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(54) **METHOD FOR MANUFACTURING NON-WOVEN FABRIC FOR CARPET FOAM BACKING**

(57) The present invention relates to a method of preparing non-woven fabric for base cloth of carpet, which has an improved fixability of BCF yarn inserted on a base cloth in a tufting process by crimp processing a web with a stretched polyester filament and needle punching the

web. The residual stress of the stretched polyester filament is eliminated and the formability of the non-woven fabric for base cloth of carpet is improved, and the fixability of the BCF yarn in the carpet can be improved by interlacing of polyester filament.

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**Description**

**[Technical Field]**

5 [0001] The present invention relates to a method of preparing non-woven fabric for base cloth of carpet, which has an improved fixability of BCF (bulked continuous filament) yarn inserted on a base cloth in a tufting process for manufacturing a carpet.

**[Background Art]**

10 [0002] Carpets are used not only for decoration in hotels, offices, homes, cars, but also for providing amenity and sound insulation.

[0003] The carpet fabric is manufactured through a process including a tufting step of introducing BCF yarn to a non-woven fabric and a back coating step of coating a solution such as PVC, PE, EVA or SBR, etc. the back side of the tufted non-woven fabric and curing. The carpet fabric is cut into squares (for example, 50 cm × 50 cm) to be used as tile carpets in hotels, offices, homes, etc., and molded in the form of a car floor to be used as a car floor mat.

[0004] The function of the base cloth of carpet is to fix the BCF yarn.

15 [0005] In the tufting process, the base cloth is punctured by a needle to have open hole of at least 160,000 holes/m<sup>2</sup>. The base cloth must maintain the arrangement of the BCF yarns in even though such physical damage and have no deformation of the shape in the post-process at the high temperature environment.

[0006] Recent trends in the tufting process are densification, diversification of pattern and the use of low denier BCF. For example, there is a tendency to increase the tufting density by using microfibers of BCF yarns, to make at least three BCF yarns at multilevel conditions, and to increase the movement of needles by using BCF yarns of various colors. Tufting becomes more difficult. Accordingly, the fixability of the BCF yarn in the non-woven fabric for base cloth has to be improved by increasing the coefficient of friction between the non-woven fabric and the BCF yarn so as to prevent the damage to the base cloth.

20 [0007] Meanwhile, conventional non-woven fabric for base cloth of carpet is produced by stretching and a thermal or chemical bonding of the filaments having potential stress. After that the residual stress of the filament is removed by heating in the post-processing for the manufacture of carpet, thereby exhibiting a high shrinkage ratio. Due to this, there is a problem that the shape of the final carpet product is deformed.

**[Disclosure]**

**[Technical Problem]**

35 [0008] In order to solve the above problems, the present invention provides a method of preparing non-woven fabric for base cloth of carpet, which has an increased fixability of BCF by improving a method of preparing non-woven fabric for base cloth of carpet.

**[Technical Solution]**

40 [0009] In order to solve the above-mentioned problems, the present invention provides a method of preparing non-woven fabric for base cloth of carpet comprising: preparing stretched polyester filament fiber having circular cross section; forming a web by integrating the filament fiber in a web form, crimp processing and calendering it; and needle punching the web.

**[Advantageous Effects]**

45 [0010] According to the present invention, the web with the stretched polyester filament is crimp processed and needle punched. By this the residual stress of the stretched polyester filament is eliminated and the formability is improved, and the fixability of the BCF yarn can be improved by interlacing polyester filament.

**[Best Mode]**

55 [0011] The present invention relates to a method of preparing non-woven fabric for base cloth of carpet comprising: preparing stretched filament to form a web, crimp processing and calendering and needle punching the web.

[0012] The present invention may use filament fibers having a circular cross section and a low fineness such as 4 to 7 deniers, which is produced by melting a polyester having a melting point of at least 250 °C, discharging it through a

spinneret to form a filament and stretching the filament to a spinning speed of 4,500 to 5,000 m/min using an air stretching device of high pressure.

**[0013]** In the present invention, when the fineness is less than 4 deniers, the damage of fibers occurs during tufting and the fixability of the BCF yarn may be deteriorated, and when the fineness is more than 7 deniers, the coefficient of friction may be lowered and it can be difficult to improve the pullout strength.

