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(54) **SYNTHETIC LEATHER, METHOD FOR ITS MANUFACTURE, AND ITS USE**

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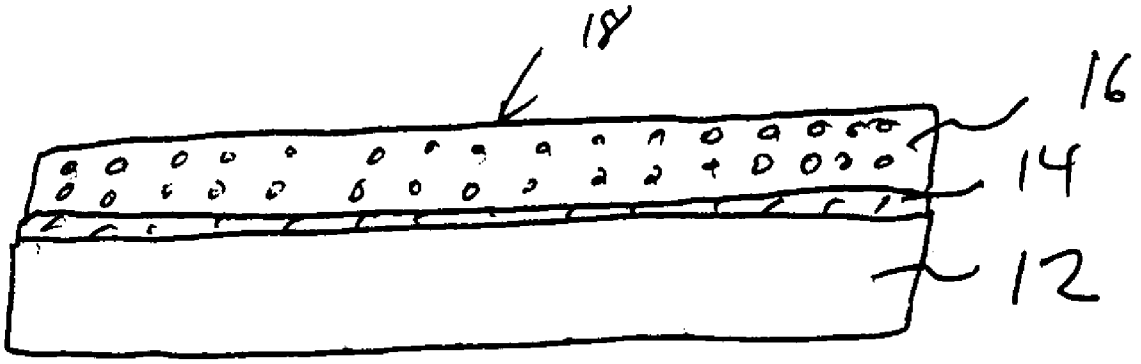
(57) **ABSTRACT**

A synthetic leather including a microfiber nonwoven has an adhesive on one surface and a layer of open-pore polyurethane foam thereon, wherein the surface of the polyurethane foam layer facing away from the microfiber nonwoven is obtained by splitting. The synthetic leather is manufacturable by a simple method in which little waste occurs. Further processing preferably takes place by back-injection in an injection molding tool.



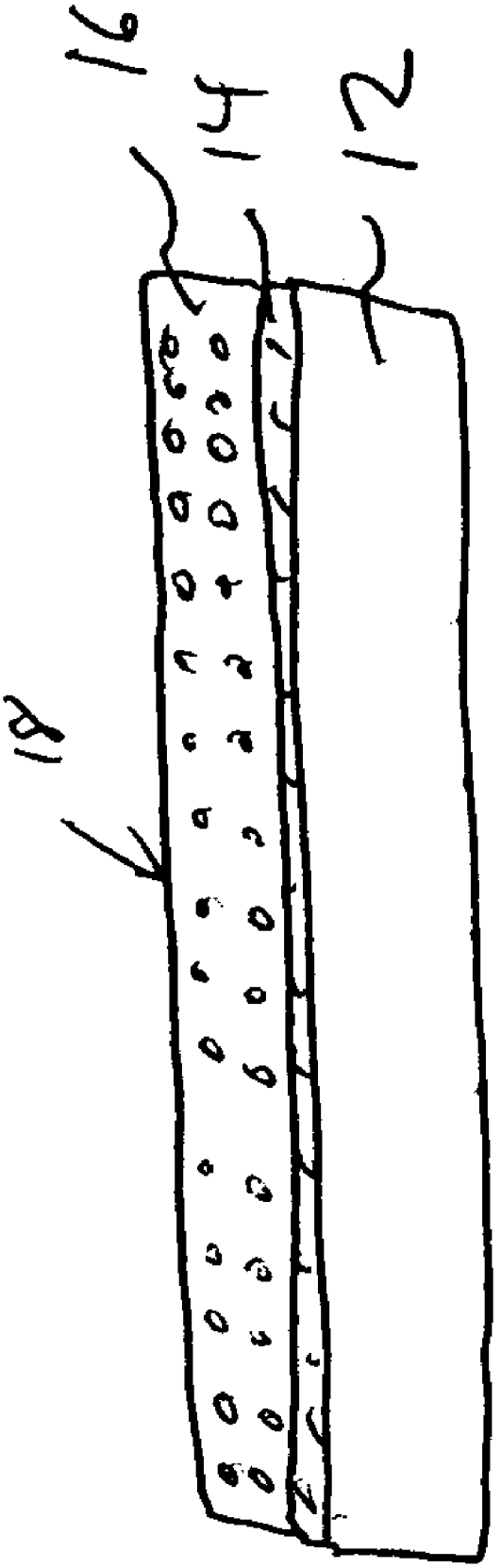


FIG. 1

SYNTHETIC LEATHER, METHOD FOR ITS MANUFACTURE, AND ITS USE

[0001] This claims the benefit of German Patent Application No. 10 2005 014 317.2 filed Mar. 30, 2005 and hereby incorporated by reference herein.

