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HEAT INSULATING AND FIREPROOF MATERIALS

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The present invention relates to processes for improving the fire-proof, heat insulating, and other properties of products consisting chiefly of asbestos or other magnesian silicates. The invention is more particularly concerned with products of this kind for protection against fire.

The object of the present invention is to improve these processes in such manner that the properties of the bodies that are treated, especially concerning their incombustibility, their thermal non-conductivity or low conductivity, their fluid-proof properties, and eventually their electrical non-conductivity and their rigidity, are considerably improved, in such manner that the resulting products can ensure a particularly efficient and reliable protection, for persons and objects, against fire, without these persons or objects having to suffer from noxious, toxic, corrosive, or unpleasant emanations.

According to the present invention, when it is desired to give products of the kind above referred to a more or less substantial rigidity, these products are subjected to the action of an aqueous solution of a hardening body, such as ammoniacal salts, disodium phosphates, to the action of another solidifying body, such as boric acid or its derivatives, and to the action of an agglutinating body, such as starch.

Furthermore, when it is desired to increase the fire-proof properties of products of the type above referred to, these bodies are subjected, in the cold state, to the action of a bath of an alkaline silicate to which there is added a mass, such as magnetic iron oxide or iron ochre, and a binder such as powdered graphite, this treatment in the cold state being preferably completed by a thermal treatment in an oven, when it is desired to obtain pieces that are rigid or capable of being shaped in advance.

When it is desired to improve the heat insulating properties of products of the type above mentioned, these products are treated, according to the present invention, over at least the portions thereof that are most exposed to the action of fire, with a coating of alkaline or alkali-earth salts (silicates, sulphates, carbonates, tungstates), of powdered materials (carbon, aluminium, kieselguhr, etc) and of incombustible binders (cobalt or lead linoleates, etc.). The solid particles of graphite, carbon, aluminum, improve the water-proofing qualities of the material.

Finally, when it is desired to improve the fluid-proof properties or the electrical insulation of the products and to prevent chemical emanations at high temperatures, these products are treated, over at least their most exposed portions, with a fluidtight and fire-proof coating, such as an incombustible coating (varnish), sheets of mica, or the like.

Other features of the present invention will appear from the following detailed description thereof.

The invention will be hereinafter described with more detail and specific examples thereof will explain how it can be carried out.

According to the present invention, the starting material consists of magnesium or calcium silicate (asbestos), of hydrated magnesium silicate (Canadian asbestos or chrysotile) or of any other mineral matter of similar nature possessing fire-proof and heat insulating properties. These products are utilized after their fibres, particles, powders, etc., are agglomerated in the usual manner, so that they are in the form of plates, bands, fabrics, or pieces of any desired shape and size.

It will first be assumed that it is desired to give the final product a certain rigidity, by eliminating the flexibility or natural deformability of the initial product, which is generally necessary for industrial applications of asbestos.

For this purpose, the materials to be treated are caused to remain, for the necessary period of time, as one hour for example, in a cold aqueous solution of a hardening material, such as ammonium sulphate, or disodium phosphate, to which ammonium carbonate may be added, either with or without the presence of an alum, such as aluminium and potassium double sulphate. These products improve, through impregnation and after drying, the hardening of the mass by filling the pores thereof and forming therein crystals, of a well defined nature and of suitable size in order that they may adhere strongly to the fibres of the product.

To the salts above mentioned there is advantageously added, another solidifying body, consisting for instance of boric acid and/or of borates, which possesses analogous properties, and also an agglutinating body, such as starch, which improves the adhesion.

Three examples of baths for the treatment of products according to the present invention are hereinafter given, which specific baths have proved to be very satisfactory in certain cases. But it should be well understood that the proportions that are set forth have no limitative character but can be modified within wide limits, according to the nature of the products that are treated, to the degree of rigidity that it is desired

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to obtain, and to the particular application for which the final product is intended.

Example I

In 100 parts in weight of water, there are dissolved 25 parts of ammonium sulphate, 5 parts of boric acid, and 1 part of starch, and the product is caused to remain in the cold solution for the necessary period of time.

