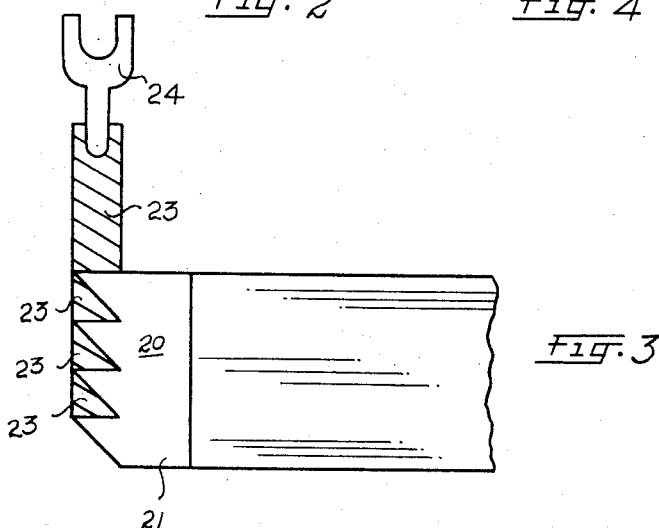
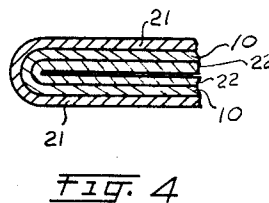
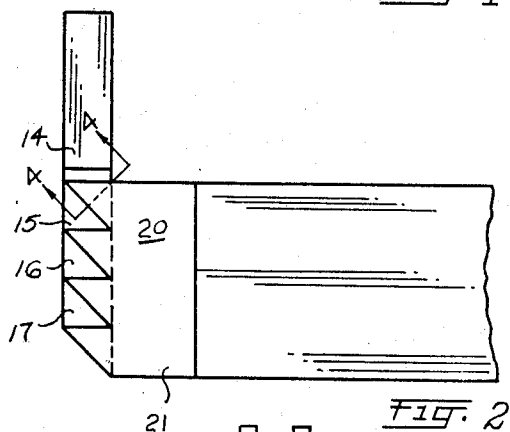
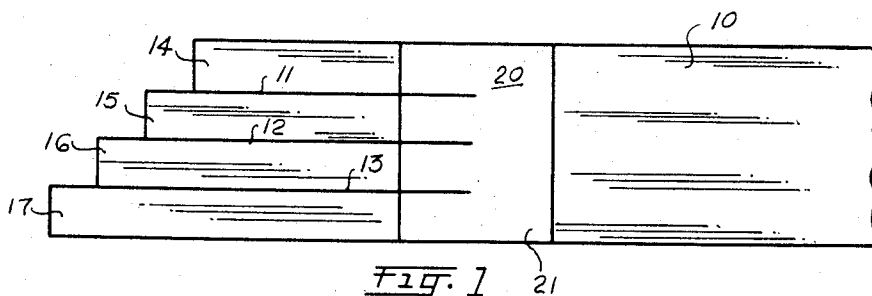


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INSULATED STRIP CONDUCTOR HAVING END PORTION
FOLDED ON CONTROLLED RADIUS
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INSULATED STRIP CONDUCTOR HAVING END PORTION FOLDED ON CONTROLLED RADIUS

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9 Claims. (Cl. 174-75)

This invention relates to an improved insulated strip conductor having a laterally extending terminal portion and, in particular, to a conductor of this type wherein the terminal portion is narrower and thicker than the main body of the conductor, but retains an electrical conductivity and mechanical flexibility commensurate therewith.

An object of the invention is to provide an improved strip conductor comprising a plurality of slitted, narrowed strips forming its terminal portion and with these strips folded on a controlled radius of curvature to provide a laterally extending terminal.

Another object is to provide an anodized aluminum strip conductor having a laterally extending terminal portion comprising a plurality of slitted narrowed strips each folded transversely to the strip on a controlled radius of curvature so as to overlap one another.

