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METHOD OF SURFACE-BONDING FIBROUS
BATTS

Camille Dreyfus, New York, N. Y.

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This invention relates to the preparation of batting materials having a basis of staple fibers, and relates more particularly to an improved process for the production of batting materials from staple fibers having a basis of a thermoplastic material.

An object of this invention is the provision of an improved process for the production of batting materials, having a basis of thermoplastic staple fibers, in the form of a firm, easily-handled and coherent web.

Another object of this invention is the production of staple fiber batting materials in a rapid, continuous and economical manner.

Other objects of this invention will appear from the following detailed description.

Batting materials of staple fibers worked up to the form of a continuous web make excellent insulation. In relatively substantial thicknesses, they may be employed as structural insulation and in a much thinner form serve as interlining materials for various types of garments. One difficulty inherent in the use of said fibrous batting materials is that their fibrous nature does not make for a sufficiently coherent structure to prevent the batting materials from shredding or separating, thus causing their continuity to be lost when handled. By suitable stitching, the batting materials may be reinforced so that a more stable, coherent structure is obtained.

Alternatively, where thermoplastic staple fibers form all or part of the batting material, the latter may be subjected to some form of heat treatment to produce the coalescence of at least a portion of the thermoplastic staple fibers, thereby rendering the structure of the batting material so treated more coherent. A relatively high temperature is usually necessary, however, to produce a satisfactory degree of melting or softening. In the case of thermoplastic fibers, and particularly those having a basis of cellulose acetate or other organic derivative of cellulose, for example, the temperature necessary to cause a reasonably rapid coalescence of the fibers is usually about 250° C., or more.

I have now found that heat treatments designed to yield a more coherent structure in batting materials made of or containing staple fibers having a basis of a thermoplastic material by the coalescence of at least a portion of the thermoplastic staple fibers contained therein may be effected at considerably lower temperatures. In accordance with my novel process this advantageous result may be obtained if water, in the form of a finely divided spray, is applied to said

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thermoplastic staple fiber batting materials and the so-wetted fibers then subjected to the desired heat treatment as, for example, by passing the same between heated calender rolls. Thus, with the aid of water alone, the use of expensive organic plasticizing agents is eliminated and an excellent degree of coalescence is obtained at lower temperatures.

For the preparation of the batting materials of staple fibers there may be employed any standard carding machine having a standard batting attachment in combination therewith, as is well known in the art. The batting attachment may comprise a carrier apron on to which the webs from the carding machine are placed in sufficient depth to produce a batting material of the desired thickness. The batting material thus formed is then carried through compression rollers, sprayed with the desired quantity of water and heat is then applied to cause the thermoplastic staple fibers contained therein to undergo the desired degree of coalescence.

The amount of water placed on the batting material may vary, but I have found that from 25 to 150%, based on the weight of the staple fibers, of water placed on the batting material yields satisfactory results. Optimum results are achieved, however, when the quantity of water on the batting material amounts to about 100% by weight. Preferably, the water placed on the batting material is applied on the surfaces thereof in the form of a finely atomized spray which may be produced by forcing water under pressure through a series of suitable nozzles placed above and below the batting so that the water is applied uniformly thereto. The water may be satisfactorily atomized employing air pressures between 5 to 20 pounds per square inch and water pressures of about up to 5 pounds per square inch.

Most advantageously the heating means employed comprises a pair of calender rolls heated to a temperature of from 150 to 190° C. The watered batting material is passed between said rolls at a rate of from 10 to 20 feet per minute, although higher or lower speeds may be employed. Usually the calender rolls are adjusted so that there is a slight clearance therebetween to prevent excessive flattening of the batting material as it is coalesced. In this way the coalescence of the thermoplastic staple fibers is controlled and takes place substantially at the surface of said batting material.

Any convenient method of heating the calender rolls may be employed such as, for example,

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steam, gas heat or electrical resistance coils, with proper thermostatic controls being employed to avoid any overheating of the rolls. After being formed, the continuous finished batting material with the surfaces thereof coalesced to yield a strong unitary structure may then be cut in any desired manner into suitable lengths or suitable shapes for any desired purpose. Where a continuous batting material is desired the cutting operation may be eliminated.

