

(19)



(11)

EP 2 927 017 B2

(12)

NEW EUROPEAN PATENT SPECIFICATION

After opposition procedure

(45) Date of publication and mention
of the opposition decision:
19.01.2022 Bulletin 2022/03

(51) International Patent Classification (IPC):
B44C 5/04 *(2006.01)*

(45) Mention of the grant of the patent:
21.02.2018 Bulletin 2018/08

(52) Cooperative Patent Classification (CPC):
B44C 5/0469

(21) Application number: **14163628.2**

(22) Date of filing: **04.04.2014**

(54) Method of covering a substrate

Verfahren zur Beschichtung eines Substrats

Procédé de recouvrement d'un substrat

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(74) Representative: **Valea AB**
Box 1098
405 23 Göteborg (SE)

(43) Date of publication of application:
07.10.2015 Bulletin 2015/41

(56) References cited:

EP-A1- 0 872 338	EP-A1- 0 872 338
EP-A1- 1 203 657	EP-A1- 1 262 607
EP-A1- 1 820 641	EP-A1- 2 263 867
EP-A1- 2 708 375	EP-A2- 0 578 957
EP-B1- 0 216 269	WO-A1-00/63314
WO-A1-99/61168	WO-A2-2006/102957
DE-A1-102004 034 790	DE-A1-102006 007 869
DE-B1- 2 812 083	US-A- 4 490 409
US-A- 5 019 447	

(73) Proprietor: **Flooring Industries Limited, SARL**
8070 Bertrange (LU)

(72) Inventor: **Vermeulen, Bruno Paul Louis**
3680 Aldeneik-Maaseik (BE)

EP 2 927 017 B2

Description

[0001] The present invention pertains to a method of manufacturing a panel.

[0002] A method of covering a substrate, in particular for manufacturing a floor panel, by means of a laminating process is known in the art. In a well-known laminating process one or more resin-impregnated paper sheets are placed on a substrate and the entire stack is pressed at elevated temperature. One of the paper sheets may be provided with a decorative pattern. Due to hot pressing the resin flows to the substrate and after cooling down the resulting product the one or more paper sheets are adhered to the substrate. A disadvantage of such a conventional laminating technique is that the method must be performed at relatively high pressure and temperature. Besides, conventional laminating techniques appear to provide inferior adherence quality between certain combinations of films and substrates due to less compatible materials, for example a PVC sheet on a substrate including an ink pattern on its surface. Furthermore, a relatively high temperature such as in case of a conventional laminating process may deteriorate a decorative pattern on the substrate, in particular in case of a decorative pattern of UV curable ink.

[0003] EP 1 203 657 is related to a translucent decorative board for use, e.g., as a window pane, light shade, partition or door pane. The decorative board is comprised of a translucent substrate board and translucent cover sheets bonded to the surfaces of the substrate board. The substrate board is generally thermoplastic and the decorative cover sheets are thermosetting. The thermosetting sheet may comprise a substrate paper sheet and a thermosetting resin impregnated in the sheet.

[0004] DE 10 2004 034 790 is related to a method for producing a decorative coating material, in particular, a foil which method involves coating a printed paper or a printed plastic carrier material with a base layer containing an abrasive filler and resins hardenable by radiation, application of a decorative cover layer containing a resin hardenable by radiation, and hardening and/or reticulation of the two combined layers by ultraviolet radiation and/or electron bombardment.

[0005] EP 2 708 375 is related to a method of decorating a panel which method comprises the steps of supplying a panel to a carrier, performing at least a first printing step by means of a first printing module and performing a second printing step by means of a second printing module, wherein the first and second printing steps are performed according to a predetermined positional relationship to form the decorated panel, and wherein during and between first and second printing steps the panel is held at a substantially fixed position with respect to the carrier.

[0006] An object of the invention is to provide an improved method of manufacturing a panel.

[0007] This is achieved by the method according to claim 1. The transparency and composition of the film

correspond to the type of radiation that is used. It is noted that the method is not finalized by removing the film, but the resulting product includes the film. Removing the film will be difficult or even impossible without damaging the surface of the cured substance.

[0008] An advantage of the method according to the invention is that the process can be performed at relatively low temperature. The method may be performed at room temperature, i.e. below 30 °C, or below 50 °C. This means that also substrates and films can be used which are sensitive to severe thermal conditions.

[0009] The curable substance forms a layer between the substrate and the film. Due to the air-tightness of the film it functions as a barrier against oxygen transfer through the transparent film. This means that local inert conditions at the curable substance are created. Therefore, an inert radiation chamber for creating inert conditions for the entire stack is not required.

