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(54) **Method of manufacturing a laminated foam article, foam article thus obtained and the use thereof**

Verfahren zur Herstellung eines geschäumten Verbundkörpers, der dadurch enthaltene Schaumkörper und seine Verwendung.

Méthode pour la fabrication d'un article en mousse stratifié, article en mousse ainsi obtenu et son utilisation.

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**EP-A- 0 047 086**
**EP-A- 0 305 219**
**CH-A- 431 048**
**DE-A- 19 915 314**
**DE-C- 19 517 702**
**GB-A- 1 250 479**

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## Description

**[0001]** The present invention relates to a method of manufacturing a laminated foam article, as well as to a laminated foam article obtained by using such a method. The present invention furthermore relates to the use of such a foam article.

**[0002]** The method referred to in the introduction is known per se from German Offenlegungsschrift DE 199 15314, wherein an upper foil comprising a layer based on a mixture of (meth)acrylate rubber and EVA having a layer thickness of 50 - 150 μm is laminated onto a lower foil based on a mixture of PP block copolymer and LLDPE by co-extrusion at a temperature of 200 °C for the upper foil and 260 °C for the lower foil, the joint thickness of said upper and said lower foil amounting to 0.3 - 1.5 mm. A composite layer thus obtained may be directly adhered to a substrate or be adhered to a foam layer by using an adhesive layer, which foam layer has a thickness of 2 - 3 mm. The laminated material thus obtained may be used as an instrument panel, a side wall member or as a door upholstery material for motorcars.

**[0003]** A method of manufacturing a laminated foam article is furthermore known from European patent application No. 0 305 219, wherein an adhesive is applied to one surface of a compressible foam layer, after which the adhesive-coated surface is contacted with a layer of a cover material for forming a so-called bilayer. Subsequently the layer of cover material is contacted with a heated die, with regions of the foam layer being compressed under the influence of pressure and heat, which compressed regions will melt and contract, as a result of which a relief pattern is formed in the bilayer. Such a laminated foam article can subsequently be cut to the desired length and be used for a number of purposes, such as seat cushions, back cushions and the like. Materials suitable for use as a cover material include both synthetic and natural fabrics, blown or cast films, or animal skins and the like, with the special selection of the cover material being determined by the intended end use of the laminate product. The relief pattern is formed for decorative reasons. One drawback of such a method is the fact that an adhesive is required for durably bonding the cover material to the foam substrate. The use of an adhesive requires that the substrate be coated with a thin layer of adhesive over the entire surface area thereof, so that no regions are formed in which an inadequate bond to the supporting surface is obtained. An additional drawback of the use of an adhesive is the fact is that there is a risk of the adhesive on the foam article becoming visible through the cover material in time if cover materials in light colours are used, which is undesirable, in particular when the material is used for seat cushions. It can be noted in this connection that if an intricately shaped foam article is used, which foam article not only has right-angled parts but also irregularly curved parts, the material with which the foam article is to be covered is insufficiently capable of enveloping the geometric shapes of the foam article, resulting in the formation of creases, wrinkles and the like, which users generally experience as undesirable.

**[0004]** From German Patentschrift DE 195 17 702 C1 there is known an aqueous dispersion which is used as a lubricant to facilitate the provision of upholstery material on a polyurethane foam article. Such a lubricant is preferably applied by means of a spray gun, and a film of lubricant is formed on the foam part, which facilitates the provision of upholstery material in a next step, and wherein furthermore the occurrence of the well-known unpleasant "creaking sounds" of upholstery materials is prevented.

**[0005]** From Swiss Patentschrift No. 431 048 there is known a method of coating polyurethane foam with a homogeneous layer of polyurethane, which material is used as a sole material, e.g. for sports shoes.

**[0006]** From British patent No. 1 250 479 there is known a sound-absorbing material comprising a flexible polyurethane foam having adhered to its surface a microporous film of an elastomer, preferably a polyurethane. A sound-absorbing material thus obtained may be used in buildings and in automobiles, for example.

**[0007]** European patent application No. 0 047 086 relates to a resilient foam material which has been rendered flame retardant by coating the foam material with a special vinylidene chloride polymer.

