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(54) Titre : TISSU ET ARTICLES UTILISANT CE DERNIER
(54) Title: WOVEN FABRIC AND ARTICLES MADE BY USING THE SAME

(57) Abrégé/Abstract:
A woven fabric made by using fiber-reinforced thermoplastic resin strands produced by stretching a bundle of sheath-core type conjugated filaments at a temperature of the melting point of the sheath component or above but below the melting point of the core component while fusing the sheath component, wherein the sheath-core type conjugated fiber is a nontwist straight one whose sheath component has a melting point lower than that of the core component by 20°C or above; and articles made by using the fabric.

ABSTRACT

A woven fabric obtained from a fiber-reinforced thermoplastic resin linear material formed by drawing sized sheath-core type bicomponent-spun fibers at a temperature that is equivalent to, or higher than, the melting point of a sheath component but lower than the melting point of a core component to melt-fuse sheath components, said sheath-core type bicomponent-spun fiber being a straight non-twisted sheath-core type bicomponent-spun fiber that has the sheath component formed from a thermoplastic resin having a lower melting point than the core component by 20°C or more, and a finished article of the woven fabric.

DESCRIPTION

WOVEN FABRIC AND ARTICLES MADE BY USING THE SAME

Technical Field

The present invention relates to a woven fabric and articles made of the same. More specifically, it relates to a woven fabric for use as covers such as a building material cover, etc., sheets such as a waterproof sheet, etc., or sheet-shaped materials such as a tent, a packaging bag, a flexible container, etc., and articles made of the same.

Background Art

Conventionally, a sheet-shaped woven fabric is produced by weaving fiber bundles obtained by sizing multifilaments, and for the weaving, the treatment of the multifilaments to cause an oil (antistatic agent) to adhere to their surfaces and the twisting of the multifilaments are essential. When the twisting is carried out, however, fiber bundles in a woven fabric are liable to be non-uniform, and as a result, it has been difficult to obtain a woven fabric having excellent properties, in particular, high tensile strength and a low elongation percentage.

Further, when the above woven fabric is imparted with a waterproofing function, the woven fabric surface is treated to impart it with water repellency. However, the thus-obtained waterproofing woven fabric has a problem that it suffers absorption of water into between monofilaments and infiltration of water into end surfaces or damaged portions of the woven fabric.

For coping with the above problems, it is disclosed that the surface of each multifilament is treated to impart it with water repellency as is found, for example, in a base fabric formed of polyethylene terephthalate (PTE) fibers obtained by using a fluorine-containing water repellent as a spinning oil (for example, see JP-A-6-136622) or in the treatment of a fiber bundle formed of polyester-based fibers constituting a base fabric of tarpaulin with an emulsion that mainly contains a fluorine-containing water repellent and a polyester-based urethane (for example, see JP-A-7-173774).

In these cases, however, the cost is increased due to the addition of the treating agent and the step of the treatment, and the above problems of a woven fabric remain unsolved. Besides these, the texture (weaving) of an obtained woven fabric is non-uniform due to the treatment of fibers or fiber bundles for impartation with water repellency, so that a product is degraded in quality and appearance.

Further, there has been proposed a resin-coated woven fabric obtained by coating at least one surface of the above water-repellent woven fabric with a resin (for example, see JP-A-6-136622). This publication (gazette) discloses that the resin coating produces an effect on a base fabric of a coarse texture using leno weave or binding filaments for preventing stitch deviation. It is assumed therefrom that since adhesion between a woven fabric having a water-repellent surface and a coating resin decreases, the adhesion is maintained only when the coating resin on front surface melt-bonds to itself on a reverse surface through interstices of the coarse texture. In this case, the finished fabric as a whole is not integrated, and it is considered that it is difficult to obtain a finished article of a water-proof woven fabric having excellent properties.

Disclosure of the Invention

Under the circumstances, it is an object of the present invention to provide, at a low cost, a woven fabric that has excellent properties such as high tenacity, a low elongation percentage, etc., and that is also excellent in waterproofing property while maintaining the above excellent properties, and a finished article of the woven fabric.

