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(54) **Laminated fire retardant upholstery fabric**

(57) The present invention relates to a laminated fire retardant upholstery fabric comprising an outer textile layer, an intermediate water repellent and/or water impervious membrane or film layer, and an inner flame retardant coating layer. The laminated fire retardant uphol-

stery fabric is used for upholstering furniture and cushions which find application in particular in e.g. nursing homes, hospitals, geriatric institutions, marine and shipping.

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Description

Field of the invention

[0001] The present invention relates to a laminated fire retardant upholstery fabric that useful for rendering upholstered articles, e.g. chairs, cushions and cushioned seats fire retardant as well as water repellent or water impervious.

Background of the invention

[0002] Currently, there is heightened awareness of fire prevention in homes, boats and geriatric institutions. This awareness has led to new standards and legislation directed to reducing the risk of fires, particularly with respect to upholstery and upholstered articles. Conventional fire prevention techniques for upholstery and upholstered articles usually involve the topical application of environmentally unfriendly or even poisonous flame retardant chemicals directly to an outer decorative layer of upholstery material.

[0003] US 4.256.786, for example, discloses an aqueous, chemical protective, fire retardant composition for a polyurethane foam or a textile laminate comprising a phosphoric acid releasing fire retarding agent and an acrylic binder.

[0004] US 4.806.185 discloses the use of a latex comprising heat conductive metal particles so that a coating of this latex has an improved heat dissipation.

[0005] US 5.102.701 discloses the use of a mixture of bromochlorinated paraffins and antimony oxide comprising an acrylic binder.

[0006] Another technique employed in the art is to provide a laminated fabric comprising a fire retardant layer. For example, GB A 2.231.789 discloses a seating upholstery fabric comprising a fire retardant inner layer (when the fabric is applied to the seat) comprising needled polyacrylate fibres. A similar seating upholstery fabric is disclosed in US 5.405.178, wherein said fabric comprises a flame-proof layer of an open-cell resilient plastic foam impregnated with a liquid flame-proofing agent, such as powdered melamine resin or aluminium hydroxide.

[0007] US 2005/0095936 discusses these prior art techniques and the disadvantages thereof. US 2005/0095936 says to provide an improved fire retardant laminate comprising a three-layer structure. This three-layer structure comprises a layer of ticking fabric, a layer of flame and heat retardant cushioning material and a layer of backing fabric. All three layers may comprise fire retardant fibres. Alternatively, the cushioning layer may be composed of thermoplastic fibres that are impregnated with a fire retardant chemical. The ticking layer may also comprise non-fire retardant fibres in which case it is coated with flame retardant chemicals.

[0008] However, the laminated fire retardant fabrics of the prior art have the disadvantage that they are not water repellent and/or water impervious, a property highly ap-

preciated in environments where the spoiling of water and aqueous compositions such as beverages is likely to occur, e.g. nursing homes, hospitals.

Summary of the invention

[0009] The present invention relates to a laminated fire retardant upholstery fabric comprising:

- (a) an outer textile layer;
- (b) an intermediate water repellent or water impervious membrane or film layer; and
- (c) an inner flame retardant coating layer.

Detailed description of the invention

[0010] In this document and in its claims, the verb "to comprise" and its conjugations is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. In addition, reference to an element by the indefinite article "a" or "an" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

The indefinite article "a" or "an" thus usually means "at least one".

[0011] According to the invention, the term "outer" and "inner" are used to indicate the structure of the fabric when applied to upholstered articles, that is when applied the textile layer is observable from the outside. Obviously, the flame retardant coating layer is not observable from the outside.

[0012] According to the invention, the outer textile layer is preferably a woven or knitted textile layer comprising fibres of natural or synthetic origin or a mixture thereof. Natural fibres comprise for example wool and cotton. Synthetic fibres comprise for example polyester, polypropylene, viscose and polyacrylates.

[0013] The intermediate water repellent or water impervious membrane or film layer can be applied on the textile layer by laminating, coating or spraying techniques.

[0014] If the intermediate layer is applied by lamination, it is preferred that an adhesive based on a moisture curable polyurethane prepolymer composition is used, wherein the prepolymer composition is applied under conditions of a relative humidity of at least 30%, more preferably at least 50%, even more preferably at least 75% and in particular at least 90%. The polyurethane prepolymer composition is applied on a web of the textile layer by e.g. spraying or by using a screen, a doctor blade or a knife.

