

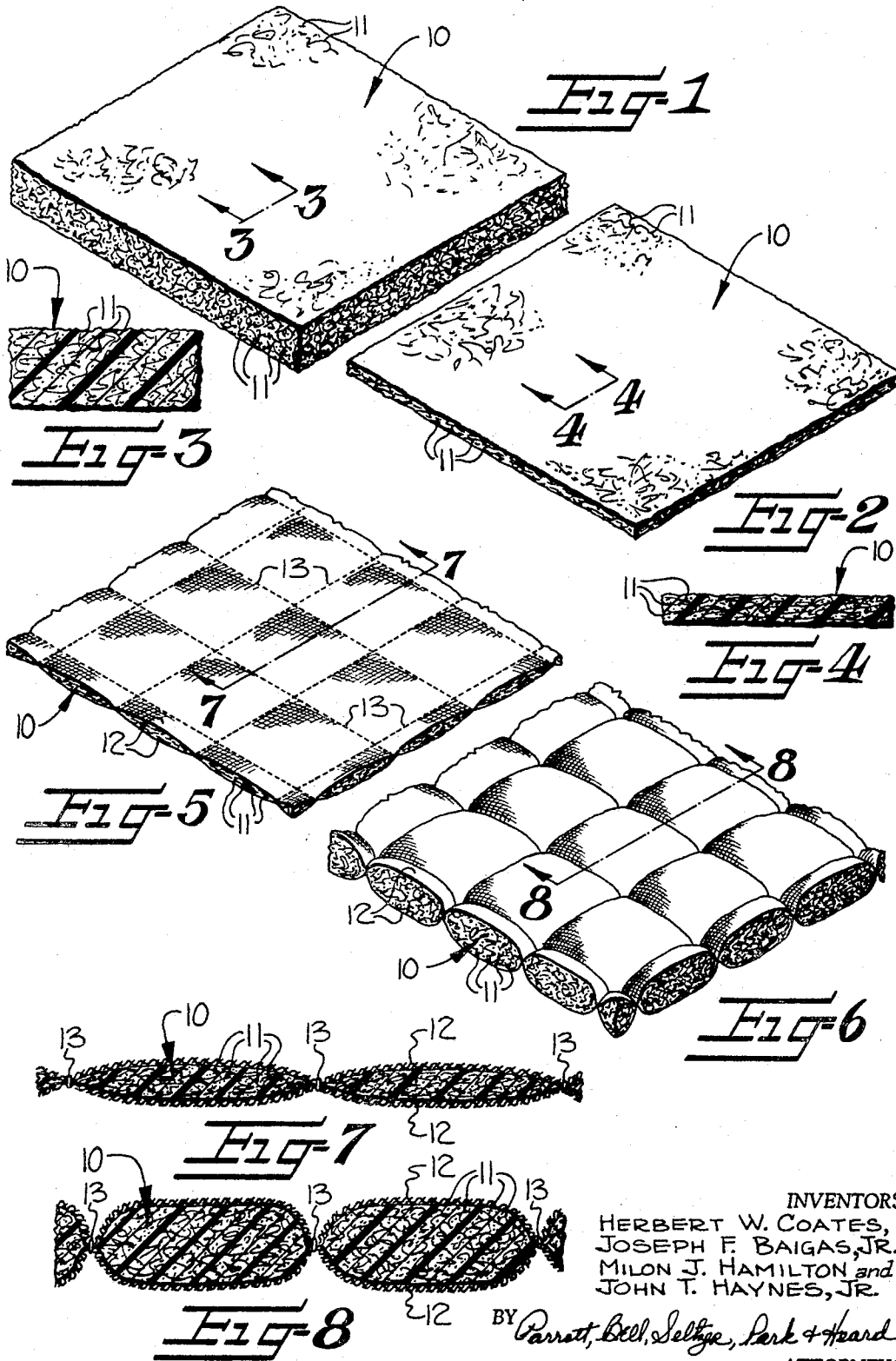
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METHOD OF PRODUCING A QUILTED NON-WOVEN TEXTILE PRODUCT

