

July 18, 1939.

A. HELGASON ET AL

2,166,841

COIL

Filed April 22, 1938

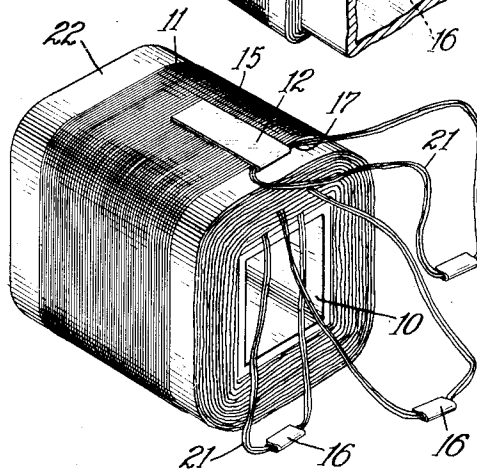
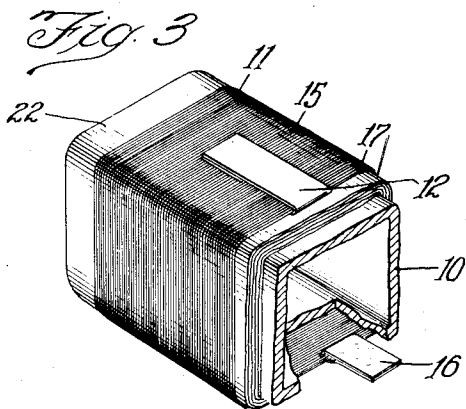
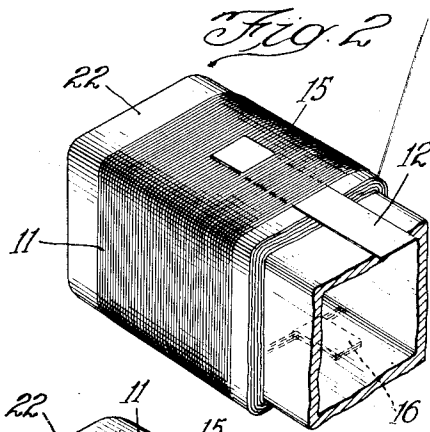
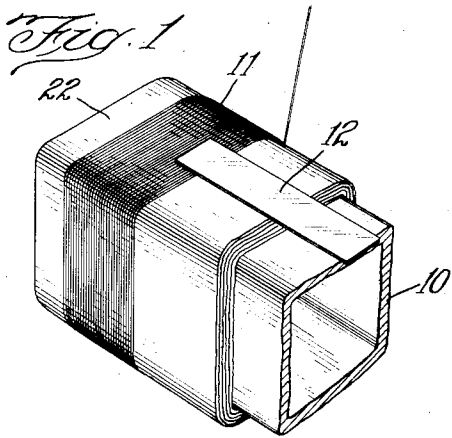
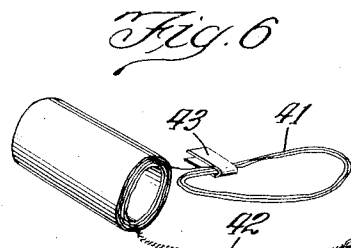
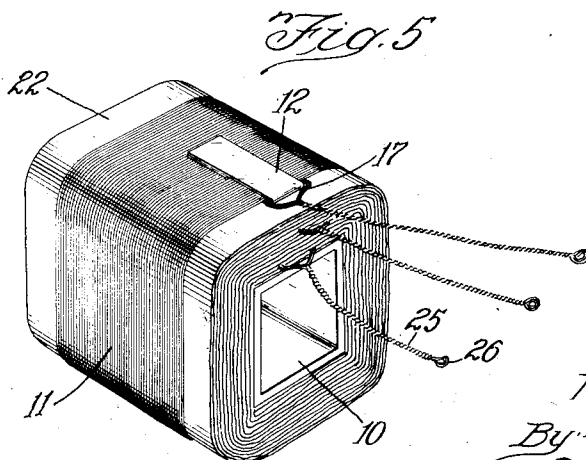


Fig. 4



Inventors:
Arni Helgason
Peter E. Keegan

By
Robert L. Kahn Atty.

UNITED STATES PATENT OFFICE

2,166,841

COIL

Arni Helgason, Wilmette, and Peter E. Keegan,
Chicago, Ill., assignors to Chicago Transformer
Corporation, Chicago, Ill., a corporation of Illi-
nois

Application April 22, 1938, Serial No. 203,640

5 Claims. (Cl. 175-21)

This invention relates to coils and coil winding and has particular application to providing leads for such coils. In the manufacture of coils or windings such as for transformers, it is necessary to provide leads to make connection to the windings at the ends and frequently at intermediate points thereof. In transformers handling a minute quantity of power, the fineness of the wire and its comparatively small tensile strength make the problem of leads difficult. The lead itself must have enough strength to withstand rough handling and enough body so that a soldering iron will not burn up the wire. The problem of providing leads for such coils is complicated by the fact that such coils are wound at high speed in multiple units by comparatively unskilled operators so that the cost and complexity of making such leads is an important factor. The difficulties of soldering to extremely fine wire makes it desirable to avoid this step.

This invention attains the objective of providing leads under the above conditions without the necessity for soldering and, in fact, by reducing to a minimum the departure from normal winding procedure. By this invention, the lead may be made as mechanically strong as desirable and may be adjusted to suit the wire size.

Referring to the drawing:
Figure 1 shows an isometric view of a coil at one stage of the winding.

