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3,260,640

STITCHED AND NEEDLED NON-WOVEN FABRIC

Filed March 4, 1965

3 Sheets-Sheet 1

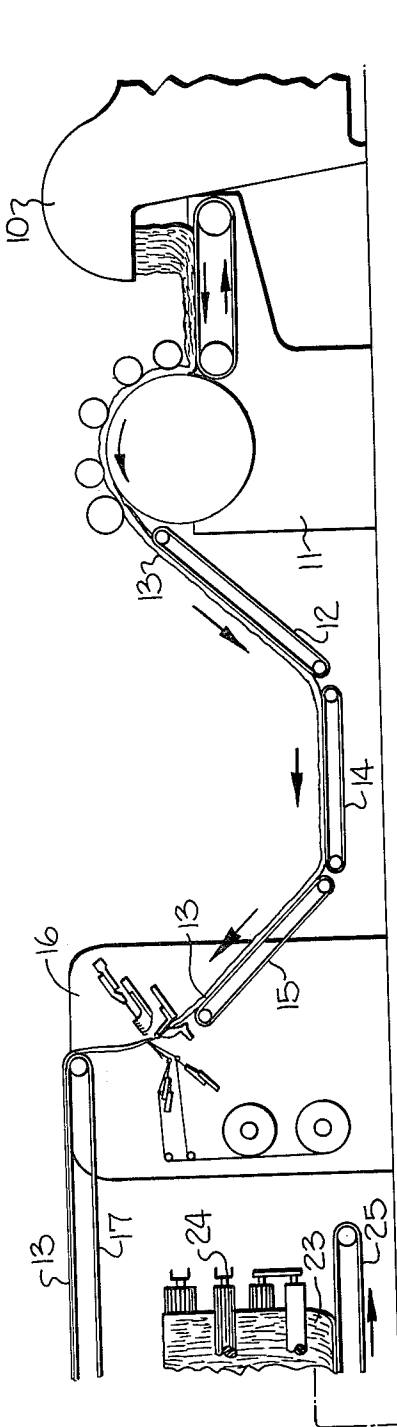


Fig-1

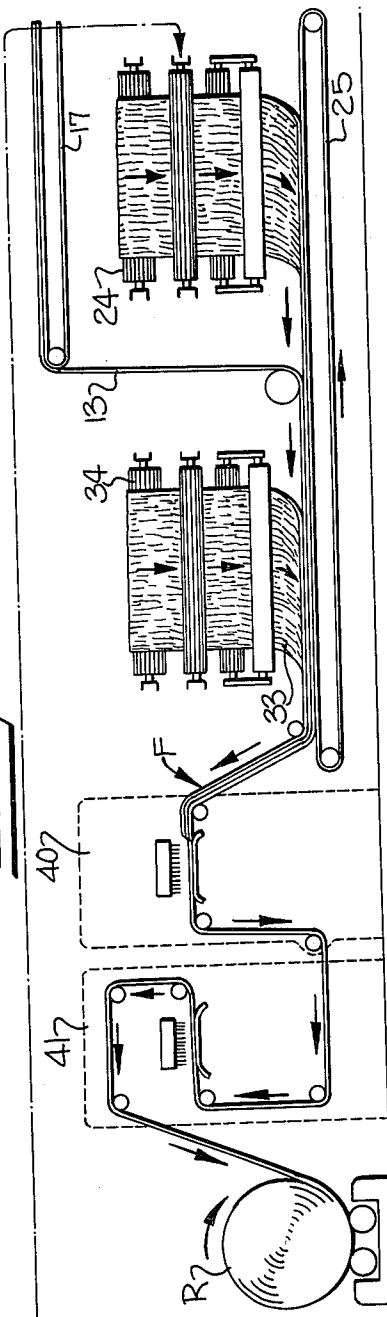


Fig-1-A

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3 Sheets-Sheet 2

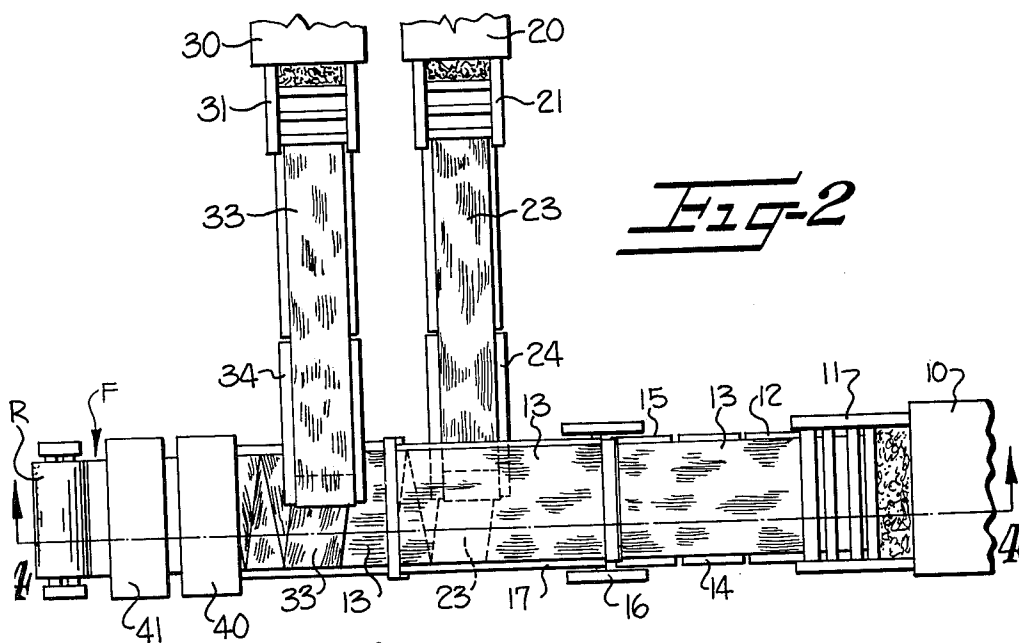


Fig-2

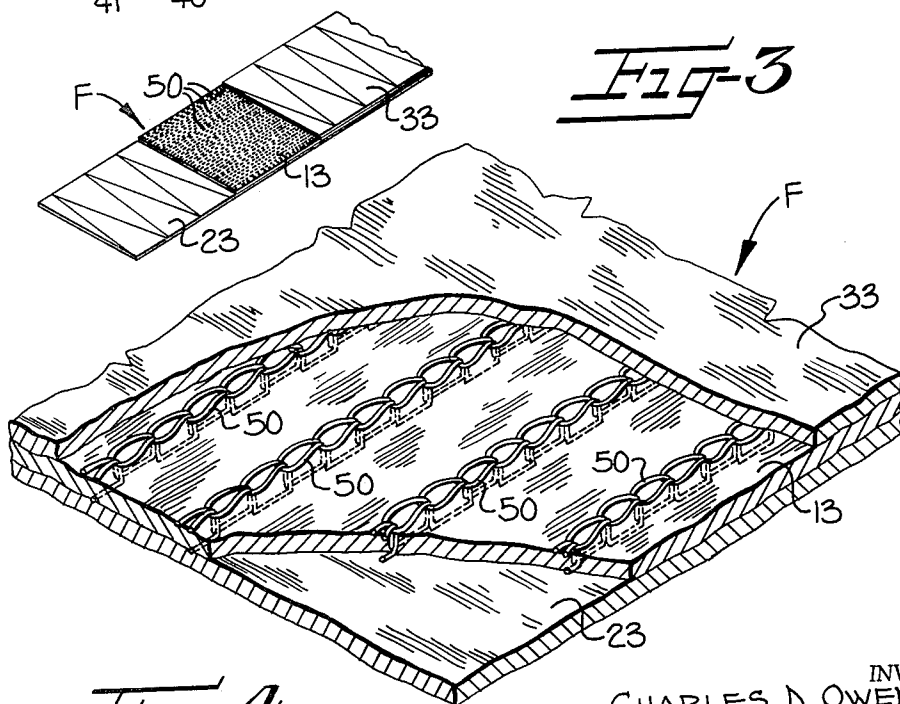


Fig-3

Fig-4

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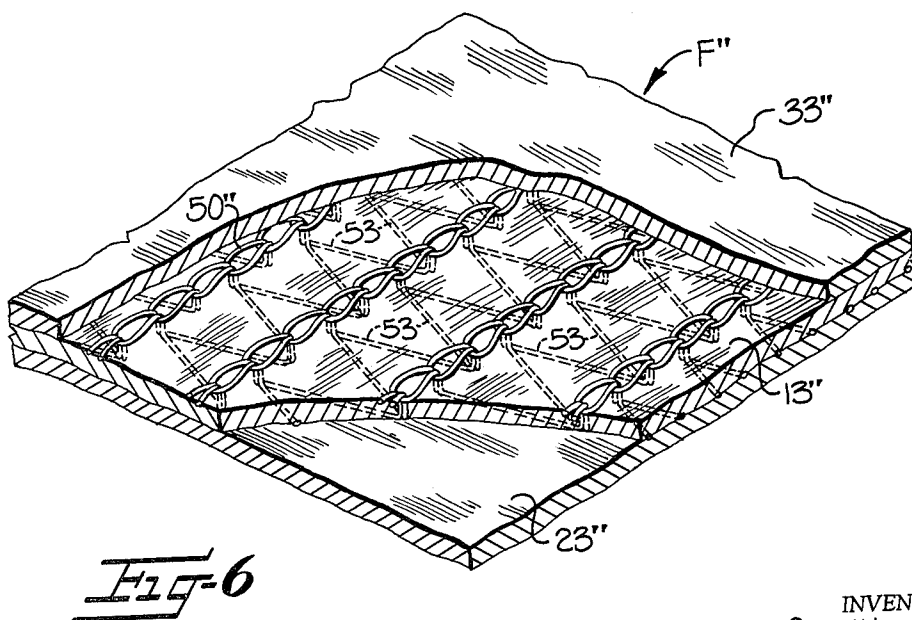
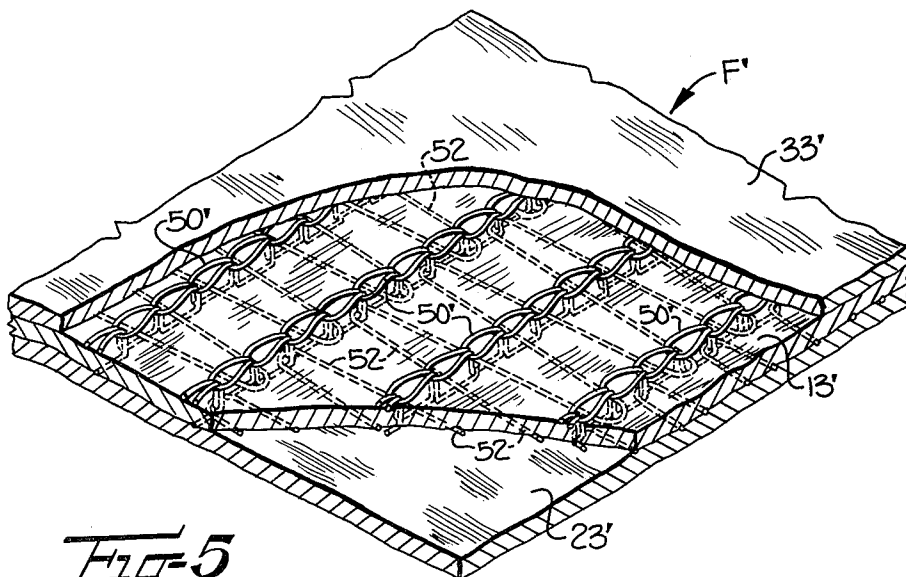
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STITCHED AND NEEDLED NON-WOVEN FABRIC

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3 Sheets-Sheet 3



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STITCHED AND NEEDED NON-WOVEN FABRIC
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4 Claims. (Cl. 161-50)