[0010] The method can be performed at minimal pressure or without pressure; bringing the film, the substance and the substrate in close contact to each other is sufficient to minimize presence of air between the film and the substrate. This means that the pressure, if applied, is far below the level that is applied in conventional laminating techniques such as DPL and HPL, for example below 20 kg/m². Furthermore, the method according to the invention provides the opportunity to laminate materials which are less compatible in conventional laminating techniques such as a PVC sheet on HDF, or a PVC sheet on a substrate including an ink pattern; it is known, for example, that conventional laminating at elevated temperature of a PVC sheet on UV curable ink may lead to inferior adherence quality.

[0011] The curable substance may comprise a synthetic resin which is polymerized during the radiation treatment, more specifically via free radical polymerization. Radiation generates radicals in the substance. Since the chemical affinity between a radical and oxygen is higher than the affinity of the radicals with each other inert conditions are advantageous. The step of radiation may be performed by UV radiation, X-ray radiation, laser radiation, electron beam radiation, visible light, infrared, or the like. If curing is performed by means of UV light the curable substance may contain photoinitiators for initiating free radical polymerization. In particular, mercury-free UV LEDs appear to be appropriate because of their advantageous penetration characteristics into the curable substance. In case of using electron beam radiation photoinitiators are not required. As described above, the transparency and/or composition of the film correspond to the type of radiation that is used. For example, in case of applying electron beam radiation the film should be transparent for electron beam radiation, but may be opaque for visible light. Of course, if a decorative pattern below the film should be visible the film must be transparent for visible light, as well.

[0012] In case the decorative pattern is applied on the substrate the method has a further advantage compared

to conventional laminating techniques in that a resin impregnated paper sheet or conventional glue can be omitted between the film and the substrate. Hence, any loss of transparency due to the manufacturing process, such as in case of applying a resin impregnated overlay paper, is minimized. Nevertheless, the method according to the invention may be applied for laminating a film, for example made of PVC, on a resin impregnated substrate when using a compatible curable substance between the film and the resin impregnated substrate.

[0013] The substance may contain additives for improving its properties during the step of applying it between the substrate and the film, for example plasticizers, fillers, or the like. The substance may also have further functional properties, for example for improving acoustic characteristics of the resulting product. It may also have anti-static properties or UV-filtering properties for protecting an underlying decorative pattern, or the like.

[0014] The resulting product may be a panel suitable for a floor, wall or ceiling covering or alternative coverings. The product may also be a panel that is suitable for furniture, or the like.

[0015] The transparent film may be coloured or decorated but should be sufficiently transparent to pass the radiation. It is noted that transparency is related to the type of radiation; in case of applying electron beam radiation curing the film may be opaque for visible light radiation, but must be transparent for electron beam radiation. Furthermore, the film should not be degenerated under influence of the radiation, for example becoming brittle. Of course, if additional layers are applied these should be sufficient transparent, as well.

[0016] Additional layers may be applied on top of the film, but the film itself may also form the top layer of the final product. In the latter case, the film may have wear-resistant properties, for example containing anti-wear particles, but the composition of the film itself may provide sufficient wear resistance such as in case of a PVC sheet. Similarly, a balancing layer may be applied on the substrate at the side opposite to the side which is provided with the decorative pattern.

[0017] The stack may be formed by first applying the substance on the substrate, and then placing the film on the substance. It is also possible to apply the curable substance first onto the film, and then laying the substrate and the film including the curable substance onto each other. Alternatively, the curable substance is applied both onto the film and the substrate, after which the substrate and the film including the curable substance are laid onto each other.

[0018] It is efficient when the substance is fixed to at least one of the film and the substrate upon curing the substance, since separate fixing means can be omitted. In that case, the contact surfaces of the film and the curable substance and/or the contact surfaces of the curable substance and the substrate should be compatible to each other. For example, the contact surfaces of the film and the substrate may be slightly rough such that the

curable substance partly enters into the contact surfaces and adheres thereto upon curing. It is also possible to apply a curable substance which reacts chemically with the film and/or the substrate such that adherence is promoted. Alternatively, one or more additional adhesive layers may be applied between the curable substance and the substrate and/or between the curable substance and the film for attaching the respective parts to each other. The additional layers may be cured by other treatments than radiation, for example by thermal treatment.

[0019] The method may be carried out as a continuous process wherein the step of bringing the film, the substance and the substrate in close contact to each other is performed by means of calendering or rollers. In general terms, the step of bringing the film, the substance and the substrate in close contact to each other may be performed by a low-pressure or no pressure laminating process, wherein the pressure is lower than 20 kg/m².

