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(54) **WOVEN FABRIC**

(57) The present invention provides a woven and knitted fabric, which prevents sliding and slipping of garments and the like, has excellent wearing feeling, and has excellent shape stability and durability. The woven and knitted fabric of the present invention includes constituent fibers containing 50% or more of polyurethane elastic fibers, the polyurethane elastic fibers containing 40% or more of heat-fusible polyurethane elastic fibers. The woven and knitted fabric has heat-fusion parts in which the heat-fusible polyurethane elastic fibers are heat-fused.

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Description

Technical Field

5 **[0001]** The present invention relates to a woven and knitted fabric.

Background Art

10 **[0002]** In general, it is desired to prevent sliding and slipping of garments and the like. As a specific example, it is desired to prevent sliding-down of a shoulder strap of underwear such as a brassiere, sliding-down of a garter or socks, and the like. In view of the foregoing, there is proposed a shoulder strap formed through use of a polyurethane yarn (for example, Patent Literature 1). An excellent effect of preventing sliding and slipping can be expected to be exhibited by increasing a constituent ratio (mixture ratio) of the polyurethane yarn. However, when the mixture ratio of the polyurethane yarn is high, there arises a problem in that shape stability of a fabric to be obtained is low, which makes it difficult to manage a product. There also arises a problem in that slight hitch causes pilling, snagging, and the like, and hence such shoulder strap lacks practicability.

15 **[0003]** On the other hand, there is proposed a shoulder strap formed of an elastomer tape (for example, Patent Literature 2). However, the elastomer tape has no air permeability, and hence sticks to the skin with sweat to become stuffy, for example. Thus, there arises a problem in that the elastomer tape has poor wearing feeling.

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Citation List

Patent Literature

25 **[0004]**

[PTL 1] Japanese Utility Model Registration No. 3079310 B

[PTL 2] JP 2001-316912 A

30 Summary of Invention

Technical Problem

35 **[0005]** The present invention has been made in view of solving the conventional problems. A main object of the present invention is to provide a woven and knitted fabric that prevents sliding and slipping of garments and the like, has excellent wearing feeling, and has excellent shape stability and durability.

Means for solving the Problems

40 **[0006]** According to one aspect of the present invention, a woven and knitted fabric is provided. The woven and knitted fabric includes constituent fibers containing 50% or more of polyurethane elastic fibers, the polyurethane elastic fibers containing 40% or more of heat-fusible polyurethane elastic fibers. The woven and knitted fabric has heat-fusion parts in which the heat-fusible polyurethane elastic fibers are heat-fused.

45 In one embodiment of the invention, the polyurethane elastic fibers include a polyurethane bare yarn and/or a polyurethane covering yarn with a coverage of 30% or less.

In another embodiment of the invention, the polyurethane elastic fibers include a single covering yarn.

In still another embodiment of the invention, the woven and knitted fabric has an opacity of 70% or less.

In still another embodiment of the invention, the woven and knitted fabric has anti-pilling performance of Class 3 or more.

In still another embodiment of the invention, the woven and knitted fabric has a fray-proof function.

50 According to another aspect of the present invention, a garment is provided. The garment includes the woven and knitted fabric.

Advantageous Effects of Invention

55 **[0007]** According to the present invention, it is possible to provide the woven and knitted fabric, including constituent fibers containing 50% or more of polyurethane elastic fibers, the polyurethane elastic fibers containing 40% or more of heat-fusible polyurethane elastic fibers, which prevents sliding and slipping of garments and the like, is excellent in wearing feeling, and is excellent in shape stability and durability. Specifically, the woven and knitted fabric includes

constituent fibers containing 50% or more of polyurethane elastic fibers, and hence has a high friction force. Consequently, the woven and knitted fabric can prevent sliding and slipping of garments and the like effectively, following the movement of a body and the stretching of a skin. When the polyurethane elastic fibers contain 40% or more of heat-fusible polyurethane elastic fibers, heat-fusion parts are formed, resulting in stabilization of a woven texture or a knitted texture. As a result, it is possible to provide the woven and knitted fabric, which is excellent in shape stability, is not deformed easily even when being elongated or contracted (used) repeatedly, and is excellent in durability, in spite of the fact that the mixture ratio of the polyurethane elastic fibers is high. Further, as the woven and knitted fabric is excellent in air permeability, the fabric is excellent in wearing feeling and is applicable to various applications.

Description of Embodiments

[0008] Hereinafter, although preferred embodiments of the present invention are described, the present invention is not limited to these embodiments.

