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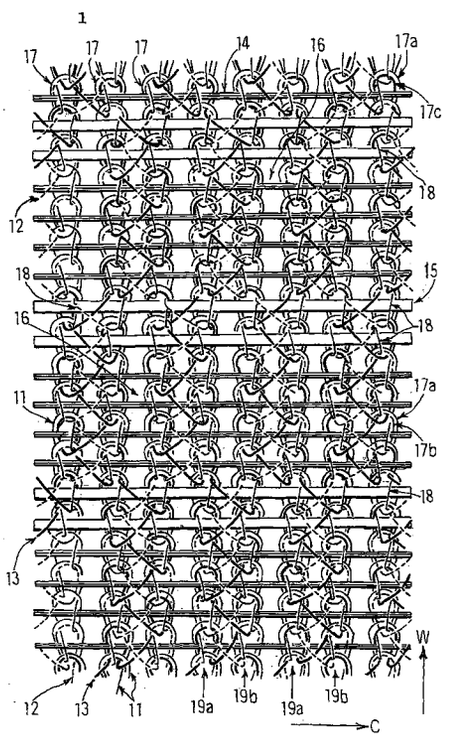
(54) ELASTIC WARP-KNIT FABRIC

(57) Thick main elastic yarn (14), which is thicker than main stitch yarn, and main inserted yarn (15), which is more bulky and thicker than the main elastic yarn(14) in appearent thickness,are knitted in line in the knitting width direction (C) or in the knitting length direction (W) of mesh like base knitted fabric (10) which is knitted up with main stitch yarns (11, 12, 13) by using warp knitting machine and which have opening (16) which is larger than needle loop formed from the stitch yarn (11,12,13) and is extending over plural knitting courses.

In accordance with the present invention,the warp knitted elastic fabric which is useful for the cushioning surface of car-seat and a like,does not cause a recess and loosened pucker result from load-hysteresis fatigue at use for the cushioning surface,is rich in dimensional stability and does not cause a distortion of stitch openings, is rich in air-permeability and does not give stuffy feeling, is able to maintain limbs in comfortable posture without in slippage when limbs are put on the cushioning surface, has soft touch feeling, is not glossy and has soft and quite natural fine appearance covered with fine fibers and is not similar to monotonous simple surface of the conventional plastic goods in apperance , and is rich in market value, can be obtained.



EP 1 574 609 A9

Description

Technical Field

[0001] The present invention relates to an air-permeable warp knitted elastic mesh fabric which is used to form a cushioning surface(24) of such a body support goods as legless-chair, single-chair, bench, seat-backrest, seat-footrest,car-seat, sofa, bed and a like,which are used to elasticaly support a body at indoors,outdoors and inside of car, by streching(hanging) between frame parts of a frame(23) of the body support goods.

Background Art

[0002] As disclosed in Japanese Patent Laid Open No. 11-279906, Japanese Utility Model Laid Open No. 56-103080 and Japanese Utility Model Laid Open No. 54-139779, warp knitted elastic mesh fabrics having openings, which is larger than a needle loop formed from stitch yarn and is extending over plural knitting courses , are well known .

[0003] As disclosed in Japanese Patent Laid Open No.11-279907 and Japanese Utility Model Publication No.3-36555, weft inserted warp knitted fabrics having inserted yarns,which are knitted into base knitted fabric formed from main stitch yarns by warp knitting machine and are in continuous in line in the knitting width direction, and warp inserted warp knitted fabrics having inserted yarns,which are knitted into base knitted fabric formed from main stitch yarns by warp knitting machine and are in continuous in line in the knitting length direction, are well known .

As disclosed in Japanese Patent Laid Open No. 11-279907,Japanese Patent No.3096356 and Japanese Patent Gazette 62-60489,knitting manner to thread an elastic yarn into warp knitted fabrics is well known .

As disclosed in Japanese Patent No. 3096356, 11-279907, polyether-ester elastic yarn is well known as the elastic yarn to be threaded into warp knitted fabrics.

[0004] It is considered to apply a woven elastic fabric (27), on which surface a honey-comb pattern was drawn with a leno and gauze textile design, to the cushioning surface (24) of the car-seat and a like. Wherein the leno and gauze textile design may be wovend up in a manner where monofilament elastic yarns of a fineness of about 2000 dtex are applied to warp yarns (25), multifilament bulky texturized yarns of which apparent thickness is thicker than the monofilament elastic yarns (warp yarns 25) are applied to weft yarns (26), warp yarns (25) arranged in the weaving width direction are classified into 8 groups,open sheds are formed by eanh pair of adjacent warp yarns (25a-25b, 25a-25b, 25a-25b, 25a-25b) of each group, shedding motion (open shed) is changed every picking,and two weft yarns (26a-26b) which was picked into the open shed in order are tied up by the pair of adjacent warp yarns (Figure 5).

[0005] In the case of application of the warp knitted mesh fabric to the cushioning surface of the car-seat, the cushioning surface which is good in air-permeability, gives cool feeling in touch, and does not give stuffy feeling, may be obtained. However, conventional warp knitted mesh fabric applied to the cushioning surface can not bear at use, since loosened puckers arise and a recess appears over the cushioning surface at use.

In this connection, in the case of application of the weft inserted warp knitted fabrics, where the elastic yarn is threaded in,and the warp inserted warp knitted fabrics, where the elastic yarn is threaded in, to the cushioning surface,loosened puckers and recess may be avoided by the elastic yarn and durable car-seat and a like may be obtained.

For the sake, it needs to densely thread the monofilament elastic yarns of single fiber fineness of more than 1500 dtex into the base knitted fabric so that stress at 10% elongation in the direction where the elastic yarn may be in continuous in the warp knitted fabric is to be set up more than 100 N/ 5 cm.

However, in the case of application of such a thick monofilament elastic yarn, the surface of the warp knitted fabric becomes similar to monotonous simple surface of the conventional plastic goods.So that, car-seat and a like having high market value can not be obtained. Since the surface of the monofilament elastic yarn, which is thick in single fiber fineness, is flat and slippery as like a surface of fishline, so that, soft and quite natural fine appearance, which is covered with fine fibers, can not be formed over the surface of the warp knitted fabric.

[0006] Especially, the surface of woven elastic fabric, where thick monofilament elastic yarns are densely woven in and expose over the surface of woven elastic fabric like a mat rush of facing tatami mats, is flat, slippery, and glossy, so that, when limbs are put on the cushioning surface formed from such a elastic fabric,limbs are in slippage,and can not be maintained in comfortable posture and are to be brought into fatigued feeling (Figure 5).

And, the woven elastic fabric woven, on which surface a honey-comb pattern is drawn out, lacks in size and shape stability, so that high durable cushioning surface can not be formed with it. Since the honey-comb pattern is formed with weft yarns which are in tortuous in a zigzag manner in the weaving width direction, and when tension acts in the weaving width direction, these weft yarns are elongated and transformed in line.