Example II

In 100 parts in weight of water there are dissolved 7 parts of ammonium sulphate, 6 parts of alum, 3 parts of boric acid and 1 part of starch, and the product is caused to remain in the cold solution for the necessary period of time.

Example III

In 100 parts in weight of water, there are dissolved 9 parts of ammonium sulphate, 3 parts of ammonium carbonate, 2 parts of boric acid, 1 part of an alkaline borate, and 1 part of starch. The product is caused to remain in the cold solution thus obtained for the necessary period of time.

According to the more or less degree of rigidity that it is desired to obtain, the dilution of the bath will be increased or reduced, and, as above stated, the preceding treatment can be wholly omitted if it is advantageous or necessary not to increase the rigidity of the final product.

If it is desired to improve the fire-proof properties of the initial product or of a product treated as above stated, the following treatment should be utilized.

The products are immersed, in the cold state, into a bath including, on the one hand, an alkaline silicate, such as sodium silicate (38° Bé.) and/or potassium silicate (38° Bé.) more or less diluted with water or ammonium sulphate, said bath also including a mass such as magnetic iron oxide or red iron ochre (silica-ferric oxide-alumina), said bath also including a binder consisting of finely powdered graphite. The product is caused to remain in the bath, for about one hour for example, said bath being constantly stirred so as to keep it homogeneous. Among the materials present in the bath, the alkaline silicate chiefly fulfills the function of a fire-proofing product or ingredient, while further giving a certain rigidity to the asbestos. The alumina present in red iron ochre also fulfills this function.

A bath of this kind, containing about 50 parts by weight of alkaline silicate, about 45 parts in weight of magnetic oxide or of red iron ochre and about 5 parts by weight of graphite, has given very satisfactory results, but it should be well understood that the proportions above set forth have no limitative character and may be modified.

When the pieces thus treated are capable of preserving their shape, for instance the shape of a plate or the like, it is advantageous to subject the product, after drying, to a thermal treatment, for about one hour, in an oven heated for example at a temperature of 300–600° C., or even more. Any suitable precautions are taken for preventing deformation (warping) of the pieces during this thermal treatment, for example by heating slowly and intercalating smooth metallic plates between the pieces. When the pieces are taken from the oven, they can be immediately fixed in position or utilized in any other way since the subsequent treatments do not necessitate their being immersed in a bath or being treated in an oven. When the pieces are to be subjected to a substantial shaping treatment, as for example when they are to be moulded in the moist state so as to give them a substantial curvature, or when they are to be applied upon supports of complicated shape or very different from the planar shape, it is preferable not to subject them to the thermal treatment, which gives them too much rigidity.

In order to improve the heat insulating properties of the product, the most exposed parts of the piece, or the whole of its surface, may be treated with a coating (after, or eventually before, the thermal treatment) consisting of a pasty mixture including, on the one hand, alkaline or alkali-earth salts such as sodium silicate, barium sulphate, calcium carbonate, trisodium sulphate, neutral sodium tungstate, ammonium and magnesium phosphate, etc., on the other hand a mass comprising finely divided carbon, aluminium powder, kieselguhr or infusorial earth (tripoli), and finally an incombustible binder, such as cobalt or lead linoleate. Eventually, suitable pigments or colorants can be added to this mass.

Hereinafter is given, by way of non-limitative example, the composition of such a coating:

Silicate of sodium----	about 65 parts by weight
Barium sulphate-----	about 10 parts by weight
Calcium carbonate---	about 10 parts by weight
Carbon ----------	about 2 parts by weight
Powder of alumina--	about 7 parts by weight
Cobalt linoleate------	about 3 parts by weight

A paste of this kind can furthermore be utilized with advantage as a kind of putty for protecting the joints of metallic pieces, and in particular those provided for the assembling of metallic partitions of tanks, safes, cabins, etc., by being applied directly on said joints. Such a paste is also well adapted to be used as a heat insulating filling material for recesses that are of complicated shape or difficult to reach.

