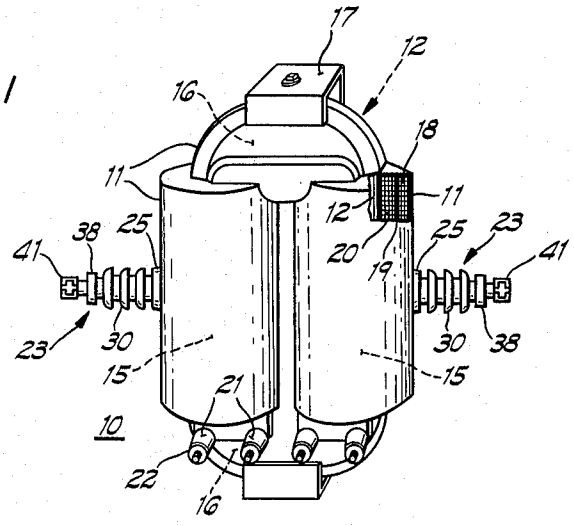
March 22, 1966 F. A. LEUTE 3,242,446

BUSHING CONSTRUCTION FOR ENCAPSULATED TRANSFORMERS

Filed July 3, 1963

Fig. 1



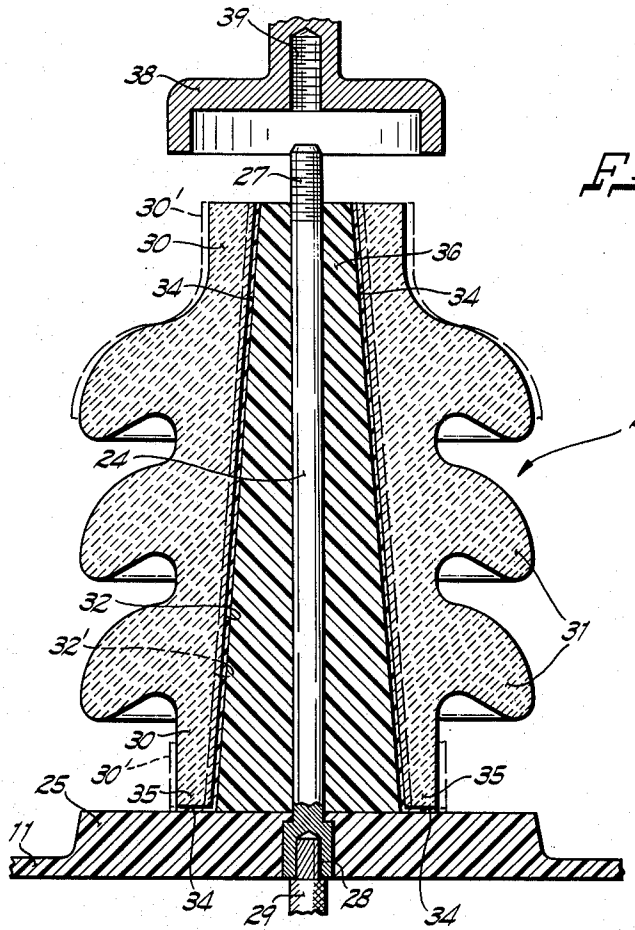


Fig. 2

INVENTOR.
Frank A. Leute
BY Lee W. Kaiser
Attorney

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BUSHING CONSTRUCTION FOR ENCAPSULATED TRANSFORMERS

Frank A. Leute, Zanesville, Ohio, assignor to McGraw-Edison Company, Milwaukee, Wis., a corporation of Delaware

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1 Claim. (Cl. 336—96)

This invention relates to encapsulated electrical transformers embedded in molded insulation.

Encapsulated electrical transformers are known wherein the transformer core and coil assembly is embedded in a resin jacket. Such encapsulated transformers may be constructed with integral projections which surround the conductors to the primary and secondary windings and accommodate terminal connections in a manner similar to insulating bushings on conventional transformers having metallic casings. Encapsulated transformers are often used outdoors, and such integral projections on the resin jacket do not provide maximum resistance to weather. Further, the surface resistivity and other electrical characteristics of such integral projections are not satisfactory, for very high voltage transformers, and such electrical characteristics deteriorate when the encapsulated transformer having said integral projections is continuously exposed to the weather. Encapsulated electrical transformers are also known having porcelain insulating bushings which are highly resistant to the weather and have anti-tracking, surface resistivity, and other electrical characteristics superior to those of the integral projections on the resin jacket. However, when a porcelain bushing on such an encapsulated transformer became cracked or broken during handling or use, it was heretofore sometimes necessary to scrap the entire transformer.

It is an object of the invention to provide an improved encapsulated transformer and a method of construction therefor which has porcelain insulating bushings that may be easily replaced if they are damaged.

This and other objects and advantages of the invention will be more readily apparent from the following detailed description when taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a view in perspective of an encapsulated electrical transformer embodying the invention with a portion broken away to illustrate the construction of the coils; and

FIG. 2 is a section view taken longitudinally through one of the primary insulating bushings of the transformer of FIG. 1.