[0007] Therefore, the present invention intends to provide a improved warp knitted elastic fabric which is useful for the cushioning surface of car-seat and a like, and which does not cause a recess and loosened pucker result from load-hysteresis fatigue at use for the cushioning surface,and which is rich in dimensional stability and does not cause a distortion of stitch openings, and which is rich in air-permeability, and which does not give stuffy feeling, and which is able to maintain limbs in comfortable posture without in slippage when limbs are put

on the cushioning surface, and which has soft touch feeling,and which is not glossy, and which has soft and quite natural fine appearance covered with fine fibers, and which is not similar to monotonous simple surface of the conventional plastic goods in apperance, and which is rich in market value.

Disclosure of Invention

[0008] A warp knitted elastic fabric, in accordance with the present invention, has the first character comprised of following elements (1), (2), (3) and (4).

(Element 1)

A base knitted fabric (10) is knitted up from main stitch yarns by using warp knitting machine.

(Element 2)

Main elastic yarns (14) are knitted in the base knitted fabric (10) and are in continuous in line in the knitting width direction (C) or in the knitting length direction (W).

(Element 3)

Main inserted yarns (15) are knitted in the base knitted fabric (10) and are in continuous in line in the knitting width direction (C) or in the knitting length direction (W).

(Element 4)

Main inserted yarns (15) are more bulky than both main elastic yarns (14) and main inserted yarns (15), and main inserted yarns (15) are thicker in appearent thickness than both main elastic yarns (14) and main inserted yarns (15).

The warp knitted elastic fabric does not call on monotonous simple imagine similar to plastic goods since a flatness and glossy appearance of the surface is restrained by the light absorption of the main inserted yarns (15) of which surface is made from countless fibers and lacks in light reflection.

And, the knitted elastic fabric is rich in soft touch feeling and is useful for the cushioning surface of car-seat and a like, since the main inserted yarns (15) are thick in appearent thickness and very bulky and the countless fluff and pile fibers of the surface of the main inserted yarns are to be projected between adjacent the sinker loops (18,18) of main stitch yarn without pushed down and without covered with these sinker loops (18, 18) of main stitch yarn.

[0009] In addition to above first character, the warp knitted elastic fabric, in accordance with the present invention,has the second character comprised of following elements (1) and (2).

(Element 1)

On the base knitted fabric (10), there is formed opening (16) which is larger than the needle loop (17) formed from main stitch yarn and which is extending over plural knitting courses.

(Element 2)

The base knitted fabric (10) is formed in mesh shaped.

The surface of the main inserted yarn (15) is covered with countless fibers and lacks in light reflection.

So that, the surface gloss and flatness of the fabric is restrained by the light absorption of the main inserted yarns (15).

In addition, the fine shape of the opening (16) acts to disturb an occurrence of the surface gloss.

Thus,the warp knitted elastic fabric becomes quite natural appearance and rich in air-permeability and cool touch feeling, and does not call on monotonous simple imagine which is similar to plastic goods, and becomes easy to mould by fitting the configuration of the frame (23) of the car-seat and a like.

[0010] In addition to above any one of characters of the first and the second, the warp knitted elastic fabric, in accordance with the present invention, has the third character comprised of following elements (1), (2), (3) and (4).

(Element 1)

The main stitch yarns for forming the base knitted fabric (10) are composed of at least two kinds of the first main stitch yarns (11) and the second main stitch yarns (12) which are to be respectively guided by the different reeds.

(Element 2)

The first main stitch yarns (11) are applied to form chain stitched rows (19) which are in continuous in the knitting length direction (W).

(Element 3)

The second main stitch yarns (12) are applied to form needle loops (17b) which are conbined as one united needle loop with the needle loop (17a) of the first main stitch yarn (11).

(Element 4)

The second main stitch yarns (12) are also applied to connect adjacent chain stitched rows (19a, 19b) of adjacent first main stitch yarns (11, 11) by being shifted laterally between the adjacentchain stitched rows (19a, 19b).

In this warp knitted elastic fabric,the main elastic yarns and the main inserted yarns are knitted in the base knitted fabric,and are in continuous in line in the length direction (W), and then become to be alined in parallel with the chain stitched row of the first main stitch yarn.

So that, it becomes easy to knit the main elastic yarns and the main inserted yarns in the base knitted fabric, thus it becomes easy to knit up the warp knitted elastic fabric.

And, in the case of weft inserted warp knitted fabrics (as disclosed in Japanese Patent Laid Open No. 11-279907), dimensional stability of the warp knitted elastic fabric is improved. Since, in corresponding to strength in the knitting width direction where is reinforced by the main elastic yarns and the main inserted yarn, strength in the knitting length direction is ensured by the chain stitched rows (19) of the first main stitch yarn.Then balance between strength in the knitting length direction and strength in the knitting width direction can be kept.

[0011] In addition to above any one of characters of the first and the second, the warp knitted elastic fabric, in accordance with the present invention, has the fourth character comprised of following elements (1), (2), (3) and (4).

(Element 1)

The main stitch yarns for forming the base knitted fabric (10) are composed of at least three kinds of the first main stitch yarns (11), the second main stitch yarns (12), and the third main stitch yarns (13), which are to be respectively guided by the different reeds.

(Element 2)

The first main stitch yarns (11) are applied to form chain stitched rows (19) which are in continuous in the knitting length direction (W).

(Element 3)

The second main stitch yarns (12) and the third main stitch yarns (13) are applied to form respectively different needle loops (17b,17c) which are conbined as one united needle loop with respectively different needle loop (17a) of the first main stitch yarn (11).

(Element 4)

The second main stitch yarns (12) and the third main stitch yarns (13) are also applied to connect adjacent chain stitched rows(19a, 19b) of adjacent first main stitch yarns (11, 11) by being shifted laterally between the adjacent chain stitched rows (19a, 19b).

In this warp knitted elastic fabric, two chain stitched rows (19a, 19b) are bound by the second and third main stitch yarns over plural knitting courses, a stripe crease to partition between adjacent openings (16,16) is formed with the two chain stitched rows (19a,19b), and the opening (16) is bordered by the thick stripe crease, then the opening (16) is put into dimensionally stable construction.

So that,the warp knitted elastic fabric becomes rich in air-permeability and dimensional stability and becomes suitable for the car-seat and a like.

The stripe crease is formed in thick, since it is formed from two chain stitched rows (19a, 19b). Also, the stripe crease is formed in lacking in light reflection,since the appearance of the stripe crease is formed with a lot of sinker loops (18) of the main stitch yarns, which form the two chain stitched rows (19a, 19b), and with fine protrusions or recess which are formed from countless fibers of the main stitch yarn. Thus,the surface gloss and flatness of the main elastic yarn(14) is restrained by the stripe crease. And, mesh pattern is drawn with such a stripe crease and an opening (16). So that,the warp knitted elastic fabric is to be made up suitable for decoration of the cushioning surface of the car-seat and a like.

[0012] In addition to above any one of characters of the first and the second, the warp knitted elastic fabric, in accordance with the present invention, has the fifth character comprised of following element(1).

(Element 1)

The main stitch yarn is made of polyether-ester polymer.

The main stitch yarn made of polyether-ester polymer is superior in tensile strength.

So that, when limds are put on the cushioning surface(24) which is composed by stretching the warp knitted elastic fabric oven the frame(23), a part of the cushioning surface(24) does not deeply sag and move to and fro due to the weight of limbs,limds are supported in stable,and the warp knitted elastic fabric does not give hard and painful touch feeling but effects moderate cushion feeling.