While the thermoplastic fibers employed preferably may comprise any organic derivative of cellulose as, for example, cellulose esters such as cellulose acetate, cellulose propionate and cellulose butyrate, mixed esters such as cellulose acetate-propionate and cellulose acetate-butyrate, and cellulose ethers such as ethyl cellulose and benzyl cellulose, fibers of other thermoplastic materials may also be employed. Examples of such other thermoplastic materials are synthetic linear polyamide condensation products, polymeric vinyl halides such as polyvinyl chloride or copolymers of vinyl chloride and vinyl acetate, polymerized vinylidene chloride, polymerized methacrylic acid esters such as polymerized methyl methacrylate and the like. Fibers of other materials which are not thermoplastic may also be mixed with the thermoplastic materials and examples of such non-thermoplastic materials are cotton, silk, wool, regenerated cellulose, jute, hemp, asbestos fibers and like materials.

In order further to illustrate my invention but without being limited thereto, the following example is given:

Example

Cellulose acetate staple fiber of about 3 denier per filament is put through a standard carding machine and formed into a batting 40 inches wide, weighing about 4 ounces per running yard. The batting is sprayed with water on both surfaces simultaneously, employing suitably placed atomizers, the amount of water applied being about 100% by weight of the batting. The wetted batting is then passed through calender rolls heated to a temperature of 160° C., the rolls being adjusted so that there is a clearance of about 0.3 inch therebetween. The wetted batting is passed through the calender rollers at a speed of about 15 feet per minute. The action of the heated rolls at this low temperature produces an excellent degree of surface coalescence. The batting produced has a firm coherent and unitary structure which is strongly resistant to shredding or separating when handled.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of a thermoplastic material, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of a thermoplastic material, applying water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface whereby at least a portion of the thermoplastic staple fibers at the surfaces only of the batting material are softened and coalesced.

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2. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of an organic derivative of cellulose, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of an organic derivative of cellulose, applying water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface whereby at least a portion of the organic derivative of cellulose staple fibers at the surfaces only of the batting material are softened and coalesced.

3. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of cellulose acetate, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of cellulose acetate, applying water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface whereby at least a portion of the cellulose acetate staple fibers at the surfaces only of the batting material are softened and coalesced.

4. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of a thermoplastic material, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of a thermoplastic material, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the combined action of heat and pressure whereby at least a portion of the thermoplastic staple fibers at the surfaces only of the batting material are softened and coalesced.

5. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of an organic derivative of cellulose, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of an organic derivative of cellulose, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the combined action of heat and pressure whereby at least a portion of the organic derivative of cellulose staple fibers at the surfaces only of the batting material are softened and coalesced.

6. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of cellulose acetate, which comprises forming a batting of interlaced and matted unplasticized staple fibers at least a portion of which fibers have a basis of cellulose acetate, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the combined action of heat and pressure whereby at least a portion of the cellulose acetate staple fibers at the surfaces only of the batting material are softened and coalesced.

7. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of a thermoplastic

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material, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of a thermoplastic material, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface at a temperature of 150 to 190° C. whereby at least a portion of the thermoplastic staple fibers at the surfaces only of the batting material are softened and coalesced.

8. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of an organic derivative of cellulose, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of an organic derivative of cellulose, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface at a temperature of 150 to 190° C. whereby at least a portion of the organic derivative of cellulose staple fibers at the surfaces only of the batting material are softened and coalesced.

9. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of cellulose acetate, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of cellulose acetate, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the action of a heated surface at a temperature of 150 to 190° C. whereby at least a portion of the cellulose acetate staple fibers at the surfaces only of the batting material are softened and coalesced.

10. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of a thermoplastic material, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of a thermoplastic material, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the pressure of a surface heated to a temperature

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of 150 to 190° C. whereby at least a portion of the thermoplastic staple fibers at the surfaces only of the batting material are softened and coalesced.

11. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of an organic derivative of cellulose, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of an organic derivative of cellulose, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the pressure of a surface heated to a temperature of 150 to 190° C. whereby at least a portion of the organic derivative of cellulose staple fibers at the surfaces only of the batting material are softened and coalesced.

12. Process for the preparation of coherent batting materials having their surfaces coalesced to yield a strong unitary structure and containing staple fibers having a basis of cellulose acetate, which comprises forming a batting of interlaced and matted unplastized staple fibers at least a portion of which fibers have a basis of cellulose acetate, applying 25 to 150% by weight of water to the surfaces thereof, and then subjecting the wetted batting material to the pressure of a surface heated to a temperature of 150 to 190° C. whereby at least a portion of the cellulose acetate staple fibers at the surfaces only of the batting material are softened and coalesced.

CAMILLE DREYFUS.

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