[0009] A woven and knitted fabric of the present invention includes constituent fibers including 50% or more of polyurethane elastic fibers, the polyurethane elastic fibers including 40% or more of heat-fusible polyurethane elastic fibers, and has heat-fusion parts in which the heat-fusible polyurethane elastic fibers are heat-fused. The constituent ratio (mixture ratio) of the polyurethane elastic fibers is preferably 70% or more, more preferably 80% or more. The capability of achieving such high mixture ratio in a woven and knitted fabric is one of the features of the present invention. Such high mixture ratio can provide a woven and knitted fabric which provides remarkably excellent effects of preventing sliding and slipping and has high transparency. The ratio of the heat-fusible polyurethane elastic fibers in the polyurethane elastic fibers is preferably 70% or more. It should be noted that the constituent ratio (%) is defined based on the standardized configuration of a fabric or a garment, is a value calculated from a yarn fineness and a yarn insertion length, and is also a value obtained by measuring a fabric satisfying desired functions according to the JIS L 1030.

[0010] In the present invention, the "heat fusion" refers to a state in which heat-fusible polyurethane elastic fibers are fused with heat or heat and pressure from outside, and the heat-fusible polyurethane elastic fibers are in close contact with each other or the heat-fusible polyurethane elastic fibers are in close contact with other fibers, or a state in which the fibers adhere to each other without being heat-fused. The heat-fusion parts are mainly present in regions where the polyurethane elastic fibers are brought into contact with each other. The heat-fusion parts are mainly crossing points (point-contact parts) of the fibers, and can be line-contact parts depending upon the density of yarns and the like. As described above, in the woven and knitted fabric of the present invention, the mixture ratio of the heat-fusible polyurethane elastic fibers is high, and a number of heat-fusion parts can be present. As a result, irrespective of the fact that the mixture ratio of the polyurethane elastic fibers is high, a woven and knitted fabric excellent in shape stability and durability can be obtained. Further, a fray and a run can be prevented effectively, and a fray does not occur easily even when a fabric is cut and a cut fabric can be used as it is.

[0011] Any appropriate polyurethane is used as the polyurethane for constructing the polyurethane elastic fibers. A composition and method of producing the polyurethane for constructing the heat-fusible polyurethane elastic fibers are not particularly limited, as long as the polyurethane forms the heat-fusion parts and keeps elasticity. Examples of the method of producing the heat-fusible polyurethane elastic fibers include: a method including subjecting a polyol to a reaction with an excess molar amount of a diisocyanate to produce a polyurethane intermediate polymer having isocyanate groups at both terminals, subjecting the polyurethane intermediate polymer to a reaction with a low-molecular-weight diamine or a low-molecular-weight diol having active hydrogen capable of easily reacting with the isocyanate groups of the intermediate polymer in an inert organic solvent to produce a polyurethane solution (polymer solution), and then removing the solvent to form the polyurethane solution into a string; a method including solidifying a polymer obtained through a reaction among a polyol, a diisocyanate, and a low-molecular-weight diamine or a low-molecular-weight diol, dissolving the polymer in a solvent, and then removing the solvent to form the solution into a string; a method including forming the solidified polymer into a string by heating without dissolving the polymer in the solvent; a method including forming a polymer obtained through a reaction among the polyol, diisocyanate, and low-molecular-weight diol into a string without solidifying the polymer; and a method including mixing the polymer or polymer solution obtained in each of the methods, and then removing the solvent from a mixed polymer solution to form the mixed polymer solution into a string. In particular, a method including melt-spinning the following polymer (polymer for spinning) without solidifying the polymer is preferred. The polymer is obtained by subjecting (A) a prepolymer having isocyanate groups at both terminals (hereinafter, referred to as "prepolymer having NCO groups at both terminals"), which is obtained through a reaction between a polyol and a diisocyanate, to a reaction with (B) a prepolymer having hydroxyl groups at both terminals (hereinafter, referred to as "prepolymer having OH groups at both terminals"), which is obtained through a reaction among a polyol, a diisocyanate, and a low-molecular-weight diol. This is because, according to this method, heat-fusible polyurethane elastic fibers which are heat-fused easily at low temperature and have heat resistance can be obtained.

[0012] The polyol is preferably a polymer diol having a number average molecular weight of about 800 to 3,000. Examples of the polymer diol include a polyether glycol, a polyester glycol, and a polycarbonate glycol. The polyol for

constructing the prepolymer having NCO groups at both terminals and the polyol for constructing the prepolymer having OH groups at both terminals may be the same or different from each other.

[0013] Examples of the polyether glycol include: ring-opening polymers of cyclic ethers such as ethylene oxide, propylene oxide, and tetrahydrofuran; and polycondensates of glycols such as ethylene glycol, propylene glycol, 1,4-butanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, and 3-methyl-1,5-pentanediol.