When polyester multifilament yarn is applied to the main stitch yarns and the main inserted yarn, it becomes possible to dye the warp knitted elastic fabric in one bath dyeing process.

[0013] In addition to above any one of characters of the first and the second, the warp knitted elastic fabric, in accordance with the present invention, has the sixth character comprised of following element (1).

(Element 1)

The main stitch yarn is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer.

When this warp knitted elastic fabric is finished up by passing through dry-heating treatment, the main elastic yarn and the main stitch yarn are thermally adhered. Then, the warp knitted elastic fabric which does not cause distortion of stitch openings under reiterative stretching, and which is rich in abrasion resistance and dimensional stability,and which is useful for the cushioning surface, can be obtained.

[0014] In addition to above any one of characters of the third and the fourth, the warp knitted elastic fabric, in accordance with the present invention, has the seventh character comprised of following element (1).

(Element 1)

The first main stitch yarn (11) is made of polyether-ester polymer.

This warp knitted elastic fabric is rich in elasticity not only in the direction,where the main elastic yarn (14) is in continuous, but also in all direction where the main elastic yarn (14) intersects. So that, in the application for the cushioning surface (24) of the frame (23) of the car-seat and a like,a body weight is to be supported evenly on the whole surface of this warp knitted elastic fabric,thus the warp knitted elastic fabric does not cause a recess and loosened pucker result from load-hysteresis fatigue under reiterative stretching caused from the body weight, and does not deeply sag the under the body weight,and does not effect hard and painful touch feeling but effects moderate cushion feeling.

[0015] In addition to above any one of characters of the third and the fourth, the warp knitted elastic fabric, in accordance with the present invention, has the eighth character comprised of following element (1).

(Element 1)

The main stitch yarn is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer.

As mentioned adove, when this warp knitted elastic fabric is finished up by passing through dry-heating treatment,the main elastic yarn and the main stitch yarn are thermally adhered.

Then,the warp knitted elastic fabric which does not cause distortion of stitch openings under reiterative stretching,and which is rich in abrasion resistance and dimensional stability, and which is useful for the cushioning surface, can be obtained.

[0016] In addition to above any one of characters of the first, the second, the third, the fourth, the fifth, the sixth, the seventh and the eighth, the warp knitted elastic fabric, in accordance with the present invention, has the ninth character comprised of following element (1).

(Element 1)

The main elastic yarn ((14)) and the main inserted yarn ((15)) are knitted in respectively the different course of the base knitted fabric ((10)).

In this case, the main elastic yarn (14) and the main inserted yarn (15) are set apart from one another by the needle loop (17) and the sinker loop (18) of the main stitch yarn and are alined in parallel with one another. So that, in the application for the cushioning surface (24) of the frame (23) of the car-seat and a like,the main inserted yarn (15) does not touch with the stretchable main elastic yarn (14). Therefore, the main elastic yarn (14) can not be rubbed by the main inserted yarn (15),so that does not wear out easily. And, stretching actions of the main elastic yarn (14) is not interfered by the main inserted yarn (15). Thus,the warp knitted elastic fabric becomes rich in stretching property and abrasion resistance and becomes suitable for the cushioning surface.

[0017] In addition to above any one of characters of the first, the second, the third, the fourth, the fifth, the sixth, the seventh, the eighth and the ninth, the warp knitted elastic fabric, in accordance with the present invention, has the tenth character comprised of following element (1).

(Element 1)

The main inserted yarn (15) is chenille yarn which is formed with axis yarns and pile fibers for covering the axis yarns wherein pile fibers are projecting from the axis yarns.

Since the pile fibers of the main inserted yarn (chenille yarn 15) are projecting and covering the surface of the warp knitted elastic fabric and effect non-slip action, limbs put on the cushioning surface (24) are not in slippage but supported in comfortable posture, and the pile fibers effect comfortable touch feeling. So that,also in this connection, the warp knitted elastic fabric becomes suitable for the cushioning surface.

[0018] In addition to above any one of characters of the first,the second,the third, the fourth, the fifth, the sixth, the seventh, the eighth, the ninth and the tenth, the warp knitted elastic fabric, in accordance with the present invention,has the eleventh character comprised of following element (1).

(Element 1)

The main stitch yarn is made of polyether-ester polymer.

As mentioned adove, themain stitch yarn made of polyether-ester polymer is superior in tensile strength. So that, when limds are put on the cushioning surface (24) which is composed by stretching and hanging the warp knitted elastic fabric over the frame (23), a part of the cushioning surface (24) does not deeply sag and move to and fro due to the weight of limbs. Thus, limds are supported in stable, and the warp knitted elastic fabric does not effect hard and painful touch feeling but effects moderate cushion feeling.

When polyester multifilament yarn is applied

to the main stitch yarns and the main inserted yarn, one bath dyable warp knitted elastic fabric can be obtained.

[0019] In addition to above any one of characters of the first, the second, the third, the fourth, the fifth, the sixth, the seventh, the eighth, the ninth, the tenth and the eleventh,the warp knitted elastic fabric, in accordance with the present invention, has the twelfth character comprised of following element (1).

(Element 1)

The main elastic yarn ((14)) is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer,of which melting point is lower than core component polymer,applied to sheath component polymer.

As mentioned adove, when this warp knitted elastic fabric is finished up by passing through dry-heating treatment,the main elastic yarn and the main stitch yarn are thermally adhered. Then, the warp knitted elastic fabric,which does not cause distortion of stitch openings under reiterative stretching, and which is rich in abrasion resistance and dimensional stability,and which is useful for the cushioning surface,can be obtained.

[0020] In addition to above any one of characters of the first,the second,the third, the fourth, the fifth, the sixth, the seventh, the eighth, the ninth, the tenth, the eleventh and the twelfth, the warp knitted elastic fabric, in accordance with the present invention, has the thirteenth character comprised of following element (1).

(Element 1)

Sum fineness of a plurality of the main elastic yarns (14) which is included within the unit distance (1 cm) in the knitting length direction (W) or in the knitting width direction (C) is set up more than 7000 dtex/cm. This warp knitted elastic fabric is improved in conection with that when it is applied to the cushioning surface (24) by stretching and hanging over the frame (23), recess and loosened pucker do not arise under reiterative loading due to limbs or body weight, and it is made up rich in durability and becomes suitable for the cushioning surface (24).

Brief Description of Drawings

[0021]

Figure 1 is a plain view of a warp knitted elastic fabric on a knitting process in accordance with the present invention.

Figure 2 is a perspective view of a seat wherein a fabric is hanged over.

Figure 3 is a view of a knitting textile design of a warp knitted elastic fabric in accordance with the present invention.

Figure 4 is a plain view of a warp knitted elastic fabric in accordance with the present invention.

Figure 5 is a plain view of a conventional woven elastic fabric.

Best Mode for Carring Out the Invention

[0022] As mentioned adove, weft inserted warp knitted fabrics having inserted yarns knitted into the base knitted fabric (10) in line in the knitting width direction (C) and warp inserted warp knitted fabrics Having inserted yarns knitted into the base knitted fabric (10) in line in the knitting length direction (W) are well known as disclosed in Japanese Patent Laid Open No. 11-279907 and Japanese Utility Model Publication No. 3-36555.

