ABSTRACT OF THE DISCLOSURE

A prefabricated flanged bobbin to be wire wound to form an electromagnetic coil with coil terminals connected to one of the flanges at one end of the bobbin and extending outwardly therefrom, which connections each provide a protective path through the flange and within its annular periphery for the ends of the wire to be wound thereon.

The present invention relates generally to bobbins of the type which are wire wound to form electrical coils.

There are many and varied forms of bobbins comprised of an elongated body with a flange provided at one or both ends prior to winding which have been devised for mass production of electrical coils.

Although time savings and quality improvement have resulted in winding such prefabricated bobbins, only limited success has been realized because of difficulties encountered in providing electrical connections for the wire ends of the coil. Such difficulties are further amplified by movement of the terminals during handling and soldering of leads, and when a plug-in type coil installation is desired.

Accordingly, an object of the present invention is to provide a prefabricated bobbin for electrical coils having improved means for electrically connecting the ends of the wire winding.

Another object of the present invention is to provide the foregoing bobbin in which the connected ends of the wire winding are protected from breaking.

And another object of the present invention is to provide the foregoing bobbin in which the connection means for the wire ends provides means for a plug and socket type installation of the resulting electrical coil.

The present invention contemplates a bobbin to be wire wound to provide an electrical coil, comprising a coil core providing an elongated bobbin body, a pair of axially spaced ends of one of the electrically connected to the core, each adjacent end thereof opposite from the other, one of the flange members having a plurality of openings there-through, a plurality of terminals each having an end extending through one of the openings and formed to engage the one of the flange members adjacent the opening through which it passes to fixedly connect the terminals to the one of the flange members, and the formed ends of the terminals and the openings through which they pass forming passages for the wire ends of a coil wound on the elongated body.

The foregoing and other objects and advantages will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings wherein several embodiments of the invention are illustrated by way of example. It is to be expressly understood, however, that the drawings are for illustrative purposes only and are not to be construed as defining the limits of the invention.

FIGURES 1 and 2 are plan and end views, respectively, of a bobbin for an electrical coil made in accordance with the present invention.

FIGURE 3 is an enlarged perspective view of the clamping end of one of the electrical connectors or flags.

FIGURES 4 and 5 are side and end views, respectively, of a modified form of bobbin, with a portion of the electrical connection end of the bobbin as shown in FIGURE 3 being broken away to more clearly show details of construction, and

FIGURE 6 is an end view of flange for the electrical connection end of a bobbin made in accordance with the present invention illustrating the means of mounting the wire end connectors.

Referring now to the drawings and particularly to FIGURES 1 and 2, a bobbin 10, made in accordance with the present invention, has an elongated body formed by a magnetic iron core 11, and a pair of axially spaced flange members 12 and 13 disposed at opposite ends of the core. Flange members are fixedly connected against movement to the core 11 by staking or molding, or in any other suitable manner known in the art.

A thin layer of any thin suitable dielectric material is provided on the core 11, and adjacent the inner surfaces of flanges 12 and 13 which extends radially outwardly from core 11 at least to the extent of the depth of the wire wrappings to be wound on the bobbin 10. As shown in FIGURE 1, this is accomplished, in this instance, by applying two overlapping wraps 16 of a dielectric material or film which, together, extends substantially the entire length of core 11 between flange members 12 and 13. In addition, a pair of insulating discs or washers 17 are provided each adjacent one of the flange members 12 or 13 and having an annular flange 18 extending therefrom which overlaps the adjacent edge of the dielectric wrap 16.

The insulation described is for illustrative purposes only and should not be construed as defining the limits of the present invention. It should be understood that the dielectric material or film may be wrapped, as shown, or preformed tubing, and have multiple overlapping portions, as shown, or may be a single width of tape or length of tubing. The dielectric material may be applied by spraying or as a preform confronting to wraps 16 and discs 17. A wire is then suitably wrapped on the insulated core 11 to provide a wire coil, as indicated in FIGURE 1, having its length limited to the distance between flange members 12 and 13.

As best shown in FIGURE 2, flange 13 has an edge 14, preferably flat or uniplanar as shown, which is broken by a plurality of spaced open ends slots, or recesses, 15 throughout. In this instance, for illustrative purposes only, four such slots or recesses 15 are provided each for receiving and supporting a U-shaped end of a terminal.

Referring particularly to FIGURE 1, while all the terminals connected at one side of a bobbin 10 normally would be of the same type, for illustrative purposes only, one flag is shown as a prong type plug-in contact 19, and the remaining three terminals 20 are each adapted for a soldered wire connection of bobbin 10. The end of a prong 19 to be connected to flange 13 is the same as the corresponding end of a terminal 20 and, accordingly, will be described in detail only as the end of a terminal connector 20. It should be understood that the number of terminals provided on a bobbin is determined by the number of wire ends to be connected. Although bobbins with four terminals are shown in the drawings and described herein, this number of terminals has been arbitrarily chosen for illustrative purposes only and should not be construed as an intent to define the limits of the present invention.

