Oct. 1, 1940. C. W. VERRILL 2,216,464

INSULATOR

Filed Jan. 13, 1939

FIG. 2

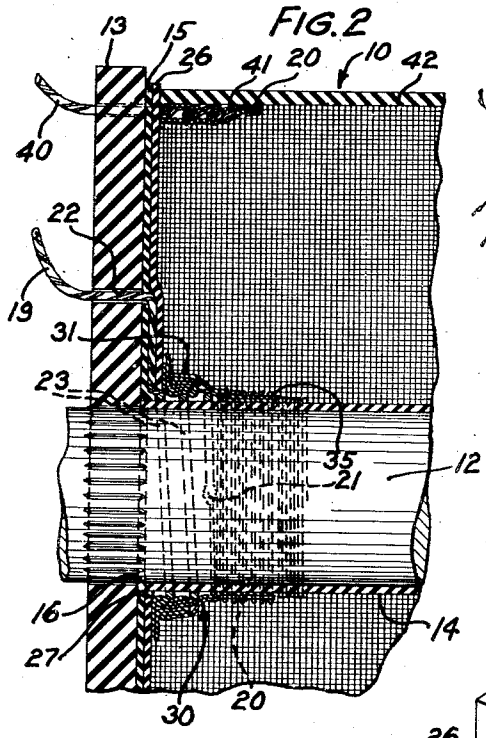


FIG. 1

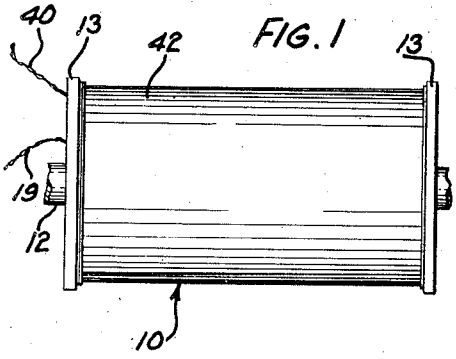


FIG. 3

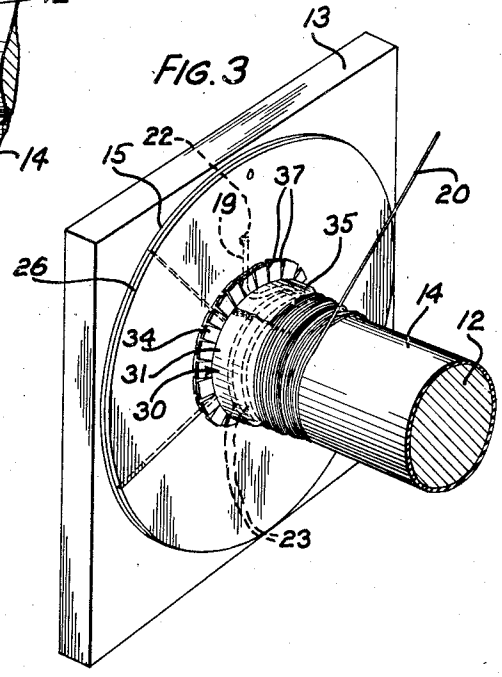


FIG. 5

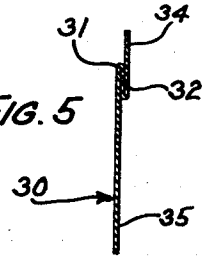
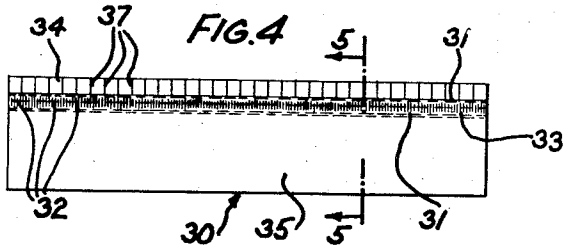


FIG. 4



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INSULATOR

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4 Claims. (Cl. 154—2.6)

This invention relates to insulators, and particularly to insulators for use in electrical coils.

In the manufacture of electrical coils, particularly of enamel insulated wire, it is the practice, in some instances, to connect a bare lead wire to a bare end of enamel insulated wire preliminary to starting the winding of the coil. The portion of the lead wire extending from the inner face of an insulating washer at the spool head to the bare end of the insulated wire is covered with an insulating element to prevent the adjacent layers of enameled winding wire from working or being pressed downwardly along the inner face of the washer into contact with the bare lead wire, which condition may result in portions of the enamel becoming removed from the winding wire, thus short circuiting one or more layers of the coil. One insulating element heretofore used has been made from celanese silk treated to stiffen and improve its insulating qualities. Such material is not only expensive in its first cost, but it requires subsequent treating, and due to its nature, even after treatment, is difficult to handle and thus a high degree of care and skill is required to apply it in the winding of the coil.