[0020] The decorative pattern comprises an ink pattern. This is printed on the substrate and/or the film by means of contact or non-contact printing, preferably by means of a digital printer. Alternative printing means are also possible. The decorative pattern may also be printed on a separate sheet that is attached to the substrate before, after or during printing. Numerous types of patterns are conceivable, for example a wood pattern, stone pattern, etc. It is noted that the substrate may be pretreated for improving the adherence of the decorative pattern to the substrate, for example a surface treatment such as plasma-treatment or applying a primer, or the like. The ink pattern may be dried before it contacts the substance, but not fully cured yet, for example, in case of a UV curable ink. Curing of the ink may occur at the same time as curing of the substance, but in practice the ink will be dried at least partially before contacting the substance and entirely curing the ink and the substance.

[0021] The transparent film may be provided with a surface texture. The surface texture may be applied during the step of bringing the film, the substance and the substrate in close contact to each other, but it is also conceivable that a film including a surface texture is supplied. In the latter case the surface texturing can be applied in a separate process and a relatively deep and sharp embossment is possible, whereas the embossment remains stable during the method of covering the substrate. Besides, an efficient process in terms of energy consumption is provided. In case of applying the step of bringing the film, the substance and the substrate in close contact to each other by means of a calander, the calander may be provided with a textured surface.

[0022] It is noted that the method according to the invention allows a relatively simple embossing-in-register process compared to a thermal lamination process. Embossing-in-register in this case can be performed more accurately than in conventional laminating processes in which a resin-impregnated paper sheet is provided with a decorative pattern, since the position of the pattern on the paper sheet varies due to the impregnation, in prac-

tice. The air-tight transparent film can be aligned with the substrate on which the decorative pattern is applied.

[0023] The transparent film may be made of PVC or an alternative wear-resistant material. This means that the resulting product may be a panel that is suitable as a floor panel. Additionally, the film may contain anti-wear particles such as corundum particles, glass beads, silica or the like.

[0024] The curable substance may be applied by means of screen printing, roller printing, spraying, curtain coating or the like. The thickness of the substance may be in a range from 20 to 500 μm , but a larger or smaller thickness is conceivable. The viscosity may be within a range from 150 centipoise to 500 poise at 20°C and more preferably within a range from 10 to 50 poise at 20°C. In practice, the substance may be a pasty liquid.

[0025] The thickness of the transparent film may be in a range from 5 to 1000 μm , but a larger or smaller thickness is conceivable.

[0026] The substrate may be rigid or flexible such that the resulting product may comprise a panel which is rigid or flexible, respectively. It may be made of wood-based material like MDF, HDF, WPC, or vinyl, metal, glass, stone, ceramic, textile, non-woven fabric, polymeric composite or the like. Furthermore, the substrate may be a flexible thin sheet such that the resulting product itself can be an intermediate product that can be attached to a second substrate.

[0027] It is conceivable that the resulting product forms a so-called hybrid product, wherein the substrate is rigid and the film and/or the cured substance is/are elastic or reversed. Conventional laminating techniques including relatively high pressure and temperature are less suitable for manufacturing such hybrid products.

[0028] The method as described hereinbefore could also be combined with a sublimation process. For example, a sublimation agent can be applied on the side of the air-tight transparent film which is directed to the curable substance. Then, the film can be pressed at a low pressure level on the curable substance and heat can be supplied so as to transfer the sublimation agent towards the substrate. When limited pressing is performed by a calander it may comprise a heated roller or a heated engraved cylinder. The curable substance can be cured by means of radiation as described above. The film can be made of PVC on which the sublimation can be printed at a relatively low resolution. Upon the step of sublimation the agent slightly diverges during travelling towards the substrate. Consequently, the printed pattern is smoothened after sublimation.

[0029] The decorative pattern may be applied on a side of the film facing the substrate. Additionally, the opposite side of the film may be provided with a layer of thermoplastic polyurethane (TPU). The latter layer may be applied before or after the step of bringing the film, the substance and the substrate in close contact to each other. TPU belongs to a class of polyurethane plastics with many useful properties, including elasticity, transparency

and resistance to oil, grease and abrasion. Technically, they are thermoplastic elastomers consisting of linear segmented block copolymers composed of hard and soft segments.

[0030] The substrate may comprise a decorative sheet, such as a paper sheet, on which the decorative pattern is applied, wherein the decorative sheet absorbs at least a part of the substance. The absorption properties of the decorative sheet and the material properties of the curable substance can be selected such that a desired level of penetration of the substance into the decorative sheet can be achieved before the step of curing the substance.