**[0008]** From the present applicant's prior Dutch patent application No. 9300960 there is known a couch provided with movable back cushions, wherein a cushion is movably connected to the frame, to which frame a rail is connected, and wherein the cushion comprises at least one element that mates with said rail for guiding the cushion along the rail. Further details with regard to the method of manufacturing such a cushion are not mentioned in said document.

**[0009]** One aspect of the present invention is to provide a method of manufacturing a laminated foam article, which foam article does not have the aforesaid drawbacks.

**[0010]** Another aspect of the present invention is to provide a method of manufacturing a laminated foam article, which foam article is composed of at least two durably bonded-together layers, the outer layer of which can be provided in any desired colour.

**[0011]** Yet another aspect of the present invention is to provide a method of manufacturing a laminated foam article, which foam article is ready for use as a piece of furniture without the stitching of separate materials and the subsequent covering of the foam article therewith by an upholsterer being required.

**[0012]** Another aspect of the present invention is to provide a laminated foam article having the appearance of a foam material enveloped in an upholstery material, which can furthermore be cleaned by means of a moist cloth.

**[0013]** One aspect of the present invention is furthermore to provide a laminated foam article wherein the con-

struction and the structure of layers is such that frequent compression and springing back of the laminated foam article will not result in the formation of cracks in the laminated foam article.

**[0014]** The method comprises the following steps:

i) the provision of a foam substrate,
ii) the application of a thermoplastic film to the foam substrate, and is characterized by step iv) and step v), which comprise:
iv) the application of a layer of a plastic dispersion to the thermoplastic film as obtained in step ii), and
v) the application of the elastomeric coating to the layer of a plastic dispersion as obtained in step iv).

**[0015]** In such an embodiment the laminated foam article will comprise three layers, viz. a first thermoplastic film, a second layer of a plastic dispersion and a third elastomeric coating. The second layer of a plastic dispersion in particular functions to give the final foam article a full sensation and a rich aura.

**[0016]** It is in particular preferable to apply the thermoplastic film in a thickness of 2-8 μm, with a thickness of about 4 μm being especially preferred.

**[0017]** It is furthermore preferable to apply the elastomeric coating in a thickness of 10-50 μm, with a thickness of 30 μm being especially preferred.

**[0018]** It is furthermore preferable to apply the layer of a plastic dispersion in a thickness of 20-100 μm, with a thickness of 60 μm being especially preferred.

**[0019]** An advantageous effect of the use of the aforesaid layer thicknesses is that the physical characteristics of the foam substrate, in particular the flexibility thereof, are retained, which is very important, e.g. when the substrate is used to form a piece of furniture.

**[0020]** The layers that are separately applied in the present method exhibit an elasticity and mutual compatibility such that no cracks will form therein upon compression and springing back, not even after prolonged intensive use.

**[0021]** The foam substrate as used in step i) of the present method is preferably a polyurethane-based foam. Polyurethane is a polymer which is obtained through condensation of a polyisocyanate and a hydroxyl-containing material, generally a polyol. In order to make polyurethane "foam" for the purpose of forming a polyurethane foam, a bubble formation reaction is induced through the use of a blowing agent. The blowing agent may comprise one or more substances which evaporate during the reaction between polyisocyanate and polyol, such as a fluorocarbon compound, or the blowing agent may chemically react with the isocyanate to form a gas, such as the reaction of water with isocyanate, as a result of which carbon dioxide is released, which carbon dioxide functions as a blowing agent. It is in particular desirable for the polyurethane foam to have a density in the 15-75 kg/m$^3$ range.

**[0022]** The thermoplastic film applied in step ii) of the present invention is preferably a polyurethane-based thermoplastic film. The thermoplastic film in particular functions to seal the pores and openings that are present in the foam substrate. After the thermoplastic film has been applied to the foam substrate, the pores and openings that are present in the foam substrate are completely sealed, so that the layer to be subsequently applied to the thermoplastic film cannot enter the substrate foam. In addition to that, the thermoplastic film must be considered to be an intermediate layer or support layer for each layer to be additionally applied. Such a thermoplastic layer is in particular desirable in order to retain the springing characteristics of the substrate. In addition, the thermoplastic layer will be capable of maintaining a durable bond with the substrate, because of the plastic nature of such a layer.

