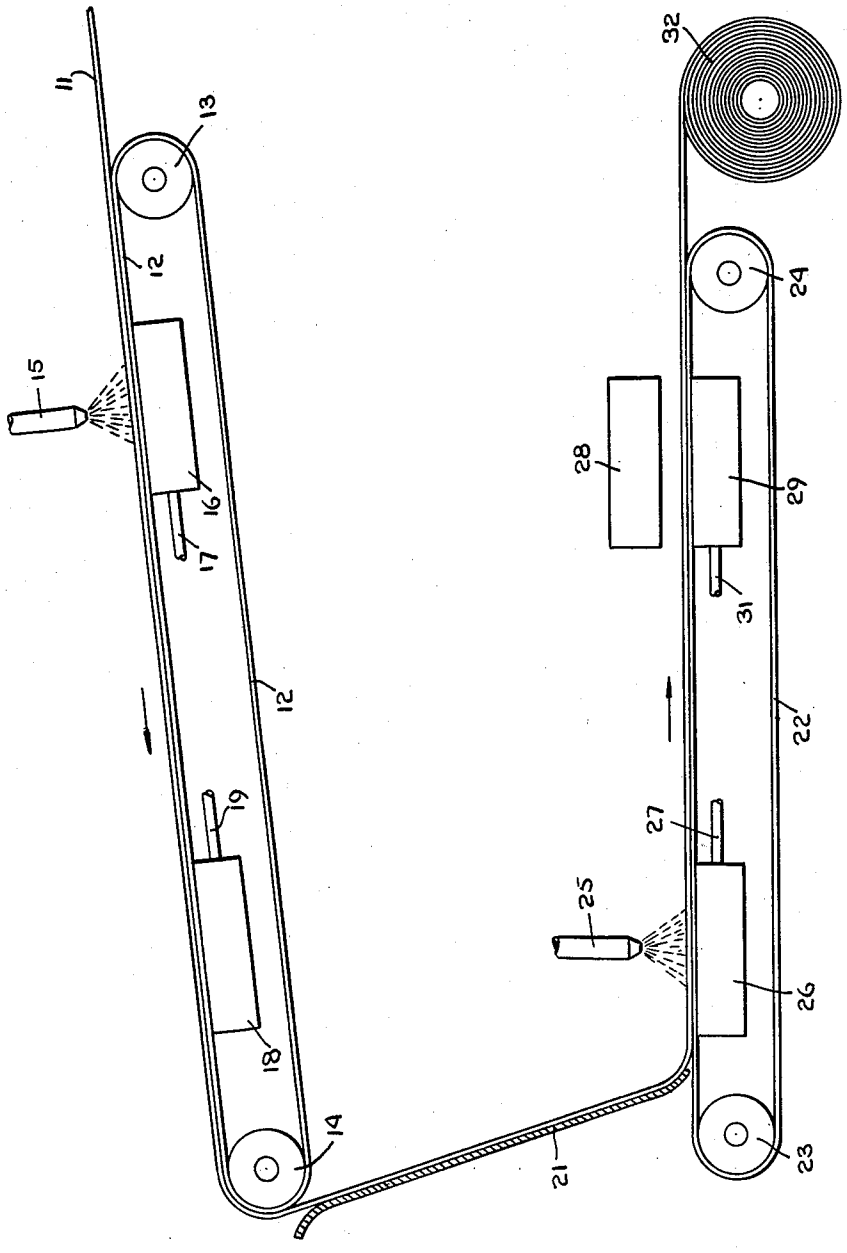
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BATTING MATERIAL AND PROCESS FOR PRODUCING SAME

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BATTING MATERIAL AND PROCESS FOR PRODUCING SAME

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This invention relates to batting materials and relates more particularly to an improved process and apparatus for the production of batting materials having a strong, coherent structure.

Batting materials formed from staple fibers are useful, among other things, as insulation and as reinforcing for plastics or the like. To be suitable for these purposes, the batting materials should bave a strong, coherent structure so that they may be readily handled during their manufacture, fabrication and final use. At the same time, the batting materials should retain to the maximum degree possible their relatively loose porous structure so that their insulating properties will not be impaired.

It is an important object of this invention to provide a process and apparatus for the production of batting materials having a strong, coherent structure which will fulfill the foregoing requirements.

A further object of this invention is to provide a process and apparatus for the production of batting materials having a strong, coherent structure by spraying a batting of staple fibers with a solvent therefor while the batting is in an uncompressed state.

Other objects of this invention will be apparent from the following detailed description and claims.

