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[54] REACTOR COIL FORM

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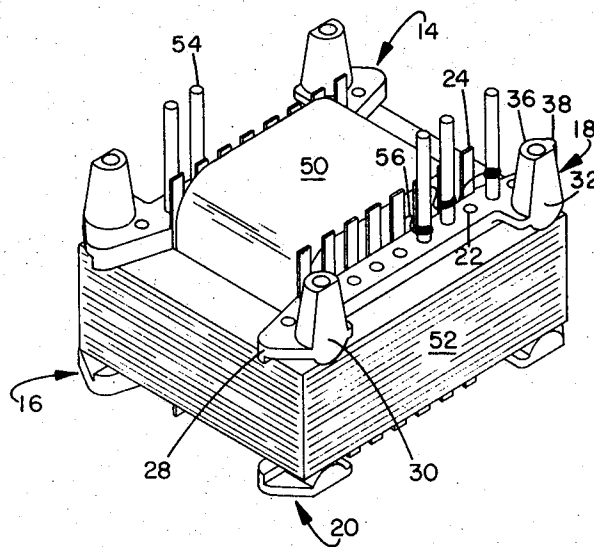
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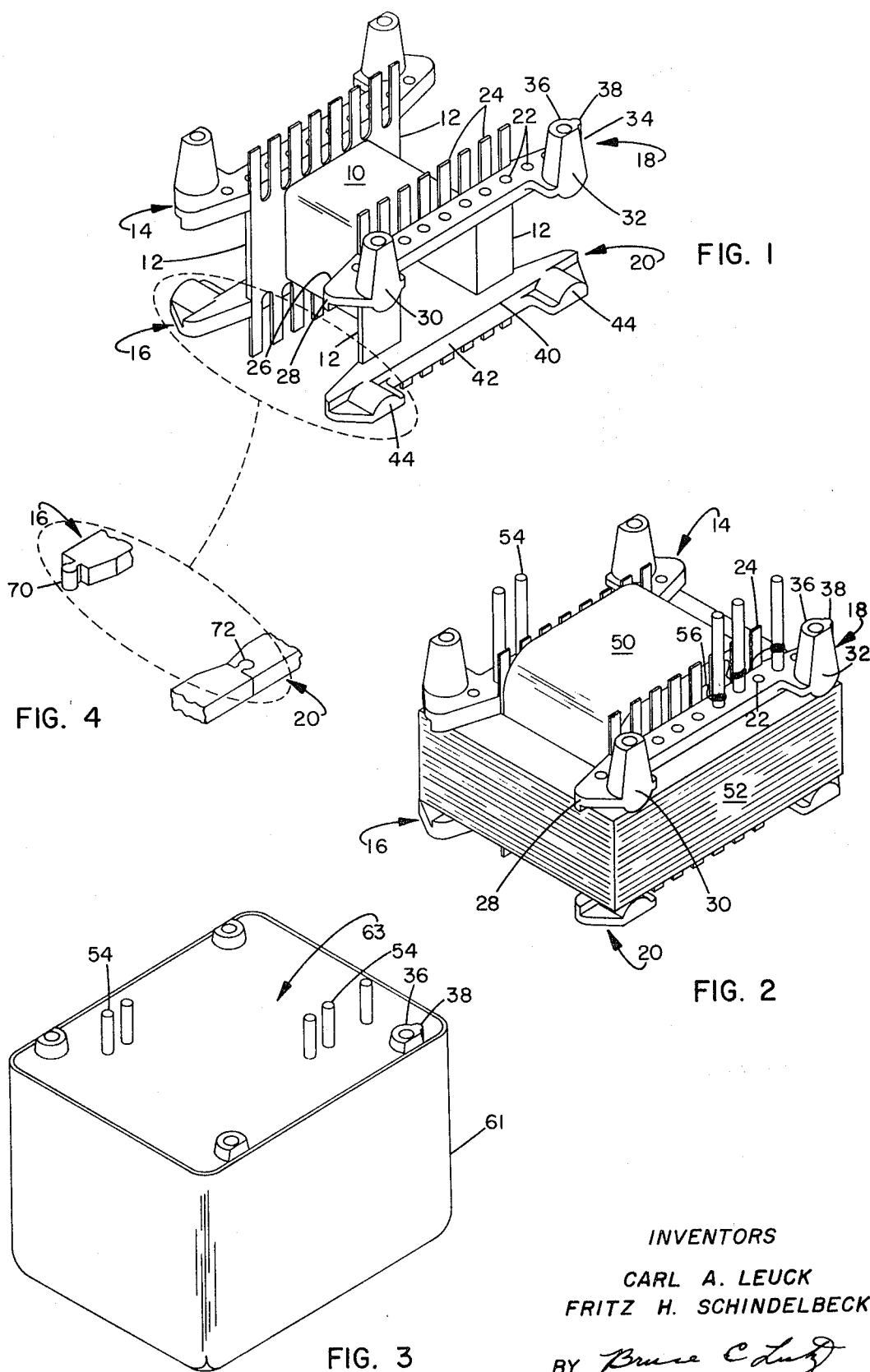
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ABSTRACT