**[0014]** The flexibility of the filament may be given by piling up the filament fibers on the conveyor in the form of a web and heating and crimp processing them.

**[0015]** The crimp processing is a processing method of heat treatment of synthetic fiber filament to form a thin curvature, and the yarn becomes curl and flexible accordingly.

**[0016]** In the present invention, the stretched filaments may be piled up on a conveyor net and at the same time, be treated at 100 to 150 °C for 30 to 60 seconds.

**[0017]** Since the residual stress of the stretched filament is removed by heating in the crimping process, the shrinkage rate of the filament is lowered and the shape stability can be improved. Further, since the filament constituting the non-woven fabric is provided with a crimp and has a high coefficient of friction, and finally the fixability of the BCF yarn can be improved.

**[0018]** The number of crimps of the polyester filament fiber in the crimping process is preferably 20 to 40 /inch. At this time, if the number of crimps is less than 20 /inch, the contact points between the filaments are decreased and the strength and elongation of the non-woven fabric after calendering or needle punching are lowered, and the force to fix the BCF yarn after tufting is weakened. When the number of crimps exceeds 40 /inch, the contact points become too large and the filaments may be damaged due to excessive adhesion between the filaments during needle punching and the coefficient of friction of the non-woven fabric is too high, thus BCF yarn with a low fineness may be damaged when tufting.

**[0019]** Thereafter, a non-woven fabric in which interlacing is formed between the filaments can be produced by passing crimp processed web through a calendering roll to adjust its thickness and needle punching it.

**[0020]** According to the calendering of the present invention, it has a thickness of 0.35-0.50 mm by applying a predetermined temperature (130-150 °C) and pressure to reduce the thickness of the non-woven fabric. Accordingly, the density increases and the amount of filament for interlacing increases.

**[0021]** Preferably, the needle punch is performed in two steps. The first step (pre-punching) is performed in the condition of 300 to 400 stroke rpm (the speed at which the non-woven fabric is bonded by the needle during passing through the conveyor net) to form a web shape by interlacing a portion of the filament. In the second step (main punching), the filaments are interlaced entirely with a condition of 600 to 800 stroke rpm to produce a non-woven fabric for base cloth of carpet.

**[0022]** In the non-woven fabric for base cloth of carpet produced as described above, the potential stress of the amorphous region oriented in the stretched filament is eliminated by the crimp processing. In the subsequent process, the shrinkage rate is reduced due to heat and the curvature is formed to increase the interlacing point of the filament. Thus, increased tensile strength and tear tension of the non-woven fabric may exhibit in the needle punching process.

**[0023]** Hereinafter, the present invention will be described in more detail with reference to the following Examples and Comparative Examples.

**[0024]** It should be noted, however, these embodiments of the present invention have been described for illustrative purposes, and therefore, the present invention is not limited thereto, and it will be apparent to those skilled in the art that modifications and variations could be made without departing from the scope and the spirit of the present invention as defined by the appended claims.

<Example 1 >

**[0025]** Polyethylene terephthalate (PET) for fibers having a melting point of 260 °C was melted in an extruder at 288 °C and discharged through capillaries of the spinneret. The discharged PET was solidified by using a cooling wind, and then stretched using a stretching device and spun at a spinning speed of 5,000 m/min. Thus, filament fiber having a circular cross section with a fineness of 6 denier was produced.

**[0026]** The crimp processing was performed such that the filament fiber was piled up on a conveyor net in form of a web and simultaneously the stacked filament was heated at 130 °C for 60 seconds to form a crimp number as shown in the following Table 1.

**[0027]** Thereafter, the calendering was carried out by passing through a heated calendering roll to have smoothness and appropriate thickness to the non-woven fabric.

**[0028]** Then, the needle punching of the first and second steps were performed in the conditions shown in Table 1 below to produce a non-woven fabric for base cloth of carpet having an interlaced filament and a weight per unit area of 120 g/m<sup>2</sup>.

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<Examples 2 to 4>

[0029] A non-woven fabric for base cloth of carpet was prepared by the same method as the Example 1, except that crimp processing and needle punching were carried out in the conditions shown in Table 1 in the Example 1.

<Comparative Examples 1 to 4>

[0030] A non-woven fabric for base cloth of carpet was prepared by the same method as the Example 1, except that crimp processing and needle punching were carried out in the conditions shown in Table 1 in the Example 1.

