United States Patent

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[54] **NONMETALLIC CORROSION-RESISTANT ENCLOSURE FOR ELECTRICAL APPARATUS**
6 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **336/90,** 174/50, 220/67, 336/92
[51] **Int. Cl.** **H01f 27/02**
[50] **Field of Search** ..... 336/90, 92, 94; 174/17 R, 17 LF, 50, 52 R; 220/85 TC, 67, 80

[56] **References Cited**

UNITED STATES PATENTS

2,366,290	1/1945	Rudd	174/15 R X
2,816,947	12/1957	Leightner et al.	336/90 X
3,385,470	5/1968	Dorosz et al.	220/67
3,406,891	10/1968	Buchner et al.	220/67 X
3,434,644	3/1969	Collie	220/67 X
3,504,319	3/1970	Leonard	336/92 X
3,511,515	5/1970	Cline et al.	220/67 X

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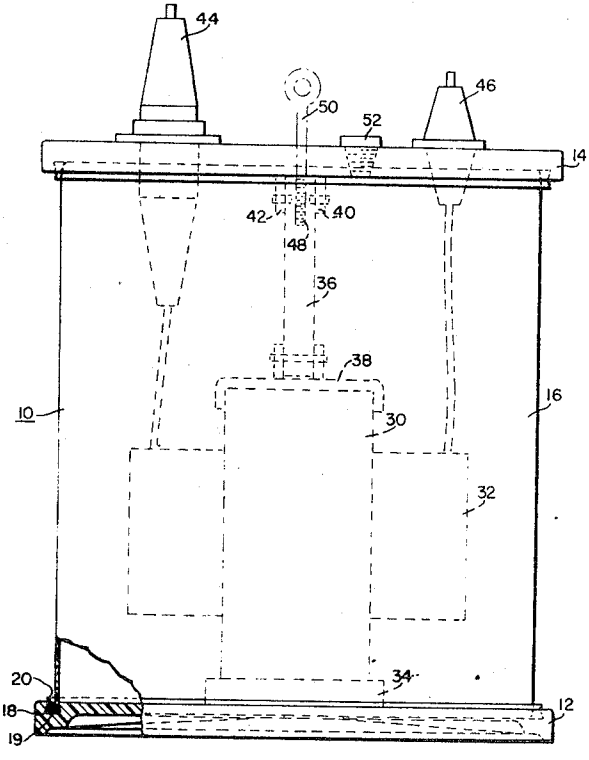
ABSTRACT: A nonmetallic corrosion-resistant enclosure for electrical apparatus comprising an outer housing or casing made from rubber or plastic material which will not deteriorate or corrode and develop leaks when exposed for an extensive period of time in a high moisture content environment.



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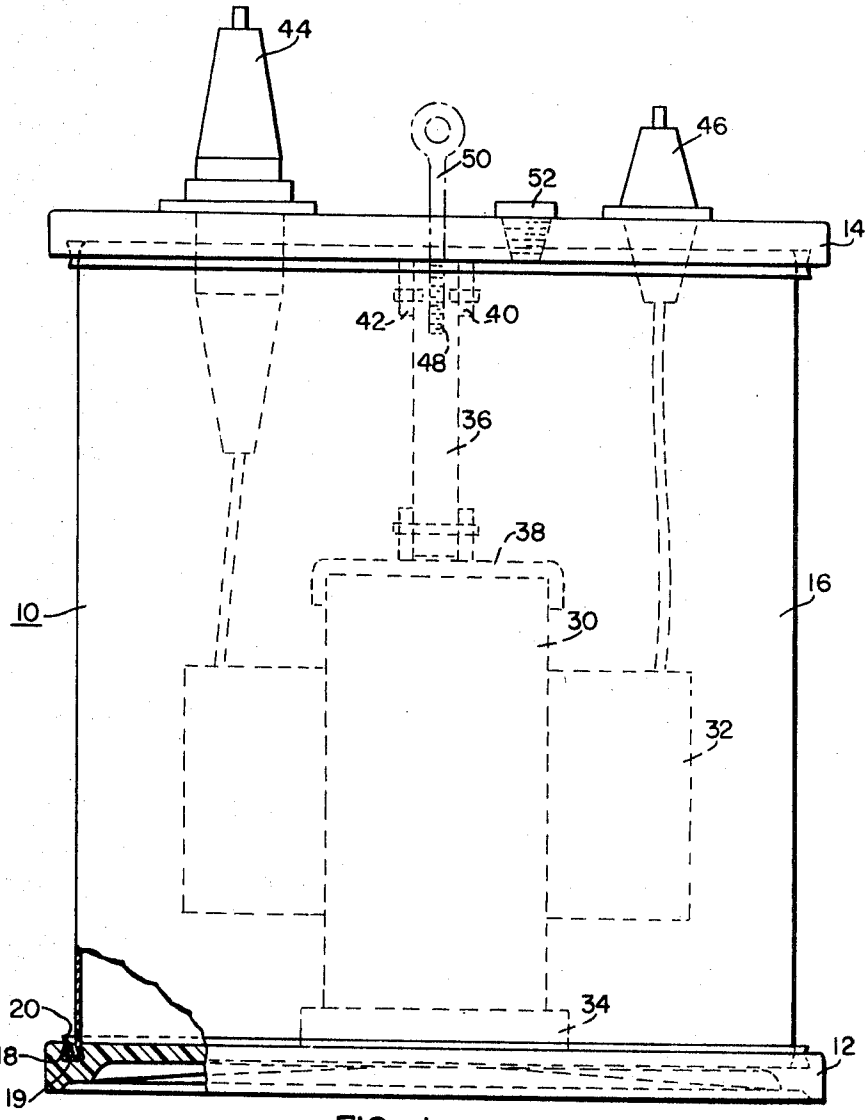

