

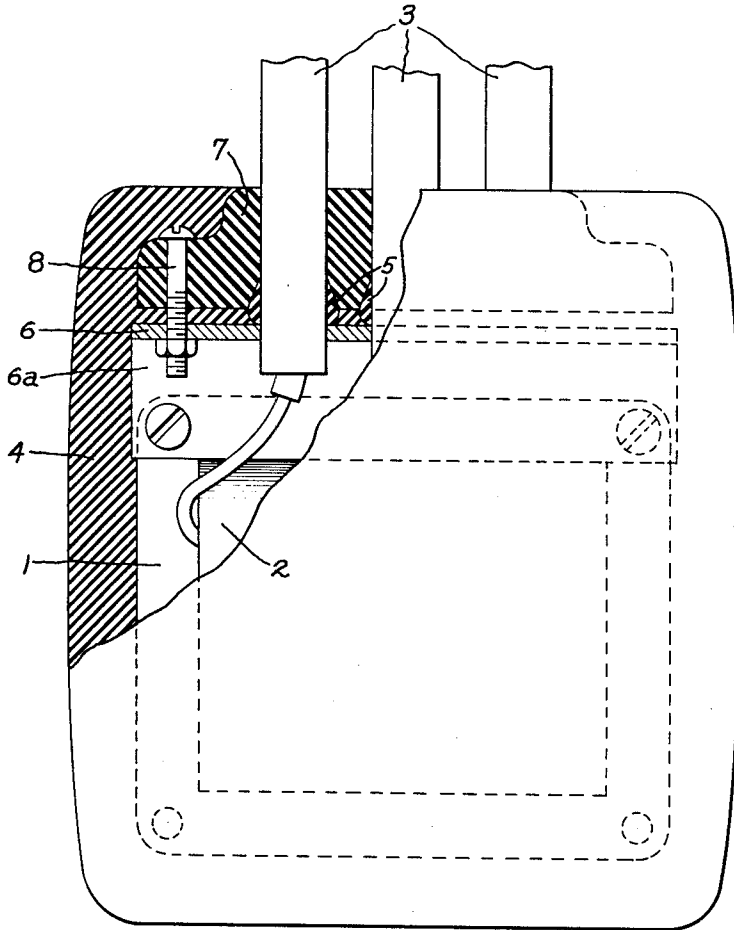
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ENCASED ELECTRICAL APPARATUS

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ENCASED ELECTRICAL APPARATUS

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My invention relates to encased electrical apparatus, and more particularly to static electric translating apparatus of the type comprising an electric translating device embedded in a fluid-impervious molded casing. My invention is particularly adapted for use with direct-burial type transformers of the kind used as insulating transformers in series lighting circuits, and the like. Direct burial of such transformers is particularly desirable in airport runway lighting circuits, and the like, where no poles or subterranean vaults are provided.

It has not been uncommon heretofore to encase electrical apparatus, and particularly transformers, ignition coils, and the like, in various insulating compounds by positioning the electrical device in an open-ended container and filling the container with an insulating composition. Various materials, such as asphaltic compositions, artificial rubbers, and various synthetic resins and polymerizable solventless varnishes have been used for this purpose. The ordinary practice with such devices is to leave the lead wires protruding from the open end of the molded casing, so that the lead wires provide an attractive, if not a proper, handle for lifting and carrying the device during shipping and installation. Such handling of the device by the lead wires places an undue strain upon these wires and upon the insulating composition immediately adjacent the wires. It has been found in the past, especially where a good bond is not formed between the wires and the immediately adjacent insulating composition that, as a result of such handling, the insulating composition molded around the wires is frequently cracked away or otherwise separated therefrom at the point of entrance of the wires into the mass of insulating material. Such cracks frequently extend deep into the insulating composition and provide paths for the entrance of moisture into the electrical device itself, thereby shortening life and frequently causing failure of the device in operation.

Accordingly, therefore, it is a general object of my invention to provide a new and improved static electrical apparatus, embedded in a fluid-impervious molded casing.

It is a further object of my invention to provide a new and improved cable entrance support and seal for electric translating apparatus embedded in a fluid-impervious molded insulating casing.

It is a still further object of my invention to provide a new and improved direct-burial type encased electrical transformer, or the like, capable of being handled by its leads without adversely affecting the moistureproof and insulating qualities of the transformer.

