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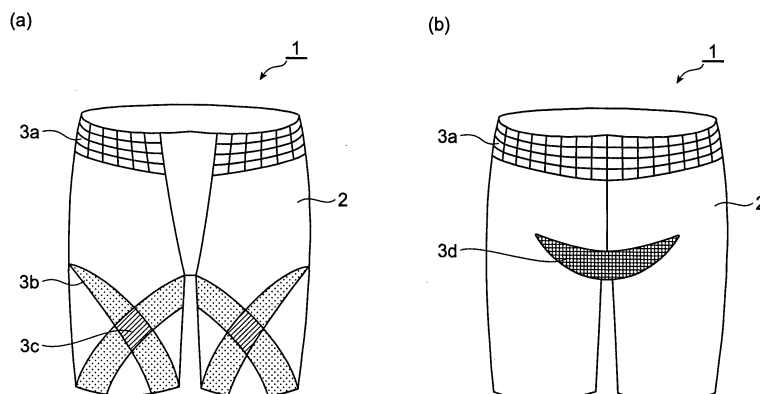
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(54) **STRETCH FABRIC**

(57) The invention provides a stretch fabric having a tightening portion on the surface of a fabric, such that the tightening portion has a resin portion comprising an elas-

tomeric resin, the tensile elongation of the fabric in a warp direction is 100 to 200%, and the elastomeric resin has a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less.

Fig.1



Description

Technical Field

5 [0001] The present invention relates to a stretch fabric.

Background Art

10 [0002] In recent years there has been ongoing study on apparel having functions for, among others, reshaping the body shape of the wearer, and/or correcting the posture and enhancing the mobility of the wearer.

[0003] For instance, Patent document 1 discloses that the above functions can be realized, and a required body constriction force or power can be generated, by forming a pattern of polyurethane or nylon resin on the surface of garments such as girdles, brassieres, swimsuits and the like.

15 [Patent document 1] Japanese Examined Utility Model Application Publication No. H07-048644

Disclosure of the Invention

Problems to be Solved by the Invention

20 [0004] In the apparel of Patent document 1, however, the elongation of the portions of the fabric where the resin is provided (hereinafter "resin portions") is not sufficiently dealt with. Specifically, the apparel in Patent document 1 affords neither sufficient matching of the resin portions to the movement of the body nor sufficient tightening force when the resin portions stretch and shrink while closely fitting against the body. Accordingly, the apparel of Patent document 1
25 leaves room for improvement as regards the constriction force or power of the resin portions.

[0005] The apparel of Patent document 1, moreover, does not delve sufficiently into air permeability before and after providing the resin, so that when air permeability is insufficient, the fitting feel may be impaired as a result of skin stuffiness or the like, in particular in the case of a bottom garment.

30 [0006] Thus, an object of the present invention is to provide a stretch fabric, a garment and a clothing article that afford sufficient body constriction force or power and that can realize excellent fitting feel. The invention allows also providing a manufacturing method of the stretch fabric, as well as a clothing article manufacturing method.

Means for Solving the Problems

35 [0007] As a result of diligent research, the inventors found out that a garment having excellent fitting feel and affording sufficient body constriction force or power can be achieved in a garment that meets the below capabilities:

(1) The garment has a tightening portion that possesses sufficient tightening force (body constriction force or power) to allow, for instance, correcting the posture of the wearer.

40 (2) The garment stretches and shrinks while closely fitting against the body, and hence the garment has sufficient elongation so as to allow matching the movement of the body, without loss of tightening force as a result of repeated stretching and shrinking.

(3) The garment is used while closely fitting against the body, and hence the fabric of the garment has good air permeability, without loss thereof in the tightening portion.

45 [0008] Specifically the present invention provides a stretch fabric having a tightening portion on at least part of a fabric, wherein the tightening portion has a resin portion comprising an elastomeric resin, the fabric has a tensile elongation of 100 to 200% in a warp direction, and the elastomeric resin has a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less.

50 [0009] Herein a tightening portion refers to an area that can impart a stimulus through direct application of a load to the body. The tensile elongation in the warp direction of the fabric refers to elongation under a putative load during wearing, and is expressed in the present invention as the stretch rate (%) measured upon application of a load of 22.1 N to a specimen having a width of 2.5 cm. The warp direction of the fabric refers to the knitting direction of the fabric. The breaking elongation refers to the elongation during rupture of a resin film under load, and denotes the ease of
55 stretching and strength of a resin. The 200% modulus refers to the resin stress during 200% stretching, and denotes the softness of the resin.

[0010] When the above stretch fabric is used in a garment, the tightening portion is provided at a position in close contact with the body of the wearer, and hence the tightening portion follows the movement of the position of close

contact, for instance when the wearer simply walks. The tightening portion can thus directly stimulate the body (in particular, the muscles) of the wearer. Also, suitably arranging the resin portion comprising the above elastomeric resin within the structure of the fabric allows the tightening portion comprising such resin portion and the fabric to have sufficient air permeability and to exert sufficient tightening force.

[0011] That is, the stretch fabric of the present invention having the above tightening portion can exert sufficient tightening force (body constriction force or power) for posture correction or the like while preventing occurrences such as skin stuffiness.

[0012] Also, setting the breaking elongation of the resin portion and the tensile elongation of the fabric in the warp direction to lie within the above ranges has the effect of allowing the tightening portion in a garment using such stretch fabric to match the movements of the body while preserving stretchability even after repeated stretching and shrinking. The stretch fabric of the present invention allows thus compensating or reshaping the body shape of the wearer, and/or correcting the posture and enhancing the mobility of the wearer.

[0013] In the stretch fabric of the present invention, preferably, the resin portion has a thickness of 75 μm or less, more preferably of 30 μm or less. In the present invention, the thickness of the resin portion denotes the value resulting from subtracting the thickness of the fabric from the thickness of the fabric having the resin portion. Fig. 3 is a cross-sectional diagram illustrating schematically an example of the stretch fabric of the present invention. A stretch fabric 10 illustrated in Fig. 3 comprises a fabric 12 and a resin portion 15, wherein part of the resin portion 15, i.e. part of an elastomeric resin, penetrates into the fabric 12. In such a stretch fabric 10, for instance, "a" denotes the thickness of the resin portion.

[0014] When the thickness of the resin portion is not larger than 75 μm , both unevenness feel and resin feel can be reduced, while enhancing the smoothness of the fabric.

[0015] From the viewpoint of preserving the texture of the fabric, the resin portion in the stretch fabric of the present invention is preferably provided to a penetration rate of the elastomeric resin in the fabric within 50%, more preferably within 30%, relative to the thickness of the fabric. The penetration rate of the elastomeric resin into the fabric is determined from the thickness of elastomeric resin that penetrates into the fabric, on the basis of cross-sectional photographs of the stretch fabric cut along the thickness direction. In the stretch fabric 10 illustrated in Fig. 3, for instance, "b" denotes the thickness of the elastomeric resin penetrating into the fabric, which has a thickness "c". Herein, the penetration rate of the elastomeric resin into the fabric is the value given by the formula "penetration rate (%) = $b/c \times 100$ ".

[0016] In terms of ensuring sufficient tightening force and matching ability by the tightening portion, while ensuring sufficient air permeability of the fabric, the resin portion in the stretch fabric of the present invention is preferably provided in such a way so as to constrain yarn-interlacing portions of the fabric without wholly filling the interstices of the fabric.

[0017] In the stretch fabric of the present invention, preferably, a portion of the tightening portion having the resin portion therein has an air permeability of 0.5 $\text{ml}/\text{cm}^2\cdot\text{s}$ or more. Air permeability is measured in accordance with JIS L1096 (Frazier method), and denotes the extent to which a gas phase inside and outside the garment can pass through the fabric. A higher air permeability value implies a more effective suppression of stuffiness.

[0018] From the viewpoint of exerting more reliably sufficient body constricting force, a portion of the tightening portion having the resin portion therein, in the stretch fabric of the present invention, has preferably a straining force that is four times or more the straining force of the fabric. The straining force denotes stress during shrinking, upon stretching and shrinking, and in the present invention is the value corresponding to 10% stretching.

