

July 17, 1956

J. M. ROGIE
ELECTRICAL CONNECTOR

2,755,452

Filed Jan. 30, 1951

2 Sheets-Sheet 1

FIG. 1

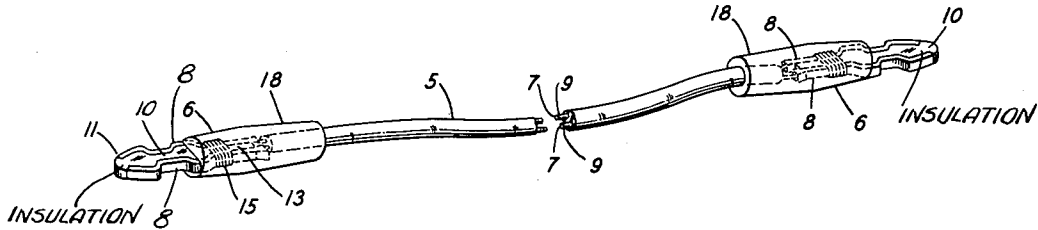


FIG. 2

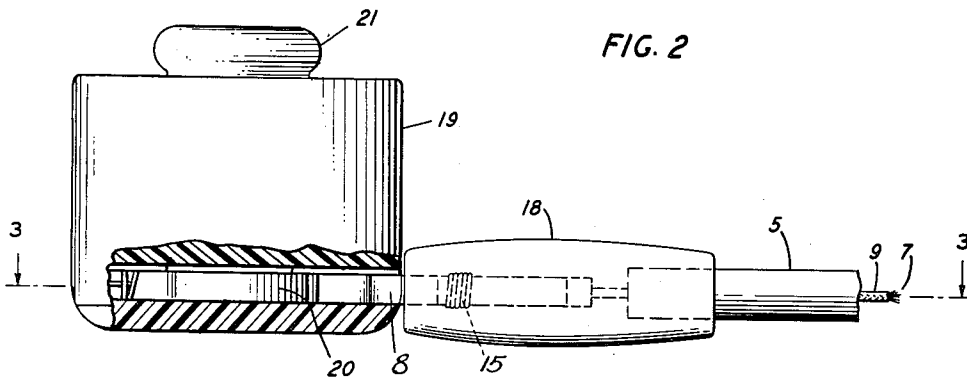
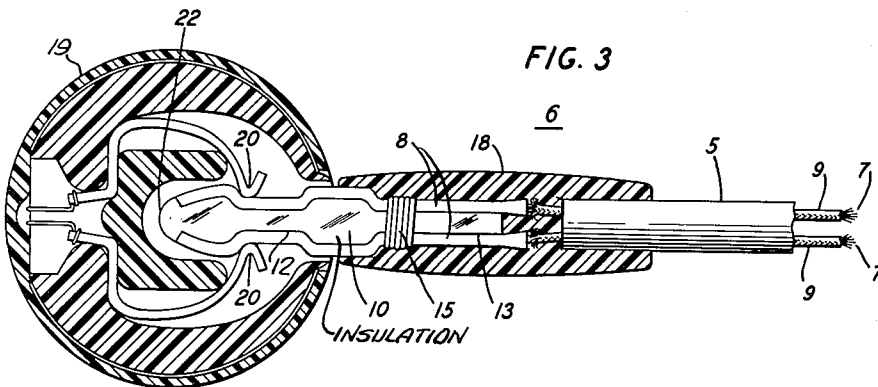


