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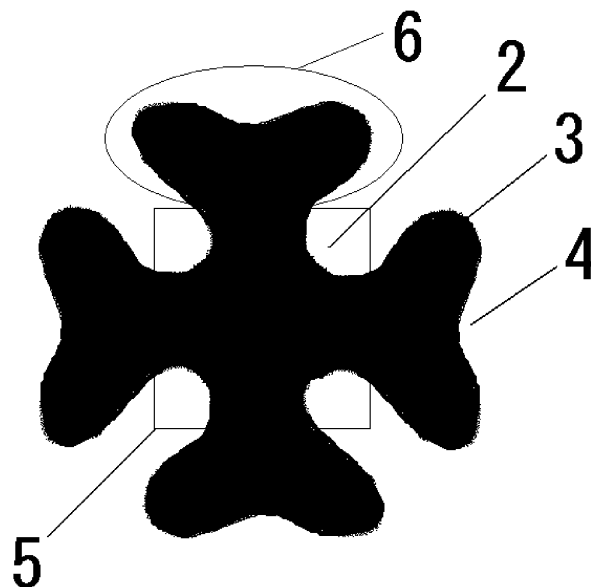
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(54) **TUFTED CARPET PRIMARY BASE FABRIC**

(57) The primary cloth is stabilized after a tufting step. The primary cloth is a nonwoven fabric of continuous filaments which are more than 10 dtex in fineness. The continuous filament is consisting of polyester which has a nearly 'V' part made of a low melting point polyester

and a nearly '+' part made of a high melting point polyester. The continuous filaments are one other bonded by melting or softening of the low melting point polyester to form the nonwoven fabric.

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Description

Technical Field

5 **[0001]** The present invention relates to a primary cloth to stitch pile yarns for a tufted carpet.

Background Art

10 **[0002]** The tufted carpet is manufactured by the following steps. After pile yarns are stitched to the primary cloth by a tufting machine (tufting step), pre-coating and backing are performed on a back side of the primary cloth (backing step), and then the tufted carpet is manufactured. A dyeing step may be inserted after the tufting step. The primary cloth needs an anti-strain by a stress force in the tufting step and the dyeing step, and an anti-destruction by stitching with needles in the tufting step.

15 **[0003]** The patent reference 1 of the applicant discloses that a nonwoven fabric consisted of continuous filaments is used as the primary cloth. The nonwoven fabric has the specific thermocompression parts by heated-embossing.

[0004] In the specific thermocompression part, the continuous filaments are weakly bonded and restricted to prevent that the continuous filaments are damaged with the needles. The example 1 of the patent reference 1 discloses that the heated-embossing is performed in the lower temperature, that is, 25 degrees in temperature than the melting point of the bonding agent of the polyester. When the needles stitch in the specific thermocompression part, the weakly restricted
20 continuous filaments are freed and the continuous filaments freely move. Therefore, the continuous filaments are not cut by the needles, the continuous filaments maintain the original strength.

[0005] However, the nonwoven fabric does not maintain the original properties to free the continuous filaments in the tufting step. Therefore, when bad parts exist in the tufted carpet, a second tufting step can not be performed after pulling out pile yarns in the bad parts.

25 **[0006]** Patent reference 1: JP2005-287745A

Description of the Invention

Problem to be solved by the invention

30 **[0007]** The present invention provides the primary cloth in which the continuous filaments are bonded and restricted after the tufting step, and which maintains the original properties.

[0008] The inventor discovers the primary cloth consisting of the specific continuous filaments which have the specific shape in the cross section. The specific continuous filaments of polyester are not damage by the needles, and maintain
35 the bonding and restricting after the tufting step. Therefore, the primary cloth maintains the original properties, especially in the rigidness.

Means for solving the problem

40 **[0009]** The invention relates to the primary cloth for the tufted carpet comprising of a nonwoven fabric which is consisting of continuous filaments of more than 10 dtex in fineness;
the shape of the continuous filament in the cross section has the following nearly 'Y4' shape which connects the bottom sides of nearly 'Y' parts to up, down, left and right;



55 the continuous filament is consisting of polyester which has a nearly 'V' part of the nearly 'Y4' shape made of a low melting point polyester and a nearly '+' part excluding the nearly 'V' part made of a high melting point polyester; the continuous filaments are bonded one another by melting the low melting point polyester.