Conventional raschel warp knitting machines having a weft yarn insert apparatus or a warp yarn insert apparatus can be applied to knit up the warp knitted elastic fabric in accordance with the present invention.

[0023] A reason to knit the main elastic yarn (14) into the base knitted fabric is to make the base knitted fabric rich in cushioning property and dimensional stability, and is to restrain occurrence of recess and loosened pucker on the cushioning surface of the car-seat and a like at use.

For the sake, it is desirable to apply a thick monofilament elastic yarn of which breaking elongation is more than 60 %, of which rate of elastic recovery after 30 % elongation is more than 90 % , of which single fiber fineness is 1000~2500 dtex,preferably 1650 ~ 2750 dtex, further preferably 2000~ 2500 dtex, and of which stress at 10% elongation is more than 0.1 cN/dtex,preferably 0.2~ 0.8 cN/dtex, to the main elastic yarn (14).

The main elastic yarn (14) is knitted into the base knitted fabric (10) so that stress (F) at 10% elongation of the warp knitted elastic fabric in the knitting length or width direction where the main elastic yarn (14) is in continuous in line is to be set up 150 ~ 600 (cN/dtex) ($150 \leqq F \leqq 600$).

For that the stress (F: N/5cm) at 10% elongation of the warp knitted elastic fabric is to be set up 150~ 600 (N/5cm), it is desirable to set up the sum (total) fineness of a plurality of the main elastic yarns (14), which is included within the unit distance (1 cm) in the knitting length direction or in the knitting width direction, more than 7000 dtex/cm.

[0024] Polyester elastic yarn, polyurethan elastic yarn and polyether-ester elastic yarn are well known as high elastic yarn which has high rate of an elastic recovery in conection with elongated strain (elongation).

Among them,polyether-ester elastic yarn is most suitable for the present invention.

Because, stress at 10% elongation of polyester elastic yarn is about

2.2 (cN/dtex) and strongest of all.

Stress at 10% elongation of polyether-ester elastic yarn is about 0.27 (cN/dtex).

Stress at 10% elongation of polyurethan elastic yarn is about 0.015 (cN/dtex) and most weak of all.

By the way, as shown in Figure 2, the present invention relates to the warp knitted elastic fabric (20) to be applied to the cushioning surface (24) by stretching and hanging over the frame (23).

For the warp knitted elastic fabric (20) used as materials of cushioning surface (24), when polyurethan elastic yarn is applied in place of polyether-ester elastic yarn,since polyurethan elastic yarn is extraordinarily weaker than polyether-ester elastic yarn, a part of the cushioning surface (24) deeply sags and moves to and fro due to the weight of limbs,then, limds are not supported in stable.

On the other hand, when polyester elastic yarn is applied in place of polyether-ester elastic yarn,since polyester elastic yarn is extraordinarily stroger than polyether-ester elastic yarn, though a part of the cushioning surface (24) does not deeply sag, the cushioning surface (24) is formed in hard, and it effects so painful touch feeling that it can not help to keep limbs on the cushioning surface at use.

And, in the case of application of weak and elongatable polyurethan elastic yarn, irregularity of tension tends to arise in the warp knitted elastic fabric at a time of stretching and hanging it over the frame (23).

On the other hand, in the case of application of strong and unelongatable polyester elastic yarn, pucker tends to arise over the warp knitted elastic fabric at a time of stretching and hanging it over the frame (23). And, bent pucker and other irregular distortions, which arised over the warp knitted elastic fabric before application to the cushioning surface, can not be easily cured by the way of stretching or expanding it.

Further, in the case of application of weak and elongatable polyurethan elastic yarn, irregularity of tension among the stitch yarns tends to arise in the knitting process, and the irregularity of tension among the stitch yarns make the knitting process difficult. And, in the case of application of strong and unelongatable polyester elastic yarn, it becomes difficult to knit up the warp knitted elastic fabric, since in the knitting process the strong and unelongatable polyester elastic yarn does not easily vary it's shape in cooperation with works or actions of reed guide and other parts of the knitting apparatus.

In consideration of these matters, it is encouraged to apply polyether-ester elastic yarn of which stress at 10% elongation is extraordinarily stroger than polyurethan elastic yarn and is extraordinarily weaker than polyether-ester elastic yarn to the main elastic yarn and main stitch yarn.

[0025] The reason of application of the main inserted yarn (15) to be knitted into the base knitted fabric is that the flatness, the slipperiness, and the surface gloss of the warp knitted elastic fabric (20), which may be effected by thick flat and glossy monofilament elastic yarn (main elastic yarn 14) which is thick like a fishline and has flat and very glossy surface, are to be restrained by the main inserted yarn (15). Other reason of application of the main inserted yarn (15) is that the soft fine and quite natural apperance of the warp knitted elastic fabric (20) as one kind of warp knitted fabrics are to be kept by the main inserted yarn (15) so that it should not be disturbed by the monofilament elastic yarn (main elastic yarn 14) and it should not become similar to monotonous simple surface of the conventional plastic goods.

For the sake, multi-fiber yarn of which surface is composed of multiple fibers in bulky and lacks in surface gloss is applied to the main inserted yarn. In this case, spun yarn, multifilament bulky texturized yarn, chenille yarn and a like may be preferably used as multi-fiber yarn. The multi-fiber yarn (main inserted yarn 15) is knitted into the base knitted fabric (10) with density of insertion, that is, rate of number (threads) of the main inserted yarns (15) versus regular interval (1 cm) where the main inserted yarns are arranged in parallel with one another toward the orthogonal direction which is across at right angles to the prolonging direction where the inserted yarns prolong, of more than 1 (threads/cm), preferably more than 2 (threads/cm), or the multi-fiber yarn (main inserted yarn 15) is knitted into the base knitted fabric (10) with rate of insertion of more than 1 (1 thread) of the main inserted yarn (15) versus 7 (7 thread) of the main elastic yarn (14) (that is, more than 1 : 7), preferably more than 1 (1 thread) of the main inserted yarn (15) versus 4 (4 thread) of the main elastic yarns (14) (that is, more than 1 : 4).

Total fineness of the main inserted yarns (15) may be set up 1000~5000 dtex, pepreferably 2000 ~4000 dtex.

[0026] In the present invention, main elastic yarn of 1000 ~4000 (dtex) and main inserted yarn of 1000 ~5000 (dtex) may be used.

These yarns (14, 15) do not disturb the knitting process of the warp knitted elastic fabric, since these yarns (14, 15) are different from the main stitch yarn (11, 12, 13) which form the base knitted fabric (10).That is, these yarns (14, 15) are to be inserted and knitted in between needle loops and sinker loops (17, 18) in a manner where these yarns (14, 15) are arranged in parallel with one another without forming a needle loop and a sinker loop.

[0027] Preferable main inserted yarn (15) is a chenille yarn which is made up bulky, that is, which is made by covering axis yarns with countless pile fibers and thick in apparent thickness.

