(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 070 176 A2**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: 82303632.2

(22) Date of filing: 09.07.82

(51) Int. Cl.^{3}: **D 03 D 15/08**

(30) Priority: 14.07.81 GB 8121705

(43) Date of publication of application: 19.01.83 Bulletin 83/3

(84) Designated Contracting States: AT BE CH DE FR GB IT LI LU NL SE

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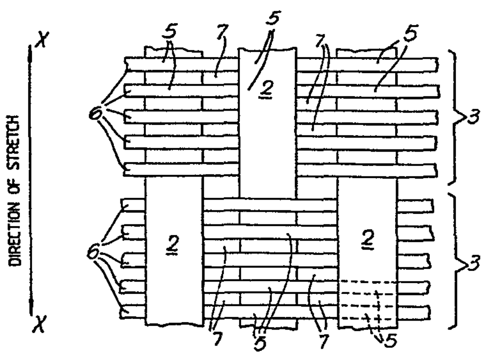
(54) **Stretched fabric material.**

(57) Fabric material is formed utilising a basic fabric taken from the loom and comprising stretchable warp yarns and weft yarns. In accordance with the present invention, the basic fabric is stretched to stretch the stretchable yarns by as much as twice their original length and the yarns are set in this stretched condition. The fabric can be cold or hot drawn, and the stretchable yarns preferably comprise plastics tape e.g. polypropylene. The weft and warp yarns may be heat bonded at their interstices, and a further preferred feature is that the weft yarns have longitudinal zones of weakness which results in the weft yarns splitting into individual strips on warp stretching. An additional base sheet or film may be employed. The inventive fabrice material provides considerably increased cover without substantial increase of cost, and the strength and stability of the fabric will be increased.

Fig. 2.



EP 0 070 176 A2

Croydon Printing Company Ltd.

"STRETCHED FABRIC MATERIAL"

The present invention relates to fabric material and particularly fabric material including longitudinal extending yarns of nylon, polyester, polypropylene, polyethylene or other stretchable plastic fabric materials.

Fabric material is known comprising a warp/weft mesh of polypropylene or other plastics material; this mesh can be made by weaving polypropylene tape or can be made by fibrillating and stitch bonding a longitudinally stretched plastics film by stitching the film e.g. with plastics yarn transversely to the direction of stretch as described in the applicant's U.K. Patent 1437179. It is the principal object of the present invention to provide an improved method of manufacturing such material.

According to one aspect of the present invention, there is provided a method of treating fabric material having stretchable yarn, the treatment comprising the steps of stretching the fabric in the longitudinal or/and the transverse directions to stretch said stretchable yarn, and setting the stretchable yarn in the stretched condition.

The yarns may be stretched cold or may be heated to their softening point prior to stretching.

Preferably, the stretchable yarn comprises synthetic resinous plastics yarn.

The stretchable yarns can be stretched to at least 30% of the original length and preferably to at least twice the original length. The fabric preferably comprises warp and weft yarns and these can be woven together: alternatively the warp yarns may be arranged as stitching to secure the weft yarns.

The fabric may include a base sheet such as plastic films or crepe paper.

According to another aspect of the present invention there is provided a method of manufacturing a fabric material comprising the steps of forming a woven base fabric of warp and weft yarns, said warp yarns comprising stretchable yarns while said weft yarns include longidutinal zones of weakness, stretching the base fabric to stretch said stretchable warp yarns, said warp stretching serving to split said weft yarns into spaced strips, and setting the stretchable warp yarn in the stretched condition.

The present invention is also fabric made by any of the above inventive methods.

This process step gives advantages over a standard woven material, namely:-

1. An increase in the area of fabric for a given quantity of material.
2. A reduction in the weight of the stretched warp or weft yarn.
3. Greater strength of fabric (in grammes/dtex) in the stretched direction.
4. An increase in width in the weft yarn may be achieved, resulting in an increase in cover in the fabric for a given quantity of yarn.
5. A bond between the warp and weft elements of the fabric may be achieved to a variable degree.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 shows a base fabric used in a first embodiment of the present invention;

Fig. 2 shows the base fabric of Fig. 1 treated in accordance with the present invention;

Fig. 3 shows a base film used in a further embodiment of the present invention;

Fig. 4 shows the film of Fig. 3 in the stitched and stretched condition in accordance with the present invention;

Fig. 5 shows a stitched base sheet used in a further embodiment of the present invention, and

Fig. 6 shows the stitched base sheet in the stretched condition and in accordance with the present invention.

