July 4, 1967 G. H. HUGHES 3,329,552

STITCHED NON-WOVEN FABRIC

Filed June 16, 1966 2 Sheets-Sheet 1

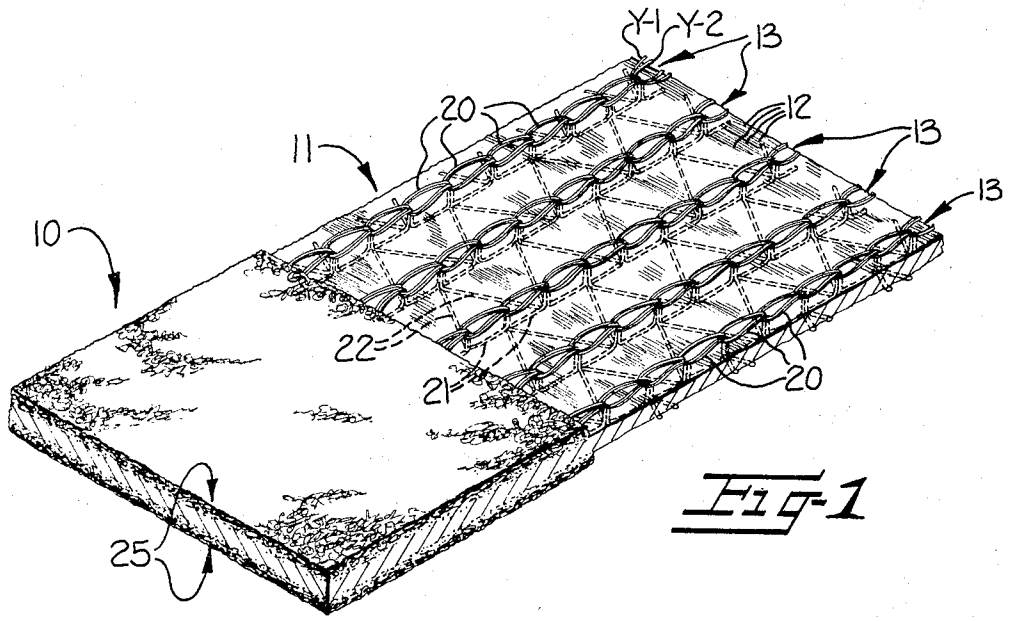

Fig-1

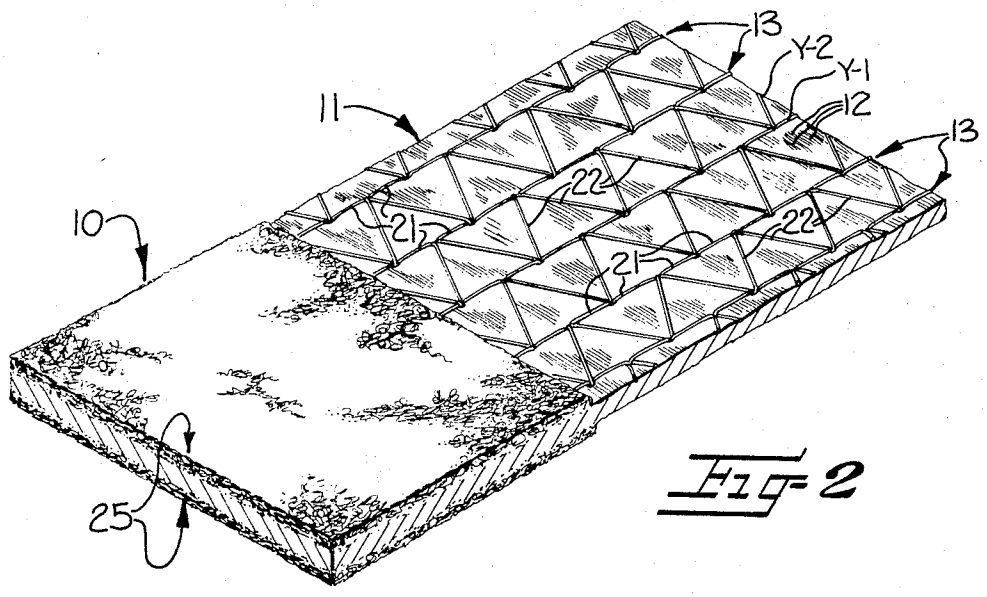

Fig-2

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STITCHED NON-WOVEN FABRIC

Filed June 16, 1966 2 Sheets-Sheet 2

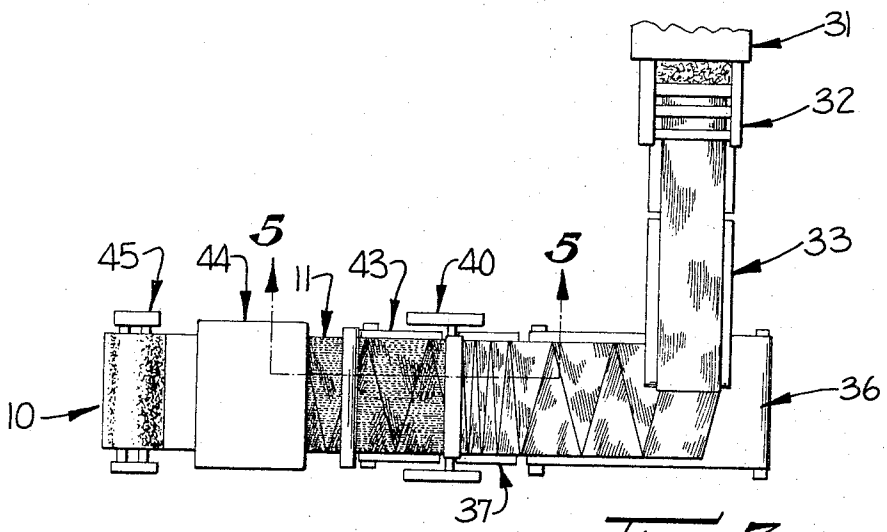

Fig-3

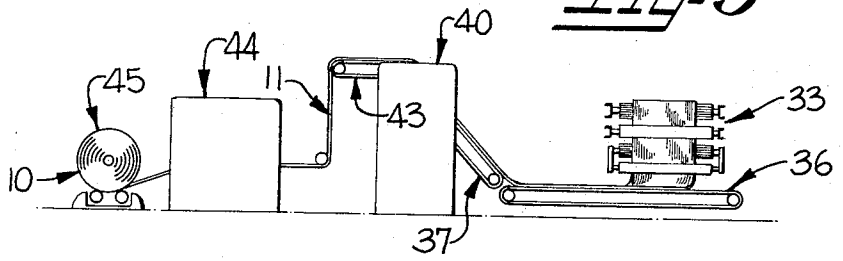

Fig-4

