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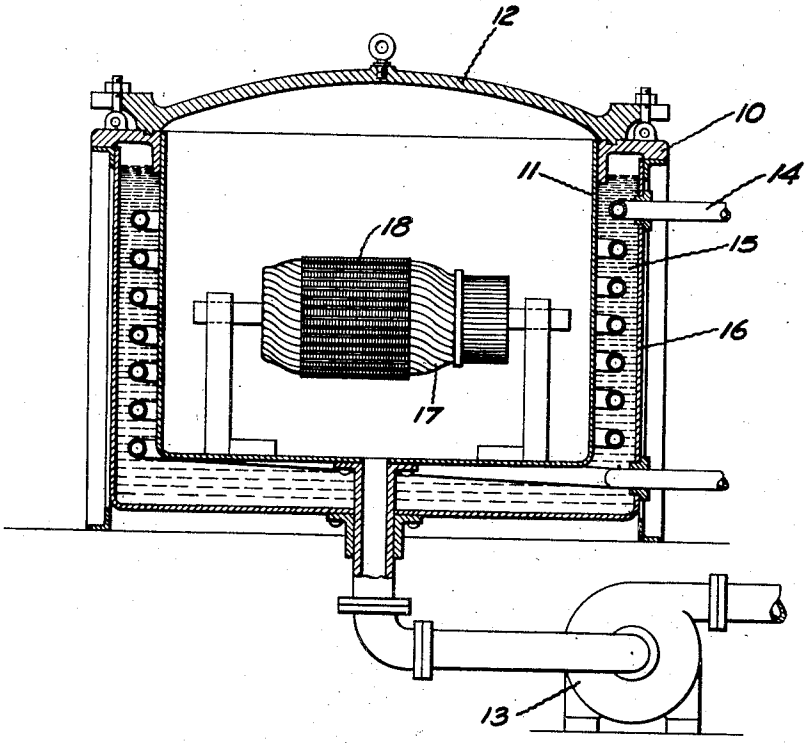
H. MILLER

METHOD OF TREATING ELECTRICAL WINDINGS

Filed May 16, 1925



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UNITED STATES PATENT OFFICE.

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METHOD OF TREATING ELECTRICAL WINDINGS.

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My invention relates to the treatment of electrical windings, more particularly to the impregnation of electrical windings with an insulating compound, such as a varnish, and has for its object the provision of a method whereby the volatile solvents in the impregnating compound are driven off before the compound has appreciably hardened.

My method may be used either before or after the electrical coil or winding is mounted on the apparatus of which it forms a part. The object of this impregnating treatment is to thoroughly saturate the insulating coverings, which are usually of fabric or other porous insulating material, on the conductors of the winding, and thus improve their insulating and thermal conducting properties and cement the conductors together. The varnish is thinned with a volatile solvent to such a consistency that it will penetrate the interior of the winding. The usual procedure is to soak the coils in the mixture of varnish and solvent until they are thoroughly impregnated, allow them to drain, and then place them in an oven heated to a suitable temperature where the varnish is hardened.

During the baking operation the solvent should first be driven off, and then the varnish hardened by oxidation and polymerization. It often happens, however, that the solvent is rapidly driven off from the outside or exposed portion of the coil or winding, and the varnish on this exposed portion then hardened before the solvent in the interior portions of the winding has had an opportunity to escape. The hardened varnish on the outside of the winding thus seals the winding and prevents the further escape of the solvent, and also prevents the oxygen in the outside air from penetrating the coils and hardening the varnish in the interior portions. The pressure of the sealed-in solvent vapors may be sufficient to puncture the outer surface of the varnish and leave a series of holes which weaken the insulation. Furthermore, the green varnish in the interior of the winding may be thrown out by centrifugal force in the case of revolving apparatus, and where enameled conductors are used there is a great possibility that the insulating properties of the enamel will be destroyed by the solvent remaining in the green varnish.

In carrying out my invention, I thoroughly remove the volatile solvents under conditions which prevent hardening of the varnish, after which the varnish is dried in the usual manner. Preferably I remove the solvents by heating the winding in a vacuum at a comparatively low temperature which does not appreciably harden the varnish itself.

For a more complete understanding of my invention, reference should be had to the accompanying drawing, the single figure of which is a sectional view of apparatus for treating coils in accordance with my invention.

Referring to the drawing, in carrying out my invention, I provide a suitable drying oven 10 from which the air can be evacuated. As shown, this oven comprises an inner receptacle 11 which can be thoroughly sealed by means of a cover 12. Communicating with the interior of the receptacle 11 is an air pump 13 by means of which the air can be removed. Suitable heating means is provided which, as shown, consists of a steam pipe 14 which is coiled around the receptacle 11. This steam pipe is preferably immersed in oil 15, which fills a space between the receptacle 11 and an outer jacket 16.

The coil or winding to be impregnated is first thoroughly soaked with the thinned varnish and allowed to drain after which it is placed in the oven 10. As shown, the winding 17 forming a part of the armature 18, after having been thoroughly impregnated with the varnish, is placed in the oven 10. The oven is now evacuated by means of the pump 13, and steam passed through the pipe 14 until the temperature in the interior of the oven is raised to from 50 to 60° C., and this temperature maintained. While this temperature is comparatively low the solvents are nevertheless boiled out quickly due to the effect of the vacuum in combination with the temperature. Since there is no atmospheric oxygen in contact with the varnish during this operation nor any considerable heat, the varnish itself is not hardened to any appreciable extent, and consequently the solvent vapors are free to escape. After the solvent has been removed the armature 18 may be removed from the oven 10 and baked in the usual way in an oven which is open to the atmosphere until the varnish is thoroughly hardened. If desired, this final baking operation may be

carried out in the same oven which is used in driving off the solvents, it being necessary however, to use a higher temperature and to ventilate the oven during the final baking operation.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. The method of treating electrical windings which consists in impregnating said winding with a varnish thinned with a volatile solvent, driving off said solvent in a rarefied atmosphere at a low temperature such that the varnish is not hardened, and then drying said winding to harden said varnish.

2. The method of treating electrical windings which consists in impregnating the winding with a varnish thinned with a volatile solvent, driving off said solvent from the winding in a rarefied atmosphere at a temperature insufficient to harden said varnish, and then baking the winding at a higher temperature to harden the varnish.

3. The method of treating electrical windings which consists in impregnating said winding with a varnish thinned with a volatile solvent, heating said winding in a rarefied atmosphere at a temperature below the hardening temperature of the varnish to drive off the solvent, and then drying the varnish in air.

4. The method of treating an electrical winding which consists in impregnating the winding with a varnish containing a volatile solvent, driving off the solvent without hardening the varnish by heating the coil in a rarefied atmosphere, and then hardening the varnish by heating the coil in air.

5. The method of treating an electrical winding which consists in impregnating the winding with a varnish thinned with a volatile solvent, heating the winding in a vacuum at a relatively low temperature to drive off the solvent, and baking the winding at a relatively high temperature in air to harden the varnish.

In witness whereof, I have hereunto set my hand this 13th day of May, 1925.

HOWARD MILLER.