Nov. 11, 1930. F. PALMER ET AL 1,781,521

ELECTRICAL CONDUCTOR AND METHOD OF MAKING THE SAME

Filed Jan. 9, 1929 2 Sheets-Sheet 1



Fig. 2.

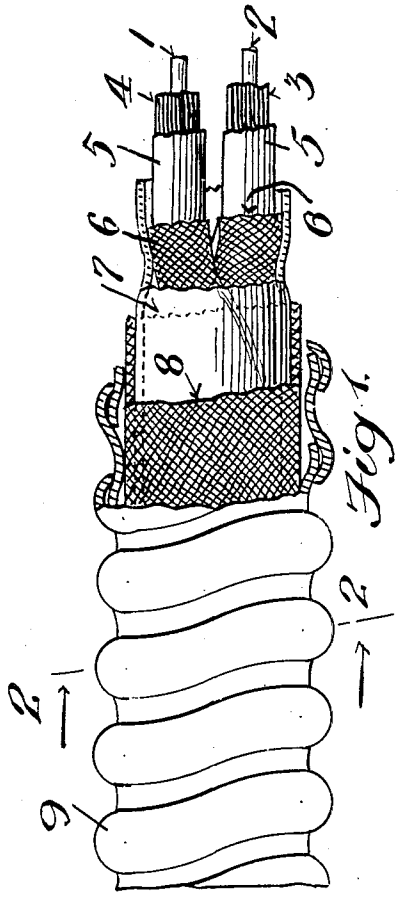


Fig. 1.

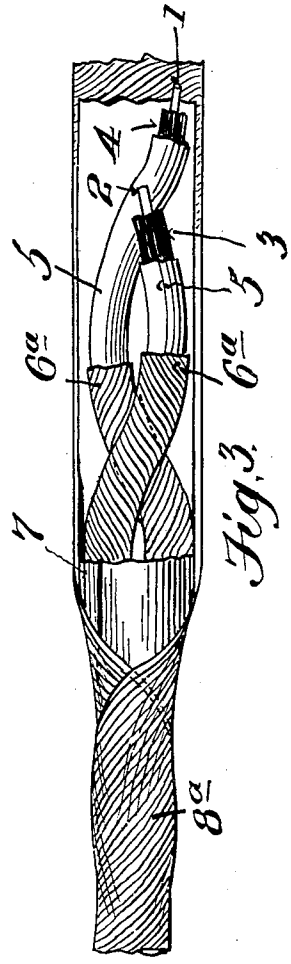


Fig. 3.

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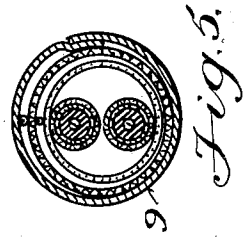


Fig. 5.

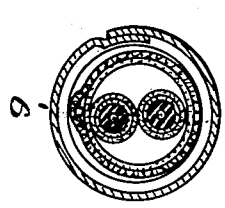


Fig. 7.

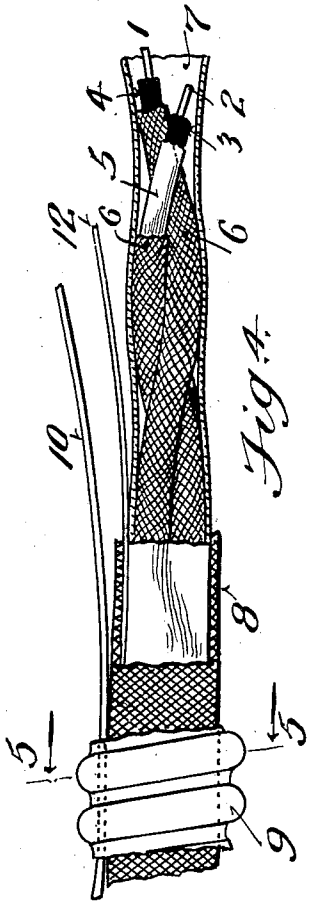


Fig. 4.

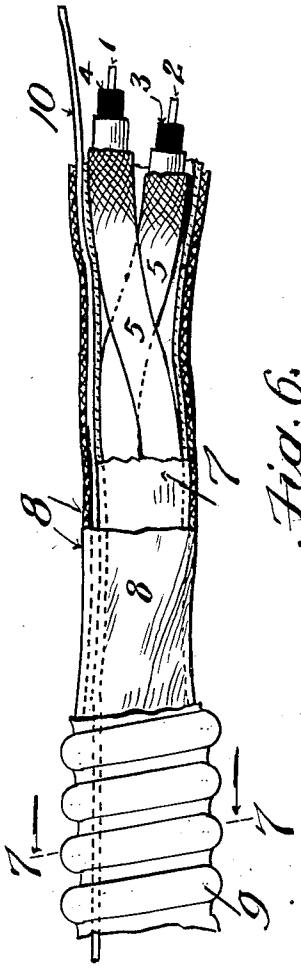


Fig. 6.