[0014] Examples of the polyester glycol include: polycondensates of at least one kind selected from glycols such as ethylene glycol, propylene glycol, 1,4-butanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, and 3-methyl-1,5-pentanediol, and at least one kind selected from dibasic acids such as adipic acid, sebacic acid, and azelaic acid; and ring-opening polymers of lactones such as ϵ -caprolactone and valerolactone.

[0015] Examples of the polycarbonate glycol include a carbonate glycol obtained through a transesterification reaction between at least one kind of organic carbonate selected from dialkyl carbonates such as dimethyl carbonate and diethyl carbonate, alkylene carbonates such as ethylene carbonate and propylene carbonate, diaryl carbonates such as diphenyl carbonate and dinaphthyl carbonate, and the like and at least one kind of aliphatic diol selected from ethylene glycol, propylene glycol, 1,4-butanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, 3-methyl-1,5-pentanediol, and the like.

[0016] Any appropriate diisocyanate such as an aliphatic, alicyclic, aromatic, or aromatic-aliphatic diisocyanate may be used as the diisocyanate. Specific examples thereof include 4,4'-diphenylmethane diisocyanate, 2,4-tolylene diisocyanate, 1,5-naphthalene diisocyanate, xylylene diisocyanate, hydrogenated xylylene diisocyanate, isophorone diisocyanate, 1,6-hexamethylene diisocyanate, p-phenylene diisocyanate, 4,4'-dicyclohexylmethane diisocyanate, m-tetramethylxylene diisocyanate, and p-tetramethylxylene diisocyanate. They are used alone or in combination. Of those, 4,4'-diphenylmethane diisocyanate and 4,4'-dicyclohexylmethane diisocyanate are preferably used.

[0017] As the low-molecular-weight diol and low-molecular-weight diamine that are chain extenders, those which have an appropriate reaction rate and are capable of providing appropriate heat resistance are preferred, and a low-molecular-weight compound having two active hydrogen atoms capable of reacting with an isocyanate and generally having a molecular weight of 500 or less is used.

[0018] Examples of the low-molecular-weight diol include aliphatic diols such as ethylene glycol, propylene glycol, 1,4-butanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, and 3-methyl-1,5-pentanediol. Trifunctional glycols such as glycerin are also used as long as the spinnability is not inhibited. They are used alone or in combination. From the viewpoints of the workability and the provision of appropriate physical properties to fibers to be obtained, ethylene glycol and 1,4-butanediol are preferred. Examples of the low-molecular-weight diamine include ethylene diamine, butane diamine, propylene diamine, hexamethylene diamine, xylylene diamine, 4,4-diaminodiphenylmethane, and hydrazine.

[0019] In the reaction described above, as a reaction modifier or a polymerization degree modifier, a monofunctional monol such as butanol and a monofunctional monoamine such as diethylamine and dibutylamine can be used.

[0020] Examples of the inert solvent used in the reaction described above or as a spinning solution include polar solvents such as N,N-dimethylformamide, N,N-dimethylacetamide, N,N,N',N'-tetramethylurea, N-methylpyrrolidone, and dimethylsulfoxide.

[0021] The heat-fusible polyurethane elastic fibers can contain any appropriate component such as a UV-absorbing agent, an antioxidant, and a light stabilizer so as to improve weather resistance, thermal oxidation resistance, and yellowing resistance. Any appropriate component is added at any appropriate timing of the reaction.

[0022] From the viewpoint of obtaining the polymer for spinning, the molar ratio of the molar amount of the total diisocyanate to the total molar amount of the total polyol and the total low-molecular-weight diol is preferably 1.02 to 1.20. The proportion of the prepolymer having NCO groups at both terminals to the prepolymer having OH groups at both terminals is adjusted so that the NCO groups remain in an amount of preferably 0.05 to 1.0% by mass, more preferably 0.10 to 0.60% by mass in a yarn immediately after spinning. It should be noted that the content of the NCO groups in the spun fibers is determined by dissolving the spun fibers (about 1 g) in a dibutylamine/dimethylformamide/toluene solution, subjecting the NCO groups in the sample to a reaction with excess dibutylamine, and titrating the remaining dibutylamine with hydrochloric acid.

[0023] As commercially available products of the heat-fusible polyurethane elastic fibers, there are given, for example, Mobilon (registered trademark) R, R-L, K-L, and R-LL manufactured by Nisshinbo Textile Inc.

