Sept. 20, 1949. C. WEIL 2,482,527

INSULATION

Filed June 9, 1944

Fig. 1.

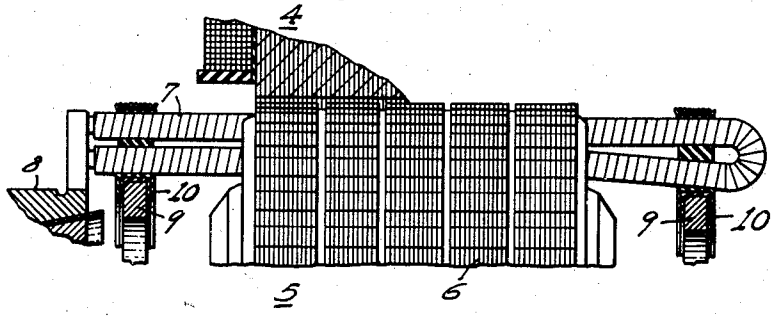


Fig. 2.

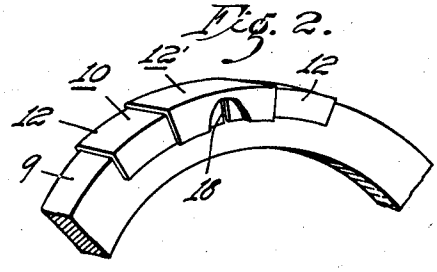
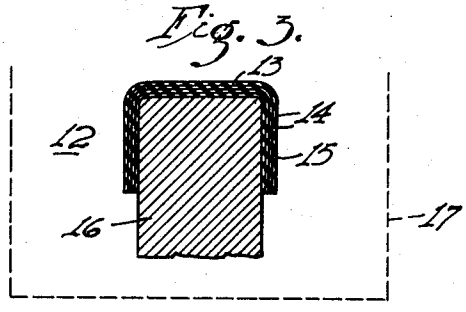


Fig. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE

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INSULATION

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8 Claims. (Cl. 171—252)

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My invention relates to molded insulation for dynamo-electric machines, and it has particular relation to a preformed molded class B insulator comprising a curved segment of a channel-shaped member adapted to fit (in one or more layers) over a support-ring for the end-turns of the armature-winding of a direct-current machine. Class B insulation is insulation which is able to continuously withstand a temperature of 150° C., or, in general terms, a temperature of more than 125° C. This temperature-limitation ordinarily excludes cellulosic materials or fibrous carbohydrates such as wood-pulp paper, or organic-thread cloth, although sometimes a small quantity or layer of such materials may be permitted, in quantities occupying only a small part of the total volume of the insulator.

Because of difficulties of applying class B insulation to armature-coil support-rings for large direct-current motors and generators, which may involve rings as large as 100 inches in diameter, it has been standard practice, for a number of years, to place several layers of thin molded strips of class B fibrous insulation, impregnated with a heat-hardening or thermosetting phenolic resinous binder. These thin strips are held in place by laboriously taping the ring, all around, with several layers of mica, held with glass or asbestos tape. This costly and laborious procedure has been adopted in order to avoid the prohibitively high tool and labor costs, on small-quantity orders, for ring-covering channel-members molded to exact size, with thermosetting resins of the phenolic type.

The object of my present invention is to provide a new form of class B insulation for such armature-coil support-rings, utilizing molded, channel-shaped, curved segments, not more than 18 inches long, to fit over various portions of the support-rings. The breaks between successive channel-segments are preferably covered by other channel-segments of appropriately larger size. These channel-segments are molded from class B flexible impregnable insulating material, and a suitable impregnating binder of a class B hardenable insulating material which will bind the impregnated material into an integral piece which is hard and mechanically rigid, at all portions thereof. The impregnable base-material is preferably asbestos or other inorganic porous material, and the binder is preferably a thermosetting material.

A further object of my invention is to provide an acceptable class B support-ring insulation at a considerable saving in cost, as applied to previous practices for this type of service.

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With the foregoing and other objects in view, my invention consists in the systems, combinations, methods, apparatus, structure and parts, hereinafter described and claimed, and illustrated in the accompanying drawing, wherein Fig. 1 is a fragmentary longitudinal sectional view of a direct-current motor, illustrating an application of my invention, Fig. 2 is a fragmentary perspective view of a support-ring, showing the manner of applying my molded segmental insulating channels, and Fig. 3 is a transverse sectional view through one of my molded class B insulating channels.

I have illustrated my invention in connection with a direct-current motor (which might be a generator), having a stationary field member 4 and a rotatable armature member 5, the latter having a magnetizable core 6, carrying armature windings 7. The armature windings 7 are connected, at one end, to a commutator 8. The end-turn portions of the armature windings 7 are supported, at each end of the armature member 5, on a support-ring 9, which is first covered with insulation 10, which constitutes the special detailed object of my invention. My present invention relates more particularly to class B insulation 10, and in general the entire motor or generator will be designed with class B insulation, although my class B support-ring insulation 10 is also applicable to class A machines.