As is best shown in FIGURE 3, a U-shaped channel is provided at the one end of a flag 20 by the body 21, which forms the height of the U, and a pair of spaced substantially parallel flanges 22 and 23 which form the legs extending from the height and are disposed substantially normal to body 21. Flanges 22 and 23, which extend beyond the end of terminal 20, have outer surfaces 24 and 25, respectively, which are substantially coplanar with the elongated edges of the body 21.
The extending portions of flanges 22 and 23 are bent away from one another to form a pair of tabs 26 and 27, respectively, being so disposed that the outer flange surfaces 24 and 25 each define an angle which is preferably less than 90°. For assembly, the channel end of a terminal 20 is inserted into a slot 15 in flange 13. The body 21 and outer flange surfaces 24 and 25 engage the bottom and sides respectively, of the slot 15 while tabs 26 and 27 are in contact with the inner surface of flange member 13. The front ends or ends opposite from tabs 26 and 27 of flanges 22 and 23, respectively, are formed, by any suitable means well known in the art such as pressing or stamping, to form opposite extending tabs 28 and 29, as shown in FIGURES 1 and 2. (only tab 28 is shown in FIGURE 3), which engage the outer surface of flange member 13. The material at the bends between flanges 22 and 23, at their forward ends, and the body 21 is normally sufficiently frangible to separate or rupture when tabs 28 and 29 are formed. However, if required, these portions of the bends may be cut or scored.

Simultaneously with such deformation of tabs 28 and 29, tabs 26 and 27 are sprung to engage the inner surface of flange member 13 to the fullest extent possible and are then disposed substantially parallel with the formed tabs 28 and 29, respectively. In this manner, flange 22 with its respective tabs 26 and 27 is set with its respective tabs 27 and 29 in a form of a pair of opposed U-shaped channels which engage the sides of slot 15 and the inner and outer surfaces adjacent thereto to connect the terminal 20 to flange member 13. The springing during deformation provides a clamping action between tabs of each of the opposed U-shaped channels for locking.

It should be readily understood that the channel end of a terminal 20 and the slot 15 in which it is retained form a passage through flange member 16 for the wire end of a wound coil which can then be soldered to the terminal with the requisite wire lead to form a single electrical connection therebetween, as shown at the uppermost flag of FIGURE 1. The passageway, therefore, protects the wire end of the coil as it crosses the normally widest portion of the coil assembly.

Alternatively, as shown on the adjacent flag of FIGURE 1, the wire end of the wound coil may be soldered to the terminal 20 within its channel end to provide a protected connection while the wire lead is connected, as usual, to the opposite or free end of the terminal.

Referring now to FIGURES 4 and 5, a modified bobbin 30 has an elongated body provided by the core 31 of the resulting electrical coil assembly, and a pair of axially spaced flange members 32 and 33 which are fixedly mounted against movement adjacent opposite ends of the core from one another. Flange members 32 and 33 may be connected to core 31 in any suitable manner as heretofore discussed relative to bobbin 10. Such connections, in this instance as shown in FIGURE 4, are accomplished by providing a plurality of sharp annular serrations or alternate annular ridges and recesses 38 at both ends or core 31 upon which flange members 32 and 33 are preferably molded. Bobbin 30 may have any suitable insulating such as heretofore discussed in connection with bobbin 10 of FIGURES 1 and 2.

Flange member 33 corresponds to flange member 13 of bobbin 10, and has a flat edge surface 34 which is broken by a plurality of spaced open end slots or recesses 35 therein corresponding to surface 14 and slots 15, respectively.

Referring now also to FIGURE 6, a groove 36 is provided in the inner surface of flange member 33, adjacent the closed end and two sides of each slot 35, in which tabs 26 and 27 of a terminal 19 or 20 are disposed. In this manner, snagging by tabs 26 and 27 inside flange member 33 is eliminated to prevent breaking the wire thereby during winding of the coil.

Additionally, the inner surface of flange member 33 has a pair of linear grooves or recesses 37 each extending from one of the inner pair of slots 35 to the surface of core 31 and on opposite sides thereof from one another. Grooves 37 provide recessed passages for the wire ends of one or more coils in the area of the flange member 33 coincident with the adjacent coil end.

Although several embodiments of the invention have been illustrated and described in detail, it is to be expressly understood that the invention is not limited there to. Various changes may be made in the design and arrangement of the parts without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art.

I claim:

1. A bobbin to be wire wound to form an electrical coil, comprising:

an elongated body of magnetic material providing a coil core;

a pair of flange members axially spaced from one another and fixedly connected to the core, each adjacent one end thereof opposite from the other defining a length of the core therebetween to be wire wound;

one of the flange members being a terminal support and having a plurality of openings therethrough;

a plurality of terminals disposed outwardly of the bobbin at one end thereof, each having a mounting end extending outwardly and flange element one of the openings of the terminal support and engaging the terminal support adjacent the opening through which it extends to fixedly connect the terminals to the bobbin;

the mounting end of each terminal being so formed to provide, in the opening through which it extends, an open end slot as a passage through the terminal support flange member for a wire end of a coil to be wound on the bobbin.