[0019] From the viewpoint of exerting more reliably sufficient body constricting force, a portion of the tightening portion having the resin portion therein, in the stretch fabric of the present invention, has preferably a stretching force that is four times or more the stretching force of the fabric. The stretching force denotes stress during stretching, upon stretching and shrinking, and in the present invention is the value corresponding to 10% stretching.

[0020] In terms of preventing loss of body constriction force on account of repeated wearing, a portion of the tightening portion having the resin portion therein, in the stretch fabric of the present invention, has preferably a hysteresis of 0 to 80 cN. Hysteresis denotes herein the difference between the stretching force and the straining force. In the present invention, hysteresis is the value obtained in accordance with the formula "hysteresis = 10% stretching force - 10% straining force". A value of hysteresis close to 0 denotes that a stable body constriction force is achieved, which makes for superior fitting feel.

[0021] The resin portion in the stretch fabric of the present invention is preferably provided such that a thickness of the resin portion is 75 μm or less, a penetration rate of the elastomeric resin in the fabric is within 50% relative to the thickness of the fabric, and yarn-interlacing portions of the fabric are constrained without wholly filling the interstices of the fabric. This allows further enhancing the effect afforded by the invention. That is, a resin portion comprising the above elastomeric resin, having a thickness upon the fabric and a penetration rate falling within the above ranges, and suitably arranged within the structure of the fabric, can impart sufficient air permeability to a tightening portion comprising such resin portion and the fabric, and allows at the same time the tightening portion to exert sufficient tightening force more reliably.

[0022] Also, a portion of the tightening portion having the resin portion therein, in the stretch fabric of the present

invention, has preferably an air permeability of 0.5 ml/cm²-s or more, a straining force that is four times or more the straining force of the fabric, and a hysteresis of 0 to 80 cN. This enhances even further the effect afforded by the invention. That is, such a stretch fabric allows preserving a high-standard balance of body constricting force, long-term body constriction force stability, and fitting feel.

[0023] Preferably, the fabric in the stretch fabric of the present invention is a knitted fabric comprising polyurethane elastic yarn. In this case, the garment can match the movement of the body of the wearer, and can better preserve stretchability even after repeated stretching and shrinking.

[0024] In the stretch fabric of the present invention, preferably, the resin portion is formed of a two-dimensional array of resin dots. A tightening portion having such a resin portion allows weakening the tightening force compared with a case in which the resin portion covers the entire surface of the tightening portion. Thus, when the tightening portion is provided for instance at a portion where the movement of the body of the wearer is substantial, weakening the tightening force of the tightening portion allows preventing a situation in which the movement of the body is hindered, while still exerting sufficient tightening force for posture correction or the like.

[0025] Such a tightening portion can also match the movement of the body irrespective of the direction thereof.

[0026] In the stretch fabric of the present invention, preferably, the resin portion is formed of a plurality of resin lines arranged along a fixed direction. A tightening portion having such a resin portion allows exerting a tightening force, in particular, along the direction of the lines. That is, when the direction of the resin line is the vertical direction, the tightening portion affords in particular a tightening force in the vertical direction, while weakening the tightening force in the horizontal direction. When for reasons of fitting feel, in particular, the tightening force should be exerted in one direction only, therefore, the tightening portion is preferably provided in accordance with the body part.

[0027] The invention provides a garment comprising the above-described stretch fabric of the present invention. The garment of the present invention is preferably a bottom garment.

[0028] Also, the invention provides a clothing article in which the garment is a girdle or shorts. In this case, a tightening portion having a predetermined shape, and formed at a location in close contact with the lower body of the wearer, allows exerting a tightening force on the quadriceps or the like. As a result, the quadriceps is stimulated and the gluteus maximus is used. Wearing the above girdle or shorts, therefore, allows shaping easily an attractive hip line.

[0029] The stretch fabric manufacturing method of the present invention comprises the step of forming, by screen printing or rotary printing, a resin portion comprising an elastomeric resin having a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less, on a predetermined position on one face of a fabric having a tensile elongation of 100 to 200% in a warp direction, to a thickness after printing of 75 μm or less, and to a penetration rate in the fabric of within 50% relative to the thickness of the fabric, such that the elastomeric resin constrains yarn-interlacing portions of the fabric without wholly filling the interstices of the fabric.

[0030] Using screen printing or rotary printing, as a method for providing a resin on a fabric, allows adjusting the shape and thickness of the resin portion. The stretch fabric manufacturing method of the present invention has excellent productivity since mass production is made possible by providing the above shapes on a screen printing plate or a rotary printing plate.

[0031] In a method for manufacturing a clothing article of the present invention, the stretch fabric of the present invention is sewn such that the resin portion faces away from a body (outwards). A clothing article obtained in accordance with such a manufacturing method has sufficient body constriction force or power, and is excellent in fitting feel.

Effect of the Invention

[0032] The present invention allows thus providing a stretch fabric, garment and clothing article that afford sufficient body constriction force or power and that can realize excellent fitting feel. The invention allows also providing a manufacturing method of the stretch fabric as well as a clothing article manufacturing method.

Brief Description of the Drawings

[0033] Fig. 1 is diagram illustrating a girdle in an embodiment of the present invention;

(a) through (f) of Fig. 2 are diagrams illustrating examples of a band-like tightening portion;

Fig. 3 is a cross-sectional diagram illustrating schematically an example of the stretch fabric of the present invention; and

(a) of Fig. 4 is an electron micrograph of a tightening portion from an upper side where a resin portion of the stretch fabric is formed, and (b) of Fig. 4 is an electron micrograph of a cross-section of the tightening portion of the stretch fabric when cut in the thickness direction of the fabric.

[0034] 1: girdle, 2: main body, 3a,3b,3c,3d: tightening portion, 5: resin portion.

Best Modes for Carrying Out the Invention

[0035] Preferred embodiments of the present invention are explained next in detail with reference to accompanying drawings. In the drawings, identical elements are denoted with identical reference numerals, and recurrent explanations thereof are omitted. The dimensional ratios in the drawings are not limited to the ratios depicted therein.

[0036] Fig. 1 is diagram illustrating a girdle in an embodiment of the present invention. (a) of Fig. 1 illustrates a front side of the girdle while (b) of Fig. 1 illustrates a rear side of the girdle. The girdle 1 in Fig. 1 is a bottom garment for hip training. The girdle 1 comprises a main body 2 and tightening portion 3a, 3b and 3c provided in part of the main body 2. Hereinafter, the tightening portion 3a, tightening portion 3b, tightening portion 3c and tightening portion 3d will be collectively referred to as tightening portion 3 when no particular distinction among them should be necessary.

[0037] In (a) and (b) of Fig. 1, the tightening portion 3 is formed at a position where the girdle 1 fits closely to the body of the wearer. That is, the tightening portion 3a is formed as a band on the waist upper end of the girdle 1, the two ends of the tightening portion 3a being separated at the front of the waist upper end. The tightening portion 3b is formed as two bands running from the inner thigh to the outer thigh, on the front of the thigh, and intersecting each other in the vicinity of the middle of the thigh. The tightening portion 3c is formed at the portion of the above intersection. A tightening portion 3d extends along the gluteal fold, from the gluteal cleft to both sides thereof. The tightening portion 3c becomes thinner as it extends away from the gluteal cleft.

[0038] When the girdle 1 of the present embodiment is worn, the tightening portion 3a abuts the iliac crest of the body, so that it can exert a tightening force on that site. This allows preventing slipping down of the girdle 1, and enables also tightening of the waist.

[0039] The tightening portion 3c, which exerts a stronger tightening force than the tightening portion 3b, abuts a site that corresponds to the midpoint between the interspinal point and the patellar midpoint of the body, whereby it can exert a strong tightening force against the quadriceps muscle that is located at this site. Since the quadriceps is stimulated, the foot of the wearer kicks back naturally, with an ample swing, during walking, so that the gluteus maximus is used. An attractive hip line can thus be formed easily.

