July 2, 1929. B. R. SCOTT 1,719,242

COIL

Original Filed Feb. 19, 1926

Fig. 1.

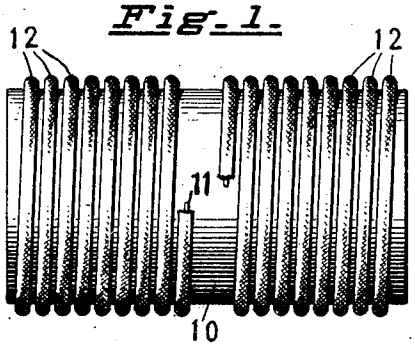


Fig. 2.

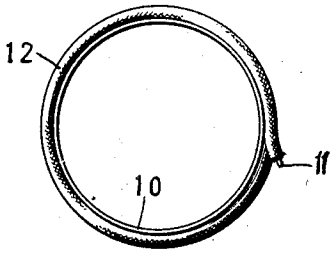


Fig. 3.

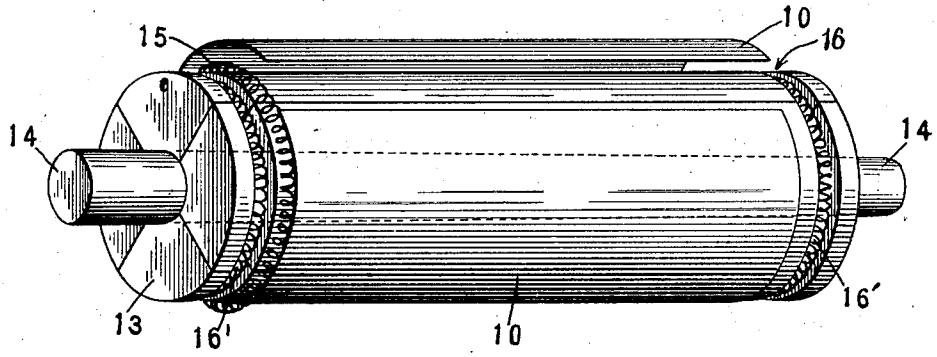


Fig. 5.

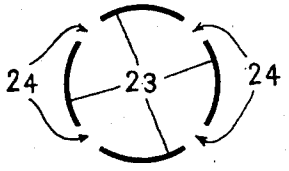


Fig. 4.

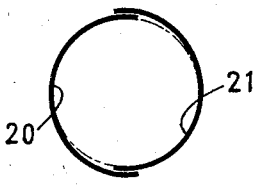


Fig. 6.

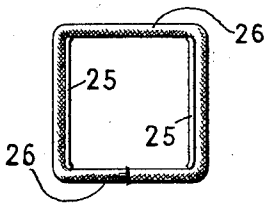


Fig. 7.

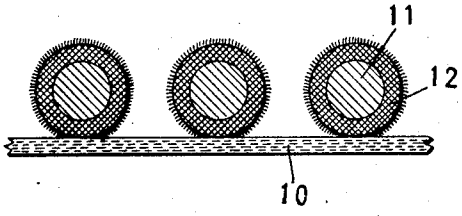
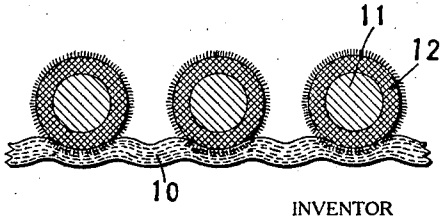


Fig. 8.



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Patented July 2, 1929. 1,719,242

UNITED STATES PATENT OFFICE.

BEVERLEY RANDOLPH SCOTT, OF WOODLYNNE, NEW JERSEY, ASSIGNOR TO THE HAMMARLUND MANUFACTURING COMPANY, INCORPORATED, A CORPORATION OF NEW YORK.

COIL.

Original application filed February 19, 1926, Serial No. 89,292. Divided and this application filed July 29, 1927. Serial No. 209,277.

My invention relates particularly to wire coils used for various purposes such as electric inductances.

One object is to provide a coil of high inductance value and low dielectric loss, relatively low resistance and small distributed capacity.

Another object is to provide a coil which can be readily handled and mounted.

Another object is to provide a coil having permanent and uniform characteristics.

I have solved the problem by the simple expedient of winding a coil upon a very thin layer of dielectric material such as celluloid to which it is permanently anchored by surface adhesion. The method of manufacture which will be hereinafter described is inexpensive and makes it possible to permanently maintain any desired spacing of the various turns.

Fig. 1 is a side view of a coil made according to my invention.

Fig. 2 is an end view of the same.

Fig. 3 is a perspective view of a mandrel showing one method of applying the dielectric.

Figs. 4 and 5 are diagrammatic end views of two other arrangements of the supporting dielectric.

Fig. 6 is a diagrammatic end view of a coil of angular cross-section supported on two strips of dielectric.

Fig. 7 is an enlarged longitudinal sectional view showing a fragment of a coil in process of manufacture.

