

July 30, 1968

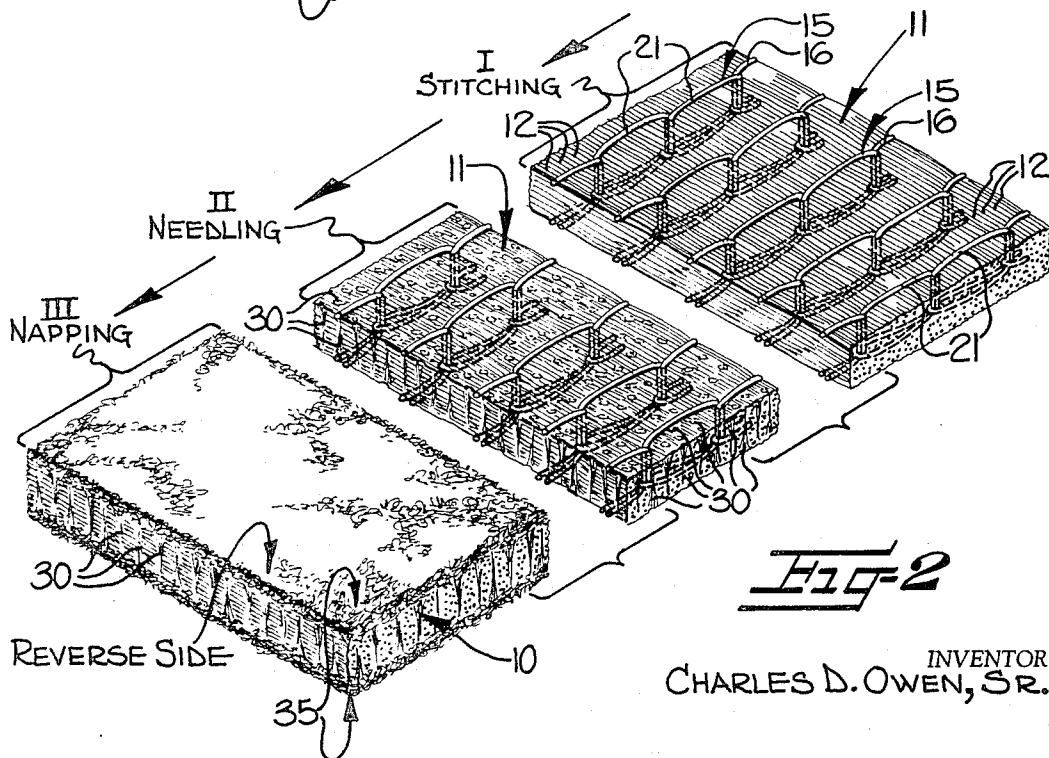
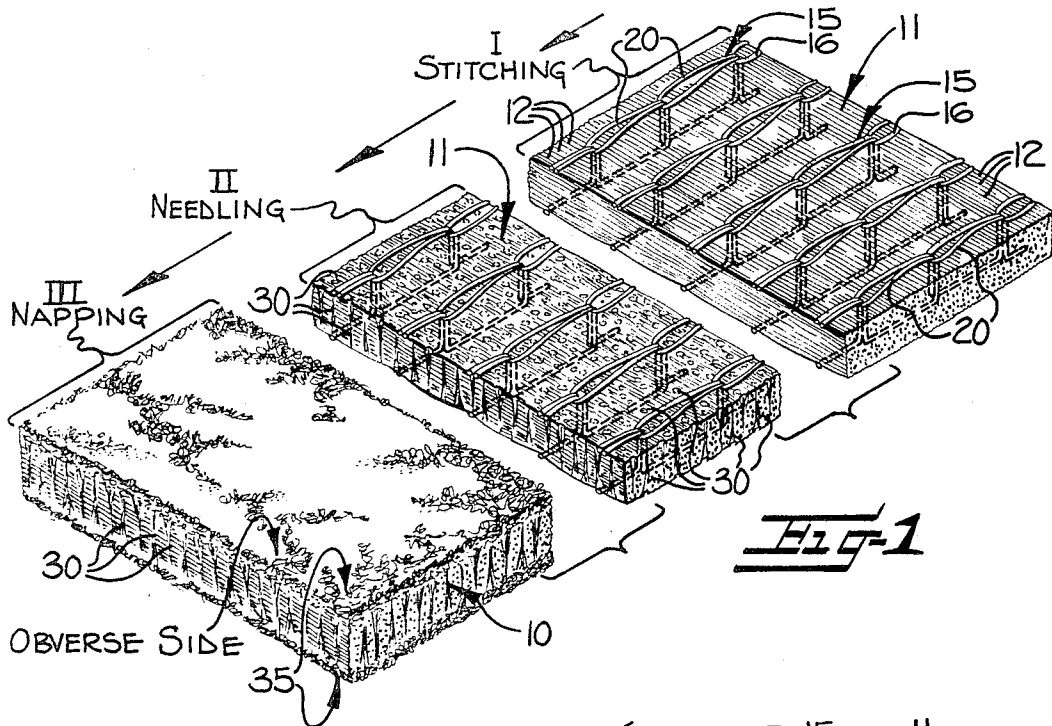
C. D. OWEN, SR

