

No. 762,111.

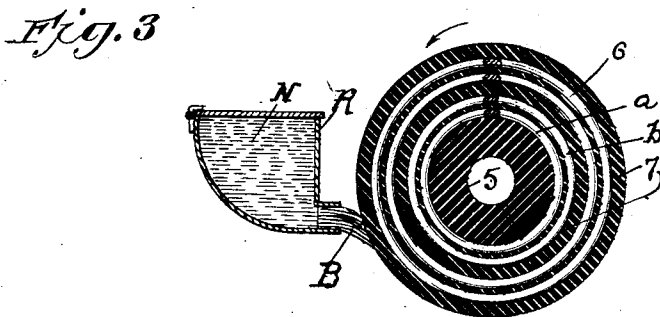
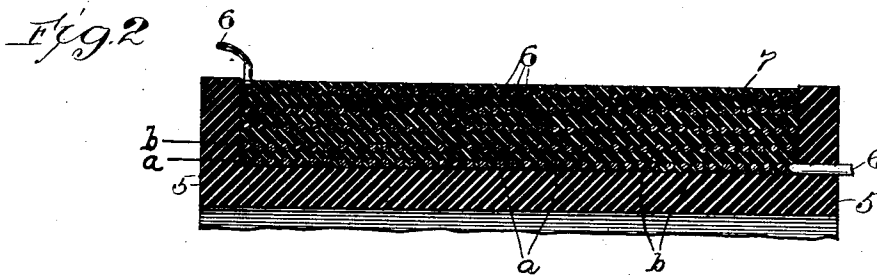
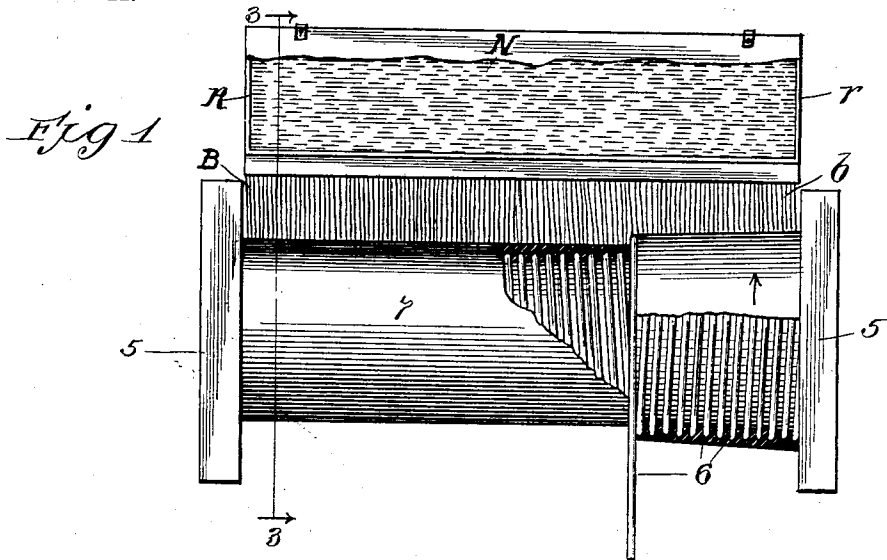
PATENTED JUNE 7, 1904.

V. G. APPLE.

ELECTRICALLY CONDUCTIVE COIL AND METHOD OF CONSTRUCTING SAME.

APPLICATION FILED SEPT. 21, 1903.

NO MODEL.



Witnesses
Ray White.

Harry C. White.

Inventor

Vincent G. Apple.

By Forée Bain Atty.

UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO.

ELECTRICALLY-CONDUCTIVE COIL AND METHOD OF CONSTRUCTING SAME.

SPECIFICATION forming part of Letters Patent No. 762,111, dated June 7, 1904.

Application filed September 21, 1903. Serial No. 173,995. (No model.)

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Electrically-Conductive Coils and Methods of Constructing Same; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

The primary object of my invention is to provide an electrically-conductive coil—such, for instance, as the coil of an electromagnet—wherein the insulation interposed between superposed layers of the coil varies in thickness, gradually increasing in thickness from a minimum between the immediately-superposed convolutions in the two layers having the least difference of potential to a maximum between the corresponding convolutions of the two layers exhibiting the greatest difference of potential.

A further object of my invention is to provide a method of applying insulation to the wire as it is being wound upon the coil, by which the object above stated may be accomplished.

To these ends my invention consists of an electrically-conductive coil embodying the features of construction set forth and prepared in the manner hereinafter recited, as particularly specified in the claims.

In the drawings, wherein I have illustrated conventionally the method of preparing the coil and the resultant product, Figure 1 indicates a coil in the course of the winding operation, part of the insulation being broken away. Fig. 2 indicates a longitudinal vertical section of a fragment of a completely-wound coil. Fig. 3 is a transverse section on line 3 3 of Fig. 1.

Throughout the drawings exaggeration for purposes of sharp illustration has been freely indulged in throughout all the figures.

Referring now to said figures, wherein like numerals of reference refer always to like parts, 5 indicates a supporting-spool, indicated as of insulating material.

6 indicates a continuous electrically-conductive wire wound thereon in successive

layers of spiral convolutions, the successive layers being wound from opposite ends of the spool.