Referring to Figs. 1 and 2, in the first embodiment of the present invention, basic fabric material 1 comprises a woven construction of warp yarns 2 and weft yarns 3, which yarns 2,3 are formed from flat polypropylene tape. The warp is a 111 tex tape produced with a stretch orientation ratio of 6:1 for example, while the weft tape 3 is a 111 tex tape with a stretch orientation ratio of 7 to 1 and which has been produced with localised weakened areas 4 running in the longitudinal directions by means of fibrillation, embossing or other methods. 39 threads per 10 cms can be provided in the warp direction and 39 threads per 10 cms in the weft direction. Fig.1 shows the fabric in the initial unstretched condition. The basic fabric 1 is now tensioned and heated to approximately 160°C at which temperature the polypropylene yarns become softened. With the temperature controlled at the desired value of 160°C approximately, the fabric 1 is stretched in the warp direction (see arrow X in Fig.2) to twice its original length. It is important to control the fabric temperature within particular limits e.g. $\pm$ 2°C for satisfactory results and the particular temperature selected will depend on the material of the yarn and other factors, such as the type of yarn bond desired. The warp yarn 2 experiences a weight reduction from 111 tex to 56 tex. However, due to the increased orientation of the warp yarn 2, the tenacity of the yarn, as expressed in gms/dtex, will be increased and the extension of the yarn at breaking load will be reduced. The weft yarn 3 will not be stretched longitudinally. However, due to the appropriate temperature applied to the fabric 1 and the tension and stretching which occurs in the process, the warp and weft yarns 2,3 in the fabric will bond together at their intersections 5. The degree of bonding may be adjusted by varying the conditions of temperature, tension and stretch. During the heating and stretching in the warp direction X and because of the bond achieved at the intersections 5 of warp and weft yarns 2,3, the weft tape 3 will be extended in its crosswise direction. Also because it has been weakened in the longitudinal direction it will tend to split along these weak zones or points 4 continuously or intermittently (depending on degree and form of weakening) into strips 6, which strips 6 will be pulled apart (see Fig.s) thus retaining to a degree the effective cover of the weft tapes 3 despite their now being situated in the fabric at 19½ threads per 10 cms instead of the original 39 threads per 10 cms. As can be seen, the individual gaps 7 in the stretched fabric are smaller than would be the case if the weft yarn did not split: this gives more effective cover. If the weft tapes are not weakened longitudinally their width will be extended by the disturbing of the molecular structure during the heat and stretch process resulting in a possible reduction in tensile strength. If however the longitudinally weakened weft tape splits into a series of narrow strips 6 during the heat and stretch process the molecular orientation is not disturbed and the tensile strength is maintained.

Ultimately, on cooling the fabric, a permanent bond is achieved at the warp/weft intersections 5 resulting in a high degree of fabric stability with a satisfactory retention of cover and strength.

The advantages to be gained from producing the fabric in this form can be listed as follows:-

1. For every one square metre produced on the loom (i.e. as in Fig. 1), two square metres of finished fabric will result (Fig.2)
2. If fabric can be produced with a resultant warp tex of 56 from an initial warp tex of 111, then this will result in a cheaper yarn cost per kilo in the fabric, as it is normal for the lower tex yarns to be more expensive per kilo than the higher tex yarns.
3. The resultant strength of the fabric in grammes/dtex in the warp direction will be greater after stretching than that of the fabric in the unstretched condition (Fig.1).

The resultant strength of the fabric 1 in the weft direction in grammes/dtex is maintained despite crosswise extension of the weft tapes 3.

It will be appreciated that a base fabric 1 containing tapes (2,3,) of yarns of other synthetic or natural materials of differing construction width, orientation ratio, polymer or fibre base and situated in the base fabric with different settings of tapes or yarns per 10 cm, provided the tapes or yarns used can be extended if necessary by the precentage required under the selected conditions of temperature and direction of base fabric stretch.

It will also be appreciated that in this embodiment the stretch may be applied to the base fabric in the longitudinal direction, or in both the longitudinal and transverse directions in varying degrees from 1% upwards.

One commercial end use for the fabric described in this embodiment would be as a material for packing purposes, particularly for production of bags and sacks where good cover, strength and stability of the fabric is desirable at a low cost.

In a modification, weft yarn for example in the form of tapes may be used which do not have the longitudinal weakened zones.

In a second embodiment of the present invention, the basic fabric comprises a stitch bonded fabric having a longitudinal yarn of a flat heat stretchable plastic tape knitted into a chain stitch formation and a transverse weft of spun yarn of a non-thermoplastics material.

The heat stretchable thermoplastics material in the warp direction can advantageously be a polypropylene and the non-thermoplastic spun yarn in the weft direction can advantageously be of jute fibre. The material in the chain in the warp direction is a 44 tex tape produced with a stretch orientation ratio of 5:1, while the weft yarn is a 276 tex spun jute yarn. The rows of chain stitch in the warp direction can be provided at 32 rows per 10 cms and the weft yarns can be provided at 78 threads per 10 cms..

