Aug. 24, 1926. 1,597,422

W. H. BASSETT

HOLLOW CONDUCTOR

Filed Oct. 3, 1924

Fig 1

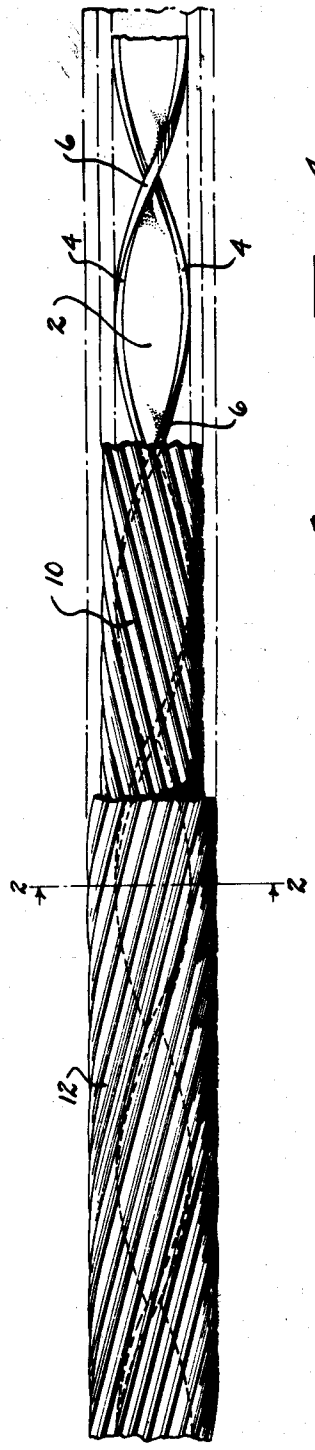


Fig 4

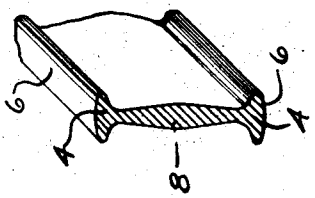


Fig 3

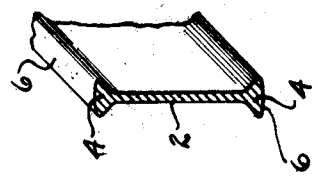
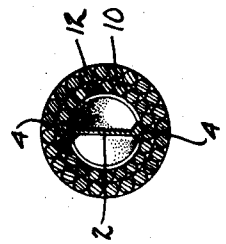


Fig 2



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UNITED STATES PATENT OFFICE.

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HOLLOW CONDUCTOR.

Application filed October 3, 1924. Serial No. 741,343. REISSUED

My invention relates to hollow conductors which are of relatively large diamter for a given cross-sectional area of the conducting material so as to permit them to be used for high voltage transmission without substantial corona loss or for other purposes requiring maximum diameter and surface with reduced cross-section of conducting material, and has for its object to produce a new and improved hollow conductor of the required flexibility, high resistance to mechanical injury liable to result from crushing stresses, high tensile strength, maximum conducting efficiency, and relatively low weight. My improved conductor may be used bare or insulated as occasion requires.

Conductors heretofore made have been open to various objections. Thus, solid conductors when used for high voltage transmission are of such small diameter that the corona losses are so great as to render the transmission relatively inefficient, a disadvantage which numerous inventors have attempted to overcome by making the conductors hollow and thus increasing the diameter of the conductors relatively to the cross-sectional area of the conducting material. Hollow conductors have been made by cabling conducting wires or strands about tubes of lead, resulting in conductors deficient in conductivity for a given weight, or lacking in tensile strength and power to resist crushing effects. It has also been proposed to cable wires or strands about a hollow flexible metal tube. In such cables, however, the tube did not practically increase the conductivity of the cable or its tensile strength, or afford the desired degree of resistance to crushing effect or other mechanical injury. Hollow cables with internal supporting means composed of helically wound wire have also been suggested but these are open to the same objections as cables having flexible tubes and also to the objection of cost and difficulty in manufacture. Hollow conductors have also been suggested in which the cabled strands or wires were supported by a twisted strip of flat metal. In such conductors, however, the twisted strip, if thin, would not sufficiently support the cabled conductors and the edges of the strip would be liable to cut and weaken the cabled wires or strands and if thick added too much weight without increasing the electrical efficiency accordingly when used to transmit high voltage alternating currents. Various other forms of cable have been suggested which have presented some or all of the above disadvantages, any one of which is objectionable particularly on account of the great lengths of transmission lines used at the present time, the consequent large production necessary in order to supply the demand, and the service which a cable has to render.

I have discovered that if a metal strip of novel form is used instead of a plain strip thick enough to support the spiral strands without cutting, the weight of metal in the strip can be much reduced so as to effect a very considerable saving without reducing the efficiency of the cable, thus cutting down the cost of the cable itself and the cost of installing it and its supports. I have further discovered that a metal strip of a given weight can be so formed that a cable comprising it will have greater conducting efficiency than a cable of equal diameter and weight having a plain twisted metal strip of the same weight as my strip. The saving and advantages are of importance when the total amount of metal and current carried are considered, such cables being at times hundreds of miles in length and carrying heavy currents.