[0024] The fineness of the polyurethane elastic fibers is set to any appropriate fineness depending upon the applications. The fineness is typically 18 to 611 dtex. As specific examples, when the polyurethane elastic fibers are used alone as a narrow-width tape and the like, high fabric strength is required, and hence the fineness is preferably 44 to 611 dtex, more preferably 78 to 567 dtex. When the polyurethane elastic fibers are used so as to be attached to another fabric, for example, as a liner, no particular limitation is imposed on the fabric strength. For example, when the polyurethane elastic fibers are attached to garments, the fineness is preferably 18 dtex to 156 dtex, more preferably 22 dtex to 78 dtex, based on relationships with the thickness of the entire fabric and the like.

[0025] The woven and knitted fabric of the present invention can contain fibers other than the polyurethane elastic fibers. Any appropriate fibers can be adopted as the other fibers depending upon the applications. Examples of the other

fibers include: natural fibers such as cotton, linen, wool, and silk; regenerated fibers such as rayon, cupra, and polynosic; semi-regenerated fibers such as acetate; and chemical synthetic fibers such as nylon, polyester, acryl, polypropylene, and vinyl chloride. Of those, cotton, nylon, and polyester are used preferably. In view of the ease of knitting, weaving, and processing, nylon and polyester are used more preferably. When complex yarns described later are adopted, nylon is particularly preferably used in view of the ease of production. It should be noted that, for example, in applications such as a narrow-width tape, which require transparency in particular, a clear yarn with high transparency is used preferably as the other fibers. When transparency is required in particular, the constituent ratio of a dull yarn is preferably 0 to 20%, more preferably 0 to 10%, particularly preferably 0 to 5%.

[0026] The fineness of the other fibers is preferably 8 to 80 dtex, more preferably 10 to 56 dtex. When the other fibers are used as a sheath yarn of a covering yarn described later, the fineness is preferably 8 to 44 dtex, more preferably 10 to 22 dtex. When the fineness exceeds 44 dtex, the coverage of the polyurethane elastic fibers described later becomes high, with the result that a sufficient effect of preventing slipping may not be obtained. When the fineness is less than 8 dtex, yarn breakage is liable to occur during a covering yarn production process, with the result that the production stability may become inferior.

[0027] The polyurethane elastic fibers are contained in a woven and knitted fabric in any appropriate form. Specific examples thereof include forms such as an original yarn (unprocessed yarn), a false twisted yarn, and a dyed yarn. Further specific examples thereof include: a bare yarn; and complex yarns with other fibers such as a covering yarn (polyurethane elastic fibers are typically used as a core yarn), a doubled yarn, and an air interlaced yarn. Examples of the covering yarn include a single covering yarn (SCY) and a double covering yarn (DCY). These forms are adopted alone or in combination.

[0028] The polyurethane elastic fibers are preferably a bare yarn and/or a covering yarn with a coverage of 30% or less. When the polyurethane elastic fibers are a covering yarn, the coverage is more preferably 20% or less, particularly preferably 10% or less. Through the adoption of such form, a woven and knitted fabric which has a high friction force and is remarkably excellent in transparency can be obtained. Further, through the adoption of such form, the polyurethane elastic fibers can be brought into contact with each other to a higher degree to enhance the heat-fusion property further, and thus, a woven and knitted fabric which is remarkably excellent in shape stability and durability can be obtained. When the polyurethane elastic fibers are a covering yarn, a single covering yarn (SCY) is preferably adopted. This is because the SCY is excellent in terms of cost and is capable of satisfying the coverage easily.

[0029] The coverage of the covering yarn is calculated with the following expression:

$$C = (0.012 \times D \times T / (1000 / DR)) \times 100$$

where C represents a coverage (%), D represents a fineness (dtex) of a sheath yarn, T represents a twisted number (T/m), and DR represents a draft magnification.

[0030] The woven and knitted fabric of the present invention adopts any appropriate texture. Specifically, in the case of the woven fabric, there are given woven textures such as a plain weave, a twill weave, and a satin weave. The knitted fabric is roughly classified into a warp-knitted fabric and a weft-knitted fabric. In the case of the warp-knitted fabric, there are given knitted textures such as a plain stitch, a rib stitch, a purl stitch, and a double stitch. In the case of the weft-knitted fabric, there are given, for example, a chain stitch, a Denbigh stitch, a cord stitch, and an atlas stitch.