[0031] The number of layers of the stack may be extended. In a particular embodiment a second radiation-curable substance and a second substrate is supplied, wherein the stack is extended by the second substrate and a layer of the second substance which is sandwiched between the substrate and the second substrate, wherein the substances are cured by means of radiation through the transparent film and the substances are fixed to the film, the substrate and the second substrate. The second radiation-curable substance between the substrate and the second substrate may be the same as the curable substance between the transparent film and the decorative sheet. The second substrate may be rigid or flexible and/or thicker than the substrate, for example a board of HDF, but numerous other types of substrates are conceivable. If the substrate comprises the decorative sheet as mentioned above, the decorative sheet can absorb the curable substance at its side facing the transparent film, whereas the opposite side facing the second substrate can absorb the second curable substance before the step of curing and fixing. The material properties of the layers can be selected such that the radiation for curing reaches both substances. For example, electron beam radiation can penetrate relatively deeply such that both substances can be cured synchronously which appears to provide a surprisingly advantageous method of covering a substrate.

[0032] The invention will hereafter be elucidated with reference to the schematic drawings illustrating embodiments of the invention by way of example.

Fig. 1 is an illustrative view of an embodiment of the method according to the invention.

Fig. 2 is a cross-sectional view of a panel that is manufactured by an embodiment of the method according to the invention.

[0033] Fig. 1 illustrates an embodiment of the method according to the invention. In this case the method is performed as a continuous process. A substrate 1 in the form of a continuous sheet is supplied at the left side in Fig. 1 and transported from left to right. The substrate 1 passes a printing station 2 where a decorative pattern 3 is printed on the substrate 1. This may be performed by means of contact printing, non-contact printing, roller

printing, inkjet printing, or the like.

[0034] Subsequently, at a coating station 4 a curable substance 5 in the form of a (pasty) liquid is applied onto the substrate 1 including the decorative pattern 3. Then, an air-tight transparent film 6 is supplied and placed on the layer of curable substance 5 and pressed at a low pressure level thereon by means of a calander 7. At this stage the curable substance 5 is still in a liquid and non-cured or partly-cured state. At a curing station 8 the curable substance 5 is cured by means of radiation which is transferred through the transparent film 6. It is also possible to apply the curable substance 5 onto both the substrate 1 and the film 6 or onto the film 6 only.

[0035] In an alternative embodiment an upper surface of the substrate 1 on which the decorative pattern 3 is printed may be pre-treated, for example by means of applying a primer.

[0036] The calander 7 may have a textured surface such that the resulting product obtains an embossment. Such a texture may coincide with the decorative pattern 3 in order to achieve embossing-in-register. Alternatively, the film 6 has already a textured surface before it is supplied to the calander 7.

[0037] The resulting product at the end of the illustrated method in Fig. 1 is a large board which is cut in separate panels. Subsequently, the edges of the separate panels are provided with locking means, for example tongues and grooves, in order to create a covering by locking similar panels to each other.

[0038] The curable substance may comprise acrylic acid esters or methacrylic acid esters which can be polymerized by a free radical mechanism by actinic radiation and which are present, on their own or together, in a polymerizable mixture. A component may be a mono- or polyfunctional prepolymer, i.e. a mono- or polyunsaturated prepolymer. In addition to this predominant component, the copolymerizable mixture contains, if appropriate, a further component having a diluting action, which is described as a diluent monomer or diluent oligomer. The proportion in the mixture of the polyfunctional prepolymer may be 20 to 100%, in particular 60 to 90%, by weight of the total weight of copolymerizable components. Prepolymers of a low viscosity, less than 100 poise at 20° C may be employed without the monomers or oligomers producing dilution.

[0039] Preferably, the components used have a strong tendency to polymerize by a free radical mechanism under the action of actinic radiation. Suitable actinic radiation is a light in the near UV region or high-energy radiation, for example electron, particle or x-ray radiation. A prepolymer which can be polymerized by free radical mechanism is a polyfunctional, unsaturated aliphatic or aromatic acrylate or methacrylate, preferably an unsaturated polyester acrylate oligomer and especially an aliphatic urethane acrylate oligomer or aromatic urethane acrylate oligomers.

[0040] In addition to the prepolymer, a mono-, di-, tri-, tetra-, penta- or hexaacrylate or -methacrylate, preferably

