing the temporary test connections of this type, the clips being connected to the leads connecting the clips to any suitable line testing apparatus. Since the clips of this type are not provided with any wire-centering means, it is quite customary for the maintenance crews of the telephone wires to experience considerable difficulty in establishing the desired connection with the stranded conductor because the needle of the clip may miss the centrally located conductor and find itself imbedded only in the insulation of the wire. The repeated attempts to establish the connection tear the insulation off the wire with the result that when the tests are over the wire is left with the impaired insulation which must be repaired by using an insulating tape. Moreover, the clips, because of their construction, cannot be very read-

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ily insulated, and as a consequence the members of the test crews are subjected to the voltage that may be on the line at the time of test. The results of such hazardous testing are sometimes fatal to the maintenance men, and such practices must be obviously avoided if safer means accomplishing the same result may be found. Moreover, because the clips are not insulated and must be dropped on the ground, after they are connected to the conductors, for manipulating the test instruments, it is not an uncommon occurrence to observe faulty test readings when the clips make direct contact with each other or establish a fairly low resistance contact when they are dropped on the wet soil. The entire testing procedure and the method of connecting the testing instrument to the telephone lines is still further aggravated by the fact that the tests are frequently conducted at night, and the maintenance crews are not allowed to use any sources of light for facilitating their work.

The invention discloses an electrical line connector which avoids the aforementioned difficulties, is very simple to use and does not expose the members of the maintenance crews to any electrical shocks since it is so constructed that the linesmen are never exposed to any contact with the inner conductor of the lines during the establishment of connections between the line and the connector.

The connector comprises two hinged complementary jaws with flat inner surfaces which are provided with the semi-cylindrical grooves having a diameter approximately equal to the outer diameter of the line wires, the grooves of one jaw being provided with the contact pins or needles which establish the electrical connections with the inner conductor after the wires are placed in the grooves and are then squeezed between the jaws.

It is, therefore, the principal object of this invention to provide an electrical line connector suitable for establishing the electrical connections with the insulated wire conductors, the connector comprising two complementary hinged jaws equipped with the grooves of appropriate shape, the grooves of one jaw being provided with the contact pins for making the connections with the inner conductors of the line wires.

It is another object of this invention to provide an electrical line connector of the above mentioned type which may be used in complete darkness and by relying exclusively on the sense of feeling during the manipulation of the connector.

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An additional object of this invention is to provide an electrical line connector which is capable of establishing the desired connections with the insulated line wires without exposing the linesmen to any danger and without impairing the insulation of the wires.

The novel features which are believed to be characteristic of the invention are set forth in the appended claim; the invention itself, however, both as to its organization and methods of operation, together with the further objects and advantages thereof, may best be understood by reference to the further description in connection with the accompanying drawing in which:

Figure 1 is a perspective view of the connector with the hinge pin removed and the jaws separated to clarify the construction of the connector;

Figure 2 is a vertical, longitudinal cross-sectional view of the connector taken along line A—A in Fig. 1; and

Figure 3 illustrates the connections between the line connector and the telephone sub-station circuit for testing the condition of the twisted pair telephone wire.

Referring to Fig. 1, it illustrates two jaws of the connector in open position. The lower jaw 10 is provided with a flat surface 12 which extends rearwardly to a central loop 14 of the hinge interconnecting the lower member 10 of the jaw with the upper member 16. The latter is provided with two hinge loops 18 and 20, and a flat portion 22, hinge loop 14 fitting into the space provided for this purpose between the hinge loops 18 and 20 of the upper jaw. The hinge loops are equipped with the cylindrical holes 23, 24 and 26, a hinge pin 27 fitting into the holes in well known manner to form a hinge, thus interconnecting the jaws when they are in an assembled position, as illustrated more clearly in Fig. 2. The jaws are provided with semi-cylindrical complementary and cooperating grooves 28, 29, 30 and 31 which form cylindrical openings 32 and 33, Fig. 2, when the two jaws are in closed position. The cylindrical openings 32 and 33 are proportioned for accommodating the largest diameter wire which the linesmen are expected to encounter in their work. Imbedded into the body of the lower jaw are two contact pins 34 and 36 which protrude into the cylindrical openings 32 and 34. The contact pins, upon entering the body of the lower jaw, are bent at right angles, and extend outwardly so as to form two external terminals 37 and 38 equipped with set screws 39 and 40 for connecting the contact pins to two insulated leads 42 and 44, the leads terminating in two alligator clips 45 and 43 which are used for connecting the line connector to the testing apparatus. The connecting lead terminals 37 and 38, as well as a portion of the connecting leads 42 and 44, are enclosed in a flexible insulating sleeve 46 which insulates the terminals from each other by means of a baffle 47, and prevents any accidental contact with the outer terminal by means of the outer walls which tightly grip the terminals and form a positive mechanical abutment against the wall of the line connector. The sleeve also prevents the connecting leads from being broken at the set screws 39 and 40 by acting as a flexible retainer of the connecting leads at that portion of the sleeve where the leads make a positive contact with the sleeve. Accordingly, the main stress that may be imposed on the connection between the connecting leads and the connector is carried by sleeve 46.

