

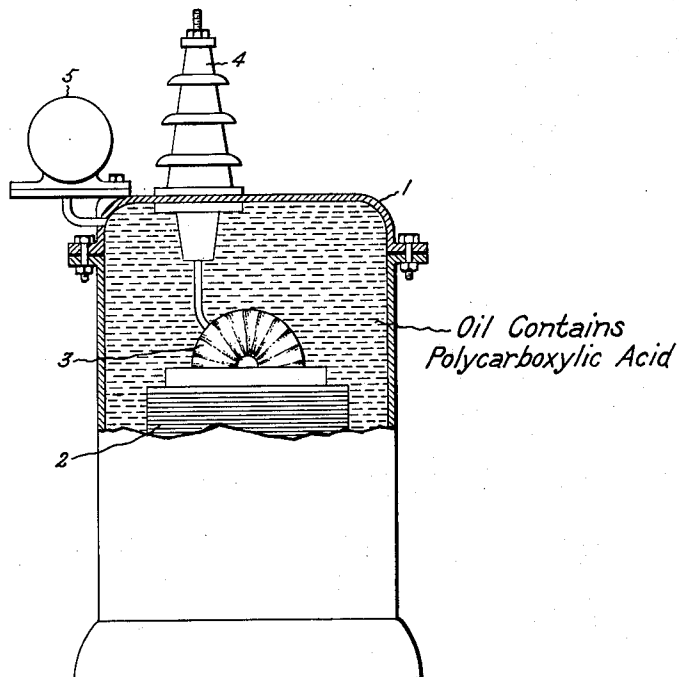
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INSULATING AND COOLING COMPOSITION FOR ELECTRIC DEVICES

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INSULATING AND COOLING COMPOSITION
FOR ELECTRIC DEVICESFrank M. Clark, Pittsfield, Mass., assignor to
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Application April 29, 1933, Serial No. 668,608

5 Claims. (Cl. 252—1)

The present invention is a continuation-in-part of my prior application Serial No. 457,674, filed May 30, 1930.

The present invention relates to the suppression or retardation of sludge formation in mineral oil and particularly in oil or wax forming part of an electrical device as, for example, when employed as an insulating medium for the core and windings of an electrical transformer or as an insulating medium for capacitors, power switches or the like.

When insulating hydrocarbon mineral oils are subjected to the conditions of high temperatures existing in such devices, that is, the chemical influences and dielectric stresses to which the oil filling is unavoidably subjected, chemical and physical changes tend to occur in the oil which depreciate the insulating property of the oil and cause a semi-solid material known as sludge to form therein. Sludge is a tarry product which is insoluble in the oil. Being semi-solid it renders oil in which it is formed less fluid and therefore less efficient as a cooling medium in electric devices. Sludge appears to be a polymerization or condensation product having a more complex molecular structure than the hydrocarbons constituting the oil. Its formation is caused or promoted by the catalytic effect on the oil by metal parts of the electrical device, such effect being particularly marked when copper members are in contact with oil. In electric power transformers, switches and other electric devices it is almost unavoidable to have copper in contact with the oil.

In accordance with my present invention sludge precipitation occurring in insulating oil is retarded and the insulation properties and fluidity of the oil are preserved by maintaining organic polycarboxylic acid, or an anhydride thereof, in contact with or dissolved in the oil during its use in such electrical device. As representative of this type of compound and capable of use in accordance with my invention are the following polycarboxylic organic acids or their anhydrides: maleic, succinic, malonic, and adipic acids.

The accompanying drawing shows in front elevation and partly in section an electric transformer as representative of the devices in which the benefits of my invention may be obtained.

In carrying out my invention a suitable carboxylic acid or a suitable mixture of such acids is dissolved in the oil which is to be immunized against sludging or if acid is employed which is

but slightly soluble in the oil, a quantity of the acid (or its anhydride) is placed in contact with the oil at the bottom of the transformer, oil switch, capacitor or in whatever device the oil is intended to be used. The amount of polycarboxylic acid added to the oil while not being critical ordinarily should be chosen within the limits of about one-tenth of one per cent to five per cent by weight. One-half of one per cent by weight of polycarboxylic acid is an effective amount. The transformer shown in the drawing comprises a tank 1 containing a core 2 and electric windings 3. Only one terminal, namely the high tension terminal 4, has been illustrated. The tank 1 is completely filled with mineral hydrocarbon oil which when expanding flows into the conservator 5. A polycarboxylic compound, in contact with the oil, retards sludging as above stated, even in the presence of copper. It prevents also a decrease in insulation characteristic and a rise of the power factor in oils when subjected to electric stresses over long periods of time. Polycarboxylic compounds may act to increase the solubility of the sludge in the oil, or as a negative catalyst or retarder of chemical changes which produce acidity or otherwise deteriorate the oil.

The term polycarboxylic acid as used herein is intended also to be inclusive of the anhydride of such acid. I have found maleic anhydride to be particularly effective as a sludge retarder.

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

1. A composition of matter comprising mineral oil containing maleic anhydride.

2. A dielectric material comprising a preponderant amount of mineral hydrocarbon oil, and less than five per cent by weight of maleic anhydride.

3. A composition of matter composed of a preponderant amount of mineral hydrocarbon oil and also a small quantity of an acid of the group consisting of maleic, succinic, malonic, and adipic acids.

4. A cooling and insulating medium for electric transformers consisting of a preponderant amount of mineral hydrocarbon oil and about ½ of one per cent of an acid of the group consisting of maleic, succinic, malonic, and adipic acids.

5. A composition of matter comprising mineral hydrocarbon oil and a small proportion, less than five per cent, of adipic acid.

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