The basic fabric is now tensioned and heated to approximately 158^{O}C, at which temperature the polypropylene tape in the chain stitch becomes softened. With the temperature controlled the basic fabric is stretched in the warp direction to twice its original length. The tape in the chain stitch experiences weight reduction from 44 tex to 22 tex. However, due to the increased orientation of the warp yarn and the equalisation of tension on the three legs of the chain, the resultant tenacity of the chain, as expressed in gms/dtex, will be considerably increased and the extension at breaking load will be reduced. The weft yarn will be unaffected by the heat applied but instead of being situated in the fabric at 32 threads per 10 cms, it will now be reduced to 16 threads per 10 cms.

The advantages to be gained from producing the fabric in this form can be listed as follows:-

1. For every one square metre of basic fabric produced, two square mètres of finished fabric will result.
2. If fabric can be produced with a resultant chain yarn tex of 22 from an initial tex of 44, then this will result in a cheaper yarn cost per kilo, as it is normal for the lower tex yarns to be more expensive

per kilo than the higher tex yarns.

3. The effect of stretching the chain formation in the warp direction results in 3 reasons for increased tenacity in gms/dtex of the chain:
   a. The yarn elements, because of increased orientation, have a resultant increased tenacity.
   b. Any tension load subsequently applied to the chain will be evenly distributed over the 3 legs of the chain, resulting in a higher breaking load.
   c. When the chain is stretched, the amount of orientation resulting at the curved end of the loop is less than the orientation in the legs of the chain loop, which results in an improved strength at the loop bend, which is normally the weak part of the link in the chain.
4. The combination of heating and tensioning the chain formation during the stretching process results in the chain formation gripping more tightly around the weft yarn and after cooling, this results in a permanent improvement in the lock between the chain formation and the weft, resulting in a fabric of improved stability.

It will be appreciated that a base fabric containing other natural yarns or tapes or synthetic yarns or tapes such as fibrillated polypropylene or other materials of differing construction, width, orientation ratio, polymer or fibre base and situated in the base fabric with different settings of tapes or yarns per 10 cm provided the tapes or yarns used can be extended if necessary by the precentage required under the selected conditions of temperature and direction of base fabric stretch.

It will also be appreciated that in this embodiment the stretch may be applied to the base fabric in the longitudinal direction, or in both the longitudinal and transverse directions in varying degrees from 1% upwards.

One commercial end use for the fabric described in this embodiment would be as a secondary carpet backing which has the appearance of a traditional jute backing, with very good properties of stability and adhesion necessary for this end use, at a low cost.

In a third embodiment of the present invention now described, by way of example, fabric material comprises a leno woven construction of warp and weft yarns, which yarns are formed from flat polypropylene tape. The warp tape is a 44 tex tape produced with a stretch orientation ratio of 6:1 while the weft tape is a 111 tex with a stretch orientation ratio of 7:1. 2 x 24 threads per 10 cms can be provided in the warp direction and 40 threads per 10 cms in the weft direction. The basic fabric is now tensioned and heated to approximately 158°C, at which temperature the polypropylene yarns become softened. The basic fabric is stretched in the warp direction to twice its original length. The warp experiences a weight reduction from 44 to 22 tex. However, due to the increased orientation of the warp yarn, the tenacity of the yarn, as expressed in gms/dtex, will be increased and the extension of breaking load will be reduced. The weft yarn will not be stretched longitudinally but instead of being situated in the fabric at 40 threads per 10 cms, it will now be situated at 20 threads per 10 cms.

Advantages to be gained from producing the fabric in this form can be listed as follows:-

1. For every one square metre produced on the loom, 2 square metres of finished fabric will result.
2. If fabric can be produced with a resultant warp tex of 22 from an initial yarn of 44, then this will result in a cheaper yarn cost per kilo, as it is normal for the lower tex yarns to be more expensive per kilo than the higher tex yarns.
3. An improvement in tenacity in the warp resulting from the increased draw ratio in the warp direction and the equalising of tensions between the two threads in the leno warp.
4. Bonding between the warp and weft tapes may be achieved, if required, to varying degrees. If no bonding is required, then an improvement of stability in the fabric can still be achieved by the tightening of the two leno warp threads around the weft.

It will be appreciated that a base fabric containing tapes or yarns of other synthetic or natural materials of differing construction, width, orientation ratio, polymer or fibre base and situated in the base fabric with different settings of tapes or yarns per 10 cm provided the tapes or yarns used can be extended if necessary by the percentage required under the selected conditions of temperature and direction of base fabric stretch.

It will also be appreciated that in this embodiment the stretch may be applied to the base fabric in the longitudinal direction, transverse direction or in both the longitudinal and transverse directions in varying degrees from 1% upwards.

One commercial end use for the fabric described in this embodiment would be as a reinforcement for needled products for use as blankets and coir matress pads, where dimensional stability and strength after needling is important, along with low cost.