[0010] The nonwoven fabric of the primary cloth is consisting of continuous filaments. The invention is characteristic

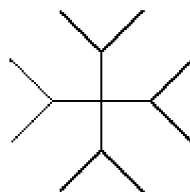
of the cross section of the continuous filament. The cross section has four nearly 'Y' parts as shown fig. 1. The bottom sides of the four nearly 'Y' parts connect to up, down, left and right, then the nearly 'Y4' shape is formed as shown fig.2. The nearly 'Y4' shape has four big concave sections 2, eight convex sections 3 and four small concave sections 4. The continuous filament has high rigidity with the shape in the cross section, especially the nearly '+' part 5 in the center and the four nearly 'V' parts 6 which are connected to the four tips of the nearly '+' part 5. That is, the continuous filament has higher rigidity with the combination of the nearly '+' part 5 and the nearly 'V' parts than a continuous filament having modified cross section such as hexagonal shape or 'Y' shape.

[0011] The continuous filament is consisting of the low melting point polyester and the high melting point polyester. The four nearly 'V' parts 6 are made of the low melting point polyester and the nearly '+' part 5 is made of the high melting point polyester. Therefore the continuous filament is a conjugate filament. The primary cloth consists of the nonwoven fabric which is manufactured by accumulating the conjugate filaments, and melting or softening the low melting point polyester, and bonding the conjugate filaments one another by cooling and solidifying the low melting point polyester. The primary cloth is superior in rigidity to bond the conjugate filaments one another with the low melting point polyester.

[0012] The melting or softening the low melting point polyester is performed by a heat treatment. The heat treatment may be performed on the heated-embossing or blowing of heated-air. In the case of the heated-embossing, the continuous filaments are bonded at the intersection thereof by melting or softening in the thermocompression part. In the case of the blowing of heated-air, the continuous filaments are bonded at the intersection thereof by melting or softening in the whole. Both the heated-embossing and the blowing of heated-air may be performed. In the invention, the heated-embossing may be preferably performed because of stabilization of the form of the primary cloth. The emboss role may be preferably have the convex parts which occupy 10~20 percent by area of the emboss role. When the convex parts less occupy, the primary cloth may be not maintain the original rigidity after the tufting step because the thermocompression parts may be vanished by the needles to decrease the area of the thermocompression parts. When the convex parts more occupy, the primary cloth may be not maintain the original strength after the tufting step because the thermocompression parts may be destroyed by the needles.

[0013] The ratio of the low melting point polyester and the high melting point polyester may be 1 to 1 from 4 because considering the strength of the continuous filament, the bonding strength among the continuous filaments and to prevent the bonding part to more harden. Then the ratio of the low melting point polyester is less, the nearly 'V' parts 6 of the low melting point polyester tend to flatness and the tips of the nearly '+' part 5 of the high melting point polyester tend to broadness. Even if the continuous filament has the above flatness or the above broadness, the continuous filament may be used in the invention.

[0014] The primary cloth of the nonwoven fabric is manufactured with a known method except changing a nozzle orifice on a melt spinning. In a method of manufacturing the nonwoven fabric by making the continuous filaments with the melt spinning of two polyesters and accumulating the continuous filaments, the nozzle orifice having the following figure is used. The figure of the nozzle orifice is said 'Y4' figure which connects the bottom sides of 'Y' parts to up, down, left and right, besides the '/' and the '\' of the adjacent 'Y' parts is parallel.



[0015] The nozzle orifice has four 'Y' parts as shown Fig.3. The bottom sides of 'Y' parts are connected to up, down, left and right to become 'Y4' figure. The '/' 8, 8 of the adjacent 'Y' parts is parallel each other, and the '\ 9, 9 of the adjacent 'Y' parts is parallel each other. The two polyester resin is provided and melt spun in the nozzle orifice which has 'Y4' figure to become the polyester conjugate filament having the nearly 'Y4' shape in the cross section. Especially, the polyester conjugate filament has the four big concave sections 2 because the '/' 8, 8 and the '\ 9, 9 of the nozzle orifice is parallel. Furthermore, the polyester conjugate filament has the nearly '+' part 5 and the nearly 'V' parts 6 joined to the each tip of it. The low melting point polyester resin is provided in a 'V' part 10 of the nozzle orifice and the high melting point polyester resin is provided in a '+' part 11 of the nozzle orifice. After melt spinning, the conjugate continuous polyester filament in which the nearly 'V' parts 6 is formed from the low melting point polyester and the nearly '+' part 5 is formed from the high melting point polyester is obtained.