[0040] The tightening portion 3b, which exerts a weaker tightening force than the tightening portion 3c, is formed so as to intersect a portion corresponding to the above midpoint, and hence the tightening portion 3b adds to the stimulus of the thigh muscles but without hindering muscular action.

[0041] The tightening portion 3d abuts the gluteal fold, and hence can exert a tightening force against the thigh muscles located at this site. An attractive hip line can thus be easily formed as a result. The tightening portion 3d becomes thinner as it extends way from the gluteal cleft, and hence the degree to which the tightening force is exerted is adjusted to allow preventing loss of fitting feel, in particular during sitting down and standing up.

[0042] The tightening portion 3 comprises a resin portion, and hence when the tightening portion 3 is provided in the girdle 1, the tightening portion 3 protrudes from the girdle 1. In the present embodiment, therefore, the tightening portion 3 is provided on the outside (away from the body) of the girdle 1. This allows imparting the girdle 1 with a superior fitting feel.

[0043] In the present embodiment, the main body 2 comprises a fabric, while the tightening portions 3a, 3b and 3c comprise the fabric provided with a resin portion.

[0044] The above fabric may be, for instance, a natural fiber, rayon, polyester, nylon, a cellulosic fiber or the like, used singly or in combinations. These fabrics may be combined with an elastic yarn from polyurethane or the like.

[0045] Preferred amongst these is a fabric comprising nylon and polyurethane elastic yarn, which is advantageous for obtaining easily a good feel against the skin, as well as properties, texture and color fastness suited to the garment.

[0046] The structure of the above fabric, which has stretchability such as in warp knit fabrics, weft knit fabrics or stretch cloths, has preferably a limited elongation. More preferred amongst these is a warp knitted fabric. In a warp knitted fabric, the shape of the fabric is stable, and occurrence of unraveling can be prevented. Such a garment can match the movement of the body of the wearer, and can better preserve stretchability even after repeated stretching and shrinking.

[0047] Preferably, the above fabric uses a stretchable base material, ideally a powernet fabric. A difference in power magnitude can be conferred partially by modifying the yarn count and thickness of an elastic yarn, and/or by modifying the knitting texture, in a base material that does not require end sewing. Further providing a resin portion allows herein achieving yet stronger power.

[0048] In the present embodiment, the tensile elongation in the warp direction of the above fabric ranges from 100 to 200%, preferably from 140 to 180%. When the tensile elongation of the fabric is less than 100%, the fabric is likely to impair the movement of the wearer, while when the tensile elongation exceeds 200%, the fabric tends to impair close-hugging and fitting of the fabric against the body. The tensile elongation in the warp direction of the above fabric is expressed as the stretch rate (%) measured upon application of a load of 22.1 N to a specimen having a width of 2.5 cm.

[0049] In the present embodiment, the breaking elongation of the elastomeric resin is 500% or more, preferably 700 to 1500%. If the breaking elongation of the elastomeric resin is less than 500%, the resin portion is likely to be damaged during stretching of the tightening portions, thereby giving rise to loss of stretching force and tension force. On the other hand, if the breaking elongation of the elastomeric resin exceeds 1500%, sufficient stretching force and straining force

are unlikely to be achieved.

[0050] In the present embodiment, the 200% modulus of the elastomeric resin is 5 N/mm² or less, preferably 2.5 N/mm² or less. When the 200% modulus exceeds 5 N/mm², the texture of the tightening portions becomes remarkably harder, which increases the likelihood of resin delamination when the tightening portions are stretched, thus impairing stretching force and straining force. Preferably, the 200% modulus of the elastomeric resin is 0.5 N/mm² or more.

[0051] In the present embodiment, setting the breaking elongation of the resin portion and the tensile elongation of the fabric to lie within the above ranges allows the fabric to match the movements of the body, while preserving stretchability even after repeated stretching and shrinking. The girdle 1 of the present embodiment allows thus compensating or reshaping the body shape of the wearer, correcting the posture and enhancing the mobility of the wearer.

[0052] Preferably, the thickness of the resin portion is 75 μm or less, more preferably 30 μm or less. When the thickness of the resin portion exceeds 75 μm, the resin tends to fill up the interstices of the fabric, thus impairing the air permeability of the latter. When the thickness of the resin portion exceeds 75 μm, also, there arises an uneven feel and the touch acquires a stronger resin feel, while the surface smoothness of the fabric may be impaired.

[0053] The penetration of the resin portion in the fabric is 50% or less, preferably 30% or less, with respect to the thickness of the fabric. When resin penetration exceeds 50%, the texture becomes markedly harder, and resin back leaking towards the skin surface is likelier to occur, all of which makes wearing discomforting.

[0054] Preferably, the surface area of the resin portion within the tightening portion is 30% or more. When the surface area occupied by the resin portion is less than 30%, the tightening force is likely to be insufficient, compared with when the surface area occupied by the resin portion lies within the above range. The tightening force increases as that surface area proportion becomes larger.

[0055] As the elastomeric resin that makes up the resin portion there may be used, although not particularly limited thereto, a silicone resin, a urethane resin, an acrylic resin or a nylon resin. Setting the thickness of the resin portion, which comprises thus the above elastomeric resin, to lie within the above range, allows the tightening portion to exert sufficient tightening force (body constriction force or power) to enable posture correction and the like.

[0056] When the elastomeric resin comprised by the resin portion is urethane the resin portion can be imparted with excellent pliability, strength and adhesiveness to the fabric. Preferably, the polyurethane molecule has ether bonds or carbonate bonds. This allows preventing discoloration and/or degradation of the resin itself

[0057] In the present embodiment, the tightening portion 3 comprises the above-described fabric and resin portion. In the tightening portion 3, the part having the resin portion exhibits preferably an air permeability of 0.5 ml/cm²·s or more, preferably 2 ml/cm²·s or more. When air permeability is 0.5 ml/cm²·s or more, occurrences such as skin stuffiness or the like during wearing can be suppressed, thus affording excellent fitting feel. In the tightening portion 3, the "part having a resin portion" denotes a portion where the fabric is covered by a resin portion. The air permeability and stretching force values are the values obtained by measuring a portion of the fabric totally covered by a resin portion.

[0058] The tightening force (body constriction force or power) is explained next. The magnitude of the tightening force can be expressed based on straining force and stretching force.

[0059] In the present invention, the straining force of the part of the tightening portion that has a resin portion ranges preferably from 100 to 150 cN. The straining force denotes stress during shrinking, upon stretching and shrinking, and in the present invention is the value corresponding to 10% stretching. When the straining force is less than 100 cN, the body constriction force drops and may no longer fulfill the function required from it, compared with when the straining force lies within the above range. When the straining force exceeds 150 cN, the body constriction force becomes excessive and likely to be oppressive during wearing, thus impairing fitting feel, as compared with when the straining force lies within the above range.

[0060] Preferably, the straining force is 4 times or more the straining force of the fabric. Preferably, the straining force is 10 times or less the straining force of the fabric. When the straining force of the portion having the resin within the tightening portion is less than 4 times the straining force of the fabric, the body constriction force drops and may no longer fulfill the function required from it, compared with when the straining force lies within the above range. On the other hand, when the straining force of the portion having the resin within the tightening portion is greater than 10 times the straining force of the fabric, the body constriction force becomes excessive and likely to be oppressive during wearing, thus impairing fitting feel, as compared with when the straining force lies within the above range.

[0061] The stretching force of the part of the tightening portion that has a resin portion ranges preferably from 150 to 200 cN. The stretching force denotes stress during stretching upon stretching and shrinking, and in the present invention is the value corresponding to 10% stretching. When the stretching force is less than 150 cN, the body constriction force tends to drop compared with when the stretching force lies within the above range. When the stretching force exceeds 200 cN, the body constriction force becomes excessive and likely to be oppressive during wearing, thus impairing fitting feel, as compared with when the stretching force lies within the above range.