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Patented Nov. 11, 1930

1,781,521

UNITED STATES PATENT OFFICE

FREDERICK PALMER AND JOHN E. McAULIFFE, OF BROOKLYN, NEW YORK, ASSIGNORS TO TRIANGLE CONDUIT COMPANY, INC., OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK

ELECTRICAL CONDUCTOR AND METHOD OF MAKING THE SAME

Application filed January 9, 1929. Serial No. 331,177.

This invention relates to electrical conductors and the method of making the same.

The object of the invention is to provide an improved electrical conductor having greater safety factors, strength, durability, insulation, etc. but which may be produced more cheaply than is possible according to the present methods of manufacture.

Further objects of the invention will appear more fully hereinafter.

The invention consists substantially in the combination, construction and relative arrangement of parts, as well as the method of fabrication of the completed product, all as will be more fully hereinafter set forth as shown in the accompanying drawing and fully pointed out in the appended claims.

Referring to the drawings,—

Figure 1 is a view of a conductor embodying our invention with parts broken away to show the interior structure thereof.

Figure 2 is a sectional view taken on the line 2—2 of Fig. 1 looking in the direction of the arrows.

Figure 3 is a fragmentary view similar to Figure 1 showing a slightly modified construction embodying our invention.

Figure 4 is a view similar to Figure 1, showing a further modified construction embodying our invention.

Figure 5 is a sectional view taken on the line 5—5 of Fig. 4 looking in the direction of the arrows.

Figure 6 is a view similar to Fig. 4 showing a still more modified arrangement embodying our invention.

Figure 7 is a sectional view taken on the line 7—7 of Fig. 6 looking in the direction of the arrows.

The same part is designated by the same reference character wherever it occurs throughout the several views.

It is among the special purposes of our present invention to provide an electrical conductor of which the cost of manufacture is greatly reduced over present practice but in which increased strength and insulation is obtained. Furthermore, the various features of our invention look toward facility of use of the conductor by electricians and wire men.

While our invention may be applied to any form of conductor, whether it be a single wire or multiple wire conductor, and whether in the case of multiple wire, the individual wires are twisted, with respect to each other, we have shown and will describe our invention as applied to a wire conductor, of the twisted type, but we wish it to be understood that our invention is not to be limited in this respect.

Referring to Figure 1 of the drawing, we show a two wire conductor, in which the wires 1 and 2 are surrounded with the usual rubber insulation, 3 and 4. Each wire is provided with a paper coating 5. This paper coating is formed of a crimped, comparatively heavy paper preferably though not necessarily impregnated with an insulating material, such as wax or a waterproofing compound, or both. As distinguished from coating the individual wires with a paper tape wound spirally on the wire, the paper covering is as long as the wire itself and is fed coincidentally with the wire, whereby the ends of the paper abut or overlap around the wire, when the paper is crushed or crimped around the wire over its rubber insulation.

The invention is not limited to crimped paper as the forms such as smooth or uncrimped paper can be used with good results.

The paper cover thus obtained on the wire is of great strength and has a great insulation value. At the same time however, greater flexibility without fear of rupture is obtained thereby permitting flexibility without danger of loss of insulation.

Each wire is then provided with a fabric coating which may be woven or braided as desired. By reason of the fact that such complete non-rupturable insulation is obtained by means of the crimped paper cover in accordance with our invention the fabric need not be of the close weave or braid type, such as is at present employed, but in accordance with our invention such fabric may be of a very loose or open weave character, having as its principal object and function the

holding in place of the paper coating. This obviously reduces the amount of fabric employed in the making of the conductor and enables a considerable saving in the manufacture thereof. Furthermore, the slippage between the fabric covering and the covering therebeneath as is prevalent in the structure heretofore known is minimized, if not completely eliminated, inasmuch as the fabric principal does not appear to slip on the crimped paper covering.

