March 17, 1942. C. A. WEBBER 2,276,902

ELECTRICAL CONDUCTOR

Filed Nov. 25, 1939

FIG. 1

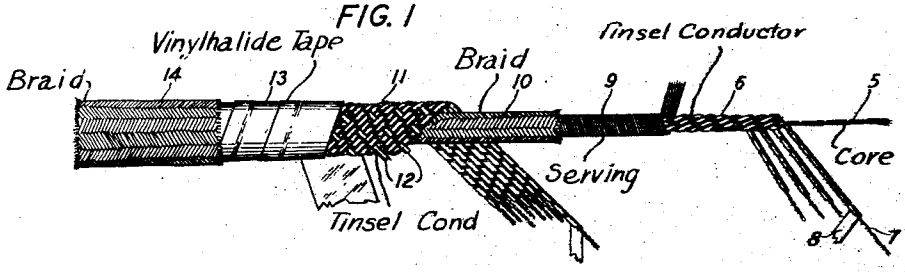



FIG. 2

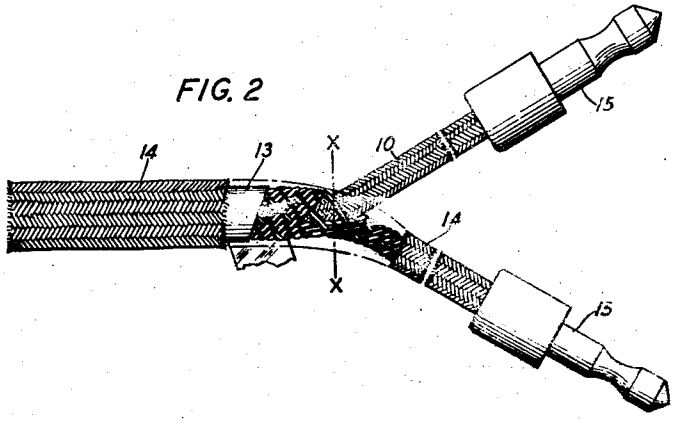



FIG. 4

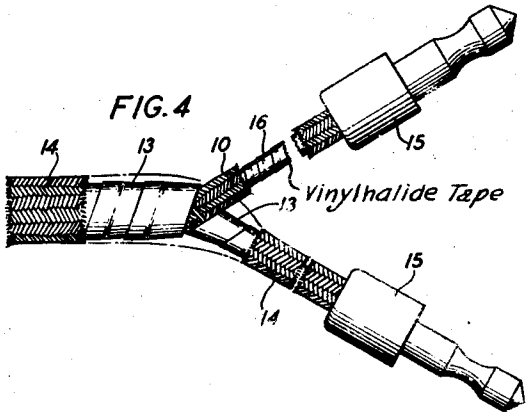
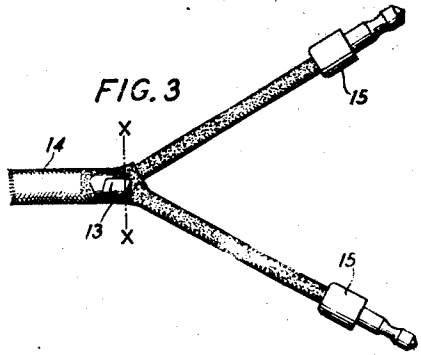



FIG. 3

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## ELECTRICAL CONDUCTOR

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7 Claims. (Cl. 174—105)

This invention relates to electrical conductors and more particularly to flexible conductors such as are used in connection with portable hearing devices for deaf people.

In order to be as inconspicuous as possible the flexible cords used in deaf sets are preferably made as small in diameter as is compatible with meeting the electrical requirements. A further requirement is that the cords be flexible without being subject to kinking. To attain the desired flexibility it is customary to employ tinsel conductors composed of thin ribbons of copper or other good conducting metal wound helically about textile threads. In view of the extreme thinness of such ribbons it is necessary to prevent, in so far as possible, the entrance of moisture which might cause corrosion and in the end rupture of one or more of the conducting ribbons, thus in turn producing a "noisy" cord. In the case of deaf sets the flexible cords often come in contact with the body of the user and as a result they become more or less saturated with perspiration when used by a person who perspires freely. Since perspiration contains an appreciable amount of acid salts it has been found to be the greatest source of corrosion with such cords. Furthermore, the textile braiding of such cords becomes saturated with conducting salts resulting in an appreciable current drain on the necessarily small batteries in addition to that required to operate the set, and thus necessitates more frequent replacement of such batteries.