a diacrylate or triacrylate, may be used as an additional suitable monomer or oligomer in the mixture which can be copolymerized by a free radical mechanism. These mono- to hexaacrylates or mono- to hexamethacrylates are esters of polyols having 1 to 6 OH groups with acrylic acid or methacrylic acid, respectively, and are therefore also known as polyol acrylates or polyol methacrylates, respectively. Suitable diacrylates are esters of acrylic acid with aliphatic, dihydric alcohols, in particular ethylene glycol, 1,2-propylene glycol, 1,3-propyleneglycol, butane diols, 1,6-hexane diol or neopentylglycol, with aliphatic ether-alcohols, in particular diethylene glycol, dipropylene glycol, dibutylene glycol, polyethylene glycols or polypropylene glycols, with oxyalkylated compounds of the above-mentioned aliphatic alcohols and ether-alcohols or with aromatic dihydroxy compounds, in particular bisphenol A, pyrocatechol, resorcinol, hydroquinone, p-xyleneglycol or p-hydroxybenzyl alcohol. Preferred diacrylates are 1,6-hexanediol diacrylate, dipropyleneglycol diacrylate, acrylic acid 2-(2-vinyloxyethoxy)-ethyl ester, propoxylated neopentylglycol diacrylate, isobornyl acrylate, mono-2acryloyloxyethyl phthalate, tricyclodecane dimethanol diacrylate, 2-carboxyethyl acrylate, Benzyl acrylate, tripropylene glycol diacrylate and 1,4-butanediol diacrylate. Preferred triacrylates are trimethylolpropane triacrylate and pentaerythritol triacrylate.

[0041] In addition to the urethane acrylate oligomers and unsaturated polyester acrylate oligomers already mentioned, suitable polyfunctional prepolymers are also epoxy-acrylate and silicone-acrylate oligomers, which are preferably used together with the diacrylates or triacrylates mentioned in the mixture which can be copolymerized by a free radical mechanism.

[0042] The prepolymers are compounds known per se and are prepared, for example, from hydroxylated copolymers in which the hydroxyl groups are distributed statistically along the copolymer chain. Statistically unsaturated acrylic copolymers are obtained from this copolymer by esterifying the hydroxyl groups with acrylic acid. Semi-terminal unsaturated acrylic copolymers are prepared by having the hydroxyl group at the end of the chain in the preparation of the hydroxylated copolymers. Urethane acrylate oligomers are prepared by reacting (meth)acrylic acid esters containing hydroxyl groups, for example, hydroxyethyl methacrylate, with polyfunctional isocyanates, preferably diisocyanates. The diisocyanates or polyisocyanates can preferably be reaction products of diols, polyether-diols or polyester-diols containing a stoichiometric excess of monomeric diisocyanate or polyisocyanate.

[0043] If the polyfunctional prepolymer preponderates in the polymerizable mixture, as the base resin, by virtue of its chemical nature, it determines the properties of the cured surface layer. The monoacrylate to hexaacrylate or monomethacrylate to hexamethacrylate added makes it possible as a diluent monomer or oligomer, to adjust the viscosity of the mixture to be cured, which is normally

within a viscosity range from 20 to 100 poise at 20° C, and entirely takes part in the free radical polymerization. When irradiated, the coating is cured through free radical polymerization between the double bonds of the prepolymer and of the diluent monomer or oligomer which may be present.

[0044] Fig. 2 shows an embodiment of a part of a panel 9 that is manufactured by an alternative method according to the invention. The upper three layers are almost similar as shown in the embodiment according to Fig. 1: the transparent film 6 forms an upper layer, but the substrate is now formed by a paper sheet 1, whereas the cured substance 5 is sandwiched between the paper sheet 1 and the film 6. The paper sheet 1 is provided with a decorative pattern which remains visible through the transparent film 6. Furthermore, the panel 9 as shown in Fig. 2 also comprises a second substrate in the form of a board 10, for example a HDF board, whereas a layer of the cured substance 5 is also sandwiched between the decorative paper sheet 1 and the board 10. Before the step of curing, the decorative paper sheet 1 has absorbed at least a part of both layers of substance 5, as indicated by reference sign 11 in Fig. 2. The layers of substance 5 are cured by means of radiation through the transparent film 6 such that all layers of the entire stack are fixed to each other in a single step of applying radiation. This is advantageous compared to conventional manufacturing techniques where the layers 1 and 6 would be attached to each other in a first step, for example by means of gluing, after which the resulting intermediate product would be adhered to the board 10 in a second step. During manufacturing the panel 9 the extended stack as shown in Fig. 2 can be stacked in a similar way as illustrated in Fig. 1. It is conceivable that the decorative sheet 1 does not absorb the substance 5, but allows to pass the radiation and adheres to the board 10 through the substance 5 upon curing.