The chenille yarn may be any one of fancy yarn which is formed by twining decorative yarns to core-yarns and by binding the decorative yarns and the core-yarns with bind yarns to form pile fibers with the decorative yarns, so called chenille yarn which is formed by putting cut pieces of pile fiber between axis yarns and by twisting the axis yarns to fix the cut pieces between

the axis yarns, and flocky yarn which is formed by electrostatically fixing pile fibers to axis yarn.

In the case of the fancy yarn, it is desirable to apply a thermo adhesible yarn (for examples: product name of Torey Co.Ltd."· Erder ") to the bind yarn to thermally adhere and fix the decorative yarn to the core-yarns through the bind yarns.

[0028] The main stitch yarns are composed of at least two kinds of the first main stitch yarn (11) and the second main stitch yarn (12).

The base knitted fabric (10) is knitted up in a manner where the first main stitch yarns (11) are applied to form chain stitched rows (19) which are in continuous in the knitting length direction (W), the second main stitch yarns (12) are applied to form needle loops (17b) which are conbined in one united needle loop with the needle loop (17a) of the first main stitch yarn (11), and the second main stitch yarns (12) are also applied to connect adjacent chain stitched rows (19a, 19b) of adjacent first main stitch yarns (11, 11) by shifted laterally between the adjacent chain stitched rows (19a, 19b).

Reasons to knit up the base knitted fabric (10) in above manner are explained as follows.

That is, in the case of warp inserted warp knitted fabrics where the main elastic yarn and the main inserted yarn are knitted in in the knitting length direction (W), since the main elastic yarns (14) and the main inserted yarns (15) are to be alined in parallel with the chain stitched row (19) of the first main stitch yarn (11), it becomes easy to knit in the main elastic yarns (14) and the main inserted yarns (15) into the base knitted fabric (10).

And, in the case of weft inserted warp knitted fabrics where the main elastic yarn and the main inserted yarn are knitted in in the knitting width direction (C), strength in the knitting length direction (W) is ensured by the chain stitched rows of the first main stitch yarn corresponding to strength in the knitting length direction (W) where is reinforced by the main elastic yarns and the main inserted yarn.

It is desirable to compose the main stitch yarns with at least three kinds of stitch yarn of the first main stitch yarns (11), the second main stitch yarns (12) and the third main stitch yarns (13).

In this case, the first main stitch yarns (11) form chain stitched rows (19) which are in continuous in the knitting length direction (W), and the second main stitch yarns (12) and the third main stitch yarns (13) are applied to bind and reinforce the adjacent chain stitched rows (19a, 19b) of adjacent first main stitch yarns over several courses.

Further, the second main stitch yarns (12) and the third main stitch yarns (13) are applied to bind and reinforce the adjacent chain stitched rows formed from respectively different first main stitch yarns (11) over several courses in a manner where the second main stitch yarns (12) and the third main stitch yarns (13) are respectively shifted laterally one wale in the opposite direction, that is, to shift between the adjacent chain stitched rows (19a, 19b), by changing shifting direction every course.

Thereby,the opening which is enclosed by reinforced left and righ chain stitched rows in the knitting width direction (C) and reinforced front and rear chain stitched rows in the knitting length direction (W) is formed.

[0029] Further, for improvement of strength and dimensional stability of the warp knitted elastic fabric, thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer,of which melting point is lower than core component polymer, is applied to at least either of the main elastic yarn (14) and the main stitch yarn, preferably at least either of the main elastic yarn (14) and the first main stitch yarn (11).

And, heat treatment is applied to the warp knitted elastic fabric after the knitting process to thermally adhere the main elastic yarn and main stitch yarn.

Thereby the needle loop and sinker loop of the base knitted fabric are finished up dimensionally stable.

In this way,the main elastic yarn and the main inserted yarn are fixed the base knitted fabric, the distortion of stitch openings is to be dissolved.

As the thermo adhesible seath core conjugate polyether-ester elastic yarn, "Dia-Flora" (product name of Toyobo Co. Ltd., fineness: 2080 dtex) is well known.

[0030] Total fineness of the main stitch yarn may be set up less than one half of total fineness of the main elastic yarn,preferably less than one quarter of total fineness of the main elastic yarn, generally 100 ~800 dtex, preferably 300 ~800 dtex.

In the case of application of a seath core conjugate filament elastic yarn, which is made of lower melting point polyether-ester elastomer applied to sheath component part and higher melting point polyether-ester elastomer applied to core component part, for the first main stitch yarn (11), it is encourage to apply a polyester multifilament yarn to the second main stitch yarn (12) and the third main stitch yarn (13), because the polyester multifilament yarn is familiar with the seath core conjugate filament elastic yarn in conection with polyester component, thus these yarns easily and thermally adhere one another.

[0031] When the polyether-ester elastic yarn is applied to the main elastic yarn,for dyeing process of the warp knitted elastic fabric may be carried out easily, either polyether-ester elastic yarn or polyester multifilament yarn is applied to the first main stitch yarn,the polyester multifilament yarn is applied to the second main stitch yarn and the third main stitch yarn, and also the polyester multifilament yarn is applied to the main inserted yarn.

That is, in conection with the dyeing property, teytile materials of the warp knitted elastic fabric is to be standardized.

For the sake of improvemet of weathering fast-

ness of the warp knitted elastic fabric, as one kind of pigment colored fibers,the polyether-ester elastic yarn and the polyester multifilament yarn are spun by adding a pigment to spinning polymer and, if necessary, teated in dyeing process.

In the case of application of pigment colored polyether-ester elastic yarn and pigment colored polyester multifilament yarn, dyeing process of the warp knitted elastic fabric can be carried out efficiently.

[0032] At inside of the warp knitted elastic fabric, the main elastic yarn (14) is setled in hard stretching situation since it is in parallel with the inelastic main inserted yarn (15) and it's stretching elasticity is restrained or limited by this inelastic main inserted yarn (15).

To avoid such restraint, it is desirable to apply high heat shrinkable elastic yarn, which is more shrinkable than the main inserted yarn, to the main elastic yarn and to heat shrink the main elastic yarn at finish treatment process or dyeing process for the warp knitted elastic fabric.

As a result, the inelastic main inserted yarn is loosened in order to the shrinking amount of the main elastic yarn, and the inelastic main inserted yarn becomes possible to follow the stretching of the main elastic yarn. In other words, stretching elasticity of the main elastic yarn becomes not to be restrained or limited by the inelastic main inserted yarn within the scope of shrinking amount of the main elastic yarn. Then, the warp knitted elastic fabric which is useful for the cushioning surface (24) of car-seat and a like can be obtained.

Heat shrinking rate of the main elastic yarn may be 10 ~50 %.

It is desirable to apply elastic yarn, which has samewhat elasticity equal to the main elastic yarn, or polytrimethyleneterephthalate multifilament yarn, which is rich in stretching property, to the axis yarn of the chenille yarn so that the main inserted yarn (chenille yarn) becomes possible to follow the stretching of the main elastic yarn.

[0033] It is desirable to set up gauge of raschel warp knitting machine, in conection with total fineness of the main stitch yarn,the main elastic yarn and the main inserted yarn, 5.5 gauge/cm (14 gauge/inch) or 9.5 gauge/cm (24 gauge/inch).