Referring to Figs. 3 and 4 in a fourth embodiment of the present invention, a band of longitudinally oriented polypropylene film 8 is supplied to the weft carrier 9 of a Malimo (RTM) stitch-bonding machine (not shown), which carrier traverses back and forth transversely to the direction of warp feed (arrow F Fig.3), to cross-lay the film strip 8 continuously. The weft carrier 9 is modified so as to preperforate the strip at appropriate intervals, causing it to separate into short lengths about 2.5 millimetres wide, which can be looped about the hooks (not shown) which normally receive the weft. Alternatively, the carrier motion may be such as to impale the strip 8 on the latter hooks, likewise causing short splits and narrow strands which can be looped above the hooks. In this way, a continuous length of cross-laid film having upper layer 8a and lower layer 8b is fed by the hooks to the stitching needles of the machine. An appropriate supply of stitching yarn 10 (Fig.4) is provided of nylon, polypropylene or other heat stretchable plastics material and the stitching yarn 10 can be in the form of tape. The stitching yarn 10 should be moderately orientated to enable the stitching process to proceed satisfactorily. The stitch needles are arranged to form spaced parallel rows of chain stitches, longitudinally of the cross-laid film 8, so securing the cross-laid layers 8a, 8b together.

There is thus produced a double-layer film 8a, 8b and the orientation (arrow K Fig.3) of the superimposed film layers 8a, 8b will run oppositely to each other and obliquely to the direction of warp feed of the machine.

The relative angularity of the cross-laid layers 8a, 8b of the film 8 will depend on the machine settings and it will be clear that this angularity can be varied within certain limits.

It has been found that the stitch needles, on penetrating the cross-laid double-layer film 8, cause short slits 11 on each layer 8a, 8b which extend in the direction of stretch orientation K of the layer and obliquely to the direction of movement of the double-layer film (i.e. to the warp direction), the slits (11b) of one layer extending oppositely to the slits (11a) of the superimposed layer due to the relative angular orientation of the superimposed layers 8a, 8b.

The stitching yarns 10 are capable of substantial further orientation and, when the stitched-bonded fabric 12 is taken from the stitch-bonding machine, the fabric 12 is passed over a heating surface (not shown) to heat the yarns 10 to a selected temperature and so as to soften the stitching yarn 10: this can be conveniently done since the stitching yarn 10 stands proud of the weft film 8. Alternatively, the fabric 12 could be completely heated causing softening of the stitching yarn 10 if the stitching has a lower melting temperature. Simultaneously with the heat softening, the stitching yarn 10 is tensioned longitudinally and stretched. In this way, the length of the fabric 12 can be as much as doubled and there is no correcponding reduction in its width.

When the double-layer film 8a, 8b is stretched in the longitudinal direction, "weft elements" 13 are created due to the stitching, which wefts extend transversely of the film and are linked by diagonally extending fibrils 14, 15 formed by said slits 11 and a material having a very regular appearance simulating a woven construction is produced. Thus it has been found that by appropriately selecting the stitching material and the stitch dimension, the separation of the cross-laid film 8 caused by the needle penetration is not continuous. There are left two series of fibrils 14,15 connecting successive "weft elements" 13 and running diagonally in saltire formation. The first series consists of a fibril 14 running diagonally across each space defined by successive weft elements 13 and adjacent rows of stitching, in the direction of orientation of the one layer (8a) of film, and the other series consists of a similar fibril 15 running across each space but in the direction of orientation of the other superimposed layer (8b) of the cross-laid film. These fibrils 14,15 improve the dimensional stability of the material to a substantial degree,in that the resistance to biasing stresses of the fabric 12 is very substantially increased.

In this fourth embodiment of the present invention, the weft film 8 employed is of weight of 50 grammes per square metre and when formed into the double layer, results in a weft direction fill weighing 100 grammes per square metre. The material in the chain 10 in the warp direction is a 44 tex polypropylene tape produced with a stretch orientation ratio of 5:1. The rows of chain stitch in the warp direction can be provided at 32 rows per 10 cms. The length of stitch can be 3.5 mms. The basic fabric when tensioned can be heated to approximately 158°C, at which temperature the polypropylene tape 10 in the chain stitch becomes softened. The basic fabric is stretched in the warp direction to twice its original length, and the tape in the chain stitch 10 experiences weight reduction from 44 tex to 22 tex. However, due to the increased orientation ofthe warp yarn, and the equalisation of tension on the 3 legs of the chain, the resultant tenacity of the chain, as expressed in grammes per dtex, will be considerably increased and the extension at breaking load will be reduced as in the second embodiment. The weft film 8 will be unaffected by the heat applied but instead of being situated in the fabric at a total weight of 100 grammes per square metre, it will not be reduced to 50 grammes per square metre.