BACKGROUND

[0002] The present invention relates to a novel synthetic leather derived from a polyurethane foam, its manufacture and use as surface lining for plastic parts.

[0003] The use of polyurethane foam products in automobile interiors or in other interiors is known.

[0004] Thus, WO-A-01/10637, hereby incorporated by reference herein, describes a multilayer material for use in automobile interiors, which includes an open-cell polyurethane foam, fibers of vegetable origin applied to its surface, a thermosetting resin for bonding the fibers to the polyurethane foam, and optional decorative layers applied thereon.

[0005] WO-A-00/06375, hereby incorporated by reference herein, describes a multilayer laminate which has a single layer of polyurethane foam, to whose surfaces a nonwoven made of a mixture of endless fibers and finite-length fibers is applied, which are bonded to the polyurethane foam layer by an adhesive layer. The laminate may be used for sound dampening in automobile interiors.

[0006] Leather manufacture is a complex process using chemicals which pollute the environment. Therefore, numerous attempts have been made to manufacture artificial leather using simpler processes and less polluting chemicals.

[0007] Different principles for manufacturing artificial leather are known from the related art.

[0008] WO-A-2004/060655 discloses a method for manufacturing a layer of polyurethane foam and a laminate manufactured therefrom.

[0009] U.S. Pat. No. 6,566,287, hereby incorporated by reference herein, describes a synthetic leather which is manufactured by impregnating a special split-fiber nonwoven with an elastic polymer and subsequently coagulating this polymer. An elastic polymer layer may be laminated on this impregnated nonwoven.

[0010] U.S. Pat. No. 6,737,004, hereby incorporated by reference herein, describes the manufacture of a stretched split-fiber nonwoven. After a shrinking process, this may be impregnated with an aqueous polyurethane solution and then combined with another layer. The laminate may be used as synthetic leather.

[0011] EP-A-1 300 508, hereby incorporated by reference herein, describes a microfiber nonwoven, which is manufactured using the "islands in the sea" method and is impregnated with a polyurethane solution or polyurethane emulsion. The impregnated nonwoven is split and dyed.

[0012] JP-A-8/060,556 describes a synthetic leather which is manufactured by impregnating a split-fiber nonwoven with a polyurethane solution, coagulating the polyurethane and subsequently subjecting it to a surface treatment.

[0013] JP-A-4/185,777 describes a synthetic leather which is manufactured by laminating a non-porous polyurethane layer onto a porous substrate. The substrate is manufactured by impregnating a microfiber nonwoven with a polyurethane solution and coagulating the polyurethane.

[0014] DE-A-199 47 869 describes a synthetic leather which contains a nonwoven, preferably a split-fiber nonwoven, impregnated and/or coated with a polymer, having mass per unit areas of 100 g/m^2 to 500 g/m^2 and high tensile strengths in the longitudinal and transverse directions. A polyurethane dissolved in dimethylformamide or an aqueous polyurethane latex is provided for impregnation and is precipitated or coagulated after being applied onto the nonwoven. The impregnated nonwoven is napped after the polyurethane surface containing the fibers is formed to lend this surface a suede leather-like texture.

[0015] DE-A-38 20 296 describes a method for manufacturing a synthetic chamois leather. To do so, a synthetic sheet material is produced, which includes a porous polyurethane matrix containing fibers or a nonwoven and a cover layer of compact polyurethane. This material is split by separating into two thin sheets in the area of the fiber layer or the nonwoven, and the part having the cover layer is post-treated on the surface produced by the split by napping. In this method a relatively high proportion of waste occurs due to the further use of only one split sheet.

SUMMARY OF THE INVENTION

[0016] On the basis of this related art, it is an object of the present invention to provide a synthetic leather having a fine surface structure which has virtually no free-standing fiber ends on the surface.

[0017] Another alternate or additional object of the present invention is to provide a synthetic leather which is usable without problems in injection molding and in which no plastic comes into contact with the layer forming the imitation leather when it is back-injected.

[0018] A further alternate or additional object of the present invention is to provide a simple method in which the least possible waste occurs and which can be operated economically.