This invention relates generally to a non-woven fabric and method of forming the same that has substantial stability and strength in both lengthwise and widthwise directions and more particularly to a dimensionally stable non-woven fabric that is particularly adapted for the formation of household blankets and the like, the lengthwise and widthwise stability being obtained by a combination of stitch-bonding and needling.

It has been the usual practice to form a non-woven blanket fabric by needling upper and lower layers of non-woven fibers to opposite sides of a loosely woven "scrim." While this woven scrim provides stability and strength to the blanket fabric in both lengthwise and widthwise directions, the use of a woven scrim has its disadvantages. For example, the woven scrim has a tendency to make the blanket fabric stiff so it does not have the described draping qualities and it does not have the soft hand that is normally desired in a blanket. Also, when a woven scrim is utilized in a lightweight non-woven blanket fabric, the woven scrim has a tendency to show through the fibers of the non-woven facing layers.

In an attempt to overcome some of these objections to the use of a woven scrim, others have utilized lengthwise extending warp yarns to replace the woven scrim between the upper and lower layers of non-woven facing fibers. In this type of blanket fabric, the warp threads are intended to provide lengthwise stability and the fibers of the facing layers are needle-punched to hold them in position on opposite sides of the warp threads. However, the warp threads are not united with the fibers of the facing layers and they may be easily pulled from between the layers of facing fibers so that they do not provide the desired lengthwise stability.

