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(54) **SECONDARY CARPET BACKING FOR TUFTED CARPETS**

(57) A secondary carpet backing for tufted carpets comprising a needlepunched nonwoven composed essentially of staple fibers and a nonwoven composed essentially of filaments, and a tufted carpet comprising such a secondary carpet backing.

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Description

[0001] The invention pertains to secondary carpet backings for tufted carpets, in particular to secondary carpet backings for tufted carpet tiles.

[0002] The process of manufacturing a tufted carpet comprises the steps of providing a primary carpet backing into a tufting machine, tufting the primary carpet backing with tufting yarns, which generally are multifilament yarns, to obtain a greige carpet having a face side showing tufts and a back side where backstitches are formed. A tuft is the visible part of the tufting yarn on the face side of a greige or tufted carpet. A backstitch is the visible part of the tufting yarn on the backside of a greige carpet.

[0003] The primary carpet backing should exhibit good tuft holding characteristics. The primary carpet backing should have a high stitch holding capacity (SHC) to hold the tufts in place during the dynamic process of tufting to obtain tufts of essentially the same height for an even carpet surface in the greige carpet. The stitch holding capacity of a primary carpet backing is the ability to put the tufts in place during the tufting process where the tufts are formed and to hold the tufts in place, directly after being formed, during the formation of the following tufts. It determines the appearance of the face of the greige carpet and the formation of backtags in the greige carpet during the tufting process. A backtag is a loose or uneven backstitch in a greige carpet, in essence a tuft which was formerly on the face of the greige carpet that is now (partially) on the back side of the greige carpet. During subsequent processing steps, such as for example dyeing, the stitch holding capacity of the primary carpet backing should be high enough to retain the surface of the greige carpet as produced during tufting.

[0004] The newly formed tufts in the greige carpet are held into place by the stitch holding capacity (SHC) of the primary carpet backing. Stitch holding (SH) is the force required to remove a (loop of the) tufting yarn from a greige carpet from the back side. It determines how strong the interaction is, between the primary carpet backing and the tufting yarn in the greige carpet. The stitch holding determines the chance on failures in the subsequent processing steps after tufting, such as for example tentering and/or transport of rolls of greige carpet, until the tufting yarns have been locked in place. Each of these processing steps may be executed under severe conditions, for example regarding temperature and/or applied tensions, which pose high demands to the tuft holding characteristics of the primary carpet backing.

[0005] To lock the tufts in the greige carpet into place a pre-coat is generally applied to the back side of the greige carpet, generally either as a latex solution or as a foamed latex, and subsequently the pre-coat is dried, and optionally cured, to form bonds between the base of the tufts, i.e. the part of the tufting yarn which is in contact with the primary carpet backing, and the primary carpet backing.

[0006] After locking the tufts in place, a heavy layer, such as for example a layer of bitumen or a layer of polyvinylchloride (PVC), can be applied onto the back side of the tufted carpet and/or a secondary carpet backing can be applied to obtain a tufted carpet, for example in the form of broadloom carpet, carpet tiles or mats.

[0007] The presence of bitumen or PVC as a heavy layer is not always desired in view of recyclability of the carpet. Therefore, a secondary carpet backing comprising a needlepunched staple fiber nonwoven, preferably composed of polyester fibers, can be used, wherein the secondary carpet backing generally comprises a layer of glass fibers to ensure that the dimensional stability of the carpet tile satisfies the requirements of the Aachen test, which is known to the skilled person. The layer of glass fibers can be e.g. a fiber glass nonwoven or a glass scrim.

[0008] As it is well known to the person skilled in the art, a scrim is an open lattice structure composed of at least two sets of parallel threads, wherein the first group of parallel threads is oriented at an angle, generally at a 90° angle, to the second group of parallel threads. The first group of parallel threads may be connected to the second group of parallel threads by chemical bonding and/or the first group of parallel threads may be interwoven with the second group of parallel threads to form a woven scrim. Preferably, the openings in the scrim have at least one dimension in the plane of the carrier material being at least 1 mm, preferably at least 2 mm, more preferably at least 5 mm. More preferably, the openings in the scrim have two dimensions in the plane of the carrier material being at least 1 mm, preferably at least 2 mm, more preferably at least 5 mm.

[0009] However, the presence of glass in the tufted carpet can also have a negative influence on the recyclability of the tufted carpet (tiles). Accordingly, there have been attempts to apply a secondary backing consisting only of a needlepunched staple fiber nonwoven. However, tufted carpet tiles comprising a secondary backing consisting only of a needlepunched staple fiber nonwoven have difficulties in meeting the dimensional stability requirements of the Aachen test.

[0010] Therefore, there remains a need for a secondary backing for tufted carpet which enables tufted carpet tiles to meet the dimensional stability requirements of the Aachen test while having improved recyclability capability.

[0011] The object of the invention can be achieved with the secondary backing according to claim 1.

