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DIELECTRIC MATERIAL AND METHOD OF PRODUCING IT

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My invention relates to improving the dielectric quality of textile materials and particularly to dielectric materials, such as those having an asbestos base, and to a process for making the same.

It is well known that asbestos and similar materials have rather poor dielectric characteristics because of the presence of conducting mineral impurities in the commercial grades of such material, and also because of the presence of moisture which makes the material slightly conductive. Numerous attempts have been made to remove the iron oxides which are the principal mineral impurities found in asbestos, but, so far as is known, none of these has proved successful.

Attempts have also been made to overcome the conductance of asbestos due to the presence of moisture therein by making the material vapor-free as a result of exposure to heat or evacuation, and then coating the material with a non-hygroscopic substance.

I have previously developed a method of increasing the dielectric value of asbestos while heating the fibres to a charring temperature with oils or other organic matter.

The low resistance of asbestos tape, which is used as an insulating material on the windings of high voltage rotating machinery, has been responsible for corona losses in the end windings of the machines, and such insulation has, in certain cases, failed in service as a result of sparking due to surface leakage through the asbestos wrapper surrounding the winding. It is, therefore, desirable to find a satisfactory tape or treatment for the tape that will improve its natural dielectric qualities.

In order to make the asbestos fibres less hygroscopic, I have tried treating them by washing with a number of different substances, such as oxalic acid or phthalic acid, with practically no improvement in the dielectric qualities of the tape. I have also attempted to remove the water-soluble impurities from the tape by treating in a Soxhlet apparatus with water, but without any appreciable improvement in the dielectric value.

Heat treatments were also tried, baking the asbestos in air at varying temperatures. At temperatures up to about 435° C., no improvement in the dielectric strength occurred. At about 500° C., there was a definite increase in resistance value. At this temperature, however, there was a partial weakening of the fibres caused by dehydration.

Such tapes have also been treated by baking at 250° C. out of contact with air. During this treatment, the cotton comprising a part of the tape structure decomposed and left the fibres coated with organic matter making a tape of high electrical resistance of about one-half the tensile strength of the untreated tape.

A number of specimens of different kinds of asbestos tape were tested under a large number of different treatments with an attempt to increase the dielectric value thereof, and tests made of the dielectric strength by placing one inch length of tape between two pairs of small brass plates clamped together by spring test clamps. The resistance tests were made by applying 550 volts direct current to the one inch length of tape, the current being read by a reflecting galvanometer. Breakdown or flashover tests were made with specimens of tape clamped in the same manner with 60 cycle voltages increased by steps of 2 kilovolts applied for one minute each or until flashover occurred.

I found by these tests that the resistance of asbestos tapes could be very considerably increased by treating the tapes with a solution of boric acid. Such tapes treated with a solution of from 2% to 10% of boric acid give very satisfactory results from a dielectric standpoint. The tapes treated in the boric acid solutions containing the higher amounts of boric acid in solution tend to become somewhat stiff for easy application where the tape is to be applied over very small conducting parts. Specimens of tape dipped in a boric acid solution of about 5% appeared somewhat better dielectrically than specimens treated with a weaker or stronger solution of the boric acid. The tape treated in this solution appeared to be particularly free from smoking or charring at high voltages, and to have a particularly high flashover voltage and to also retain a high dielectric value after several flashovers.

The material was prepared by soaking the untreated tape from twelve to eighteen hours in the boric acid solution, draining the tape for about one hour, and then drying it by heating it in an oven at a temperature of about 100° C. for about eighteen hours.

After the tape was treated by soaking in the boric acid solution as described above, and draining, the increase in weight due to the absorbed solution would be 60% or 62% of the weight of the untreated material, or, if a 5% solution of boric acid were used in the treatment about 3.5% by weight of boric acid.

I have also treated tapes by dipping them in a boric acid solution in the rolled condition, and

dried as described above, with satisfactory results. The dipping may be done by passing the tape continuously through the solution. The tape should remain in the solution long enough to thoroughly wet or saturate the fabric.

While a solution of boric acid in water produces satisfactory results, other solutions, such as an alcoholic solution of boric acid may be used, if desired.

It is to be understood that the description of particular embodiments of my invention is to be taken as illustrative of the principle and mode thereof, and that modifications may be made within the spirit of the invention without departing from the scope of the appended claims.

I claim as my invention:

1. A method of treating asbestos tape to improve its dielectric properties comprising soaking the tape in a five percent solution of boric acid, for from ten to eighteen hours, draining, and drying in an oven at a temperature of about 100° C.

2. A method of treating textiles, such as asbestos, to improve its dielectric properties comprising soaking it in a solution of boric acid of a strength from two to ten percent, draining, and drying at a temperature of about 100° C.

3. A method of treating textiles, such as asbestos, to improve its dielectric properties comprising soaking it in a solution of boric acid for a sufficient time for the material to take up from 3 to 4 percent by weight of the untreated material of boric acid, draining, and dried for about eighteen hours at a temperature of about 100° C.

4. A dielectric tape material comprising a tape of textile material that has been soaked in a solution of boric acid for 1 to 18 hours, or till saturated, drained, and dried by heating to about 100° C. for about eighteen hours.

5. A dielectric tape comprising textile material that has been soaked in a solution of boric acid for a sufficient time to take up from 3 to 4 percent boric acid by weight, and from which the moisture added during the soaking process has been substantially removed.

6. A dielectric material comprising asbestos or like textiles that has been soaked in a 2 to 10 percent solution of boric acid for 1 to 18 hours, or till saturated and from which the added moisture has been substantially removed.

7. A dielectric material comprising asbestos or like textiles that has been soaked in a 2 to 10 percent solution of boric acid for 1 to 18 hours, or till saturated, drained, and dried at an elevated temperature for about eighteen hours.

8. A method of treating asbestos, or like material, to improve its dielectric properties, which consists in soaking it in a 2 to 10 percent solution of boric acid for a sufficient time to take up 3 to 4 percent of its weight of boric acid, and in subsequently removing the moisture added during the soaking process.

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