With the foregoing in mind, it is a primary object of the present invention to provide a non-woven blanket which overcomes the above-noted objections and deficiencies of a non-woven blanket fabric that includes either a woven scrim or warp threads.

It is a further object of the present invention to provide a non-woven blanket fabric that includes an intermediate carrier or foundation layer of non-woven fibers that is stitch-bonded to provide stability and strength in at least the lengthwise direction.

It is yet another object of the present invention to provide a non-woven blanket fabric in which the carrier is stitch-bonded by rows of stitch loops that penetrate the layer of non-woven fibers to provide stability and strength in a lengthwise direction and wherein the rows of stitch loops may be connected by cross-threads to provide stability in both lengthwise and widthwise directions.

It is still another object of the present invention to provide a method of forming a non-woven blanket fabric of the type described in a continuous and economical manner and wherein the carrier layer of non-woven fibers is stitch-bonded and then layers of non-woven facing fibers are needle-punched to opposite sides of the stitch-bonded carrier.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURES 1 and 1-A are somewhat schematic side elevations illustrating the manner in which the non-woven blanket fabric may be formed in a continuous manner;

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FIGURE 2 is a plan view of FIGURES 1 and 1-A and schematically illustrating the continuous formation of the present non-woven blanket fabric;

FIGURE 3 is a schematic illustration of a short length of the non-woven blanket fabric and illustrating the manner in which the fibers of the upper and lower facing layers are cross-lapped so that the fibers are orientated in substantially a widthwise direction while the inner carrier is provided with lengthwise extending rows of stitch loop chains;

FIGURE 4 is an enlarged fragmentary isometric view of one embodiment of the non-woven blanket fabric to illustrate the manner in which the upper and lower facing layers are sandwiched on opposite sides of the intermediate carrier layer and to further illustrate one type of knit stitch loop chain which may be employed in stitch-bonding the carrier;

FIGURE 5 is a view similar to FIGURE 4, but showing a modified type of stitch loop chain which may be employed to stitch-bond the carrier layer and wherein two yarns are utilized, one of the yarns providing the lengthwise stability and the other yarn extending between stitch chains and providing widthwise stability to the carrier; and

FIGURE 6 is a view similar to FIGURES 4 and 5 and illustrating yet another modified type of stitch loop chain which may be utilized to provide lengthwise and widthwise stability to the carrier.

For economical reasons, it is preferred that the present non-woven blanket fabric be formed in a continuous operation, such as is schematically illustrated in FIGURES 1, 1-A and 2. A conventional opening and feeding device, broadly indicated at 10, feeds the bulk fibrous material in staple form to a garnett or carding machine 11. The fibers from the card 11 are fed onto a conveyor 12 in the form of a web 13 in which the fibers are arranged substantially parallel and extend in the direction of advance of the conveyor 12. Additional conveyors 14 and 15 move the carded web 13 into a stitch-bonding machine, illustrated somewhat schematically at 16 in FIGURE 1.

The stitch-bonding machine 16 is preferably of the type having a bank of side-by-side knitting needles which are adapted to pass through the non-woven web 13 and form individual lengthwise or warpwise extending chains of knit stitch loops which may be independent from each other and spaced apart across the width of the web. The stitch-bonding machine 16 may also be operated to form cross-thread connections between the chains of knit stitch loops to provide widthwise or fillingwise stability and strength to the web 13.

Although the web 13 is illustrated as being produced by a single card 11, it is to be understood that carded webs from several carding machines may be combined to produce any desired thickness and weight in the carded web 13 as it is moved into the stitch-bonding machine 16. While the fibers in the web produced by the card 11 are orientated in a warpwise direction, the web 13 could be produced by cross-lapping so that the fibers would be orientated in a fillingwise direction, if desired. Also, the stitch-bonding apparatus 16 may be of the type that has spaced apart sewing or quilting needles which form rows of stitch loops penetrating the fibrous web 13 to provide stability and strength in at least the lengthwise direction. As shown in FIGURES 1 and 1-A, the stitch-bonded web 13 is supported on a conveyor 17 as it is moved from the stitch-bonding apparatus 16.