Claims

1. A method of manufacturing a panel, such as a floor panel, wall panel or a ceiling panel, said method comprising the steps of:
 - supplying a substrate (1), a curable substance (5) and a substantially air-tight transparent film (6),
 - applying a decorative pattern (3) on at least one of the substrate (1) and the film (6), forming a stack of the substrate (1), the substance (5) and the film (6),
 - wherein the substance (5) is sandwiched between the substrate (1) and the film (6),
 - bringing the film (6), the substance (5) and the substrate (1) in close contact to each other,
 - curing the substance (5) by means of radiation through the transparent film (6) and fixing the substance (5) to the film (6) and the substrate (1),
 - wherein the decorative pattern (3) comprises an ink pattern printed by means of contact or non-contact printing, and
 - wherein the panel is provided with locking means for coupling the panel to locking means of an adjacent similar panel.
2. A method according to claim 1, wherein the stack is formed by first applying the substance (5) on the substrate (1), and then placing the film (6) on the substance (5).
3. A method according to claim 1 or 2, wherein the substance (5) is fixed to at least one of the film (6) and the substrate (1) upon curing the substance (5).
4. A method according to one of the preceding claims, wherein the method is carried out as a continuous process wherein the step of bringing the film (6), the substance (5) and the substrate (1) in close contact to each other is performed by means of calendering.
5. A method according to one of the preceding claims, wherein the surface of the substrate (1) on which the decorative pattern (3) is applied is provided with a primer for adherence of the decorative pattern (3) and/or the substance (5).
6. A method according to one of the preceding claims, wherein the curable substance (5) comprises a synthetic resin which is polymerized by radiation.
7. A method according to one of the preceding claims, wherein the transparent film (6) is provided with a surface texture.
8. A method according to claim 7, wherein the surface texture is applied during the step of bringing the film, the substance and the substrate in close contact to each other.
9. A method according to one of the preceding claims, wherein the curable substance (5) is applied by means of screen printing, roller printing, spraying, curtain coating or the like.
10. A method according to one of the preceding claims, wherein the thickness of the transparent film (6) is in a range from 20 to 1000 μm .
11. A method according to one of the preceding claims, wherein the thickness of the substance (5) is in a range from 5 to 200 μm .
12. A method according to one of the preceding claims, wherein the decorative pattern (3) is applied on a

side of the film (6) facing the substrate (1), wherein the opposite side of the film (6) is provided with a layer of thermoplastic polyurethane (TPU).

13. A method according to one of the preceding claims, wherein the substrate (1) comprises a decorative sheet, such as a paper sheet, on which the decorative pattern is applied, which decorative sheet (1) absorbs at least a part of the substance.
14. A method according to one of the preceding claims, wherein a second radiation-curable substance (5) and a second substrate (10) is supplied, wherein the stack is extended by the second substrate (10) and a layer of the second substance (5) which is sandwiched between the substrate (1) and the second substrate (10), wherein the substances (5) are cured by means of radiation through the transparent film and the substances (5) are fixed to the film (6), the substrate (1) and the second substrate (10).

Patentansprüche

1. Verfahren zur Herstellung eines Paneels, wie eines Fußbodenpaneels, Wandpaneels oder eines Deckenpaneels, das Verfahren umfassend die Schritte:

Zuführen eines Substrats (1), einer aushärtbaren Substanz (5) und eines im Wesentlichen luftdichten transparenten Films (6),
Anbringen eines dekorativen Musters (3) an mindestens einem des Substrats (1) und des Films (6),
Bilden einer Schichtung des Substrats (1), der Substanz (5) und des Films (6), wobei die Substanz (5) sandwichartig zwischen dem Substrat (1) und dem Film (6) angeordnet ist, in engen Kontakt miteinander Bringen des Films (6), der Substanz (5) und des Substrats (1),
Aushärten der Substanz (5) mittels Strahlung durch den transparenten Film (6) und Fixieren der Substanz (5) an dem Film (6) und dem Substrat (1),
wobei das dekorative Muster (3) ein Tintenmuster gedruckt mittels Kontakt- oder Nicht-Kontakt-Druckens umfasst, und
wobei das Paneel mit Verriegelungsmitteln versehen wird, um das Paneel mit Verriegelungsmitteln eines benachbarten gleichartigen Paneels zu koppeln.

2. Verfahren nach Anspruch 1, wobei die Schichtung gebildet wird, indem zuerst die Substanz (5) auf dem Substrat (1) angebracht wird und dann der Film (6) auf der Substanz (5) platziert wird.
3. Verfahren nach Anspruch 1 oder 2, wobei nach Aus-

härten der Substanz (5) die Substanz (5) an mindestens einem des Films (6) und des Substrats (1) fixiert ist.

4. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Verfahren als kontinuierlicher Prozess ausgeführt wird, wobei der Schritt des in engen Kontakt miteinander Bringens des Films (6), der Substanz (5) und des Substrats (1) mittels Kalandern durchgeführt wird.
5. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Oberfläche des Substrats (1), worauf das dekorative Muster (3) angebracht wird, mit einer Grundierung zur Haftung des dekorativen Musters (3) und/oder der Substanz (5) versehen wird.
6. Verfahren nach einem der vorhergehenden Ansprüche, wobei die aushärtbare Substanz (5) ein synthetisches Harz umfasst, das durch Strahlung polymerisiert wird.
7. Verfahren nach einem der vorhergehenden Ansprüche, wobei der transparente Film (6) mit einer Oberflächentextur versehen wird.
8. Verfahren nach Anspruch 7, wobei die Oberflächentextur während des in engen Kontakt miteinander Bringens des Films, der Substanz und des Substrats angebracht wird.
9. Verfahren nach einem der vorhergehenden Ansprüche, wobei die aushärtbare Substanz (5) mittels Siebdruck, Rotationsdruck, Sprühen, Vorhangbeschichtung oder dergleichen aufgebracht wird.
10. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Dicke des transparenten Films (6) im Bereich von 20 bis 1000 μm liegt.
11. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Dicke der Substanz (5) im Bereich von 5 bis 200 μm liegt.
12. Verfahren nach einem der vorhergehenden Ansprüche, wobei das dekorative Muster (3) an einer dem Substrat (1) zugewandten Seite des Films (6) angebracht wird, wobei die entgegengesetzte Seite des Films (6) mit einer Schicht aus thermoplastischem Polyurethan (TPU) versehen wird.
13. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Substrat (1) einen dekorativen Bogen, wie etwa einen Papierbogen, umfasst, worauf das dekorative Muster angebracht wird, welcher dekorative Bogen (1) mindestens einen Teil der Substanz absorbiert.

14. Verfahren nach einem der vorhergehenden Ansprüche, wobei eine zweite strahlungs-aushärtbare Substanz (5) und ein zweites Substrat (10) zugeführt wird, wobei die Schichtung um das zweite Substrat (10) und eine Schicht der zweiten Substanz (5), die sandwichartig zwischen dem Substrat (1) und dem zweiten Substrat (10) angeordnet wird, erweitert wird, wobei die Substanzen (5) mittels Strahlung durch den transparenten Film ausgehärtet werden und die Substanzen (5) an dem Film (6), dem Substrat (1) und dem zweiten Substrat (10) fixiert werden.

Revendications

1. Procédé de fabrication d'un panneau, tel qu'un panneau de sol, un panneau de mur ou un panneau de plafond, le procédé en question comprenant les étapes consistant à :

fournir un substrat (1), une substance durcissable (5) et un film transparent (6) essentiellement étanche à l'air ;
appliquer un motif de décoration (3) sur au moins un élément choisi parmi le substrat (1) et le film (6) ;
former une pile avec le substrat (1), la substance (5) et le film (6), la substance (5) étant intercalée entre le substrat (1) et le film (6) ;
amener le film (6), la substance (5) et le substrat (1) en contact étroit l'un avec l'autre ;
durcir la substance (5) au moyen d'une exposition à un rayonnement à travers le film transparent (6) et fixer la substance (5) au film (6) et au substrat (1) ;
dans lequel le motif de décoration (3) comprend un motif d'encre imprimé au moyen d'une impression par contact ou d'une impression en absence de contact ; et
dans lequel le panneau est équipé de moyens de verrouillage qui sont destinés à l'accouplement du panneau à des moyens de verrouillage d'un panneau similaire adjacent.

2. Procédé selon la revendication 1, dans lequel on forme la pile en appliquant d'abord la substance (5) sur le substrat (1) et en plaçant ensuite le film (6) sur la substance (5).
3. Procédé selon la revendication 1 ou 2, dans lequel la substance (5) est fixée à au moins un élément choisi parmi le film (6) et le substrat (1) après le durcissement de la substance (5).
4. Procédé selon une des revendications précédentes, dans lequel le procédé est mis en œuvre sous la forme d'un procédé en continu dans lequel l'étape

consistant à amener le film (6), la substance (5) et le substrat (1) en contact étroit l'un avec l'autre est mise en œuvre au moyen d'un calandrage.

5. Procédé selon une des revendications précédentes, dans lequel la surface du substrat (1) sur laquelle est appliqué le motif de décoration (3) est munie d'une couche d'apprêt à des fins d'adhérence du motif de décoration (3) et/ou de la substance (5).
6. Procédé selon une des revendications précédentes, dans lequel la substance durcissable (5) comprend une résine synthétique qui est polymérisée par exposition à un rayonnement.
7. Procédé selon une des revendications précédentes, dans lequel le film transparent (6) est muni d'une texture superficielle.
8. Procédé selon la revendication 7, dans lequel la texture superficielle est appliquée au cours de l'étape dans laquelle on amène le film, la substance et le substrat en contact étroit l'un avec l'autre.
9. Procédé selon une des revendications précédentes, dans lequel la substance durcissable (5) est appliquée au moyen d'une sérigraphie, d'une impression au rouleau, d'une pulvérisation, d'une enduction du type à rideau, ou analogue.
10. Procédé selon une des revendications précédentes, dans lequel l'épaisseur du film transparent (6) se situe dans une plage de 20 à 1.000 μm .
11. Procédé selon une des revendications précédentes, dans lequel l'épaisseur de la substance (5) se situe dans une plage de 5 à 200 μm .
12. Procédé selon une des revendications précédentes, dans lequel le motif de décoration (3) est appliqué sur un côté du film (6) opposé au substrat (1), le côté opposé du film (6) étant muni d'une couche de polyuréthane thermoplastique (TPU).
13. Procédé selon une des revendications précédentes, dans lequel le substrat (1) comprend une feuille décorative, comme par exemple une feuille de papier, sur laquelle on applique le motif de décoration, ladite feuille décorative (1) absorbant au moins une partie de la substance.
14. Procédé selon une des revendications précédentes, dans lequel on fournit une seconde substance (5) durcissable par exposition à un rayonnement et un second substrat (10), la pile étant prolongée par le second substrat (10) et par une couche de la seconde substance (5) qui est intercalée entre le substrat (1) et le second substrat (10), les substances (5)

