

June 18, 1940.

H. R. ARNOLD
ELECTRICAL APPARATUS

2,205,236

Filed May 25, 1938

Fig. 1.

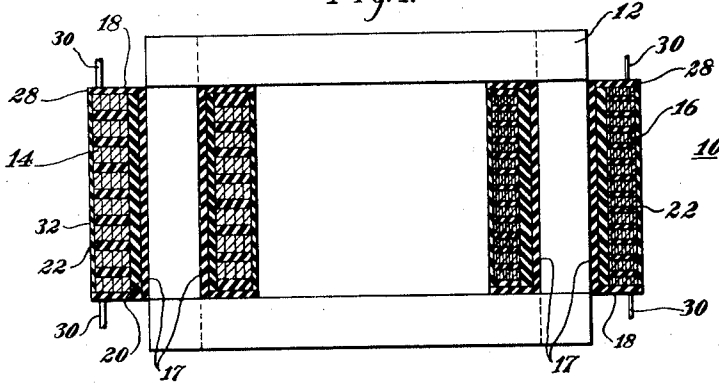


Fig. 2.

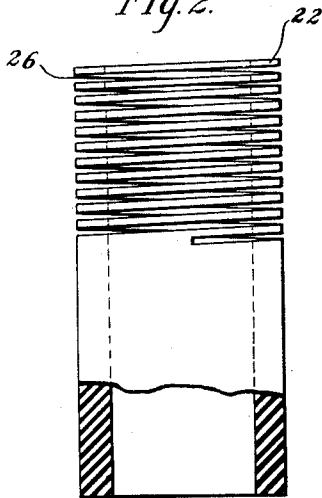


Fig. 3.

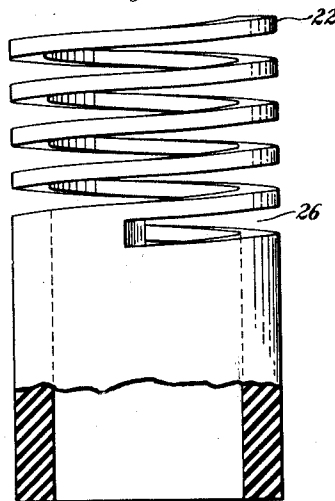


Fig. 4.

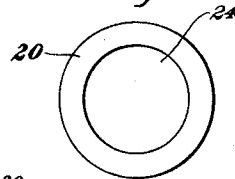
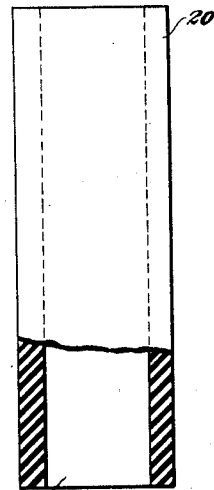


Fig. 5.



WITNESSES:

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2,205,236

ELECTRICAL APPARATUS

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Application May 25, 1938, Serial No. 210,082

2 Claims. (Cl. 175—362)

This invention relates to electrical apparatus and particularly to the forms for winding the coils of electrical apparatus.

An object of this invention is the provision of an improved coil form for electrical apparatus.

Another object of this invention is to provide a form suitable for insulating and supporting the turns of a coil.

A further object of this invention is the provision in a coil form of a turn insulator of spiral form which will permit movement of the spiral turns relative to one another for accommodating the turns of a winding.

A more specific object of this invention is the provision in a coil of a two-piece coil form suitable for supporting and insulating the turns of the coil.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawing, in which:

Figure 1 is an elevational view in section of the core and coil assembly of a transformer embodying the teachings of this invention;

Fig. 2 is an elevational view partly in section of a cylindrical body of insulating material comprising a portion of the coil form;

Fig. 3 is a view similar to Fig. 2 of a cylindrical body of insulating material embodying a modification of this invention;

Fig. 4 is an end view of a base or supporting member of insulating material; and

Fig. 5 is an elevational view partly in section of the base or supporting member shown in Fig. 4.

Referring to the drawing, and particularly Fig. 1, this invention is illustrated as embodied in the core and coil assembly 10 of a transformer. The assembly illustrated in Fig. 1 comprises a laminated core member 12 which may be constructed in any suitable manner, and a primary coil 14 and a secondary coil 16 disposed about the legs of the core member 12. In order to prevent movement of the coils about the legs of the core member, suitable wedges 17 are disposed between the coil form described hereinafter and the legs of the core member.

In constructing the coils 14 and 16, the turns of wire are wound on a coil form 18 particularly adapted for supporting the turns and for adjustment or movement whereby it can be employed with different sized turns of wire. In making the coil, a coil form 18 which comprises a core or supporting member 20 of insulating material illustrated in Figs. 4 and 5, and a cylindri-

cal tubular member 22 of insulating material as illustrated in Figs. 2 and 3, is employed for supporting and insulating the turns of the coil.

The core or supporting member 20 of the coil form is preferably a hollow base of a fibrous material impregnated with a synthetic resin, such as phenolic, urea or thiourea resin, molded under heat and pressure to the desired form. In this form, the hollow base 20 has an opening 24 therethrough of any desired shape suitable for receiving the legs of the core member 12.