For achieving the above object, the present inventors had made diligent studies and as a result it has been found that the above object can be achieved by a woven fabric obtained from a fiber-reinforced thermoplastic resin linear material formed by drawing non-twisted sheath-core type bicomponent-spun fibers whose sheath component is a thermoplastic resin having a lower melting point than its core component by 20°C or more, under specific conditions. The present invention has been completed on the basis of the above finding.

That is, the present invention provides

(1) a woven fabric obtained from a fiber-reinforced

thermoplastic resin linear material formed by drawing sized sheath-core type bicomponent-spun fibers at a temperature that is equivalent to, or higher than, the melting point of a sheath component but lower than the melting point of a core component to melt-fuse sheath components, said sheath-core type bicomponent-spun fiber being a straight non-twisted sheath-core type bicomponent-spun fiber that has the sheath component formed from a thermoplastic resin having a lower melting point than the core component by 20°C or more,

(2) a woven fabric of the above (1), which has a tenacity contribution, represented by the following expression, of 80 % or more,

Tenacity contribution (%) = (B/A) x 100 ... (1)

wherein A is a tensile tenacity (N/3 cm) calculated from the fiber-reinforced thermoplastic resin linear material, the tensile tenacity being calculated according the expression of tenacity (N) of said linear material x filament count of said linear material/2.54 cm x 3 cm, and B is a tensile tenacity (N/3 cm) of the woven fabric,

(3) a woven fabric of the above (1) or (2), which has a basis weight of 50 to 500 g/m^2,

(4) a woven fabric of any one of the above (1) to (3), wherein the thermoplastic resin is a polyolefin,

(5) a woven fabric finished article obtained by working on the woven fabric recited in any one of the above (1) to (4),

(6) a woven fabric finished article of the above (5), wherein the working is hot press treatment,

(7) a woven fabric finished article of the above (5) or (6), wherein the working is a treatment to newly form a thermoplastic resin coating layer on at least one surface,

(8) a waterproof sheet-shaped material comprising the woven fabric recited in any one of the above (1) to (4), which is measured for a height of water from an end face after allowed to stand for 10 minutes according to a Byrek method defined in JIS L 1907, to show 10 mm or less, and

(9) a waterproof sheet-shaped material of any one of the above (5) to (7), which is measured for a height of water from an end face after allowed to stand for 10 minutes, according to a Byrek method defined in JIS L 1907, to show 10 mm or less.

According to the present invention, there can be provided, at a low cost, a woven fabric having excellent properties such as high tenacity, a low elongation percentage, etc., and having an excellent waterproofing property while maintaining the excellent properties and a woven fabric finished article thereof.

Brief Description of Drawings

Fig. 1 is a cross-sectional view of one example of a sheath-core type composite fiber for use in the present invention.

Fig. 2 is a cross-sectional view of an essential portion showing one example of the fiber-reinforced thermoplastic resin linear material for use in the present invention.

Preferred Embodiments of the Invention

The woven fabric of the present invention is a woven fabric produced from a fiber-reinforced thermoplastic resin linear material formed by drawing sized (bound) sheath-core type bicomponent-spun fibers at a temperature that is equivalent to, or higher than, the melting point of a sheath component but lower than the melting point of a core component to melt-fuse the sheath components.

The core component (high melting point component) in the above sheath-core type bicomponent-spun fiber can be selected from a crystalline propylene polymer, crystalline polyesters such as polyethylene terephthalate and polybutylene terephthalate, a polyamide (nylon), an aromatic polyester resin (liquid crystal polymer) or the like, and these may be used singly or in combination. Of these, when the sheath component to be described later is a polyolefin resin, a crystalline propylene polymer that is a like polyolefin resin is preferred when recyclability is taken into account.