In accordance with my present invention, the support-ring insulation 10 is provided in the form of a plurality of preformed molded insulator-segments 12, each of which is a curved segment of a channel-shaped member, having its web portion 13 on the outside, and curved to fit a segment of a circle, as shown in Fig. 2 of the drawing. Each of these segmental channel-members 12 is made in one mechanically rigid, integral piece, composed of a plurality of layers 14 of molded sheets of initially flexible asbestos paper, which may either be substantially pure asbestos, or commercial forms of asbestos-cloth or asbestos-paper, with or without the addition or admixture of a small percentage of organic fibrous materials, for ease of handling; or, in general, any initially flexible impregnating insulating material may be utilized, which will stand a temperature of more than 125° C. continuously, or which is resistant to attacks of a thermosetting impregnating material which is capable of strongly attacking the usual forms of fibrous carbohydrates.

The layers 14 are united together, in a hard,

integral whole, by means of an impregnating binder 15 of a hardenable insulating material which will bind the sheets together into an integral piece which is hard and mechanically rigid at all portions thereof. The binder is preferably a thermosetting resin, which is capable of permanently changing its form, as by polymerizing, under the influence of a suitable elevated temperature, applied for a brief time, so as to change its form from a very fluid substance, of the approximate consistency of water, to an extremely hard solid, which does not materially soften again, even when raised to still higher temperatures than the initial thermosetting temperature.

The resin may be a copolymer of propylene glycol-maleate and styrene. Other thermosetting resins which might be utilized include the general class of alkyd resins dissolved in a vinyl compound, which include combinations of a polyhydric alcohol, an unsaturated dibasic acid, and a vinyl compound, or, in general, most or all of the resinous reaction-products of organic acids, as well as other hardenable impregnating agents, which could also be utilized. I prefer, but am not limited to, a resin having an acid value of 50 or more, referring to the number of milligrams of KOH necessary to neutralize each gram of the sample.

In the manufacture of my molded segmental channel-members 12, the layers of initially soft or flexible absorbent or impregnable material, preferably in the form of sheets, is first laid over a suitable mold 16. Either before or after laying said sheets over the mold they are impregnated with a hardenable insulating binding-material of the class which has already been described. The impregnated sheets are then subjected to heat in a suitable oven, as indicated by dotted lines 17, in which the necessary binder-hardening temperature is applied, either with, or without, the application of pressure to the molded article. The resulting product is extremely hard and compact, and it can be made at a relatively small cost, as compared with previous class B insulation for armature-coil support-rings.

Preferably, as shown in Fig. 2, the molded segments 12 are made in two sizes, the smaller-sized segments being placed directly over the armature-coil support-ring 9, in abutting relationship, or with slight spaces 18 between the abutting ends of the successive segments. These spaces 18 are preferably covered over with a second ring of insulator segments 12' which are of such size as to fit over the first ring of insulator-segments, as clearly shown in Fig. 2.

While I have described my invention in a single preferred form of embodiment, I wish it to be understood that my invention is susceptible of changes, without departing from the essential principles thereof. I desire, therefore, that the appended claims shall be accorded the broadest construction consistent with their language.

I claim as my invention:

1. A preformed molded insulator comprising a curved segment of a channel-shaped member having its web portion on the outside and curved to fit a segment of a circle, less than a complete circle in length, said member being made in one mechanically rigid integral piece composed of an impregnable insulating material which will stand a temperature of more than 125° C. continuously, and an impregnating binder of a hardenable insulating material.

2. A preformed molded insulator comprising a curved segment of a channel-shaped member having its web portion on the outside and curved to fit a segment of a circle, less than a complete circle in length, said member being made in one mechanically rigid integral piece composed of asbestos fibers and an impregnating binder of a hardenable insulating material.

3. A preformed molded insulator comprising a curved segment of a channel-shaped member having its web portion on the outside and curved to fit a segment of a circle, less than a complete circle in length, said member being made in one mechanically rigid integral piece composed of an impregnable insulating material which will stand a temperature of more than 125° C. continuously, and an impregnating binder of a thermosetting insulating material.

4. A preformed molded insulator comprising a curved segment of a channel-shaped member having its web portion on the outside and curved to fit a segment of a circle, less than a complete circle in length, said member being made in one mechanically rigid integral piece composed of asbestos fibers and an impregnating binder of a thermosetting insulating material.

5. A preformed molded insulator comprising a curved segment of a channel-shaped member having its web portion on the outside and curved to fit a segment of a circle, less than a complete circle in length, said member being made in one mechanically rigid integral piece composed of a plurality of layers of molded sheets of impregnable insulating material which will stand a temperature of more than 125° C. continuously, and an impregnating binder of a hardenable insulating material which will bind said sheets together into an integral piece which is hard and mechanically rigid at all portions thereof.

6. The invention as defined in claim 5, characterized by said impregnable layers being of inorganic material.

7. The invention as defined in claim 5, characterized by said impregnable layers being of asbestos.

8. The invention as defined in claim 5, characterized by said binder being a thermosetting material.

CONRAD WEIL.

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