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(54) **METHOD FOR MAKING A COAGULATED FABRIC AND RELATIVE COAGULATED FABRIC**

(57) Described is a method for making a coagulated fabric, comprising the following steps of preparing a support fabric; applying a solution of water, polyurethane particles and surface-active substances on said support fabric; preparing a tank containing water and an acid compound and moving the support fabric in said tank, to obtain said coagulated fabric.

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## Description

**[0001]** This invention relates to a method for making a coagulated fabric.

**[0002]** The invention also relates to a relative coagulated fabric obtained using the above-mentioned method.

**[0003]** In particular, the invention relates to a method for making a spread coagulated fabric.

**[0004]** The term "spread coagulated fabric" means a base fabric (or support fabric) on which a layer of plastic material, for example polyurethane, is applied.

**[0005]** The application of the layer of plastic material allows the end product to be given new technical and aesthetic features.

**[0006]** Spread coagulated fabrics are widely used, for example, in the production of footwear, items of clothing or accessories, and more generally in the clothing, automotive or furnishing sectors.

**[0007]** There are currently various prior art methods for making spread coagulated fabrics.

**[0008]** The prior art teaches, for example, the making of these coagulated fabrics starting from the preparation of a solution of polyurethane and DMF "chips", that is to say, N, N-dimethylformamide.

**[0009]** The term "DMF" means in particular a well-known polar solvent used in these methods to produce a solution with the polyurethane, making the latter substantially soluble.

**[0010]** The known method comprises a step of impregnating or spreading a support fabric using the polyurethane and DMF solution, and then passing the impregnated or spread fabric in a tank of water and DMF.

**[0011]** When the fabric is in the bath of water and DMF, the DMF solvent of the starting solution is joined to the water, leaving only the polyurethane (plus any additives) on the support fabric.

**[0012]** This known method represents a good method for making coagulated fabrics, but is certainly not free of drawbacks.

**[0013]** A first major drawback is due to the fact that the solvent used in the above-mentioned method, that is to say, the DMF, has been declared to be not only toxic for humans, but also as carcinogenic.

**[0014]** This implies the strong need to avoid the use of this solvent for making the coagulated fabrics.

**[0015]** This negative feature therefore makes it necessary for the prior art methods to perform numerous washes before continuing with the finishing operations, in such a way as to eliminate or at least greatly reduce the percentage presence of DMF in the final product intended for the consumer.

**[0016]** The need to carry out numerous washes has as a further drawback the fact of consuming excessive quantities of water.

**[0017]** Moreover, another drawback of the prior art methods is due to the fact that the carcinogenicity of the DMF solvent forces the operators to carry out meticulous checks to detect the percentage of this solvent in the coagulated fabric.

**[0018]** This implies an increase of production times and consequent increases in production costs.

**[0019]** Another drawback of the prior art methods is due to the fact that the material used for making the above-mentioned coagulated fabrics is not very sustainable.

**[0020]** In addition, the DMF production waste is very complicated to dispose of.

**[0021]** The aim of this invention is therefore to provide a method for making a coagulated fabric and relative coagulated fabric which is able to overcome the drawbacks of the prior art.

**[0022]** Another aim of the invention is to provide a method for making a coagulated fabric and relative coagulated fabric which are simple and inexpensive to implement (method) and make (product).

**[0023]** Another aim of the invention is to provide a method for making a coagulated fabric and relative coagulated fabric which guarantee the use of materials which are sustainable and have a low environmental impact.

**[0024]** Another aim of the invention is to provide a method for making a coagulated fabric and relative coagulated fabric which is able to provide an optimum product both from a technical point of view and from an aesthetic point of view.

**[0025]** Another aim of the invention is to provide a method for making a coagulated fabric and relative coagulated fabric such as to guarantee total safety for an end user. According to the invention, these aims and others are achieved by a method for making a coagulated fabric and the relative coagulated fabric comprising the technical features described in the accompanying claims.