According to the present invention, a batting material having a strong, coherent structure is prepared by forming a batting of staple fibers. There is then sprayed or otherwise applied to one surface of the batting, while the batting is in an uncompressed state, a volatile substance having solvent action on the staple fibers, preferably, while suction is applied to the opposite surface of the batting to draw the solvent and solvent vapors through the body of the batting. Following this treatment, there is sprayed onto the previously untreated surface of the batting, while the batting is in an uncompressed state, a volatile susbtance having solvent action on the staple fibers, preferably, while suction is applied to the opposite surface of the batting to draw the solvent and solvent vapors through the body of the batting. Finally, a current of heated air or other gas may be drawn through the body of the batting to remove the residual solvent therefrom. The solvent causes the staple fibers to coalesce or bond one to the other at their points of contact. This coalescence is at a maximum at the surfaces of the batting, and decreases gradually toward the interior thereof. As a result, the batting will be strong and coherent and may be readily handled without shredding or tearing. At the same time, the insulating powers of the batting will be high since the batting is not compressed and a high proportion of the staple fibers in the interior of the batting will not be coalesced or bonded together. Moreover, the surface of the batting will be free from projecting fibers. This, combined with the strength of the batting, permits the batting of this invention to be readily rolled for storage and shipping. The batting shows little or no tendency to shed during use. The batting, particularly when it has been stitched, can be

washed without damaged and does not ball up during the washing operation. Since the batting contains no foreign materials, such as adhesives and the like, it will retain unimpaired all the properties of the staple fibers. The batting material prepared in this manner, is, therefore, well suited, among other things, for use as insulation and as reinforcing for plastics.

This invention is generally applicable to the treatment of batting materials formed from staple fibers of various kinds for which volatile solvents are available, including, for example, staple fibers of polyamides such as polyhexamethylene adipamide and polyamino-caproic acid, polyesters such as polyethylene terephthalate, polyurethanes, polyaminotriazoles, an polymers and copolymers of vinyl chloride such as vinyl chloride-vinyl acetate copolymers. It is eminently suited for the treatment of batting materials of staple fibers, of organic derivatives of cellulose, including, for example, celulose acetate, cellulose, propionate, cellulose butyrate, cellulose acetate formate, cellulose acetate propionate, cellulose acetate butyrate, cellulose benzoate, and ethyl cellulose. The staple fibers are advantageously crimped prior to being incorporated into the batting materials to increase the resiliency of the batting and also to improve the bonding of the staple fibers to one another.

The staple fibers are converted into the batting in any suitable manner. They may, for example, be carded to form a batting in which the staple fibers are arranged in a generally parallel fashion. The staple fibers may also be carried in a current of air onto a foraminous surface where they will settle in a random manner. The batting formed in these or any other ways is preferably directed continuously to a suitable apparatus for applying the treatment of this invention, following which the batting may be taken up in the form of a roll, or the like.

Any substances possessing a solvent power for the staple fibers of which the batting is formed and which are volatile at normal or elevated temperatures may be employed for carrying out the process of this invention. In the case of organic derivative of cellulose staple fibers suitable solvents include acetone, chlorinated hydrocarbons either alone or in admixture with lower aliphatic alcohols, and the like.

The drawing shows a preferred form of apparatus for carrying out the invention.

Referring now to the drawing, the reference numeral **11** designates a batting of staple fibers which is drawn from any source, not shown, and deposited on an endless foraminous belt **12**, trained around the rolls **13** and **14**. The belt **12**, which is driven in any suitable manner, carries the batting **11** under a nozzle **15** from which a spray of a solvent for the staple fibers in the said batting is directed toward said batting. Positioned below the foraminous belt **12** at a point opposite the nozzle **15** is a suction box **16** which is connected by means of a conduit **17** to the suction of a pump, or the like. The suction causes a current of air carrying the solvent and solvent vapors in the spray emerging from the nozzle **15** to be drawn through the body of the batting **11** and the foraminous belt **12**. Belt **12** then carries the batting **11** over a second suction box **18** which is connected by means of a conduit **19** to the suction side of a pump, or the like. The suction box **18** draws a stream of air through the batting **11** and the foraminous belt **12** and thereby removes from the batting the major portion of the residual solvent and solvent vapors present therein so that the treated surface of the batting will not be tacky.