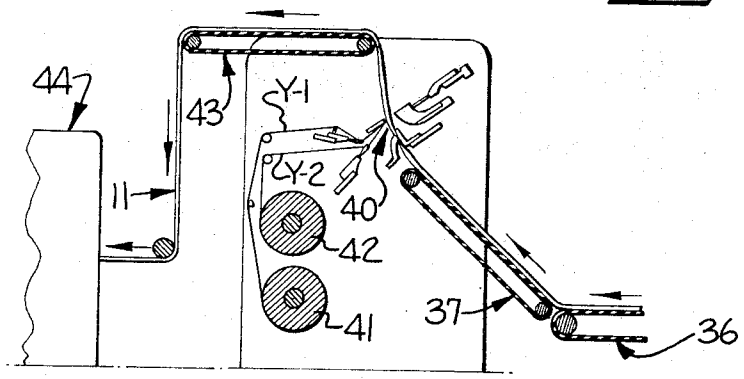

Fig-5

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United States Patent Office

3,329,552

Patented July 4, 1967

3,329,552

STITCHED NON-WOVEN FABRIC

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Filed June 16, 1966, Ser. No. 557,953
3 Claims. (Cl. 161—52)

This is a continuation-in-part of my prior application Ser. No. 439,774, filed Mar. 15, 1965 and now abandoned.