[0062] Preferably, the stretching force of the portion having the resin within the tightening portion is 4 times or more the stretching force of the fabric. Preferably, the stretching force of the portion having the resin within the tightening portion is 10 times or less the stretching force of the fabric. When the stretching force of the portion having the resin

within the tightening portion is less than 4 times the stretching force of the fabric, the body constriction force drops and may no longer fulfill the function required from it, compared with when the stretching force lies within the above range. On the other hand, when the stretching force of the portion having the resin within the tightening portion is greater than 10 times the stretching force of the fabric, the body constriction force becomes excessive and likely to be oppressive during wearing, thus impairing fitting feel, as compared with when the stretching force lies within the above range.

[0063] Hysteresis of a part of the tightening portion that has a resin portion ranges preferably from 0 to 80 cN. Hysteresis denotes herein the difference between the stretching force and the straining force. Specifically, hysteresis is given by:

$$\text{Hysteresis} = 10\% \text{ stretching force} - 10\% \text{ straining force}$$

When hysteresis exceeds 80 cN, stable body constriction becomes more difficult to achieve during wearing, which tends to detract from fitting feel, as compared with when hysteresis lies within the above range.

[0064] Sufficient tightening force can be reliably realized in the tightening portion when the straining force, the stretching force and hysteresis are within the above ranges.

[0065] The shape of a resin portion 5 in the tightening portion 3 is explained next with reference to Fig. 2. Although not particularly limited, the shape of the resin portion 5 in the tightening portion is preferably as illustrated in (a) through (f) of Fig. 2.

[0066] In the tightening portion illustrated in (a) of Fig. 2 (hereinafter "first tightening portion") the fabric is entirely covered by a resin portion. However, the resin portion does not entirely fill the interstices of the fabric. A first tightening portion having such a shape affords a particularly strong tightening force. The shape of the tightening portion 3c of the girdle 1 illustrated in Fig. 1 corresponds to that first tightening portion.

[0067] The tightening portion illustrated in (b) of Fig. 2 (hereinafter "second tightening portion"), the tightening portion illustrated in (c) of Fig. 2 (hereinafter "third tightening portion"), and the tightening portion illustrated in (d) of Fig. 2 (hereinafter "fourth tightening portion") have a constitution in which the resin portion 5 is provided as a grid on the fabric. The adjacent grid spacing is narrowest in the second tightening portion, compared with the third tightening portion and the fourth tightening portion, and becomes widest in the fourth tightening portion. Accordingly, the second tightening portion affords a weaker tightening force than the first tightening portion but a stronger tightening force than the third tightening portion and the fourth tightening portion, while the third tightening portion affords a stronger tightening force than the fourth tightening portion. The shape of the tightening portion 3c of the girdle 1 illustrated in Fig. 1 corresponds to the shape of the second tightening portion, the shape of the tightening portion 3d of the girdle 1 illustrated in Fig. 1 corresponds to the shape of the third tightening portion, and shape of the tightening portion 3a of the girdle 1 illustrated in Fig. 1 corresponds to the shape of the fourth tightening portion.

[0068] The resin portion 5 in the tightening portion illustrated in (e) of Fig. 2 (hereinafter "fifth tightening portion") has a constitution in which resin dots comprising the above elastomeric resin are arranged in a two-dimensional array on the fabric. Such a fifth tightening portion affords a weaker tightening force than the first through fourth tightening portions. Thus, when the tightening portion is provided for instance at a site where the movement of the body of the wearer is substantial, weakening the tightening force of the tightening portion allows preventing a situation in which the movement of the body is hindered.

[0069] The first through fifth tightening portions can match the movement of the body, irrespective of the direction thereof.

[0070] In the tightening portion illustrated in (f) of Fig. 2 (hereinafter "sixth tightening portion") and the tightening portion illustrated in (g) of Fig. 2 (hereinafter "seventh tightening portion"), the resin portion 5 has a constitution of resin lines, comprising the above elastomeric resin, arranged along a fixed direction on the fabric. In this case, the tightening portion allows exerting a tightening force, in particular, along the direction of the resin line. When the direction of the resin line is the vertical direction, thus, the tightening portion affords in particular a tightening force in the vertical direction, while weakening the tightening force in the horizontal direction. When, for instance, the tightening force should be exerted in one direction for reasons of fitting feel or the like, therefore, the tightening portion can be provided in accordance with the portion of the body. In the sixth tightening portion, the spacing between adjacent resin lines is narrower than in the seventh tightening portion. The sixth tightening portion, therefore, affords a stronger tightening force than the seventh tightening portion. The sixth and seventh tightening portions can match the movement of the body.

[0071] Preferably, the resin portion is continuous, as illustrated in (a) through (d), (f) and (g) of Fig. 2. In this case the tightening portion can not only exert a compression force for muscle contraction, but also a tightening force in the direction of the fabric.

[0072] The magnitude of the tightening force and/or the direction in which the tightening force acts can thus be modified by means of the position and the shape of the resin portion provided in the tightening portion. A desired tightening portion can thus be used in accordance with muscular motion and/or fitting feel. Using a stretch fabric having such tightening

portions allows achieving sufficient body constriction force or power, thereby providing a garment having excellent fitting feel.

[0073] A manufacturing method of the stretch fabric of the present invention, as well as a manufacturing method of a garment and clothing article, are explained next.

[0074] In the stretch fabric manufacturing method of the present embodiment a fabric is prepared first. Herein is used a fabric having a tensile elongation of 100 to 200% in the warp direction. The tensile elongation in the warp direction of the fabric is expressed as the stretch rate (%) measured upon application of a load of 22.1 N to a specimen having a width of 2.5 cm. On a predetermined position on one face of the fabric there is applied next a resin solution capable of forming an elastomeric resin having a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less, to a residual thickness on the fabric of 75 μm or less, preferably 30 μm or less, and to a penetration rate of within 50% relative to the thickness of the fabric, such that the resin constrains the yarn-interlacing portions without wholly filling the interstices of the fabric. As the resin solution there is used a solution obtained by dispersing or dissolving in water and/or a solvent a component for forming an elastomeric resin, for instance a resin, a cross-linking agent and a catalyst, as a base resin. In particular, an aqueous dispersible resin is preferably used as the resin. Such a resin affords a better work environment and a safer operation. After being applied, the resin solution is dried at high temperature. Specifically, the resin solution is preferably dried at a high temperature of 150°C or more. This enhances film formability and adhesiveness of the resin. The resin solution may also comprise a suitable thickener for adjusting the thickness of the resin portion and/or the penetration rate of the elastomeric resin in the fabric.

[0075] Methods for applying the resin solution include, for instance, spraying, transfer, gravure printing, screen printing, rotary printing and the like, preferably printing by screen printing or rotary printing. Uniform application tends to be difficult in spraying, while transfer is apt to impair garment breathability.

[0076] The shape and thickness of the resin portion can be easily adjusted by using screen printing or rotary printing as the method for applying the resin solution to the fabric. Specifically, a resin portion having a surface pattern, a line pattern, a dot pattern or the like can be formed in screen printing or rotary printing by imparting a predetermined shape to the screen printing plate or rotary printing plate used. Screen printing and rotary printing afford also excellent productivity, as they permit continuous application and hence enable mass production. The garment where a tightening portion is formed through screen printing or rotary printing is conferred thus sufficient body constriction force or power, and becomes a garment having excellent fitting feel.

[0077] Preferably, the stretch fabric manufacturing method according to the present embodiment comprises the step of forming, by screen printing or rotary printing, a resin portion comprising an elastomeric resin having a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less, on a predetermined position on one face of a fabric having a tensile elongation of 100 to 200% in the warp direction, to a thickness after printing of 75 μm or less, and to a penetration rate in the fabric of within 50% relative to the thickness of the fabric, such that the elastomeric resin constrains yarn-interlacing portions of the fabric without wholly filling the interstices of the fabric.

[0078] A garment can be manufactured by sewing a fabric where a tightening portion is provided such that the resin portion of the tightening portion faces outwards (away from the body). When the garment has a crotch, a highly stretchable base material is preferably used for the crotch portion of the garment, with a view of preventing hindering of the longer stride of the walking wearer that the garment of the present embodiment affords.