FIG. 3



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FIG. 4

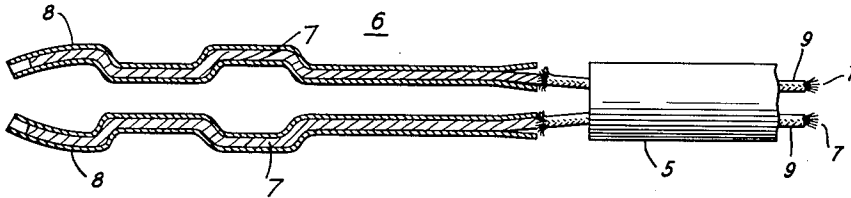


FIG. 5

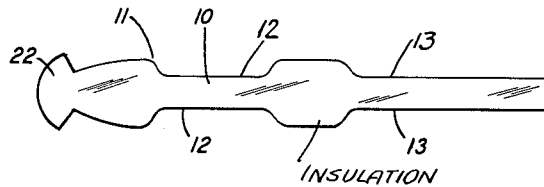


FIG. 6

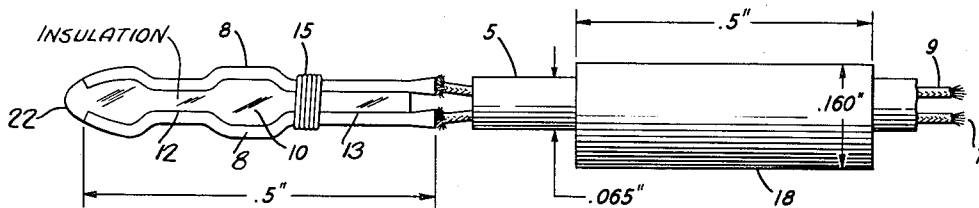


FIG. 7.

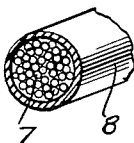
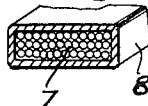


FIG. 8.



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2,755,452

ELECTRICAL CONNECTOR

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2 Claims. (Cl. 339—196)

This invention relates to electrical connectors and particularly to those of the type used with flexible conductors, for example in hearing aids and like apparatus.

With apparatus for aiding the hearing of a deaf person, it is usual to provide a small receiver to be worn in or over the ear and supplied with acoustic power from a small amplifier itself connected to a transmitter inconspicuously worn by the user of the aid. The prime requisites of all these devices, and particularly of the conductor cord and its terminations between amplifier and receiver, are long life and inconspicuousness. In addition, flexibility and freedom from discoloration are desired of the cord and its terminal connectors.

In such hearing aid apparatus, the trend is toward smaller size and less weight, and this imposes more and more stringent requirements on the process of manufacture. The present invention provides a terminal connector for a hearing aid cord which is easy and inexpensive to manufacture, besides combining stability and ruggedness with acceptable appearance.

It is thus a general object of the invention to provide a hearing aid cord termination which shall be simple and compact in design and inexpensive in fabrication.

Further, an object of the invention is the provision of such a terminal connector which shall at the same time be electrically and mechanically dependable and of light weight and pleasing contour.

It has been repeatedly observed that conductor cords for hearing aid and other apparatus most commonly fail at the terminations whereby they are connected to other parts of the apparatus. The present invention, by providing flexible junctions between conductors and connectors, substantially avoids this cause of failure. This is therefore another object of the invention.

A feature of the invention is the insertion of each conductor of a cord into a cylindrical metal tube which is then shaped under pressure to have a rectangular section of area equal to that of the tube prior to shaping. This insures that there shall be no crushing of any of the component strands of a stranded conductor in the process of shaping the tubes to the required configuration.

The connector of the present invention, while especially useful in hearing aid apparatus is in form and construction adaptable to general application in all apparatus where simplicity and flexibility is desired in connecting electrical cords to electric outlets, requiring merely changes in size to meet a specific need.

The invention will be understood and its objects apparent from the following description, referring to the accompanying drawings in which:

Fig. 1 is a view of a conductor cord terminated at each end by an electrical connector according to the invention;

Fig. 2 is a side elevation of a hearing aid receiver with a portion broken away to show the insertion of the cord termination;

Fig. 3 is a sectional view of the construction of the receiver disclosed in Fig. 2 taken on the line 3—3 in the direction of the arrows;

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Fig. 4 is a plan view, partly in section, of the connector at an intermediate stage of its construction with the bare strands of the conductors confined in their respective tubes;

Fig. 5 is a plan view of the insulator separating the tube contacts of Fig. 4;

Fig. 6 is a plan view of the connector and cord at a later stage of assembly.

Fig. 7 is a fragmentary cross sectional view of one of the tubes with the bare strands of the conductor inserted therein, prior to the deformation of the tube; and

Fig. 8 is a view similar to Fig. 7 and shows the tube after deformation.

Referring first to Fig. 1, conductor cord 5 is terminated at each end by a connector 6 constructed according to the invention. Cord 5 is any suitable length of commercially obtainable cordage comprising two conductors 7, each of which is formed of a plurality of tinsel strands individually wrapped about plastic threads composed of saponized acetate rayon manufactured by the Du Pont Company and known in the trade as "Fortisan", the strands being then wrapped about a core of "Fortisan" thread as described above in a cable lay and served with a wrapping of nylon thread. The two conductors are then laid side by side and covered with an extruded plastic jacket of polyvinyl chloride which provides additional insulation between and about the nylon-wrapped conductors.

