

Nov. 5, 1968

H. DE VINE ET AL
TELEPHONE CONDUCTORS WITH LONGITUDINALLY WRAPPED AND
BONDED PAPER TAPE INSULATION
Filed June 12, 1967

3,409,734

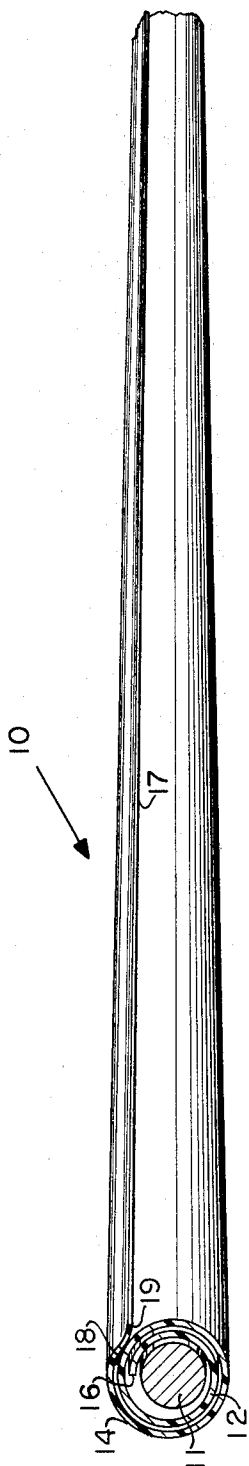


Fig. 1

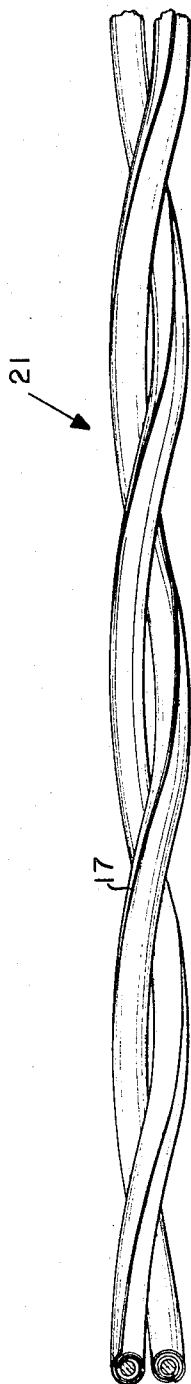


Fig. 2

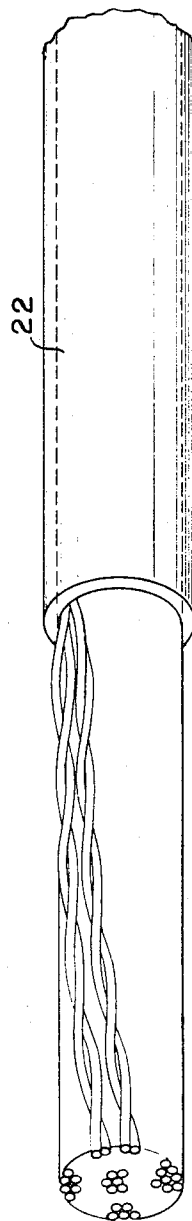


Fig. 3

INVENTORS
HENRY De VINE
W. F. MORRISON
BY *W F Morrison*

THEIR AGENT

1

3,409,734

TELEPHONE CONDUCTORS WITH LONGITUDINALLY WRAPPED AND BONDED PAPER TAPE INSULATION

Henry De Vine, Belton, Mo., and William F. Morrison, Sycamore, Ill., assignors to Anaconda Wire and Cable Company, a corporation of Delaware

Filed June 12, 1967, Ser. No. 645,414

3 Claims. (Cl. 174—113)

ABSTRACT OF THE DISCLOSURE

In telephone cables of the type where the conductors have paper wraps with a longitudinal seam, the paper is bonded to itself by means of a narrow band of adhesive close to its edge.

Background of the invention

This invention relates to insulated multiple conductor cables such as telephone cables and to the conductors making up such cables where the conductors are insulated with wrapped paper tapes.

It has long been known to use paper tapes for the insulation of communications cables and, more recently, it has been found advantageous to apply such tapes with a longitudinal edge, rather than helically. Burr Patent 3,271,508 describes such a cable and Burr application Ser. No. 383,335, filed July 17, 1964, now Patent No. 3,337,386, describes apparatus for applying paper insulation with such a longitudinal seam. The actual insulating wall provided by this tape consists not only of the layer of paper, but of the intermediate layers of air. This combination has a low dielectric constant that results in a low capacitance that, in turn, has the desirable effect of reducing attenuation. It has been recognized, however, that paper-wrapped cables would be improved if some means were found to prevent the paper from unwrapping from the conductors at the stripped-back ends of a cable, particularly when the ends are left exposed under humid conditions for long periods during, or in preparation for splicing.

