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PROCESS OF MAKING HEAT INSULATING BODIES

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This invention relates to insulating bodies and process of making the same and is particularly useful in the manufacture of boards or slabs of heat insulating material.

The heat insulating value of a material depends upon its density and upon the number of small air cells which it contains. Many fibrous materials, such as mineral wool, cellulose fibres and the like have been used for making insulating bodies, but it has been necessary to add a binding material so as to cement the fibres together and give strength to the board. The binder fills the voids, thus increasing the density of the board and materially reducing its insulating properties.

We have found that a heat insulating body may be made from a mass of material, such as a suitable fibre, by mixing it with a binder in a solvent or a mixture of solvents, and effecting evaporation of the solvent or solvents. During the evaporation of the solvent or solvents, the binder is carried toward the surface of the body so that the product has a strong and hard exterior shell while the interior remains soft, light and full of minute air cells. The shell may act as a water or fire retarding coating. The insulating body thus formed has the double advantage of being a good insulating material because of its internal structure, and of possessing long life because of the resistant qualities of its exterior surface.

Generally stated, the process of manufacture comprises adding to the body material a solution of a suitable binder in such concentration that while the solvent is being evaporated, the binding material comes to the surface to a greater or less degree. This results in the formation of a hard exterior coating on the softer interior of the board. The thickness of the coating and its density may be regulated at will by controlling the temperature at which the material is dried, the concentration of the solution of binder and the kind of solvent or mixture of solvents in which the binder is dissolved.

The invention is particularly useful in making boards or slabs of insulating material, the non-uniform distribution of the binder in the mass of body material resulting in the formation of a board having hard and dense sides and edges and a soft core of high insulating properties. Such boards may be made of any desired size and for house insulating may be nailed to the framing in the condition they are received from the factory.

A specific illustration of our method follows:—

Ten gallons of a 20% solution of asphalt in naptha was placed in a suitable mixer and to this was added two and one-half pounds of mineral wool. The mineral wool was thoroughly mixed in the solution. The excess solution was removed in a suction mold and the body thus formed in the mold was taken therefrom and dried at a temperature sufficient to volatilize the solvent. The excess solution removed in the suction mold may be returned to the mixer and used for the treatment of further quantities of mineral wool.

The relative density of the shell and the center of the board may be varied. Quick drying gives a board with a very porous and fluffy center while slow drying causes a more uniform final distribution of the binder. In either case, however, the board has a relatively hard shell and soft center.

In the above recited example, the distribution of the binder in the mass is indicated by the relative color of the shell and the center. If the board is quickly dried, the shell is dark and the center is very light in color, thus showing that practically all of the asphalt has been carried to the outer portions of the board. This is particularly true if naphtha is used as a solvent. Where the solvent is naptha and kerosene or kerosene alone, the color distribution is more uniform.

Body materials other than mineral wool

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may be employed. Fibrous materials are particularly useful. These may either be inorganic fibres, such as mineral wool or asbestos, or organic fibres. Other solvents and binders may be used. The following are examples of binders and solvents which have been found satisfactory:

(*a*) Nitrocellulose lacquer-amyl acetate as chief solvent

(*b*) Varnish—alcohol or turpentine as chief solvent

(*c*) Wax tailings—naptha as solvent

(*d*) Stearine pitch—naptha as solvent

The fiber is generally mixed with an excess of solution. This is desirable as it insures thorough mixing. The excess solution may be removed in the mold or by means of a centrifuge or other means. For continuous production of insulating board a machine of the Fourdrinier type may be used and the excess solvent taken off when the mix is on the wire. The excess solvent therefore may be removed either before or during the molding step.

The invention permits of making insulating bodies at a low labor cost and permits of using relatively inexpensive materials.

We have described a preferred embodiment of the invention and certain modifications thereof. It will be understood, however, that it is not limited to the materials or to the sequence of steps described, as it may be otherwise embodied or practiced within the scope of the following claims.

We claim:—

1. The process of making bonded heat insulating bodies having greater concentration of binder at the surface than at the interior, which comprises forming a body of insulating material impregnated with a binder in solution in a volatile solvent, and evaporating the solvent from the body, the solvent being initially present in sufficient amount and the rate of evaporation being sufficiently rapid to draw a part, at least, of the binder from the interior toward the surface.

2. The process of making bonded heat insulating bodies having unequal distribution of binder therein, which comprises forming a body of insulating material impregnated with a binder in solution in a volatile solvent, and evaporating the solvent from the body at the portion thereof where it is desired to have the greater concentration of binder, the solvent being initially present in sufficient amount and the rate of evaporation being sufficiently rapid to draw a part, at least, of the binder from the other portions of the body toward such portion.

3. The process of making bonded heat insulating bodies which comprises mixing heat insulating material with a binder in liquid solution in a relatively large amount of a volatile solvent and shaping the body therefrom and evaporating the solvent from the body with sufficient rapidity to draw the dissolved binder from the interior to the surface, whereby the body is formed with a relatively open porous interior and a relatively hard dense surface.

4. The process of making bonded heat insulating bodies, which comprises mixing a body material with a binder in liquid solution in a volatile solvent and shaping the mass to form the body, and applying heat to effect a sufficiently rapid evaporation of the solvent to transfer a considerable portion of the dissolved binder from the center to the exterior of the body to form a body having a relatively open porous interior and a relatively hard dense exterior.

5. The process of making bonded heat insulating bodies, which comprises forming a mix containing a fibrous material and a binder dissolved in a volatile solvent and molding the article from such mix, and thereafter evaporating the solvent from the molded body, the solvent being initially present in sufficient amount and the rate of evaporation being sufficiently rapid to draw enough of the dissolved binder from the interior to the surface of the body to produce a relatively open porous interior and a relatively hard dense surface.

6. The process of making bonded heat insulating bodies, which comprises forming a body containing a fibrous material and a binder in solution in a volatile solvent distributed therein, and evaporating the solvent from the body, the solvent being initially present in sufficient amount and the rate of evaporation being sufficiently rapid to transfer a considerable portion of the dissolved binder from the interior of the body to its surface and deposit such transferred binder at the surface so as to produce a surface layer considerably more compact and dense than the material at the interior of the body.

7. The process of making a heat insulating unit, which comprises mixing mineral fibers with a binder in liquid solution in a volatile solvent, shaping the mass, evaporating the solvent with sufficient rapidity to withdraw a substantial portion of the dissolved binder from the interior of the unit to its surface, whereby the unit is formed with a relatively open porous interior and a relatively hard dense surface.

In testimony whereof we have hereunto set our hands.

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