An object of this invention is to provide an improved insulator of the above described character which is economical to produce and having characteristics permitting it to be easily handled and applied with a minimum of skill in the winding of a coil.

In order to attain this object, in accordance with the features of one embodiment of the invention, as applied to spool wound electrical coils, an initially flat insulator is provided which is formed from cellulose acetate strip material folded adjacent one longitudinal edge to provide a double flat fold which is appreciably spaced from the opposite edge of the sheet, the several thicknesses of material being coalesced by applying colored acetone to a series of perforations formed in the folded material and extending along the length of the fold, the colored acetone seeping between the folds, coalescing the several thicknesses of material and producing a colored line. The single thickness of material extending from one edge of the fold to the adjacent edge of the sheet is serrated to permit it to readily flex and form an outwardly directed flange at the annular corner or juncture of the inner face of the coil head washer and a core of the coil while the single thickness of material extending from the opposite edge of the fold to the other edge of the sheet is wrapped around the connected ends of the lead and winding wires. The fold adjacent the serrated edge serves as a reinforcement and stiffener for the insulator which is effective to prevent the single thickness of thin cellulose acetate material from tearing through the fold and also to facilitate the handling of the insulator. In applying the insulator in the winding of a coil the colored line indicates to the operator which edge of the insulator is serrated and thus facilitates the mounting thereof.

A complete understanding of the invention may be had from the following detailed description taken in conjunction with the appended drawing, in which:

Fig. 1 is an elevational view of a completed electrical coil embodying the invention;

Fig. 2 is an enlarged longitudinal vertical sectional view of the left end of the coil shown in Fig. 1;

Fig. 3 is an enlarged perspective view of the left end of the coil shown in Fig. 1 illustrating the coil before it is completely wound, but with the insulator embodying the features of the invention applied;

Fig. 4 is an enlarged plan view of the insulator before being applied to the coil, and

Fig. 5 is an enlarged vertical section taken on the line 5—5 of Fig. 4.

Referring now to the drawing, particularly Figs. 1 and 2, one embodiment of an insulator embodying the features of the invention is shown applied to a spool wound electrical coil 10 of the type used extensively for relays and other electrical apparatus. Briefly, the coil 10 comprises a spool having a core 12, usually made of a soft magnetic metal or alloy and a spool head 13 or flange, generally made of fibre or other non-conducting material rigidly secured at each end of the core.

To insulate the metal core 12 effectively from the subsequently applied winding the section of the core between the heads 13 is covered with a sheet 14 of cellulose acetate or other material having satisfactory dielectric properties. A split disk or washer 15 (Fig. 2) preferably made of cellulose acetate is placed around the core 12 and abutted against the inner face of each spool head 13. The washer 15 has a central aperture conforming with the contour of the insulating sheet 14 surrounding the core and a flange 16 extending from the inner face of the washer and over the core insulating sheet 14 for a short distance.

Preparatory to the winding of the coil 10 a

suitable length of bare stranded terminal or lead wire 19 is connected at its inner end to the uninsulated inner end of enameled insulated winding wire 20, by either soldering the ends together or in any suitable manner, as indicated at 21. The outer end of the stranded lead wire 19 is then passed through apertures 22 formed in the head 13 and washer 15 adjacent the periphery of the core 12. Thereafter, the inner end of the lead wire 19 is spirally wrapped around the core for a few turns, as shown at 23, (Figs. 2 and 3), and a second split disk or washer 26 of suitable insulating material and provided with a central aperture 27 adapted to freely surround the stranded lead wire turns 23 is placed on the core and pressed toward the spool head 13 and washer 15, the length of the lead wire 19 between the aperture 22 of the washer 15 and the core being held between the opposed faces of the two washers.

Before the actual winding of the coil a member of insulating material is wound around the few turns 23 of the stranded bare lead wire 19 and its connection 21 to the winding wire 20 to prevent, as hereinbefore described, the subsequently wound adjacent layers of enameled winding wire from working or being pressed downwardly into contact with the bare lead wire with the possibility of short circuiting one or more layers of the coil.