étant durcies au moyen d'une exposition à un rayonnement à travers le film transparent et les substances (5) étant fixées au film (6), au substrat (1) et au second substrat (10).

5

10

15

20

25

30

35

40

45

50

55

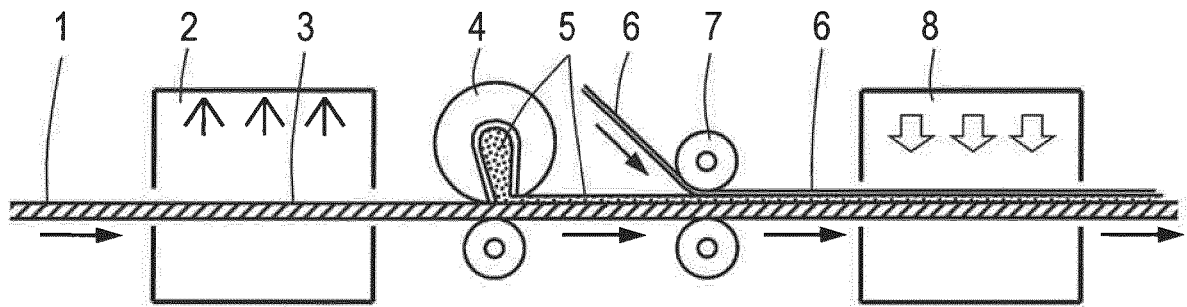


Fig.1

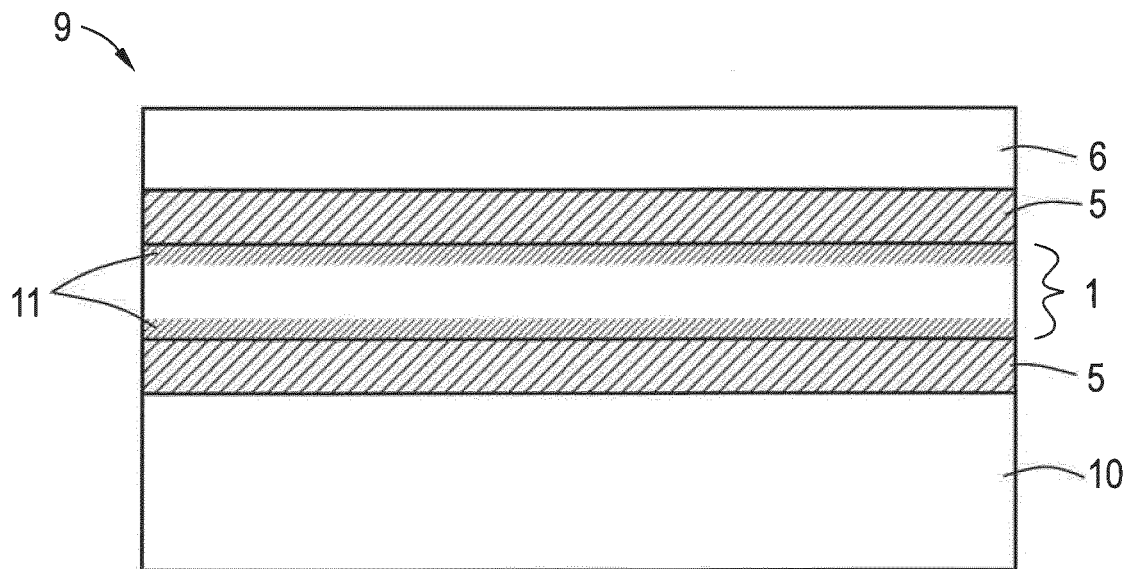


Fig.2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1203657 A [0003]
- DE 102004034790 [0004]
- EP 2708375 A [0005]