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ELECTRIC CONDENSER

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The present invention relates in general to electric condensers, and more particularly to the dielectric material used in such condensers. The principal object of the invention is to provide a new and improved dielectric and process of making the same.

Condensers made from paraffin-impregnated paper are in common use and are undoubtedly satisfactory for low voltages, but when used in power packs for radio or other purposes where voltage peaks of one or more kilovolts are encountered, they are not satisfactory. For meeting these higher voltages with a paper condenser, a make-shift plan is in common use at the present time which consists in increasing the number of layers of paper between the electrodes. This procedure does undoubtedly give a high dielectric strength while the condenser is new, but introduces factors conducive to dielectric breakdown by continued use of the condenser under high voltage.

Many widely different theories have been voiced to explain the cause of this failure, but it is generally conceded that every condenser using impregnated paper contains reasonably large quantities of gas and any bubble or layer of gas must be regarded as a dielectric in series with the composite dielectric on each side of it in a radial direction. Microscopic films and pockets of either gas or moisture are undoubtedly entrapped within the kinky windings of the capillary ducts in the paper material. If it is air, the air pocket will be ionized under the electric stress following high potential and will elongate with the poles of the elongation pointing towards the respective electrodes; ionization of any air pocket or film will, of course, result in dielectric breakdown; if microscopic moisture films are present, these films may also become elongated by the electric field due to their higher specific capacity which then forms a conducting bridge across the dielectric.

Although special precautions are taken for drying the paper, as well as the fact that impregnation takes place by the aid of heat, it is highly improbably that every one of the enormous number of fibers which are contained per square foot of insulation is absolutely dry, although the bulk may be; and it is understood, of course, that just a single duct carrying gas or moisture is sufficient to start the failure in the form of dielectric breakdown.

Now, taking it for granted that in a condenser it is desirable to have a dielectric of a homogeneous, non-fibrous nature, I have invented a condenser for high tension purposes which contains a new dielectric and also means for manufacturing this dielectric in a practical way.

My improved dielectric comprises a main insulating body which is supported on a relatively thin tissue which I term a carrier. As a carrier for my insulation I use very thin gutta percha tissue which in its physical and chemical characteristics is quite different from paper. It is homogeneous and contains no capillaries of any sort. It is not hygroscopic, a property which is characteristic of all fibrous materials. A tissue of pure gum rubber may also be used.

Regardless of magnitude of voltage for which my condenser is to be used, I use only one layer of fine tissue, but reinforce this tissue and modify its characteristics by treating it with a solution of asphalt. This asphalt insulation may be built up in layers, thus increasing the thickness of the final insulation, the thickness being dependent upon the voltage which the condenser is to be operated at. Thus, in my condenser the main body is not only uniform, perfectly homogeneous, non-fibrous, and chemically and physically stable because of the pure asphalt used, but its carrier is also of a homogeneous, uniform, non-fibrous structure.

To the foregoing characteristics of this in-

sulation is added the very important one of being self-healing under certain conditions. In the ordinary paper impregnated condenser the insulation possesses practically no viscosity or plasticity. At normal temperatures, the pin-hole resulting from electric puncture remains, while the insulation in my condenser is plastic and will seal itself unless conducting conditions are brought about to an extent beyond repair by the closing action of the asphalt.

In order to make this new insulation, I do this: I dissolve pure asphalt in carbon tetrachloride or in gasoline, or in any solvent which is common to the gutta percha and to the asphalt as well. The result of using a solvent for the asphalt which also affects the gutta percha is this—that not only is a good physical union between the first layer of asphalt and the gutta percha brought about, but the asphalt is also thereby incorporated into the tissue to such an extent as to render its use more desirable. This tissue is sensitive towards light and heat which tends to harden it and render it brittle, while the tissue into which the asphalt has penetrated is beneficially affected so as to remain soft and flexible under the protective action of the asphalt. In addition, this compound of gutta percha tissue and asphalt is a good dielectric in itself. Furthermore, this tissue may contain pin-holes at times, but these pin-holes are all sealed securely by the asphalt treatment.

The amount of carbon tetrachloride or other solvent used in practice will vary and depends on the physical characteristics of the particular grade of asphalt used. Sufficient should be used to make a freely flowing solution. The gutta percha tissue may be in the form of strips of the proper width for use in condensers of the rolled type. The strips of tissue may be sprayed with the solution, or may be floated across the top of the liquid in a tank. In either case, after the coating is put on, the strip of tissue is run through a drier in order to evaporate the solvent. After being dried, the asphalt side may be given a fine coating of talcum to prevent sticking during handling and to permit of the dielectric being wound up on reels. However, the dielectric may be routed immediately to the winding machines to be formed into condensers, and in this case the coating of talcum may be omitted.

Having described my invention, what I consider to be new and desire to secure by Letters Patent will be pointed out in the following claims.

What is claimed is:

1. A dielectric comprising a carrier of thin tissue formed of gum of the gutta percha family and a relatively thick insulating coating of asphalt adhering to said tissue.

2. A dielectric comprising a layer of gum such as gutta percha, a layer of pure asphalt, and an intervening layer comprising a mixture of both.

3. The process of making dielectric composed of gutta percha or similar tissue and asphalt, which consists in dissolving the asphalt in a solvent which is common to asphalt and the tissue used, in coating the tissue with the solution, and in evaporating the solvent.

In witness whereof, I hereunto subscribe my name this 15th day of March, A. D. 1929.

GODFREY STEERUP.