Still another object is to provide a strengthened strip conductor having an inorganic insulation coating and with a narrower and flexible terminal portion of the conductor, which is integral therewith and folded transversely thereof, on a controlled radius of curvature.

Other objects and advantages will become apparent when the following description is considered in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of one end of a relatively wide strip conductor prior to the folding of the end thereof;

Fig. 2 is a plan view of the conductor shown in Fig. 1 with the terminal portion folded but prior to attachment of the terminal member and terminal insulation;

Fig. 3 is a plan view of the finished terminal portion of the conductor; and

Fig. 4 is a sectional view of one folded portion taken on line 4-4 of Fig. 2 and to a greatly exaggerated scale.

While our invention, in its broader aspects, is useful in the fabrication of electrical coils and the like from strip conductors provided with many diverse forms of insulating coverings, we find it particularly advantageous for use in connection with aluminum strip conductors having an anodic insulating coating of aluminum oxide. As disclosed in the co-pending application for U.S. Letters Patent, Serial No. 487,057, filed February 9, 1955, we, together with Clarence F. Manning, have disclosed certain Aluminum Strip Electromagnetic Windings and Methods in which an intermediate article is provided with rounded lateral edges by means of a brushing operation. As a result of this invention, thin aluminum foil or sheet in the range of 0.060 to as low as 0.001 inch in thickness may be uniformly provided with an anodic insulating coating having a thickness of about 0.001 to 0.0001 inch and comprising an aluminum oxide. Such a coating extends over the entire flat surfaces and edges of the strip conductor and gives a substantially uniform insulating property to the conductor, which, by virtue of its thin nature, is especially well suited for winding into compact forms of coils.

Referring now to Fig. 1, an aluminum strip conductor

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10 having a relatively thin insulating coating, preferably an anodic deposited coating, and preferably having brushed edges as described in said application, is provided. This conductor is slitted, by any conventional apparatus, along longitudinal parallel lines 11, 12 and 13 to a suitable distance inwardly of the end of the conductor. It will be understood that in so doing, the resultant slitted edges are devoid of insulation. The slitted portions are then formed into a single narrow and thickened tap and for the purpose of uniformity of length thereof, the several slitted strips 14, 15, 16 and 17 are formed with unequal lengths, as shown, the several slit lines terminating in a single transverse plane of the conductor as seen in Fig. 1.

Prior to the slitting action a band 20 of supplementary insulation or other material is affixed or placed on the strip conductor at the junction of the slitted strips and the unslitted main conductor. This band of material is positioned on the side of the strip conductor which is to be folded upon itself, thus covering the inner fold line, and by its physical presence at the fold line, serves to provide a controlled radius of curvature in the folding operation, as will later appear. If desired, this band may be affixed to both sides of the conductor, including the edges thereof and, in either case, has a width sufficient to encompass the entire fold lines later to be formed. Preferably, the supplementary insulation comprises a sheet of conventional inorganic insulating tape, such as glass tape or mica tape and has a thickness of not less than one-fourth the thickness of the strip conductor which is to be folded. Where the band surrounds both sides of the conductor, as shown in Fig. 4, it accordingly has a first portion 21 lying on one side of the conductor and a second portion 22 lying on the other side of that conductor. If the band is positioned following the slitting of the conductor, the band in turn is then slitted to conform to the slits in the conductor beneath the band.

Following the thus described preparatory steps, the strip 14 is folded on a diagonal or bias with respect to the main axis of the conductor as seen in Fig. 2. The remaining strips 15, 16 and 17 are likewise folded thus to provide a thickened and narrowed lateral extension or tap formed by a plurality of overlapping single strips. This series of overlapping strips not only narrows the original larger conductor to a usable size for a terminal without introducing any joining problems, but at the same time it is accomplished without any loss of electrical conductivity. Moreover, the resulting thickened terminal section, with its plurality of flexible strips, retains a flexibility which is commensurate with the flexibility of the rest of the conductor. Since each of these strips forming the terminal or tap now has uninsulated edges, we may add a spirally wound separate insulation tape 23 therearound beginning at the folded base of longer strip 17 and successively encompassing each of the shorter strips as seen in Fig. 3. Finally, a conventional terminal member 24 may be suitably affixed, as by welding, to the laterally extending tap.