[0031] The woven and knitted fabric of the present invention is typically produced by forming a weaving fabric and/or a knitting fabric from the constituent fibers and subjecting the fabric to heat treatment. As a condition for the heat treatment, any appropriate condition is adopted as long as the heat-fusion parts can be formed. Specifically, the heat treatment may be dry heat treatment or wet heat treatment. In the case of the dry heat treatment, the treatment temperature is preferably 100 to 200 °C, more preferably 110 to 190 °C. The treatment time is typically 30 to 120 seconds. On the other hand, in the case of the wet heat treatment, the treatment temperature is preferably 90 to 140 °C, more preferably 95 to 130 °C. The treatment time is typically 10 to 30 seconds. Further, as a method for the heat treatment, in addition to the method described above, there is given a method including conducting heat treatment by pressing a weaving fabric or a knitting fabric directly to a heating medium such as an iron. In this case, the treatment temperature is preferably 80 to 180 °C, more preferably 80 to 120 °C. The treatment time is typically 5 to 20 seconds. It should be noted that a steam iron is preferably used in this method.

[0032] The heat-fusion force of the heat-fusible polyurethane elastic fibers is preferably 0.1 cN/dtex or more, more preferably 0.15 cN/dtex or more. The heat-fusion force can be regulated by adjusting the mixture ratio, the coverage, the heat treatment conditions, and the like of the heat-fusible polyurethane elastic fibers. When the heat-fusion force is 0.1 cN/dtex or more, a woven and knitted fabric excellent in resistance to unweaving or resistance to unknitting can be obtained.

[0033] The heat-fusion force is determined by the following method.

For the measurement, a tension testing machine (precision universal testing machine manufactured by Shimadzu Corporation) is used.

(In the case of knitted fabric)

5
[0034] Unknitting is performed so that heat-fusible polyurethane elastic fibers or a complex yarn containing heat-fusible polyurethane elastic fibers is placed at a fabric end. A knitted fabric is held by an upper chuck and heat-fusible polyurethane elastic fibers or a complex yarn containing heat-fusible polyurethane elastic fibers taken out from a fabric end is held by a lower chuck under a load of 0.1 cN. Under this condition, the knitted fabric is pulled at a chuck interval of 100 mm and a tension rate of 100 mm/min., and a tension at a time when the heat-fusible yarn is unknitted from the fabric is measured.

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[0035] Regarding a peak point of an unknitting tension, which is measured every time a heat-fusion part is peeled, the largest to the third largest values are averaged between elongation amounts of 100 mm and 200 mm at which an unknitting stress is stabilized to determine a peak average unknitting tension. The peak average unknitting tension (cN) is divided by an initial fineness (dtex) of the heat-fusible polyurethane elastic fibers to obtain a heat-fusion force (cN/dtex).

(In the case of woven fabric)

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[0036] Unweaving is performed so that heat-fusible polyurethane elastic fibers or a complex yarn containing heat-fusible polyurethane elastic fibers is placed at a fabric end. The heat-fusible yarn is held and pulled in a direction of unweaving a yarn from a woven fabric end. A force of unweaving the fabric at this time is defined as an unweaving tension and measured in the same way as in the knitting fabric.

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[0037] It should be noted that, when the heat-fusion force between the polyurethane elastic fibers or between the polyurethane elastic fibers and the used non-elastic fibers increases, an unknitting tension increases. When heat fusion proceeds further, the held heat-fusible elastic fibers are broken through the elongation. This case is evaluated as "complete fusion," which indicates that a heat fusion force reaches maximum.

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[0038] The fabric density of the woven and knitted fabric of the present invention is set to any appropriate value depending upon the applications. Specifically, the fabric density is set depending upon desired fabric strength (tensile cutting strength). For example, when the woven and knitted fabric is used alone as a narrow-width tape or the like (a), high fabric strength is required, and hence, the tensile cutting strength is preferably 150 N or more. When the woven and knitted fabric is used as a liner (b), high fabric strength is not required and the fabric strength is not particularly limited. It should be noted that the "tensile cutting strength" is a value determined according to JIS L1096.

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[0039] The woven and knitted fabric of the present invention includes constituent fibers containing 50% or more of polyurethane elastic fibers, and hence has a high friction force. Consequently, the woven and knitted fabric can prevent sliding and slipping of a garment and the like effectively, following the movement of a body and the stretching of a skin. Further, the polyurethane elastic fibers includes 40% or more of heat-fusible polyurethane elastic fibers, and heat-fusion parts are formed to stabilize a woven texture or a knitted texture. As a result, a woven and knitted fabric can be provided, which is excellent in shape stability, is not deformed easily even when being elongated or contracted (used) repeatedly, and is excellent in durability, in spite of the fact that the mixture ratio of the polyurethane elastic fibers is high.