In carrying out my invention I employ a twisted strip of a peculiar form which decreases the cost of the cable, avoids the objections of the suggested twisted strip cables above referred to, and also those of the lead tube cable and the flexible tube cable and the other cables and acts effectively to increase the conductivity of the cable particularly when carrying alternating currents. To avoid the difficulties and secure the advantages referred to I form a twisted strip having projecting flanges at its edges so that in cross-section it is thickened at the edges and somewhat in the shape of an I-beam. I also curve the head surfaces of the I-strip so that the twisted strip will present transversely curved supporting surfaces to the inner surface of the tube formed by the cabled strands engaging therewith. These supporting surfaces are spiral and extend a considerable distance longitudinally of each strand so as to support the same without danger of cutting them at the points of engagement. The body of the strip is relatively thin, so that

its weight is less than if it were uniformly of a thickness equal to the width of the heads. Moreover, the thickened edges being remote from the center of the cable act to afford a conducting path at points where there is a concentration of the current due to the well known effect of alternating currents so that the conducting efficiency for a given weight of metal is increased.

While the twisted strip may be of the same material as the conducting wires or strands cabled about it, it may be made of other suitable metal alloy. I preferably make the conducting strands or wires of copper or copper alloy and make the twisted strip of a similar material. Such copper or copper alloys can be effectively worked and provide the necessary strength and stress resisting characteristics.

In making the hollow conductor, the conductor wire or strands are spirally wrapped or cabled around the I-shaped twisted strip so as to be laid up in spiral courses and there may be one layer or more than one. Such wires or strands may be spiralled in either direction but I prefer to cable the inner layer around in a direction opposite to the twist of the strip and the succeeding layer in the same direction as the twist of the strip.

With the construction described, the diameter of the cable is large for a given cross-sectional area of conducting material and cables of very considerable size may be formed so as to be adapted for very high voltage transmission without substantial corona loss and for other purposes requiring large diameter and surface with relatively small cross-section of conducting material. The major part of the conducting material, including the cabled wires and the flanges on the strip, is distributed at the outer portions of the cable so that, when alternating currents are used at frequencies which tend to concentrate the current toward the outside surface, the conducting material is used efficiently.

Moreover, the amount of heat dissipated from the hollow conductor described is greater than from a conductor of equal cross-section of conducting material and smaller diameter.

A cable embodying my invention is shown in the accompanying drawings, in which:—

Figure 1 shows a portion of cable partly in side elevation and partly broken away;

Fig. 2 shows a transverse section of the same on the line 2—2, Fig. 1;

Fig. 3 shows a portion of the strip on an enlarged scale; and

Fig. 4 shows, on an enlarged scale, a modified form of strip.

Referring more particularly to the drawings, 2 represents a twisted strip having at its edges laterally projecting portions or flanges forming thickened edges or heads 4—4 so as to make it substantially I-shaped in cross-section. The outer surfaces 6—6 of these heads are curved so as to substantially conform to the inner surfaces of wires or strands cabled thereon. The central part 8 of the body portion of the strip may be thickened so as to give the strip greater tensile strength as shown in Fig. 4. The twisted strip is twisted about its longitudinal axis, the preferable pitch being about one complete twist to four inches for a strip five-eigths of an inch in width. A strip of such width whose body portion is .040 of an inch thick and whose edges are .090 of an inch thick gives satisfactory results.

About the twisted strip, wires or strands 10 are cabled and if desired another layer of wires or strands 12, thus making up the completed cable as shown. As shown in the drawings the wires or strands are round but obviously that form of wire or strand is not necessary to the embodiment of the invention.

In forming the cable the strip in untwisted form with its projecting flanges is first produced. It is then twisted as shown and then fed to a cabling machine where it is surrounded with one or more layers of conducting wires or strands thus producing the complete cable.

The thickened edges of the core are of especial importance in connection with the manufacture of the cable. Where a flat strip is used, the strip being twisted often suddenly changes from a spiral twist to a helical twist or curl which would continue for a foot or more before it could be stopped. In some cases in working with the flat strip this has happened so often as to spoil the entire lot even for experimental purposes. A single spot where the twist has changed from a spiral form to a helical form ruins the core for commercial purposes. When the strip has the flanges described herein this difficulty is eliminated, and cores many miles in length can be made without defects in the twist.

As will be evident to those skilled in the art, my invention permits of various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:—

1. In a conducting cable comprising a series of strands cabled so as to form a tube, a core formed by a twisted strip having a body portion and projecting flanges forming thickened edges thereon, said flanges providing thickened conducting portions and spiral surfaces engaged by said strands and supporting the same.

2. In a conducting cable comprising a series of strands cabled so as to form a tube, a core formed of a twisted strip having a thin body portion and projecting flanges

upon its edges so as to have an I-shaped cross-section, said flanges providing thickened conducting portions and spiral surfaces supporting said strands.

3. In a conducting cable comprising a series of strands cabled so as to form a tube, a core formed by a twisted strip having a body portion and projecting flanges forming thickened edges thereon, said flanges providing thickened conducting portions and spiral surfaces engaged by said strands and supporting the same, said spiral surfaces being curved transversely so as to substantially conform to the inner surface of the tube.

4. In a conducting cable comprising a series of strands cabled so as to form a tube, a core formed by a twisted strip having a body portion and projecting flanges forming thickened edges thereon, said flanges providing thickened conducting portions and spiral surfaces engaged by said strands and supporting the same, said thickened conducting portions being about twice as thick as the adjacent body portion.

WILLIAM H. BASSETT.