With the foregoing description in mind, reference now is made to Fig. 4 showing a fold having the controlled radius of curvature. As will be apparent, the relative dimensions of the several parts are not drawn to scale. The thin aluminum conductor 10 when folded upon itself is required to bend or fold with a radius determined essentially by the thickness of the two layers of interposed insulation or other material 22 lying between adjacent surfaces of that conductor. As a result, the minimum radius of curvature may be determined by the selection of a band 20 of appropriate thickness and this in turn may be made dependent upon the known bending characteristics of the anodized strip conductor 10. To a lesser

extent, the bending required of a given terminal strip depends upon its relative position with respect to the other terminal strips. For example, in the drawings the shorter strip 14, when bent, may lie in the plane of the main conductor 10, whereas the adjacent strip 15 will, when bent, lie upon the bent strip 14 and thus will not bend into the plane of conductor 10.

The upper limit to the thickness of band 20 may be of any desired value consistent with the formation of a terminal which is not unduly bulky.

It has been found that, in the absence of a controlled radius of curvature at the fold, the two surfaces of conductor 10 contact each other and are folded along a straight line to a large extent, a construction which, over a period of time, may result in a fold which is mechanically weak, particularly when vibration is encountered in the apparatus into which the wound conductor will be used. By means of our invention, this deficiency is overcome.

As seen in Fig. 3, a finished conductor folded as above described and insulated with the separate tape 23 provides an article having the advantages of compactness; mechanical strength; inexpensive construction; and substantial uniformity of insulating properties at the places where most needed. As will be apparent to those skilled in the art, other metallic conductors than aluminum and having other thin coatings than anodic coatings, may also be used without departing from the broader aspects of our invention.

Since many changes could be made without departing from the scope of the appended claims, it is intended therefore that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an electrical strip conductor comprising an elongated metallic member having a relatively thin insulating coating upon its surface and with an end portion comprising a plurality of strips formed by longitudinal slitting of said conductor, each strip being provided with said insulating coating and being folded on a bias in overlapping relation to each other to provide a single laterally extending tap; the improvement comprising means for establishing a predetermined minimum radius of curvature of each of said folded strips and including a band of supplementary material contacting said conductor and covering the entire inner fold line of each of said strips

thereby to assure the bending of each of said strips of said insulated conductor upon said predetermined minimum radius of curvature.

2. The conductor of claim 1 wherein the thin insulating coating comprises an inorganic insulation.

3. The conductor of claim 2 wherein the metallic member is aluminum and the thin insulating coating is an anodic deposited aluminum oxide.

4. The conductor of claim 1 wherein said supplementary material comprises an inorganic insulating tape.

5. The conductor of claim 4 wherein said supplementary material comprises glass tape.

6. The conductor of claim 4 wherein said supplementary material comprises mica tape.

7. In an electrical strip conductor comprising an elongated metallic member having a relatively thin insulating coating upon its surface and with an end portion comprising a plurality of strips formed by longitudinal slitting of said conductor, each strip being provided with said insulating coating and being folded on a bias in overlapping relation to each other to provide a single laterally extending tap; the improvement comprising means for establishing a minimum radius of curvature of each of said folded strips and including a band of supplementary insulation affixed to and surrounding said conductor at the junction of said slitted strips and the unslitted conductor and encompassing the entire fold lines of said slitted strips, thereby to maintain the insulating property of said folded thin coating at each of said folds by preventing the bending thereof upon a radius less than said predetermined minimum radius.

8. The conductor of claim 7 including separate insulation means covering the exposed edges of each of said folded slitted strips and holding each of said folded strips in the form of a single laterally extending tap.

9. The conductor of claim 8 including a terminal member affixed to said single tap.

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