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(54) METHOD FOR THE MANUFACTURE OF AWNING FABRICS

VERFAHREN ZUR HERSTELLUNG VON MARKISENSTOFFE

PROCEDE DE FABRICATION DE TOILES POUR AUVENTS

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Description

[0001] The present invention refers to a method to manufacture awning fabrics.

BACKGROUND OF THE INVENTION

[0002] For the manufacture of awning fabrics, mass dyed acrylic yarns are used.

[0003] The use of acrylic yarn for manufacturing awning fabrics has the following disadvantages or aspects to be improved;

- Need to treat solvents used in the process of extrusion to guarantee a correct environmental management of those solvents.
- Difficulty of recycling due to its high cost.
- Limited resistance to tearing and traction of yarns due to the fact that they are formed from cut fibres joined by the process of conventional or ring spinning.
- Shape loss of the fabric in case of plenty of rain, due to the loss of resistance the acrylic yarn suffers once wet.
- Easy degradation of the fabric in highly damp environments.
- A fabric's level of toxicity which fails to meet the Oeko-Tex Standard 100 Class I, indicating that the product is suitable to be used by babies.
- Difficulty to keep the fabric clean due to its low repellence and the impossibility to use bleach for its cleaning.
- Higher heat conductivity of the material, raising the temperature under the awning.

[0004] The United States patent application num. US 2001/0031590 A1 discloses awning fabrics which are made from polyester filament yarn (continuous filament yarn) and/or polyester monofilament yarn. The invention of said document has as its object to create awning fabric that has the lowest possible weight per unit area while providing good UV stability and weather resistance.

[0005] Likewise, the European patent application num. 1355001 discloses an awning fabric which is formed by weaving, at a high density, high-bulky and texturised polyester filament yarns and then by treating uniformly the inner and outer surfaces of the resulting fabric with a coating solution of polytetrafluoroethylene.

[0006] There are well-known fabrics manufactured with polyolefinic materials applicable to the nautical sector as outdoor covering materials, including, on one or both sides, a compact coat of plastic material based on polyvinyl chloride (PVC), polyolefins or other plastic resins, making them completely impermeable. These fabrics are not suitable to be used in manufacturing awnings, since their fabric is too thick and too heavy, and the compact plastic coat cracks and bleaches easily.

[0007] There are well-known fabrics manufactured with polyolefinic materials, from continuous filament yarn, applicable to upholstery and outdoor furniture covering. These fabrics have a warp yarn density under 16 yarns per centimetre and a weft yarn density under 10 yarns per centimetre. This density disadvantageously restricts the kind of water-repellent treatment to apply to the fabric, so only one range of water-repellent treatments is applicable making the product unsuitable for awning manufacturing due to the fact, for instance, that the resulting fabric is too thick and too heavy. Thus, in practice, the known fabrics manufactured with polyolefinic materials applicable to upholstery and outdoor furniture covering, have a low resistance (<IS05) to wetting (UNE EN 24920 Regulation) and water penetration resistance (UNE EN 20811 Regulation) under 10 cm of water column.

[0008] There are known fabrics manufactured with polyolefinic materials applicable to awning fabrics, such as those disclosed by EP 0607933, EP 0629724 and EP 0816544.

[0009] The awning fabrics disclosed in these patents have in common that all of them are manufactured with polyolefine yarns obtained from cut fibres, joined by the conventional spinning or ring process, and that the composition of the polyolefinic plastic material used comprises always at least two polymeric components with different melting point; as for example, polypropylene and polyethylene.

[0010] In EP 0816544 and EP 0629724, the use of yarns of cut fibres of polyolefinic plastic material with a base of a single polymeric component, such as polypropylene, is ruled out, because the fabrics manufactured with fibres of said material present a texture, inscription effects and rigidity degree not suitable to be used in the manufacturing of awnings.