[0079] The embodiment described thus far is an ideal embodiment of the present invention, but the latter is not necessarily limited to such an embodiment.

[0080] As in the explanation of the above embodiment, which was based on a girdle, the garment of the present invention is preferably a bottom garment. Besides a girdle, the invention can be used for other bottom garment articles such as brassieres, girdles, shorts, leggings, men's leggings, swimsuits, tights, supporters, stockings, sports tights, leotards, bodysuits, men's pants, waist nippers and the like.

[0081] The tightening portion in the above embodiment is not limited to a band-like shape, and may be shaped arbitrarily, provided that sufficient body constriction force or power is afforded thereby. The tightening portion may be shaped, for instance, as a band, a rhombus, an oval or the like.

[0082] In the above-described embodiment, the resin dots of the tightening portion illustrated in (e) of Fig. 2 are shaped as squares, but they may also be shaped as circles or ovals.

EXAMPLES

[0083] The present invention is explained in more specifically next based on examples. The invention is in no way meant to be limited, however, to or by these examples.

(Example 1)

[Preparation of a fabric]

[0084] A fabric was obtained by knitting 67% nylon (44 dtex, 34 filament) and 33% polyurethane (78 dtex) into a 32G tricot Denbigh structure. The fabric was scoured in accordance with ordinary methods and was thermally treated at 190°C for 2 minutes. The fabric was then dyed and dried in accordance with ordinary methods.

[Manufacture of a resin solution]

[0085] A mixed solution was obtained by mixing 100 parts by weight of an ether urethane resin "Superflex E4000" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.), 5 parts by weight of a block-isocyanate cross-linking agent "Elastoron BN 11" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.), and 0.25 parts by weight of an organometallic curing catalyst "Elastoron CAT21" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.). To this mixed solution was then added a polyacrylic acid thickener "Superflex VF" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.) up to a viscosity of 20000 cps/20°C, to yield a resin solution.

[Application step]

[0086] A screen printing plate was prepared for applying the resin. The screen printing plate was prepared with a 700-mesh screen. On a predetermined position of this screen there was formed a solid pattern (the pattern illustrated in (a) of Fig. 2) in accordance with a photoengraving method.

[0087] The above resin solution was printed as a solid pattern (the pattern illustrated in (a) of Fig. 2) on the fabric, with a rubber squeegee in an automatic printing machine, using the above screen printing plate. After printing, the fabric was dried at 120°C in a hot-air dryer, to yield a tightening portion in which there was formed a resin portion. The resin portion was formed without wholly filling the interstices of the fabric. A post-treatment was carried out that comprised padding to a squeezing rate of 40% in a treatment solution comprising 3wt% of a silicone softener and 97wt% of water, at 120°C for 2 minutes, followed by further heating at 170°C for 1 minute. A stretch fabric of Example 1 was thus obtained. Fig. 4 illustrates an electron micrograph of this stretch fabric. The photograph in (a) of Fig. 4 is a photograph of a tightening portion from the upper side where the resin portion of the stretch fabric is formed. The photograph in (b) of Fig. 4 is a photograph of a cross-section of the tightening portion of the stretch fabric when cut in the thickness direction of the fabric.

[Sewing step]

[0088] A stretch fabric having formed thereon a tightening portion, obtained in the same way as described above, was sewn such that the resin portion of the tightening portion faced outwards, to yield a garment of Example 1.

(Example 2)

[0089] A stretch fabric of Example 2 was obtained in the same way as in Example 1, but herein the fabric of Example 1 was modified into a 36G tricot Denbigh knitted fabric of 70% nylon (33 dtex, 26 filament) and 30% polyurethane (44 dtex). A garment of Example 2 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 3)

[0090] A stretch fabric of Example 3 was obtained in the same way as in Example 1, but modifying herein the amount of added polyacrylic acid thickener, during preparation of the resin solution, so as to yield a viscosity of the resin solution of 30000 cps/20°C. A garment of Example 3 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 4)

[0091] A stretch fabric of Example 4 was obtained in the same way as in Example 1, but using herein 100 parts by weight of an ether urethane resin "Superflex E4800" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.) instead of the ether urethane resin "Superflex E4000", and by adjusting the amount of added polyacrylic acid thickener, during preparation of the resin solution, so as to yield a viscosity of the resin solution of 20000 cps/20°C. A garment of Example 4 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 5)

[0092] A stretch fabric of Example 5 was obtained in the same way as in Example 1, but modifying herein the amount of added polyacrylic acid thickener, during preparation of the resin solution, so as to yield a viscosity of the resin solution of 5000 cps/20°C. A garment of Example 5 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 6)

[0093] A stretch fabric of Example 6 was obtained in the same way as in Example 1, but adjusting herein the amount of added polyacrylic acid thickener, during preparation of the resin solution, so as to yield a viscosity of the resin solution of 50000 cps/20°C. A garment of Example 6 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 7)

[0094] A grid pattern (pattern as illustrated in (b) of Fig. 2: line width 1 mm, line spacing 2 mm for both vertical and horizontal lines) was manufactured as the pattern of the screen printing plate used in the application step, instead of a solid pattern (pattern illustrated in (a) of Fig. 2). A stretch fabric of Example 7 was then obtained as in Example 1 but printing herein the resin solution on the fabric with a grid pattern (pattern as illustrated in (b) of Fig. 2) using this screen printing plate. A garment of Example 7 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 8)

[0095] A grid pattern (pattern as illustrated in (b) of Fig. 2: line width 1 mm, line spacing 6 mm for both vertical and horizontal lines) was manufactured as the pattern of the screen printing plate used in the application step, instead of a solid pattern (pattern illustrated in (a) of Fig. 6). A stretch fabric of Example 8 was then obtained as in Example 1, but printing herein the resin solution on the fabric with a grid pattern using this screen printing plate. A garment of Example 8 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Example 9)

[0096] A stretch fabric of Example 9 was obtained in the same way as in Example 1, but adjusting herein the amount of added polyacrylic acid thickener, during preparation of the resin solution, so as to yield a viscosity of the resin solution of 40000 cps/20°C. A garment of Example 9 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Comparative example 1)

[0097] A stretch fabric of Comparative example 1 was obtained in the same way as in Example 1, but herein the fabric of Example 1 was modified into a 36G tricot half knitted fabric of 62% cation polyester (33 dtex, 26 filament) and 38% polyurethane (44 dtex). A garment of Comparative example 1 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Comparative example 2)

[0098] A stretch fabric of Comparative example 2 was obtained in the same way as in Example 1, but herein the fabric of Example 1 was modified into a 32G tricot half knitted fabric of 82% polyester (56 dtex, 34 filament) and 18% polyurethane (44 dtex). A garment of Comparative example 2 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Comparative example 3)

[0099] A stretch fabric of Comparative example 3 was obtained in the same way as in Example 1, but using herein 100 parts by weight of an ester urethane resin "Superflex 700" (by Dai-Ichi Kogyo Seiyaku Co., Ltd.) instead of the ether urethane resin "Superflex E4000", and by adjusting the amount of added polyacrylic acid thickener, during preparation

of the resin solution, so as to yield a viscosity of the resin solution of 20000 cps/20°C. A garment of Comparative example 3 was obtained by sewing this similarly obtained stretch fabric such that the resin portion of the tightening portion faced outwards.

(Evaluation method)

[Tensile elongation of the tightening portion]

[0100] Specimens having a size of 2.5cm×15cm (the longitudinal direction corresponds to the warp direction of the fabric) were cut from the tightening portions of the stretch fabrics obtained in Examples 1 to 9 and Comparative examples 1 to 3, then the specimens were set, at a measurement gap of 10 cm, in a Instron-type universal tensile strength tester (Autograph AG-1, by Shimadzu), where a load of 22.1 N was applied in the warp direction of the fabric. The stretch rate (%) upon application of the load was taken as the tensile elongation of the tightening portion. The results are given in Table 1 and Table 2.

