Nov. 22, 1932. L. O. LARSEN 1,888,275

ELECTRICAL APPARATUS AND A METHOD OF MANUFACTURING IT

Filed July 7, 1931

Fig. 1

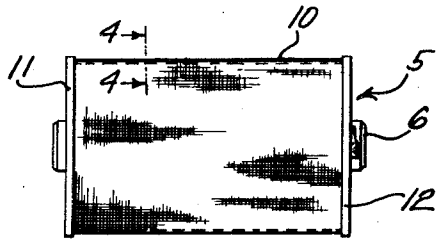



Fig. 2

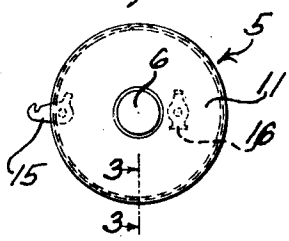



Fig. 3

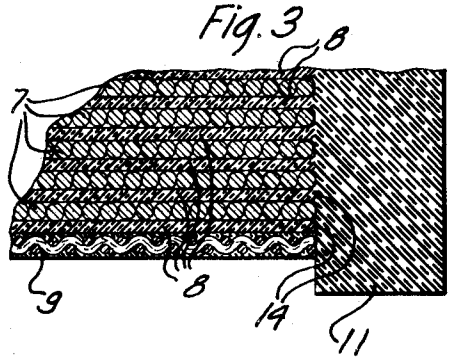
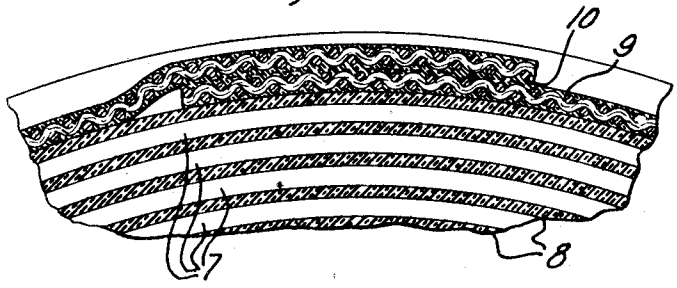



Fig. 4

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Patented Nov. 22, 1932

1,888,275

# UNITED STATES PATENT OFFICE

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## ELECTRICAL APPARATUS AND A METHOD OF MANUFACTURING IT

Application filed July 7, 1931. Serial No. 549,285.

This invention relates to electrical apparatus and a method of manufacturing it and more particularly to electrical coils and a method of manufacturing them.

It is an object of the present invention to provide a moisture impervious electrical coil and an economical method of manufacturing such a coil.

In accordance with one embodiment, the invention contemplates an electrical coil which may be produced by applying to a core alternate layers of windings of wire and an insulating material composed of a fibrous material impregnated with a cellulose derivative, and by securing to the structure so built up, spool heads composed of a cellulose impregnated fibrous material. The insulating material being composed of a fibrous material impregnated with a cellulose derivative may be secured to spool heads by dipping the ends of the coil in a bath of cellulose acetate dissolved in acetone and forcing the heads into engagement with the layers of interleaving material to cause the heads to coalesce to each layer and provide a moisture impervious envelope for each layer of winding. After the spool has been so formed, a protective covering composed of a fibrous material comprising a fabric impregnated with a cellulose derivative and faced with sheets of cellulose material coalesced to the impregnated sheet is wrapped with overlapping edges about the wound coil, and the overlapping edges coalesced by applying an acetone solution to the fabric.

Other objects and advantages of the invention will more fully appear from the following detailed description, reference being had to the accompanying drawing, wherein

Fig. 1 is a front elevational view of a completed coil;

Fig. 2 is an end elevational view of the structure shown in Fig. 1;

Fig. 3 is an enlarged fragmentary sectional view taken on the line 3—3 of Fig. 2 in the direction of the arrows, and

Fig. 4 is an enlarged fragmentary sectional view taken on the line 4—4 of Fig. 1 in the direction of the arrows.

Referring now to the drawing wherein like reference characters designate the same parts throughout the several views, the numeral 5 indicates generally an electrical coil constructed in accordance with this invention comprising a core member 6 upon which has been applied a wrapping of paper impregnated with cellulose acetate and held in place by a serving of an insulated conductor 7 upon which in turn is superposed a layer 8 of paper impregnated with cellulose acetate. Alternate layers of servings of insulated electrical conductor and cellulose acetate impregnated paper are wound upon the core until the desired number of turns to provide the required electrical characteristics for the coil have been applied to the core whereupon a sheet 9 of muslin or other fabric preliminarily impregnated with cellulose acetate and then having sheets of cellulose acetate applied to each face thereof and coalesced thereto by the application of heat and pressure to the assembled fabric and cellulose material is wound about the core with its edges overlapping as shown at 10. Prior to applying the composite sheet just described, the abutting edges thereof are treated with a solution of acetone which may be either sprayed on the sheet or applied thereto with a brush whereupon they are pressed together manually and permitted to coalesce to provide a sealed protective covering.

After the coil form has been so wound, the ends of the coil are dipped in a solution of cellulose acetate in acetone and preformed heads 11 and 12 composed of a cellulose material, such as layers of paper or fabric impregnated with cellulose acetate, are forced into intimate engagement with the edges of the coil and permitted to be coalesced to each layer of interleaving cellulose acetate impregnated paper as shown at 14 (Fig. 3), to seal the layers of windings of insulated conductor in separate individual envelopes comprised of the heads 11 and 12 of the coil and the layers 8 of interleaving paper. Suitable leads having been taken from the ends of the coiled conductor, passed through the head 11 of the spool in any known manner and fixed to terminals 15 and 16 to permit

the coil to be connected in an electrical circuit.