In this case,wale density of the warp knitted elastic fabric may be set up 20~40 (wale/24.5cm), and course density of the warp knitted elastic fa bric may be set up 15 ~40 (course/24.5cm)).

Embodiment

[0034]

Figure 1 is a plain view of a warp knitted elastic fabric on a knitting process in accordance with the embodiment of the present invention.

Figure 4 is a plain view of a warp knitted elastic fabric in accordance with the embodiment of the present invention.

Figure 3 is a view of a knitting textile design of the warp knitted elastic fabrics, which are shown in Figures 1 and 4, in accordance with the embodiment of the present invention.

The main stitch yarns are composed of the first main stitch yarns, the second main stitch yarns and the third main stitch yarns.

Polyether-ester monofilament elastic yarn (fineness: 300 dtex) is used for the first main stitch yarn (11).

Polyester multifilament yarn (total fineness: 500 dtex) is used for the second main stitch yarn (12) and the third main stitch yarn (13).

Polyether-ester monofilament elastic yarn (fineness: 2500 dtex) is used for the main elastic yarn (14).

Chenille yarn is used for the main inserted yarn (15).

This chenille yarn is formed by appling a polytrimethyleneterephthalate multifilament yarn (total fineness: 150 dtex) to core-yarn, by twining polyester multifilament bulky texturized yarn (total fineness: 150 dtex) around the core-yarn with overfeeding rate of 200 %, and by twining thermo adhesible yarn (total fineness: 150 dtex, product name of Torey Co.Ltd. "Erder") to thermally adhere and fix the polyester multifilament bulky texturized yarn to the core-yarn.

Single raschel warp knitting machine, which has a weft yarn insert apparatusis and three reeds (L_1), (L_2) and (L_3) (each 24 gauge/24.5mm), is used to knit up a warp knitted elastic fabric(20).

The first main stitch yarns(11) are guided and knitted in by the first reed(L_1). The second main stitch yarns (12) are guided and knitted in by the second reed (L_2). The third main stitch yarns(13) are guided and knitted in by the third reed (L_3).

As shown in figure 3 the first reed (L_1) is knitting with a movement of 0-1/1-0/0-1/1-0/0-1/1-0/····· for formation of one-in-one-out knitting textile design.

The second reed (L_2) is knitting with a movement of 1-0/2-3/4-5/3-2/4-5/3-2/4-5/3-2/1-0/2-3/ ····· for formation of knitting textile design.

The third reed(L_3) is knitting with a movement of 4-5/3-2/1-0/2-3/1-0/2-3/1-0/2-3/4-5/3-2/4-5/3-2/····· for formation of knitting textile design.

In this manner, the base knitted fabric (10) of 12 course/ 1 repeat is knitted up.

In this knitting process, the main inserted yarns (15) are inserted and knitted into the first course (C_1) and the second course (C_2) of the knitting textile design shown in Figure 3 .

After that, the main elastic yarns (14) are inserted and knitted into the third course (C_3), the fourth course (C_4), the fifth course (C_5) and the sixth course (C_6) of the knitting textile design.

After that, the main inserted yarns (15) are inserted and knitted again into the seventh course (C_7) and the eighth course (C_8) of the knitting textile design.

After that, the main elastic yarns (14) are inserted and knitted again into the ninth course (C_9), the tenth course (C_{10}), the eleventh course (C_{11}) and the twelfth course (C_{12}) of the knitting textile design.

In this manner, the main elastic yarns (14) and the main inserted yarns (15) are knitted in the base knitted fabrics (10).

[0035] As shown in Figure 1, the sinker loops (18), which is formed from the main stitch yarn, are penetrated by the main elastic yarns (14) and the main inserted yarns (15) which are knitted in the base knitted fabric (10).

The loop-shaped needle loop (17) exists over one side of the main elastic yarns and the main inserted yarns, that is, the rear side of the drawing pa per of Figure 1 .

On the other hand,over another side of the main elastic yarns and the main inserted yarns, that is , the surface side of the drawing paper of Figure 1 , a part of arch-shaped sinker loop (18) exists.

As a result,the main elastic yarns (14) and the main inserted yarns (15) are exposed (appear) over one side of the base knitted fabric (10), that is, the surface side of the drawing paper of Figure 1, where parts of arch-shaped sinker loops (18) exists (appears), more than another side of the base knitted fabric (10), that is, the rear side of the drawing paper of Figure 1 , where the loop-shaped needle loop (17) exists (appears).

As mentioned above, the main inserted yarns (15) should be applied to restrain or avoid gloss and flatness which are caused (effected) from main elastic yarn (14) over the surface of the warp knitted elastic fabric (20).

So that, the warp knitted elastic fabric (20) is applied to the cushioning surface (24) of car-seat and a like in a manner where the sinker loop surface side (18), that is, the surface side of the drawing paper of Figure 1, where the main inserted yarns (15) are exposed more, is faced to out side,that is, out side of car-seat and a like.

Industrial Applcability

[0036] In accordance with the present invention,the warp knitted elastic fabric which is useful for the cushioning surface of car-seat and a like,does not cause a recess and loosened pucker result from load-hysteresis fatigue at use for the cushioning surface, is rich in dimensional stability and does not cause a distortion of stitch openings, is rich in air-permeability and does not give stuffy feeling, is able to maintain limbs in comfortable posture without in slippage when limbs are put on the cushioning surface, has soft touch feeling, is not glossy and has soft and quite natural fine appearance covered with fine fibers and is not similar to monotonous simple surface of the conventional plastic goods in apperance, and is rich in market value, can be obtained.

Claims

1. An warp knitted elastic fabric **characterized by** following elements.

(Element 1)

A base knitted fabric is knitted up from main stitch yarns by using warp knitting machine.

(Element 2)

Main elastic yarns are knitted in the base knitted fabric and are in continuous in line in the knitting width direction or in the knitting length direction

(Element 3)

Main inserted yarns are knitted in the base knitted fabric and are in continuous in line in the knitting width direction or in the knitting length direction

(Element 4)

Main inserted yarns are more bulky than both main elastic yarns and main inserted yarns, and main inserted yarns are thicker in appearent thickness than both main elastic yarns and main inserted yarns .

2. An warp knitted elastic fabric as set forth in claim 1, wherein:

(1)

On the base knitted fabric, there is formed opening which is larger than the needle loop formed from main stitch yarn and which is extending over plural knitting courses.

(2)

The base knitted fabric is formed in mesh shaped.

3. An warp knitted elastic fabric as set forth in any one of claims 1 and 2, wherein:

(1)

The main stitch yarns for forming the base knitted fabric are composed of at least two kinds of the first main stitch yarns and the second main stitch yarns which are to be respectively guided by the different reeds.

(2)

The first main stitch yarns are applied to form chain stitched rows which are in continuous in the knitting length direction.

(3)

The second main stitch yarns are applied to form needle loops which are conbined as one united needle loop with the needle loop of the first main stitch yarn.

(4)

The second main stitch yarns are also ap-

plied to connect adjacent chain stitched rows of adjacent first main stitch yarns by shifted laterally between the adjacent chain stitched rows.