It is therefore the principal object of the present invention to overcome the difficulties resulting from perspiration in the flexible cords of deaf sets.

A further object of the invention is a flexible conductor which is small in size and not subject to snarling or kinking. These and other objects of the invention are attained by providing a very thin perspiration-resistant shield between the conductor and the braiding of the cord and impregnating the ends of the cord with a perspiration-resistant material which bonds with the shield and prevents the braiding at the ends of the cord from becoming saturated with perspiration salts and thereby conducting. To provide further protection in extreme cases a similar shield is provided about each individual conductor.

The invention may be more clearly understood by reference to the accompanying drawing in which:

Fig. 1 discloses the structure of the body portion of a cord embodying the invention;

Figs. 2 and 3 show the end portions of such cord; and

Fig. 4 shows a modified structure.

In the arrangement disclosed in Figs. 1 and 3 the body portion of the cord consists of a textile thread or core 5 about which are twisted a plurality of tinsel strands to form the conducting member 6. Each of these strands consists of a textile thread 7 wrapped with a thin tape 8 of copper or other good conducting material. The conductor 6 is covered with an insulating layer 9 composed of textile threads, preferably silk, wrapped tightly about the textile strands and thus serving to maintain the conductor in compact form as well as to provide the necessary insulation. A textile braiding 10 surrounds the served conductor over its entire length. The outer conductor 11 consists of a plurality of strands of tinsel threads similar to those composing the inner conductor 6. These strands in the form of a flat band are served about the braiding 10 to form a closed helix by means of a braider and with a number of textile threads 12, 12 having a reverse lay to combine the strands into a braiding. Over the outer conductor there is provided a layer of insulating material which is resistant to moisture and particularly resistant to the effects of perspiration. As shown this layer preferably is in the form of a thin tape 13 which is served on the conductor with a slight overlap. In practice a tape approximately .002 inch thick and 3/8 inch wide is employed and this tape preferably consists of a vinyl chloride or other vinyl halide which has satisfactory mechanical properties and is resistant to perspiration. A material which has been found satisfactory for this purpose is the composition known by the trade name Koroseal. An outer braiding 14 is provided over the tape 13.

The method of branching out the cord ends is disclosed in Fig. 2 in which a portion of the braiding and moisture-resistant tape is removed to more clearly show the construction. Although only one cord end is illustrated, it will be understood that both ends of the cord are treated in the same manner. As shown in this figure the tape serving 13 ends approximately at the point X where the individual conductors are separated and the conductor 6 with its braiding 10 passes out through the strands of conductor 11 and its braiding 14 which consequently are reduced in size. Terminal members 15, 15 are soldered or otherwise secured to the conductor ends in accordance wtih common practice.

The ends of the cord after being constructed

as described are then impregnated to prevent them from becoming saturated with perspiration salts which would cause the braids 10 and 14 to become conducting and thus permit the flow of an appreciable leakage current between terminals 15, 15. This treatment consists preferably in dipping the cord ends into a heated bath consisting of a vinyl halide, preferably a vinyl chloride diluted with a solvent such as chlorbenzene or chlortoluene to an amount such as to permit thorough impregnation of the braiding. For this purpose satisfactory results have been obtained when using equal parts of chlortoluene and a vinyl halide, commonly known as Korolac. When maintaining this bath at a temperature of approximately 240° F. it has been found that an impregnating period of approximately one minute is sufficient to drive out any moisture and thoroughly impregnate the braiding without seriously decreasing its flexibility. The cords are next placed in an oven at a temperature of approximately 150° F. for a period of about one hour to drive off the solvent. As will be noted from Fig. 3 the cords are dipped so that the impregnation extends beyond the point X at which the tape serving ends and since the impregnating bath is a solution of the same material as the tape there is formed an intimate bond which effectively precludes entrance of moisture or perspiration into the body of the cord.