**[0026]** The technical features of the invention, with reference to the above-mentioned aims, are clearly described in the accompanying claims and its advantages are apparent from the detailed description which follows.

**[0027]** The method for making a coagulated fabric according to this invention, hereinafter also referred to simply as "method", comprises the step of preparing a support fabric.

**[0028]** The term "support fabric" is used to mean any fabric generated by an interlacing of threads of natural or synthetic origin.

**[0029]** The method according to the invention also comprises a step of applying a solution of water, polyurethane particles and surface-active substances on said support fabric, wherein the solution defines a basic environment.

**[0030]** The term "surface-active substances" refers to substances with a large emulsifying capacity.

**[0031]** In particular, the surface-active substances are partly polar and partly apolar.

**[0032]** The surface-active part of these surface-active substances attaches itself to the polyurethane particles (neutral base) making them charged.

**[0033]** In this way, these charged polyurethane particles disperse in the water floating, instead of stabilising on the bottom as would occur without the use of the surface-active substances.

**[0034]** Advantageously, the above-mentioned step of applying the solution comprises a step of preparing a first tank containing the solution of water, polyurethane particles and surface-active substances.

**[0035]** Advantageously, a plurality of additives are also added to the solution, for example having a colouring, thickening and/or spreading effect.

**[0036]** The step of applying the solution also comprises a step of moving the support fabric in the first tank in such a way as to impregnate the support fabric with the above-mentioned solution.

**[0037]** Alternatively, the step of applying the solution comprises a step of spreading the support fabric with the above mentioned solution of water, polyurethane particles and surface-active substances.

**[0038]** The method according to the invention also comprises a step of preparing a second tank containing water and an acid compound, wherein the second tank defines an acid environment.

**[0039]** Advantageously, the acid compound comprises citric acid. Advantageously, the acid compound, in particular the citric acid, has the further effect of keeping the second tank clean, being in effect a bactericidal, avoiding the need to perform numerous successive washes, as is the case, for example, with the prior art methods.

**[0040]** The citric acid is also clearly non-toxic for humans, either during production or, even less so, if present in the finished product.

**[0041]** The method according to this invention comprises a step of moving the support fabric in the second tank to an acid environment.

**[0042]** In this way, the passage from the basic environment to the acid environment allows the stable attachment of polyurethane particles on the support fabric, to obtain a coagulated fabric by precipitation due to the variation of pH.

**[0043]** Substantially, the dispersion in water of the polyurethane particles is stable whilst the solution is of the basic type, whilst it destabilises when the pH is lowered suddenly, passing to an acid environment.

**[0044]** The term "pH" means a physical quantity indicating the acidity and the basicity of gaseous and liquid solutions. The coagulated fabric obtained therefore comprises the support fabric and a plastic layer defined by polyurethane particles.

**[0045]** The method according to this invention also comprises a step of finishing the coagulated fabric.

**[0046]** The finishing step comprises a step of spreading a further layer of hydroalcoholic-based polyurethane on the coagulated fabric.

**[0047]** This makes it possible to define in an optimum manner the colour of the finished product and make it pleasant to the touch.

**[0048]** The finishing step also comprises a step of printing a graphical pattern on the coagulated fabric.

**[0049]** Advantageously, the printing step is performed in a digital manner.

**[0050]** Alternatively, the printing step is performed by means of printing cylinders.

**[0051]** The finishing step comprises a step of embossing the coagulated fabric.

**[0052]** This embossing step makes it possible to form protrusions on the coagulated fabric and to give it a desired degree of sheen and roughness.

**[0053]** The invention also relates to a coagulated fabric made using the method described above.

**[0054]** The coagulated fabric according to this invention comprises a support fabric and a first plastic layer defined by the above-mentioned polyurethane particles.

**[0055]** The first plastic layer is stabilised on the support fabric.

**[0056]** Advantageously, the coagulated fabric according to the invention comprises a second plastic layer of alcoholic-based polyurethane.