One form of an interleaving insulator 30 by the use of which the above difficulty is overcome and embodying the features of the invention is shown in detail in Figs. 4 and 5. This insulator is preferably made from cellulose acetate or a similar non-fibrous material having satisfactory dielectric properties. In producing the insulator 30 a sheet of cellulose acetate strip material of a suitable width and which is relatively thin is formed with a longitudinally extending flat double fold as indicated at 31, the longitudinal edges of the fold being parallel to and spaced from the corresponding edges of the sheet. The several thicknesses of material comprising the flat fold 31 are coalesced by first forming a series of perforations 32 in two adjacent layers thereof, the perforations extending longitudinally along and intermediate opposite edges of the fold and thereafter applying acetone to the perforations by suitable means, for instance, by drawing a fountain pen therealong. The acetone seeps through the perforations and between the layers of folded material and firmly secures the several layers together. In the present embodiment of the invention colored acetone is preferably used which produces a colored line 33 of appreciable width along the length of the fold 31 for a purpose which will be presently referred to. An edge portion 34 of the sheet extending from one edge thereof to the adjacent edge of the fold 31 is relatively narrow as compared to an edge portion 35 extending from the opposite edge of the fold to the corresponding edge of the sheet. Formed in and along the length of the narrow edge portion 34 are a series of serrations 37 which extend from the outside edge of the portion to substantially the adjacent edge of the fold 31.

The insulator 30 is applied to the connected lead and winding wires 19 and 20, respectively, by placing the serrated edge portion 34 at the annular corner or juncture of the inner face of the washer 26 and the insulated core 12 and wrapping it around the connected wires, the insulator being of such a length that several thicknesses thereof may be applied. Due to the serrations 37 and the single thickness of material extending from the outer edge of the portion 34 to the adjacent edge of the fold 31 the edge portion 34 will readily flex adjacent the edge of the fold and form an outwardly directed flange lying closely against the face of the head washer 26. The colored line 33 hereinbefore described, along the fold 31 is very useful to an operator in applying the insulator 30 since the line, which is relatively close to the serrated edge portion 34, readily indicates which edge portion is serrated and thus in picking an insulator from a supply and carrying it to the coil being wound it will be clearly apparent to the operator which edge portion is to be placed against the washer 26. The edge portion 35 is of such width that it will completely form an insulating cover for the several turns of uninsulated lead wire 19 and its connection 21 to the winding wire 20.

Due to the thinness of the cellulose acetate sheet material of which the insulator is made, it would be easily tearable, particularly at its serrated edge portion 34, during the handling thereof in applying it to the coil, if not reinforced by the fold 31 which effectively prevents tearing thereof. Furthermore, the fold 31 serves to stiffen the insulator, thus making it easier to handle and apply.

The winding of the coil is then continued in the usual manner and the outer end of the winding wire 20 connected to a stranded terminal or lead wire 40 and a few turns of the lead wire and connected winding wire are taken around the body of the coiled wire, the turns of wire being enclosed in a suitable insulator 41. Thereafter, the outer end of the lead wire 40 is threaded through apertures in the washers 26 and 15 and the head 13 and an outer insulating cover 42 is applied.

It will be understood that the nature and embodiment of the invention herein described is merely illustrative and that many changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A flexible insulator for use in coil winding comprising a sheet of cellulose acetate material having a fold extending longitudinally thereof and spaced from an edge of the sheet, several thicknesses of material of the fold having a series of perforations, and acetone within said perforations for coalescing the folded matreial, said fold preventing tearing of the material past the fold.

2. A flexible insulator for use in coil winding comprising a sheet of cellulose acetate material having a flat fold spaced from an edge of the sheet, said fold preventing tearing of the sheet past the fold, the edge of the sheet having a series of serrations extending toward the fold for permitting the edge portion to readily flex adjacent an edge of the fold during the application of the insulator.

3. A flexible insulator for use in coil winding comprising a sheet of cellulose acetate material having a double fold of three thicknesses of material extending longitudinally thereof and spaced from an edge of the sheet, two adjacent thicknesses of material of the fold having a series of perforations, and acetone within said perforations for coalescing the three thicknesses of folded material, said fold preventing tearing of the material past the fold.

4. A flexible insulator for use in coil winding comprising a sheet of cellulose acetate material

having a flat double fold of three thicknesses of material spaced from an edge of the sheet, two adjacent thicknesses of material of the fold having a series of perforations, and acetone within said perforations effective to coalesce the three thicknesses of material, said edge of the sheet having a series of parallel serrations extending toward the fold for permitting the edge portion to readily flex adjacent an edge of the fold during the application of the insulator.

CHARLES W. VERRILL.