As the above crystalline propylene polymer, an isotactic polypropylene resin is preferred. Above all, an isotactic polypropylene resin having an isotactic pentad factor (IPF) of at least 85 %, more preferably at least 90 %, is advantageous. Further, preferably, the Q value (weight average molecular weight/number average molecular weight, Mw/Mn) as an index for a molecular weight distribution is 6 or less, and the melt index MI (temperature 230°C, load 2.16 kg) is in the range of 3 to 50 g/10 minutes. When the above IPF is less than 85 %, the steric regularity is insufficient, the crystallinity is low and an obtained linear material is poor in physical properties such as strength.

The isotactic pentad factor (IPF) (which is also called "mmmm factor") refers to a ratio of steric structures in each of which five methyl groups as side chains are positioned in the same direction to a carbon-carbon main chain constituted of arbitrary recurring five propylene units, and it can be determined from Pmmmm (absorption intensity derived from a methyl group in a third propylene unit in a portion where five propylene units are continuously isotactic-bonded) in an isotope carbon nuclear magnetic resonance spectrum (^{13}C-NMR) and Pw (absorption intensity derived from all of methyl groups of the propylene units) on the basis of the expression of

$$IPF(\%) = (Pmmmm/Pw) \times 100.$$

Further, the above polypropylene resin may be a homopolymer of propylene or may be a copolymer of propylene and α-olefin (ethylene, butene-1 or the like).

That is, examples of the crystalline propylene polymer include an isotactic propylene homopolymer having crystallinity, an ethylene-propylene random copolymer of which the ethylene unit content is small, a propylene block copolymer constituted of a homopolymer portion that is a propylene homopolymer and a copolymer portion that is an ethylene-propylene random copolymer of which the ethylene unit content is relatively large, and, further, a crystalline propylene-ethylene-α-olefin copolymer in which the homopolymer portion or copolymer portion of the above propylene block copolymer is formed by further copolymerization with α-olefin such as butene-1 or the like.

As a sheath component (low melting point component), a thermoplastic resin having a lower melting point than the above core component by 20°C or more is used. This thermoplastic resin includes various olefin polymers and a low-melting-point polyethylene terephthalate. Examples of the above olefin polymers include ethylene polymers such as high-density, medium-density and low-density polyethylenes and linear low-density polyethylene, copolymers of propylene and other α-olefins, specifically such as a propylene-butene-1 random copolymer and a propylene-ethylene-butene-1 random copolymer, non-crystalline propylene polymers such as soft polypropylene, and poly(4-methylpentene-1). These olefin polymers may be used singly or may be used in combination.

A combination of polypropylene as a core component and polyethylene as a sheath component is less expensive and is hence preferred.

The sheath-core type bicomponent-spun fiber for use in the present invention is constituted from the above core component and a sheath component that coats the core component. The method for the production thereof is not specially limited, and there may be employed a known method that is used for the production of a conventional sheath-core type bicomponent-spun fiber. For example, the above sheath component and the above core component are melt-spun with a bicomponent fiber spinning machine having two extruders and a nozzle for a sheath-core type fiber at a spinning temperature of approximately 200 to 260°C, whereby a bicomponent spun fiber having a sheath-core structure can be obtained.

It is generally determined that the core/sheath cross-sectional area ratio in the thus-obtained sheath-core type bicomponent spun fiber is in the range of 40/60 to 80/20.

In the present invention, the above sheath-core type bicomponent spun fiber is sized (bound) in a straight form without twisting it, and then the sized (bound) sheath-core type bicomponent spun fibers are drawn at a temperature that is equivalent to, or higher than, the melting point of the sheath component and that is lower than the melting point of the core component to melt-fuse the sheath components, whereby a fiber-reinforced thermoplastic resin linear material is produced.

The method for the above drawing may be any method so long as a desired fiber-reinforced thermoplastic resin linear material can be obtained, and it is hence not specially limited. However, it is preferred to draw the above sheath-core type bicomponent spun fiber in a pressurized saturated steam since in this case a fiber-reinforced sheath-core type thermoplastic resin linear material having excellent properties can be obtained.