**[0057]** The term "alcoholic-based polyurethane" means a polyurethane dissolved in alcohol with a high molecular weight, for example greater than 80 grams\mole (g\mol). For example, alcoholic-based polyurethanes which can be used in this invention are: methoxypropanol, dipropylene methyl ether, dimethyl carbonate.

**[0058]** The second plastic layer is stabilised on the first plastic layer.

**[0059]** Advantageously, moreover, the coagulated fabric comprises a graphical pattern made on the above-mentioned second plastic layer.

**[0060]** Advantageously, the second plastic layer has a rough upper surface.

**[0061]** The method for making a coagulated fabric and relative coagulated fabric according to the invention overcome the above-mentioned drawbacks and achieve important advantages.

**[0062]** The first advantage achieved by the method for making a coagulated fabric and relative coagulated fabric according to the invention is due to the fact that a production process and an end product are provided such as to guarantee total safety for an end user, since the method does not comprise the use of harmful substances.

**[0063]** A further advantage achieved by the method for making a coagulated fabric and relative coagulated fabric according to the invention is due to the fact of providing a process which comprises the use of sustainable raw materials and such as to considerably reduce the environmental impact compared with the prior art processes and products.

**[0064]** Moreover, the method for making a coagulated fabric and relative coagulated fabric according to this invention allow an optimum product to be provided both from a technical and aesthetic point of view, greatly limiting water consumption compared with the prior art, thus reducing the waste and the production costs.

## Claims

1. A method for making a coagulated fabric, comprising the following steps:

   - preparing a support fabric;
   - applying a solution of water, polyurethane particles and surface-active substances on said support fabric, said solution forming a basic environment;

   the step of applying the water solution comprising the steps of:

   - preparing a first tank containing the first solution;
   - moving said support fabric through said first tank;
   - preparing a second tank containing water and an acid compound, said second tank defining an acid environment;
   - moving said support fabric in said second tank, in such a way that the passage from said basic environment of said first tank to said acid environment of said second tank allows the stable attachment of said polyurethane particles on said support fabric to obtain said coagulated fabric by precipitation with variation of pH.

2. The method according to claim 1, **characterised in that** said step of applying said substance comprises the step of spreading said support fabric with said solution of water, polyurethane particles and surface-active substances.

3. The method according to any one of the preceding claims, **characterised in that** said step of preparing a tank containing water and an acid compound comprises the step of preparing citric acid.

4. The method according to any one of the preceding claims, **characterised in that** it comprises a step of finishing said coagulated fabric.

5. The method according to the preceding claim, **characterised in that** said finishing step comprises the step of spreading a further alcoholic-based layer of polyurethane on the coagulated fabric.

6. The method according to the preceding claim, **characterised in that** said finishing step comprises the step of printing a graphical pattern on said coagulated fabric.

7. The method according to the preceding claim, **characterised in that** said printing step is performed in a digital manner, by means of printing cylinders or by means of a step of embossing said coagulated fabric.

8. A coagulated fabric made using the method according to claims 1 to 7.

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# EUROPEAN SEARCH REPORT

Application Number
EP 24 18 0262

## DOCUMENTS CONSIDERED TO BE RELEVANT

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| Y | CN 113 152 114 B (JIANGXI MINGCHUAN SCIENCE AND TECH INDUSTRIAL CO LTD)<br>16 May 2023 (2023-05-16)<br>* example 1 and 2 *<br>* claim 1 * | 5-7 | |
| A | US 2023/167602 A1 (HAAKMEESTER BRIAN [NL] ET AL) 1 June 2023 (2023-06-01)<br>* paragraph [0022] *<br>* paragraph [0030] *<br>* paragraph [0035] *<br>* paragraph [0049] *<br>* paragraphs [0051] - [0053] *<br>* figure 3 *<br>* claims 1, 2, 6, 15, 20, 21 * | 1-8 | TECHNICAL FIELDS SEARCHED (IPC)<br>D06N |
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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 |
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| The Hague | 27 September 2024 | Rella, Giulia |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 18 0262

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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