[0016] After obtained the conjugate continuous polyester filaments, the filamentous web is formed with accumulating them. The heat treatment is applied to the filamentous web. The low melting point polyester of the conjugate polyester filament is molten or softened, and cooled to solidify. Then, the conjugate polyester filaments are one another bonded with the low melting point polyester. So, the nonwoven fabric of the continuous polyester filaments is manufactured. If

necessary, a few binder agent may be applied to the nonwoven fabric.

[0017] The continuous polyester filament is preferably over 10 dtex, more preferably over 15 dtex in fineness so that the nowoven fabric has the rigidness and stabilization after the tufting step. Because the continuous polyester filament is over 10 dtex in fineness, it is prevented to damage the continuous polyester filament by the needles in the tufting step.

The upper limit of the fineness is not limited, but may be about 30 dtex to easily cool the continuous polyester filament in the melt spinning.

[0018] The weight of the primary cloth may be 60 ~130 g/m² to hold the pile yarns. Because the primary cloth is superior in the rigidness and stabilization, the weight of it may be lowered than the known primary cloth.

[0019] The pile yarns are stitched to the primary cloth to form piles on the primary cloth, then the tufted carpet is obtained. As the pile yarn, a nylon yarn, a polypropylene yarn or a polyester yarn etc. is used. If necessary, the back side of the primary cloth having the piles is coated with a backing material after applied with a resin to pre-coat so that the piles are fixed and the tufted carpet is stabilized. As the backing material, a polyvinylchloride resin or polyethylene resin etc. is used.

Effect of the invention

[0020] The primary cloth comprises of the nonwoven fabric consisting of the continuous polyester filaments. The continuous polyester filament has the nearly '+' part and the nearly 'V' parts joined to the each tip of it in the cross section. Both the nearly '+' part and the nearly 'V' parts are more rigid than a circle etc. in the cross section. It increases the rigidness to combine the both. Therefore, the primary cloth comprising the continuous polyester filaments is superior in the rigidness. When the pile yarns are stitched with the needles, even if the needles hit the continuous polyester filaments, the rigidness of the continuous polyester filaments is not substantially lowered. Therefore, the primary cloth maintains the original form, and is difficult to be deformed by the force of the dyeing step and the backing step. By using the primary cloth, the tufted carpet is manufactured in stabilization.

[0021] Additionally, the primary cloth is rigid because that the continuous polyester filaments are bonded with the low melting point polyester consisting of the nearly 'V' parts. The bonding points become at the nearly 'V' parts, the area of the bonding points become smaller than the filaments which are circle sheath-core filaments in the cross section. Therefore, the bonding points are difficult to damage as they are not resinous. The primary cloth maintains the original form after the tufting step. Furthermore, the primary cloth strongly holds the pile yarns because that the continuous polyester filaments have a lot of the concave parts.

Example

[0022] Hereinafter, the invention is described on the basis of the examples. The melting point and etc. in the examples are measured as the following methods.

(1) Melting point (°C) of polyester:

The melting point was measured on 20°C/min. of rising temperature speed with differential scanning calorimeter DSC-2 produced by Perkin Elmer Co., Ltd..

(2) Relative viscosity of polyester:

Using the solution that 0.5 g of the polyester is solved in 100 g of the solvent which a phenol and an ethane tetrachloride are mixed in equal weight, it was measured at 20°C.

(3) Fineness of continuous polyester filament (dtex):

After five continuous polyester filaments of 1.5 meter length were kept for 24 hr. under 20°C and 60 %RH, each weight of the continuous polyester filament was measured and the average was calculated.