In the present invention, pre-drawing may be carried out as required before the drawing in a pressurized saturated steam.

In the step of the above pre-drawing, the bicomponent spun fiber is drawn at a temperature lower than the drawing temperature in the primary drawing step that follows the pre-drawing. As a method for the above pre-drawing, for example, there can be employed a method of contact-heat drawing with a metal hot roll or a metal hot plate, or a method of non-contact-heat drawing with a hot fluid such as hot water, steam having a pressure of atmospheric pressure to approximately 0.2 MPa or hot air or heat rays such as far infrared rays, and these methods are generally known. Further, the pre-drawing can be carried out at a temperature lower than the drawing temperature in the primary drawing step by means of the same system as a high-pressure steam drawing vessel to be used in the primary drawing step.

The draw ratio in the above pre-drawing step is suitably in the range of 25 to 90 % based on the total draw ratio including the draw ratio in the primary drawing. Drawing conditions can be determined as required depending upon the system of a pre-drawing apparatus and a drawn state. In particular, when two-step drawing is carried out after one-step pre-drawing, the pre-draw ratio is preferably in the range of 25 to 85 % of the total draw ratio, more preferably in the range of 35 to 80 %. Further, the above pre-drawing may be carried out at one step or may be carried out at multi-steps of two steps or more. When the pre-drawing is carried out at the multi-steps, there can be employed a method in which the drawing temperature is constant and the pre-draw ratio is set at multi-levels or a method in which the drawing temperature is set at gradient temperatures and the draw ratio is set at multi-levels.

The primary drawing step is a step in which the bicomponent spun fiber or the pre-drawn bicomponent spun fiber from the above pre-drawing step is finally drawn by heating it with a pressurized saturated steam having a temperature that is equivalent to, or higher than, the melting point of the sheath component and that is lower than the melting point of the core component.

The primary draw ratio is determined as required depending upon the size of the bicomponent spun fiber or the pre-drawn bicomponent spun fiber, while it is generally determined that the total draw ratio is 5 to 20 times, preferably 7 to 17 times.

In addition, the drawing method based on the pressurized saturated steam and the drawing apparatus therefor are described in detail in JP-A-11-350283.

The fiber-reinforced thermoplastic resin linear material obtained in the above manner generally has the following properties.

The fineness thereof is generally in the range of approximately 50 to 5,000 dTex, preferably 100 to 3,000 dTex, more preferably 500 to 1,500 dTex. Further, the fineness cross-sectional form of the core fiber is preferably 1 to 70 dTex (10 μm to 100 μm of maximum diameter), and when flexibility is demanded, about 30 dTex or less is preferred.

When the maximum diameter is less than 10 μm, the core fiber is too narrow to maintain a form, and a formed sheet is liable to have degraded properties. When it exceeds 100 μm, the fiber-reinforced thermoplastic resin linear material per se is too large, and the flexibility may be impaired. Preferably, the maximum diameter is 15 μm to 40 μm.

The fiber-reinforced thermoplastic resin linear material is produced while a plurality of bicomponent fiber non-drawn filaments are bound and drawn, and the count of the filaments to be bound is preferably 20 to 500. When the above filament count is less than 20, individual bicomponent filaments are large and spinability may be degraded. When it exceeds 500, the spinning nozzle density increases and individual bicomponent filaments are also narrow, so that both spinability and drawability may be degraded. The count of the above filaments is more preferably 100 to 300. The tensile strength is generally preferably 4 cN/dTex or more, and mostly in the range of 4 to 12 cN/dTex. Further, the elongation percentage is generally in the range of approximately 5 to 30 %, preferably 10 to 25 %, more preferably 15 to 20 %.

The above tensile strength and elongation percentage refer to values obtained by measurements according to JIS L 1096.