[Table 1]

Example	Crimp number	First step needle punching condition (stroke rpm)	Second step needle punching condition (stroke rpm)
Example 1	20	350	700
Example 2	30	350	700
Example 3	40	350	700
Example 4	30	350	800
Comparative Example 1	15	350	700
Comparative Example 2	30	350	500
Comparative Example 3	50	350	700
Comparative Example 4	30	350	900

[0031] The Examples and Comparative Examples were evaluated by the following evaluation methods and the results thereof are shown in the following Table 2.

<Evaluation method>

1. Tensile strength (kgf/5 cm) and elongation (%)

[0032] KS K 0521 method was used. A specimen having a size of length  $\times$  width = 5 cm  $\times$  5 cm was measured by a measuring instrument of Instron with fixing by a jig having upper/lower 5 cm  $\times$  5 cm at a tensile speed of 200 mm/min.

2. Formability

[0033] After applying PVC solution on the back of the non-woven fabric and drying it, a lattice pattern with gap of 2 cm is drawn on the specimen having a size of length  $\times$  width = 50 cm  $\times$  50 cm. Thereafter, the non-woven fabric is preheated at 180 °C for 3 minutes in a preheating plate and the molding is performed using a square mold having a size of 20 cm  $\times$  20 cm with the engraved lower plate and the embossed upper plate. After molding, the number of lattice patterns at the torn portion in the non-woven fabric was counted to obtain the width of the torn portion.

[0034] Ex) Number of cells in torn area = 2 cells = 2  $\times$  2 = 4

3. Pullout strength (gf)

[0035] Loft type tufting is performed at a speed of 800 rpm under the condition of 10 needles per inch in the width direction and 13 needles per inch in the length direction when tufting. After tufting, one adjacent loop to the loop to be measured is cut off and a loop with 10 loops apart on the opposite side is cut off. An average of 10 intensity peaks appearing when the loops to be measured are pulled in a direction perpendicular to that of the non-woven fabric using an Instron is calculated. The number of specimens is three.

[Table 2]

	Tensile strength (MD/CD, kgf/5cm)	Tensile elongation (MD/CD, %)	formability (cm×cm)	Pullout strength (gf)	Overall evaluation	
5	Example 1	14.1/15.7	34.2/35.9	0	2.1	○
	Example 2	15.9/16.3	31.4/34.3	0	2.6	⊙
10	Example 3	18.8/20.7	28.3/29.2	0	2.8	⊙
	Example 4	17.3/18.8	29.4/30.1	0	2.7	⊙
	Comparative Example 1	10.1/12.5	40.6/37.4	7	Tufting impossible	×
15	Comparative Example 2	14.3/15.1	30.3/34.7	3	2.3	△
	Comparative Example 3	23.8/24.7	38.9/37.6	4	2.4	△
20	Comparative Example 4	10.8/11.7	39.8/38.1	15	Tufting impossible	×

**[0036]** From the results of the Table 2, when the number of crimps of the filaments constituting the non-woven fabric was small (Comparative Example 1), tufting was impossible. It is considered because the number of contact points was small and the friction coefficient was improved with minimal compared with Example 1. When the number of crimps of the filaments is large (Comparative Example 2), the mechanical strength is improved, but the non-woven fabric becomes stiff and the formability is declined.

**[0037]** When the needle punching was excessive (Comparative Example 4), tufting was impossible, which is confirmed by the damage of the filament. When the needle punching is performed in small degree (Comparative Example 2), the mechanical strength is not improved and the formability is lowered.

#### [Industrial Applicability]

**[0038]** From the above, it can be seen that the non-woven fabric according to the present invention is improved in formability and pullout strength in the process of preparing a carpet, thereby contributing the improvement of productivity and quality of the carpet.

#### Claims

1. A method of preparing non-woven fabric for base cloth of carpet comprising:

preparing stretched polyester filament fiber having circular cross section;  
forming a web by integrating the filament fiber in a web form, crimp processing and calendering it; and  
needle punching the web.

2. The method of preparing non-woven fabric for base cloth of carpet of claim 1, wherein the crimping processing is performed such that the stretched filament fiber is piled up on a conveyor net for forming the web and at same time, the stretched filament is treated at 100 to 150 °C for 30 to 60 seconds to form number of crimps of 20 to 40 per inch.