In a completed coil as shown in Figs. 1 and 4, the protective covering is coalesced along the overlapping portions and the separate layers of cellulose acetate impregnated paper used for interleaving between the layers of winding 7, are coalesced to the heads and in effect provide a separate envelope for each layer of windings of conductors 8 which envelopes are impervious to moisture and insulatively separate the winding. With this type of construction, there is no necessity for further securing the heads to the coil and the protective covering of cellulose acetate impregnated and sheathed muslin provides a water impervious covering having a high degree of mechanical strength.

The term "cellulose material" is used in the appended claims to refer to material composed of a pure cellulose derivative or paper or other fibrous sheets impregnated with a cellulose derivative and/or muslin, paper or other fibrous material impregnated with a cellulose derivative or paper or fabric impregnated with cellulose derivative and having sheets of cellulose acetate or other suitable esters of cellulose coalesced to each other through the sheet of fibrous material, and the term "solvent" as employed in the appended claims, is intended to include not only true solvents of the cellulose material, but also to include plasticizers.

Although the invention has been described as applying to an article having layers of paper between the servings of insulated conductor and a muslin and cellulose derivative composite sheet as a protective covering, it will be understood that various modifications of the described article and process may be made without departing from the scope of the invention which is to be limited only by the scope of the appended claims.

What is claimed is:

1. A method of forming electrical coils comprising assembling alternate layers of insulating material and the conducting material on a core, dissolving the edges of the insulating material, and coalescing a head comprising a similar insulating material to the layers of insulating material.

2. A method of forming electrical coils comprising interposing servings of conductors between layers of insulating material, dissolving the edges of the layers of insulating material, and coalescing a sheet of similar material to the layers of insulating material.

3. A method of forming electrical coils which comprises interposing servings of conductors between layers of a cellulose material, dissolving the edges of the layers of cellulose material, and coalescing a sheet of cellulose material to the dissolved edges.

4. A method of forming electrical coils comprising interposing servings of conductors between layers of fibrous material impregnated with a cellulose derivative, dissolving the edges of the cellulose impregnated fibrous material, and coalescing a sheet of cellulose impregnated fibrous material to the dissolved edges.

5. A method of forming electrical coils comprising interposing servings of conductors between layers of paper impregnated with a cellulose derivative, dissolving the edges of the cellulose impregnated paper, and coalescing a sheet of paper impregnated with a cellulose derivative to the dissolved edges.

6. A method of forming electrical coils comprising interposing servings of conductors between layers of paper impregnated with a cellulose derivative, treating the edges of the cellulose impregnated paper with a solvent of the cellulose derivative, and coalescing sheets of paper impregnated with a cellulose derivative to the dissolved edges.

7. A method of forming electrical coils comprising interposing servings of conductors between layers of cellulose acetate impregated paper, treating the edges of the cellulose acetate impregnated paper with a solvent, and coalescing a sheet of cellulose acetate impregnated paper to the dissolved edges.

8. A method of forming an electrical coil comprising applying to a core alternate layers of cellulose material and servings of conductors, treating the ends of the layers of cellulose material with a solution including a cellulose derivative to dissolve partially the edges of the layers of cellulose material, and applying a head composed of a cellulose derivative to the edges of the layers of cellulose material to coalesce the head to the coil.

9. A method of producing an electrical coil comprising winding alternate layers of conductors and a cellulose material, partially dissolving the edges of the cellulose material, and securing a head of cellulose material to the layers of cellulose material by coalescence.

10. A method of producing an electrical coil comprising winding alternate layers of conductors and a cellulose material, partially dissolving the edges of the cellulose material, applying a head of cellulose material to the layers of cellulose material to cause the layers and head to coalesce, and applying a protective covering to the wound material comprising a sheet of fibrous material impregnated with a cellulose derivative with overlapping edges and coalescing the overlapping edges.

11. A method of forming an electrical coil which comprises applying to a core alternate layers of conductors and insulators, applying to the outer insulator a sheet composed of a fibrous material impregnated with a cellulose derivative with the edges of the material overlapping, and coalescing the overlapping edges.

12. A method of forming an electrical coil which comprises applying to a core alternate layers of conductors and paper impregnated with a cellulose derivative, dissolving the edges of the cellulose impregnated paper, coalescing a sheet of paper impregnated with a cellulose derivative to the dissolved edges, applying to the outer layer of paper a sheet composed of a fibrous material impregnated with a cellulose derivative with the edges of the material overlapping, and coalescing the overlapping edges.

13. As an article of manufacture, an electrical coil comprising alternate layers of cellulose material and conducting material, and a head composed of cellulose material coalesced to the edges of the layers of cellulose material.

14. An electrical coil comprising alternate layers of cellulose and conducting material, a head of cellulose material coalesced to the edges of the layers of cellulose material, and a protective coating comprised of cellulose material wrapped about the layers with overlapping coalesced edges.

15. As an article of manufacture, an electrical coil comprising alternate layers of cellulose acetate impregnated paper and conducting material, and a head composed of cellulose acetate impregnated paper coalesced to the edges of the layers of cellulose acetate impregnated paper.

16. An electrical coil comprising alternate layers of cellulose acetate impregnated paper and conducting material, a head of cellulose acetate impregnated paper coalesced to the edges of the layers of cellulose acetate impregnated paper, and a protective coating comprised of insulating material wrapped about the layers with overlapping coalesced edges.

In witness whereof, I hereunto subscribe my name this 25th day of June A. D., 1931.

LEONARD O. LARSEN.