Further, since the above fiber-reinforced thermoplastic resin linear material is produced by melt-fusing the sheath components while drawing sized sheath-core type bicomponent spun fibers, the internal structure thereof is a sea-islands structure in which the core components are arranged in the form of islands in a sea constituted of melt-fused sheath components. The fiber-reinforced thermoplastic resin linear material is not specially limited with regard to its form, and it may have cross-sectional form such as a circle, an ellipse, a low-profile form or the like.

Fig. 1 is a cross-sectional view of one example of the sheath-core type bicomponent spun fiber for use in the present invention, and a sheath-core type bicomponent spun fiber 3 has a structure in which the entire circumferential surface of the core component 1 is coated with the sheath component 2.

Fig. 2 is a cross-sectional view of a key portion showing one example of the fiber-reinforced thermoplastic resin linear material for use in the present invention. A fiber-reinforced thermoplastic resin linear material 4 has a structure in which the core components 1 are arranged in the form of islands in a sea 2′ formed by melt-fusion of the sheath components.

In the present invention, a woven fabric is produced from the thus-obtained fiber-reinforced thermoplastic resin linear material. The method for the production of the woven fabric is not specially limited, and any method can be selected from conventionally known methods. In this case, the count of filaments and the basis weight of the linear material can be determined as required depending upon use and required physical properties, while the basis weight is generally 50 to 500 g/m^2, preferably 100 to 400 g/m^2, more preferably 150 to 300 g/m^2. When the basis weight is in the range of 50 to 500 g/m^2, the woven fabric is excellent in physical properties such as tensile tenacity, tensile strength, etc., and the woven fabric has a practical thickness.

Further, the woven fabric texture is not specially limited, and it can be selected, for example, from textures such as plain weave, twill weave and satin weave and variants of these textures as required depending upon use.

The woven fabric of the present invention maintains the tensile tenacity and excellent physical properties of the above fiber-reinforced thermoplastic resin linear material, and its tenacity contribution is generally 80 % or more, preferably 85 % or more. The tenacity contribution refers to a value calculated on the basis of the following expression,

Tenacity contribution (%) = (B/A) x 100 ... (1)

wherein A is a tensile tenacity (N/3 cm) calculated from the fiber-reinforced thermoplastic resin linear material, the tensile tenacity being calculated according the expression of tenacity (N) of said linear material x count of filaments of said liner material/2.54 cm x 3 cm, and B is a tensile tenacity (N/3 cm) of the woven fabric. The above tensile tenacity refers to a value measured according to JIS L 1096.

Further, the woven fabric of the present invention has an excellent waterproofing property without any treatment for imparting water repellency.

The present invention also provides a woven fabric finished article obtained by working on the above woven fabric.

Examples of the above woven fabric finished article include a sheet obtained by hot-pressing the above woven fabric and a woven fabric finished article having a thermoplastic resin coating layer formed on at least one surface of the above sheet or the above woven fabric.

The resin for forming the resin coating layer is not specially limited, and one or more resins selected from those resins which are already described as examples of the above core component can be used as required. In particular, when a melting point and adhesiveness are taken into account, it is preferred to use a resin that is the same as the sheath component for the sheath-core type bicomponent spun fiber used as the woven fabric.

The method for forming the resin coating layer is not specially limited and conventionally known methods can be employed. For example, in a batch method, a hot press or hot roller method can be employed. Further, in a continuous method, an extrusion laminate method, a dry laminate method, a calender method or the like can be employed, while an extrusion laminate method is preferred. Although not specially limited, the thickness of the resin coating layer is generally in the range of approximately 50 to 500 μm, preferably 100 to 300 μm, more preferably 150 to 200 μm.

Further, since the woven fabric and woven fabric finished article of the present invention contain the thermoplastic resin, they permit side-by-side joint by hot press as required.