Summary

We have made an improvement in telephone cables by our invention of an insulated electrical conductor with a metal strand of indefinite length insulated with a paper tape. The tape is wrapped to form substantially two layers around the strand while maintaining the edges of the tape straight and parallel to the strand. A coating of adhesive is applied in a narrow band at the inside surface of the tape, close to, but not touching, its outer edge. Surprisingly, this improvement has been made without an appreciable increase in capacitance although any adhesive that is used is known to have a higher dielectric constant than air. Our success apparently resides in the fact that in confining the adhesive to a narrow band in the location we have selected, although some of the air space is reduced, the insulation structure is made more resistant to collapse under pressure, such as when the conductors are twisted together, and the pairs stranded into a cable.

When the insulated conductors hereinabove described are twisted together each rotation of the pair also rotates each of the conductors with its surrounding tape insulation, so that the tape edges take a helical form with a length of lay the same as the length of lay of the pair twist. Such a pair is a product of our invention as are telephone cables comprising a plurality of said pairs helically stranded together and covered with a protective jacket.

Brief description of the drawing

FIGURE 1 shows a section and lengthwise view of an insulated conductor of our invention.

2

FIGURE 2 shows a section and lengthwise view of a twisted pair of our invention.

FIGURE 3 shows a section and lengthwise view of a cable of our invention.

Description of the preferred embodiments

In FIGURE 1 an insulated conductor, indicated generally by the numeral 10, has a metal strand 11 surrounded by a first inner layer 12 of a paper tape and a second outer layer 14 of said tape. The section of the two layers forms a continuous spiral with an inner edge of a tape 16 and an outer edge 17 of said tape being straight and parallel to the strand 11. A narrow band 18 of adhesive has been applied to the inside surface of the outer layer 14 bonding it to the underlying tape in such a manner as to leave a fine strip 19 of the tape, adjacent to the edge 17, free from adhesive. The adhesive used for the band 18 should be moisture resistant, and very free flowing so that it can be applied by means such as a fine hollow needle. We have preferred that a suspension of polyvinyl acetate, which is widely available commercially, be used for the adhesive bond 18.

Although we have shown the band of adhesive 18 to have a visible thickness, in actual practice the quantity of adhesive used is so small that it is visible only under a microscope.

In FIGURE 2, two of the conductors of FIGURE 1 have been twisted together to form a pair 21. As is well known to persons skilled in the cabling arts, it is possible, by so-called planetary stranding, to twist strands so that no twist is imparted to the individual members; but because of the high manufacturing cost of this method, we prefer to employ a well-known twisting method for the manufacture of pairs that does twist the individual strands on their own axes, and in so doing, imparts a twist of the same lay length to the tape insulation. This twisting of the edge is clearly shown in FIGURE 2 where it can also be seen that twisting together the strands tends to crush the insulation and to increase the mutual capacitance between pairs. Bonding the tapes prevents this crushing action from tightening the spiral sections of the tapes around the strands. The free edges of the tapes also adds to the separation of the pairs with the beneficial result that the addition of adhesive has not appreciably increased the mutual capacitance.

In FIGURE 3, the tapes have been subjected to further crushing by being stranded into a cable 22. The stranding of the pairs is performed with a length of lay considerably greater than the length of lay of the pair twists but the stranding operation still has some crushing effect which is resisted by reason of our improved insulation.

We have invented new and useful articles of which the foregoing description has been exemplary rather than definitive and for which we desire an award of Letters Patent as defined in the following claims.

We claim:

1. An insulated electrical conductor comprising:
 - (A) a metallic strand of indefinite length,
 - (B) a paper tape surrounding said strand and providing electrical insulation therefor,
 - (a) said tape being wrapped with its edges straight and substantially parallel to said strand, and
 - (b) said tape forming substantially two layers around said strand,
 - (C) a coating of adhesive bonding said tape to itself,
 - (a) said coating being applied in only a narrow band at the inside surface of said tape close to, but not touching, the outer edge of said tape.
2. A telephone conductor pair comprising:
 - (A) two metallic strands of indefinite length twisted together throughout said length,

3

(B) paper tapes surrounding each of said strands and providing electrical insulation therefor,

(a) said tapes being wrapped with their edges having the same helical length of lay as the length of lay of said pair twist,

(b) said tapes each forming substantially two layers around its respective strand,

(C) a narrow band of adhesive bonding each of said tapes to itself close to the edge of said tape.

3. A telephone cable comprising a plurality of the

4

pairs of claim 2 helically stranded together and covered with a protective jacket.

References Cited

UNITED STATES PATENTS

3,271,508 8/1966 Burr ----- 174-113

LEWIS H. MYERS, *Primary Examiner*.

E. GOLDBERG, *Assistant Examiner*.

5

10