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METHOD OF PRODUCING A QUILTED NON-WOVEN TEXTILE PRODUCT

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ABSTRACT OF THE DISCLOSURE

A method of producing a covered, quilted, non-woven textile product including the steps of compacting a non-woven textile fabric formed from thermoplastic fibers bonded together with thermoactive resinous bonding material to a less open, self-sustaining, compacted state, superimposing cover sheets of material onto said compacted non-woven fabric, securing the superimposed compacted non-woven fabric and cover sheets together at spaced locations to form a predetermined pattern and restoring the compacted non-woven fabric to the original open state thereof so that the non-woven fabric will expand and fill the spaces between securing locations and between the cover sheets to mold the quilted product.

This application relates to a method of producing a covered, quilted non-woven textile product.

Covered, quilted non-woven textile fabrics of the type utilizing fibers coated with adhesive or binder to form a self-supporting porous batt, have found wide utility in the domestic, manufacturing and industrial fields, such as insulated underwear and outer wear, interlinings for clothing, comforters and blankets, paddings and packaging materials, etc. These non-woven fabrics are generally constructed of a plurality of fibers, either straight or curled, of various lengths, held in three dimensional arrangement by means of an adhesive or resinous binder. The fibers are generally substantially coated with this binder and are joined together at points where the fibers cross and intersect by the resinous binder or adhesive to form and open, low density, non-woven batt.

These open, non-woven batts are often fabricated into covered, quilted products by the manufacturers thereof or are sold in rolls to other manufacturers for subsequent fabrication into the desired covered, quilted non-woven products. These covered, quilted, non-woven products are usually produced by sandwiching the bulky non-woven product between cover sheets of thinner material and then securing the layers together, such as by sewing, to form a quilted, covered non-woven product.

Due to the bulky nature of these highly porous non-woven fabrics or batts, fabrication of these covered, quilted non-woven products has long been a problem with the manufacturer. The bulky nature of the non-woven fabric has rendered it extremely difficult to secure the cover sheets and the non-woven fabric together to form the covered, quilted products inasmuch as it has heretofore required the use of special machines for securing the cover sheets and the thick and bulky non-woven fabric to each other when compared to ordinary machines used to secure other layers of thinner ordinary textile fabrics.

Also, when it is desired to form a particular shape, covered, quilted non-woven product, it is necessary to cut the non-woven fabric into the desired shape. Due to the bulky nature of the non-woven fabric, it has heretofore been extremely difficult to satisfactorily cut the non-woven fabrics. This is especially true when the normal cutting operations of other textile fabrics are accomplished by stacking a multiplicity of layers of the textile

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fabric on each other and subsequently dye or pattern cutting a multiplicity of desired shapes from these stacks. The bulky nature of the non-woven fabrics limited the number of layers which could be stacked on each other for this type of cutting operation.

It is, therefore, an object of this invention to overcome the problems of producing a covered, quilted non-woven textile product.

It is a more specific object of this invention to provide a method of producing a covered, quilted non-woven textile fabric which eliminates the problems heretofore encountered in securing the cover sheets of material to the non-woven fabric to form a covered, quilted product.

It has been found by this invention that the above objects may be accomplished by providing a process whereby the non-woven fabric may be compacted during or following manufacture thereof to reduce its dimensions or bulk to allow the performance of the securing operation while the non-woven fabric is in this compacted state and whereby the compacted, covered, quilted non-woven product may be subsequently restored to substantially the original bulk or dimensions of the non-woven fabric following securing of the layers so that the non-woven fabric will fill the spaces between securing locations and between the cover sheets to mold the quilted product.