The above woven fabric finished article maintains the tensile tenacity and excellent properties of the fiber-reinforced thermoplastic resin linear material like the above woven fabric, and the tenacity contribution therein is generally 80 % or more, preferably 85 % or more. Further, the above woven fabric finished article is excellent in waterproofing property, and when the woven fabric finished article is measured for a height of water from an end face after allowed to stand for 10 minutes according to a Byrek method defined in JIS L 1907, the height of water is 10 mm or less, preferably 5 mm or less, still more preferably 3 mm or less like the above woven fabric, and water absorption does not take place in its surface, any side surface or any broken portion.

Examples

The present invention will be explained further in detail with reference to Examples hereinafter, while the present invention shall not be limited by these Examples.

Properties are measured according to the following methods.

(1) Tensile tenacity, tensile strength and elongation percentage

A sample was measured according to JIS L 1096. Tenacity contributions were calculated on the basis of the foregoing expression (1).

(2) Water absorptivity

A sample was evaluated on the basis of a height (mm) of water from an end face after it was allowed to stand for 10 minutes according to a Byrek method defined in JIS L 1907.

Example 1

(1) Preparation of fiber and fiber-reinforced thermoplastic resin linear material

A sheath-core type bicomponent spun fiber having a core component/sheath component cross-sectional area ratio of 55/45 was obtained from a polypropylene (PP) (trade name "SA02", melt index (MI) = 20 g/10 minutes, melting point = 164, supplied by Nippon Polychem Corp.) as a core material and a low-density polyethylene (Suntec LD M7620, melt flow rate (MFR) = 20 g/10 minutes, melting point = 113°C, supplied by Asahi Kasei Corporation) as a sheath material at a spinning temperature of 240°C.

Then, 150 filaments of the above sheath-core type bicomponent spun fiber were sized (bound) and the sized (bound) filaments were drawn by a spin draw method (spin-draw direct-connection method) under conditions of G1 rate = 23 m/minute, a draw temperature = 145°C (high-pressure steam), G2 rate = 322 m/minute and a draw ratio = 14 times, to give a PP-reinforced thermoplastic resin linear material.

Concerning physical properties, the above linear material had a fineness of 2,200 dTex (PP fineness = 1,210 dTex), a tensile tenacity of 131 N, a tensile strength of 6.0 cN/dTex and an elongation percentage of 14.3 %.

(2) Preparation of woven fabric

A plain woven fabric having a basis weight of 250

g/m^2 was prepared at a filament count of 14 x 14/inch (2.54 cm) from the PP-reinforced thermoplastic resin linear material obtained in the above (1). In the above linear material, the sheath components were melt-fused and integrated, so that the plain woven fabric could be produced without twisting.

(3) Post-working (making of sheet)

(a) Preparation of sheet

The woven fabric obtained in the above (2) was hot-pressed under conditions of 120°C and 0.41 MPa to spread the low-density polyethylene to produce a sheet having a thickness of 0.35 mm.

(b) Preparation of resin-coated sheet

A low-density polyethylene (Suntec LD M7620, MFL = 20 g/10 minutes, supplied by Asahi Kasei Corporation) was coated on both surfaces of the sheet obtained in the above (1) to form coatings having a thickness of 150 μm each to produce a resin-coated sheet.

(4) Evaluations of physical properties

The woven fabric obtained in the above (2) and the sheet and resin-coated sheet obtained in the above (3) were evaluated for physical properties. The results are as shown below.

	Woven fabric	Sheet	Resin-coated sheet
Tensile tenacity	1951N/3 cm	1981N/3 cm	1930N/3 cm
Tenacity contribution	90.1 %	91.5 %	89.1 %
elongation percentage	22 %	21 %	23 %

All of them exhibited tenacity contributions [tenacity after working/tenacity calculated from linear material (131 (tenacity of linear material) x 14 (count of filaments)/2.54 cm x 3 cm = 2,166N/3 cm)] of over 80 % and it was found that they maintained excellent physical properties.

Further, they showed water absorptivity of 0 mm and hence showed excellent waterproofing properties although they had not been treated for imparting them with water repellency.