4. An warp knitted elastic fabric as set forth in any one of claims 1 and 2, wherein:

(1)
The main stitch yarns for forming the base knitted fabric are composed of at least three kinds of the first main stitch yarns , the second main stitch yarns and the third main stitch yarns which are to be respectively guided by the different reeds.
(2)
The first main stitch yarns are applied to form chain stitched rows (19) which are in continuous in the knitting length direction.
(3)
The second main stitch yarns and the third main stitch yarns are applied to form respectively different needle loops which are conbined as one united needle loop with respectively different needle loop of the first main stitch yarn.
(4)
The second main stitch yarns and the third main stitch yarns are also applied to connect adjacent chain stitched rows of adjacent first main stitch yarns by shifted laterally between the adjacent chain stitched rows.

5. An warp knitted elastic fabric as set forth in any one of claims 1 and 2, wherein:

The main stitch yarn is made of polyether-ester polymer.

6. An warp knitted elastic fabric as set forth in any one of claims 1 and 2, wherein:

The main stitch yarn is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer.

7. An warp knitted elastic fabric as set forth in any one of claims 3 and 4, wherein:

The first main stitch yarn is made of polyether-ester polymer.

8. An warp knitted elastic fabric as set forth in any one of claims 3 and 4, wherein:

The main stitch yarn is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer, of which melting point is lower than core component polymer, applied to sheath component polymer.

9. An warp knitted elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7 and 8, wherein:

The main elastic yarn and the main inserted yarn are knitted in respectively the different course of the base knitted fabric.

10. An warp knitted elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8 and 9, wherein:

The main inserted yarn is chenille yarn which is formed with axis yarns and pile fibers for covering the axis yarns wherein pile fibers are projecting from the axis yarns.

11. An warp knitted elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, wherein:

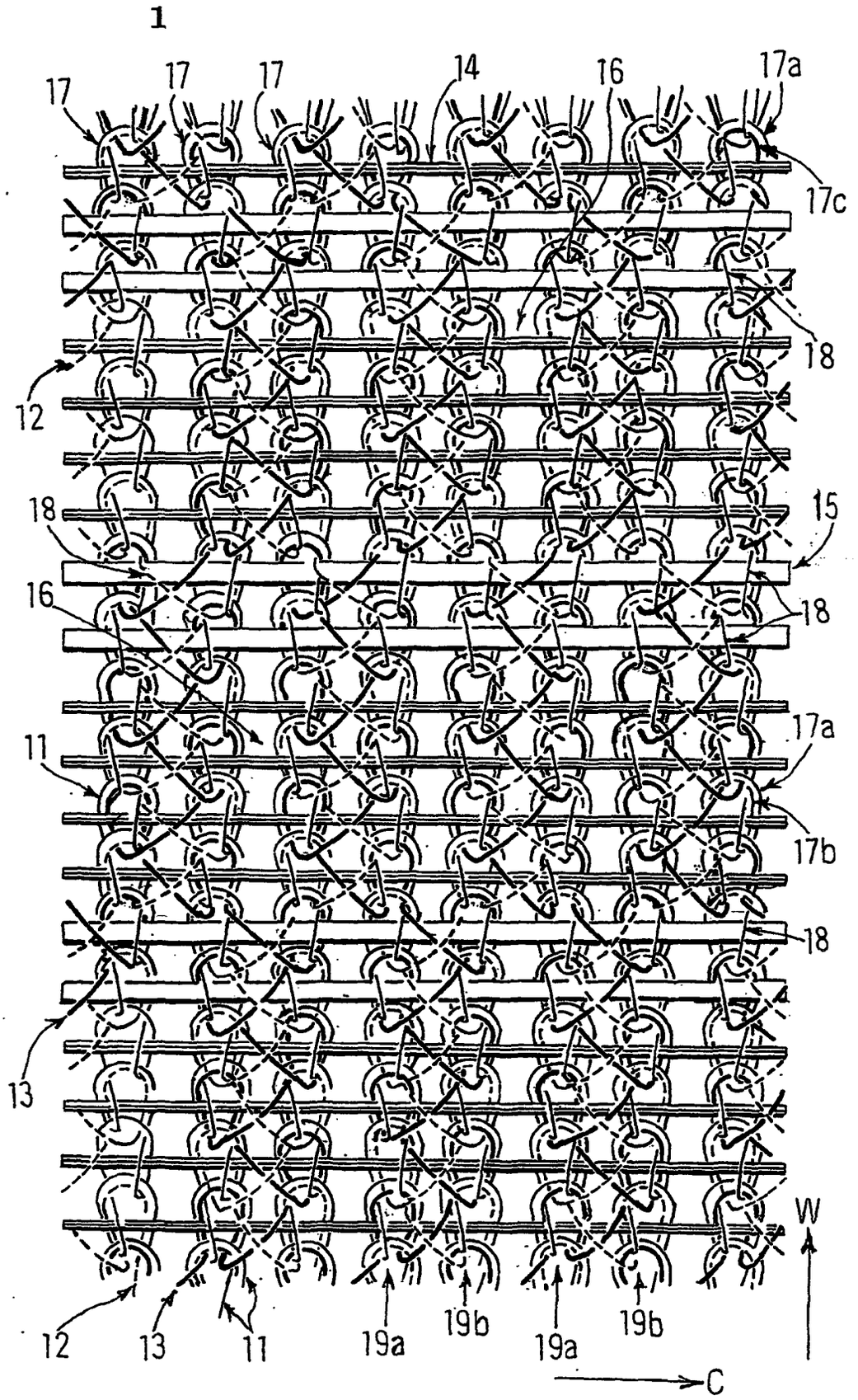
The main stitch yarn is made of polyether-ester polymer.

12. An warp knitted elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11, wherein:

The main elastic yarn is thermo adhesible seath core conjugate polyether-ester elastic yarn which is made of polyether-ester applied to core component polymer and thermo adhesible polymer,of which melting point is lower than core component polymer,applied to sheath component polymer.