40
[0040] The woven and knitted fabric of the present invention includes constituent fibers containing 50% or more of polyurethane elastic fibers, and hence has high transparency. Consequently, even when the woven and knitted fabric is used alone or in combination with other materials, the fabric can be excellent in design and is applicable to various applications. The opacity of the woven and knitted fabric of the present invention is preferably 70% or less, more preferably 55% or less. The capability of achieving such high transparency in a woven and knitted fabric is one of the features of the present invention. Herein, the "opacity" is a value determined according to JIS P8149. It should be noted that the opacity O_p refers to a value determined by expressing a ratio of a single sheet luminous reflectance factor R_0 to an intrinsic luminous reflectance factor R_∞ in terms of a percentage, regarding the same sample, and is measured through the use of a spectrophotometer CM-3700d manufactured by Konica Minolta Holdings, Inc.

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[0041] The woven and knitted fabric is more excellent in air permeability than an elastomer tape or film. As a result, the woven and knitted fabric is excellent in wearing feeling and is applicable to various applications. The air permeability can be regulated by adjusting a fabric density, a fabric texture, and the like. It should be noted that the woven and knitted fabric is more excellent in degree of freedom in design for the fabric density, fabric texture, and the like compared with a non-woven fabric. Further, the woven and knitted fabric is also excellent in strength. Consequently, the woven and knitted fabric is applicable to various applications.

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[0042] The woven and knitted fabric of the present invention has a stabilized woven texture or knitted texture due to heat fusion and is excellent in anti-pilling property, in spite of the fact that the mixture ratio of the polyurethane elastic fibers is high. The anti-pilling property is preferably Class 3 or more, more preferably Class 4 or more, particularly preferably Class 5 or more. Herein, the anti-pilling property is determined according to JIS L1076 (ICI-type pilling testing

machine). It should be noted that the woven fabric and the knitted fabric are evaluated for the anti-pilling property with an ICI-type testing machine for 10 hours and 5 hours, respectively.

[0043] The woven and knitted fabric of the present invention is applicable to various applications, and any appropriate form can be adopted. Specifically, when the woven and knitted fabric is used as a shoulder strap of a brassiere or the like, for example, the woven and knitted fabric is formed into a narrow-width tape. When the woven and knitted fabric is used so as to be attached to another fabric for leg products such as socks and the like, for example, the woven and knitted fabric is formed into a strip. Alternatively, the woven and knitted fabric may be finished as a wide-width fabric, for example, a roll of cloth with a width of 170 cm and a length of 40 m, and then cut into any appropriate shape (for example, 20 cmx20 cm). The cut woven and knitted fabric has a fray-proof function. Therefore, the cut woven and knitted fabric may be used as it is, or the fabric end may be subjected to processing such as sewing or ultrasonic cutting.

Examples

[0044] Hereinafter, the present invention is described specifically by way of examples. However, the present invention is not limited to these examples.

(Examples 1 to 10 and Comparative Examples 1 to 5)

[0045] A weaving fabric and a knitting fabric were produced and then heat-treated to obtain a woven fabric and a knitted fabric. Table 1 shows production conditions and heat treatment conditions for the weaving fabric and the knitting fabric. It should be noted that, in Table 1, constituent yarns indicate trade names and degrees of fineness. Amixture ratio 1 indicates a ratio of polyurethane elastic fibers in constituent fibers, and a mixture ratio 2 indicates a ratio of heat-fusible polyurethane elastic fibers in polyurethane elastic fibers.

The details of complex yarns (SCY) of Example 4 and Comparative Example 3 are shown regarding both a constituent yarn 1 and a constituent yarn 2 (the same complex yarn production method).

In Example 10, Mobilon R and water-soluble vinylon were knitted by plating knitting with a circular knitting machine and subjected to preset dry heat treatment to produce a knitted fabric, and thereafter, the knitted fabric thus obtained was soaked in a water bath to remove vinylon by dissolution. Thus, a fabric substantially formed of only Mobilon R was produced.

(Comparative Example 6)

[0046] An elastomer tape made of polyurethane was used as a narrow-width tape.

[0047] Examples 1 to 10 and Comparative Examples 1 to 6 were evaluated as described below.

Table 1 shows the evaluation results.

1. Anti-slipping effect

[0048] The obtained narrow-width tapes (Examples 1 to 7, Comparative Examples 1 to 3, and Comparative Example 6) were worn as shoulder straps of brassieres, and the other fabrics (Examples 8 to 10 and Comparative Examples 4 and 5) were attached to the reverse side of garments to be worn. Under these conditions, an evaluation was made.

⊙: No sliding occurs irrespective of intensive exercise.

○: No sliding occurs during wearing.