3,395,065

NON-WOVEN BLANKET FABRIC AND METHOD

Filed Oct. 6, 1967

2 Sheets-Sheet 1



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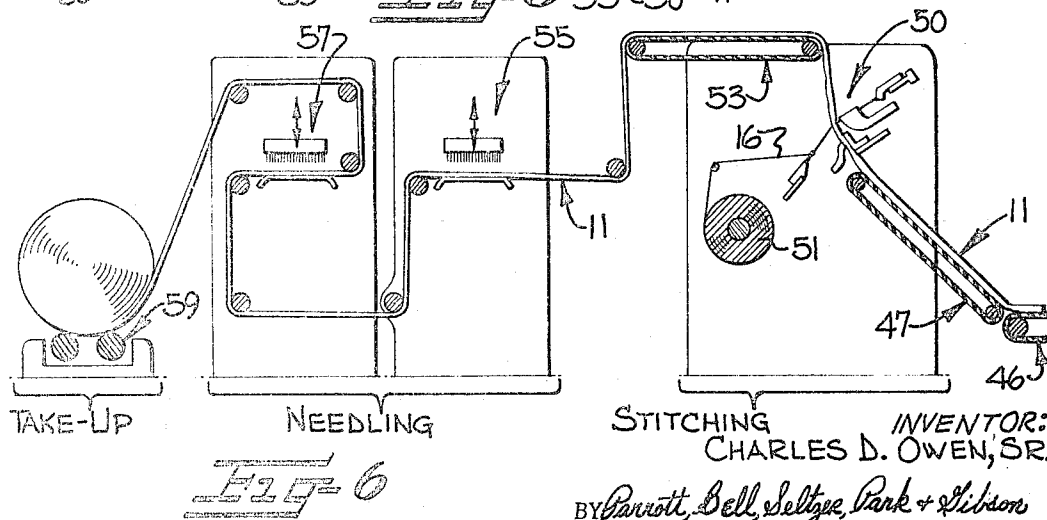
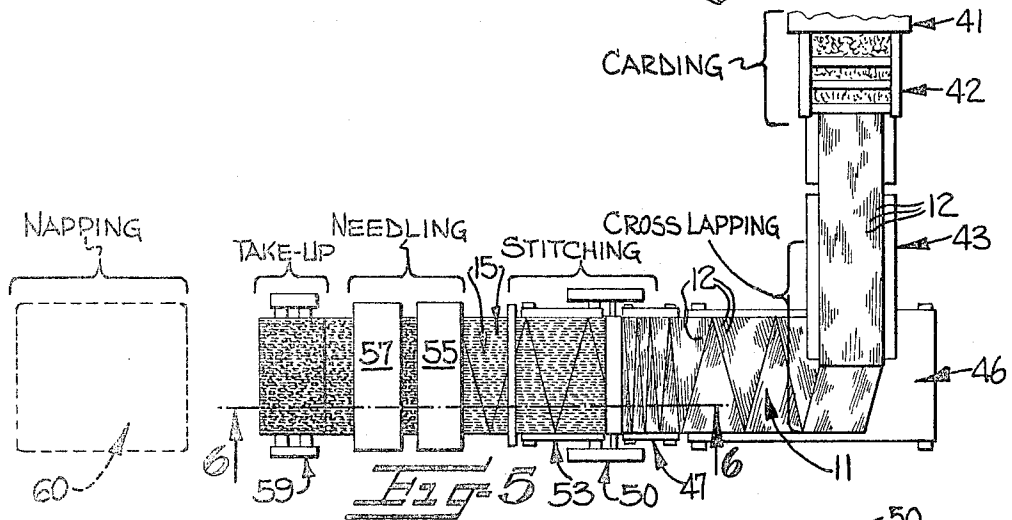
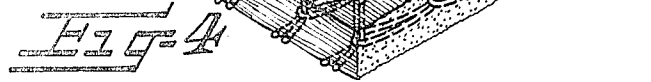
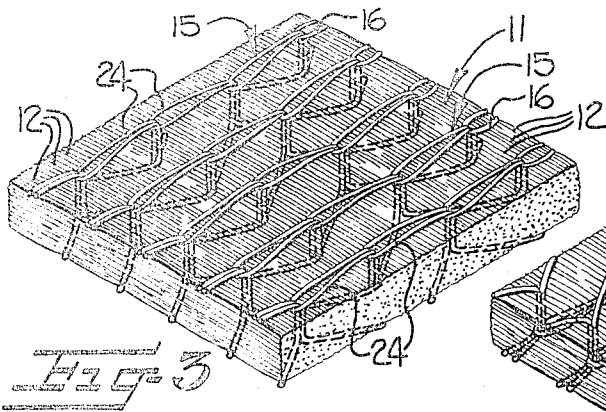
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3,395,065

