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BOBBIN WITH SLOTTED FLANGE FOR TERMINAL ACCESS

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2 Sheets-Sheet 2

FIG. 3

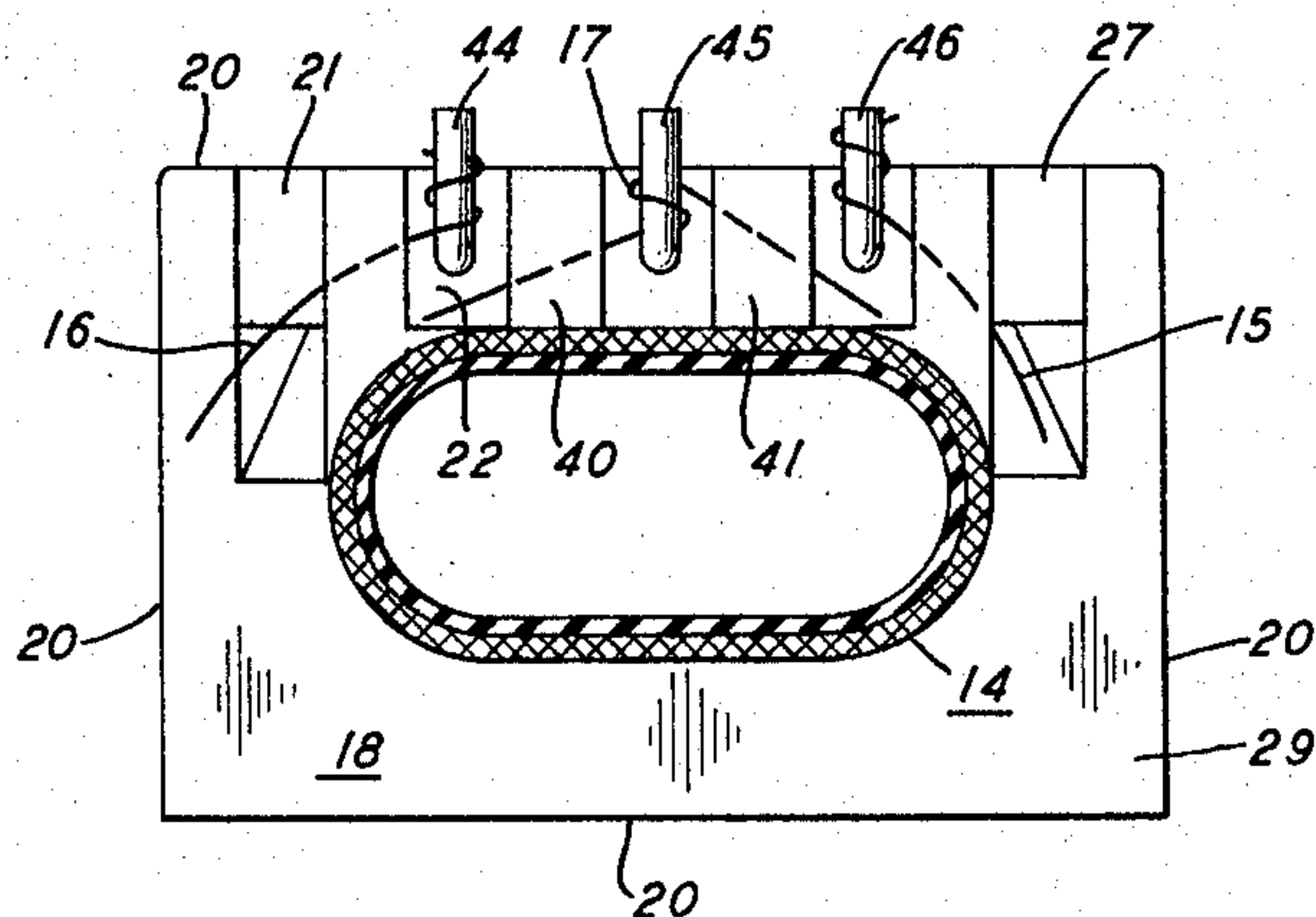
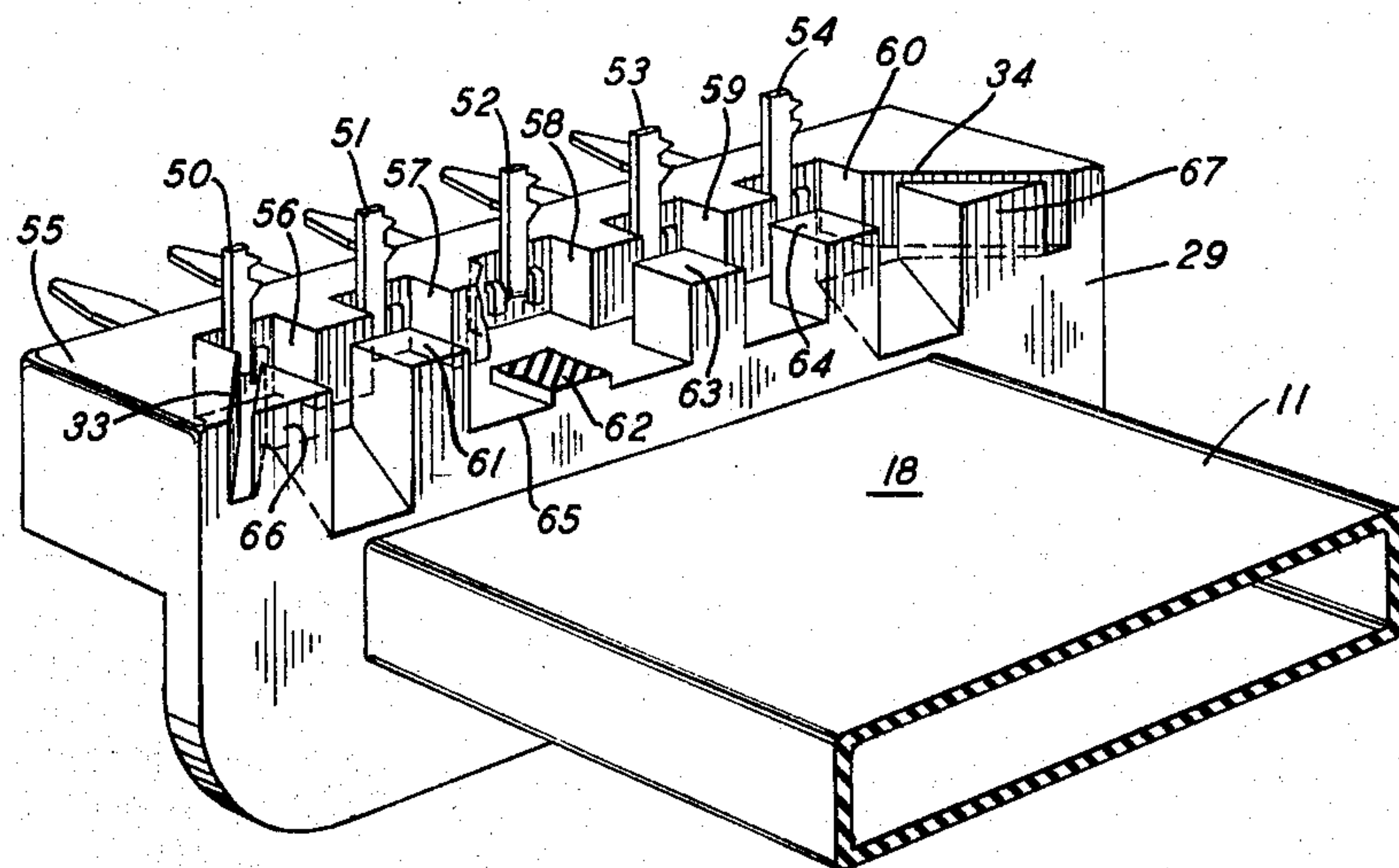