The advantages to be gained from producing the fabric in this form can be listed as follows:-

1. For every one square metre of basic fabric produced, two square metres of finished fabric will result.
2. If fabric can be produced with a resultant chain yarn tex of 22 from an initial tex of 44, then this will result in a cheaper yarn cost per kilo, as it is normal for the lower tex yarns to be more expensive per kilo than the higher tex yarns.
3. The effect of stretching the chain formation in the

warp direction results in 3 reasons for increased tenacity in grammes per dtex of the chain:

a. The yarn elements, because of increased orientation, have a resultant increased tenacity.

b. Any tension load subsequently applied to the chain will be evenly distributed over the 3 legs of the chain, resulting in a higher breaking load.

c. When the chain is stretched, the amount of orientation resulting at the curved end of the loop is less than the orientation in the legs of the chain loop, which results in an improved strength at the loop end which is normally the weak part of the link in the chain.

4. The combination of heating and tensioning the chain formation during the stretching process results in the chain's formation gripping more tightly around the strips of weft film and after cooling, this may result in a bonding between the film and the chain stitch or a permanent improvement in the mechanical lock between the chain formation and the strips of weft, resulting in a fabric of improved stability.

5. The stretching of the double layer film in the longitudinal direction results in the creation of "weft elements" as described earlier in this embodiment, resulting in considerable improvement of the dimensional stability of the material, in that the resistance to biassing stresses is very substantially increased.

It will be appreciated that a base fabric containing a weft direction oriented web, row, or film of other synthetic or natural materials of differing construction, width weight and thickness, could be used and that in the warp direction, stitching yarns of other synthetic or natural materials of differing construction, width, orientation ratio, polymer or fibre base and situated in the base fabric with different settings of tapes or yarns per 10 cm provided the warp and weft direction materials can be extended if necessary by the percentage required under the selected conditions of temperature and direction of base fabric stretch. It will also be appreciated that in this embodiment stretch may be applied to the base fabric in the longitudinal direction or in both the longitudinal and transverse directions in varying degrees from 1% upwards.

The fabric could be used commercially for the manufacture of open weave sacks and bags for vegetables, where lightness and good stability are required in the product, along with a low cost of production.

Referring to Figs. 5 and 6, in a fifth embodiment of the present invention, a basic fabric 16 (Fig.4) comprises a stitch bonded crepe paper 17 crimped transversely with resultant longitudinal stretch, having a longitudinal warp yarn 18 of a partially oriented polyester continuous filament yarn knitted into a chain stitch formation and a transverse weft 19 of continuous filament polyester with standard orientation. The yarn 18 extends transversely to the crimp. The material in the chain in the warp direction is a 30 tex POY polyester yarn, while the weft yarn 19 is a 15 tex continuous filament, conventionally drawn, polyester yarn. The rows of chain stitch in the warp direction can be provided at 20 rows per 10 cms and the weft yarns can be provided at 15 threads per 10 cms.

The basic fabric 16 is now tensioned and stretched in the warp direction from the unstretched condition in Fig. 5 to twice its original length without the application of heat i.e. to the condition in Fig.6. The POY yarn 18 experiences a weight reduction from 30 tex to 15 tex. However, due to the nature of the POY and the increased orientation in the warp along the equalisation of tensions on the 3 legs of the chain, the resultant tenacity of the chain, as expressed in grammes per dtex, will be considerably increased and the extension at breaking load will be reduced to normal levels as explained previously. The weft yarn 19 instead of being situated in the fabric at 15 threads per 10 cms, will now be reduced to 7½ threads per 10 cms. The advantages to be gained from producing the fabric in this form can be listed as follows:-

1. For every one square metre of basic fabric produced, two square metres of finished fabric will result.
2. If the fabric can be produced with a resultant chain yarn tex of 15 from an initial tex of 30, using a POY yarn as a base, then this will result in a cheaper yarn cost per kilo, as it is normal for the lower tex yarns to be more expensive per kilo than the higher tex yarns and for POY yarn to be cheaper than the fully oriented variety.
3. The effect of stretching the chain formation in the warp direction results in 3 reasons for increased tenacity in grammes per dtex of the chain:
   a. The yarn elements, because of increased orientation, have a resultant increased tenacity.

b. Any tension load subsequently applied to the chain will be evenly distributed over the 3 legs of the chain, resulting in a higher breaking load.

c. When the chain is stretched, the amount of orientation resulting at the curved end of the loop is less than the orientation in the legs of the chain look, which results in an improved strength at the loop bend, which is normally the weak part of the link of the chain.

It will be appreciated that a base fabric containing extendable base materials other than crepe paper extendable in one or both directions may be utilised. The yarns used may be of other synthetic or natural materials of differing construction, width, orientation ratio, polymer or fibre base and situated in the base fabric with different settings of tapes or yarns per 10 cm provided the tapes or yarns used can be extended if necessary by the percentage required under the selected conditions of temperature and direction of base fabric stretch.

It will also be appreciated that in this embodiment stretch may be applied to the base fabric in the longitudinal or longitudinal and transverse directions in varying degrees of stretch from 1% upwards.