△: Sliding occurs slightly during wearing, but the sliding is incomplete, which causes no problems for wearing.

×: Sliding occurs frequently during wearing, which is uncomfortable.

2. Anti-pilling performance

[0049] An evaluation was made according to JIS L107 6 (ICI-type pilling testing machine). The woven fabric and knitted fabric were evaluated for the anti-pilling performance with an ICI-type testing machine for 10 hours and 5 hours, respectively.

3. Elongation and contraction fatigue degree

[0050] An evaluation was made by a Wacoal method.

[0051] Specifically, a sample of 17.0 cmx9.0 cm (narrow-width tape is measured by its width) was taken, fixed at an

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elongation and contraction fatigue degree testing machine, and treated 7, 500 times at a rotation speed of 200 per minute. The treated sample was taken out and placed gently on a flat plane, and a change in shape of the fabric was visually checked. It should be noted that a test elongation degree was set under the following three conditions by an elongation test: (1) a 15-N elongation degree of less than 100%: 15-N elongation degree; (2) a 10-N elongation degree of less than 150% and a 15-N elongation degree of 100% or more: (10-N elongation degree + 15-N elongation degree) /2; and (3) a 10-N elongation degree of 150% or more: 150%.

o: No change in woven texture and knitted texture is found, and no deformation is found.

Δ: A slight change is found, which is within the usable range.

×: A large change in shape is found, which exceeds the usable range.

4. Opacity

[0052] An evaluation was made according to JIS P8149.

[0053]

[Table 1]

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8
Fabric texture	Plain weave	Plain weave	Plain weave	Plain weave	Chain stitch	Plain weave	Half tricot	Plain stitch
Constituent yarn 1	Warp: Mobilon RL 78T	Warp: SCY Mobilon RL 311T × Nylon 13T	Warp: Mobilon RLL 110T	Warp: SCY Mobilon K 78T (Non-heat-fusible yarn) × Nylon 13T	Chain stitch: Mobilon RLL 78T	Warp: Mobilon RLL 156T Cotton no. 80 One alternate	SCY Mobilon R 78T × Nylon 22T	Mobilon RL 44T
Constituent yarn 2	Weft: Nylon 33T	Weft: Nylon 33T	Weft: SCY Mobilon RLL 110T × Nylon 13T	Weft: SCY Mobilon RLL 110T × Nylon 13T	Insertion yarn: SCY Mobilon RLL 56T × Polyester 22T	Weft: Mobilon RLL 156T Nylon 13T Parallele d	-	-
Details of complex yarn (SCY)	Fineness of sheath yarn (dtex)	13	13	13	22	-	22	-
	Twisted number (T/m)	-	600	800	1,000	-	600	-
	Draft magnification (times)	-	1.8	2.3	2.3	-	2.3	-
	Coverage (%)	0	3.1	6.0	8.0	15	-	7.8
Mixture ratio 1 (%)	70	79	92	76	82	78	61	100
Mixture ratio 2 (%)	100	100	100	50	100	100	100	100
Fabric shape	Narrow-width tape	Narrow-width tape	Narrow-width tape	Narrow-width tape	Narrow-width tape	Narrow-width tape	Small-size fabric	
Heat treatment	Dry heat at 110 °C for 20 seconds	Wet heat at 100 °C for 20 seconds	Wet heat at 110 °C for 20 seconds	Dry heat at 150 °C for 60 seconds	Wet heat at 110 °C for 10 seconds	Dry heat at 180 °C for 45 seconds	Wet heat at 130 °C for 20 seconds	

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(continued)

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8
Slipping prevention effect	○	⊙	⊙	⊙	○	△	⊙	
Anti-pilling performance	Class 5	Class 5	Class 5	Class 5	Class 5	Class 5	Class 5	
Elongation and contraction fatigue degree	○	○	○	○	○	○	○	
Air permeability	○	○	○	○	○	○	○	
Opacity (%)	45	48	51	59	65	60	15	
Fabric texture	Example 9 Double stitch	Example 10 Plain stitch	Comparative Example 1 Plain weave	Comparative Example 2 Plain weave	Comparative Example 3 Plain weave	Comparative Example 4 Plain weave	Comparative Example 5 Plain stitch	Comparative Example 6 -
Constituent yarn 1	SCY Mobilon R56T × Nylon 13T	Mobilon R 44T	Warp: Mobilon RL 56T	Warp: Mobilon RL 33T	Warp: SCY Mobilon RL 156T × Nylon 44T	Warp: Lycra T127C 78T (Non-heat-fusible yarn)	Mobilon K 33T (Non-heat-fusible yarn)	-
Constituent yarn 2	-	Water-soluble vinylon 78T	Weft: Nylon 78T	Weft: Nylon 78T	Weft: SCY Mobilon RL 156T × Nylon 44T	Weft: Nylon 33T	-	-