FIG. 4



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BOBBIN WITH SLOTTED FLANGE FOR TERMINAL ACCESS

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This invention generally relates to devices for supporting turns of wire and in particular relates to coil supporting devices having insulating paths channeled therein for conducting coil ends out from under overlaid coil windings.

One form of device to which this invention relates is commonly called a bobbin. Bobbins are generally spool-shaped and comprise a support or inner winding member that has one or two outer end flanges affixed orthogonally thereto.

Bobbins serve as a foundation upon which turns of wire may be conveniently wound into coils. Coil wound bobbins are suitable for use in almost every situation where a wound coil is required. Furthermore, bobbins can readily be made with varying diameters in order to adapt to a variety of core shapes.

Coil wound bobbins, however, pose two serious problems. First, electrical breakdown or shorting between windings often occurs when the inner lead from the first layer of windings on the bobbin is brought out from under the overlaid turns or outer windings for connection to a terminal. For example, when the inner lead is brought out, it must pass between the end flange of the bobbin and the end of the coil made up by the overlaid windings. Consequently, the inner lead is separated from the outermost winding by a plurality of intermediate windings. As a result, an electrical potential can appear therebetween.

Where the electrical potential therebetween is appreciable, there is a strong possibility of an insulation breakdown. The breakdown will occur between the inner lead and one of the outer windings. When such a breakdown occurs, the coil can be shorted and ruined.

Heretofore, the inner lead has been insulated from the outer windings by using tape, an insulated washer, or by using a slot cut in the end flange of the bobbin. See, for example, Patent 3,083,930 issued to B. O. Brekke on April 2, 1963, Patent 3,014,164 issued to D. W. Howenstine on December 19, 1961, and Patent 3,117,294 issued to P. C. Muszynski et al. on January 7, 1964. Each of these patents overcomes the problem of lead shorting by using a slot cut in the end flange of the bobbin for insulating the inner lead from the outer windings as it passes to its associated terminal post.

The second problem posed by coil wound bobbins is not restricted to coil wound bobbins but is common to other types of coils as well. The problem is coil failure due to vibration fatigue in lead-out wires.

In vibration fatigue, the portion of the coil wire attached to a terminal on the bobbin breaks as a result of metal fatigue brought on by vibration. It is known, however, that such breakage can be avoided when slack is introduced in the wire attached to the terminal. Heretofore, slack has been obtained by splicing a piece of lead-in wire between the terminal and the coil proper. Splicing, however, adds an additional step to the assembly operation and, accordingly, adds an element of cost.

It is, therefore, an object of this invention to improve the characteristics of bobbins.

It is another object of this invention to eliminate the necessity of splicing a lead-in wire between the core and its terminal.

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It is another object of this invention to eliminate splicing, insulate lead-in wires, and achieve protection for the terminal posts in bobbins.

According to one embodiment of this invention, a bobbin equipped with a winding member comprises a winding space surrounding the winding member, terminals insulated from the winding space by an end flange, and a plurality of passages for interconnecting the terminals and the winding space through the end flange.

Other objects and features of this invention are readily apparent from a reading of the specification when taken in conjunction with the drawings in which:

FIG. 1 is a plan view of one embodiment of this invention;

FIG. 2 is a section view of the embodiment shown in FIG. 1 taken along the line 2-2;

FIG. 3 is a section view of the embodiment shown in FIG. 1 taken along the line 3-3; and

FIG. 4 is an isometric view showing another form of this invention.

A bobbin 10 is illustrated in FIG. 1. The bobbin 10 comprises a winding member 11 and a support or end flange 12 extending outwardly from the winding member 11. The winding member 11 and the end flange 12 can be conveniently made of any electrically insulating material.

As shown in FIG. 2, an opening 13 for accepting core members therein passes through the winding member 11 and the support or end flange 12.

A coil 14, shown in FIG. 1, is wound on the winding member 11. The coil 14 comprises an inner lead 15, an outer lead 16, and an intermediate lead 17. The coil 14 occupies a winding space 18 surrounding the winding member 11.

The end flange 12 has a periphery 20 interconnecting an outer surface 28 and an inner surface 29 thereon. The inner surface 29 separates the end flange 12 from the winding space 18. Channeled in the periphery 20 are a plurality of passageways or corridors 21, 22, 23, 24, 25, 26, and 27. All of the corridors communicate with the winding space 18 through the inner surface 29.