3. The method of preparing non-woven fabric for base cloth of carpet of claim 1, wherein the needle punching is performed in a first step and a second step and in a condition of 300 to 400 stroke rpm in the first step and 600 to 800 stroke rpm in the second step.

4. A non-woven fabric for base cloth of carpet prepared by the method any one of claims 1 to 3, which comprises a polyester filament fiber having a monofilament fineness of 4 to 7 denier, and has a pullout strength of 2.0 to 3.0 gf (strength to pull loop after loop type tufting) in the non-woven fabric.

INTERNATIONAL SEARCH REPORT

International application No.

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5	<p>A. CLASSIFICATION OF SUBJECT MATTER  <i>D04H 3/105(2012.01)i, D04H 3/011(2012.01)i, D01D 5/088(2006.01)i, D01D 5/098(2006.01)i, D01D 5/22(2006.01)i, D06C 15/02(2006.01)i, D04H 13/00(2006.01)i</i>                  According to International Patent Classification (IPC) or to both national classification and IPC</p>																
	<p>B. FIELDS SEARCHED</p>																
10	<p>Minimum documentation searched (classification system followed by classification symbols)                  D04H 3/105; D04H 1/42; D04H 1/44; B60N 3/04; D04H 1/46; D04H 1/498; D04H 1/50; A47G 27/02; D04H 1/60; D04H 3/011; D01D 5/088; D01D 5/098; D01D 5/22; D06C 15/02; D04H 13/00</p>																
	<p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched                  Korean Utility models and applications for Utility models: IPC as above                  Japanese Utility models and applications for Utility models: IPC as above</p>																
15	<p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)                  eKOMPASS (KIPO internal) &amp; Keywords: polyester, crimp, calendaring, web, needle punching, non-woven fabric, carpet, substrate sheet</p>																
	<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p>																
20	<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">25</td> <td> <p>Y JP 2003-293255 A (ASAHI KASEI CORPORATION) 15 October 2003                      See claim 1; and paragraphs [0001], [0005], [0012], [0023].</p> </td> <td style="vertical-align: top;">1-4</td> </tr> <tr> <td>Y JP 4034520 B2 (JAPAN VILENE CO., LTD.) 16 January 2008                      See claim 11; and paragraphs [0011], [0037], [0043], [0044], [0067].</td> <td style="vertical-align: top;">1-4</td> </tr> <tr> <td>Y KR 10-1035110 B1 (SONG, Uk) 19 May 2011                      See claim 1.</td> <td style="vertical-align: top;">3</td> </tr> <tr> <td style="vertical-align: top;">30</td> <td> <p>A JP 2005-029052 A (JAPAN VILENE CO., LTD.) 03 February 2005                      See the entire document.</p> </td> <td style="vertical-align: top;">1-4</td> </tr> <tr> <td>A KR 10-0212752 B1 (HYUNDAI MOTOR COMPANY) 02 August 1999                      See the entire document.</td> <td style="vertical-align: top;">1-4</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	25	<p>Y JP 2003-293255 A (ASAHI KASEI CORPORATION) 15 October 2003                      See claim 1; and paragraphs [0001], [0005], [0012], [0023].</p>	1-4	Y JP 4034520 B2 (JAPAN VILENE CO., LTD.) 16 January 2008 See claim 11; and paragraphs [0011], [0037], [0043], [0044], [0067].	1-4	Y KR 10-1035110 B1 (SONG, Uk) 19 May 2011 See claim 1.	3	30	<p>A JP 2005-029052 A (JAPAN VILENE CO., LTD.) 03 February 2005                      See the entire document.</p>	1-4	A KR 10-0212752 B1 (HYUNDAI MOTOR COMPANY) 02 August 1999 See the entire document.	1-4	
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40	<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p>																
45	<table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>		* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed				
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50	<p>Date of the actual completion of the international search                  30 MARCH 2018 (30.03.2018)</p>	<p>Date of mailing of the international search report                  30 MARCH 2018 (30.03.2018)</p>															
55	<p>Name and mailing address of the ISA/KR   Korean Intellectual Property Office                  Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701,                  Republic of Korea                  Facsimile No. +82-42-481-8578</p>	<p>Authorized officer                   Telephone No.</p>															

INTERNATIONAL SEARCH REPORT  
Information on patent family members

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