A reactor coil form or bobbin comprising shelves for holding magnetic laminations in place and structured to additionally space the reactor from a potting container. The shelves include irregularities to produce better bonding of the potting compound to the shelves and the magnetic laminations. Further, the coil form includes integral stand-off and mounting projections for positioning and holding a potted reactor to and slightly off a mounting base.

7 Claims, 4 Drawing Figures





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REACTOR COIL FORM

THE INVENTION

The present invention is directed generally towards reactors and more specifically towards a reactor coil form.

The prior art relative to reactors and especially potted reactors is quite copious. However, potted reactors are neither cheap nor easy to produce. The coil form which is the subject matter of the present invention combines various features in a single unit which greatly facilitate the manufacture of a potted reactor.

It is therefore an object of the present invention to provide improved reactor coil forms.

Other objects and advantages of this invention may be ascertained from a reading of the specification and appended claims in conjunction with the drawings wherein:

FIG. 1 is an isometric view of an empty reactor coil form;

FIG. 2 is an isometric view of a coil form having a winding situated thereupon and having magnetic laminations inserted therein;

FIG. 3 is an isometric view of a containerized potted reactor; and

FIG. 4 is a view of a portion of another embodiment of the coil form of FIG. 1.

The reactor coil form of FIG. 1 has a central four-sided tubular or conduit portion 10. Extending from the ends of the center portion 10 are flanges 12. Attached to the flanges 12 and the central portion 10 are a plurality of shelves as 14, 16, 18, and 20. Each of these shelves contains holes or cavities generally designated as 22 and teeth or combs 24. Referring specifically to shelf 18 it will be noted that there is a portion designated as 26 which is sloped inwardly from the edge of the shelf toward the central portion 10. The edge 26 facilitates automatic winding of the coil form by reducing the possibility of the wire which is being wound, catching on the shelf. The shelf also has extremities 28 and 30 at one end with similar extremities 32 and 34 at the other end. The extremities 28-34 provide environmental protection for magnetic core means inserted in the coil form. The remaining shelves are shaped in a similar manner. On each end of shelves 14 and 18 are stand-offs or mounting posts. One of these posts is designated as 36. Each of these posts has internal self-locking threads, and it will be noted that post 36 is configured differently from the remaining posts in that there is a small orientation tab 38. The tab 38 is used for identification and orientation of the reactor when the entire unit has been potted or otherwise hermetically sealed. Referring now to the lower shelf 20 it will be noted that the upper surface of the shelf has an edge 40 which is not perpendicular with the lower surface of shelf 20. As may be observed, edge 40 is closer to central portion 10 and results in a sloped surface 42 between the lower and upper surfaces of the shelf 20. Each of the remaining shelves also has a sloped portion similar to portion 42 wherein the shelf slopes inwardly from the outer surface thereof toward the interior surface and the tubular portion 10. Shelf 20 also illustrates a pair of spherical protrusions or bumps 44. These bumps 44 appear in a corresponding position on the remaining shelves although only visible elsewhere on shelves 16 and 18.