7 indicates a body of insulating material applied to the wires in such a way as to insulate each convolution thereof from every other convolution.

In the present instance the insulating material is preferably a plastic substance, such as varnish, wherein each of the convolutions of the wire 6 is separately embedded. The application of the varnish or other material employed as insulation is accomplished in such manner that in respect to immediately-superposed layers of convolutions those corresponding convolutions of the two layers which exhibit the least difference of potential are separated by the minimum thickness of insulation, while those corresponding convolutions of said layers which exhibit the greatest difference of potential are separated by the maximum thickness of insulation.

It will be apparent that considering the first and second layers *a* and *b* upon the spool, the last-wound convolution of the layer *a* being the convolution next in electrical continuity to the first-wound convolution of the layer *b*, there will be but slight difference of electrical potential between the two said convolutions, whereas the first-wound convolution of the layer *a* being, as regards electrical continuity, removed by twice the number of convolutions in a layer from the last convolution of layer *b* the difference of electrical potential between such convolutions will be relatively great. It is obvious, therefore, that the thickness of insulation required between the first-wound convolution of layer *a* and the last-wound convolution of layer *b* to secure proper insulation thereof is greater than the thickness required between the last-wound convolution of layer *a* and the first-wound convolution of layer *b*. To secure such efficient and properly-proportioned insulation, therefore, I place the non-conductive material 7 upon the windings in varying thickness, gradually decreasing as to each layer from a maximum at the end whereon the first convolution is wound to a minimum at the end whereon the last convolution of said layer is wound. To accom-

plish this result, I apply the non-conducting material in the manner indicated in Figs. 1 and 3 of the drawings. In such figures, B indicates a brush, preferably of the same length as the portion of the body of the spool 5, so as to fit between the heads thereof.

R indicates a reservoir arranged to supply material to the brush.

N indicates a body of electrically-non-conducting material, such as varnish, contained within the reservoir to be constantly fed therefrom to the brush. In operation the spool is rotated upon its axis in parallelism to the brush, as indicated in Fig. 1, said brush being arranged in such proximity to the spool as to sweep over all exposed surfaces of the wire-wound portion thereof. With each revolution of the spool, therefore, it is obvious that the exposed surface of every peripherally-exposed wire will receive a coat of the varnish or such other non-conducting plastic material as is employed. The varnish is preferably of such a nature as to dry with great rapidity and may be applied under such conditions of temperature as will effect its quick hardening, so that a number of successive coats will form a layer of considerable thickness over the wire. It will be apparent, therefore, that during the winding of two layers of wire the first-wound convolution of the lower layer being exposed during the winding of all except the last convolution of the completed two layers will receive a number of coats of varnish equal to double the number of convolutions in a layer less one, each successive convolution of said lower layer receiving two less coats than the preceding convolution until the last-wound convolution of said lower layer is reached, which receives only a single coat. Consequently the first-wound convolution of the lower layer and the last-wound convolution of the superposed layer will be separated by a considerable body of the insulating material, the thickness whereof gradually decreases to the opposite ends of the layers. In the same manner the first-wound convolution of the second layer will be thickly insulated from the last-wound convolution of the third layer, and so on throughout the spool.

If it be desired to wind the lowest layer directly upon the spool, as indicated in the drawings, some means may be employed to prevent that portion of the brush which would contact with the spool from feeding the insulating-varnish. For instance, a strip of paper may be laid over the brush and gradually withdrawn as the convolutions of wire approach the distant end of the spool, or the feed may be stopped in any other obvious way.

While I have herein suggestively illustrated the apparatus for carrying my invention into effect, I do not desire to be understood as limiting myself thereto.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An electrically-conductive coil comprising a support, a plurality of superposed layers of convolutions of a continuous electric conductor wound thereon, and a body of insulating material electrically separating each convolution from every other, said body of insulation being thicker between immediately-superposed convolutions of relatively higher difference of potential than between immediately-superposed convolutions of relatively lower difference of potential.

2. An electrically-conductive coil comprising a support, two superposed layers of convolutions of a continuous electrical conductor wound thereon from opposite ends, and a body of insulating material separating the layers, said body of insulating material gradually decreasing in thickness from a maximum between the first-wound convolution of the lower layer and the last-wound convolution of the superposed layer to a minimum between the last-wound convolution of the lower layer and the first-wound convolution of the superposed layer.

3. As an article of manufacture, an electrically-conductive coil comprising a support, layers of convolutions of a continuous electrical conductor wound thereon, each layer being wound from the end opposite that from which the next preceding layer is wound, a body of insulation covering each layer and gradually decreasing in thickness from the first-wound convolution of the layer to the last-wound convolution thereof.

4. The process of constructing electrically-conductive coils which consists in constantly rotating a spool about its longitudinal axis, feeding a conductive wire thereto to be wound thereon by the rotation of the spool, and constantly applying plastic insulation to an area of the wire-wound portion of the spool exposed to a relatively stationary, longitudinal line coextensive with the length of said wire-wound portion of the spool.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VINCENT G. APPLE.

In presence of—

L. M. ARNOLD,

N. H. KELLEHER.