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METHOD AND MEANS FOR THE IDENTIFICATION OF ELECTRICAL CABLES

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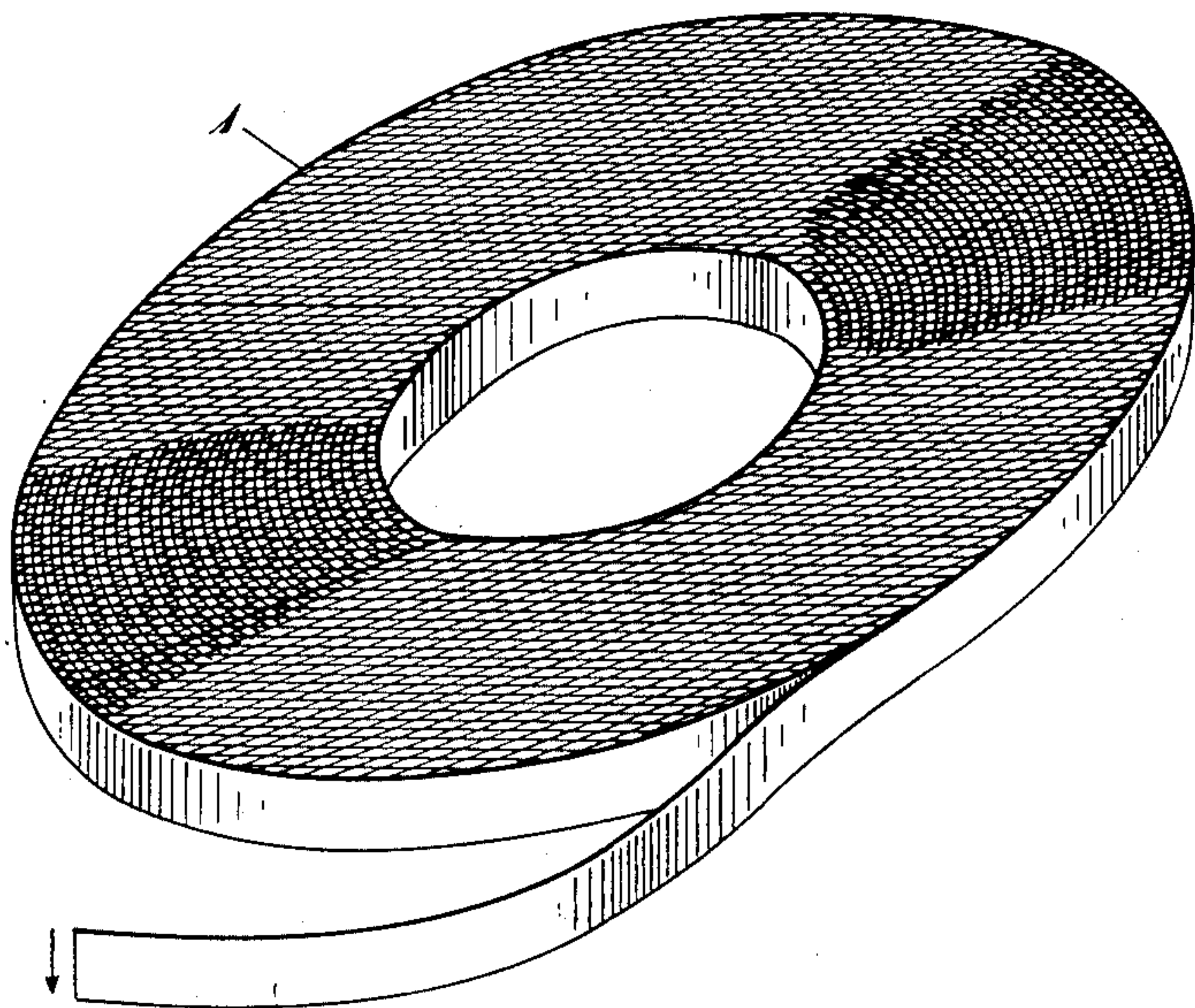


Fig. 1

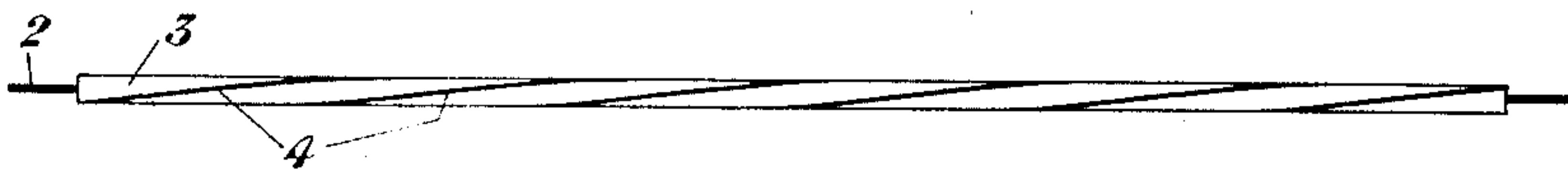


Fig. 2



Fig. 3

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METHOD AND MEANS FOR THE IDENTIFICATION OF ELECTRICAL CABLES.