[0011] The fabrics and the associated method for manufacturing said fabrics, disclosed in said three patents, present these aspects to be enhanced:

- Limited strength to breaking, tearing, abrasion and to the deformation of the fabric, because the yarns are made from cut fibres.
- The fabric is difficult to be washed, because of the great number of cavities formed between the yarn fibres.
- The water-resistant finishing of the fabric is difficult to be performed, because of the great number of cavities formed

between the yarn fibres, where water particles can be deposited easily.

- It is easy that mildew appears in the fabric, because of the great number of cavities formed between the fibres of the yarn, which make the fabric too sensitive to humidity.
- High cost of treatment/elimination of the wastes generated during the manufacturing method of the yarn, because oils are used which are very water-soluble, in the spinning process and in the twisting process.
- It is difficult to recycle the polyolefinic plastic material, because this is formed at least by two polymeric components with different melting point.
- It is difficult to apply the finishing processes to give water-proof properties to the fabric, because of the little temperature margin that can be used with a polyolefinic plastic material, which comprises more than one polymeric component with different melting point.

[0012] There are not well-known fabrics manufactured from continuous filament yarn with a single polymeric component of the polyolefin group applicable to awning fabrics.

DESCRIPTION OF THE INVENTION

[0013] The aim of the present invention is to solve the mentioned disadvantages by developing a manufacturing method of awning fabrics from continuous filament yarn with a single polymeric component of the polyolefin group, offering the advantages that will be described below.

[0014] According to this aim, the method of the present invention refers to awning fabrics with warp yarns and weft yarns involving the steps of weaving said warp yarns and said weft yarns with a density over 16 warp yarns per centimetre and 10 weft yarns per centimetre, and treating the fabric by immersion with a water-repellent product, and is characterised in that prior to the weaving step, warp yarns and weft yarns are prepared following the steps of:

- a) Preparing plastic material comprising granulate of a single polymeric component of the polyolefin group, and at least 0.2% of UV stabiliser.
- b) Extruding the continuous filament warp yarn and the continuous filament weft yarn.
- c) Texturing said continuous filament warp yarn or said continuous filament weft yarn.

[0015] As UV stabiliser it means a product which, when admixed with a thermoplastic resin, selectively absorbs UV rays.

[0016] Manufacturing awnings from polyolefin yarns offers the following advantages regarding the manufacture from acrylic yarns:

- No dangerous solvents or chemicals are used in the polyolefin yarn manufacturing method.
- Low melting point of the polyolefin yarn, so the need of energy of the manufacturing method is lower than that of the acrylic yarn. Additionally, the low melting point makes it easier to weld different pieces of fabric and roll them up later.
- Recycling of polyolefin yarns and fabrics is possible and also financially feasible.
- Higher resistance to tearing and breaking of polyolefin yarn than that of acrylic yarn due to its being made up of continuous filaments.
- Same resistance of polyolefin yarn either dry or wet, so there is no shape loss in case of plenty of rain.
- Polyolefin yarns humidity absorption is 0.05%, outstandingly lower than that of acrylic yarns, which is between 1% and 2.5%, so this means a high resistance to bacteria and micro organisms.
- No toxicity of polyolefin fabrics, so they can meet the Oeko-Tex Standard 100 Class I, and they are suitable to be used on products for babies.
- High resistance to stains on polyolefin fabrics due to the low absorption and water repellence. Cleaning of polyolefin fabrics is simpler than that of acrylic fabrics since they can be washed with bleach without degrading the fabric.
- Polyolefin yarns density is lower than that of acrylic yarns, so polyolefin fabrics are very light.
- Lower heat conductivity of polyolefins contributing to a lower temperature under the awning.

[0017] Surprisingly, the fabrics of the present invention, manufactured from continuous filament yarns of a single polymeric component of the polyolefin group, have presented a texture, rigidity and inscription effects optimal to be used in awnings. Furthermore, said fabrics present the advantages which are described below, respect to the fabrics for awnings with polyolefin yarns, described in the state the art.