NON-WOVEN BLANKET FABRIC AND METHOD

Filed Oct. 6, 1967

2 Sheets-Sheet 2



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2

3,395,065
NON-WOVEN BLANKET FABRIC AND METHOD
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Manufacturing Company, a corporation of Delaware
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5 Claims. (Cl. 161—50)

ABSTRACT OF THE DISCLOSURE

An improved non-woven fabric adaptable for use as a blanket and particularly characterized by a single layer stitched and needled construction which eliminates the necessity for a plural layer construction, a supporting layer and a double-yarn lock stitch construction. The fabric includes a needled entangled fiber and stitch construction that provides markedly high strength and avoids raveling of the stitches.

This invention concerns a non-woven blanket fabric of markedly high strength that is produced by a greatly simplified and economical method of manufacture.

The product and method of this invention constitute an improvement on the blanket fabric disclosed and claimed in the Charles D. Owen Patent No. 3,260,640, issued July 12, 1966, and assigned to Beacon Manufacturing Company, the same assignee as the present application. The blanket fabric covered by that patent employs in its manufacture three batts of non-woven fibers, one of which constitutes a supporting layer that is stitched sufficiently to hold it together and enable satisfactory handling when combining the three batts. The stitched supporting batt is placed in between the other two non-woven batts and the assembly then needled to integrate the three batts to produce the basic blanket fabric which may then be napped to provide a conventional blanket surface on both sides of the product. This three-component blanket fabric has proven of substantial commercial value in the production of blankets on a large scale and offers very worthwhile advantages over prior woven and non-woven blanket fabrics.

The purpose of the present invention is to simplify the construction of the blanket fabric and its method of manufacture and the production equipment therefor. The present invention which has accomplished this threefold objective with substantial commercial significance is based on the critical combination of a certain stitching operation that cofunctions with a subsequent needling operation. The special stitching operation is carried out on a single batt of non-woven fibers and is followed by a needling operation that cofunctions with the stitch construction to effect a stabilization and interlocking of the stitches and entanglement of the needled fibers so as to produce a product of exceptionally high strength, uniformity and dimensional stability. The stitches may be in the form of simple chain stitches using a single stitching yarn or single yarn "shogged" stitches.

The strength of the product of the present invention utilizing the chain stitches is approximately one hundred percent greater than the strength of the above prior Owen patent product. Where even greater strength is desired in the blankets or the like produced from the fabric of the present invention, the "shogged" form of stitch is used, and for maximum strength, the rows of stitches may be placed closer together.