As a result of this method it has been found that a much tighter and smoother covered, quilted non-woven product may be formed inasmuch as the restoring operation of the non-woven fabric after it has been secured between cover sheets will act to expand the non-woven fabric to completely fill the spaces between securing locations and between the cover sheets thereby tightening the cover sheets onto the non-woven fabric and eliminating any looseness of the cover sheets. This operation results in very smooth outer surfaces of the covered, quilted non-woven product which is highly desirable in the finished product.

Reference may be had to our copending application Ser. No. 408,339, filed Nov. 2, 1964, now U.S. Patent No. 3,291,677, issued Dec. 13, 1966, for a disclosure of the broad method of compacting and subsequently restoring a non-woven textile fabric. It is to be understood that the previously filed application relates to the broad principle of compaction and subsequent restoration of a non-woven fabric; whereas, the present application is directed to covered, quilted non-woven products and the method of producing the same.

Further features of this invention will be understood from a consideration of the following more detailed description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of a portion of an open, bulky, low density, self sustaining non-woven textile fabric;

FIGURE 2 is a perspective view of the non-woven fabric of FIGURE 1 compacted to a less open, less bulky, higher density, self-sustaining compacted state;

FIGURE 3 is a partial cross-sectional view of the non-woven fabric of FIGURE 1 taken substantially along the line 3—3 of FIGURE 1;

FIGURE 4 is a partial cross-sectional view of the compacted non-woven fabric of FIGURE 2 taken substantially along the line 4—4 of FIGURE 2;

FIGURE 5 is a perspective view of a covered, quilted non-woven product formed from the compacted non-woven fabric illustrated in FIGURE 2;

FIGURE 6 is a perspective view of the covered, quilted non-woven product of FIGURE 5 which has been restored to the original open, bulky, low density state of the non-woven fabric shown in FIGURE 1;

FIGURE 7 is a partial cross-sectional view of the com-

packed, covered, quilted non-woven product of FIGURE 5 taken substantially along the line 7—7 of FIGURE 5; and

FIGURE 8 is a partial cross-sectional view of the covered, quilted non-woven product of FIGURE 6 which has been restored to the original state of the non-woven fabric taken substantially along the line 8—8 of FIGURE 6.

Referring now to the drawings, there is shown in FIGURE 1 a non-woven textile fabric, generally indicated by the reference numeral 10, which is formed from a plurality of thermoplastic fibers 11 disposed in intermingled, three dimensional arrangement throughout the length, width and depth of the fabric and bonded together at spaced points by a thermoactive resinous bonding material to fixedly join the fibers together to form an integral non-woven fabric structure.

The fibers 11 used to form the non-woven fabric 10 may be any type of thermoplastic fibers and particularly fibers selected from the group consisting of polyester, nylon, acrylic, acetate, modacrylic, triacetate, polypropylene, polyethylene or combinations thereof. The bonding material utilized to bond these fibers together to form the non-woven fabric may be any type of thermoactive resinous bonding material and particularly those bonding materials selected from the group consisting of acrylic, vinyl, melamine, polyvinyl chloride, polyvinyl acetate, butadiene styrene, butadiene acrylonitrile, melamine formaldehyde, urea formaldehyde, phenol formaldehyde, polyvinylidene chloride, epoxy type resin or combinations thereof.

As is more specifically set out in our above identified patent application, this non-woven fabric 10 may be compacted to a less open, less bulky, higher density, self-sustaining compacted state, as shown in FIGURE 2. This compaction operation is performed by heating the non-woven textile fabric 10 to a temperature below the plastic flow temperatures of both the thermoplastic fibers 11 and the thermoactive bonding material, applying pressure to the heated non-woven fabric to compact the fabric to a less open, less bulky, higher density, self-sustaining compacted state and cooling the heated and compacted non-woven fabric so that the fabric will remain in the compacted state.