[Tensile elongation of the fabric]

[0101] Test specimens having a size of 2.5cm×15cm (the longitudinal direction corresponds to the warp direction of the fabric) were cut from the fabrics used in Examples 1 to 9 and Comparative examples 1 to 3. The specimens were set in the above Instron-type universal tensile strength tester (Autograph AG-1, by Shimadzu) at a measurement gap of 10 cm, where a load of 22.1 N was applied in the warp direction of the fabric. The stretch rate (%) upon application of the load was taken as the tensile elongation of the tightening portion. The results are given in Table 1 and Table 2.

[Measurement of the stretching force and the straining force]

[0102] The stretching force and the straining force were determined based on stretching measurements using an Instron-type universal tensile strength tester (Autograph AG-1, by Shimadzu) in accordance with the procedure below. Test specimens having a size of 2.5cm×15cm were cut from the tightening portions of the stretch fabrics obtained in Examples 1 to 9 and Comparative examples 1 to 3, and also test specimens having a size of 2.5cm×15cm were cut from the fabrics used in Examples 1 to 9 and Comparative examples 1 to 3. Firstly, the various specimens were applied a load of 14.7 N with a grip separation of 10 cm. Subsequently, during load application, when stretch was less than 60% the specimens were subjected to stretching / recovery up to 40% of the specimen length (grip separation) at a tensile rate of 300±20mm/min, when stretch was 60 to 80%, the specimens were similarly stretched /recovered up to a specimen length of 60%, and when stretch was greater than 80%, the specimens were subjected to stretching / recovery to 80% of the specimen length. This operation was repeated three times. Then, upon the third stretch and recovery, the value at 10% stretch was taken as the stretching force, while the value at recovery was taken as the straining force. The results are given in Table 1 and Table 2.

[Air permeability]

[0103] Tightening portions of the stretch fabrics obtained in Examples 1 to 9 and Comparative examples 1 to 3 having a size of 20cm × 20 cm were set on an instrument while stretched at a vertical and horizontal stretch rate of 10%, which resembles conditions upon actual garment wearing, and then air permeability was measured in accordance with JIS L1096 (Frazier method). The results are given in Table 1 and Table 2.

[Thickness]

[0104] Five sheets of tightening portions of the stretch fabrics obtained in Examples 1 to 9 and Comparative examples 1 to 3 were stacked and then the thickness thereof was measured under slight pressure from a thickness gauge (model SM-1201, by Teclock Co.). Also, the thickness of five sheets of resin portion-free fabrics used in Examples 1 to 9 and Comparative examples 1 to 3 was measured in the same way, then the thickness of the resin portion per sheet of stretch fabric was calculated based on the difference between the foregoing values. The results are given in Table 1 and Table 2.

[Breaking elongation of the resin]

[0105] After air-drying the resin solution at room temperature for 24 hours, a film having a thickness of 500 μm was manufactured through thermal heating at 170°C for 5 minutes. The film, cut into a 2.5 cm × 10 cm piece, was then ruptured using an Instron-type universal tensile strength tester (Autograph AG-1, by Shimadzu) in accordance with the

method in JIS L 1096 A (sample width 2.5 cm, grip separation 5 cm, tensile rate 15 cm/min). The elongation (stretch rate %) upon rupture was measured and the obtained value thereof was taken as the breaking elongation of the resin. The results are given in Table 1 and Table 2.

[Modulus of the resin]

[0106] After air-drying the resin solution at room temperature for 24 hours, a film having a thickness of 500 μm was manufactured through thermal treatment at 170°C for 5 minutes. The film, cut into a 2.5 cm × 10 cm piece, was then stretched using an Instron-type universal tensile strength tester (Autograph AG-1, by Shimadzu) in accordance with the method in JIS L 1096 A (sample width 2.5 cm, grip separation 5 cm, tensile rate 15 cm/min). The load upon 200% stretching of the film was measured and the obtained value was taken as the 200% modulus of the resin. The results are given in Table 1 and Table 2.

[Resin penetration]

[0107] A cross-section of the tightening portion was observed using an electronic microscope, and then the penetration rate of the resin into the fabric was determined as the proportion of the thickness b of permeated elastomeric resin relative to the thickness c of the fabric, as illustrated in Fig. 3, on the basis of the formula:

$$\text{Penetration rate (\%)} = b/c \times 100$$

The results are given in Table 1 and Table 2.

[Resin surface covering rate]

[0108] The surface rate (%) of resin portion occupying a surface area unit of a tightening portion of the stretch fabric was calculated as the surface area occupied by a resin portion in a tightening portion. The results are given in Table 1 and Table 2.

[Smoothness]

[0109] The resin surface of samples of tightening portions of the garments obtained in Examples 1 to 9 and Comparative examples 1 to 3 was touched with the palm and the back of the hand to evaluate the touch and rate it into three categories in accordance with the criteria below. The results are given in Table 1 and Table 2.

- : No resin feel
- △: Slight resin feel
- ×: Strong resin feel

[Texture]

[0110] The texture of samples of tightening portions of the garments obtained in Examples 1 to 9 and Comparative examples 1 to 3 was evaluated and rated into three categories in accordance with the criteria below. The results are given in Table 1 and Table 2.

- : Soft
- △: Stiff
- ×: Very stiff

[0111]

Table 1

	EXAMPLE 1	EXAMPLE 2	EXAMPLE 3	EXAMPLE 4	EXAMPLE 5	EXAMPLE 6	EXAMPLE 7	EXAMPLE 8	EXAMPLE 9
FABRIC CHARACTERISTICS	STRUCTURE	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH	TRICOT DENBIGH
	KNITTING	WARP KNIT	WARP KNIT	WARP KNIT	WARP KNIT	WARP KNIT	WARP KNIT	WARP KNIT	WARP KNIT
	WARP DIRECTION TENSILE ELONGATION (22.1N)	147%	152%	147%	147%	147%	147%	147%	147%
	STRETCHING FORCE (cN) 10%	35	10	35	35	35	35	35	35
RESIN CHARACTERISTICS	STRAINING FORCE (cN) 10%	15	5	15	15	15	15	15	15
	RESIN BREAKING ELONGATION	960%	960%	960%	960%	960%	960%	960%	960%
	200% MODULUS	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

(continued)

	EXAMPLE 1	EXAMPLE 2	EXAMPLE 3	EXAMPLE 4	EXAMPLE 5	EXAMPLE 6	EXAMPLE 7	EXAMPLE 8	EXAMPLE 9
RESIN ADHERING STATE	25	25	35	25	20	85	25	25	70
RESIN PORTION (ON FABRIC) THICKNESS (μm)									
PENETRATION (PENETRATION RATE)	30%	30%	30%	30%	70%	30%	30%	30%	30%
RESIN SURFACE COVERING RATE	100%	100%	100%	100%	100%	100%	56%	27%	100%
TIGHTENING PORTION CHARACTERISTICS	102%	101%	105%	65%	98%	114%	117%	131%	110%
TENSILE ELONGATION (22.1N)									
STRETCHING FORCE (cN) 10%	190	187	193	203	177	203	168	120	199
STRAINING FORCE (cN) 10%	121	111	125	117	89	136	98	59	132
STRETCHING FORCE RATIO (RELATIVE TO THE FABRIC)	5.4X	18.7X	5.5X	5.8X	5.1X	5.8X	4.8X	3.4X	5.7X
STRAINING FORCE RATIO (RELATIVE TO THE FABRIC)	8.1X	22.3X	8.3X	7.8X	6.0X	9.1X	6.5X	3.9X	8.8X
HYSTERESIS (cN)	69	76	68	86	88	67	70	61	67

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(continued)

	EXAMPLE 1	EXAMPLE 2	EXAMPLE 3	EXAMPLE 4	EXAMPLE 5	EXAMPLE 6	EXAMPLE 7	EXAMPLE 8	EXAMPLE 9
	8	2.3	1.9	3	19.7	0.1	16.5	22.6	0.8
AIR PERMEABILITY (mL/cm ² ·s)	○	○	○	○	○	×	○	○	Δ
SMOOTHNESS	○	○	○	Δ	×	×	○	○	○
TEXTURE	○	○	○						

[0112]