This invention relates to a stitched non-woven fabric adaptable for use as a blanket and other products and having markedly higher stability and strength, as compared with prior non-woven, needled fabrics, the high strength being sufficient to eliminate the necessity of a supporting layer or scrim in the fabric.

Heretofore, in the manufacture of fabrics, adaptable for use as blankets, bedspreads, children and adult outerwear, etc., it has been the usual practice to form a relatively thick or heavy fabric by weaving the fibers or yarns together to provide the stability and strength desired in this type of fabric to withstand wear and normal clearing procedures. This method of forming fabric is a necessarily expensive and time consuming procedure inasmuch as it requires a number of preliminary steps in the formation of yarns prior to the weaving operation, such as carding, spinning, etc., and the weaving operation itself is time consuming and requires the use of expensive looms.

More recently, it has been contemplated to produce non-woven fabric for use as blankets by needling a batt of non-woven fibers with barbed needles without thread to interlace or interloop the fibers of the batt for producing a self-sustained non-woven fabric. While this method of manufacturing is less expensive and less time consuming than weaving, it is subject to the disadvantage that the needled non-woven fabric does not possess the desired stability and strength and resistance to shedding during wear and laundering.

In an attempt to overcome these deficiencies in a needled non-woven fabric, it has been proposed to produce a woven or otherwise dormed scrim or supporting layer between upper and lower layers of non-woven fibers and needle these layers of non-woven fibers to opposite sides of the scrim or supporting layer. It has also been proposed to utilize lengthwise extending warp yarn as the supporting layer between the upper and lower layers of non-woven fibers and to needle these layers of non-woven fibers to the warp yarns for providing stability and strength in a lengthwise direction.

A comparative form of non-woven blanket presently on the market and manufactured by Chatham Manufacturing Company is patent marked under Patent No. 3,112,552, issued Dec. 3, 1963, and assigned to said Chatham Manufacturing Company. Comparative tests between this patented blanket and blankets made in accordance with the present invention and which show the superiority of the latter have been carried out in the test data described below.

Even with the use of the supporting layer or scrim in the needled non-woven blanket fabrics produced under the above patent, the blankets do not have the markedly high strength that characterizes the blankets of the present invention which do not require a scrim or support.

These prior needled non-woven blankets or blanket fabrics fail to provide the strength and stability required to combat wear and cleaning procedures and to prevent

shedding. Furthermore, if the number of needle penetrations utilized in these prior needling operations increased in an attempt to improve the strength and stability of the blanket fabric, the resulting fabric will be too "boardy" or stiff to be used as a blanket or the like.

In accordance with the present invention, the superior non-woven fabric, which does not require a scrim, may be produced by utilizing a self-sustaining batt of non-woven fibers which preferably extend generally in the widthwise direction of the fabric to provide strength and stability to the fabric in the widthwise direction and elongated spaced-apart rows of stitches embedded in the batt of fibers and formed from separate continuous yarns extending in generally the lengthwise direction of the batt throughout the length thereof and passing from one face of the batt to the other face of the batt to interlock the fibers and to provide strength and stability to the fabric in the lengthwise direction. The thus formed fabric also includes at least one outer treated surface on the batt comprising fibers so disposed as to cover substantially the rows of stitches in the batt and provide the desired finish on the fabric for use as blankets, bedspreads, outerwear, etc.

The self-sustaining batt is preferably a carded and cross lapped batt. However, the batt may be needled before stitching or after stitching to enhance the stability and strength thereof with the number of needle penetrations being carefully controlled to avoid "boardiness" or the like.

The treated surface may comprise a napped surface on one or both sides of the fabric when the fabric is used as blankets, bedspreads or the like; or may include a calendered, brushed, sheared, etc. surface when utilized as garment material.