[0015] The polyurethane prepolymer composition can be a solution having a solids content of 10 wt. - 50 wt.% of the polyurethane prepolymer. However, it is preferred that the composition has a solids content of about 100 wt.%. These percentages are calculated on the total weight of the polyurethane prepolymer.

[0016] The polyurethane prepolymer composition has preferably a Brookfield viscosity of 1200 mPa.s (80°C) to 14.000 mPa.s (130°C), more preferably of 1300 mPa.s (80°) to 13.000 mPa.s (130°C). The polyurethane prepolymer composition preferably comprises a free isocyanate content of 0,1 to 3,0%, in particular of 0,5 to 2,0%.

[0017] The density of the polyurethane prepolymer composition is preferably 1.05 to 1.25 g/m³, more preferably 1.10 to 1.20 g/cm³.

[0018] The web of the textile layer is preferably provided with the polyurethane prepolymer composition at a dose of 0.5 to 40 g/m², in particular of 1,0 to 25 g/m².

[0019] According to the invention, the intermediate water repellent or water impervious membrane or film layer comprises a thermoplastic material which is preferably selected from the group consisting of polyurethanes, polyesters, polyethyleneterephthalates, polyvinylchlorides and combinations thereof. According to this embodiment, the thermoplastic material is in the form of a film which is applied by lamination, preferably by using the adhesive comprising the polyurethane prepolymer composition described above.

[0020] The intermediate water repellent or water impervious membrane or film layer can also be applied by coating, wherein the coating comprises a polyurethane or a polyester.

[0021] According to the invention, the (inner) flame retardant coating layer comprises a polyurethane, an acrylate or a methacrylate homopolymer or copolymer, optionally in combination with environmentally friendly non-poisonous flame retarding chemicals. These flame retarding chemicals can be added by impregnation, finishing or coating. Alternatively, the flamer retardant coating layer may comprise flame retardant fibrous materials or flame retardant fibres, e.g. glass fibres or polypropylene fibres. According to a preferred embodiment, the flame retardant coating layer comprises a foam coating.

[0022] The laminated fire retardant upholstery fabric according to the present invention has in general a weight of 250 - 750 g/m² and is used with a width of about 130 - 150 cm.

[0023] The laminated fire retardant upholstery fabric is furthermore characterized by a tensile strength of more than 40 N as determined according to ISO 13937-5, preferably more than 80. N and in particular more than 100N. The tensile strength is determined using a ballistic pendulum method (Elmendorf).

[0024] The seam resistance of the laminated fire retardant upholstery fabric is less than 4 mm as determined according to ISO 13936-2, preferably less than 3 mm and in particular less than 2 mm. The seam resistance or slippage resistance of yarns at a seam in woven fabrics is measured with the fixed load method.

[0025] The Martindale abrasion of the laminated fire retardant upholstery fabric is more than 35000 rubs, preferably more than 50000 rubs. The Martindale abrasion test is performed according to DIN 61010-98. In the Martindale abrasion test a special test apparatus is used that

is for example available from Qualitest International Inc., Canada. This test apparatus is primarily designed to determine the abrasion resistance of fabrics of all types including fabrics used by the shoe industry. Hence, woven, nonwoven, knit apparel, household and industrial fabrics can be subjected to this test. The abrasion resistance is measured by subjecting a specimen to a rubbing motion in the form of a geometric figure. Resistance to abrasion is evaluated by various means, including comparison to visual aids in the form of photographs or actual samples.

[0026] Changes in the surface of a fabric during processing, use, and care can be as obvious as loss of structural integrity due to abrasion or as subtle as for example pilling or apparent changes in colour and texture. Pilling, although less likely to affect a textile's functional performance, frequently results in consumer dissatisfaction and subsequent disposal of textile products long before they reach the end of their useful wear life. In this document pills are defined as bunches or balls of tangled fibres which are held to the surface of a fabric by one or more fibres whereas pilling resistance is the resistance to the formation of pills on the surface of a textile fabric. The laminated fire retardant upholstery fabric according to the present invention has a rating in the pilling test according to ISO 105X12 of more than Grade 3, preferably more than Grade 4 and in particular more than Grade 5.