[0012] Surprisingly, it has been found that a secondary carpet backing for tufted carpets comprising a needlepunched nonwoven composed essentially of staple fibers and at least one further nonwoven composed essentially of filaments enables that tufted carpet tiles comprising the secondary carpet backing meet the dimensional stability requirements of the Aachen test without the need of including a layer of glass fibers in the secondary backing, which improves the recyclability of the tufted carpet.

[0013] Further advantageous embodiments of the sec-

ondary backing are disclosed in claims 2 to 3.

[0014] Within the scope of the present invention it is understood that the term "fibers" refers to both staple fibers and filaments. Staple fibers are fibers which have a specified, relatively short length in the range of 2 to 200 mm. Filaments are fibers having a length of more than 200 mm, preferably more than 500 mm, more preferably more than 1000 mm. Filaments may even be virtually endless, e.g. when formed by continuous extrusion and spinning of a filament through a spinning hole in a spinneret.

[0015] The terms "spunbonded" and "spun-laid", are understood to mean a nonwoven layer of fibers, wherein the fibers are extruded from a spinneret and subsequently laid down on a conveyor belt as a web of filaments and subsequently bonding the web to form a nonwoven layer of fibers, or by a two-step process wherein filaments are spun and wound on bobbins, preferably in the form of multifilament yarns, followed by the steps of unwinding the multifilament yarns and laying the filaments down on a conveyor belt as a web of filaments and bonding the web to form a nonwoven layer of fibers.

[0016] The needlepunched nonwoven is composed essentially of staple fibers, which means that the needlepunched nonwoven is composed for at least 50 wt.% of staple fibers, preferably for at least 75 wt.% of staple fibers, more preferably for at least 90 wt.% of staple fibers, most preferably for at least 95 wt.% of staple fibers. In an embodiment the needlepunched nonwoven consists of staple fibers.

[0017] The staple fibers may have any cross sectional shape, including round, trilobal, multilobal or rectangular, the latter exhibiting a width and a height wherein the width may be considerably larger than the height.

[0018] The weight of the needlepunched nonwoven composed essentially of staple fibers comprised in the secondary backing may be varied widely. In an embodiment, the needlepunched nonwoven composed essentially of staple fibers comprised in the secondary backing has a weight in the range of 100 g/m^2 to 2000 g/m^2, preferably in the range of 150 g/m^2 to 1500 g/m^2, more preferably in the range of 200 g/m^2 to 1000 g/m^2.

[0019] The staple fibers of the needlepunched nonwoven may be composed of any thermoplastic polymer. In an embodiment, the staple fibers are polyester staple fibers.

[0020] The needlepunched nonwoven is dimensionally stabilized by the at least one further nonwoven composed essentially of filaments, wherein the term composed essentially of filaments means that the nonwoven is composed for at least 50 wt.% of filaments, preferably for at least 75 wt.% of filaments, more preferably for at least 90 wt.% of filaments, most preferably for at least 95 wt.% of filaments. In an embodiment the nonwoven consists of filaments.

[0021] The filaments of the at least one further nonwoven may have any cross sectional shape, including round, trilobal, multilobal or rectangular, the latter exhibiting a width and a height wherein the width may be considerably larger than the height.

[0022] Preferably, the secondary backing does not comprise a layer of glass fibers, neither in the form of a fiber glass nonwoven nor in the form of a woven or laid scrim of glass fibers.

[0023] In an embodiment, the at least one further nonwoven comprised in the secondary backing may be composed of a single type of mono-component filaments, which are bonded by any suitable bonding technique, such as for example by calendering the web of filaments between two calender rolls, by bonding the web of filaments in a double belt press, by mechanical needling, by hydroentanglement, by ultrasonic bonding or by any combination thereof.

[0024] In another embodiment, the at least one further nonwoven comprised in the secondary backing may comprise at least two different types of mono-component filaments, each type of mono-component filaments being composed of a polymer of different chemical construction and/or having a different melting point. the at least one further nonwoven may comprise two, three or more different types of mono-component filaments. Preferably, the at least one further nonwoven consists of two different types of mono-component filaments. It is preferred that the melting points of the two different polymers in the different types of filaments differ by at least 10°C. More preferably the melting points differ by at least 50°C. Such a nonwoven layer could be thermally bonded by subjecting the web of fibers to a temperature in the range of the melting point of the polymer with the lower melting point, preferably by hot air bonding.

[0025] The melting point of a polymer is determined by Differential Scanning Calorimetry by heating the polymer at a rate of 10°C per minute from 0°C to a temperature where the polymer has completely melted, e.g. to a temperature of 300°C. The melting temperature of the polymer is defined by the temperature at the maximum of the endothermic melting peak.

[0026] In an embodiment, the at least one further nonwoven comprised in the secondary carpet backing comprises bicomponent filaments, preferably selected from the group consisting of side-by-side, segmented pie, islands-in-the-sea and core/sheath filaments, each component of the bicomponent filaments being composed of a polymer of different chemical construction and/or having a different melting point. Bicomponent filaments enable to thermally bond the nonwoven, preferably by hot air bonding. It is preferred that the melting points of the two different polymers in the bicomponent filaments differ by at least 10°C. More preferably the melting points differ by at least 50°C. Such a nonwoven layer could be thermally bonded by subjecting the web of fibers to a temperature in the range of the melting point of the polymer with the lower melting point.

