Sept. 23, 1930. F. M. CLARK 1,776,309

OIL INSULATED ELECTRICAL DEVICE

Filed Jan. 10, 1929

Fig. 1.

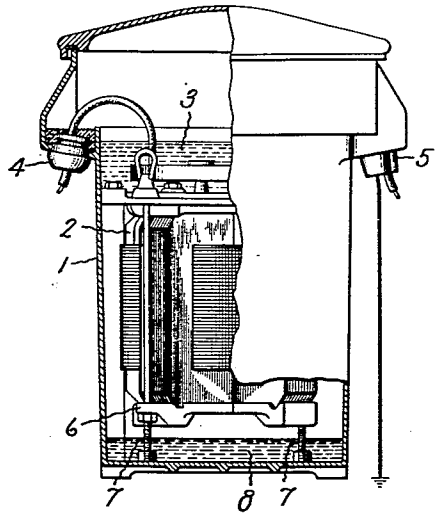
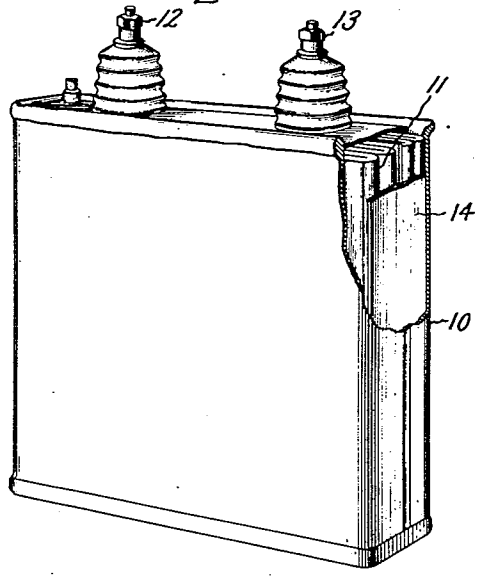


Fig. 2.



Inventor:
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Patented Sept. 23, 1930 1,776,309

UNITED STATES PATENT OFFICE

FRANK M. CLARK, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

OIL-INSULATED ELECTRICAL DEVICE

Application filed January 10, 1929. Serial No. 331,686.

The present invention relates to the preservation and refining of the chemical and physical properties of insulating oils, regardless of whether such oils are of mineral or organic origin.

When insulating oils are subjected to the high temperatures, chemical influences and dielectric stresses existing in electrical devices, such as transformers, capacitors, switches and the like, chemical and physical changes occur in the oil which depreciate its insulating properties. Oxidation products are formed in the oil, its color darkens and an appreciable acidity develops. The dielectric energy loss increases and the electric break-down is lowered when such changes occur. Some of these changes are caused or promoted by a catalytic effect upon the oil of metals, such effect being particularly marked in the case of copper, which of course is commonly present in electrical devices.

In accordance with my present invention the chemical changes occurring in insulating oil are retarded and the insulation properties of the oil are preserved by maintaining a polyhydric alcohol in contact with the oil during use.

The accompanying drawing shows in Fig. 1 a vertical section of an oil-immersed transformer, and in Fig. 2 a perspective view of a capacitor (the casing being in part broken away) as a representative embodiment of my invention.

Referring to the drawing, the outfit illustrated by Fig. 1 comprises a tank 1, in which is located a transformer 2, (comprising a core and windings as well understood), surrounded by a bath of petroleum oil 3. The transformer is provided with insulated terminals 4, 5 and is supported by a frame 6 resting on pedestals 7. At the bottom of the tank is a charge 8 of glycerine, ethylene glycol, mannitol, dulcitol, or other equivalent polyhydric alcohol, this charge being out of contact with the insulation and electrical members of the transformers.

In Fig. 2 is illustrated a capacitor comprising a tank 10, in which are provided condenser or capacitor units 11, these being suitably connected to the terminals 12, 13. A charge of insulating oil (not shown) surrounds the condenser units. The insulating medium may consist of a pertoleum compound or may be an organic oil, such as castor oil, linseed oil (boiled or raw) or menhaden oil (a fish oil). An absorbent material, such as a cellulose pressboard 14, soaked with glycerine, or other suitable polyhydric alcohol is provide in the tank in contact with the oil filling.

In either embodiment of my invention the presence of polyhydric alcohol greatly prolongs the useful life of the oil, whether of mineral or organic character, in an electric device of which the devices illustrated are examples. The alcohol appears to function as a neutral solvent which extracts from the oil impurities formed in the oil during use and thus acts continuously during use as a refining agent.

The alcohol also acts as a negative catalyst or retarder of chemical changes which produce acidity or otherwise deteriorate the oil. My work has shown that its presence retards the color, sludge and acid formation of oil heated to an elevated temperature in the presence of copper. It prevents also the decrease in insulation resistance and rise of power factor in oils when subjected to electric stresses over long periods of time. This is most marked in the case of linseed, or other vegetable drying oil, which loses its insulating value even at room temperature when subjected to voltage stresses for long periods.

In a copending application Serial No. 415,115, filed by Frank M. Clark and Arthur T. Harding and assigned to the same assignee as the present application, claims are made to the purification of crude and oxidized mineral oil by means of a polyhydric alcohol liquid at ordinary temperatures, the process therein claimed involving the freeing of the purified oil from the extraction liquid.

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

1. The process of purifying mineral oil containing oxidation products which consists in extracting said products with a polyhydric alcohol.

2. The process of purifying mineral oil containing oxidation products which consists in extracting said products with glycerine.

3. The process of maintaining a high state of purity in oil during use as an insulating medium in an electrical device at elevated temperatures which consists in maintaining a body of polyhydric alcohol in contact with said oil during use.

4. The method of preserving the dielectric properties of oil during use under voltage stresses which consists in maintaining a polyhydric alcohol in contact with said oil.

5. The method of preserving the dielectric properties of oil during use under voltage stresses which consists in maintaining glycerine in contact with said oil.

6. The method of preserving the dielectric properties of oil in an electric device having copper members which consists in maintaining a body of glycerine in contact with said oil but out of contact with said device.

7. The combination of a tank, an electrical device therein, a body of oil in said tank surrounding said device and a polyhydric alcohol in said tank in contact with said oil.

8. The combination of a transformer containing a body of petroleum oil and a body of glycerine in contact with said oil.

9. The combination of an electrical device charged with a body of insulating oil, and an absorbent material containing a polyhydric alcohol in contact with said body of oil.

In witness whereof, I have hereunto set my hand this 8th day of January, 1929.

FRANK M. CLARK.