[0027] The laminated fire retardant upholstery fabric should pass the fire retardancy test according to BS 5852 Part 2, crib-5, and/or to DIN 4102 B2. The BS 5852 Part 2, crib-5, test is used for testing the ignitability of upholstered composites for seating, e.g. furniture and furnishings wherein the test specimen is subjected to a smouldering cigarette. A cleaned test specimen together with a standard untreated flexible cellular polyurethane foam filling material is mounted on a test rig constructed to simulate the seat and back or seat and arm of a typical chair. A smouldering cigarette of specified characteristics is placed between the horizontal and vertical portions of the test rig and the ignitability of the covering and filling materials observed. The extent of any damage which may occur in length, width and depth is recorded for both horizontal and vertical assemblies. The test specimen passes this test when it does not exhibit either progressive smouldering ignition or flaming ignition when tested

[0028] In the DIN 4102 B2 test, the ignitability of the laminated fire retardant upholstery fabric is tested inside a test chamber or fire cabinet where the test specimen is mounted vertically. The test specimen is subjected to the edge and/or surface exposure from a gas flame. During the test, the time of ignition, burning droplets and whether the flames reach the top marking of the test specimen within the prescribed time period is registered.

[0029] Resistance to micro-organisms (mildew fungi) of fabrics is tested because of the hazards that may be caused to humans. In the DIN 53931 test, the fabric is directly exposed to the action of micro-organisms result-

ing in the deterioration of fabric functional properties. The growth of micro-organisms in textiles can bring about allergic reactions, irritations of mucous tunic of nose, throat, eyes and intensify symptoms of asthma. Therefore, manufacturers who want to offer textile products with the highest quality and to ensure that the offered goods pose no hazard to users, have usually their products assessed for the action of micro-organisms. The laminated fire retardant upholstery fabric according to the present invention should also pass the DIN 53931 test.

[0030] Another important property of the laminated fire retardant upholstery fabric according to the present invention is its waterproofness. The waterproofness is determined according to ISO 811 and the water column level is preferably more than 7 m, more preferably more than 10 m.

[0031] The laminated fire retardant upholstery fabric according to the present invention is in particular suitable for upholstering furniture and cushions, in particular those that are in use in nursery homes, geriatric institutions, marine and shipping.

Claims

1. Laminated fire retardant upholstery fabric comprising:

- (a) an outer textile layer;
- (b) an intermediate water repellent and/or water impervious membrane or film layer; and
- (c) an inner flame retardant coating layer.

2. Laminated fire retardant upholstery fabric according to claim 1, wherein the outer textile layer is a woven or knitted textile layer.

3. Laminated fire retardant upholstery fabric according to claim 1 or claim 2, wherein the intermediate water repellent or water impervious membrane or film layer comprises a thermoplastic material.

4. Laminated fire retardant upholstery fabric according to claim 3, wherein the thermoplastic material is selected from the group consisting of polyurethanes, polyesters, polyethyleneterephthalates, polyvinylchlorides and combinations thereof.

5. Laminated fire retardant upholstery fabric according to claim 1 or claim 2, wherein the intermediate water repellent or water impervious membrane or film layer is formed by coating.

6. Laminated fire retardant upholstery fabric according to claim 5, wherein the coating comprises a polyurethane or a polyester.

7. Laminated fire retardant upholstery fabric according to claim 1 or claim 2, wherein the inner flame retardant coating layer comprises a polyurethane, an acrylate or a methacrylate homopolymer or copolymer.

8. Laminated fire retardant upholstery fabric according to claim 6 or claim 7, wherein the coating is a foam coating.

9. Laminated fire retardant upholstery fabric according to any one of claims 1 - 8 having a tensile strength of more than 40 N as determined according to ISO 13937-5.

10. Laminated fire retardant upholstery fabric according to any one of claims 1 - 9 having a seam resistance of less than 4 mm as determined according to ISO 13936-2.

11. Laminated fire retardant upholstery fabric according to any one of claims 1 - 10 having a Martindale abrasion of more than 35000 rubs according to DIN 61010-98.

12. Laminated fire retardant upholstery fabric according to any one of claims 1-11 having a rating in the pilling test according to ISO 105X12 of more than Grade 3.

13. Laminated fire retardant upholstery fabric according to any one of claims 1 - 12 having a water column level of more than 7 m according to ISO 811.

14. Use of the laminated fire retardant upholstery fabric according to any one of claims 1 - 13 for upholstering furniture and cushions.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 6288

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Place of search The Hague		Date of completion of the search 20 October 2006	Examiner Hillebrand, Gerhard
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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