[0019] The invention relates to a synthetic leather including a microfiber nonwoven which has an adhesive on one surface and a layer of open-pore polyurethane foam thereon, the surface of the polyurethane foam layer facing away from the microfiber nonwoven having been obtained by splitting.

[0020] The present invention also relates to the manufacture of the above-described synthetic leather including the following steps:

[0021] i) applying an adhesive layer to a microfiber nonwoven;

[0022] ii) applying a layer of open-pore polyurethane foam to the adhesive layer;

[0023] iii) applying another adhesive layer to the open-pore polyurethane foam;

[0024] iv) applying another microfiber nonwoven to the second adhesive layer;

[0025] v) splitting the composite thus produced in the area of the open-pore polyurethane layer, and

[0026] vi) if necessary, napping the surfaces of the open-pore polyurethane foam layer produced by splitting.

[0027] Microfiber nonwoven is understood within this description as any nonwovens which have at least 50% by weight, preferably at least 80% by weight, and especially preferably 100% by weight of fibers having a diameter of less than 1 μm.

[0028] The fibers may be endless filaments, finite-length fibers, fiber or filament yarns, or a mixture thereof.

[0029] The microfiber nonwovens used according to the present invention may be manufactured in different ways.

[0030] Microfiber (mixtures) or mixtures of microfibers with non-microfibers may be manufactured using current web laying methods such as wet laying, carding, spun-bond methods, melt-blown methods, electrospinning, or air-laid methods.

[0031] Microfiber nonwovens used according to the present invention typically have a mass per unit area of 30 g/m^2 to 500 g/m^2, preferably 50 g/m^2 to 300 g/m^2. They have a typical thickness of 0.3 mm to 3 mm, preferably 0.5 mm to 2 mm.

[0032] The microfiber nonwovens used according to the present invention are stabilized by methods known per se, for example, by needle punching, water jet treatment, or the use of thermal and/or chemical binders. Microfiber nonwovens treated with water jets are preferably used.

[0033] Split fiber nonwovens are especially preferably used. For this purpose, multicomponent fibers made of incompatible polymers are laid according to the spun-bond method or another method to form a nonwoven, which is then compacted by mechanical treatment, while the multicomponent fibers are split longitudinally into finer constituents.

[0034] The nonwovens used according to the present invention may be made of fibers of any desired cross section. Furthermore, the fibers may be crimped or uncrimped.

[0035] The microfiber nonwovens may contain fibers made of different synthetic materials. In principle, any fiber-forming polymer may be used. Examples include polyesters, preferably polyethyleneterephthalate, polyamides, preferably aliphatic polyamides or aliphatic-aromatic polyamides, or polyolefines, preferably polypropylene.

[0036] Especially preferably, split-fiber nonwovens are used, whose filaments or fibers are made of polyester and polyamide or polyester and polyolefine, or polyamide and polyolefine.

[0037] The adhesive layer may be made of any desired adhesive. The function of this layer is to ensure sufficient adhesion between the microfiber nonwoven and the polyurethane foam layer during processing and use.

[0038] Contact adhesives are preferably used in addition to hot-melt-type adhesives. Examples of the latter include two-component adhesives or thermosetting plastics in particular. Polyurethane adhesives are especially preferably used. These form compact layers and provide a particularly good bond between the polyurethane foam and the microfiber nonwoven.

[0039] Any desired systems may be used for forming the open-pore polyurethane foam layer. Thermoplastic or thermosetting polyurethane foams may be used. Foaming may take place by using chemical and/or physical foaming agents. The manufacture of open-pore polyurethane foams is known to those skilled in the art.

[0040] Aliphatic polyurethane is preferably used, which is characterized by a high degree of light-fastness. Aliphatic polyurethane is understood within this description as a polyurethane which is derived from aliphatic or cycloaliphatic polyisocyanates and aliphatic or cycloaliphatic polyols.

[0041] After the above-described polyurethane laminate and the microfiber nonwoven bonded thereto have been manufactured, they are divided in two by splitting the open-pore polyurethane layer. Splitting layers of synthetic materials is known to those skilled in the art.

[0042] A surface of leathery appearance containing no fibers is obtained by the split within the polyurethane foam layer. The method according to the present invention produces virtually no waste, since both parts of the split material may be used as synthetic leather.

[0043] The parts produced in this way may be further processed in subsequent steps. For example, the surface obtained by splitting may be processed by napping.