2. The bobbin in accordance with claim 1, and each of said terminals comprising:

an elongated flat blade body;

a pair of spaced flanges disposed along the edges at one end of the body and extending therefrom to provide substantially a U-shape opening, through said terminal support flange member, at the mounting end thereof;

each of the flanges of said pair being formed as U-shaped channels disposed on a plane transverse to the body, with each of said U-shaped channels opening away from the other of the channels; and

the channels overlapping and engaging both sides of the terminal support adjacent the opening through which the mounting end extends.

3. The bobbin in accordance with claim 1, and each of said terminals comprising:

an elongated flat blade body;

a pair of spaced flanges disposed along the edges at one end of the body to provide substantially a U-shape opening, through said terminal support flange member, at the mounting end thereof;

the flanges each having an end portion which extends past the end of the flat blade body and is formed away from the other of the flanges to provide a tab which overlaps and engages the surface of the terminal support facing the other of the flange members adjacent the opening through which the mounting end extends;

the other end of each flange opposite the tab thereof being formed substantially parallel to the tab thereof and engaging the outer surface of the terminal support; and

the tabs at the ends of each of the flanges clamping the terminal support therebetween to fixedly connect the terminals to the bobbin.

4. The bobbin in accordance with claim 1 wherein:

each of the openings is substantially a U-shaped slot intersecting the edge of the terminal support at its open end defined by a pair of spaced substantially parallel side walls connected to each other at corre-
sponding ends by a bottom wall which is opposite the open end of the slot;
the mounting end of each terminal being substantially 
U-shaped the legs of which engage the side walls of 
the slot through which such mounting end extends 
and the height between the legs engages the bottom 
wall of such slot; and 
the legs being formed as U-shaped channels, each opening 
away from one another, which overlap and engage both sides of the terminal support adjacent both 
sides of the slot.
5. The bobbin in accordance with claim 4, wherein: 
the surface of the terminal support facing the other 
flange member adjacent the slots is recessed.
6. The bobbin in accordance with claim 4, wherein: 
the terminal support has a flat uniplanar edge; and 
the slots are spaced along and extend inwardly from 
the flat uniplanar edge.
7. The bobbin in accordance with claim 6, and each 
of said terminals comprising: 
an elongated flat blade body; 
a pair of spaced flanges disposed along the edges at 
one end of the body to provide substantially a U-
shape at the mounting end thereof engaging the side 
and bottom walls of the slot through which the 
mounting end extends;
the flanges each having an end portion which extends 
past the end of the body and is formed away from 
the other of the flanges to provide a tab which over-
laps and engages the surface of the terminal support 
-facing the other of the flange members adjacent the 
slot through which the mounting end extends;
the other end of each flange opposite from the tab 
thereof being formed substantially parallel to the 
tab thereof and engaging the other surface of the 
terminal support; and 
the tabs at the ends of each of the flanges clamping 
the terminal support therebetween to fixedly connect 
the terminals to the bobbin.
8. The bobbin in accordance with claim 6, wherein: 
the surface of the terminal support facing the other 
flange member adjacent the slots is recessed.
9. The bobbin in accordance with claim 8, wherein: 
the recessed surface of the terminal support has a pair 
of linear grooves each with one adjacent the core 
and its other end intersecting the recess adjacent the 
bottom wall of one of the slots.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent</th>
<th>Date</th>
<th>Inventor</th>
<th>Number</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>737,720</td>
<td>9/1903</td>
<td>Duncan</td>
<td>336—192</td>
<td></td>
</tr>
<tr>
<td>822,469</td>
<td>6/1906</td>
<td>Opgt</td>
<td>336—192</td>
<td></td>
</tr>
<tr>
<td>1,815,212</td>
<td>7/1931</td>
<td>Ogg</td>
<td>336—192</td>
<td></td>
</tr>
<tr>
<td>1,823,827</td>
<td>9/1931</td>
<td>Franz</td>
<td>336—208</td>
<td></td>
</tr>
<tr>
<td>2,039,957</td>
<td>5/1936</td>
<td>Hall</td>
<td>339—220 XR</td>
<td></td>
</tr>
<tr>
<td>2,433,358</td>
<td>12/1947</td>
<td>Garberding</td>
<td>339—220 XR</td>
<td></td>
</tr>
<tr>
<td>2,972,727</td>
<td>2/1961</td>
<td>Flanagan et al.</td>
<td>339—258 XR</td>
<td></td>
</tr>
</tbody>
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FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Patent</th>
<th>Date</th>
<th>Inventor</th>
</tr>
</thead>
<tbody>
<tr>
<td>898,998</td>
<td>1962</td>
<td>Great Britain</td>
</tr>
</tbody>
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