In making the turn insulator 22 sheets of cloth, paper or the like, impregnated with a synthetic resin are rolled into the form of a hollow laminated tubular body which is molded under heat and pressure to a desired form. As molded, the tubular body has an inside diameter equal to the outside diameter of the supporting member 20, and a total wall thickness depending upon the turns to be applied to the coil, as will be explained more fully hereinafter.

As illustrated in Fig. 2, the wall of the turn insulator 22 is so cut as to provide a continuous spiral groove or space 26, greatly exaggerated in the drawing, from end to end of the member. This spiral groove or space may be of a very fine cut with the turns so spaced apart as to provide a thickness of insulating material between the turns sufficient for insulating the turns of wire which are to be wound therein.

With the turn insulator spirally cut in the manner described, it is disposed on the base member 20 for the winding of the coil. In forming the complete coil, end collars 28 of suitable insulating material are disposed about the ends of the base member as illustrated in Fig. 1 and extend outwardly to the outer edge of the coil. The base member 20 carrying the turn insulator and end collars is then placed on a suitable mandrel and a turn of the winding is wound on the base member adjacent one of the end collars. As the first turn of the winding is completed, the end of the spirally cut turn insulator is placed between the first and second turns of the winding and the winding proceeds with the spiral turns of the turn insulator separating the adjacent turns of the winding. As illustrated in Fig. 1, the turn of the winding is brought out through suitable slots in the end collars 28 for forming the leads 30 of the coil. The turn may or may not comprise a plurality of strands of wire, one turn per layer being disposed between turns of the turn insulator.

Since the turn insulator is of tubular shape, it will have no tendency to move radially from

the base member and the turns of the winding will securely hold it in place longitudinally. Because of the inherent spring action of the spirally cut turn insulator, it is evident that the turns of the turn insulator are movable relatively to one another to accommodate the turns of the winding as they are wound in the grooves formed by the turn insulator and the base member. Because the turns of the turn insulator are capable of movement relative to one another, it is apparent that a coil form employing such a turn insulator may be adapted to the making of a coil employing any predetermined size of wire. After the coil is wound, in order to eliminate the possibility of the end of the turn insulator from creeping out of place between the turns of the winding, the completed coil is usually taped with one or more layers of suitable insulating tape as illustrated in Fig. 1 to hold the turn insulator in position.

Where the coil form is to be employed in the making of coils embodying heavy turns of wire, it is sometimes found that the thickness of the insulation required between the adjacent turns of the coil is so great that the fine cut groove of the cylindrical turn insulator of Fig. 2 cannot be adjusted longitudinally sufficient to receive the heavy turns. Where such heavy insulation is required between the turns of the coil, the tubular turn insulator is grooved in the manner illustrated in Fig. 3 of the drawing. Here the turn insulator is double cut to form the continuous spiral groove or space 26 therein, the convolutions of the spiral cut being so spaced as to provide spiral turns of the insulator of predetermined thickness for giving a predetermined value of turn insulation. In this form, by reason of the double cut employed in making the groove or space, it is found that there is sufficient longitudinal flexibility as to permit a slight movement of the turns of the turn insulator relative to each other for accommodating different sized heavy wire.

In practicing this invention, the thickness of the wall of the tube 22 for making the turn insulator will depend upon its use in the coil. The turn insulator may be readily constructed having a thickness equal to the total turn thickness of the coil, or where desired, a plurality of the turn insulators may be employed. In the latter case, the turn insulator may be of a thickness equal to the thickness of one turn, and when assembled on the supporting member 20 with the turn wound therein, may be covered with a suitable solid insulating material such as a sheet

of paper, or suitable spacing strips may be disposed thereabout and a second turn insulator having an inside diameter equal to the outside diameter of the first turn insulator may be mounted thereon. Additional turn insulators may be mounted thereon with separating insulator sheets or spacers therebetween as the coil is wound to form the complete coil. By employing the plurality of turn insulators in the manner described, it is possible to construct a coil employing different-sized turns of wires for the different layers of the coil, as desired.

The coil form of this invention has the advantage that the proper turn insulation is provided for a predetermined size of wire, while the thickness of the insulator between the turns is sufficient for supporting them in position. Further, the turn insulators, whether the grooves or spaces are formed therein by means of the fine cut or double cut, as described, may be used interchangeably upon the coil support having the outside diameter of predetermined size.

Although this invention has been described with reference to a particular embodiment thereof, it is, of course not to be limited thereto except insofar as is necessitated by the prior art and the scope of the appended claims.

I claim as my invention:

1. A coil form for a winding comprising in combination, a base of insulating material, a spacer consisting of a continuous turn insulator of fibrous material impregnated with a synthetic resin disposed on the base, the continuous turn insulator being of self-supported spiral shape having a spiral space between the spiral turns of the insulator for receiving the winding, the turns of the spacer being movable relative to one another on the base to adjust the size of the space for receiving different sized windings.

2. A coil form for a winding comprising in combination, a base of insulating material, a spacer consisting of a continuous turn insulator of fibrous material impregnated with a synthetic resin disposed on the base, the continuous turn insulator being of self-supported spiral shape having a spiral space between the spiral turns of the insulator for receiving the winding, the turns of the spacer being disposed edgewise to the base and having a thickness sufficient to support the winding, the turns of the spacer also being movable relative to one another on the base to adjust the size of the space for receiving different sized windings.

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