Production of the three-component product disclosed and claimed in my above Patent No. 3,260,640, requires three carding machines and three cross-lapping machines and a system of conveyors for forming, moving and assembling the respective three batts. The greatly simplified

procedure of the present invention so minimizes the equipment requirements that the operation may be carried out with a single carding machine and a single cross-lapping machine. This results in reducing the equipment requirement by two-thirds and a similar reduction in the required floor space. If desired, the simplified arrangement of one carding machine and one cross-lapping machine may be placed "in line" with one stitching machine followed by the needling apparatus for efficient commercial production.

It has been discovered, in accordance with this invention, that the order of the stitching and needling operations is critical and cannot be reversed; that is, the single batt must be stitched first and then needled from both sides, and not vice versa, to obtain the markedly improved results of this invention. The needling operation stabilizes and locks the chain stitches and prevents them from raveling.

The stitch construction of the present invention which requires only a single yarn constitutes a marked improvement over the George H. Hughes Patent No. 3,329,552, issued July 4, 1967, and assigned to the same assignee as the present invention. The product disclosed and claimed in the Hughes patent is made with two sets of yarns for each row of stitching. This produces a locked stitch construction and results in a high strength product but requires approximately twice as much yarn as the product of the present invention.

Another practical advantage of the single batt stitched and needled fabric of the present invention, as compared with multiple-batt fabrics, is that it avoids any delamination problem and the usual loss of fiber which occurs with delamination, particularly when the fabric is piece dyed. Prior non-woven multiple-layer products have required stock dyeing of the fibers before stitching or needling. The single batt or single layer fabric of this invention avoids this requirement and permits dyeing of the whole fabric after completion of the stitching and needling operations. This is preferable from an appearance standpoint because it effects uniform color dyeing of the stitching yarn and fibers in the finished product.

While the improved non-woven fabric of this invention has been described above and will be described hereinafter with particular reference to a napped blanket material, it is to be understood that this novel fabric may be utilized in the napped, unnapped or partially napped or otherwise surface treated condition for uses other than blankets and this invention is not intended to be restricted to blankets.

Further details of the product, method and equipment that characterize the present invention will be understood from the following more detailed description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is an enlarged fragmentary exploded perspective view of the obverse side of the improved non-woven fabric of this invention illustrating the fabric in the three basic stages of its construction;

FIGURE 2 is an enlarged fragmentary exploded perspective view of the reverse side of the fabric of FIGURE 1 illustrating the fabric in the three basic stages of its construction;

FIGURE 3 is an enlarged fragmentary perspective view of the obverse side of a stitched batt of non-woven fibers illustrating an alternative stitch construction from that illustrated in FIGURE 1;

FIGURE 4 is a view similar to FIGURE 3 and illustrating the reverse side of the stitched batt of FIGURE 3;

FIGURE 5 is a somewhat schematic top plan view illustrating one example of suitable apparatus for forming the improved non-woven fabric of this invention; and

FIGURE 6 is a somewhat schematic side elevational view taken along the line 6—6 of FIGURE 5 and illustrating

ing more particularly the stitching and needling apparatus shown in FIGURE 5.

Referring now to the drawings, there is illustrated in FIGURES 1 and 2 both sides of the improved non-woven fabric constructed according to this invention and generally indicated by the reference numeral 10. FIGURES 1 and 2, as described above, are exploded views illustrating the improved non-woven fabric 10 in the three basic stages of its construction.

The improved non-woven fabric 10 comprises a single, unitary, self-sustaining batt 11 of non-woven fibers 12 defining the entire ultimate dimensions of the fabric 10 without other fibrous batts being combined therewith. The non-woven fibers 12 extend generally in the widthwise direction of the fabric 10 to provide strength and stability to the fabric 10 in the widthwise direction.

The batt 11 of non-woven fibers 12 includes spaced-apart rows of stitches 15 embedded in the batt 11 of non-woven fibers 12. Each row of stitches 15 is formed from a single continuous stitching yarn 16. The rows of stitches 15 extend in generally the lengthwise direction of the batt 11 throughout the length thereof and pass from one face of the batt to the other face thereof to interlock the fibers 12 and provide strength and stability in the lengthwise direction.

The specific form of stitching 15 utilized may be straight chain stitches, as illustrated in FIGURES 1 and 2, having straight chain loop components 20 on one side of the batt 11 and having straight-line components 21 on the other side of the batt 11 which are parallel to the chain loop components 20. Alternatively, the rows of stitches 15, as shown in FIGURES 3 and 4, may comprise "shogged" stitches having straight chain loop components 24 on one side of the batt 11 and diagonal or shogged components 25 on the other side of the batt 11 which extend generally diagonally of the batt 11 alternately between rows of the chain loop components 24.