[0018] As they are continuous filament yarns, in spite of yarn of cut fibres, it is observed:

- Increase of the breaking strength in at least 30% in the direction of the weft, and in 10% in the direction of the warp.

- Increase of the tear strength in at least 20% in the direction of the weft, and in 10% in the direction of the warp.
- Greater abrasion strength.
- Greater strength against deformations.
- Greater cleaning capability, because there are no cavities in the yarn.
- Greater simplicity to provide the water-proof finishing of the fabric, because there are no cavities in which the water form a deposit.
- Greater resistance to the formation of mildew, because it is less sensible to humidity because the yarn has no cavities.
- Lower treatment/elimination cost of the debris generated by the manufacturing method of the yarn, because no spinning oils associated to said method are used, because there is no spinning process.

[0019] As they are polyolefin yarns which comprise a single polymeric component, in spite of several polymeric components, it is observed:

- Easier recycling, because only the melting temperature of one polymeric component has to be taken in account.
- It is easier to apply the finishing process to provide water-proof properties to the fabric, because the margin of temperatures which can be used is very wide, as it is a plastic material of a single component.
- Lighter weight of the fabric.

[0020] Thanks to the method of the present invention, it is possible to obtain fabrics manufactured with continuous filament polyolefin yarn with high resistance (ISO5) to wetting (UNE EN 24920), water penetration resistance (UNE EN 20811 Regulation) over 10 cm of water column, preferably of 20 cm, and an index of fastness of colour under the light (UNE-EN ISO 105-b02:2001 Regulation) classified as good to very good, that is, higher than 6, preferably of 7.

[0021] Fabrics of polyolefin obtained by the method of the present invention are very suitable for manufacturing awnings since they have, respect of other polyolefin fabrics of continuous filament known in the state of the art, at the same time, an optimum resistance to wetting, water penetration and bleaching caused by the sunlight.

[0022] Preferably, said only polymeric component is polypropylene.

[0023] the step which involves texturing the warp or weft yarn allow to achieve a natural fibre look of the fabric.

[0024] Advantageously, after step b) a step which involves twisting the weft or warp yarn to make the weaving easier is carried on.

[0025] Preferably, after the step of texturing the warp or weft yarn is carried on a step which involves twisting the weft or warp yarn.

[0026] According to a preferred embodiment of the present invention, the warp yarn is textured to achieve a natural fibre look, and, at the same time, the weft yarn is twisted to make the yarn weaving easier.

[0027] Preferably, the extruded yarn has between 30 and 340 filaments, so that a good texturing of the yarn is carried on.

[0028] Preferably, the fabric has 30 warp yarns per centimetre and 15 weft yarns per centimetre, to create a woven structure dense enough to achieve a good resistance to water penetration.

[0029] Preferably, the water-repellent product is a fluoro-acrylic copolymer, so that a water penetration resistance between 10 and 80 cm of water column is achieved.

[0030] Preferably, the UV stabiliser comprises a Hindered Amine Light Stabiliser (HALS). HALS is a chemically reactive substance that scavenge free radicals, created by the UV light induced degradation of the polymer matrix, which prevents the physical degradation of said polymer.

[0031] Preferably, said plastic material comprise between 0.1% and 10% of pigments, to obtain the desired colour.

[0032] Advantageously, said UV stabilizer product comprises, furthermore, an UV absorber of high molecular weight, which protects from the sun the pigments with comprises the plastic material, and prevents the decolouration of the fabric.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0033] For a better understanding of the invention, an example of the embodiment is shown below.

[0034] The method of manufacturing awning fabrics starts with the preparation of material of polypropylene granulate, adding 0.8% of stabilizer product and 3% of a combination of pigments based on polyolefin. The stabilizer product comprises a mix of a Hindered Amine Light Stabilizer (HALS) and an UV absorber of high molecular weight, preferably of the benzotriazole group.

[0035] According to this preferred embodiment, the method of manufacturing continuous filament warp yarn and continuous filament weft yarn starts, with the extrusion method. Following that, it continues with the texturing process for the warp yarn and the twisting process for the weft yarn.