It will be noted that connectors 6 are alike. This is satisfactory, because in a hearing aid the voltage to be applied between the receiver circuit conductors is always low; it is advantageous because all cords are reversible end for end, thus minimizing wear.

Each conductor 7 is terminally enclosed in a metal tube 8, suitably of nickel, which is threaded over the conductor stripping back the nylon serving over a short length of the strands. A preformed ethyl cellulose insulator 10 having a head portion 22, better shown in Fig. 5, is installed between tubes 8 which are then under appropriate lateral pressure formed into the shape shown in Fig. 1 and in greater detail in Fig. 4, embracing insulator 10.

Tubes 8, originally cylindrical, as shown in Fig. 7, are shaped in the operation just indicated into rectangular section, as shown in Fig. 8, the long side of the rectangle being at right angles to the plane of the cords and of insulator 10. Care is taken that the area of this section shall be the same as that of the original circular section, itself just large enough to admit smoothly the bared cable lay of the tinsel threads in each conductor. In addition to this flattening of the section, the shaping operation crimps the tubes axially to fit snugly against the respective sides of insulator 10 at the neck 11 and over the successive indentations 12 and 13. The tube portions at 12 receive the respective cooperating spring contacts 20—20 of the receiver 19 as shown in Figs. 2 and 3 or similar contacts in an amplifier (not shown) to which the cord 5 may be connected. At 13, the tubes are wrapped with a serving 15 of nylon thread.

To provide over-all insulation for the tubes 8 and at the same time furnish a flexible shield for conductors 7 near their entrance into the tubes, a flexible plastic sleeve 18 (of polyvinyl chloride, for example) is slipped over cord 5 prior to the operations thus far described. After threading tubes 8 individually over conductors 7 and binding the tubes to the desired embracement of insulator 10, tubular sleeve 18 is advanced to the position shown in Fig. 1 to surround the tubes, from a point on cord 5 well behind the point of entrance of conductors 7 into their respective tubes to a point just behind indentation 12. Sleeve 18 is then, under suitable pressure and

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heat, made to adhere firmly over the whole surface of cord 5 and connector 6.

Cord 5 is thus furnished a flexible protection over a part of its length behind the separation of conductors 7 in addition to the pliable sheath which has been initially extruded over it. At the same time, connector 6 remains substantially rigid.

As shown in Fig. 2 the connector 6 is positioned in the hearing aid receiver 19 with the ends of the tubes 8 in engagement with the contact springs 20 which are formed to receive the ends of the tubes 8. Contacts 20 are supported in the base of receiver 19, and to them are soldered leads from the diaphragm driving coil (not shown) of the receiver. Extension 21 is a means for installing receiver 19 in a plastic ear piece, not shown.

What is claimed is:

1. A connector for flexible electrical conductors comprising a pair of rigid, spaced apart, hollow, elongated terminal members, an insulating body having converging and diverging portions positioned between and separating said terminal members, said terminal members co-planar with respect to said insulating body and so shaped as to conform to the contour thereof and to be in intimate contact therewith, one end of said insulating body extending beyond the ends of said terminal members and providing therewith a smooth re-entrant portion having a reduced neck portion adjacent thereto, means comprising a wrapping of insulating material around said terminals and said insulating body for maintaining said terminal members in juxtaposition with respect to each other, conductors positioned in said hollow terminal members and making electrical contact therewith, and a flexible insulating sleeve positioned over a portion of said body, said terminal members and said conductors, said insulating sleeve firmly embracing said terminals and said insulating body.

2. A connector for flexible conductors having a com-

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mon outer jacket comprising a pair of rigid, spaced apart, elongated, hollow terminal members, each having a substantially rectangular cross section, an insulating body having converging and diverging portions positioned between and separating said terminal members, said terminal members co-planar with respect to said insulating body and so shaped as to conform to the contour thereof and be in intimate contact therewith, one end of said insulating body extending between the ends of the terminal members and providing therewith a smooth re-entrant portion having a reduced neck portion adjacent thereto, means comprising a wrapping of insulating material around said terminals and said insulating body for maintaining said terminal members in juxtaposition with respect to each other, conductors positioned in said hollow terminal members, extending substantially the full length thereof and making electrical contact therewith and a flexible insulating sleeve positioned over a portion of said body, said terminal members, said conductors and said outer jacket, said insulating sleeve firmly embracing said terminals, said insulating body, said conductors and said outer jacket.

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