It has been found by this invention that the straight chain stitches, illustrated in FIGURES 1 and 2, when combined with the other features of this invention, will provide sufficient strength and stability to the fabric 10; however, if additional strength is desired, the alternative shogged stitch construction, shown in FIGURES 3 and 4, may be utilized. Also, the rows of stitches 15 may be varied from approximately one-tenth of an inch apart to one-fifth of an inch apart to obtain more or less strength and stability in the non-woven fabric 10. Moreover, other stitch constructions utilizing one stitch yarn in each row of stitching may be used.

Following stitching of the batt 11 of non-woven fibers 12, the stitched batt is then needed from both sides to form a multiplicity of needled fiber entanglements, generally indicated at 30, which extend from each side of the stitched batt and interlock the fibers of the batt with each other and with the stitches to prevent dislocation and raveling of the stitches and to increase strength and stability of the fabric. This needling operation, as will be discussed more specifically hereinafter, is performed with a needling machine having barbed needles thereon which act to entangle the fibers 12 of the batt 11 with each other and to entangle these fibers with the stitching yarns 16, so that the normally raveling stitches 15 will be secured and interlocked with the fibers 12 of the batt 11 to prevent raveling.

It has been found by this invention that a satisfactory product may be provided when the stitched batt is needed to provide approximately 400 needled fiber entanglements per square inch from each side of the fabric 10.

The thus formed stitched and needled fabric construction may be napped to raise the fibers on each side thereof, as broadly indicated at 35 in FIGURES 1 and 2, to a sufficient height and density to cover the stitches 15 and the needled fiber entanglements 30 to provide conventional blanket surfaces thereon.

The non-woven fibers 12 utilized in the batt 11 may be

any suitable synthetic fibers including viscose, acrylic, polyester and polyamide fibers, or natural fibers including cotton and wool, or other textile fibers, or blends thereof. The stitching yarns 16 utilized to form the rows of stitches 15 may be of various natural or synthetic fibers or blends but continuous filament synthetic yarns, e.g., nylon yarn or polyester yarn, are advantageous to obtain relatively high strength and to prevent breakage in the manufacturing operation and also to give good tensile strength in the finished fabric.

Referring now to FIGURES 5 and 6, suitable apparatus is illustrated for forming the improved non-woven fabric 10 of this invention; however, it is to be understood that this apparatus is illustrative only and that other suitable apparatus might also be used.

As shown in these figures, a conventional opening and feeding device, broadly indicated at 41, feeds the bulk fibers 12 in staple form to a card, garnett, or other suitable fiber opening device, broadly indicated at 42, to form a batt of fibers 12 extending generally lengthwise of the batt. This batt of fibers 12 from the card 42 is fed to a cross-lapping device 43.

The cross-lapping device 43 operates back and forth across a conveyor 46 to deposit the batt of fibers 12 thereon. The cross-lapping device 43 is preferably operated at a sufficient speed, relative to the speed of the conveyor 46, so that the fibers 12 are deposited onto the conveyor 46 to form a batt 11 of desired thickness having the fibers 12 extending generally widthwise thereof to provide strength and stability to the fabric 10 in the widthwise direction. The cross-lapped batt 11 is conveyed from the cross-lapping device 43 to another conveyor 47 which moves the batt 11 into a stitch-forming mechanism, illustrated somewhat schematically at 50, to form lengthwise extending rows of stitches 15 in the batt 11 of fibers 12 to interlock the fibers 12 and to provide lengthwise stability and strength to the fabric 10.

The stitch-forming mechanism 50 is of the type utilizing a single beam 51 for supplying a single set of continuous stitching yarn 16 to the stitch-forming instrumentalities for forming the stitch constructions, described above, utilizing a single set of yarns therein.

The stitch-forming mechanism 50 may be of the type having a bank of side-by-side stitching needles which are adapted to pass through the batt and form individual lengthwise extending rows of stitches 15 with the above-described stitch components therein.