[0036] The extrusion process of the warp yarn and the weft yarn starts with the insertion of the polyolefinic plastic material, comprising the UV stabiliser and the pigments, into an extruder and it continues with the application of an extrusion temperature of 230°C. The melted plastic is driven through an isolated conduct up to the spinning head of the

extruder, where it is forced by the pressure pumps through the spinplates. The spinplates have 0.3 mm-diameter holes. The number of holes determines the yarn filaments, due to be 120.

[0037] Once the yarn has gone through the spinplates it is air-cooled at 15°C. Afterwards, 1% of spinning oil is applied. The yarn is then stretched to orientate and align the molecular chains, thus achieving an acceptable tenacity. It is stretched by means of hot cylinders (120°C) and/or by means of ovens (140°C). The stretch ratio is from 1 to 4. Once stretched, the yarn suffers a process of shrinking of 5% by means of hot cylinders and/or by means of ovens. The amount of melted material going through the spinplates along with the stretch and shrinkage ratio determines the yarn coarseness or count, of preferably 440 dtex. Finally, the cone winding of the yarn is carried on by means of a winding machine.

[0038] The wound warp yarn is textured to achieve a natural fibre look by air pressure. The method involves putting the yarn into water to moisten it, and immediately inserting it into a hole under air pressure, in a determined direction, which curls the filaments and achieves the texturing effect. The air pressure rating in this hole is 11 bar. Once textured, the yarn is wound again.

[0039] To carry on the process of weft yarn twisting, the extruded yarn is inserted into a double-twist twisting machine applying an 80 turns per metre torsion.

[0040] To carry on the method of manufacturing the fabric, the warp yarns are warped in a beam and then placed on the back of the loom, in the right shape to achieve the necessary design. The weft yarns are placed on a bobbin holder and they are then inserted into the loom perpendicularly to the warp yarns. The final fabric obtained with a specific weaving machine for this case, has a woven structure of 15 weft yarns per centimetre and 30 warp yarns per centimetre. This weaving density is enough to achieve a good water penetration resistance with the subsequent finishing treatment.

[0041] The finishing process involves treating the fabric with a water-repellent product. This process starts with the fabric washing with an anionic product at 90°C for 6 hours to remove the remains of spinning oil. After that, a water wash is carried on and finally a moister-proofing of the fabric with a fluoro-acrylic copolymer in emulsion. The application dose of this copolymer is 4% for a initial 50% fabric humidity. The treated fabric is dried in an oven at 130°C for 2.5 minutes. The finishing guarantees a fabric enduring a 20 cm water column, according to UNE EN 20811 Regulation, and having a high resistance (ISO5) to wetting, according to UNE EN 24920 Regulation.

[0042] The described process results in obtaining a fabric of continuous filament yarn of polypropylene which, unlike the other polyolefinic fabrics with continuous filament yarns known in the state of the technique, meets all quality standards established for awning fabrics, especially regarding its water penetration and wetting resistance.

[0043] The annexed table shows the results of a comparative test made with two pieces of polyolefin fabric of continuous filament yarn. Fabric A is a sample of the fabric obtained by the method of the present invention, whereas fabric B is a current state of the art polyolefin fabric suitable to be applied to upholstery and outdoor furniture covering.

[0044] The parameters analysed on the fabric were the following:

■ Mass per unit area, under UNE EN 12127 Regulation, involving the determination of a square metre of fabric's weight.

■ Resistance to wetting, under UNE EN 24920 Regulation, involving the determination of the fabrics' water-repellence.

■ Resistance to water penetration, under UNE EN 20811 Regulation, involving the determination of the amount of water (cm) which can go through a fabric.

■ Fastness of colour under the light, under UNE EN ISO 105-b02-Method 2, involving the determination of the index of fastness of the colour under the light, within a lower to higher fastness scale, from 1 to 8.