5 [0054] As shown in Table 1, the woven and knitted fabrics obtained in Examples 1 to 10 had both of an excellent slipping prevention effect and excellent shape stability and durability. Further, the fabrics were also excellent in air permeability and transparency. On the other hand, no slipping prevention effect was found in Comparative Examples 1 to 3. Further, in Comparative Examples 4 and 5, shape stability was ensured during formation of a knitting fabric, but the obtained knitted fabric had no heat-fusion part and was inferior in shape stability and durability owing to its too high elongation property.

Industrial applicability

10 [0055] The woven and knitted fabric of the present invention is applicable to various applications as described above. Specifically, the woven and knitted fabric of the present invention is used as a shoulder strap of a brassiere, innerwear for women, a foundation garment, outerwear, or the like, and is also be used by being attached to a product requiring prevention of sliding and slipping, for example. For example, the woven and knitted fabric of the present invention is used for preventing sliding-down of a girdle, socks, pantyhose, or the like, for preventing sliding of swimming wear, a T-shirt, or the like, for preventing sliding-up of a hem of a shirt, a blouse, or the like, and for preventing sliding-up of a side band of a brassiere. Further, in addition to the garments, for example, the woven and knitted fabric of the present invention is used for preventing sliding-down of a strap of a shoulder bag, a backpack, or the like, for preventing sliding of a waist bag, for preventing a cap from being blown off with wind, for preventing wet compress from peeling; for preventing sliding of glasses, for preventing sliding-down of a wig, and as a fixing tool for a wristwatch.

Claims

- 25 1. A woven and knitted fabric, comprising constituent fibers containing 50% or more of polyurethane elastic fibers, the polyurethane elastic fibers containing 40% or more of heat-fusible polyurethane elastic fibers, wherein the woven and knitted fabric has heat-fusion parts in which the heat-fusible polyurethane elastic fibers are heat-fused.
- 30 2. A woven and knitted fabric according to claim 1, wherein the polyurethane elastic fibers comprise a polyurethane bare yarn and/or a polyurethane covering yarn with a coverage of 30% or less.
- 35 3. A woven and knitted fabric according to claim 2, wherein the polyurethane elastic fibers comprise a single covering yarn.
- 40 4. A woven and knitted fabric according to any one of claims 1 to 3, which has an opacity of 70% or less.
- 45 5. A woven and knitted fabric according to any one of claims 1 to 4, which has anti-pilling performance of Class 3 or more.
- 50 6. A woven and knitted fabric according to any one of claims 1 to 5, which has a fray-proof function.
- 55 7. A garment, comprising the woven and knitted fabric according to any one of claims 1 to 6.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/066668

A. CLASSIFICATION OF SUBJECT MATTER D03D15/08(2006.01)i, A41D31/00(2006.01)i, D04B1/18(2006.01)i, D04B21/18(2006.01)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) D03D15/00-15/12, A41D31/00-31/02, D04B1/00-1/28, D04B21/00-21/20		
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 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010		
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.
X Y	WO 2009/025224 A1 (Nisshinbo Industries, Inc.), 26 February 2009 (26.02.2009), paragraphs [0001], [0021] to [0025] & EP 2186868 A1	1, 2, 4, 6, 7 3, 5
X Y	JP 2008-95240 A (Nisshinbo Industries, Inc.), 24 April 2008 (24.04.2008), claims; paragraphs [0012] to [0014], [0021], [0083] to [0088] (Family: none)	1, 2, 4, 6, 7 3, 5
X Y	JP 2008-75230 A (Yugen Kaisha Marumatsu Sen'i), 03 April 2008 (03.04.2008), claims; paragraphs [0002], [0013] to [0030] (Family: none)	1, 2, 4, 6, 7 3, 5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:		
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Date of the actual completion of the international search 18 October, 2010 (18.10.10)	Date of mailing of the international search report 26 October, 2010 (26.10.10)	
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer	
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/066668

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X Y	JP 2007-154321 A (Nisshinbo Industries, Inc.), 21 June 2007 (21.06.2007), claims; paragraphs [0099] to [0109] (Family: none)	1, 2, 4, 6, 7 3, 5
X Y	JP 2006-307409 A (Nisshinbo Industries, Inc.), 09 November 2006 (09.11.2006), claims; paragraphs [0161] to [0181] (Family: none)	1, 2, 4, 6, 7 3, 5
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