The stitched batt is led from the stitch-forming mechanism 50 by a conveyor 53 to a first needling apparatus, broadly indicated at 55. The needling apparatus 55 is of the conventional type utilizing a bank of barbed needles to reciprocate up and down to penetrate the stitched batt 11 from one side thereof and to form the needled fiber entanglements 30 extending from one side thereof.

From the first needling apparatus 55, the stitched and partially needled batt 11 is reversed and led through a second needling apparatus, broadly indicated at 57, which is similar to the first needling apparatus 55 and is adapted to needle the material from the other side thereof to form needle penetrations 30 extending from the other side of the material.

From the second needling apparatus 57, the stitched and after-needled fabric 10 may be led to any suitable winding or take-up apparatus, generally indicated in the drawings at 59, or it may be led directly to a napping apparatus, generally indicated in FIGURE 5 at 60, for napping the material to provide the napped surfaces 35 thereon.

While the above-described apparatus has been illustrated in a continuous operation, it is to be understood that one or more of the individual mechanisms thereof may be separated and the material wound or otherwise collected from a previous operation and fed thereto. Also, it is to be understood that a single needling apparatus could be utilized for needling the material from both sides thereof.

In the drawings and specification, there have been set forth preferred embodiments of this invention and, although specific terms are employed they are used in a descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the appended claims.

What I claim is:

1. An improved non-woven fabric adaptable for use as a blanket, said fabric being particularly characterized by a single layer stitched and needled construction which eliminates the necessity for a plural layer construction, a supporting layer and a double-yarn lock stitch construction, said fabric having an entangled fiber and stitch construction that provides markedly high strength and avoids raveling of the stitches, said fabric comprising:

- (a) a single, unitary, self-sustaining batt of non-woven fibers defining the entire ultimate dimensions of said fabric without other fibrous batts being combined therewith and extending in generally the widthwise direction of said fabric to provide strength and stability to said fabric in the widthwise direction;
- (b) elongate spaced-apart rows of stitches embedded in said batt of fibers and each row of which is formed from a single continuous stitching yarn, said rows of stitches extending in generally the lengthwise direction of said batt throughout the length thereof and passing from one face of said batt to the other face thereof to interlock said fibers and provide strength and stability thereto in the lengthwise direction; and
- (c) a multiplicity of needled fiber entanglements extending from each side of said stitched batt and interlocking said fibers of said batt with each other and with said stitches to prevent dislocation and raveling of said stitches and to increase the strength and stability of said fabric.

2. An improved non-woven fabric, as set forth in claim 1, in which said fabric includes napped, raised fibers on each side thereof of sufficient height and density to cover said stitches and said needled fiber entanglements to provide conventional blanket surfaces.

3. An improved non-woven fabric, as set forth in claim 1, in which each of said rows of stitches comprises straight chain stitches having straight chain loop components on the other side of said fabric and straight-line components on the other side of said fabric which are parallel to said chain loop components.

4. An improved non-woven fabric, as set forth in claim 1, in which each of said rows of stitches comprises shogged stitches having straight chain loop components on one side of said fabric and diagonal or shogged components on the other side of said fabric which extend generally diagonally of said fabric alternately between rows of said chain loop components.

5. A method for producing an improved non-woven fabric adaptable for use as a blanket and being particularly characterized by a single layer stitched and needled construction which eliminates the necessity for a plural layer construction, a supporting layer and double-yarn lock stitch construction by providing an entangled fiber construction that imparts markedly high strength and avoids raveling of the stitches, said method comprising the steps of:

- (a) forming a single, unitary, self-sustaining batt of non-woven fibers defining the entire ultimate dimensions of said fabric without other fibrous batts being combined therewith and orienting the fibers in generally the widthwise direction of the fabric to provide strength and stability to the fabric in the widthwise direction;
- (b) forming elongate spaced-apart rows of stitches in the batt of fibers in generally the lengthwise direction throughout the length thereof and from one face of the batt to the other face thereof to interlock the fibers and provide strength and stability thereto in the lengthwise direction and forming each row from a single continuous yarn; and
- (c) needling the stitched batt from both sides thereof to form a multiplicity of fiber entanglements which extend from each side of the stitched batt and which interlock the fibers of the batt with each other and with the stitches to prevent dislocation and raveling of the stitches and to increase the strength and stability of the fabric.

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