Referring now to FIG. 2 it will be noted that the reactor coil form is almost completely enclosed. The shelves 18 and 14 are still visible as well as protrusions from shelves 16 and 20. Around the central portion 10 is wrapped a winding 50 and magnetic core laminations in the form of an E core 52 enclose the winding 50. The central leg of the E core laminations are positioned in the center of the reactor coil form and of the winding 50 while the outer legs of the E core laminations are adjacent the winding itself. However, the flanges 12 extend beyond the edge of winding 50 and prevent the contact of the magnetic laminations with the winding 50. As shown, some of the holes 22 now contain pins or electrical terminals generally designated as 54. The pins 54 accommodate soldered or otherwise attached wires 56 which are part of winding 50. The

terminals 54 may be merely straight pieces of circular wire which are cut to length and inserted in a friction or force fit in the holes 22 or other shape pins suitable for wire wrap or similar termination. It will be further noted that the extremities of the shelves project beyond the magnetic core 52 in all directions.

Referring now to FIG. 3 it will be noted that very little is visible of the reactor as shown in FIG. 2. The reactor has been inserted in a container 61 which has been filled with a potting or hermetic sealing compound generally designated as 63. Protruding from the potting compound 63 are the terminals 54 and the various posts including the post 36 with its identifying projection 38. As will be noted, each of the posts extends beyond the upper edge of the container 61 and the potting compound 63. Further, each of the posts includes an internal thread.

The prior art utilized attachment means connected to the container 61. Normally the mounting, connection or attachment means were not purchased as an integral part of the container 61. Thus, excessive expense occurred as to obtaining accurate registration of the mounting means from one reactor unit to the next. Since the posts such as 36 are molded as an integral part of the coil form, the registration of the posts will always be maintained identical as long as the same mold is used to produce the coil form.

FIG. 4 illustrates a modified arrangement for the shelves wherein it is desired to have two windings around the outer legs of a magnetic means such as "C" or "U" core rather than a single winding around the central portion of the E core. This figure illustrates the modified ends of the shelves 16 and 20 wherein shelf 16 would have an interlocking type male projection 70 while shelf 20 would have a receiving or female portion 72 to interlock with a projection identical to projection 70. In this manner the two reactor coil forms for use with the end legs of the magnetic core may be identical and may interlock to prevent separation of the coil forms to control pin and mounting post locations and still permit insertion of the magnetic laminations.

Since the winding of a reactor coil form is well known to those skilled in the art the procedure for winding same will not be pursued.

It will be realized by those skilled in the art that there is a tendency for the magnetic laminations to displace themselves or fall away from the reactor coil form after the magnetic laminations have been inserted in a reactor coil form and before the reactor is potted. This has been prevented in the prior art by gluing the laminations or using some type of strapping material to maintain their relative position. The shelves of the present coil form are utilized to prevent the movement of the magnetic laminations after insertion thereof. The bumps 44 provide the contact with the magnetic laminations while the removal of material from the shelf to form the sloped edge 42 produces a large contact surface for the potting material 63 to allow entry of the potting material between the shelves of the coil form and the magnetic laminations. The entry of such potting material is essential to prevent fracture of the potting material which may result in warpage of the coil form relative to the laminations and the winding when the reactor is temperature cycled.

It will be realized that the various portions of the potted reactor unit as shown in FIG. 3 will have different temperature coefficients of expansion. During temperature cycling the shelves may, in some instances, tend to move with respect to the core 52 if there is not sufficient bonding force to resist such movement. By supplying the bumps 44 and indenting the edges of the shelves except at the corners of the reactor, there is a large amount of surface area for the potting compound to coact with on both the shelf and the magnetic core 52. This large amount of surface area provides sufficient surface area for bonding with the potting material which will be adequate to prevent buckling or movement of the shelves with respect to the core 52. Such buckling may in some instances impair the electrical connections of the unit and/or disfigure the container 61.

As is known, the normal or most popular method of potting a reactor involves completing the reactor connections within its potting container before filling the container with potting material. The present invention, since the reactor may be previously electrically completed, allows filling the container 61 with a measured amount of the potting compound and then inserting the reactor of FIG. 2 into the filled container. The reactor displaces the potting material to the desired filled level of the container 61.