Fig. 8 is a similar sectional view showing the same after the wire has been permanently secured in place.

The foundation 10 of the coil is made up of one or more strips of a non-conducting material such as a nitro-cellulose composition, for instance, celluloid or pyroxolin, which is normally hard and not tacky or sticky at room temperature.

The conductor 11 is preferably covered with insulating material 12 such as silk or cotton fibre.

In making the coil I preferably employ a mandrel 13 made up of a series of sections such as shown in Fig. 3 and provided with a tapered shaft 14 capable of supporting and expanding the mandrel.

According to the preferred method of manufacture, a very thin foundation sheet of celluloid, say five-thousandths of an inch thick, is wrapped around the mandrel and the edges of the sheet overlapped, as indicated in Fig. 3, and stuck together by the simple expedient of applying a suitable solvent, such as ethyl-acetate, to the material along the line of overlap, the edges of the sheet being drawn together smoothly and pressed together immediately after the solvent is applied. I have found that this operation of cementing the edges together can be greatly facilitated by the use of a sphinctor spring 15. This spring normally rests in a groove 16 in one end of the mandrel and is run along the surface of the celluloid as soon as the overlapping edges have been moistened with the solvent. Springs 16′ hold the mandrel parts yieldingly together.

When the edges of the sheet have been united on the mandrel, the mandrel is expanded in the usual manner by simply driving the shaft longitudinally. This places the celluloid tube under tension.

The mandrel is then placed in a winding machine and the wire wound on it under tension. This tension should remain substantially constant throughout the winding operation and the feeding of the wire should of course be at the proper rate to lay the wire with the desired spacing between adjacent turns.

When the coil has been wound, a suitable solvent, such as ethyl-acetate is applied to the foundation between the adjacent turns of the wire, for instance, by means of a brush. This solvent also penetrates the insulation of the wire and immediately softens the surface of the foundation adjacent the wire.

The coil being under tension, as before described, of course tends to contract in diameter and its inner surface thus sinks slightly in to the softened surface of the celluloid or the like. The change in condition before and after the application of the solvent is shown by the difference between the relative positions of the coil and foundation as shown in Figs. 7 and 8.

The shaft may be retracted and the mandrel contracted and withdrawn as soon as the material has substantially hardened, which requires only a few minutes. The finished coil will, however, continue to dry

out for some time, the length of time varying with the composition of the material, the nature of the solvent and the amount applied, as well as the atmospheric conditions. In drying out the coil shrinks lengthwise, sometimes as much as 10%.

The coil may be wound at any length desired for special purposes. The method of manufacture lends itself particularly to the production of long tubes which can be very readily cut up into such lengths as may be desired which is much cheaper than the winding of small individual coils.

In the manufacture of these tubes, particularly in small diameters, there is sometimes a tendency for the tube to warp when made as above described, due to the overlapped joint along one edge. This can be readily avoided, however, by using two strips, such as 20 and 21, as shown in Fig. 4, so that there will be oppositely disposed joints which will offset each other in the shrinking process.

It should also be understood that a number of foundation strips may be used and that these strips may be spaced apart as shown for instance in Fig. 5. Here I have shown four strips 23 with spaces 24 between them, which form an open work or skeleton tube. A coil wound in this manner has an added advantage of reducing the dielectric material to a minimum. Such a coil having no overlapped joint has no tendency to warp in drying.

Although the coil is preferably circular in cross-section, it should be understood that certain features of the invention are applicable to coils of other cross-sections, for instance, in Fig. 6, I have shown a square coil wound on two separate strips 25 on opposite sides. This would, of course, leave the portions 26 of the wires on the intermediate sides of the coil spaced apart from each other without supports except at the edges of the strips 25. This requires much less of the foundation material.

Coils wound according to my invention may be used for various purposes, such, for instance, as radio frequency variable couplers, antenna couplers, interstage couplers, neutrodyne coils, short wave coils, etc. As they are very light in weight and self-supporting they can be easily handled and mounted in various ways.

This is a division from my application #89,292 filed Feb. 19, 1926, in which I broadly claim a coil comprising a helix of conducting wire together with a sheet of insulating material touching and adhering to a surface of the helix throughout substantially the entire extent of the helix, the wire making contact with the sheet on only a small segment of the circumference of the wire as herein set forth.

The method of forming a coil as herein set forth is claimed in my divisional application #209,276 filed herewith.

I claim:

1. A coil comprising a foundation of a number of strips of celluloid-like material spaced apart from each other and a conductor wound on the outside of said strips and embedded slightly therein and adhering thereto.

2. A coil comprising a helix of wire with the adjacent turns spaced apart from each other and a number of spaced strips of celluloid-like material extending longitudinally of the coil and self-cemented to portions of the wall thereof.

3. A self supporting coil comprising a foundation consisting of a number of strips of thin sheet celluloid and turns of wire cemented in the outer surface of the celluloid, the celluloid foundation strips being corrugated and the wire being cemented in the grooves of the corrugations.

BEVERLEY RANDOLPH SCOTT.