Comparative Example 1

(1) Preparation of fiber

A polypropylene (PP) (trade name "SA02", MI = 20 g/10 minutes, supplied by Nippon Polychem Corp.) was spun at a spinning temperature of 225°C, and 120 filaments of this single fiber were sized (bound). The sized (bound) filaments were drawn by a spin draw method under conditions of G1 rate= 45 m/minute, a draw temperature = 162°C (high-pressure steam), G2 rate = 423 m/minute and a draw ratio = 9.4 times, to give a PP-multi-filament. For imparting them with sizability, a surfactant was added.

The above multi-filament was evaluated for physical properties to show a fineness of 757 dTex, a tensile tenacity of 70.6 N, a tensile strength of 9.3 cN/dTex and an elongation percentage of 16.5 %.

(2) Preparation of woven fabric

The PP multi-filament obtained in the above (1) was twisted at 100 turns/m for increasing the sizability of the fiber, and then a woven fabric was produced. A plain woven fabric having a count of 20 x 20 filaments/inch (2.54 cm) at a basis weight of 120 g/m^2 was produced.

(3) Post working

A low-density polyethylene (Suntec LD M7620, MFL = 20 g/10 minutes, supplied by Asahi Kasei Corporation) was laminated on both surfaces of the plain woven fabric obtained in the above (2) to form coatings having a thickness of 150 μm each to produce a sheet.

(4) The woven fabric obtained in the above (2) and the sheet obtained in the above (3) were evaluated for physical properties. The results are as shown below.

	Woven fabric	Sheet
Tensile tenacity	1305N/3 cm	1262N/3 cm
Tenacity contribution	78.2 %	75.6 %
Elongation percentage	16.5 %	15.8 %

They exhibited tenacity contributions [tenacity after working/tenacity calculated from material filament (70.6 (tenacity of linear material) x 20 (count of filaments)/2.54 cm x 3 cm = 1,668N/3 cm)] of less than 80 % and it was found that they did not maintain excellent physical properties.

Concerning water absorptivity, further, both of them showed values of over 200 mm.

Industrial Utility

The woven fabric and woven fabric finished article of the present invention have excellent physical properties and excellent waterproofing properties and can be suitably applied to covers such as a building material cover, etc., sheets such as a waterproof sheet, etc., or sheet-shaped materials such as a tent, a packaging bag, a flexible container, etc.

CLAIMS

1. (Amended) A woven fabric obtained from a fiber-reinforced thermoplastic resin linear material formed by drawing sized sheath-core type bicomponent-spun fibers at a temperature that is equivalent to, or higher than, the melting point of a sheath component but lower than the melting point of a core component to melt-fuse sheath components, the fiiber-reinforced thermoplastic resin linear material having a cross-sectional structure in which the core components are arranged in a state of islands in a sea formed by the melt-fusion of the sheath components, said sheath-core type bicomponent-spun fiber being a straight non-twisted sheath-core type bicomponent-spun fiber that has the sheath component formed from a thermoplastic resin having a lower melting point than the core component by 20°C or more.

2. The woven fabric of claim 1, which has a tenacity contribution, represented by the following expression, of 80 % or more,

Tenacity contribution (%) = (B/A) x 100 ... (1)

wherein A is a tensile tenacity (N/3 cm) calculated from the fiber-reinforced thermoplastic resin linear material, the tensile tenacity being calculated according the expression of tenacity (N) of said linear material x filament count of said linear material/2.54 cm x 3 cm, and B is a tensile tenacity (N/3 cm) of the woven fabric.

3. The woven fabric of claim 1 or 2, which has a basis weight of 50 to 500 g/m^2.

4. The woven fabric of any one claims 1 to 3, wherein the thermoplastic resin is a polyolefin.

5. The woven fabric finished article obtained by working on the woven fabric recited in any one of claim 1 to 4.

6. The woven fabric finished article of claim 5, wherein the working is hot press treatment.

7. The woven fabric finished article of claim 5 or 6, wherein the working is a treatment to newly form a thermoplastic resin coating layer on at least one surface.