The modification illustrated by Fig. 4 differs from the structure described in that a tape 16 of vinyl halide, preferably vinyl chloride, is also positioned inside of the braiding 10 thus providing a shield of moisture-resistant material between the respective conductors over their entire length. The cord ends are then impregnated in the manner described above to form intimate bonds with the tapes and prevent leakage of current over the braiding.

Although a cord has been described employing only a pair of conductors it is obvious that the invention is also applicable to cords employing a greater number of conductors either positioned concentric to each other or in a twisted or parallel relation.

What is claimed is:

1. A flexible electric cable comprising a pair of concentric conductors separated by a layer of insulating material, a textile braiding extending over the entire length of the inner of said conductors, a layer of vinyl chloride tape surrounding the greater portion of the outer conductor and a second braiding placed over the layer of vinyl chloride and extending over the end portion of said outer conductor, the end portions of said braidings being impregnated with a solution of vinyl chloride to form an intimate bond with said tape.

2. An electrical cable comprising a tinsel conductor, a layer of insulating material thereabout, a braiding of textile material about said insulated conductor, a conductor consisting of multiple strand tinsel conductors served about the greater portion of said inner braided conductor, a layer of moisture-resistant material positioned about said outer conductor and a textile braiding surrounding said outer conductor over its entire length, the end portions of said braidings being impregnated with a solution of said moisture-resistant material to form an intimate bond therewith.

3. An electrical cable comprising a tinsel conductor, a layer of insulating material thereabout, a braiding of textile material about said insulated conductor, a second conductor consisting of multiple strand tinsel conductors served as a flat band about the greater portion of said braided conductor, a layer of thin vinyl chloride tape served with an overlap about said second conductor over the greater portion of its length, and a braiding of textile material surrounding said first conductor over its entire length, the end portions of said braidings being impregnated with a solution of vinyl chloride to form an intimate bond with said tape.

4. A flexible electrical cable comprising a tinsel conductor, a layer of insulating material thereabout, a layer of thin vinyl chloride tape served about said insulated conductor over its entire length, a braiding of textile material about said serving, a second conductor positioned about and surrounding said textile braiding, a layer of vinyl chloride tape served with an overlap about said second conductor over its entire length and a braiding of textile material surrounding said tape, the end portions of said braidings being impregnated with a solution of vinyl chloride to form an intimate bond with said layers of vinyl tape.

5. An electrical cable comprising a body portion in which a plurality of insulated conductors are enclosed within a single braiding and end portions in which the respective insulated conductors are branched out from said braiding to serve as connecting terminal members, said body portion being provided with a layer of vinyl halide tape wound helically about said insulated conductors inside of said braiding and extending to the point at which the conductors are branched out and said end portions being impregnated with a solution of vinyl halide to form an intimate bond with said tape.

6. An electrical cable comprising a body portion in which a pair of insulated conductors are enclosed within a textile braiding and end portions in which the respective conductors are branched out from said braiding to serve as connecting terminal members, one of said conductors comprising a flexible conductor provided with a textile braiding over its entire length, the other of said conductors being concentric with said first conductor and surrounded by a layer of vinyl halide tape throughout the body portion of said cable and having its end portions enclosed within extensions of the braiding covering the body portion of the cable, the end portions of said braiding being impregnated with a solution of vinyl halide to form an intimate bond with said tape.

7. An electrical cable comprising a body portion in which a pair of insulated conductors are enclosed within a textile braiding and end portions in which the respective conductors are branched out from said braiding to serve as connecting terminal members, one of said insulated conductors comprising a flexible conductor surrounded by a helically wrapped layer of vinyl halide tape and a textile braiding over its entire length, the other of said conductors being concentric with said first conductor and surrounded by a layer of vinyl halide tape throughout its entire length and having its end portions enclosed within extensions of the braiding covering the body portion of the cable, the end portions of said cable being impregnated with a solution of vinyl halide to form an intimate bond with said tape.

CARROLL A. WEBBER.