The utilization of holes 22 in the shelf allows the use of a cheap material such as wire for the terminals of the reactor. These terminals 54 are friction fitted into the holes, and wires from the reactor winding are connected directly to the terminals 54. These wires may be brought out from the winding directly through the indentations provided at the combs 24 so that a connection may be made immediately instead of waiting until the entire reactor is wound. The combs 24 provide separation for the various wires to prevent accidental contact between said wires. The indentations allow the spacing of the wires from the rest of the reactor winding without the use of other insulation. When the lead 56 is wrapped around the wires or terminals 54, there is a protrusion, whether or not the wire is soldered, which in addition to the friction fitting of the wire prevents the removal of terminals 54 after the potting compound 63 is hardened in the container 61.

As will be noted from FIG. 3, if there were no identifying protrusion such as 38 and if the terminals 54 were identical in placement and position, there would be no way of identifying the input and output terminals on a finished device as shown in FIG. 3. However, the utilization of a special marking on one of the reactor coil form posts, such as 36, provides instant reference with which to identify the various terminals in a clock-wise or counter clock-wise direction. As will be further noted, the post 36 protrudes from the container 61 and the potting compound 63 such that this post may be utilized as both the mounting means by which the unit can be connected to a mounting surface and as the spacer so that the transformer does not physically contact the mounting surface to short out some of the connections, or preclude cleaning.

In the prior art the container 61 was normally tapped or other screw means were utilized to provide a connection to a mounting base. Thus, many separate components were required including spacers and means for preventing the potting compound from escaping through the holes made in providing the mounting means. Since the present invention utilizes the reactor coil form itself for spacing the core from the normally conductive container 61 and additionally provides accurately registered mounting means, stand-off means, and terminal identification as well as providing a simple method of holding the magnetic laminations in place once assembled and enabling the use of inexpensive terminals, it may be appreciated that the manufacturing difficulties in producing a finished potted reactor are greatly reduced.

We wish to be restricted not by the embodiment disclosed but only by the scope of the invention as claimed in the appended claims.

We claim:

1. Integral reactor coil form means for use with an electrical winding means and magnetic core means comprising, in combination:

a rectangular conduit means including first, second, third,

and fourth sides each having first and second ends and each having interior and exterior portions; flanges perpendicular to said first and third sides at said first and second ends thereof; and

shelves extending outwardly from said conduit means parallel to said second and fourth sides at the first and second ends of each of said second and fourth sides, said shelves further extending outwardly at the ends thereof in a direction parallel with the axis of the conduit means further than at the more centrally located portions of said shelves, said shelves being further structured to include spherical contact means on the interior portion thereof for providing contact with inserted magnetic core means and said shelves being further structured so that the more centrally located edges thereof slope inward from the exterior portion to the interior portion, whereby magnetic core means inserted into the interior portion of said coil form are held in place by said spherical contact means of said shelf means and wherein said flange means prevents contact of the magnetic core means with electrical winding means on the exterior portion of said conduit means.

2. Apparatus as claimed in claim 1 wherein said shelves additionally comprise internally threaded mounting posts on the shelves attached to said second side, said posts being perpendicular to the plane of said shelves.

3. A reactor means including the apparatus of claim 1 and comprising in addition for receiving electrical terminal means; winding means wound on said conduit means; and magnetic core means inserted in said conduit means and between said shelves whereby said spherical contact means of said shelves hold said magnetic means in place and said shelves extend in all directions beyond said magnetic means for protection of said magnetic means for environmental contacts and wherein said flanges protect said winding means from contact with said magnetic means.

4. Apparatus as claimed in claim 3 wherein at least one of said shelves include friction fitted terminals inserted in the cavities thereof for connection to input and output leads of said reactor winding.

5. Apparatus as claimed in claim 3 wherein said shelves include further flanges in the form of teeth to separate wires leading to said winding and to prevent spreading of the winding as it is placed on said reactor coil form and additionally including straight wire terminals inserted in the cavities of said shelf means for connection to said winding leads.

6. Hermetically sealed reactor means including the apparatus of claim 5 and comprising in addition: environmental protective container means enclosing said reactor means;

hermetic sealing compound situated in said container means and substantially enclosing said reactor means; internally threaded mounting posts forming an integral part of the shelves of said form and electric terminals extending from said shelves and both said posts and said terminals protruding from said hermetic sealing compound.

7. Apparatus as claimed in claim 6 wherein said posts also extend beyond the confines of said container means and wherein one of said posts includes orientation means for identification of the electric terminals.

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