[0027] Preferably, the nonwoven comprises bicomponent core/sheath filaments, which enables to obtain a bonding point at each crossing point of filaments.

[0028] A nonwoven composed of filaments may be produced by well-known spunbonding processes wherein filaments are extruded from a spinneret, stretched by an air flow and laid down on a conveyor belt as a web of filaments and subsequently consolidated, also known as bonding, the web to form a nonwoven layer of fibers, or by a two-step process wherein filaments are spun, mechanically stretched and wound on bobbins, preferably in the form of multifilament yarns, followed by the step of unwinding the filaments or multifilament yarns and laying the filaments down on a conveyor belt as a web of filaments and consolidating the web to form a nonwoven layer of fibers.

[0029] In a preferred embodiment, the nonwoven composed of filaments is produced by a two-step process wherein filaments are spun and wound on bobbins, preferably in the form of multifilament yarns, followed by the step of unwinding the filaments or multifilament yarns and laying the filaments down on a conveyor belt as a web of filaments and consolidating the web to form a nonwoven layer of fibers. This two-step process enables to provide a nonwoven having improved isotropy, i.e. having almost equal mechanical properties, in the machine direction, in cross machine direction and/or in the diagonal direction, i.e. at an angle of 45° to both the machine direction and the cross machine direction. In particular, the two-step process enables to provide a nonwoven having a high isotropy with respect to strength at break, elongation at break and modulus, which is especially advantageous in tufted carpet tiles. The strength at break, elongation at break and modulus, wherein the modulus is determined as the load at specified elongation of 2% (LASE2%), are determined in accordance with EN29073-3 (08-1992) with a clamp speed of 200 mm/min at a temperature of 20°C.

[0030] Preferably the core/sheath ratio in the core/sheath bicomponent fibers lies between 95/5 Vol. % and 5/95 Vol.%. More preferably the core/sheath ratio lies between 50/50 Vol.% and 95/5 Vol.%.

[0031] The weight of the at least one further nonwoven composed essentially of filaments comprised in the secondary backing may be varied widely. In an embodiment, the at least one further nonwoven composed essentially of filaments comprised in the secondary backing has a weight in the range of 50 g/m^2 to 500 g/m^2, preferably in the range of 75 g/m^2 to 250 g/m^2, more preferably in the range of 80 g/m^2 to 150 g/m^2.

[0032] The needlepunched nonwoven composed essentially of staple fibers and the at least one further nonwoven composed essentially of filaments comprised in the secondary carpet backing may be supplied as two separate layers, oriented plane parallel to the backside of the tufted primary carpet backing. However, it is preferred that the needlepunched nonwoven composed essentially of staple fibers and the at least one further nonwoven composed essentially of filaments comprised in the secondary carpet backing are connected to each other by any suitable technology to form an integrated secondary carpet backing to facilitate handling of the secondary carpet backing and to improve the dimensional stability of the tufted carpet. The needlepunched nonwoven composed essentially of staple fibers and the at least one further nonwoven composed essentially of filaments comprised in the secondary carpet backing may be connected by any suitable known technology, including mechanical connection technology, for example by stitching, mechanical needling and/or hydrodynamic action by fluid jets, in particular by hydroentanglement, by chemical connection technology, for example by applying an adhesive or a binder dispersion or a binder solution between the first layer of fibers and the second layer of fibers, and/or by thermal treatment, for example by calandering, ultrasonic bonding and/or hot air bonding.

[0033] Preferably, the at least one further nonwoven composed essentially of filaments is arranged directly adjacent to the backside of the tufted primary carpet backing.

[0034] Furthermore, tufted carpets, in particular tufted carpet tiles, comprising the secondary carpet backing according to any of the embodiments above are object of the invention.

[0035] Preferably, the tufted carpet, in particular the tufted carpet tiles, do not comprise a layer of glass fibers, neither in the form of a fiber glass nonwoven nor in the form of a woven or laid scrim of glass fibers.

[0036] Preferably, the tufted carpet, in particular the tufted carpet tiles, do not comprise a heavy layer comprising a layer of bitumen or a layer of polyvinylchloride (PVC).

Claims

1. A secondary carpet backing for tufted carpets comprising a needlepunched nonwoven composed essentially of staple fibers and at least one further nonwoven composed essentially of filaments.

2. The secondary carpet backing according to claim 1 wherein the staple fibers of the needlepunched nonwoven are thermoplastic polymer fibers, preferably polyester fibers.

3. The secondary carpet backing according to any of the previous claims wherein the at least one further nonwoven composed essentially of filaments is composed of bicomponent filaments, preferably of core/sheath bicomponent filaments.

4. A tufted carpet, in particular a tufted carpet tile comprising the secondary carpet backing according to any of the previous claims.

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 1164

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 May 2019	Barathe, Rainier

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X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 15 1164

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