FIG. 1

WITNESSES

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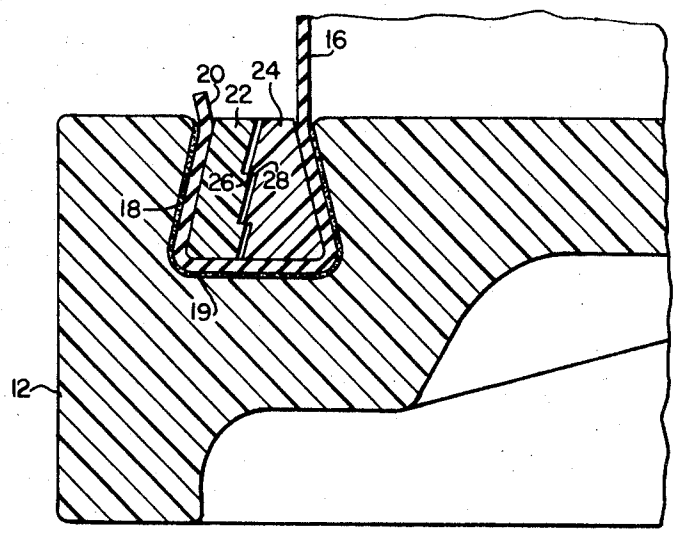
16
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FIG. 3

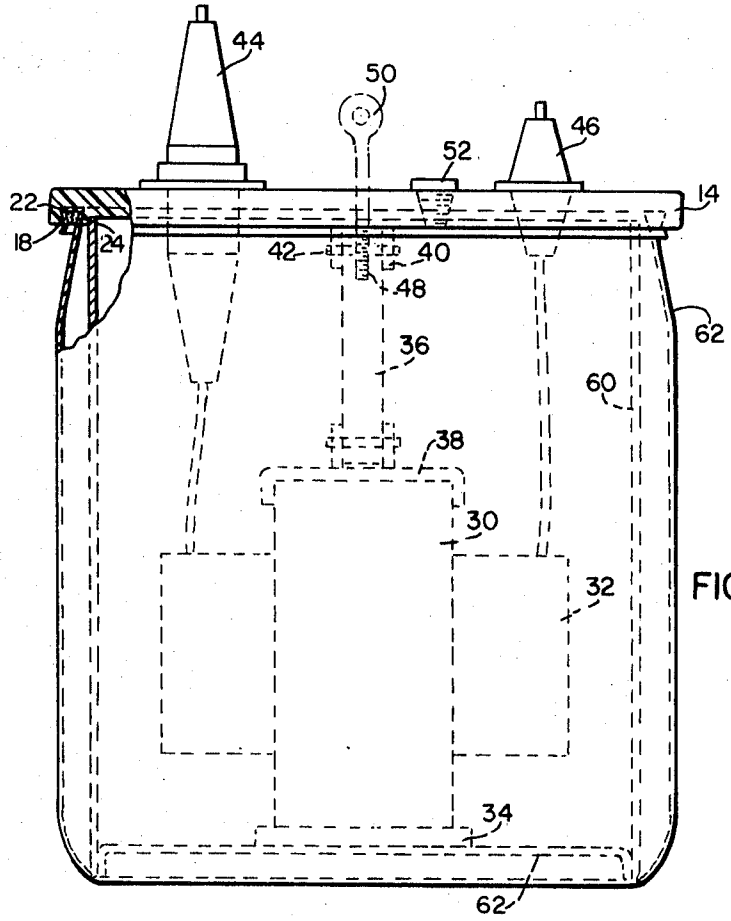
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FIG. 2