In the preferred form of the non-woven fabric of this invention, it has been found that the spacing of the stitches and the type of stitch utilized is important for obtaining the superior strength and stability in the non-woven fabric.

For this purpose, the rows of stitches are spaced apart a distance less than the length of the fibers in the batt to effect interlocking of the fibers. Normally, the fibers utilized in this non-woven fabric have an average staple length of from about one-half inch to about four inches and the spaces between the rows of stitches are preferably from about one-sixteenth inch to about one-eighth inch.

The preferred stitch construction for the non-woven fabric of this invention is one in which two sets of continuous yarns are utilized and each of the rows of stitches is formed from at least two continuous yarns and has stitch loop components on one side of the batt and interconnected diagonally extending and straight line stitch components on the other side of the batt and in which the stitch loop components are formed from both of the yarns and in which the diagonally extending stitch components are formed from one of the yarns and the straight line stitch components are formed from the other of the yarns. This type of stitch construction insures the desired interlocking of the fibers within the batt and provides superior strength and stability to the fabric in both the lengthwise and the widthwise direction.

To determine the comparative strength of the non-woven stitched fabric of the present invention and the prior non-woven needled fabrics, such as disclosed in the above-identified Smith patent, strictly comparable tests were made on these two types of blanket fabric. These tests included breaking strength in the lengthwise and widthwise directions, bursting strength in all directions and delamination force necessary to separate one layer of

the fabric from another. The results of these tests are as follows:

GRAB TENSILE TESTS

[ASA Standards for woven household blanket fabrics are 25 lbs. Breaking strength in both the lengthwise and widthwise directions]

Stitched Samples (without supporting layer) Breaking Strength in lbs.		Needled Samples (with supporting layer) Breaking Strength in lbs.	
Lengthwise	Widthwise	Lengthwise	Widthwise
75.2	86.1	17.1	14.8
81.7	79.9	17.9	14.2
82.0	81.6	17.2	16.7
86.2	79.2	17.0	20.1
75.0	84.8	17.9	17.8
*80.0	*82.3	*17.4	*16.7

*Average.

STRIP TENSILE TESTS

Stitched Samples (without supporting layer) Breaking Strength in lbs.		Needled Samples (with supporting layer) Breaking Strength in lbs.	
Lengthwise	Widthwise	Lengthwise	Widthwise
41.3	27.0	13.8	5.7
39.4	22.4	18.5	6.2
41.8	27.8	16.6	5.0
44.5	20.0	11.9	6.0
44.5	27.1	17.2	4.8
*42.3	*24.9	*15.6	*5.5

*Average.

BALL BURSTING TESTS

Stitched Samples (without supporting layer) Bursting Strength in lbs.	Needled Samples (with supporting layer) Bursting Strength in lbs.
160	75
147	84
*154	*80

*Average.

DELAMINATION TESTS

Stitched Samples (without supporting layer) Delamination Strength in lbs.		Needled Samples (with supporting layer) Delamination Strength in lbs.	
Lengthwise	Widthwise	Lengthwise	Widthwise
(It was found impossible to delaminate these samples)		1.0	0.7

As may be seen from the above tests, the stitched samples without a supporting layer therein (constructed according to this invention) were from about 200% to about 500% stronger and more stable than the needled samples with a supporting layer therein (constructed according to the Smith patents).

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

FIGURE 1 is an enlarged fragmentary perspective view of one side of the stitched fabric constructed according to this invention and having treated surfaces on one portion thereof and illustrating the stitch construction in the other portion thereof;

FIGURE 2 is an enlarged fragmentary perspective view of the other side of the stitched fabric of FIGURE 1 having treated surfaces on one portion thereof and illustrating the stitch construction on the other side in the other portion thereof;

FIGURE 3 is a somewhat schematic top plan view illustrating one example of how the stitched fabric may be constructed according to this invention;

FIGURE 4 is a somewhat schematic side elevational view of the apparatus of FIGURE 3; and

FIGURE 5 is a somewhat schematic side elevational view taken along the line **5—5** of FIGURE 3 and particularly illustrating the stitching instrumentalities utilized in this invention.

