Patented Jan. 19, 1937 2,068,208

# UNITED STATES PATENT OFFICE

2,068,208

## ELECTRICAL INSULATION

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No Drawing. Application January 18, 1935, Serial No. 2,451

3 Claims. (Cl. 106—12)

This invention relates to electrical insulation comprising fibres of improved properties and to the method of making such insulation.

It is conventional to provide electrical insulation for a wire, for example, by applying to the wire a wrapping of asbestos fibres in the form of roving or yarn.

The present invention comprises the product resulting from and the method of treating asbestos fibres or the like to increase the electrical resistance thereof. In a typical product the treated fibres had approximately one hundred times the resistance of the same kind of fibres that had not been treated.

An embodiment of the invention that is preferred will be illustrated in connection with the manufacture of roving for use as a wrapping material for an electrical conductor.

There is first provided a supply of fibres of the type of asbestos that are adapted to react with a soap, as, for example, in an aqueous solution. These fibres may consist of serpentine asbestos, such as chrysotile. Or, there may be used hornblende asbestos, such as amosite or crocidolite, which has been previously activated. This activation of hornblende asbestos, imparting thereto the necessary reactivity to soap in solution, may be accomplished by autoclaving with an aqueous alkali mixture as described below.

Thus, there may be used amosite fibres that have been activated by being mixed with water and a slightly soluble compound of magnesium and then subjected to an elevated temperature. Such fibres may be activated by autoclaving a mixture containing, for example, 80 parts by weight of the fibres, 40 parts of finely divided basic magnesium carbonate, and 2,000 parts of water, preferably in the presence of 2 parts of sodium carbonate, at a final temperature of approximately 430° F., this temperature being reached, suitably, by gradual heating from atmospheric to the maximum temperature in the course of about one hour or longer.

During such treatment, there is presumably an exchange of bases, some of the magnesium of the basic carbonate replacing some of the iron in the amosite fibres, the sodium carbonate, if used, acting as a carrier or catalyst.

Finally, the temperature and the pressure are lowered, the reaction mixture is filtered, to remove a major part of the water therefrom, and the remaining treated fibres are then dried or treated directly with the soap solution as described below.

Crocidolite fibres may be treated similarly, to activate them.

The reactive asbestos fibres, either natural or activated as described, are then treated with an aqueous solution of a soap. Thus, the fibres may be immersed in a composition (an aqueous solution) containing approximately 3 parts by weight of an ammonium or alkali metal salt of a higher fatty acid, such as stearic, palmitic, or oleic, in 97 parts of water. The period of immersion should be sufficient to cause thorough impregnation of the fibres by the composition. After immersion, the fibres are separated from the excess of the soap solution, as by filtration. Unreacted soap may then be washed from the fibres by further water treatment. Finally, the treated fibres are subjected to drying, as, for example, at an elevated temperature of the order of 180° F.

The washing step, after completion of the reaction, is desirable when alkali metal soaps are used, in order to free the treated fibres of all water-soluble material. It may be omitted when an ammonium soap is used, since the ammonia component may be driven off in the final drying stage, the resulting excess fatty acid, being insoluble, acting as a waterproofing agent.

Without commitment to any theory of explanation of the invention, it should be said that the fibres of improved electrical resistance may include substantial amounts of the insoluble reaction product of a water-soluble soap with fibres of the type of reactive asbestos. During and subsequent to the impregnation, the soap of the type described and the material of the fibres presumably react to produce chiefly an insoluble water-repellent material, such as a magnesium soap, distributed over or throughout the fibres and forming an integral part thereof. In the case of crysotile asbestos, for instance, it may be assumed that some of the magnesia in a given fibre is united to the silicate of the fibres and that some of the magnesia in the same fibre is united, on the other hand, to soap radicals applied during the treatment specified. Such integrality of the water-repellent soap with the fibres gives to the product substantially uniform properties throughout a considerable mass thereof, even though the soap used may be present in very small proportion. Thus, good results have been obtained when the proportion of soap to fibres in the finished product is of the order of 3 parts by weight of the insoluble soap to 100 parts of fibres. Other proportions that may be used for some purposes are 1 to 5 parts for 100 parts of fibre.


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During the reaction of an ammonium soap with the fibres, ammonia is formed, as a by-product. The subjection of the reacted material to drying serves to expel the ammonia, dry the precipitated soap in situ, and fix the soap in the intimate association with the fibres that has been discussed above. Expulsion of ammonia leaves behind only insoluble substances.

After the treated fibres have been dried they are made into usable form in any suitable manner. Thus, the dried fibres may be separated into fluffy condition in a carding machine and formed into a roving, with conventional machines and methods. Such roving is adapted for use as an insulating wrapper around an electrical conductor such as a wire.

If the fibres in the form of yarn are to be used for electrical insulation, they may first be spun and then immersed as the yarn in a soluble soap, as described above. The immersed yarn is then removed from the solution and subjected to drying as, for example, at the temperature previously stated.

The improvement in the electrical resistance of fibres of the type of chrysotile asbestos, due to the soap treatment and subsequent drying, as described, is pronounced. In a typical test, chrysotile asbestos fibres that had not been so treated had an electrical resistance approximately of 2 megohms; similar fibres, after the treatment with 3 per cent of sodium stearate on the weight of the fibres, when tested in the same apparatus and under comparable conditions had an electrical resistance of more than 200 megohms. In each case, the fibres, before being tested, were allowed to stand for a long time in contact with the atmosphere.

The details that have been given are for the purpose of illustration, not restriction. Variations within the spirit of the invention are to be included within the scope of the appended claims.

What I claim is:

1. Electrical insulation comprising fibres of the type of chrysotile asbestos and the insoluble product of the reaction of a water-soluble soap with the said fibres, the said product being distributed substantially uniformly over the fibres.

2. Electrical insulation comprising chrysotile asbestos fibres and the insoluble reaction product of the said fibres with an aqueous solution of a soap of the type of an alkali metal stearate.

3. Electrical insulation comprising asbestos fibres and a small proportion of a water-repellent soap integral with the fibres, the proportion of soap to fibres being of the order of 3 parts by weight of soap to 100 parts of fibres.

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