When the batting **11** reaches the end of the foraminous belt **12**, it drops onto a plate **21** which directs the said batting onto an endless foraminous belt **22**, with the previously untreated surface of the batting **11** facing upward away from the said belt. The foraminous belt **22** is

trained around rolls 23 and 24 which are driven in any suitable manner so as to cause the said belt to carry the batting 11 under a nozzle 25 from which a spray of solvent for the staple fibers in said batting is directed toward the upper surface of said batting. Positioned below the foraminous belt 22 at a point opposite the nozzle 25 is a suction box 26 which is connected by means of a conduit 27 to the suction side of a pump or the like. The suction box 26 causes a stream of air carrying the solvent and solvent vapors emerging from the nozzle 25 to be drawn through the batting 11 and the foraminous belt 22. The said belt then carries the batting 11 between a heating device or radiator 28 and a suction box 29 which is connected by means of a conduit 31 to the suction side of a pump or the like. The suction box 29 draws a stream of air over the radiator 28 where it is heated and then through the batting 11 and the foraminous belt 22 to remove from the said batting all the residual solvent and solvent vapors present therein. Finally, the treated batting is taken up in the form of a roll 32.

The solvent vapors entering the conduits 17, 19, 27, and 31 are preferably sent to a suitable solvent recovery system wherein they are recovered for further use.

The following example is given to illustrate this invention further.

Example

One surface of 3 oz. per square yard batting formed of crimped cellulose acetate staple fibers 2 inches long and having a denier of 3 is sprayed with acetone in the apparatus shown in the accompanying drawing. After passing through the first portion of the apparatus, the batting is turned over and its second surface is sprayed with acetone and passed through the last portion of the apparatus and taken up in the form of a roll.

The treated batting is strong and coherent and is eminently suited for use as insulation, plastic reinforcing and the like.

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

Having described our invention, what we desire to secure by Letters Patent is:

1. Process for the production of batting materials, which comprise applying onto one surface of a batting of staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, applying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers, and applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

2. Process for the production of batting materials, which comprises spraying onto one surface of a batting of staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, spraying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers, and applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

3. Process for the production of batting materials, which comprises spraying onto one surface of a batting of crimped staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, spraying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers, and applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

4. Process for the production of batting materials, which comprises spraying onto one surface of a batting of staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, spraying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, and passing a current of heated air through the batting to remove residual solvent and solvent vapors therefrom, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

5. Process for the production of batting materials, which comprise applying onto one surface of a batting of cellulose acetate staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers, applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, applying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers, and applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

6. Process for the production of batting materials, which comprises spraying onto one surface of a batting of cellulose acetate staple fibers while the batting is in an uncompressed state a volatile solvent for the staple fibers without thoroughly impregnating the batting, ap-

plying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, spraying onto the previously untreated surface of the batting while the batting is in an uncompressed state a volatile solvent for the staple fibers without thoroughly impregnating the batting, and applying suction to the surface of the batting opposite the solvent-treated surface to draw solvent and solvent vapors through the body of the batting, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said solvent and the amount and duration of the solvent treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

7. Process for the production of batting materials, which comprises spraying acetone onto one surface of a batting consisting essentially of crimped cellulose acetate staple fibers while the batting is in an uncompressed state, applying suction to the surface of the batting opposite the acetone-treated surface to draw acetone and acetone vapors through the body of the batting, and passing a current of heated air through the batting to remove residual acetone and acetone vapors therefrom, the material of said fibers being such that said fibers coalesce and bond one to the other on treatment with said acetone and the amount and duration of the acetone treatment being such that the proportion of said fibers coalesced to one another is at a maximum at the surfaces of the batting and decreases gradually toward the interior thereof with a high proportion of the fibers in the interior of the batting not being coalesced.

8. A non-woven coherent batting of staple fibers coalesced one to the other at their points of contact, the proportion of said fibers coalesced to one another being at a maximum at the surfaces of the batting and decreasing gradually toward the interior thereof, a high proportion of the fibers in the interior of the batting not being coalesced.

9. A non-woven coherent batting of cellulose ester staple fibers coalesced one to the other at their points of contact, the proportion of said fibers coalesced to one another being a maximum at the surfaces of the batting and decreasing gradually toward the interior thereof, a high proportion of the fibers in the interior of the batting not being coalesced.

10. A non-woven batting as defined in claim 9, wherein the surfaces of said batting are free from projecting fibers.

11. A non-woven batting as defined in claim 9, wherein said staple fibers consist essentially of crimped cellulose acetate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,338,624	Heppes	Apr. 27, 1920
1,773,968	Dreyfus	Aug. 26, 1930
2,065,892	Hanley	Dec. 29, 1936
2,341,130	Unsworth	Feb. 8, 1944
2,478,148	Wilson	Aug. 2, 1949
2,501,979	Wood	Mar. 28, 1950
2,543,101	Francis	Feb. 27, 1951

FOREIGN PATENTS

704,610	Great Britain	Feb. 24, 1954