The connector is provided with a latch spring

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49 which fits into an appropriate recess 50 in the upper jaw of the connector as seen more clearly in Fig. 2. The recess 50 is provided with a metal plate 52 imbedded in the upper jaw which reinforces the retaining edge of the recess. The contact pins or needles are radially disposed in the semi-cylindrical grooves of the lower jaw, and are so dimensioned that the tips of the needles preferably terminate at the center axes of the cylinders. The needles are made of sufficiently small diameter to prevent any injury of the insulation of the wire which is used in telephone lines.

The jaws may be made of any suitable insulating matter, but it is preferable to have them made of synthetic plastic which may be very readily molded with the metallic members of the connector conveniently imbedded in the mold. The contact pins should be made of a sufficiently hard metal to resist premature wearing out of the sharp ends of the pins, to prevent the abrasive action on the wire insulation. The pins may be made replaceable, as illustrated in the drawing, by providing pin sockets in the connectors.

The functioning of the line connector should be apparent from the given description. The connector is ordinarily suspended from the linesman's belt by means of the connecting leads 42 and 44, spring latch 49 holding the connector in its closed position. When it is desired to establish a connection with the line, the connector is opened, and the two wires are inserted into the grooves 28 and 29 of the lower jaw, the pins 32 and 33 immediately coming into contact with the outer insulation of the wires. The upper jaw is then closed whereupon the pins penetrate the insulation of the wires and establish contact with the stranded conductor. Latch 49 snaps into a closed position as illustrated in Fig. 2 and holds the line connector in closed position with the contact pins 32 and 33 making positive contact with several strands of the wires. The connector may now be dropped on the ground if so desired without any danger of establishing any ground connections since the wires are fully insulated from ground by the jaws. The linesmen are not subjected to any hazardous electrical contact with the inner conductor, and the desired contact may be established in complete darkness by feeling the jaws and the semi-cylindrical grooves 28 and 29.

Figure 3 illustrates the connections between the twisted pair of wires 300, the line connector, and the testing apparatus consisting of a telephone sub-station circuit. The insulated alligator clips of the connecting leads 42 and 44 are connected to terminals 302 and 304 of the sub-station circuit, either before or after the line connector 306 is connected to the twisted pair of wires 300, and, after the establishment of the above mentioned contacts, an alternating current generator 307 is turned by means of a handle 308 which connects the armature 309 of the sub-station circuit to contact 310. The generator thus becomes connected to the telephone wires 300, and, depending upon the condition of the line, the linesman is at once in a position to determine whether it is a closed, short-circuited or open line by feeling the load imposed by the line on the generator.

The advantages of the line connector described in this specification should be apparent to those skilled in the art. Positive electrical connections are made with the insulated conductor without any difficulties, without exposing the linesman to

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any danger, and without injuring the inner conductors or their insulation. Accordingly, after the connector is disconnected from the line wire there is no need of repairing the insulation of the wires since the openings made by the sharp pins are too small to be objectionable.

While there has been described what is at present considered a preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is aimed in the appended claim to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

An electrical line connector comprising two

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hinged-together jaws made of insulating material, each of said jaws having a flat surface engaging with the corresponding flat surface of the other jaw when said jaws are in closed position, two spaced, parallel semi-cylindrical grooves recessed in the body of each jaw with the axes of said grooves lying substantially in the plane of said surface, and said groove axes being parallel to the hinge axis of said connector, a removable contact pin radially disposed in each groove of one jaw with the tip of said pin terminating substantially at the axis of its groove, electrical terminals protruding from said jaw, each of said terminals being electrically connected to the respective pin, and a snap spring latch for holding said connector in closed position.

TURNER R. COTTRELL.