(4) Weight of nonwoven fabric (g/m²):

Ten samples which had 50 cm in length and 50 cm in width were picked from the obtained nonwoven fabric. After the samples contained the equilibrium moisture, each weight of ten samples was measured. And the average was calculated at a square meter. The average was the weight of the nonwoven fabric (g/m²).

(5) Tensile strength of nonwoven fabrics (N/5cm in width):

It was measured on JIS L 1096. Ten samples of 5 cm in width and 30 cm in length were prepared. Each sample was tensioned by using Tensilon RTM-500 provided by Toyo Baldwin on the conditions of 20 cm in distance between chucks and 20 cm/min. in tensile speed. Tensile strength of each sample was measured and the average was calculated. The average was the tensile strength of nonwoven fabric (N/5cm in width). The average in MD direction (machine direction) and in CD direction (cross direction to MD direction) were measured and calculated.

(6) Stress force (N/5cm in width) at 10 percent elongation:

Each stress force was measured at 10 percent elongation on the stress-strain curve when each sample was tensioned with the above method described in (5). The average stress force was calculated and was the stress force (N/5cm in width) at 10 percent elongation. The each average in MD direction (machine direction) and in CD direction (cross direction to MD direction) was calculated.

Example 1

[0023] The low melting point polyester was prepared by copolymerizing terephthalic acid of 92 mol percent and isophthalic acid of 8 mol percent as a dicarboxylic acid with ethylene glycol of 100 mol percent as a diol. The low melting point polyester has a melting point of 230 °C and a relative viscosity of 1.44. A Titanium oxide of 4 percent of weight as a nucleating agent was added into the low melting point polyester.

[0024] The high melting point polyester was prepared by copolymerizing terephthalic acid of 100 mol percent as a dicarboxylic acid with ethylene glycol of 100 mol percent as a diol. The high melting point polyester has a melting point of 260°C and a relative viscosity of 1.38.

[0025] The low melting point polyester was provided and melt spun in 'V' parts shown Fig. 4 of the nozzle orifice and the high melting point polyester was provided in a '+' part shown Fig. 4. The melt spinning was performed by discharging the two types of polyester at the rate of 8.33 g/min. per nozzle orifice and at 285°C. The two polyester is the low melting point polyester of 1 weight mass and the high melting point polyester of 2 weight mass.

[0026] By melt spinning, continuous filaments were spun from the nozzle orifices. The continuous filaments were passed in an air sucker device to be drawn into 17 dtex in fineness. The air sucker device was set the place which was 2 meters under the nozzle orifices. The conjugate continuous filaments were opened by an opening device, and accumulated on a moving conveyor of net to obtain a filamentous web. The filamentous web was passed between an embossing role and a flat role which was a heat embossing device. The embossing role had a large number of convex parts each of which had the area of 0.7 mm² in the tip, and total area of the convex parts were occupied 15 percent of the entire surface of the embossing role. The embossing condition was 210 °C on the surface of the embossing role, and the linear pressure was 300 N/cm. The obtained nonwoven fabric was 120 g/m² by the weight. A dimethylpolysiloxane emulsion was applied to the obtained nonwoven fabric to put on the solid dimethylpolysiloxane of 0.7 percent by the weight of the nonwoven fabric. As the above, the primary cloth was manufactured.

Example 2

[0027] With only changing the speed of the conveyor, the tufted carpet was obtained of 100 g/m² by the same method of the example 1.

Comparative Example 1

[0028] The low melting point polyester and the high melting point polyester used in the example 1 were prepared. The two types of polyester were provided in the nozzle orifice as shown Fig. 5 which had six slit orifices radially extending from the center. The low melting point polyester were provided and melt spun in the 'a' parts in the orifices and the high melting point polyester were provided in the 'b' parts in the orifices. The melt spinning was performed by discharging the two types of polyester at the rate of 2.46 g/min. per nozzle orifice and at 285 °C. The two polyesters are the low melting point polyester of 1 weight mass and the high melting point polyester of 2 weight mass.