**[0023]** Furthermore it is desirable to use a polyurethane-based, 2-component elastomer composition as the elastomeric coating.

**[0024]** Furthermore it is desirable in specific embodiments to add one or more components selected from the group consisting of liquefiers, pigments, solvents and crosslinking enhancers to the composition for forming the thermoplastic film. In addition it is desirable in specific embodiments to add one or more components selected from the group consisting of liquefiers, pigments, solvents, crosslinking enhancers, UV light-absorbing agents and flame retardants to the composition for forming the elastomeric coating.

**[0025]** Since a foam substrate having irregular geometric shapes is generally used in step i) in practice, steps ii) ,iv) and v) are preferably carried out by spraying. Since each layer is separately applied by means of a spray gun, it is possible to provide all the places on the substrate that are difficult of access with a layer.

**[0026]** The present invention furthermore relates to a laminated foam article built up of, successively, a foam substrate, a thermoplastic film and an elastomeric coating, wherein a layer of a plastic dispersion is present between said thermoplastic film and said elastomeric coating.

**[0027]** The laminated foam article obtained by using the present method is in particular used in a situation in which an element of a slightly resilient nature is required, in particular in the field of pieces of furniture, in which connection couches, footstools, chairs, headrests and footrests, bean-bag seats, as well as playground equipment and cushions for chairs are to be considered. The chairs based on the present laminated foam article are suitable for use as desk chairs or conference chairs, but also as chairs for handicapped people. In addition, the present laminated foam article is also suitable for use in wet spaces, for example as a toilet mat, a bathroom mat or shower mat, a shower stool, a bathtub, a water bed rim or a head support in a bathtub. The laminated foam article obtained by using the present method may also be mounted on a rigid support, which, after being fitted with associated legs and possibly with a backrest and

armrests, can be used as a chair. It is also possible, however, to form a construction, especially a piece of furniture, in particular a chair, substantially entirely from the laminated foam article.

## Claims

1. A method of manufacturing a laminated foam article, comprising

   i) the provision of a foam substrate, and
   ii) the application of a thermoplastic film to the foam substrate,
   **characterized in that** step iv) and step v) are carried out which comprise:
   iv) the application of a layer of a plastic dispersion to the thermoplastic film as obtained in step ii), and
   v) the application of the elastomeric coating to the layer of a plastic dispersion as obtained in step iv).

2. A method according to claim 1, **characterized in that** the thermoplastic film is applied in a thickness of 2-8 μm.

3. A method according to any one of the preceding claims, **characterized in that** the elastomeric coating is applied in a thickness of 10-50 μm.

4. A method according to any one of the preceding claims, **characterized in that** the layer of a plastic dispersion is applied in a thickness of 20-100 μm

5. A method according to any one of the preceding claims, **characterized in that** a polyurethane-based foam is used as the foam substrate.

6. A method according to claim 5, characterizes in that the polyurethane foam has a density in the 15-75 $kg/m^3$ range.

7. A method according to any one of the preceding claims, **characterized in that** the thermoplastic film is a polyurethane-based thermoplastic film.

8. A method according to any one of the preceding claims, **characterized in that** a polyurethane-based, 2-component elastomer composition is used as the elastomeric coasting.

9. A method according to any one of the preceding claims, **characterized in that** one or more components selected from the group consisting of liquefiers, pigments, solvents and crosslinking enhancers are added to the composition for forming the plastic film.

10. A method according to any one of the preceding claims, **characterized in that** one or more components selected from the group consisting of liquefiers, pigments, solvents, crosslinking enhancers, UV light-absorbing agents and flame retardants are added to the composition for forming the elastomeric coating.

11. A method according to any one of the preceding claims, **characterized in that** one or more of the steps ii), iv) and v) are carried out by spraying.

12. A laminated foam article built up of, successively, a foam substrate, a thermoplastic film and an elastomeric coating, **characterized in that** a layer of a plastic dispersion is present between said thermoplastic film and said elastomeric coating.

13. A laminated foam article according to claim 12, **characterized in that** said thermoplastic film has a layer thickness of 2-8 μm.

14. A laminated foam article according to claim 12 or 13, **characterized in that** said elastomeric coating has a layer thickness of 10-50 μm.