NONMETALLIC CORROSION-RESISTANT ENCLOSURE FOR ELECTRICAL APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to nonmetallic corrosion-resistant enclosures for electrical apparatus and more particularly to housings or casings for distribution transformers installed in locations where the environment has a high moisture content.

2. Description of Prior Art

In the prior art it has been the practice to provide metallic housings or casings for transformer apparatus. These casings or housings are very satisfactory when the apparatus is located in an area where the environment atmosphere has a low moisture content. However, the present trend is to install transformers underground or partially buried. This practice introduces problems, since in practically all underground or partially buried installations the surrounding atmosphere has a high moisture content. This moisture causes the metallic housing or casing to corrode. This corrosion often develops leaks in the casing or housing. Once a leak develops in the casing or housing the fluid coolant is lost and the transformer becomes overheated or develops a short circuit and destroys its usefulness as a transformer. This invention overcomes the objection to the prior art metallic housing or casing by providing a nonmetallic housing or casing which is highly resistant to corrosion or other effects of moisture. The housing or casing of the present invention is made completely of insulating corrosion-resistant material, such as a plastic, for example epoxy, polyvinyl chloride, rubber, or other suitable plastic material. The housing or casing of the present invention will not corrode due to moisture and develop leaks.

SUMMARY OF THE INVENTION

This invention provides a nonmetallic corrosion-resistant housing or casing for electrical apparatus. The casing comprises cast or molded bottom and top members. The bottom and top members are cast or molded from a suitable resin, such as filled epoxy, or any other castable or moldable insulating material. A body portion connects to the bottom and top members to provide a container or housing. This body portion also comprises insulation material, such as epoxy, polyvinyl chloride, rubber, or other insulating material. The body portion is attached to the bottom and top members by means of dovetail slots having slanting sides. The dovetail slots receive the top and bottom of the body member and locking rings snap into the dovetail slots to firmly hold the bottom and top of the body member in the dovetail slots in the bottom and top members. The bottom edge and top edge of the body members are cemented in the dovetail slots with a suitable adhesive, such as epoxy or rubber cement, to provide a fluidtight connection to the bottom and top members prior to snapping the locking rings in place in the dovetail slots. The locking rings are made of plastic material, such as nylon, or other suitable thermoplastic material. The core-and-coil assembly of the transformer rests on the bottom member. A rigid post is connected to the core-and-coil assembly. This rigid post is connected to and supports the top member. This rigid support, provided by the core-coil assembly and the rigid post, maintains proper spacing between the bottom member and the top member and prevents the body member from collapsing or otherwise deforming. Bushings for bringing the necessary conductors into the casing or housing are mounted on the top member. A hole for receiving an eyebolt for lifting the transformer is provided through the top member and extends into the rigid post. This hole is normally closed with an insulating plug which is removed for insertion of the eyebolt when it becomes necessary to lift the apparatus. A fill plug is provided in the top member for filling the casing or housing with the required fluid cooling medium.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of one embodiment of a casing or housing provided by this invention;

FIG. 2 is a side elevational view of a second embodiment; and

FIG. 3 is a detail of the dovetail joint and locking rings for connecting the body portion of the housing or casing to the bottom and top portions.

DESCRIPTION OF PREFERRED EMBODIMENTS

Throughout the description which follows, like reference characters refer to like parts on each of the various figures of the drawing.