[0029] By melt spinning, continuous filaments were spun from the nozzle orifices. The continuous filaments were passed in an air sucker device to be drawn into 4.9 dtex in fineness. The air sucker device was set the place which was 2 meters under the nozzle orifices. The conjugate continuous filaments each of which had a six leaf in the cross section were opened by an opening device, and accumulated on a moving conveyor of net to obtain a filamentous web. The filamentous web was passed between the heat embossing device used in the example 1. The embossing condition was 240 °C on the surface of the embossing role, and the linear pressure was 300 N/cm. The obtained nonwoven fabric was 120 g/m² by the weight. A dimethylpolysiloxane emulsion was applied to the obtained nonwoven fabric to put on the

solid dimethylpolysiloxane of 0.7 percent by the weight of the nonwoven fabric. As the above, the primary cloth was manufactured.

[0030] The original tensile strength and original stress force at 10 percent elongation of each primary cloth of the example 1, 2 and the comparative example 1 was described in the following.

[The original tensile strength]

[0031]

The example 1: MD=281 N/5cm in width, CD = 158 N/5cm in width

The example 2: MD= 262 N/5cm in width, CD = 127 N/5cm in width

The comparative example 1

[0032]

: MD=219 N/5cm in width, CD=99 N/5cm in width

[The stress force at 10 percent elongation]

[0033]

The example 1: MD= 234 N/5cm in width, CD = 137 N/5cm in width

The example 2: MD=219 N/5cm in width, CD = 110 N/5cm in width

The comparative example 1

[0034]

: MD=217 N/5cm in width, CD=50 N/5cm in width

[0035] A pile yarns were stitched to each primary cloth of the example 1, 2 and the comparative example 1. The pile yarn was a crimped nylon yarn which has 1930 dtex in fineness. The condition of stitching was the gauge ratio of 10 needles/2.54 cm, and the stitch ratio of 10 times/2.54 cm. The height of the cut pile was 3.5 cm. After stitching, the pile yarns were pulled from each primary cloth. After pulling from, the tensile strength and stress force at 10 percent elongation of each of the primary cloths used were in the following.

[The original tensile strength]

[0036]

The example 1: MD= 174 N/5cm in width, CD = 47 N/5cm in width

The example 2: MD= 265 N/5cm in width, CD = 42 N/5cm in width

The comparative example 1

[0037]

: MD=72 N/5cm in width, CD =14 N/5cm in width

[The stress force at 10 percent elongation]

[0038]

5 The example 1: MD = 125 N/5cm in width, CD = 20 N/5cm in width
The example 2: MD = 128 N/5cm in width, CD = 16 N/5cm in width

The comparative example 1

10 [0039]

: MD = 70 N/5cm in width, CD = 6 N/5cm in width

15

[0040] The primary cloths by the example 1 and 2 maintained the tensile strength and the stress force at 10 percent elongation compared with the primary cloth by the comparative example. Therefore, when bad parts exist in the tufted carpet, the pile yarns were pulling from the primary cloth and the second tufting step can be applied to the primary cloth used. The primary cloths by the example 1 and 2 strongly held the pile yarns because it is difficult to pull from them compared with the primary cloth by the comparative example. The thermocompression parts of the primary cloths by the example 1 and 2 were remained after pulling from, therefore the primary cloths was superior to maintain the original form.

25 Description of drawings

[0041]

30 Fig. 1 is one nearly 'Y' part in the nearly 'Y4' shape which is the cross sectional view of the continuous filament used in the invention.
Fig. 2 is the cross sectional view of the continuous filament used in the invention.
Fig. 3 is one 'Y' part in the 'Y4' figure of the nozzle orifice.
Fig. 4 is the 'Y4' figure of the nozzle orifice.
Fig. 5 is the nozzle orifice which is used in the comparative example 1. Using the nozzle orifice, the continuous filament which has a six leaf in the cross section is obtained.

Description of numeral of drawings

[0042]

40 Numeral 1 is the tip of the nearly 'Y' part in the nearly 'Y4' shape which is the cross section of the continuous filament.
Numeral 2 is the concave section in the nearly 'Y4' shape.
Numeral 3 is the convex section in the nearly 'Y4' shape.
Numeral 4 is the small concave section in the nearly 'Y4' shape.
45 Numeral 5 is the nearly '+' part in the nearly 'Y4' shape.
Numeral 6 is the nearly 'V' part in the nearly 'Y4' shape.
Numeral 7 is the tip of the 'Y4' figure of the nozzle orifice used at the melt spinning.
Numeral 8 is / of the 'Y' part.
Numeral 9 is \ of the 'Y' part.
50 Numeral 10 is the 'V' part of the 'Y4' figure.
Numeral 11 is the '+' part of the 'Y4' figure.