Table 1: Characteristics of the fabric of the present invention (A) and a state of the art polyolefin fabric (B) applicable to upholstery and outdoor furniture covering.

Fabric	Mass per unit area	Resistance to wetting	Resistance to water penetration	Fastness of the colour under the light
	g/M ² UNE EN 12127	UNE EN 24920	Cm UNE EN 20811	Index UNE EN ISO 105B02:2001
A	250.28	ISO5	21.4	6-7
B	202.85	ISO1	3.8	6-7
Note : ISO 5 = No water adherence or penetration ISO 1 = Total wetness of the whole upper surface				

[0045] As may be observed on table 1, the resistance to water penetration and to wetting of fabric (A) of the present invention is much higher than that of fabric (B). Thus, in spite of the fact that both fabrics are prepared for a long-term exposure to the sunlight, since they have the same fastness of colour under the sunlight, only fabric (A) of the present invention is suitable to be used on manufacturing awnings, due to the fact that only this fabric has a resistance to water penetration and to wetting suitable to be used on manufacturing awnings.

Claims

1. Method of manufacture of awning fabrics with warp yarns and weft yarns involving the steps of weaving said warp yarns and said weft yarns with a density over 16 warp yarns per centimetre and 10 weft yarns per centimetre, and treating the fabric by immersion with a water-repellent product,
characterised in that prior to the weaving step, warp yarns and weft yarns are prepared following the steps of:
 - a) Preparing plastic material comprising granulate of a single polymeric component of the polyolefin group, and at least 0.2% of UV stabiliser.
 - b) Extruding the continuous filament warp yarn and the continuous filament weft yarn.
 - c) Texturing said continuous filament warp yarn or said continuous filament weft yarn.
2. Method according to claim 1, **characterised in that** said single polymeric component is polypropylene.
3. Method according to claim 1, **characterised in that**, after step b), a step which involves twisting the weft or warp yarn is carried on.
4. Method according to claim 1, **characterised in that**, after the step of texturing the warp yarn or the weft yarn, a step which involves twisting the weft or warp yarn is carried on.
5. Method according to claim number 1 or 4, **characterised in that** the extruded yarn comprises between 30 and 340 filaments.
6. Method according to claim 1, **characterised in that** the fabric comprises 30 warp yarns per centimetre and 15 weft yarns per centimetre.
7. Method according to claim 1, **characterised in that** the water-repellent product is a fluoro-acrylic copolymer.
8. Method according to claim 1, **characterised in that** the UV stabiliser comprises a Hindered Amine Light Stabiliser.
9. Method according to claim 1, **characterised in that** said plastic material comprise between 0.1% and 10% of pigments.
10. Method according to claims 8 and 9, **characterised in that** said UV stabilizer product also comprises an UV absorber of high molecular weight.
11. Use of textured continuous filament yarn of a single polymeric component of the polyolefin group as warp yarn or weft yarn in fabrics to be used as awnings.

Patentansprüche

1. Verfahren zum Herstellen von Markisenstoffen mit Kettfäden und Schussfäden, umfassend die Schritte des Webens der Kettfäden und der Schussfäden mit einer Dichte über 16 Kettfäden pro Zentimeter und 10 Schussfäden pro Zentimeter, und Behandeln des Stoffs durch Eintauchen in ein wasserabweisendes Produkt,
dadurch gekennzeichnet, dass vor dem Webschritt, die Kettfäden und die Schussfäden gemäß den folgenden Schritten vorbereitet werden:
 - a) Vorbereiten von Kunststoffmaterial, das Granulat einer einzigen Polymerkomponente der Polyolefingruppe und wenigstens 0,2 % eines UV-Stabilisators aufweist,
 - b) Extrudieren des kontinuierlichen Faserkettfadens und des kontinuierlichen Faserschussfadens,