In accordance with a preferred embodiment of my invention, I provide each lead wire of a translating device to be encased in a cast body of insulating material with an annular resilient rubber gland, and I clamp the glands tightly against the wires and between a pair of apertured clamping plates, at least one of which is formed as a precast block of fluid-impervious electric insulating com-

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pound. Having thus made a good mechanical seal around the lead wires by means of the clamped resilient glands, I then cast the entire apparatus, including at least that surface of the precast insulating clamping plate which is adjacent the translating device, into an integral cast or moulded body of the same or a compatible, insulating material from which the clamping plate is preformed. This outer cast body of insulating material fills the interstices between the parts and forms a good fluid-impervious bond with the precast clamping plate. I find that in this manner a translating device and its lead wires may be effectively sealed, even though the encasing compound would not itself form a good bond with the wire insulation which may be of a different material.

My invention itself will be more fully understood and its various objects and advantages further appreciated by referring now to the following detailed specification taken in conjunction with the accompanying drawing, the single figure of which shows, partly in section, an encased electrical apparatus embodying my invention.

Referring now to the drawing, I have there shown a preferred embodiment of my invention wherein a transformer including a magnetizable frame 1, a coil 2 and insulated lead wires or cables 3 is cast into an integral molded body 4 of fluid-impervious insulating compound. The insulating compound from which the body 4 is molded may be any suitable thermoplastic or thermosetting insulating compound such as an asphaltic compound, a synthetic resin, solventless varnish, or the like. I prefer to use for this purpose a polymerizable solventless varnish compound with a suitable filler such as talc or the like. The lead wires 3 are provided with insulating casings, and the other insulation is preferably formed of a fluid-impervious resilient material, such as natural or artificial rubber or the like. Specifically, I prefer to use for the external insulating coating of the wires 3 an artificial rubber, such as neoprene, chloroprene, thiokol, or the like.

I find that where such a transformer and its leads are embedded in a molded casing such as the body 4, a good fluid-tight bond is not ordinarily formed between the molded body and the lead insulation, especially where a different insulating material is used for the molded body than on the leads.

For the purpose of sealing and supporting the lead wires 3, I provide upon each lead wire an annular rubber gland 5 compressed between a pair of clamping plates 6 and 7. The clamping plate 6 is formed as an L-shaped angle iron, or bar 6a fixedly mounted upon the transformer frame 1 and having its overhanging flange 6 apertured to provide passage therethrough of the lead wires 3. The clamping plate 7 is formed as a precast apertured block of electric insulating compound, and is bolted to the clamping plate or flange 6 by means of a plurality of clamping bolts 8, only one of which is shown, the plates 6 and 7 compressing between them the resilient cable glands 5.

The precast clamping plate or block 7 is formed of the same compound of which the casing 4 is formed and provided with apertures through which the lead wires 3 pass. These apertures are of a size to fit closely over the wires 3, and are of a sufficient length, i. e., the plate 7 is sufficiently thick, to provide appreciable mechanical support for the wires 3 and prevent distortion or displacement of the glands 5. The lead wire apertures in the insulating clamping plate 7 are reamed out and enlarged conically at the side adjacent the cooperating clamping plate 6, thereby to ensure wedging of the annular rubber glands tightly against the sides of the lead wires. This clamping plate and gland structure provides a tight, fluid-impervious mechanical seal between the lead wires and the annular rubber glands, and also firmly supports the

lead wires immediately above the glands thereby to prevent displacement of the glands by distortion of the outer leads.

After the lead wires 3 are firmly clamped in the structure described above, the entire apparatus is embedded in the cast or molded body 4 of electric insulating compound. This compound fills the interstices between the parts and forms an integral fluid-impervious outer casing. The encasing body 4 is formed of the same insulating compound as is the precast clamping member or plate 7, and preferably completely embeds the entire transformer or other translating device as well as both clamping plates 6 and 7, as illustrated. It will of course be understood that without departing from the spirit or scope of my invention the preformed clamping plate 7 and the outer cast body 4 may be formed of compounds which, though not of identical composition, are compatible or similar at least to the extent that they form at their contacting surfaces a good fluid-tight bond.