Claims

55 1. A primary cloth for a tufted carpet comprising of a nonwoven fabric which is consisting of continuous filaments of more than 10 dtex in fineness;
a shape of the continuous filament in the cross section h as the following nearly 'Y4' shape which connects the

bottom sides of nearly 'Y' parts to up, down, left and right;



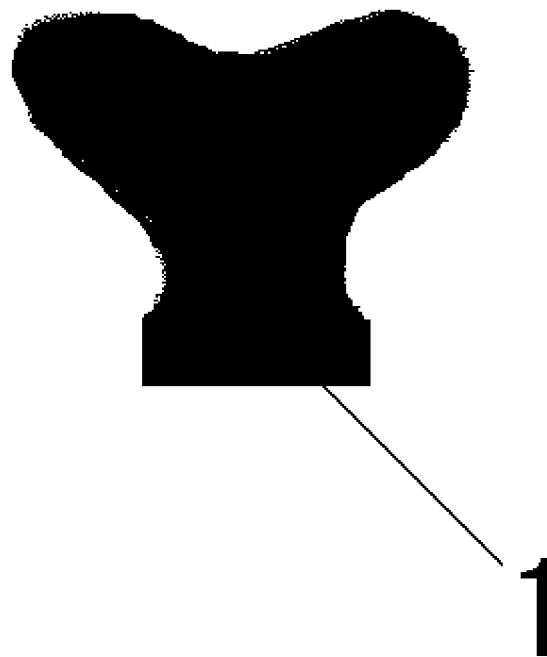
the continuous filament is consisting of polyester which has a nearly 'V' part of the nearly 'Y4' shape made of a low melting point polyester and a nearly '+' part excluding the nearly 'V' part made of a high melting point polyester;

the continuous filaments are bonded one another by melting the low melting point polyester.

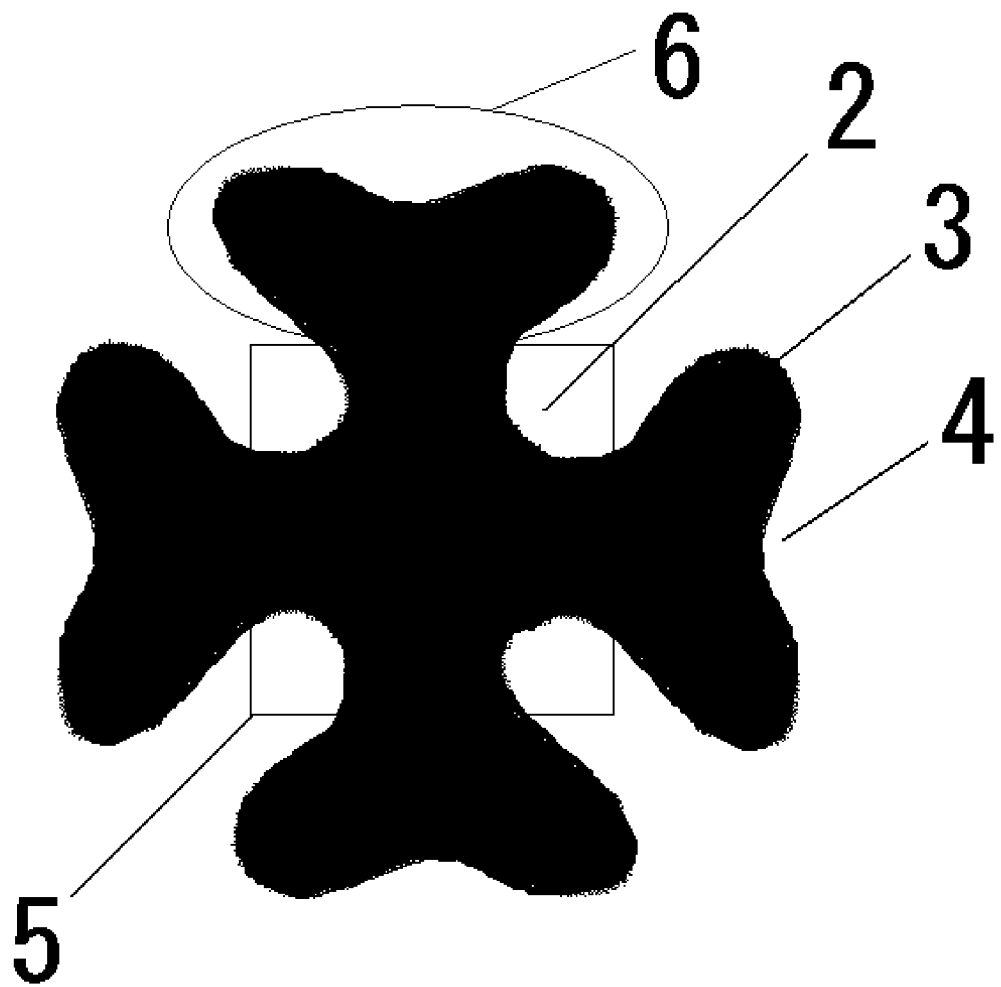
2. The primary cloth for the tufted carpet according to claim 1 wherein has partially thermocompression parts by heated-embossing, and the continuous filaments are bonded in the partially thermocompression parts.