Referring to the drawing, an encapsulated electrical distribution transformer **10** has a resin jacket **11** enclosing a transformer core and coil assembly which may include a closed magnetic core **12** having a pair of winding legs surrounded by cylindrical coils **15** and connected by upper and lower yokes **16**. A mounting bracket **17** for transformer **10** may engage the portions of resin jacket **11** surrounding the yokes **16**. Magnetic core **12** may be constructed of a plurality of magnetic ribbons of different widths to provide a cruciform cross section, and the coils **15** may be wound on the straight winding legs of the core **12** in a well-known manner. Each coil **15** may include a primary winding **18** separated by an insulating barrier **19** from a secondary winding **20** radially inward therefrom. Jacket **11** may be of a suitable thermosetting encapsulating epoxy resin material to which a suitable hardener is added, and the jacket **11** may be formed by placing the core and coil assembly in a mold and then introducing the epoxy resin in liquid state into the mold. A plurality of secondary insulating bushings **21** extend outward from the portion of jacket **11** surrounding lower yoke **16** and are provided with metallic secondary terminal means **22** extending through jacket **11** and electrically connected to the low voltage windings **20**. A pair of primary insulating bushings **23** constructed in accordance with the invention extend radially outward from portions of resin jacket **11** surrounding the coils **15**.

Each primary insulating bushing **23** includes a conductor rod **24** extending through a boss **25** on the exterior surface or resin jacket **11**. Conductor rod **24** is molded within jacket **11** and extends outwardly through boss **25**. Conductor rod **24** has external threads **27** on its outer end and an axial opening **28** in its inner end in which the conductor of a cable **29** electrically connected to the primary winding **18** may be swaged. A porcelain shroud **30** having a plurality of petticoats **31** thereon and a conical axial bore **32** surrounds conductor rod **24** and rests upon the radially outer generally flat surface of boss **25**. During construction, a coating **34** of a suitable release agent such as silicone grease which will not adhere to the epoxy resin material is coated on the internal surface of porcelain shroud **30** which defines the conical bore **32** and on the bottom surface **35** thereof which rests on boss **25**. After porcelain shroud **30** is placed over conductor rod **24**, a suitable epoxy resin material in liquid state is introduced into the conical bore **32** in porcelain shroud **30** and cured. During curing the resin within porcelain shroud **30** solidifies into a frustoconical mass, or projection **36** which adheres tenaciously to the surface of boss **25** but does not adhere to the coating of silicone grease **34**. A metallic terminal cap **38** having a tapped hole **39** therein is threaded on the end of conductor rod **24** and rigidly clamps porcelain shroud **30** against boss **25** on resin jacket **11**. Terminal cap **38** carries eyebolt connector means **41** for clamping a power line conductor (not shown).

If porcelain shroud **30** is cracked or otherwise damaged during handling, shipping, or use, the primary insulating bushing can be replaced without scrapping the entire encapsulated transformer as was sometimes required with prior art devices. Inasmuch as silicone grease coating **34** on the surfaces of porcelain shroud **30** defining the conical bore **32** and the bottom wall **35** does not adhere to the epoxy resin mass **36**, it is only necessary to unscrew terminal cap **38** from conductor rod **24** and lift off porcelain shroud **30** from the epoxy resin mass **36**. In order to install a new bushing, a porcelain shroud **30'** (partially shown in dotted lines) is provided having a conical bore **32'** (shown in dotted lines) slightly larger in diameter than bore **32**; the bore **32'** and the bottom wall of new porcelain shroud **30'** are coated with silicone grease **34**, the porcelain shroud **30'** is placed over conductor rod **24** and conical epoxy resin projection **36**; epoxy resin material in liquid state is introduced into the annular space between epoxy resin projection **36** and the conical bore **32'** in new porcelain shroud **30**; and the epoxy resin is cured. Terminal cap **38** is threaded on the end of conductor rod **24** to clamp porcelain shroud **30'** against boss **25**.

It will be appreciated that an encapsulated transformer embodying the invention has insulating bushings possessing the highly desirable weather resistant, anti-tracking, and high surface resistivity characteristics of porcelain and which may easily be replaced in the event the porcelain becomes cracked or damaged, thus obviating the necessity of scrapping the entire transformer as was required when a porcelain bushing of a prior art encapsulated transformer was damaged.

While only a single embodiment of the method and article of the invention has been illustrated and described, many modifications and variations thereof will be apparent to those skilled in the art, and consequently it is

intended in the appended claim to cover all such modifications and variations thereof which come within the true spirit and scope of the invention.

I claim:

In combination, a transformer core and coil assembly including a magnetic core linked by a winding, a resin jacket surrounding said core and coil assembly, a conductor rod embedded in and extending through said jacket and being electrically connected to said winding, a porcelain bushing having a conical bore therein disposed over said rod and against said jacket, a coating of a release agent on the surface of said bushing defining said conical bore and on the surface thereof disposed against said resin jacket, a cured resin mass filling said bore in surrounding relation to said rod and being adhered to said resin jacket, and a metallic terminal cap releasably engaging said rod and clamping said bushing against said jacket, whereby said porcelain bushing may easily be replaced if it is damaged.

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ROBERT K. SCHAEFER, *Primary Examiner.*

JOHN F. BURNS, *Examiner.*

T. J. KOZMA, *Assistant Examiner.*