Table 2

		COMPARATIVE EXAMPLE 1	COMPARATIVE EXAMPLE I	COMPARATIVE EXAMPLE I
5 10 15	FABRIC CHARACTERISTICS	STRUCTURE	TRICOT HALF	TRICOT HALF
		KNITTING	WARP KNIT	WARP KNIT
		WARP DIRECTION TENSILE ELONGATION (22. IN)	253%	250%
		STRETCHING FORCE (cN) 10%	30	35
		STRAINING FORCE (cN) 10%	10	15
20	RESIN CHARACTERISTICS	RESIN BREAKING ELONGATION	960%	520%
		200% MODULUS	1.1	7.1
25 30	RESIN ADHERING STATE	RESIN PORTION (ON FABRIC) THICKNESS (μm)	25	25
		PENETRATION (PENETRATION RATE)	30%	50%
		RESIN SURFACE COVERING RATE	100%	100%
35 40 45 50 55	TIGHTENING PORTION CHARACTERISTICS	TENSILE ELONGATION (22. IN)	245%	237%
		STRETCHING FORCE (cN) 10%	95	35
		STRAINING FORCE (cN) 10%	70	25
		STRETCHING FORCE RATIO (RELATIVE TO THE FABRIC)	1.3X	1.2X
		STRAINING FORCE RATIO (RELATIVE TO THE FABRIC)	1.3X	2.5X
		HYSTERESIS (cN)	25	10
		AIR PERMEABILITY ($\text{ml}/\text{cm}^2\cdot\text{s}$)	21	168
		SMOOTHNESS	○	○

(continued)

		COMPARATIVE EXAMPLE 1	COMPARATIVE EXAMPLE I	COMPARATIVE EXAMPLE I
5	TEXTURE	○	Δ	×

10 [0113] As Tables 1 and 2 show, the tightening portions of the stretch fabrics of Examples 1 to 9 had better stretching force and straining force than those of Comparative examples 1 to 3. In particular, the stretch fabrics of Examples 1 to 3 and 7 to 8 exhibited also excellent smoothness and texture. The above results indicate that the stretch fabric of the present invention affords sufficient body constriction force or power, and allows obtaining a garment having excellent fitting feel.

Industrial Applicability

15 [0114] The present invention allows thus providing a stretch fabric, a garment and a clothing article that afford sufficient body constriction force or power and that can realize excellent fitting feel. The invention allows also providing a manufacturing method of the stretch fabric as well as a clothing article manufacturing method.

Claims

1. A stretch fabric having a tightening portion on at least part of a fabric,
wherein said tightening portion has a resin portion comprising an elastomeric resin,
said fabric has a tensile elongation of 100 to 200% in a warp direction,
and said elastomeric resin has a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less.
2. The stretch fabric according to claim 1, wherein said resin portion is provided such that a thickness of said resin portion is 75 μm or less, a penetration rate of said elastomeric resin in said fabric is within 50% relative to the thickness of said fabric, and yarn-interlacing portions of said fabric are constrained without wholly filling the interstices of said fabric.
3. The stretch fabric according to claim 1 or 2, wherein a portion of said tightening portion having said resin portion therein has an air permeability of 0.5 ml/cm²·s or more, a straining force that is four times or more the straining force of said fabric, and a hysteresis of 0 to 80 cN.
4. The stretch fabric according to any one of claims 1 to 3, wherein said fabric is a knitted fabric comprising polyurethane elastic yarn.
5. The stretch fabric according to any one of claims 1 to 4, wherein said resin portion is formed of a plurality of resin lines arranged along a fixed direction.
6. The stretch fabric according to any one of claims 1 to 5, wherein said resin portion is formed of a two-dimensional array of resin dots.
7. A garment comprising the stretch fabric according to any one of claims 1 to 6.
8. A clothing article, wherein the garment according to claim 7 is a girdle or shorts.
9. A stretch fabric manufacturing method, comprising the step of forming, by screen printing or rotary printing, a resin portion comprising an elastomeric resin having a breaking elongation of 500% or more and a 200% modulus of 5 N/mm² or less, on a predetermined position on one face of a fabric having a tensile elongation of 100 to 200% in a warp direction, to a thickness after printing of 75 μm or less, and to a penetration rate in said fabric of within 50% relative to the thickness of said fabric, such that said elastomeric resin constrains yarn-interlacing portions of said fabric without wholly filling the interstices of said fabric.
10. A method for manufacturing a clothing article, comprising the step of sewing a stretch fabric obtained in accordance with the manufacturing method of claim 9, such that said resin portion faces away from a body.