A conventional opening and feeding device 20 (FIGURE 2) feeds staple fibers into a garnett or carding machine 21 which in turn forms a web of carded fibers 23. The web 23 is carried to a cross-lapping device 24 which operates back and forth across a conveyor 25 (FIGURE 1-A) to deposit the web 23 thereon. The cross-lapping

device 24 is preferably operated at a sufficient speed, relative to the speed of the conveyor 25, that the fibers of the web 23 are deposited onto the conveyor 25 in substantially a widthwise or fillingwise direction. As the cross-lapped web 23 is moved along by the conveyor 25 (FIGURE 1-A), the stitch-bonded intermediate web or carrier layer 13 is deposited on the cross-lapped web or lower facing layer 23.

Another opening and feeding device 30 (FIGURE 2) feeds staple fibers into a card 31 where a web of carded fibers 33 is formed. The web 33 is moved forwardly to a cross-lapping device 34 (FIGURE 2) which operates back and forth across the conveyor 25 (FIGURE 1-A) to deposit the web 33 on top of the stitch-bonded web 13 as it is moved along by the conveyor 25. The back and forth motion of the cross-lapping device 34 is suitably timed to build up the required thickness or weight in the web 33 as it is cross-lapped and the fibers are orientated in substantially a widthwise or fillingwise direction on top of the stitch-bonded carrier 13.

The sandwiched webs or layers or non-woven material, including the lower facing layer 23, the intermediate stitch-bonded carrier layer 13, and the upper facing layer 33, is indicated broadly at F in FIGURE 1-A. The non-woven composite fabric F then passes through a first conventional needle-punching apparatus 40 where barbed needles penetrate the non-woven fabric F. The needle-punching of the fabric F causes the fibers of the upper and lower facing layers 33, 23 to be coherently united and entangled with each other and with the fibers of the intermediate stitch-bonded carrier layer 13, in a well-known manner.

The non-woven fabric F is then guided by a suitable arrangement of guide rollers to pass through a second conventional needle-punching apparatus 41 (FIGURE 1-A) where barbed needles again penetrate the fabric F, but from the opposite side. It is to be understood that the non-woven fabric F may be needle-punched more than two times, if desired. The needled non-woven fabric is then wound into a suitable roll R (FIGURE 1-A) for further processing, such as napping. The continuous length of stitch-bonded and needled blanket fabric can then be cut into the desired lengths for forming household blankets and the like.

The non-woven stitch-bonded and needled blanket fabric F of the present invention is shown schematically in FIGURE 3 and includes the lower facing layer of non-woven fibers 23 which is preferably cross-lapped so that the fibers extend in substantially fillingwise or widthwise directions, the intermediate or carrier layer 13 which has been stitch-bonded to provide stability and strength in at least a lengthwise or warpwise direction and the fibers of which may be orientated in either the lengthwise or widthwise directions, and an upper facing layer of non-woven fibers 33 which is cross-lapped so that the fibers extend in substantially widthwise directions. The upper facing layer 33 and the lower facing layer 23 are needled to opposite sides of the stitch-bonded intermediate or carrier layer 13.

Three different types of stitch-bonded and needled non-woven blanket fabrics are shown in FIGURES 4, 5 and 6 and it is to be understood that various other types of stitch-bonding may be used to form blanket fabrics in accordance with the present invention. In the blanket fabric F shown in FIGURE 4, the stitch-bonded carrier includes spaced apart independent knit stitch loop chains 50 which penetrate the web of non-woven fibers 13. Each of the knit stitch loop chains 50 is formed of suitable thread to provide the desired amount of lengthwise or warpwise stability and strength to the fabric F. In this particular embodiment, the fibers of the upper and lower facing layers 33, 23 are orientated in widthwise or fillingwise directions to provide the required widthwise stability and strength when the fabric is needled and the fibers are coherently united and entangled with each other and with the fibers of the intermediate or carrier layer 13.

In the embodiment shown in FIGURE 5, the non-woven blanket fabric is indicated at F' and includes an intermediate or carrier layer 13', a lower facing layer 23' and an upper facing layer 33'. The carrier or intermediate layer 13' is provided with warpwise extending knit stitch loop chains 50' which extend through and penetrate the non-woven fibers of the carrier layer 13'. The stitch loop chains 50' are connected together by separate filling threads 52. During the formation of the knit stitch loop chains 50' on the stitch-bonding apparatus 16, the filling threads 52 are laid between the stitch chains 50' and connected therebetween by separate thread guides which move transversely of the knitting needles in a predetermined pattern.