8. A waterproof sheet-shaped material comprising the woven fabric recited in any one of claims 1 to 4, which is measured for a height of water from an end face after allowed to stand for 10 minutes according to a Byrek method defined in JIS L 1907 to show 10 mm or less.

9. The waterproof sheet-shaped material comprising the woven fabric finished article of any one of claims 5 to 7, which is measured for a height of water from an end face after allowed to stand for 10 minutes according to a Byrek method defined in JIS L 1907, to show 10 mm or less.

Fig. 1

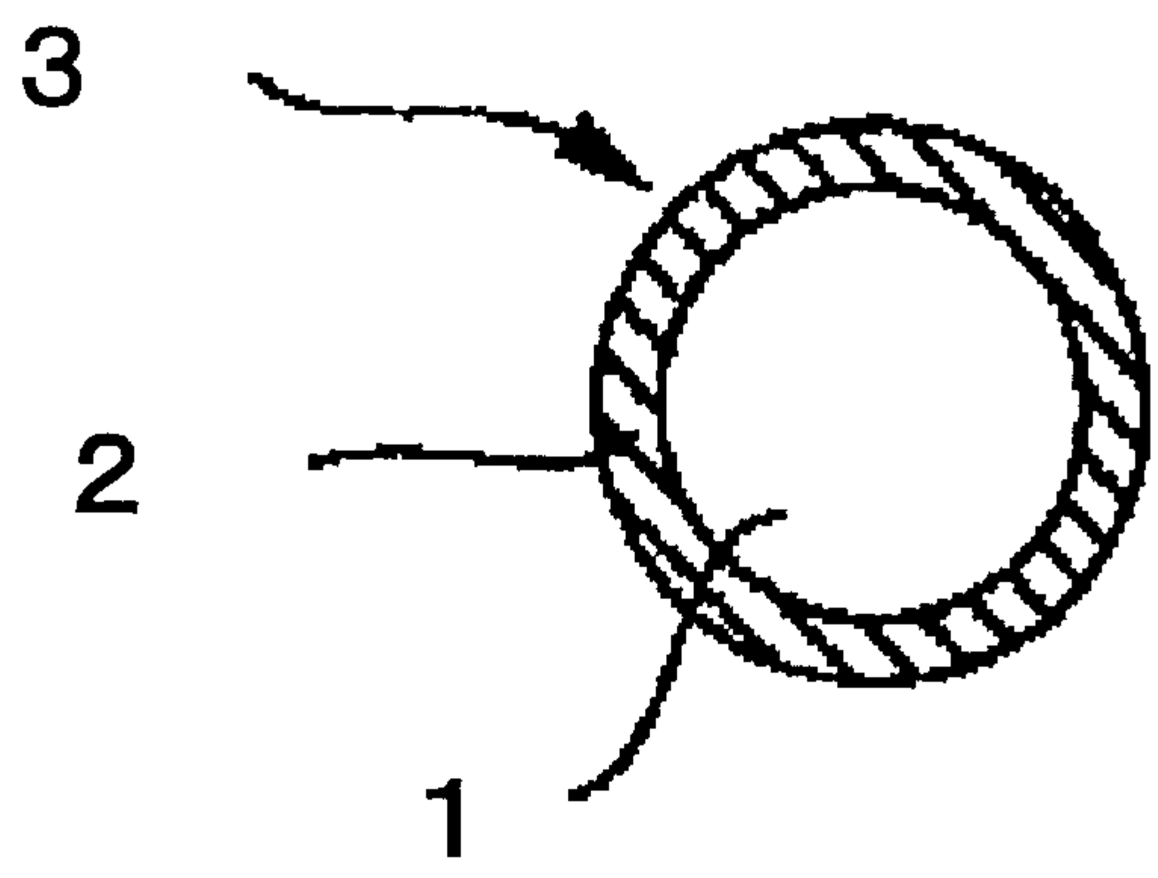

Fig. 2