One commercial end use for the fabric described in this embodiment would be as a material for the production of base fabric for carpet underlay production, where strength and rigidity at lost cost are important.

CLAIMS:

1. A method of treating fabric material including yarns characterised in that the yarns are stretchable yarns (2) and in that the fabric is stretched in the longitudinal or/and transverse directions to stretch said stretchable yarns (2), and the stretchable yarns(2) are set in the stretched condition.

2. A method as claimed in Claim 1, characterised in that the stretchable yarns comprise warp yarns (2) and there are provided weft yarns (3) including longitudinal zones of weakness (4), said warp yarn defining said stretchable yarn and in that said warp stretching serves to split said weft yarns (3) into spaced strips (6).

3. A method as claimed in Claim 1 or 2, characterised in that the stretchable yarns (2) comprise synthetic resinous plastics yarns.

4. A method as claimed in Claim 2, characterised in that the weft yarns (3) comprise synthetic resinous plastics yarns, and said longitudinal zones of weakness (4) are provided by yarn fibrillation, embossing or like process.

5. A method as claimed in Claim 1 or 2, characterised in that the stretchable yarns (2) are stretched and set with a length increase of at least 30% of the original length.

6. A method as claimed in Claim 1, characterised in that the fabric comprises warp and weft yarns woven together.

7. A method as claimed in Claim 1, characterised in that weft yarns (3) are secured to stretchable warp yarns (2) by chain stitching of the warp yarns (2), the stretching

of the warp yarns (2) serving to increase the strength of the chain stitching.

8. A method as claimed in Claim 1, characterised in that the fabric includes a base sheet or film (8,17).

9. A method as claimed in Claim 8, characterised in that the base sheet (8) comprises a double film-layer, each film-layer (8a, 8b) being stretch orientated with the stretch-orientation of one layer transverse to that of the other layer, the stretchable yarns (10) being stitched to the double layer base sheet to secure the layers so that when the yarns (10) are stretched the base sheet (8) adopts a fibrillated form.

10. A method as claimed in Claim 9, characterised in that the double-layer base sheet (8) is formed by cross-laying a strip of film.

11. A method as claimed in Claim 8, characterised in that the base sheet (17) comprises a sheet of crimped material e.g. crepe paper, the stretchable yarns (18) extending transversely to the direction of crimp, the stretchable yarns (18) and the base material (17) being stretched and set in the stretched condition.

12. A method as claimed in Claim 1 or 2, characterised in that the stretchable yarns (2) are stretched in the heated condition.

13. A method as claimed in Claim 12, characterised in that the stretchable yarns (2) are thermoplastic synthetic resinous materials; and stretching is achieved by initially holding the stretchable yarns (2) in tension,

heating the yarns (2) to a selected temperature to soften the yarns (2), then stretching the heated yarns (2) to the desired length while controlling the heating temperature.

14. A method as claimed in Claim 1 or 2, characterised in that the stretchable yarns (2) are heat stretched so as to cause heat bonding between warp and weft yarns (2,3) of the fabric at their intersections.

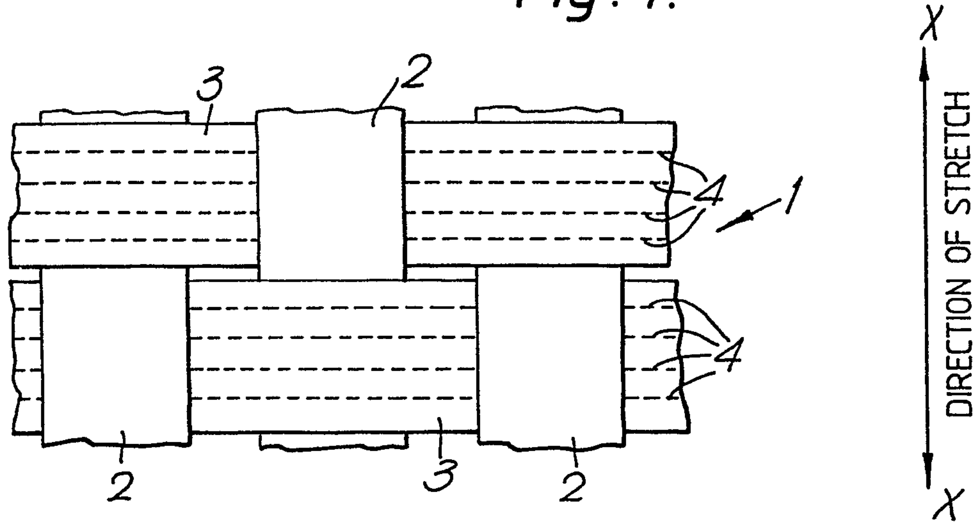
15. Fabric material including yarns, characterised in that the yarns (2) are stretched and set in the stretched condition by virtue of stretching of the fabric material (1) in any of the longitudinal and transverse directions.