In a single wire conductor the woven or braided fabric may if desired again be provided with a crimped paper covering as hereinbefore described which in turn may likewise be provided with an additional fabric cover and as many alternate layers as desired may be employed. In the two wire conductor selected as above explained merely for the purpose of illustration, we find it advisable to provide the two twisted wires made as above set forth with a paper coating 7 likewise formed of crimped paper extending throughout the entire length of the conductors and crushed, crimped, abutted or overlapped thereon as hereinbefore explained and as distinguished from spirally wound paper tape. The paper covering for the two conductors thus obtained obviously increases the insulation of the conductor, lends it greater strength and rigidity, while at the same time permitting flexibility without fear of rupture. A fabric 8 if desired may then be loosely or openly woven or braided over the paper cover 7, serving to hold the crimped paper in place. Here again considerable saving in cotton or other material is permitted by reason of the loose or open weave or braid. If a metallic sheath conductor is desired the usual flexible metallic sheath 9 may surround the assembled conductors as illustrated in Fig. 1. Instead of using a woven fabric for holding the crimped paper 5 in place around the individual wires, the threads may be spirally wound around the individual conductors, as shown at 6^a, Fig. 3 and similarly the threads 8^a may be spirally wound around the paper 7 as shown in Fig. 3.

As a safety factor and to permit the utilization of the metallic armor or sheath 9 as a conductor in the event a portion of the conductor becomes grounded or short circuited it has heretofore been proposed (for example in the copending application of John E. McAuliffe, Ser. No. 274,343, filed May 1, 1928) to utilize the conducting wire 10, see Fig. 4, extending throughout the conductor between the outer fabric 8 and the metallic sheath 9. It will be apparent that such a conducting wire can be utilized in the structure of our invention. Furthermore, in view of the fact that a very loose or braid weave 8 may be employed, as the outer fabric in the conductor of our invention it is possible (as shown in Fig. 6) to locate the conducting wire 10 between the paper 7 and the fabric 8. In this arrangement not only will the conductor 10 serve as a carrier or conductor in conjunction with the metal armor or in the event of short circuit or ground between the various sections of the metallic sheath, but it can also serve as a cutter for the fabric when the electrician desires to strip the wires for connection.

In lieu of wire 10 for this purpose, however, a rip cord 12 (see Fig. 4) may be employed and located beneath the fabric 8. Indeed, the rip cord could be located beneath the outer paper 7 if desired, but inasmuch as the paper is rapidly stripped, extending longitudinally with the wire as distinguished from being spirally wound therearound it is the breaking down of the fabric which is the important element for speedy utilization thereof.

Obviously, if desired a number of these individual features may be combined with any particular conductor and we wish it to be understood that we do not desire to be limited or restricted to the invention of the use of any of these features of the metallic sheath as the invention is applicable to a non-metallic sheath structure as well. It will likewise be understood that any of the standard forms or types of impregnation of the fabric material, as well as the paper material may be utilized, and where desired the weave of the fabric may be varied at will, as well as the size employed therewith.

Furthermore, the invention is equally applicable to a lead-in case conductor, either with or without a metallic sheath used in conjunction therewith.

Many modifications and changes in details will readily occur to those skilled in the art without departing from the spirit and scope of our invention as defined in our claims but having now set forth the objects and nature of our invention and having shown and described structures embodying the principles thereof, what we claim as new and useful and of our own invention and desire to secure by Letters Patent is:

1. The method of forming a cable having a multi-element conductor which comprises covering each conductor element with an insulation, crushing paper so as to substantially surround the insulation of each conductor element with the edges of the paper extending substantially parallel with the axis of the conductor element, covering the paper of each conducting element with a fabric, crushing paper so as to substantially surround all of the conductor elements so formed so as to hold them in fixed position with respect to each other, the edges of the crushed paper in this case extending substantially parallel with the axis of the cable, covering said paper

with a fabric and finally applying a protecting covering.

2. The method of forming a cable having a multi-element conductor which comprises covering each conductor element with an insulation, compressing paper so as to substantially surround the insulation of each conductor element with the edges of the paper extending substantially parallel with the axis of the conductor element, covering the paper of each conducting element with a fabric, compressing paper so as to substantially surround all of the conductor elements so formed so as to hold them in fixed position with respect to each other, the edges of the compressed paper in this case extending substantially parallel with the axis of the cable, covering said paper with a fabric and finally applying a protecting covering.

3. A multi-element electrical conductor comprising a plurality of conducting elements each provided with an insulation, paper crushed therearound, a covering for the paper, crushed paper surrounding all of said elements, all of said paper coverings having edges thereof substantially parallel to the longitudinal axes thereof and a covering for said paper.

4. A cable forming a multi-element electrical conductor comprising a plurality of conducting elements each provided with an insulation, crimped paper therearound with its edges substantially parallel to the axis of the conductor, a covering for the paper, crimped paper surrounding all of said elements to hold them in fixed position with respect to each other, the edges of the crimped paper likewise in this case extending substantially parallel to the axis of the cable, and an outer protecting covering.

In testimony whereof we have hereunto set our hands on this 2nd day of January, A. D. 1929.

FREDERICK PALMER.
JOHN E. McAULIFFE.