Referring now to the drawings, there is illustrated in FIGURES 1 and 2 both sides of the stitched fabric constructed according to this invention and generally indicated by the reference **10**. The stitched fabric **10** comprises a self-sustaining batt, generally indicated by the reference **11**, of non-woven fibers **12** extending generally in the widthwise direction of the fabric to provide strength and stability to the fabric in the widthwise direction.

The fabric **10** further comprises elongated spaced-apart rows of stitches **13** embedded in the batt of fibers and extending in generally the lengthwise direction of the batt throughout the length thereof and passing from one face of the batt to the other face of the batt to interlock the fibers and to provide strength and stability to the fabric in the lengthwise direction. The rows **13** of stitches are preferably spaced apart a distance less than the length of the fibers in the batt to insure the desired interlocking of the fibers and to provide strength and stability to the batt. Each of the rows of stitches **13** are formed from two continuous yarns **Y1** and **Y2** and have stitch loop components **20** on one side of the batt **11** and interconnected straight line stitch components **21** and diagonally extending stitch components **22** on the other side of the batt **11**. The stitch loop components **20** are formed from both of the yarns **Y1** and **Y2** and the straight line stitch components are formed from one of the yarns **Y1** only and the diagonally extending stitch components are formed from the other of the yarns **Y2** only.

The fibers **12** utilized for making up the batt **11** may be any suitable natural or synthetic fibers including viscose or acrylic or other textile fibers or blends thereof with wool, nylon and polypropylene. The yarns **Y1** and **Y2** utilized to form the rows of stitches **13** may be of various natural or synthetic fibers or blends but continuous filament synthetic yarns are advantageous to obtain relatively high strength and to prevent breakage in the manufacturing operation and to also give good tensile strength to the finished fabric.

The stitched non-woven fabric **10** also includes at least one outer treated surface on the batt comprising fibers so disposed as to substantially cover the rows of stitches in the batt and provide the desired finish on the fabric. As illustrated in FIGURES 1 and 2, the stitched batt **11** includes outer napped surfaces **25** of napped fibers which have been napped to a sufficient height and density to cover the rows of stitches in the fabric and provide uniform outer faces on the fabric to adapt the fabric for use as blankets or the like. However, it is to be understood that these outer treated surfaces may comprise other types of mechanical treatment other than napping, as pointed out above. As is illustrated in FIGURES 1 and 2 only a portion of the fabric has been napped to illustrate the rows of stitches; however, it is to be understood that the entire faces of the blanket fabric would be napped.

Referring now to FIGURES 3–5, a suitable apparatus is illustrated for forming the stitched non-woven fabric **10** of FIGURES 1 and 2; however, it is to be understood that this apparatus is only illustrative and forms no part

of this invention and that other suitable apparatus might also be used.

As shown in these figures, a conventional opening and feeding device, broadly indicated at **31**, feeds the bulk fibers **12** in staple form to a card, Garnett, or other suitable fiber opening device, broadly indicated at **32**, to form a batt of fibers **12** extending generally lengthwise of the batt. The batt of fibers **12** from the card **32** fed to a cross-lapping device **33**.

The cross-lapping device **33** operates back and forth across a conveyor **36** to deposit the batt of fibers **12** thereon. The cross-lapping device **33** is preferably operated at a sufficient speed, relative to the speed of the conveyor **36**, so that the fibers **12** are deposited onto the conveyor **26** to form another batt **11** having the fibers **12** extending generally widthwise thereof to provide strength and stability in the fabric in the widthwise direction. The cross-lapped batt **11** conveyed from the cross-lapping device **33** to another conveyor **37** which moves the batt **11** into a stitch forming mechanism, illustrated somewhat schematically at **40**, to form lengthwise extending rows of stitches **13** in the batt **11** of fibers **12** to interlock the fibers **12** and to provide lengthwise strength and stability to the fabric **10**. The stitch forming mechanism **30** is of the type utilizing two beams **41** and **42** for supplying two sets of continuous yarns **Y1** and **Y2** to the stitch forming instrumentalities for forming stitch constructions utilizing two sets of yarns therein.

