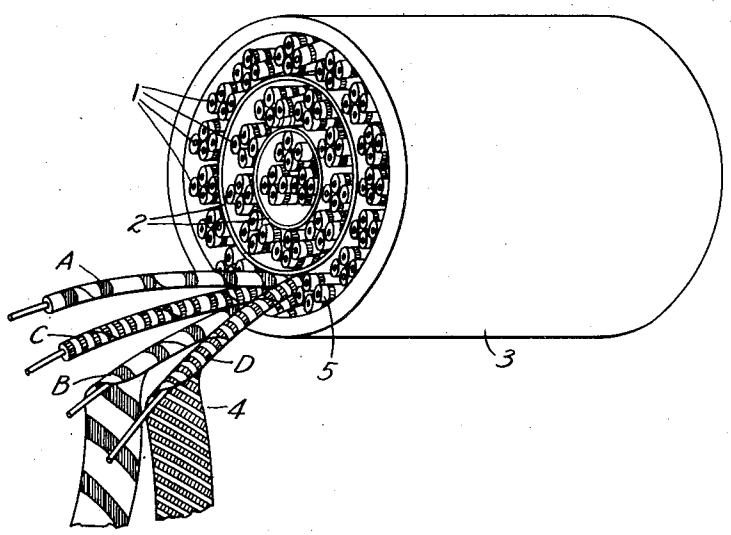
May 3, 1932. W. K. WESTON 1,856,676

TELEPHONE CABLE

Filed Feb. 9, 1929



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UNITED STATES PATENT OFFICE

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TELEPHONE CABLE

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In the manufacture of cables for telephone communication it is usual to select certain conductors for particular circuits and to assemble them into corresponding groups which may be pairs, quads or larger order groups. In such an arrangement proper balance of electrical characteristics in each group is essential to high quality transmission and to attain such balance various expedients are in use. It is also necessary to provide a means for distinguishing any conductor, pair or sub-group from others in any particular group in the cable. This is usually done by applying an identifying color or mark to the paper insulation of the conductors.

The present invention provides an improved electric cable in which all the insulated conductors of one group or in any individual group are marked or identified by the same color or are marked so that the coloring material both as regards quality from an electrical standpoint, and quantity per unit area on each conductor insulation, is as nearly as possible the same. By this means any electrical unbalance due to difference of electrical characteristics of the coloring or marking of conductors in each group may be appreciably reduced.

The invention will be described by way of example with reference to a quadded cable as represented in the accompanying drawing.

The cable comprises a plurality of quads 1 arranged in layers which are shielded by a metallic screen 2 in known manner. The quads each contain four conductors insulated from each other by a paper insulation applied for example in the form of a ribbon. The four conductors of each quad are arranged in pairs. The two conductors of each pair are twisted together. The number of twists per unit of length of one pair preferably differs from that of the other pair in the same quad. The pairs are twisted together to form the quad and the length of lay of the quadded twist is different from that of either of the pairs. Each conductor is insulated by a paper ribbon of a neutral color or of a natural color printed with identification marks. The color or colors of the insulation employed for all the conductors in one quad are all the same. The four papers for one quad may preferably be chosen from adjacent positions in the paper roll, these four papers being imprinted with the same amount of ink on each paper, the ink being also of the same color or composition. The identification of either pair in any quad is permitted by using different markings on the pairs, taking care that in giving this different marking the same amount of coloring material is present on all the conductors of the quad. This is shown in the figure in which conductors A, B, form one pair, while conductors C, D form the other pair of a quad 4. The identification in this case may be, for example, by means of black marks upon a natural color ground and the conductors C, D would have narrow stripes for identification purposes, but the total amount of color per unit of surface of any of the conductors, A, B, C or D is the same. If desired, of course, the conductors of each pair may also be identified in a similar manner provided the said precaution is taken. The identification between the conductors of different quads may be made by using different colors for different quads, for example quad 5 may comprise conductors which are insulated by means of paper having a red stripe on a natural colored ground, the identification between the pairs of quad 5 being permitted by arranging different width stripes on the insulation as in the case of quad 4.

By so marking the insulation of the conductors in the cable it is found that capacity unbalances are not introduced through nonuniformity of the insulation surrounding the conductors of each quad, and in order further to ensure this it is preferable that the disposition of the ink upon each of the papers of a quad is made substantially in similar manner for all four conductors in order that the qualities of the paper may not be differently affected.

The identification marks shown in the drawing are in the form of stripes at right angles to the length of the conductors. This is obtained by marking the ribbon with

oblique stripes so that after wrapping around the conductor the angle of application of the ribbon produces the right angle direction of the stripe. If desired the stripes may be marked on the paper in such a way in the finished cable that they may appear at a different angle on the insulation and in some cases a difference in the angle may be used for giving the identification between different conductors of a quad or between the conductors of different quads.

A lead sheath or the like 3 is provided in the usual manner to complete the cable.

In an actual cable the quads would be much closer than shown on the drawing which is intended to illustrate the principles of the invention with most clearness.

It should be understood that it is within the scope of the invention to use other insulating materials than paper as described above and that the insulation, even in the case of paper, may be applied in other forms than that of a ribbon; coloring matter furthermore may be applied to the insulation after the latter has been placed upon the conductor. Thus, the conductor may be insulated with papier-mâché and the identification color applied after the papier-mâché has been formed about the conductor and dried.

What is claimed is:

1. A telephone cable having a plurality of conductors, paper insulation on said conductors, a coloring substance applied to said paper insulation in such an amount as to equalize the capacities between conductors and in such formation as to serve as distinguishing marks on said conductors.

2. A telephone cable having a plurality of pairs of conductors, paper insulation on said conductors, a coloring substance applied to said paper in such amounts that the capacity of conductors of different pairs will be equal, and in such configuration that individual conductors may be identified thereby.

3. A cable comprising a plurality of paper insulated conductors arranged in groups and having colored identification markings applied to the outer surface of the insulating paper wherein the ground color for the marking is the same for at least two of the conductors in one group and the identification marking is composed of such coloring matter and has such configuration that said conductors have substantially the same dielectric characteristics and that the markings on said conductors are substantially different.

4. A cable comprising a plurality of paper insulated conductors arranged in groups and having colored identification markings applied to the insulating paper wherein for at least two of the conductors of any one group the ground color for the marking is the same, and the coloring matter of the marking is the same and is applied in the same amount per unit area of paper insulation and wherein the formation of the coloring matter on one of said conductors of a group is different from that on the other of said conductors.

5. A cable in accordance with claim 4 wherein the identification marking on the conductors in any one group comprises stripes of different shapes.

6. A telephone cable comprising paper insulated conductors arranged in a quad and forming two pairs and having colored identification markings applied to the outside surface of the insulating paper, the ground color of all of said conductors being the same, the dielectric characteristics and the amount of coloring matter being the same for said conductors, the marking matter on the paper of one conductor of the pair being disposed differently from the marking matter on the other conductor of said pair.

In witness whereof, I hereby subscribe my name this twenty-ninth day of January, 1929.

WILLIAM KIRBY WESTON.