13. An warp knitted elastic fabric as set forth in any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, wherein:

Sum fineness of a plurality of the main elastic yarns which is included within the unit distance (1 cm) in the knitting length direction (W) or in the knitting width direction is set up more than 7000 dtex/cm.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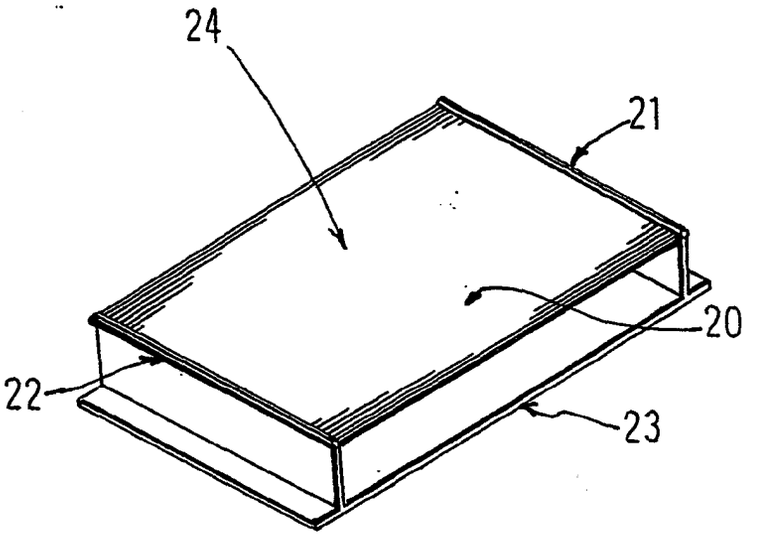
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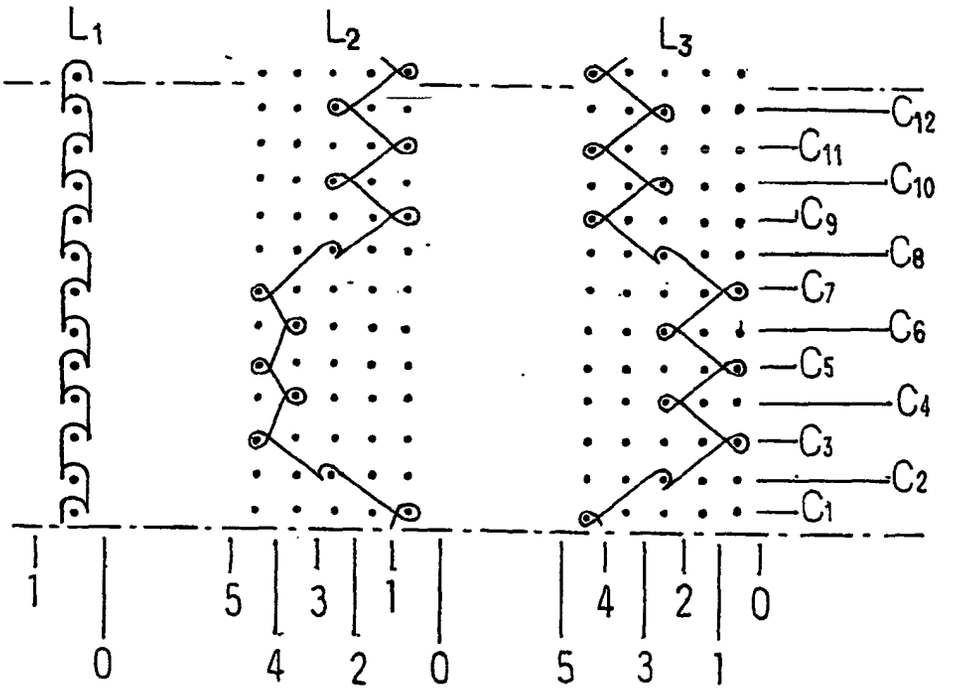
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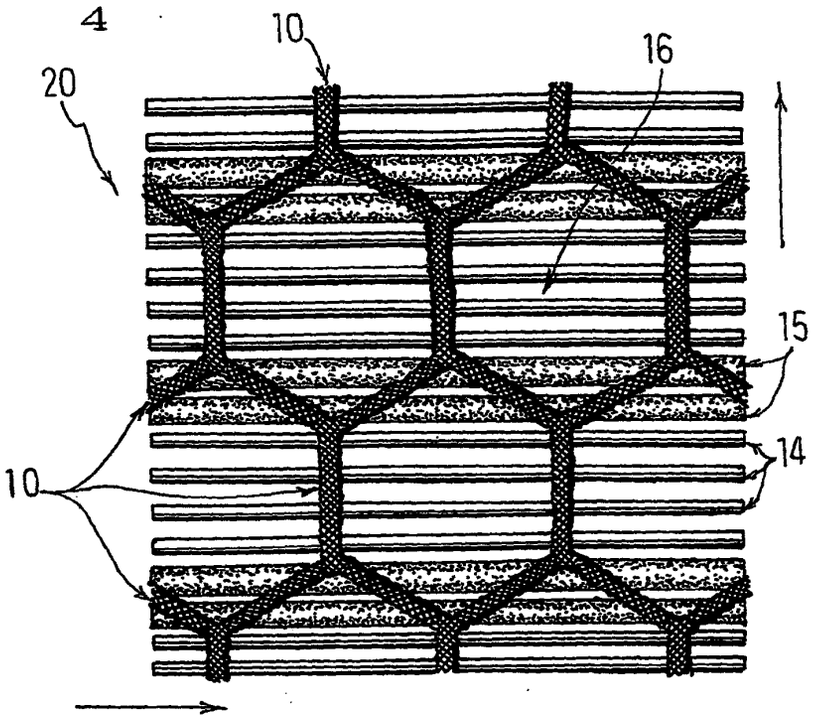
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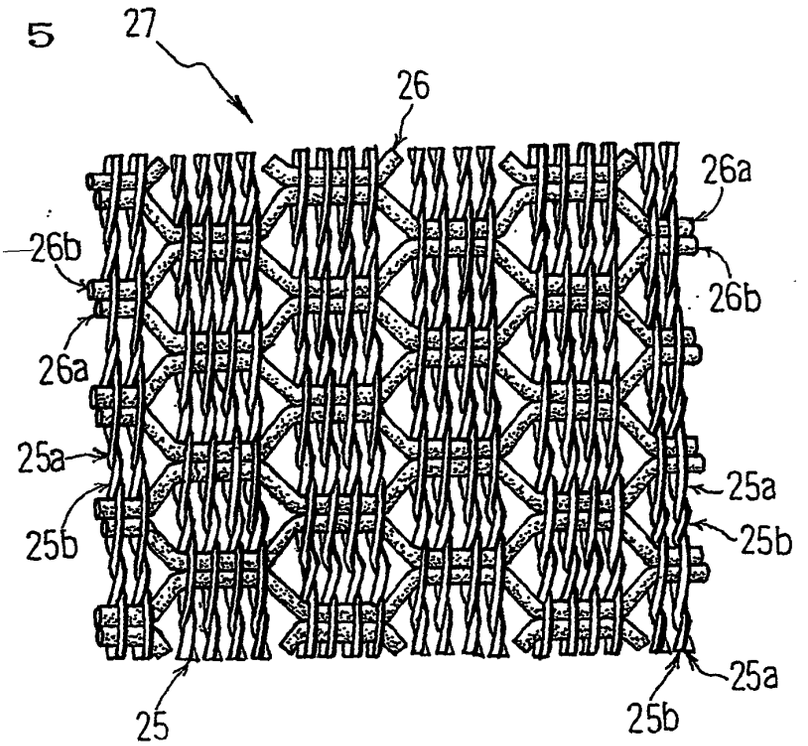
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/10911

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] D04B21/18, D04B21/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] D04B21/18, D04B21/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1926-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-248540 A (Toyobo Co., Ltd.), 12 September, 2000 (12.09.00), Claims; Fig. 1 (Family: none)	1-13
Y	EP 936295 A1 (LAINIERE DE PICARDIE), 18 August, 1999 (18.08.99), Claim 2; Fig. 1 & US 6389851 B1 Claim 2; Fig. 1 & JP 11-279907 A Claim 2; Par. No. [0007]; Fig. 1	1-13
Y	JP 2001-164447 A (Sakae Resu Kabushiki Kaisha), 19 June, 2001 (19.06.01), Claim 5; Par. No. [0048] (Family: none)	1-13

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 November, 2003 (12.11.03)	25 November, 2003 (25.11.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)