c) Texturieren des kontinuierlichen Faserkettfadens oder des kontinuierlichen Faserschussfadens.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die einzige Polymerkomponente Polypropylen ist.
- 5 3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** nach Schritt b) ein Schritt ausgeführt wird, der das Zwirnen des Kettfadens oder des Schussfadens umfasst.
- 10 4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** nach dem ersten Schritt des Texturierens des Kettfadens oder des Schussfadens, ein Schritt ausgeführt wird, der das Zwirnen des Kettfadens oder des Schussfadens umfasst.
- 5 6. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der extrudierte Faden zwischen 30 und 340 Fasern aufweist.
- 15 7. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Stoff 30 Kettfäden pro Zentimeter und 15 Schussfäden pro Zentimeter aufweist.
- 20 8. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das wasserabweisende Produkt ein Fluor-Acryl-Copolymer ist.
- 25 9. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der UV-Stabilisator ein Hindered Amine Light Stabilisator ist.
- 30 10. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Kunststoffmaterial zwischen 0,1 % und 10 % Pigmente aufweist.
11. Verfahren nach Anspruch 8 und 9, **dadurch gekennzeichnet, dass** das UV-Stabilisatorprodukt auch einen UV-Absorbierer von hohem Molekulargewicht aufweist.
- 30 11. Verwendung von texturiertem kontinuierlichem Fasergarn einer einzigen Polymerkomponente der Polyolefingruppe als Kettfaden oder Schussfaden in Stoffen, die als Markisen verwendet werden.

Revendications

- 35 1. Procédé de fabrication de toiles pour auvents avec des fils de chaîne et des fils de trame impliquant les étapes consistant à tisser lesdits fils de chaîne et lesdits fils de trame avec une densité supérieure à 16 fils de chaîne par centimètre et 10 fils de trame par centimètre, et à traiter le tissu par immersion avec un produit hydrofuge,
40 **caractérisé en ce que**, avant l'étape de tissage, les fils de chaîne et les fils de trame sont préparés en suivant les étapes de :
 - a) Préparation d'une matière plastique comprenant un granulat de composant polymère simple du groupe des polyoléfines et au moins 0,2 % de stabilisateur d'UV.
 - b) Extrusion du fil de chaîne en filament continu et du fil de trame en filament continu.
 - 45 c) Texturation dudit fil de chaîne en filament continu et dudit fil de trame en filament continu.
2. Procédé selon la revendication 1, **caractérisé en ce que** ledit composant polymère simple est du polypropylène.
3. Procédé selon la revendication 1, **caractérisé en ce que**, après l'étape b), une étape qui consiste à tordre le fil de chaîne ou de trame est réalisée.
- 50 4. Procédé selon la revendication 1, **caractérisé en ce que**, après l'étape de texturation du fil de chaîne ou du fil de trame, une étape qui consiste à tordre le fil de trame ou de chaîne est réalisée.
- 55 5. Procédé selon la revendication 1 ou 4, **caractérisé en ce que** le fil extrudé comprend entre 30 et 340 filaments.
6. Procédé selon la revendication 1, **caractérisé en ce que** le tissu comprend 30 fils de chaîne par centimètre et 15 fils de trame par centimètre.

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7. Procédé selon la revendication 1, **caractérisé en ce que** le produit hydrofuge est un copolymère fluoro-acrylique.
8. Procédé selon la revendication 1, **caractérisé en ce que** le stabilisateur d'UV comprend un photostabilisant à base d'amine encombrée.
9. Procédé selon la revendication 1, **caractérisé en ce que** ladite matière plastique comprend entre 0,1 % et 10 % de pigments.
10. Procédé selon les revendications 8 et 9, **caractérisé en ce que** ledit produit stabilisateur d'UV comprend aussi un absorbeur d'UV de poids moléculaire élevé.
11. Utilisation d'un fil en filament continu texturé d'un composant polymère simple du groupe des polyoléfinés en tant que fil de chaîne ou fil de trame dans des tissus destinés à être utilisés en tant qu'auvents.

REFERENCES CITED IN THE DESCRIPTION

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