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This invention relates broadly to the manufacture of electrical cables, and especially to the method and means for placing a designating mark upon the insulated conductors used in the manufacture of such cables in order to insure greater accuracy, and therefore efficiency, in the manufacture and installation of such cables.

The telephone cables of any of the well-known types usually consist of a plurality of pairs of insulated conductors stranded together in order to form a compact core. Each conductor of such a cable is covered with paper insulation usually in the form of a tape spirally applied in such manner that each successive convolution overlaps partly the preceding one. Two conductors thus insulated, but usually differing in the color of the insulating paper, are twisted together to form a pair. The use of a different color of insulation upon each conductor of a pair of wires was found desirable in order to distinguish the two sides of the pair during the processes of manufacturing and of installing the cables containing these conductors.

With the increase in the number of pairs contained in such cables, especially exchange cables which are intended for subscribers' distribution purposes, it became increasingly difficult to select certain pairs therein for splicing and terminating, so that this led to the adoption of a group color system. Thus, for example, in a 101 pair exchange cable there are fifty red-white pairs, fifty blue-white pairs and a so-called tracer pair, having some distinctive color combination. The pairs of each of these groups have definite numbers assigned to them, so that the splicing and terminating of particular pairs is greatly facilitated by such a color code. In larger cables a greater number of groups are employed, the pairs in each group having the same combination of colors of insulation, while the color combination of the different groups varies.

In the manufacture of these so-called exchange cables (as distinguished from toll cables, which have different color combinations), the pairs of wires are laid up in layers which vary in number depending upon the size of the cable. These layers are twisted around a central core, consisting of a few pairs of wires, the adjacent layers being twisted in opposite directions. If the adjacent pairs in any layer have the same

length of twist, it will be seen that a parallelism exists between the conductors of the said pairs, so that that form of inductive interference known as cross-talk will result. It has accordingly been proposed to make up these cables with the adjacent pairs having different lengths of twist. Thus for example, a red-white pair of X inches twist would be flanked on each side by other red-white pairs of Y inches twist. Similarly, in other groups of the same cable, as for example, the blue-white group, a blue-white pair of X inches twist would be placed adjacent to similarly colored pairs of Y inches twist.

It will be apparent from the foregoing description that, since such a cable is composed of like colored pairs having different lengths of twist, confusion is likely to result unless some means be provided to readily distinguish the pairs of different twists. This need for a suitable distinguishing mark arises in the storerooms where the spools of twisted insulated pairs are stored prior to their use in forming the cables. An equally, if not more important need for such identifying means arises in the stranding process to enable the workmen and supervisors to determine whether the twisted pairs upon the spools which have been arranged upon the spindles of the stranding machines have the proper length of twist to produce the desired lay-up in the stranded cable.

In view of the fairly complex nature of the existing color code of exchange cables, it was necessary to avoid the use of distinguishing marks which would add to the present complexity and might tend to cause confusion in manufacturing and installing exchange cables embodying the present color code.

It is one of the objects of this invention to provide a simple method for distinctively marking the insulation of one of the wires of a pair having a predetermined length of twist to distinguish that pair from another pair having the same colors of insulation, but a different length of twist from the first mentioned pair.

This invention will be clearly understood from the following description when read in connection with the attached drawing of which Figure 1 represents a pad of insulating paper marked in a manner hereinafter described which forms a part of the

invention; Fig. 2 represents a conductor to which such marked insulation has been applied; and Fig. 3 shows a pair of wires, one of which bears the designating mark shown in Fig. 2.

In preparing the paper used in insulating the conductors of a telephone cable, it is customary to cut transversely or to slice a large roll of paper into a number of smaller rolls or pads, each of which is a flat, tightly coiled helix. Such a pad of paper, which is in the nature of a long, coiled tape, is put upon an insulating machine of the type well known in the art, and the paper is drawn off at a definite angle, while the pad revolves around the conductor to be insulated. This paper tape is placed upon the conductor in a way that the successive convolutions of paper tape overlap the preceding one, the amount of overlap being determined by various factors. This leaves uncovered one edge of the tape after it has been applied to the electrical conductor. By utilizing this characteristic of the paper insulated conductor, namely, the exposed edge of the spiralled tape, it is practicable to clearly distinguish two insulated conductors, even though the color of the insulating material is the same upon both conductors.