Referring specifically to the drawings, FIG. 1 illustrates a side elevation view of one embodiment of a casing or housing **10** as provided by this invention. The casing or housing **10** comprises a bottom member **12**, a top member **14** and a body member **16** connected between the bottom member **12** and the top member **14**. The members **12** and **14** are cast or molded from nonmetallic insulating material such as filled epoxy resin, polyvinyl chloride, or any other suitable nonmetallic material that can be readily cast or molded. The body member **16** extends between the bottom member **12** and the top member **14** and is attached to the bottom member **12** and the top member **14** with a fluidtight and mechanically strong connection. The embodiment of the casing or housing **10** shown in FIG. 1 has a round cross section, however, it is understood that the cross section of the housing or casing **10** may have any convenient configuration such as elliptical, round, square, or rectangular.

The bottom member **12** and the top member **14** are circular in shape and they each example, the a dovetail groove **18** formed therein. The body member **16** is made of nonmetallic electrical insulating material such as epoxy, polyvinyl chloride, rubber or the like. The body member **16** may be made of rigid self-supporting material or flexible sheet material. The body member **16** is attached to the bottom member **12** and the top member **14** by folding the ends of the body member **16** as indicated at **20** and sealing the ends of the body member to the inside of the dovetail grooves **18** by means of a good cement **19** which will provide a fluidtight seal. For example, the cement **19** may be epoxy sealant or room temperature vulcanizing rubber. This cement **19** seals the edges of the body member **16** to the inside of the dovetail grooves **18** to form a fluidtight joint between the body member **16** and the bottom and top members **12** and **14**. After the edges **20** of the upper end and the lower end of the body member **16** have been sealed to the inside of the dovetail grooves **18** to provide a fluidtight seal, a pair of lockrings **22** and **24** are forced into the dovetail grooves **18** to provide a strong mechanical connection between the body member **16** and the bottom member **12** and the top member **14**.

The sealing rings **22** and **24** may be made of nylon or some other suitable resilient thermoplastic material. The ring **22** is first placed in position and then the ring **24** is forced in position as shown more clearly in the detail in FIG. **3**. Because of the slanted sides of the dovetail slots **18**, when the ring **24** is forced into position, projections **26** on the outer ring **22** mate with projections **28** on the inner ring **24** to form a single interlocked ring which is tight and cannot be removed once the inner ring **24** has been forced into place. Any tendency to remove the rings **22** and **24** will force the material of the body member **16** tightly against the inclined sides of the dovetail slots **18** and provides a tight seal. The epoxy or room-temperature-vulcanizable rubber which is used to seal the edges of the body member **10** in the dovetail grooves **18** of the end members **12** and **14** provides a fluidtight seal between the body member **16** and the bottom member **12** and the top member **14**, and the snap-in rings **22** and **24** provide mechanical strength for the joint between the body member **16** and the bottom member **12** and the top member **14**. In some assem-

blies, a liquid thermosetting resin or a puttylike thermosetting resin may be substituted for the locking rings 22 and 24 to provide mechanical strength for the joint.

In the embodiment shown in FIG. 1, a distribution transformer comprising a core 30 and a coil 32 is shown positioned in the housing or casing 10. The core-coil assembly comprising the core 30 and the coil 32 rests on a pad 34 positioned on the bottom member 12 of the casing or housing 10. A rigid support or rod member 36 is attached to the top of the core 30 by means of a clamp 38. This clamp 38 may be permanently attached to the core 30 by pressure, tack welding or any other suitable means. The upper end of the rigid rod or support member 36 is attached to the underside of the top member 14 by means of a flange 40 and a pin 42. The rigid support 36 is strong enough to freely support the top member 14 from the core 30. High-voltage bushings 44 and low-voltage bushings 46, for bringing leads into the housing or casing 10 to connect to the coil 32, are supported on the top member 14. A threaded hole 48 is provided through the top member and extends into the rigid post or support rod 36 for insertion of an eyebolt 50 for lifting the transformer. Normally, the eyebolt will be removed and the threaded hole 48 closed with an insulating plug and the plug will be removed when it is desired to insert the eyebolt 50 for lifting the transformer. A fill hole which is normally closed by an insulating plug 52 is provided in the top member 14 for filling the transformer with liquid dielectric.