3. A tufted carpet is manufactured by stitching pile yarns to the primary cloth according to claim 1 or 2.

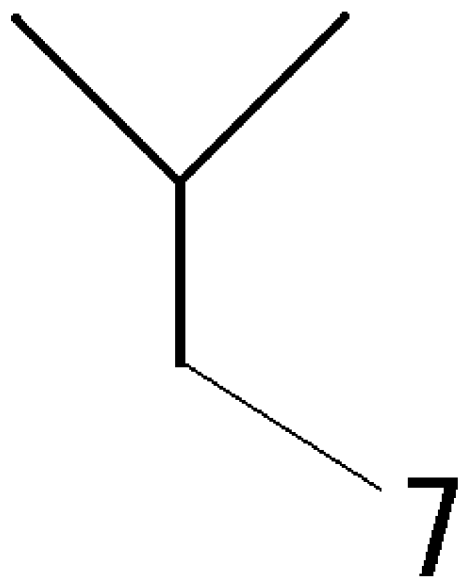
F i g . 1



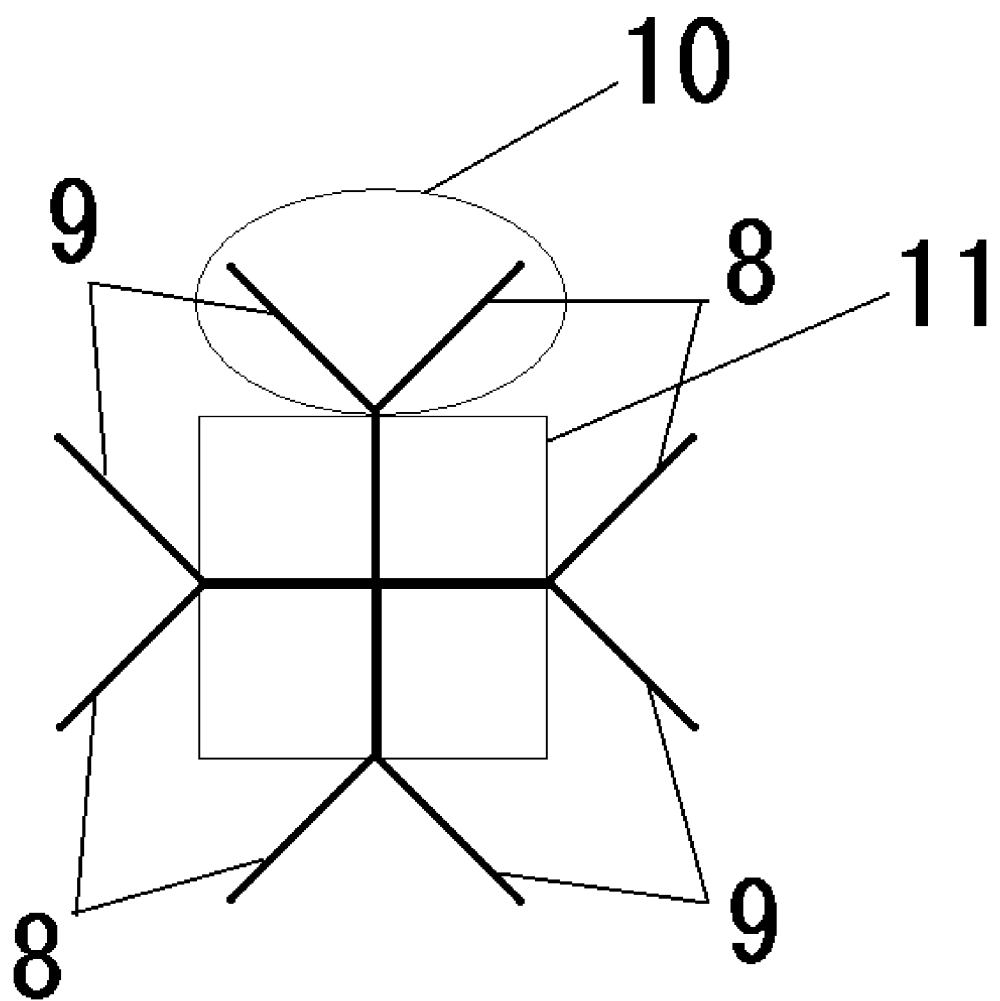
F i g . 2



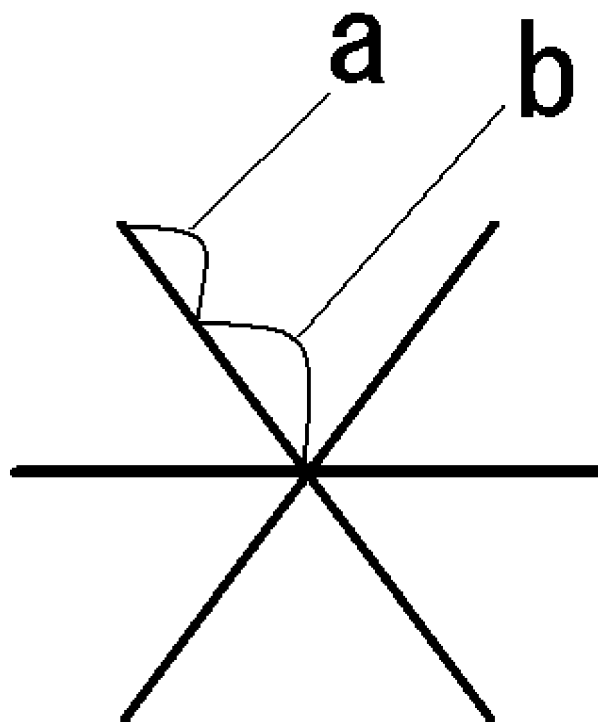
F i g . 3



F i g . 4



F i g . 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/084781

A. CLASSIFICATION OF SUBJECT MATTER

D04H3/018(2012.01)i, A47G27/02(2006.01)i, D04H3/011(2012.01)i, D04H3/147(2012.01)i, D05C17/02(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)

D04H1/00-18/04, A47G27/00-27/06, D05C17/02

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 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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 2001-181956 A (Unitika Ltd.), 03 July 2001 (03.07.2001), claims; paragraph [0023] (Family: none)	1-3
A	JP 10-273863 A (Toray Industries, Inc.), 13 October 1998 (13.10.1998), claims (Family: none)	1-3
A	JP 63-295712 A (Mitsubishi Rayon Co., Ltd.), 02 December 1988 (02.12.1988), claims; drawings (Family: none)	1-3

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search
05 March, 2014 (05.03.14)

Date of mailing of the international search report
18 March, 2014 (18.03.14)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/084781

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	JP 2013-76182 A (Unitika Ltd.), 25 April 2013 (25.04.2013), claims (Family: none)	1-3

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005287745 A [0006]