My invention consists in placing upon one side of the pad before it is unrolled a coating of a distinctive color and in applying the paper tape to a conductor in such manner that the coated edge of the paper tape is the one which is not covered up by the overlapping of the successive convolutions of the tape. Such a marked conductor presents the appearance of having a colored thread spiralled over the insulating material, which thread, however, is sufficiently fine as not to cause confusion.

The first step in carrying out this invention will be clearly seen in Fig. 1, where the upper surface of the pad 1 has been colored in a distinctive manner. It is preferable that this color shall form only a coating upon the side of the pad, that is to say, that it shall not penetrate transversely through the pad in the direction shown by the arrow. Such penetration would tend to cause discoloration of the insulating paper and to increase the difficulty in distinguishing the different wires in the subsequent processes of manufacture and of installing the cables. The application to a conductor of the paper insulating tape of Fig. 1 is clearly shown in Fig. 2 wherein the conductor 2 is insulated by means of the spiral wrapping of paper 3. The colored edge of the paper, represented by 4, may be made as light or as heavy as is demanded by the circumstances of each particular case. It is important, however, that in signaling cables, particularly telephone cables, the coloring matter shall not penetrate through

the pad of insulating paper to such extent as to change the appearance of the color of the paper tape, because any material change in such colors tends towards the impairment of the splicing efficiency of such cables.

Fig. 3 shows a pair of conductors in which this invention is employed. As will be readily seen, the insulation upon conductor 5 has a marked edge 6, which readily distinguishes the pair of wires with which it is associated from another pair of wires having paper insulation of the same colors as the first pair, but not having such designated marking thereon. If, for example, conductor 7 is insulated with blue paper and conductor 5 with white or grey paper, having the exposed edge of the insulation slightly blackened, such a pair of insulated conductors will be readily distinguishable from another blue-white or blue-grey pair in which the white or grey insulation bears no distinguishing mark such as is carried by the first mentioned pair. Thus, similarly colored pairs which have different lengths of twist may be readily distinguished.

While the invention is not limited to any particular method for applying this colored film or coating to a pad of insulating paper, it has been found practicable to do so by means of the ink roller of the ordinary printing press. Furthermore, various ways may suggest themselves to those skilled in the art, but it is desirable that the film or coating shall not penetrate greatly in a transverse direction as represented by the arrow in Fig. 1.

The utility of this invention in the store-rooms and in the factory where the pairs of wires are assembled in the form of cables, has already been referred to, but it also finds use in the field during the installation and maintenance of such cables. Since the conductors of a pair having a shorter twist are longer than the conductors of a pair having a longer twist, it may be desirable in order to equalize the lengths of conductors in a cable, and thereby to equalize the loop resistances, to splice together adjacent sections of cable in such manner that the pairs having short twists in one section will be spliced to pairs in the next section having long twists. The presence of the distinguishing mark along the uncovered edge of the insulation of a conductor of one pair will enable the splicer to distinguish such pairs from the other similarly colored pairs having a different length of twist.

While this invention has been described as applied to paper insulation, it is not limited to this type of insulation, but may be applied to other suitable insulating material. Furthermore, while mention has been made of a colored film or coating, it is to be understood that this does not mean that the coloring material cannot and does not penetrate

the fibre of the insulation to some extent. The invention covers the use of dyes or stains applied to the edge of the tape, even though such method may involve some penetration through the fibre of the tape.

Although this invention has been disclosed as embodied in a particular form and arrangement of parts, it is to be understood that it is not so limited, but may be embodied in other forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. The method of placing a distinguishing mark on a tape intended for insulating electrical conductors, which consists in coiling the tape in a compact spiral and then applying coloring material to one face of the spiral, thereby marking the corresponding edge of the strip along its entire length.

2. As an article of manufacture, a circular pad of paper comprising a strip wound

tightly in the form of a flat helix having one edge thereof colored differently from the color of the paper constituting said pad.

3. As an article of manufacture, a pad consisting of a helix of insulating tape, one side of the said pad being distinctively colored to contrast with the rest of the tape.

4. As an article of manufacture, an insulating tape having an edge distinctively colored to contrast with the rest of the tape.

5. As an article of manufacture, an insulating tape having both edges distinctively colored to contrast with the rest of the tape.

6. As an article of manufacture, an insulating tape having an edge distinctively colored to contrast with the rest of the tape, the faces of the said tape being substantially unaffected by the edge coloring.

In testimony whereof, I have signed my name to this specification this 25th day of September 1922.

WILLIAM H. MARTIN.