Figure 2 is a similar view of the coil with a complete wire layer.

Figure 3 is a similar view showing the coil with a complete wire layer and lead turns.

Figure 4 shows a completed coil with the lead loops pulled out.

Figure 5 shows the coil with the leads completely finished.

Figure 6 shows a modification.

While the drawing shows only one coil, it is understood, of course, that this process is of general application and is applied to coils where they are wound simultaneously on a long form.

Referring to the drawing, a form 10 of cardboard or any other material has a plurality of layers or banks, each one having turns 11 of wire wound thereon. At the beginning or any intermediate point of one layer, a strip of insulation 12 is disposed directly on the paper 22. Strip 12 may be of paper or fabric and may be gummed or clear as desired. The winding is thereupon continued over strip 12 so that a plurality of wire turns or coils 15 are formed over a portion of strip 12.

These additional turns 15 are provided until the

complete predetermined layer of wires is provided.

Then a strip of paper or other material 16 is disposed along paper cover 22 and additional lead turns 17 are wound on over both strips 12 and 16. Preferably the two strips are on opposite sides of the coil although this is not necessary.

When this entire layer, including the lead turns 17, is wound, strip 12 is turned back over the wire while strip 16 is doubled back to extend away from the coil proper. The wire winding may then be continued in the usual fashion with separating layers 22 of paper and additional wire layers. The number of additional lead turns is dependent upon the fineness of the wire used and may be adjusted to suit individual requirements. Thus, for extremely fine wire about five or ten extra turns are ample.

After the entire coil is finished, strip 16 is used as a handle for pulling out the additional lead turns 17 to form loops 21. This is shown in Figure 4. It is necessary to so design the wire layers that the leads come at a coil end for obvious reasons. The various loops 21 when pulled out free will be anchored by means of the turned back strip 12. The anchorage is independent of the strength of the wire itself and merely depends upon the strength of strip 12 and the friction of the various wire layers on the strip. If gum is not objectionable, strip 12 may be adhesive tape so that a tight grip on the wire results. Otherwise the succeeding layers of paper and wire may be relied upon to hold the folded back part of the strip.

After the loops 21 are pulled out, they are twisted to form leads 25 and the tips 26 may be bared of their insulation to provide a soldering junction. It is clear that the length of the various leads 25 will depend upon the length of the lead turns of which they are composed so that as the layer recedes from the center of the coil, the lead grows longer.

By the provision of such leads, it is true that the electrical connection is dependent upon one wire retaining its continuity with the winding proper. However, the remaining wires forming the lead provide the mechanical strength.

As shown in the drawing, the lead turns come after the corresponding layer has been wound. Obviously, this may be reversed so that the lead turns are wound first and then the layer is wound. This reversal would be necessary when beginning a coil. At the end of the coil, the very last turns would be lead turns. At intermediate points, the leads would be either at the

beginning or end (with reference to winding order) of each layer depending upon at which end of the coil the lead is desired. In any event, it is to be understood that in the description and claims a winding order is set forth merely for convenience and that a reversal thereof is within the scope of the invention as described and claimed.

Where extremely small coils are being wound or where longer leads are desired, they may be provided as shown in Figure 6. In this particular case, instead of providing lead turns 17, a plurality of large loops 41 are provided. These loops may be as large as desired and when flattened down and twisted may form a lead 42. Prior to twisting of these loops 41, a strip 43 is inserted to engage the loops, and this strip is suitably anchored in the wire coil at any desired place. Thus, these leads may be formed during the winding process and anchored at the layer from where taken. Hence, the two wires by which the loops are connected to the rest of the coil, or if an end lead, the single wire, will merely serve to electrically connect the lead to the coil and have no mechanical function whatsoever. It is obvious that lead 42 may be as long as desired.

Such loops and leads are made during the winding process. In order to prevent tangling wires, it is desirable that the looped coils 41 be twisted to form lead 42 and this lead be temporarily coiled about the spindle and anchored until the entire winding program is finished. If the bulge is not objectionable, lead 42 may be coiled on the layer where formed. However, it is usually more desirable to coil it around the paper tube or form beyond the limits of the coil when finally cut.

What is claimed is:

1. In the art of coil winding, the method of providing a stranded lead integral with the coil

wire which comprises adding lead turns about the same base that the coil turns are wound on, anchoring a portion of each lead turn by means common to all said lead turns and pulling out unanchored portions of the lead turns whereby each lead turn forms two elements of the stranded lead.

2. The method of claim 1 wherein said lead turns only are wound over a strip of fabric or the like at an unanchored portion of each lead turn, said strip thereafter being looped so that both ends project beyond the coil end as a handle for pulling out said lead turns.

3. In an electrical coil, a layer of wire turns consisting of a predetermined number of coil turns and remaining lead turns all wound continuously on the same base, and means common to all lead turns for anchoring a portion of each of said lead turns to said base, the unanchored portions of the lead turns being adapted to be pulled out to form a stranded lead with each lead turn forming two elements thereof.

4. The structure of claim 3 wherein said anchoring means comprises a strip of fabric or the like enclosing all lead turns and a number of coil turns.

5. In an electrical coil, a plurality of wire turns forming a part of said coil and a stranded lead integral with and composed only of said coil wire, said lead having the coil wire extending back and forth continuously in successive sections from one lead end to the other lead end with the wire sections lying along each other to form a heavy stranded lead and means separate from the single wire joining the lead and coil proper for anchoring a portion of said lead on said coil.

ARNI HELGASON.
PETER E. KEEGAN. 40