It will be further understood by those skilled in the art that it is not essential that the entire clamping plate 7 be embedded in the body 4, but it is only necessary that at least that face of the clamping plate 7 on the side adjacent the encased translating apparatus be so embedded, whereby a fluid-tight seal is formed between the encasing body 4 and the gland receiving side of the precast insulating clamping plate 7. Moreover, it is not necessary that the clamping plate 6 be fixedly mounted upon the translating apparatus, nor that it be positioned on that side of the insulating clamping plate 7 which is adjacent the translating apparatus. If the clamping plate 6 is positioned on the remote or outer side of the clamping plate 7, it is not essential to the formation of a good seal that the plate 6 be even partially embedded in the insulating body 4. It is, of course, desirable that both clamping plates be embedded whatever their relative positions.

As previously indicated, the juncture between the precast clamping plate 7 of insulating compound and the outer molded casing 4 of the same insulating compound forms a good fluid-impervious bond or seal. This bond, in conjunction with the mechanical seal between the compressed rubber glands 5 and the lead wires 3, completely isolates the encased translating apparatus from external moisture. In addition, the lead wires 3 are mechanically supported by the clamping plate 7, so that the deformation of the external portions of the wires does not affect the sealing of the wires.

I have further found that the bond between the precast clamping plate 7 of insulating compound and the outer encasing body 4 of the same insulating compound is improved if the body 4 is cast before the clamping plate 7 is fully cured. For this purpose I prefer to inhibit curing of the clamping plate 7, as by coating the mold from which the plate is formed, at least at those portions of the plate which will ultimately contact the body 4, with a cure inhibiting compound. Such compound may, for example, be as an antioxidant which would retard polymerization at the surface of the cast material. The encasing body 4, when it is cast, normally includes a curing agent, and this curing agent is sufficient to cure both the body 4 and complete the curing of the clamping plate 7. Such curing agent may, for example, comprise a polymerization catalyst, such as benzoyl peroxide, when using a solventless varnish compound.

While I have described only a preferred embodiment of my invention by way of illustration, many modifications will occur to those skilled in the art, and I, therefore, wish to have it understood that I intend in the appended

claims to cover all such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric translating apparatus comprising a static electric translating device having electric conducting lead wires covered with a fluid-impervious resilient electric insulating material, a resilient annular gland encircling each of said insulated wires, a pair of clamping plates having aligned wire-receiving apertures positioned on opposite sides of said glands, the clamping plate remote from said translating device being formed as a precast body of molded electric insulating compound having an appreciable thickness and apertured to fit snugly over said wires, means for drawing said plates together to compress said glands and form a tight mechanical seal between said glands and the associated wires, and an outer cast body formed of a molded insulating compound similar to that of said remote clamping plate, said outer body completely embedding said translating device the adjacent clamping plate and at least that side of said remote clamping plate adjacent said translating device, whereby said remote clamping plate supports said wires and seals said wires against said glands while making a fluid-tight bond with said outer cast body of insulating material.

2. An electromagnetic induction apparatus including a magnetizable frame and a winding thereon having insulated lead wires extending therefrom, said wires being covered with an external insulating coating of resilient fluid-impervious electric insulating material, a bracket fixed to said frame and provided with an apertured overhanging flange through which said lead wires extend, a resilient annular sealing gland encircling each said insulated wire adjacent said flange on the side thereof remote from said frame and winding, an apertured clamping plate formed of precast electric insulating compound and disposed on said wires to hold said glands in clamping relation against said wires between said clamping plate and said apertured flange, said clamping plate being sufficiently thick and the apertures therein fitting closely over said wires thereby mechanically to support said wires, the apertures in said clamping plate being conically enlarged adjacent said glands to wedge said glands against said wires, and an outer cast body of molded electric insulating compound completely embedding said frame, winding and bracket and at least that side of said clamping plate adjacent said bracket, said outer body being formed of the same insulating compound as said clamping plate and forming a fluid-tight bond therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

1,763,115	Wermine	June 10, 1930
1,851,940	Williams	Mar. 29, 1932
1,884,071	Menzel	Oct. 25, 1932
2,343,725	Wilson	Mar. 7, 1944
2,376,427	Handforth et al.	May 22, 1945
2,383,926	White	Aug. 28, 1945
2,391,038	Rifenbergh	Dec. 18, 1945

FOREIGN PATENTS

611,526	Great Britain	Nov. 1, 1948
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OTHER REFERENCES

Abstract: Houser, 7,005, published in O. G. March 18, 1952.

Review of Scientific Instruments, vol. 15, No. 2, Feb. 1944, pages 46-47.