15. A laminated foam article according to any of claim 12-14, **characterized in that** said layer of a plastic dispersion has a layer thickness of 20-100 μm.

16. Use of a laminated foam article according to any one or more of the claims 12-15 as a piece of furniture.

17. Use of a laminated foam article according to any one or more of the claims 12-15 as a cushion.

18. Use of a laminated foam article according to any one or more of the claims 12-15 as a playground apparatus.

19. Use of a laminated foam article according to any one or more of the claims 12-15 as a mat in a wet space.

20. Use of a laminated foam article according to any one or more of the claims 12-15 as a bathtub.

## Patentansprüche

1. Verfahren zur Herstellung eines laminierten Schaumartikels, umfassend:

   i) die Bereitstellung eines Schaumsubstrats;
   ii) das Aufbringen eines thermoplastischen Films auf dem Schaumsubstrat;
   **dadurch gekennzeichnet, dass** Schritt iv) und Schritt v) ausgeführt werden, die Folgendes umfassen:

iv) das Auftragen einer Schicht aus einer Kunststoffdispersion auf den thermoplastischen Film, der in Schritt ii) erhalten wurde, und
v) das Auftragen der elastomeren Beschichtung auf die Schicht aus einer Kunststoffdispersion, die in Schritt iv) erhalten wurde.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der thermoplastische Film in einer Dicke von 2 bis 8 μm aufgetragen wird.

3. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die elastomere Beschichtung in einer Dicke von 10 bis 50 μm aufgetragen wird.

4. Verfahren nach einem oder mehr der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Schicht aus einer Kunststoffdispersion in einer Dicke von 20 bis 100 μm aufgetragen wird.

5. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Schaum auf Polyurethanbasis als Schaumsubstrat verwendet wird.

6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, dass** der Polyurethanschaum eine Dichte im Bereich von 15 bis 75 kg/m$^3$ aufweist.

7. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der thermoplastische Film ein thermoplastischer Film auf Polyurethanbasis ist.

8. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Zweikomponenten-Elastomer-Zusammensetzung auf Polyurethanbasis als elastomere Beschichtung verwendet wird.

9. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** eine oder mehr Komponenten, ausgewählt aus der Gruppe bestehend aus Verflüssigern, Pigmenten, Lösemitteln und Vernetzungsverstärkern, der Zusammensetzung hinzugefügt werden, um den thermoplastischen Film zu bilden.

10. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** eine oder mehr Komponenten, ausgewählt aus der Gruppe bestehend aus Verflüssigern, Pigmenten, Lösemitteln, Vernetzungsverstärkern, UV-Licht absorbierenden Mitteln und Flammhemmstoffen, der Zusammensetzung zur Bildung der elastomeren Beschichtung hinzugefügt werden.

11. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** einer oder mehrere der Schritte ii), iv) und v) durch Sprühen ausgeführt werden.

12. Laminierter Schaumartikel, der der Reihe nach aus einem Schaumsubstrat, einem thermoplastischen Film und einer elastomeren Schicht aufgebaut ist, **dadurch gekennzeichnet, dass** eine Schicht aus einer Kunststoffdispersion zwischen dem thermoplastischen Film und der elastomeren Beschichtung vorhanden ist.

13. Laminierter Schaumartikel nach Anspruch 12, **dadurch gekennzeichnet, dass** der thermoplastische Film eine Schichtdicke von 2 bis 8 μm aufweist.

14. Laminierter Schaumartikel nach Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die elastomere Beschichtung eine Schichtdicke von 10 bis 50 μm aufweist.

15. Laminierter Schaumartikel nach einem der Ansprüche 12 bis 14, **dadurch gekennzeichnet, dass** die Schicht aus einer Kunststoffdispersion eine Schichtdicke von 20 bis 100 μm aufweist.

16. Verwendung eines laminierten Schaumartikels nach einem oder mehreren der Ansprüche 12 bis 15 als Möbelstück.

17. Verwendung eines laminierten Schaumartikels nach einem oder mehreren der Ansprüche 12 bis 15 als Polster.

18. Verwendung eines laminierten Schaumartikels nach einem oder mehreren der Ansprüche 12 bis 15 als Spielgerät.

19. Verwendung eines laminierten Schaumartikels nach einem oder mehreren der Ansprüche 12 bis 15 als Matte in einem Nassraum.