From the foregoing description, it is seen that the embodiment of FIG. 1 has provided a nonmetallic casing or housing for a distribution transformer wherein there are no metallic parts exposed to ambient atmosphere on the outside of the casing. The core-and-coil assembly is supported on the bottom member 12 of the housing 10, and the top member 14 and all of the associated bushings and other hardware mounted on the top member 14 are supported from the core by means of a rigid post or support 36 connected between the core 30 and the top member 14 of the casing or housing 10.

FIG. 2 shows s5apin second embodiment of a nonmetallic casing or housing for transformer apparatus wherein all of the parts exposed to ambient atmosphere are made of nonmetallic material. The embodiment of FIG. 2 comprises a top member 14 similar to that disclosed for FIG. 1. However, in FIG. 2 a metallic casing comprising sides 60 and a bottom member 62 is attached to the nonmetallic top member 14. In addition to the inner housing or container comprising the metallic sides 60 and the metallic bottom 62, the inner container is surrounded by an outer container 62. The outer container 62 is made from some plastic material such as epoxy, polyvinyl chloride, rubber or other suitable plastic material. The top member 14 of this embodiment is also provided with a dovetail slot 18. The upper edge of the nonmetallic housing member 62 is fastened in the groove 18 by means of an adhesive and a pair of snap-in rings 22 and 24 in a manner similar to that described for the embodiment of FIG. 1. This connection provides a fluidtight and mechanically strong connection between the top member 14 and the outer nonmetallic housing 62. The embodiment of FIG. 2 in all other respects is identical to that described hereinbefore for FIG. 1. However, it is stated hereinbefore that the inner housing comprising a body member 60 having a bottom 62 is made of metal, it is understood that this body member may also be made of filament-wound glass-epoxy or any other suitable resinous material. In the embodiment of FIG. 2 the cross section of the housing or container is round; however, as specified for FIG. 1, the cross section may assume any desired shape.

FIG. 2 is an enlarged detail illustrating the dovetail slots 18, with the edge 20 of the body member 16 sealed to the inside of the slanted sides of the dovetail slots 18 with a good sealant 19, such as epoxy, room-temperature-volcanizing rubber. The snap-in rings 22 and 24 are shown in place to provide mechanical strength to the joint between the body portion 16 of the container and the end members 12 and 14 of the container or housing.

From the foregoing description taken in connection with the drawings, it is seen that this invention has provided a nonmetallic, corrosive-resistant, housing or casing for a distribution transformer which may be installed in an environment where the atmosphere contains a large quantity of moisture or other agents which would cause corrosion of metals. Since the entire exposed surface of the tank or casing provided by this invention is made of nonmetallic corrosive-resistant resinous materials, the housing or casing will resist deterioration because of the moisture better than the metallic tanks used in the prior art, and will cause less trouble and outages due to corrosion of the housings or casings for transformers installed in areas which would normally subject the metallic prior art housing or casing to rapid corrosion.

I claim as my invention:

1. A housing for electrical apparatus comprising a nonmetallic bottom member, a nonmetallic top member, a nonmetallic body member extending between said bottom member and said top ember and means providing a fluidtight and mechanically strong connection between said body member and said bottom member and between said top member and said body member to provide a fluidtight enclosure, said means for providing a connection between said body member and said top and bottom members comprises a dovetail slot having slanting sides in said bottom member and said top member with the edges of the bottom end of said body member sealed to the inside slanting walls of said dovetail slot in said bottom member with an adhesive and with the edges of the upper end of said body member sealed to the inside slanting walls of said dovetail slot in said top member, said adhesive providing a fluidtight seal between said bottom member and said body member and between said top member and said body member and means positioned in said dovetail slots in said bottom member and said top member to provide mechanical strength for the joints between said body member and said d bottom member and said top member.

2. The apparatus of claim 1 wherein said means positioned in said dovetail slots comprises a snapring means.

3. The apparatus of claim 2, wherein said snapring means comprises an inner ring having a slanted side corresponding to the slanted side of said dovetail slot and an outer ring having a slanted side corresponding to another slanted side of said dovetail slot.

4. The apparatus of claim 3 wherein said inner snapring and said outer snapring have interlocking projections.

5. The apparatus of claim 1 wherein said means position in said dovetail slots comprises thermosetting resin.

6. The housing as claimed in claim 1 having a core-and-coil assembly positioned therein with the core-and-coil assembly resting on said bottom member and a rigid support extending from said core and attached to said upper member to support said upper member in fixed relation with respect to said bottom member.