It is important that the temperature utilized for compaction of the non-woven fabric does not exceed the plastic flow point of the bonding material because if the temperature does exceed this plastic flow point, the bonding material will become sticky and will rebond at other fiber points permanently holding the compacted non-woven fabric in the compacted state. It is also important that the temperature utilized for compaction does not exceed the plastic flow point of the fibers 11 because if the temperature does exceed this plastic flow point, a substantial permanent stress-strain relationship will be set up in the fibers and the fibers will be given a permanent crimp which will permanently hold the non-woven fabric in the compacted state.

In the compaction step, the heating of the non-woven fabric may be performed in any suitable manner during manufacture or following manufacture, such as in an oven, with infrared heat or the like. The compacting may be performed by any convenient means, such as pressure rolls, calender rolls or the like. Cooling the heated and compacted non-woven fabric may be performed by any suitable means, such as exposing the heated and compacted fabric to normal room temperature or by special cooling apparatus.

It has been further found that the compaction is better accomplished on non-woven fabrics made from the above described fibers and bonded with the above described bonding materials when the heating is performed within the temperature range of 125° F. to 450° F. for a period of time between less than one second and ten minutes. The preferred pressure for compacting the heated non-woven fabric is between 1.0 p.s.i. and 25.0 p.s.i. for a

period of time from less than one second to ten seconds.

When performing the compaction operation within these ranges of temperature, time and pressure, it has been found that the non-woven fabric will be compacted from about 99 percent to 4 percent of its original volume. It has also been found, that the network of intercommunicating voids between the fibers in the compacted state of the fabric will comprise not more than about 74.3 percent of the volume of the nonwoven fabric.

Following compaction of the non-woven fabric 10, cover sheets 12 of material are supplied. These cover sheets 12 may be of any suitable material, such as, knitted or woven textile material, rubber or plastic material, etc.

The compacted non-woven fabric 10 and the cover sheets 12 are superimposed so that the compacted non-woven fabric 10 is sandwiched between the cover sheets 12, as may be seen in FIGURES 5-8.

The superimposed compacted non-woven fabric 10 and the cover sheets 12 are secured together by inserting spaced, intersecting, continuous lines of stitching 13 so as to define predetermined shaped spaces between the lines of stitching. These lines of stitching 13 are normally placed in a predetermined pattern to form the quilted effect on the product. Any desired pattern of stitching may be used to provide the desired quilted effect. It is to be understood that this securing could be accomplished by means other than stitching such as heat setting, bonding, etc.

Following securing of the superimposed cover sheets 12 and the compacted non-woven fabric 10, the covered, quilted non-woven product may be restored to the original open, bulky, low density state of the non-woven fabric 10 by heating the covered, quilted non-woven product to a temperature below the plastic flow temperatures of both the thermoplastic fibers 11 and the thermoactive bonding material to allow the covered, quilted non-woven product to expand and fill the spaces between lines of stitching 13 and between cover sheets 12 to mold the quilted product, as may be seen in FIGURES 6 and 8. This restoring operation will produce a very tight product having smooth outer surfaces inasmuch as the non-woven fabric 10 will expand within the confines of the cover sheets 12 and the securing locations to draw the cover sheets 12 very tightly on the non-woven fabric 10. This will produce very smooth surfaces for the covered, quilted non-woven product.

More specific details of this restoring operation may be had by reference to our above identified copending application. It is important that the heating during the restoring operation does not exceed the plastic flow temperatures of both the thermoplastic fibers and the thermoactive bonding materials for the reasons set forth in connection with the above described compacting operation.

It has been found that the restoring of compacted non-woven fabrics made from the above identified types of fibers bonded with the above identified types of bonding materials is better performed by heating the compacted non-woven products to a temperature between 125° F. and 450° F. for a period of time between less than one second and ten minutes.

When performing the restoring operation within these ranges of temperatures and time, it has been found that the non-woven textile fabric will be restored from about 1 percent to 1700 percent of its compacted volume and that the network of intercommunicating voids between the fibers 11 forming the non-woven fabric, when restored to the original dimensions of the non-woven fabric, will comprise not less than about 75 percent of the volume of the non-woven fabric.