Fig.1

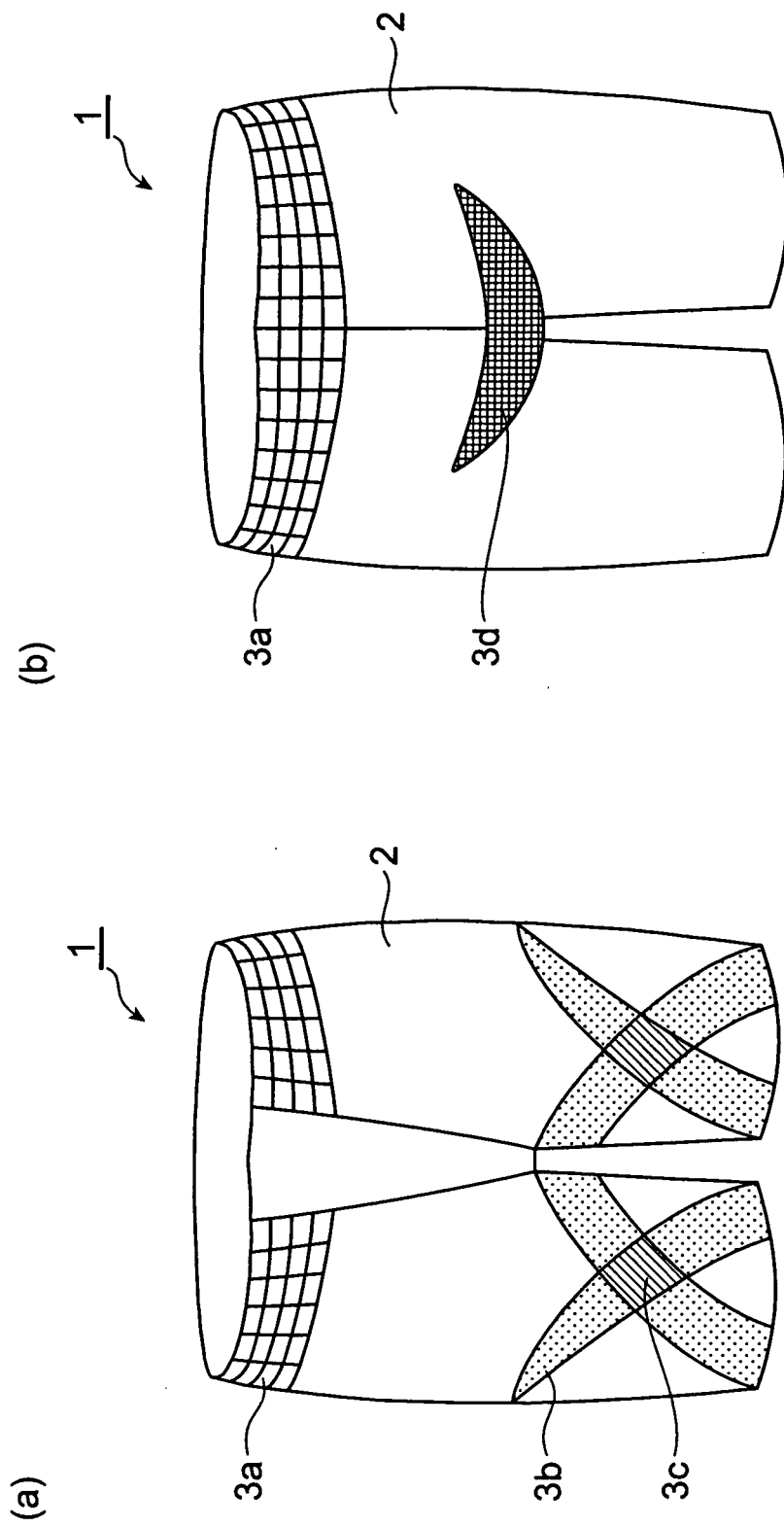


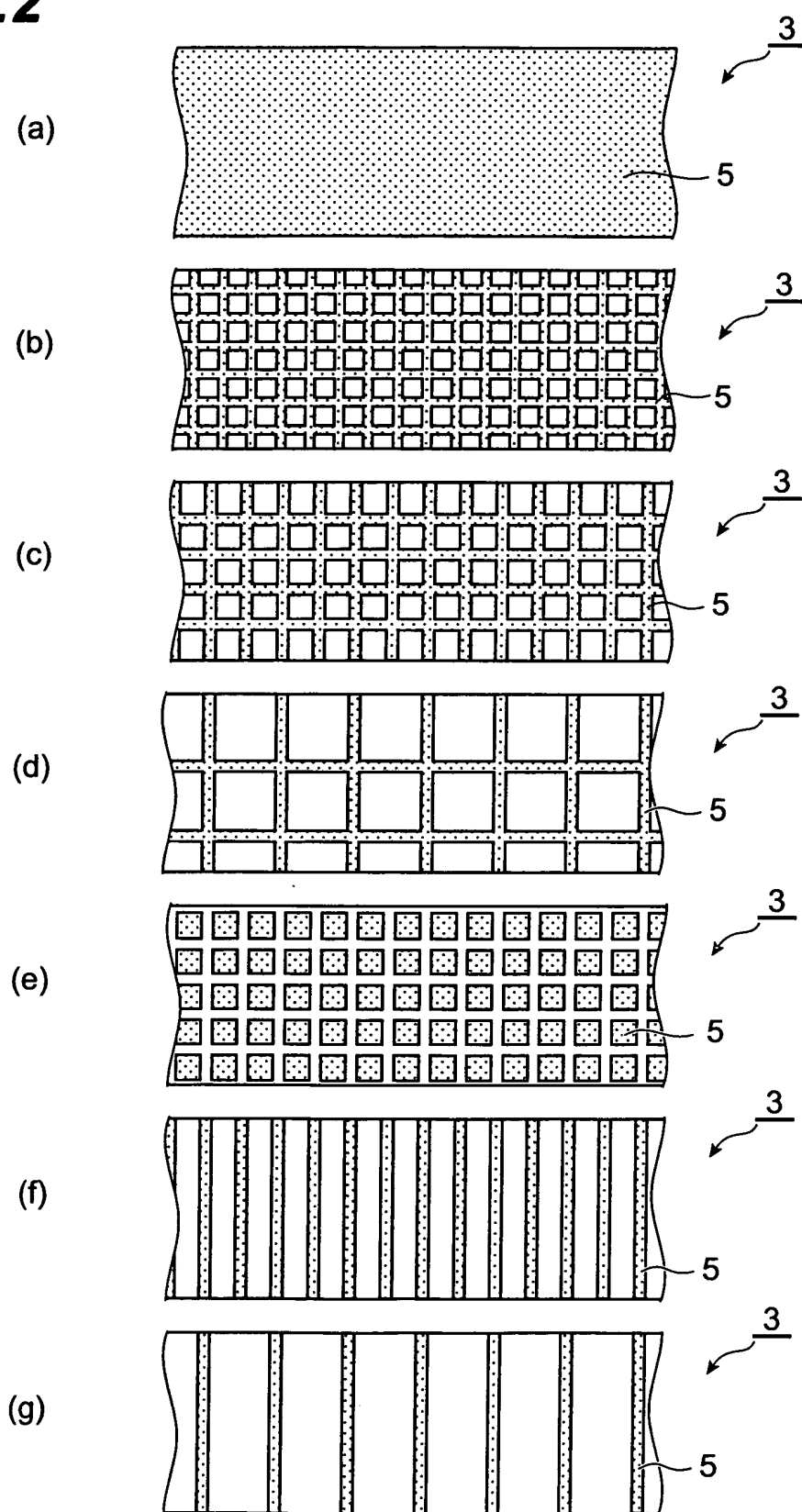
Fig.2

Fig.3

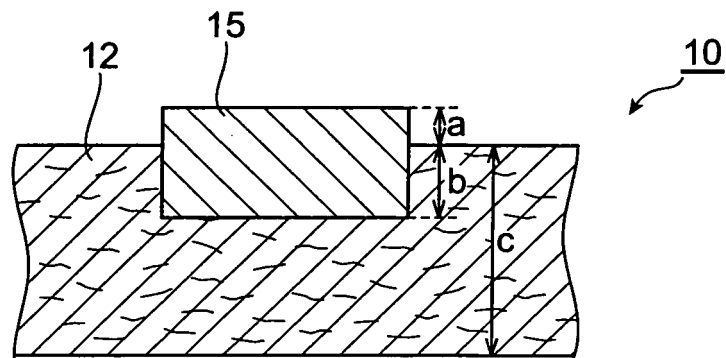


Fig.4

(a)



(b)



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/309256

A. CLASSIFICATION OF SUBJECT MATTER <i>D04B21/18(2006.01)i, A41C1/00(2006.01)i, A41C1/02(2006.01)i, D06M15/263(2006.01)i, D06M15/568(2006.01)i, D06M23/16(2006.01)i</i> 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) <i>D04B21/00-21/20, D04B1/00-1/28, D03D1/00-27/18, A41C1/00-5/00, A41B9/00-9/16, 13/00, 13/04-117/00, A41C1/02, D06M13/00-15/715, D06M23/00-23/18, A41B11/00-11/14</i> Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006 Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006 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.
A	JP 11-50305 A (MIZUNO INC.), 23 February, 1999 (23.02.99), Claims 1, 3 (Family: none)	1-10
A	JP 2001-192903 A (Wacoal Corp.), 17 July, 2001 (17.07.01), Claims 1, 19; Par. No. [0094] & US 2003-28952 A1 & EP 1342423 A1	1-10
A	JP 2005-264394 A (Kabushiki Kaisha Gorudo Uintekunikarusenta), 29 September, 2005 (29.09.05), Claim 1; Par. No. [0016] (Family: none)	1-10
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 11 August, 2006 (11.08.06)		Date of mailing of the international search report 22 August, 2006 (22.08.06)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/309256

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 62-6087 Y2 (Kabushiki Kaisha Senko Nairon), 12 February, 1987 (12.02.87), Claim 1 (Family: none)	1-10
A	JP 6-33909 U (Wacoal Corp.), 06 May, 1994 (06.05.94), Claims 1, 6, 8, 9; Par. No. [0051] (Family: none)	1-10
A	JP 3019851 U (Owari Seisen Co., Ltd.), 18 October, 1995 (18.10.95), Claim 1; Par. Nos. [0015], [0032] (Family: none)	1-10
A	JP 2004-308037 A (Seiren Co., Ltd.), 04 November, 2004 (04.11.04), Claims 1 to 3, 6; Par. No. [0035]; examples 1, 2 (Family: none)	1-10
A	JP 7-18579 A (Sanei Chemical Kabushiki Kaisha), 20 January, 1995 (20.01.95), Claims 1, 2; Par. No. [0004] (Family: none)	1-10

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INTERNATIONAL SEARCH REPORT

International application No.

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The "elastic resin exhibiting a specific breaking extension and a specific modulus" and "stretch fabric exhibiting a specific tensile elongation" as set forth in claim 1 have been examined in view of Examples and Comparative Examples in Detailed Description of the Invention. As a result, it is considered that the a poly-ether-urethane resin satisfies the parameters of the former and a knitted fabric made of nylon yarn and polyurethane yarn and coated with the resin by screen printing or rotary printing satisfies the parameter of the latter.

Consequently, search has been made not only on elastic resins and stretch fabrics satisfying the parameters respectively but also on knitted fabrics made of nylon yarn and polyurethane yarn and coated with a poly-ether-urethane resin by screen printing or rotary printing and processes for the production thereof.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H07048644 A [0003]