When it is desired to prevent chemical emanations resulting from the action of a high temperature (although the emanations that be produced, especially after the thermal treatment, are not in any way noxious or toxic, owing to the material that is employed, and may only be disagreeable) when it is desired to protect the pieces against the action of the effects of bad weather, of the moisture present in the atmosphere, of salt water, etc., and when it is desired to obtain a good preservation of the pieces, at least some of the parts of said pieces may be treated with a fluidtight and incombustible coating.

Such a coating may for instance consist of a fluidtight and fireproof varnish, such as sold on the market (for instance a fatty varnish treated with ammonia or ammonium acetate), or sheets of mica. It should be noted that such a coating, especially when it contains mica, greatly increases the electricity insulating properties of the product, which in some cases advantageously completes the protective properties of the materials that are utilized.

Concerning the mounting of the panels, pieces or articles made chiefly of asbestos which have been subjected to one or more of the treatments above described, it should be noted that when several plates or panels are to be juxtaposed, it is generally advantageous to leave between these pieces intervals through which air can circulate, said pieces being suitably held relatively to one another by means of incombustible parts.

The various pieces can then be assembled together in any suitable manner, eventually by

means of the paste above referred to, so as to protect the joints and to fill the interstices.

Pieces consisting chiefly of asbestos or any other analogous mineral fibrous matter which have been treated as above described possess considerably improved heat insulating, fire-proofing, and other qualities and can be employed with advantage whenever it is desired to protect persons, objects or valuable documents, combustible, explosive, or inflammable matters, etc. against the action of fire, even when very strong, without any risk of the protecting elements being destroyed, even partly, or becoming sufficiently good conductors of heat for reducing the protection afforded to the objects.

What I claim is:

1. A method of treating asbestos products by subjecting same to a bath containing ammonium sulphate, alum, boric acid, and starch, drying the material, and then surface coating such material with an alkaline silicate having in suspension therein finely powdered graphite.

2. A method of treating asbestos products by subjecting same to a hardening bath by which the pores of the asbestos are filled with a mixture of mineral and colloidal material, and then applying a surface to said asbestos products comprising an alkaline silicate in which a fine mineral powder is suspended.

3. A method of treating asbestos products by subjecting same to a bath containing ammonium sulphate, boric acid, and starch, then applying a surface coating to said material by subjecting same to a mixture of liquid sodium silicate having in suspension therein finely powdered magnetic iron oxide.

4. A method of treating asbestos products by subjecting same to a bath in the cold state of an alkaline silicate in combination with finely powdered magnetic iron oxide, drying the material and then surface coating the material with a fireproofing composition.

5. A method of treating asbestos products by subjecting same to a bath in the cold state of an alkaline silicate in combination with finely powdered magnetic iron oxide, drying the material and then surface coating the material with a fireproofing composition containing a mixture of barium sulphate, sodium tungstate, and a phosphate.

6. A process of treating asbestos products by subjecting same in the cold to a hardening bath containing ammonium sulphate and a finely powdered mineral, drying and heating said products and then surface coating said products with a fireproofing composition.

7. A process of treating asbestos products by subjecting same in the cold to a hardening bath containing ammonium sulphate and a finely powdered mineral, drying and heating said products and then surface coating said products with a fireproofing composition comprising alkaline salts.

8. A method of treating asbestos products which consists in subjecting same to a bath of an aqueous solution of a silicate, a finely divided iron oxide, and graphite.

9. A method of treating asbestos products which consists in subjecting same to a bath of an aqueous solution of a silicate, a finely divided iron oxide, and graphite, and then surface coating the material with a fireproofing composition.

10. A method of treating asbestos products by subjecting same to the action in the cold of a solution of a sodium silicate having in suspension therein magnetic iron oxide and graphite, drying and heating the material and then surface coating the material with a fireproofing composition.

11. A method of treating asbestos products by subjecting same to the action in the cold of a solution of a sodium silicate having in suspension therein magnetic iron oxide and graphite, drying and heating the material and then surface coating the material with a fireproofing composition consisting of a solution of the alkalis of the alkaline earths.

12. An asbestos product comprising asbestos materials impregnated with a mixture of sodium silicate, powdered magnetic iron oxide, and powdered graphite, and having a surface coating of fireproofing composition thereon.

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