Therefore, it may be seen that the covered, quilted non-woven product and the method of producing same of this invention has eliminated the problems heretofore encountered in the production of covered, quilted, non-woven products and has eliminated the necessity of special equipment in such manufacturing operations.

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What is claimed is:

1. A method of producing a covered, quilted non-woven textile product comprising:

(a) supplying an open, bulky, low density, self-sustaining non-woven textile fabric formed from thermoplastic fibers bonded together with a thermoactive resinous bonding material;

(b) compacting the non-woven fabric to a less open, less bulky, higher density, self-sustaining compacted state;

(c) supplying cover sheets of material;

(d) superimposing the compacted non-woven textile fabric and the cover sheets so that the compacted non-woven fabric is sandwiched between the cover sheets;

(e) securing the superimposed compacted non-woven fabric and the cover sheets together at predetermined locations to form a predetermined pattern; and

(f) restoring the compacted, covered, non-woven product to the original open, bulky, low density state of the non-woven fabric so that the non-woven fabric will expand and fill the spaces between securing locations and between the cover sheets to mold the quilted product.

2. A method of producing a covered, quilted non-woven textile product, as set forth in claim 1, in which said compacting step comprises:

(1) heating the non-woven textile fabric to a temperature below the plastic flow temperatures of both the thermoplastic fibers and the thermoactive bonding material;

(2) applying pressure to the heated non-woven fabric to compact the fabric to a less open, higher density, self-sustaining compacted state; and

(3) cooling the heated and compacted non-woven fabric so that the fabric will remain in the compacted state.

3. A method of producing a covered, quilted, non-woven textile product, as set forth in claim 1, in which said securing step comprises:

(1) sewing the superimposed compacted non-woven fabric and the cover sheet together with spaced, intersecting, continuous lines of stitching so as to define predetermined shaped spaces between lines of stitching.

4. A method of producing covered, quilted, non-woven textile products, as set forth in claim 1, in which said restoring step comprises:

(1) heating the compacted, covered non-woven product to a temperature below the plastic flow temperatures of both the thermoplastic fibers and the thermoactive bonding material to allow the compacted non-woven fabric to expand to the original open, bulky,

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low density, self-sustaining state thereof to fill the spaces between securing locations and between the cover sheets to mold the quilted product.

5. A method of producing a covered, quilted, non-woven textile product comprising:

(a) supplying an open, bulky, low density, self-sustaining non-woven textile fabric formed from thermoplastic fibers bonded together with a thermoactive resinous bonding material;

(b) compacting the non-woven fabric to a less open, less bulky, higher density, self-sustaining compacted state, said compacting step comprising:

(1) heating the non-woven textile fabric to a temperature below the plastic flow temperatures of both the thermoplastic fibers and the thermoactive bonding material,

(2) applying pressure to the heated non-woven fabric to compact the fabric to a less open, less bulky, higher density, self-sustaining compacted state, and

(3) cooling the heated and compacted non-woven fabric so that the fabric will remain in the compacted state;

(c) supplying cover sheets of material;

(d) superimposing the compacted non-woven textile fabric and the cover sheet so that the compacted non-woven fabric is sandwiched between the cover sheets;

(e) securing the superimposed compacted non-woven fabric and the cover sheets together by inserting spaced, intersecting, continuous lines of stitching so as to define predetermined shaped spaces between the lines of stitching; and

(f) restoring the compacted, covered non-woven product to the original open, bulky, low density state of the non-woven fabric by heating the compacted, covered non-woven product to a temperature below the plastic flow temperatures of both the thermoplastic fibers and the thermoactive bonding material to allow the compacted non-woven fabric to expand and fill the spaces between lines of stitching and between the cover sheets to mold the quilted product.

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