One end or portion of each corridor or slot 22, 24, and 26 is arranged to accept a terminal, and each is numbered 30, 31, and 32, respectively. Moreover, each corridor 22, 24, and 26 is arranged to communicate with an adjacent corridor or slot. For example, a portion of corridor 22 communicates with a portion of corridor 24 through a corridor or slot 23. Similarly, a portion of corridor 26 communicates with a portion of corridor 24 through a corridor or slot 25. Further, another portion of part of the corridor 24 and two more portions of parts of each of the corridors 22 and 26 are arranged to communicate with the winding space 18. Moreover, in each of the corridors 22 and 26 one of the two portions is arranged to communicate with the winding space 18 through corridors 21 and 27, respectively.

One terminal or terminal post is disposed in each of the corridors 22, 24, and 26. Specifically, a terminal 44 is located in the portion 30 of the first, a terminal 45 is located in the portion 31 of the second, and a terminal 46 is located in the portion 32 of the third. While the terminals are more advantageously located at the center of the corridors, satisfactory results can be obtained where the terminals are off center. When so arranged, each terminal 44, 45, and 46 communicates with the winding space 18 through at least two corridors or slots.

All of the terminals 44, 45, and 46 are similar. As a result, a description of one will suffice for the others. As shown in FIG. 2, the terminal 45 is substantially L-shaped and comprises two portions 47 and 48.

The portion 47 is embedded in the end flange 12 in order to hold the terminal 45 thereto, and protrudes from

the outer surface 28 in order to serve as a connecting point between the terminal 45 and an external electrical circuit (not shown). The portion 48 projects above the periphery 20 so that selected parts of the coil 14 may be conveniently connected thereto.

The arrangement of terminal posts and corridors illustrated in FIG. 1 is particularly compatible with automatic coil winding machines. For example, an automatic winding operation starts by spinning several turns of wire around a starting terminal as illustrated by the inner lead 15 shown wrapped around the terminal 46 in FIG. 3.

When several turns of wire have been spun on the starting terminal, the coil winding machine proceeds to lay up a number of turns in the winding space 18. The winding operation ceases when the coil winding machine spins off several turns of wire on the stopping terminal as illustrated by the outer lead 16 shown wrapped around the terminal 44 in FIG. 3.

When starting and stopping, the inner lead 15 and the outer lead 16 pass through the corridors 27 and 21, respectively. As a result, each lead is insulated electrically from the intermediate windings of the coil 14 and insulation breakdowns will not occur.

While the arrangement described provides a two-terminal coil, other arrangements are possible. For example, the combination of the terminal 45 with the corridors 23 and 25 shown in FIG. 1 can be utilized to obtain an intermediate tap on the coil 14. The intermediate tap, furthermore, can readily be made without interrupting the winding cycle of the coil winding machine.

For example, instead of ending on the terminal 44, the coil winding machine is arranged to end temporarily on the terminal 45. However, instead of stopping, the coil winding machine proceeds as if the terminal 46 were the start terminal, and goes on to complete the winding operation on the terminal 44. Accordingly, when the operation is complete, an intermediate tap is formed by the intermediate leads 17 threaded through the corridors or slots 23 and 25 and wound on the terminal 45.

From FIG. 3 it will be noted that a portion of the corridors 21 and 27 are cut into the end flange 12 to a depth below the surface of the winding member 14 so that either the inner lead 15 or the outer lead 16 can remain within the end flange 12 for the longest possible distance.

The described arrangements eliminate additional steps heretofore required for attaching coil leads to terminals. Moreover, each of the lead-out wires is insulated from other windings in the coil and protection against voltage breakdown is provided.

In addition to the foregoing, the arrangements of the corridors and the terminals also permits the terminals to be retracted below the periphery 20. As a result, the terminals are protected and the amount of mounting space required for the bobbin is reduced.

As shown by the phantom view in FIG. 1, the terminal 45 can be bent back into the corridor 24. Moreover, the terminal 44 can be bent back into the corridor 22, and the terminal 46 can be bent back into the corridor 26 in a similar manner.

As can be seen from the phantom view in FIG. 2, when the portion 48 of the terminal 45 is bent back to a position adjacent to the inner guide member 41, the end thereof will retract below the surface of periphery 20 out of harm's way.