16. Fabric material as claimed in Claim 1 characterised in comprising a woven base fabric of warp yarns (2) and weft elements (6), the warp yarns (2) having been set in a stretched condition by virtue of stretching of the base fabric while the weft elements (6) are formed on stretching of the warp yarns (2) by longitudinal splitting of individual weft yarns (3) provided with longitudinal zones of weakness (4).

17. Fabric material sa claimed in Claim 15 or 16, characterised by warp (2) and weft yarns(6) which are heat bonded together at their intersections (5).

18. Fabric material as claimed in Claim 15 characterised in that there is additionally included a base layer (8,17) to which the stretchable yarns (2) are secured.

Fig. 1.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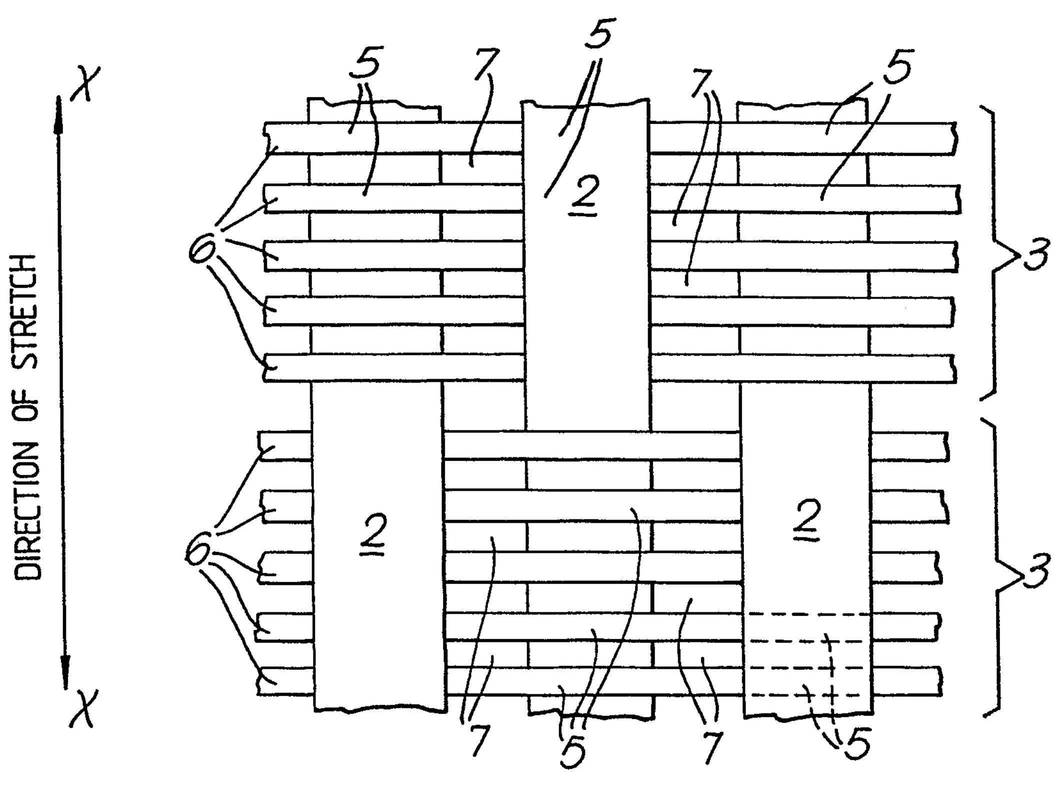
DIRECTION OF STRETCH
X