[0044] The synthetic leather is preferably bonded to a synthetic molded part by back-injection in the injection molding process. The precondition for this is the thermal moldability of the substrate. In the case of a microfiber nonwoven such as the one described in U.S. Pat. No. 5,899,785, thermal moldability is achieved in a particularly rapid and simple manner.

[0045] An alternate or additional object of the present invention is also the use of the above-described synthetic leather as back-injectable decorative material, in particular for automobile interiors, as well as for upholstering items of sitting furniture, in particular car seats.

BRIEF DESCRIPTION OF THE DRAWINGS

[0046] **FIG. 1** shows schematically one embodiment of the synthetic material of the presentr invention.

DETAILED DESCRIPTION

[0047] **FIG. 1** shows schematically a synthetic leather **10** comprising a microfiber nonwoven **12** having an adhesive **14** on one surface and a layer **16** of open-pore polyurethane foam thereon, wherein the surface **18** of the polyurethane foam layer facing away from the microfiber nonwoven has been obtained by splitting.

[0048] The following examples elucidate the present invention without limiting it.

EXAMPLE 1

[0049] A plastified polyethyleneterephthalate- and nylon-based split-fiber nonwoven having a mass per unit area of 130 g/m^2 was directly coated and laminated in a conventional 3-head coating system using the applicator blade method.

[0050] A polyurethane adhesive layer was applied to the first spreader head via an air applicator (gap approximately 0.1 mm). An aqueous dispersion containing a cross-linking agent was used. The adhesive layer was oven dried and

cross-linked. A foam was applied to the second spreader head via a roller applicator having a gap of approximately 1 mm to 4 mm. A mechanical foam of approximately 300 g/L to 800 g/L was produced from an approximately 35% to 60% aqueous polyurethane dispersion using foam mixers with the addition of foaming agents. After drying and cross-linking, an adhesive layer was applied again to the third and last spreader head using roller applicators. The same polyurethane formula and the same setting as in applying the first layer were used here. Prior to drying, a second layer of a split-fiber nonwoven was laminated into the still moist adhesive using a laminator. The same nonwoven as the nonwoven used as a basis was used here.

[0051] The laminate thus obtained was split into two coated split-fiber webs with the aid of a splitting machine normally used for leather and rubber processing. The surfaces of the split foam are similar to those of a Nubuk leather.

EXAMPLE 2

[0052] The method is similar to the one described in Example 1. Instead of a polyurethane adhesive layer containing a cross-linking agent, an aqueous dispersion of a polyurethane adhesive layer without a cross-linking agent was applied. Two coated split-fiber webs were produced by splitting. The surfaces of the split foam are similar to those of a Nubuk leather.

What is claimed is:

1. A synthetic leather comprising:

a microfiber nonwoven having a first surface;

an adhesive on the first surface; and

a layer of open-pore polyurethane foam on the adhesive, a surface of the polyurethane foam layer facing away from the microfiber nonwoven being split.

2. The synthetic leather as recited in claim 1 wherein the microfiber nonwoven is a split-fiber nonwoven.

3. The synthetic leather as recited in claim 2 wherein the split-fiber nonwoven has polyester or polyamide filaments or fibers.

4. The synthetic leather as recited in claim 1 wherein the adhesive layer comprises a thermosetting plastic.

5. The synthetic leather as recited in claim 4 wherein the thermosetting plastic is polyurethane.

6. The synthetic leather as recited in claim 1 wherein the open-pore polyurethane foam is made of aliphatic polyurethane.

7. A method for manufacturing a synthetic leather comprising the following steps:

applying an adhesive layer to a microfiber nonwoven;

applying a layer of open-pore polyurethane foam to the adhesive layer;

applying another adhesive layer to the open-pore polyurethane foam layer;

applying another microfiber nonwoven to the second adhesive layer; and

splitting the composite thus produced in an area of the open-pore polyurethane foam layer.

8. The method as recited in claim 7 further comprising napping the surfaces of the open-pore polyurethane foam layer produced by the splitting.

9. A back-injectable decorative material comprising the synthetic leather as recited in claim 1.

10. An automobile interior material comprising the synthetic leather as recited in claim 1.

11. An upholstering item of sitting furniture comprising the synthetic leather as recited in claim 1.

12. The upholstering item as recited in claim 11 wherein the sitting furniture is a car seat.

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