In this embodiment, the intermediate layer 13' is thus stabilized in both lengthwise and widthwise directions, the lengthwise stabilization being provided by the knit stitch loop chains 50' and the widthwise stabilization being provided by the filling threads 52 which connect the stitch chains 50' together. Since the carrier layer 13' is stabilized in both directions, the lower and upper facing layers 23', 33' may have their fibers orientated in either the lengthwise or widthwise directions, before they are needled into cohering fiber entanglement with each other and with the fibers of the intermediate layer 13'.

In the embodiment shown in FIGURE 6, the non-woven stitch-bonded and needled blanket fabric is indicated at F'' and includes a carrier or intermediate layer 13'', a lower facing layer 23'' and an upper facing layer 33''. In this instance, the intermediate layer 13'' is provided with warpwise extending knit stitch loop chains 50'' which extend through and penetrate the non-woven fibers of the carrier layer 13''. The stitch loop chains 50'' are connected together by cross-threads indicated at 53. The cross-threads 53 are formed of the same thread as the stitch chain loops 50'' and are formed by shogging the thread guides of the stitch-bonding apparatus 16, in a well-known manner.

Thus, the intermediate or carrier layer 13'' is stabilized in a lengthwise direction by the spaced apart rows of knit stitch loop chains 50'' and it is also stabilized in a widthwise direction by the connecting cross-threads 53. Since the carrier layer 13'' is stabilized in both lengthwise and widthwise directions, the orientation of the fibers in the various layers may be varied as desired since stabilization and strength is not dependent upon the direction of orientation.

In the formation of each of the embodiments shown, the carrier layer is stitch-bonded and then the upper and lower facing layers of non-woven fibers are needled to opposite sides of the carrier layer so that the stitch-bonding thread in the carrier layer is completely hidden by the outer facing layers of non-woven fabrics that are needled thereto. The outer surfaces of the resulting non-woven fabric can be treated, such as by napping, without disturbing or destroying the thread forming the stitch-bonding chains of the carrier layer since they are protected by the outer facing layers of needled non-woven fibers. Also, since the lengthwise and widthwise stability strength of the non-woven blanket fabric is provided by the combination of stitch-bonding and needling, it is possible to obtain satisfactory tensile strength in the blanket fabric by the use of relatively short staple fibers.

The stabilized blanket fabric of the present invention can be formed in any suitable width and after the usual surface treatment, it may be cut into the lengths required for household blankets. The blankets may then be finished, such as by binding the cut opposite ends and dyeing.

A wide range of different types of staple length fibers may be used in forming the intermediate carrier layer as well as the outer facing layers of the blanket fabric. When synthetic staple fibers are employed, they will preferably be in the range of from about 1½ to 15 denier. The stitch-bonding thread may be formed of cellulosic fibers, such as cotton and rayon, or it may be formed

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of other synthetic fibers or filaments, such as nylon, acrylic, polyester, polypropylene, etc. When the stitch-bonding thread is formed of cellulosic fibers or filaments, it should be suitably treated to stabilize it so that the stitch-bonding thread will not shrink during the finishing or subsequent laundering of the blanket fabric.

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

I claim:

1. A non-woven fabric adaptable for use in the formation of blankets and the like and being characterized by having substantial stability and strength in both the lengthwise and widthwise directions, said non-woven fabric comprising:

(a) a carrier comprising

- (1) a self-sustaining batt of woven fibers extending generally in the widthwise direction of said batt and said fabric to provide strength and stability to said layer and said fabric in the widthwise direction, and
- (2) elongated spaced apart rows of stitch loops penetrating said batt of non-woven fibers and extending in generally the lengthwise direction of said batt and said fabric for providing strength and stability to said batt and said fabric in the lengthwise direction and for interlocking said fibers; and

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(b) upper and lower facing layers of non-woven fibers positioned on opposite sides of said carrier, the fibers of said upper and lower facing layers being needed to unite the fibers thereof with each other and to unite said upper and lower facing layers with said carrier and to provide strength and stability to said fabric.

2. A non-woven fabric, as set forth in claim 1, in which said fibers of said upper and lower facing layers extend in generally the widthwise direction of said fabric for providing additional strength and stability to said fabric in the widthwise direction.

3. A non-woven fabric, as set forth in claim 1, in which said elongated spaced apart rows of stitch loops include cross thread connections extending between said rows for providing strength and stability to said carrier in the widthwise direction.

4. A non-woven fabric, as set forth in claim 1, in which said upper and lower facing layers of non-woven fibers include napped surfaces thereon.

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