When the terminals are bent into the corridors, slack automatically occurs in the leads attached thereto. For example, when the terminals 44, 45, and 46 are bent into adjacent corridors, the inner lead 15, the intermediate lead 17, and the outer lead 16, respectively, are moved towards the winding member 11. Accordingly, slack is introduced into each lead wire. As a result, untimely failure of the lead wires due to tension and vibration fatigue is eliminated.

FIG. 4 illustrates another embodiment of this inven-

tion wherein five terminals 50, 51, 52, 53, and 54 are embedded in a support or end flange 55. Corridors or slots 56, 57, 58, 59, and 60 for accepting the terminals and leads associated therewith are channeled in the end flange 55. Each corridor or slot includes an end or portion for accepting part of a terminal, an end or portion for communicating with a winding space 18, and two side parts or portions. Both side portions on the inside corridors 57, 58, and 59 and one of the side portions on each corridor 56 and 60 provide means of communication between adjacent corridors while the remaining portions on each corridor 56 and 60 provide access to the winding space 18.

In the embodiment shown in FIG. 4, the corridors or slots are defined by rectangularly shaped projections and guide members. While not essential, a rectangular shape for the projections is particularly suitable to molding procedures. The slots or corridors, however, function in a manner similar to the earlier described embodiment shown in FIGS. 1, 2, and 3.

Accordingly, there has been disclosed herein a new and novel bobbin wherein corridors channeled in the end flange thereof cooperate first to protect terminal posts embedded in the bobbin from external harm, and second, to insulate leads interconnecting the terminal posts and a coil wound on the bobbin. In so cooperating, moreover, the corridors also allow the lead-in wires to be slacked. As a result, a major cause of lead failure is eliminated.

It is to be understood that the embodiments disclosed herein are illustrative of the principles of the invention only. Numerous other modifications of its structure may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A bobbin comprising:

a winding member;

a winding space surrounding said winding member;

a support extending outwardly from said winding member, said support including an outer surface, an inner surface separating said support from said winding space, and a periphery interconnecting said outer and inner surfaces;

terminal means embedded in said support with a first portion protruding through said outer surface and a second portion protruding through said periphery; and

a plurality of individual spaces cut in the periphery of said support, said spaces being disposed side by side and each having a portion occupied by the second portion of a terminal, another portion extending through said inner surface to said winding space, and another portion opening into a counterpart portion of an adjacent space.

2. A bobbin in accordance with claim 1 wherein the first portion of said terminal means includes one leg of an L-shaped terminal and the second portion of said terminal means includes the other leg of said L-shaped terminal.

3. A bobbin comprising:

a winding member;

a winding space surrounding said winding member;

an end flange extending outwardly from said winding member, said end flange including an outer surface, an inner surface separating said end flange from said winding space, and a periphery interconnecting said inner and outer surfaces;

a plurality of terminals embedded in said end flange, each with a first portion protruding through said outer surface and a second portion protruding through said periphery; and

a plurality of adjacent slots channeled in said periphery, each slot including a portion containing one of said terminals, a portion for communicating with an adjacent slot, and a first portion for communicating with said winding space through said inner surface.

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4. A bobbin in accordance with claim 3 wherein two of said slots each include a ramp for communicating with said winding space through said inner surface.

5. A bobbin in accordance with claim 1 wherein said spaces are divided into an inner set and an outer set, each space in said inner set having four projections arranged to form a cross and each space in said outer set having three projections disposed in a manner similar to the disposition of the projections on said spaces in said inner set and a projection extending to said winding space.

6. A bobbin comprising:

a winding member;

a winding space surrounding said winding member;

a support extending outwardly from said winding member, said support including an outer surface, an inner surface separating said support from said winding space, and a periphery interconnecting said outer and inner surfaces;

terminal means embedded in said support with a first portion protruding through said outer surface and a second portion protruding through said periphery; and

a plurality of first and second spaces cut into said periphery, said first spaces being disposed side by side with one end occupied by the second portion of a terminal and the other end extending through said inner surface to said winding space, and said second spaces being disposed in said periphery diagonally

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with respect to said first spaces, each of said second spaces having one end engaging said winding space and one end occupied by the second portion of a terminal.

7. A bobbin in accordance with claim 6 wherein at least two of said second spaces extend from one first space to another first space.

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