The stitch forming mechanism **30** 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 with the above described stitch components.

The stitched batt is led from the stitch forming mechanism **40** by a conveyor **43** to a treating mechanism, broadly indicated at **44**. This treating mechanism **44** may be a napping mechanism or, as set forth above, a calendering, brushing, shearing, etc, mechanism, depending upon the desired finish to be placed on the fabric. In the case of a napping mechanism, the napped surfaces **25** would be formed on each face of the fabric **10** of sufficient density to cover the rows of stitches **13** in the fabric **10**, as may be seen in FIGURES 1 and 2. The napped fabric **10** may then be wound on suitable apparatus, generally indicated in the drawings at **45**.

Thus, it may be seen, that by this invention, a stitched non-woven fabric has been produced which is adaptable for use as blankets and other products and which has markably higher stability and strength, as compared with prior non-woven, needled fabrics, the higher strength being sufficient to eliminate the necessity of a supporting layer or scrim in the fabric.

In the darwings and specification, there have been set forth preferred embodiments of the invention and, although specific terms have been 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.

What is claimed is:

1. A stitched non-woven fabric adaptable for use as a blanket, said fabric being constructed to eliminate the necessity for the use of a supporting layer or scrim therein by providing marked increased strength and stability as compared with prior non-woven, needled fabrics, said fabric comprising:

(a) a self-sustaining batt of non-woven fibers extending generally in the widthwise direction of said fabric to provide strength and stability to said fabric in the widthwise direction; and

(b) elongated spaced apart rows of stitches embedded in said batt of fibers and formed from separate continuous yarns and 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 of said batt to interlock said fibers, said rows of stitches being spaced apart a distance less than the length of said fibers in said batt to insure the desired interlocking of said fibers and to provide strength and stability to said batt, said rows of stitches being formed from two sets of continuous yarns interlocked with each other and having a stitch component extending along the rows of stitches in generally the lengthwise direction of said fabric and having a stitch component extending between rows of stitches in generally the widthwise direction of said fabric for providing strength and stability to said fabric in both the lengthwise and the widthwise directions thereof.

2. A stitched non-woven fabric, as set forth in claim **1**, including at least one outer treated surface on said batt comprising fiber so disposed as to cover substantially said rows of stitches in said batt and provide the desired finish on said fabric.

3. A stitched non-woven fabric adaptable for use as a blanket, said fabric being constructed to eliminate the necessity for the use of a supporting layer of scrim thereing by providing marked increased strength and stability as compared with prior non-woven, needled fabrics, said fabric comprising:

(a) self-sustaining batt of non-woven fibers extending generally in the widthwise direction of said fabric to provide strength and stability to said fabric in the widthwise direction; and

(b) elongated spaced-apart rows of stitches embedded in said batt of fibers and formed from separate continuous yarns and 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 of said batt to interlock said fibers, said rows of stitches being spaced apart a distance less than the length of said fibers in said batt to insure the desired interlocking of said fibers and to provide strength and stability to said batt, each of said rows of stitches being formed from at least two continuous yarns and having stitch loop components on one side of said batt and interconnected diagonally extending and straight line stitch components on the other side of said batt and in which said stitch loop components are formed from both of said yarns and in which said diagonally extending stitch components are formed from one of said yarns and said straight line stitch components are formed from the other of said yarns.

References Cited

UNITED STATES PATENTS

2,890,579	6/1959	Mauersberger	66—192
3,112,552	12/1963	Smith	161—69

FOREIGN PATENTS

729,987	5/1955	Great Britain.

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