20. Verwendung eines laminierten Schaumartikels nach einem oder mehreren der Ansprüche 12 bis 15 als Badewanne.

**Revendications**

1. Procédé de fabrication d'un article en mousse stratifié, comprenant les étapes suivantes :

i) prendre un substrat en mousse ;
ii) et appliquer sur ce substrat en mousse un film de matériau thermoplastique ;
**caractérisé en ce que** sont effectuées les étapes (iv) et (v) :

iv) appliquer, sur le film de matériau thermoplastique obtenu lors de l'étape (ii), une couche de dispersion de matière plastique ;
v) et appliquer, sur la couche de dispersion de matière plastique obtenue lors de l'étape (iv), un revêtement de matériau élastomère.

**2.** Procédé conforme à la revendication 1, **caractérisé en ce que** le film de matériau thermoplastique appliqué est épais de 2 à 8 μm.

**3.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce que** le revêtement de matériau élastomère appliqué est épais de 10 à 50 μm.

**4.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce que** la couche de dispersion de matière plastique appliquée est épaisse de 20 à 100 μm.

**5.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce qu'**on utilise, en tant que substrat en mousse, une mousse à base de polyuréthane.

**6.** Procédé conforme à la revendication 5, **caractérisé en ce que** ladite mousse à base de polyuréthane présente une masse volumique de 15 à 75 kg/m$^3$.

**7.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce que** le film de matériau thermoplastique est un film de matériau thermoplastique à base de polyuréthane.

**8.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce qu'**on utilise, en tant que revêtement de matériau élastomère, une composition d'élastomère à deux composants et à base de polyuréthane.

**9.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce qu'**on ajoute, à la composition employée pour former le film de matière plastique, un ou plusieurs composants choisis dans l'ensemble formé par les agents liquéfiants, les pigments, les solvants et les promoteurs de réticulation.

**10.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce qu'**on ajoute, à la composition employée pour former le revêtement de matériau élastomère, un ou plusieurs composants choisis dans l'ensemble formé par les agents liquéfiants, les pigments, les solvants, les promoteurs de réticulation, les agents absorbant le rayonnement ultraviolet et les agents ignifugeants.

**11.** Procédé conforme à l'une des revendications précédentes, **caractérisé en ce qu'**une ou plusieurs des étapes (ii), (iv) et (v) sont réalisées par pulvérisation.

**12.** Article en mousse stratifié, constitué, dans l'ordre, d'un substrat en mousse, d'un film de matériau thermoplastique et d'un revêtement de matériau élastomère, **caractérisé en ce qu'**il y a, entre ledit film de matériau thermoplastique et ledit revêtement de matériau élastomère, une couche de dispersion de matière plastique.

**13.** Article en mousse stratifié, conforme à la revendication 12, **caractérisé en ce que** l'épaisseur dudit film de matériau thermoplastique vaut de 2 à 8 μm.

**14.** Article en mousse stratifié, conforme à la revendication 12 ou 13, **caractérisé en ce que** l'épaisseur dudit revêtement de matériau élastomère vaut de 10 à 50 μm.

**15.** Article en mousse stratifié, conforme à l'une des revendications 12 à 14, **caractérisé en ce que** l'épaisseur de ladite couche de dispersion de matière plastique vaut de 20 à 100 μm.

**16.** Utilisation d'un article en mousse sratifié, conforme à l'une des revendications 12 à 15, en tant que pièce d'ameublement.

**17.** Utilisation d'un article en mousse sratifié, conforme à l'une des revendications 12 à 15, en tant que coussin.

**18.** Utilisation d'un article en mousse sratifié, conforme à l'une des revendications 12 à 15, en tant qu'appareil d'aire de jeux.

**19.** Utilisation d'un article en mousse sratifié, conforme à l'une des revendications 12 à 15, en tant que natte dans un lieu humide.

**20.** Utilisation d'un article en mousse sratifié, conforme à l'une des revendications 12 à 15, en tant que cuve à bain.

## REFERENCES CITED IN THE DESCRIPTION

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