Fig. 2.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DIRECTION OF STRETCH
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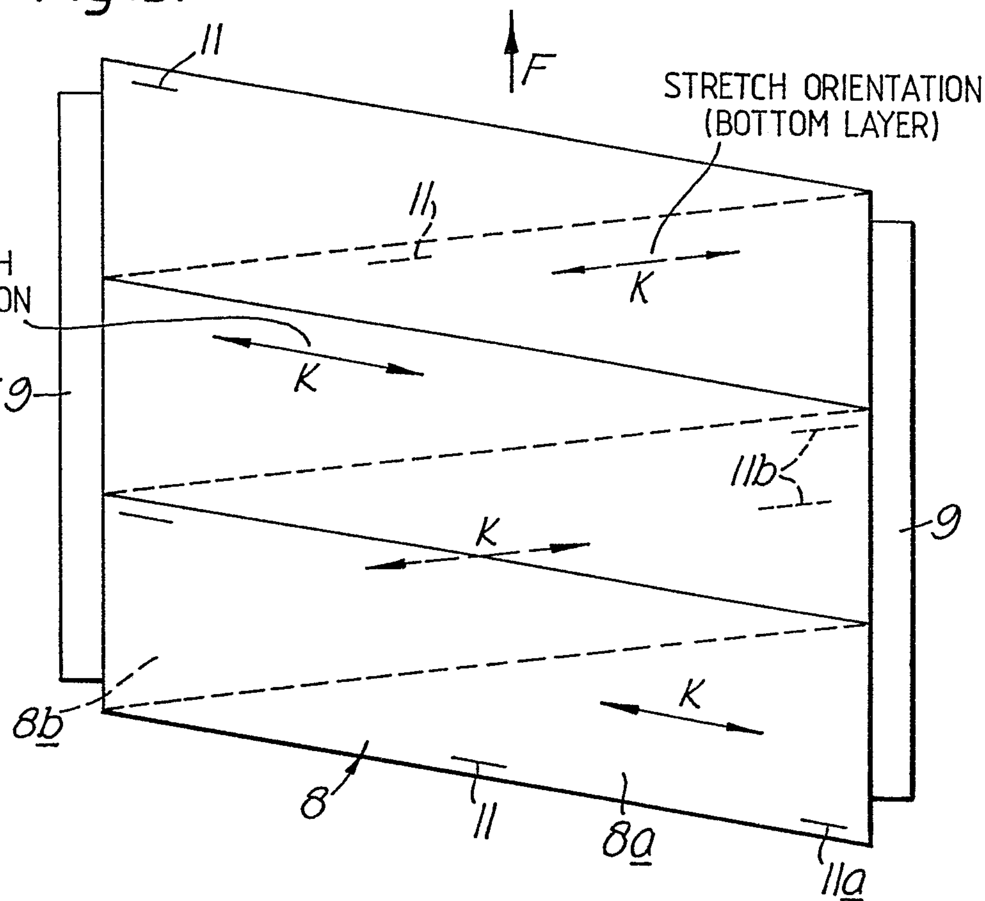
Fig. 3.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STRETCH ORIENTATION (BOTTOM LAYER)
STRETCH ORIENTATION (TOP LAYER).
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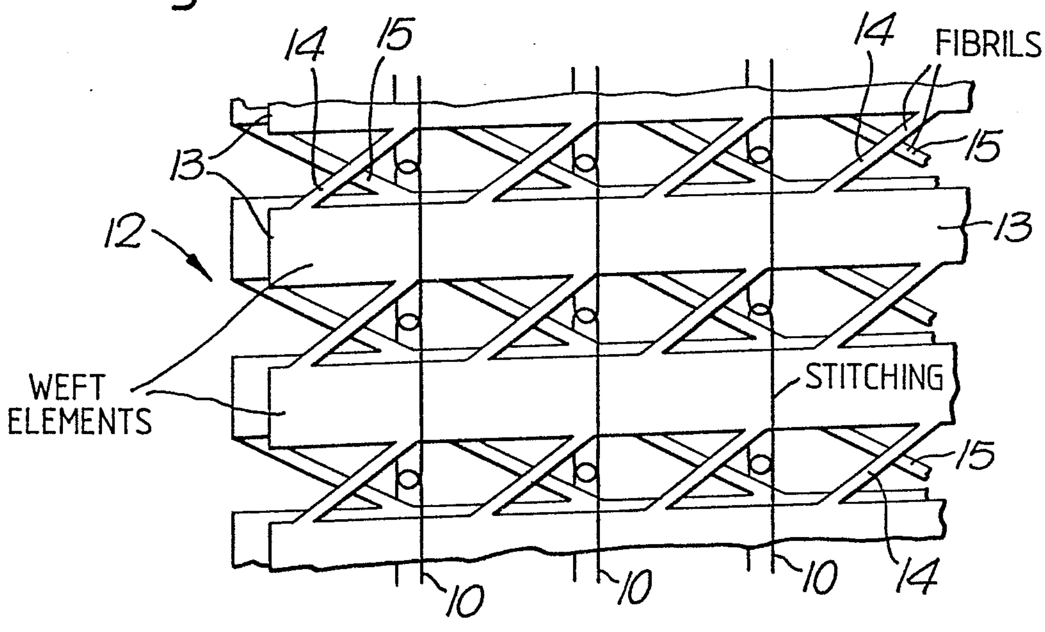
Fig. 4.


14
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FIBRILS
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13
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12
WEFT ELEMENTS
STITCHING
15
14
10
10
10

Fig. 5.

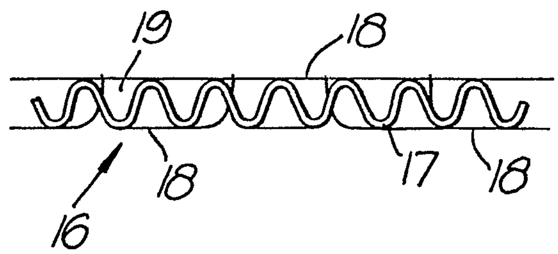

Fig. 6.