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(54) **A method of manufacturing a panel, and a panel**

(57) A method of manufacturing a panel includes the steps of providing a carrier, applying a coating onto at least one side of the carrier so as to form a coated carrier, providing a substrate, placing the coated carrier and the substrate onto each other such that said coated side faces the substrate, attaching the coated carrier and the substrate to each other so as to fix the coating to the substrate, removing the carrier from the coated substrate so as to form the panel.

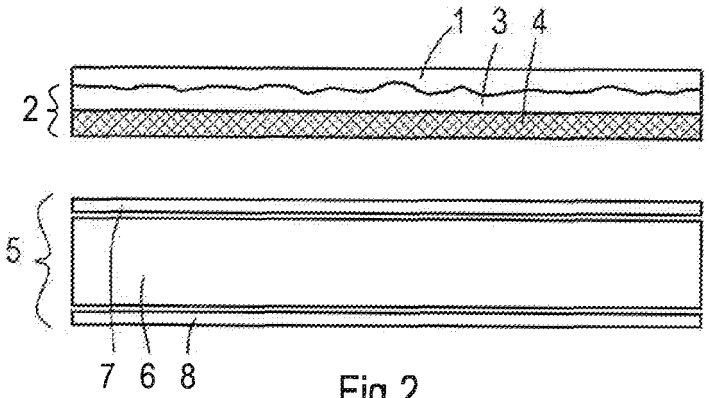

Fig.2

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Description

[0001] A method of manufacturing a panel, and a panel

[0002] The invention relates to a method of manufacturing a panel, including the steps of providing a carrier, applying a coating onto at least one side of the carrier so as to form a coated carrier, providing a substrate, placing the coated carrier and the substrate onto each other such that the coated side faces the substrate and attaching the coated carrier and the substrate to each other.

[0003] Such a method is known from WO 95/06568. The carrier in the known method comprises a transfer paper onto which a coating resin is applied. After drying the coated transfer sheet is placed onto a resin impregnated decorative facing sheet comprising a decoration pattern, and both sheets are laminated to each other under heat and pressure. After that a throw-away portion of the transfer paper is removed. A disadvantage of the known method is that the decoration pattern of the resulting panel tends to fade.

[0004] Basically, a conventional laminate, such as a laminated floor panel, comprises a core, a decorative sheet and an overlay. The decorative sheet and the overlay are often resin impregnated paper sheets. In a conventional manufacturing process the decorative sheet is placed on top of the core and the overlay is placed on top of the decorative sheet. Then, the stack of layers is placed between press plates and pressed under elevated temperature. The resins of the decorative sheet and the overlay melt and flow. As a result, the core, the decorative sheet and the overlay are joined. Normally, the overlay comprises wear-resistant particles and is translucent such that the decoration pattern of the decorative sheet can be observed.

[0005] It is an object of the present invention to provide a method of manufacturing a panel, which improves the transparency of the coated side of the resulting panel.

[0006] In order to achieve this object the method comprises the step of removing the carrier from the coated substrate so as to form the panel.

[0007] As a result of the method according to the invention substantially only the coating, i.e. without the carrier, remains on the resulting panel. The portion of the coating that contacted the carrier becomes the upper surface of the resulting panel. In practice such a coating is often applied as a wear-resistant layer on floor panels in order to protect an underlying decoration pattern. Conventionally, such a coating comprises a resin which is impregnated in a paper sheet which is laminated on a decorated substrate at elevated temperature and pressure. Such a resin impregnated paper sheet, however, leads to reduced transparency. In fact, the overlay sheet functions as the carrier in that case, but remains on the panel.

[0008] The advantage of the method according to the invention is that due to removing the carrier, only the coating remains on the resulting panel, which provides the opportunity to increase the visibility of the decoration pattern if this is present below the coating. This is also advantageous in comparison with removing only a throw-away portion of a transfer paper as known in the prior art.

[0009] Manufacturing a panel by the method according to the invention also provides opportunity to reduce the weight of a balancing layer at the back side of the panel to be made. Conventional laminates often comprise such a balancing layer of resin-impregnated kraft paper to compensate stress in the panel due to the presence of the overlay sheet and/or a resin at the upper side of the panel. In case of omitting a resin impregnated overlay paper the weight of the balancing layer may be reduced, as well.

[0010] It is noted that the step of attaching may be formed by a step of laminating the coated carrier and the substrate to each other, but this is not necessary. For example, it is also possible that the substrate comprises a layer of granulates that is attached to the coated carrier by means of hot pressing.

[0011] In practice the carrier may comprise a continuous element, such as a flexible sheet, which remains a continuous element during the method of manufacturing. The carrier may also comprise any substance which adheres to the continuous element before removing the carrier, but which is also removed from the continuous element upon removing the carrier from the coated substrate. Thus, in fact the substance does not longer belong to the carrier. For example, a releasing agent may be present on the continuous element and partly stick to the continuous element as well as to the coated substrate after removing the continuous element. The remainder on the coated substrate may for example remain thereon permanently or temporarily. In case of temporary presence, the remainder in fact belongs to the carrier which is removed. In case of permanent presence, the remainder belongs to the coating.

[0012] If the carrier comprises a flexible sheet it may be made of paper, clay-coated paper, a polymer, a polymeric composite, PET, or the like.

[0013] It is noted that there may be a certain period of time between the step of applying the coating and the step of placing the coated carrier onto the substrate. It is also possible that the coating is at least partly dried and/or cured. Furthermore, the coated carrier may be wound-up on a roll and transported to a laminating site.

[0014] Preferably, the method according to the invention is such that after the step of attaching the adherence force between the coating and the substrate is higher than between the coating and the carrier. It may be possible that the step of attaching activates the releasing properties of the carrier with respect to the coating.

[0015] The carrier may comprise a textured surface on the side onto which the coating is applied. The textured surface can have any pattern, for example a wood nerves pattern or natural stones pattern, but numerous alternative patterns are conceivable. The texture may also be relatively fine in order to create at least a region of a certain gloss level on the panel to be made. The textured

pattern may be such that it is embossed-in-register with respect to an underlying decoration pattern in the resulting panel, but this is not required. If the step of attaching is performed by hot pressing the press plate may be flat since the texture is created by the carrier. Nevertheless, the press plate may also be provided with a textured pattern which can correspond or be complementary to the pattern of the carrier and/or a decoration pattern which underlies the coating of the resulting panel.

[0016] If the step of attaching is performed by means of pressing, the attaching process may be carried out by continuous pressing, for example by calendaring, or by means of a double belt press, rollers or the like, or discontinuous pressing, for example by means of press plates.

[0017] The coating may comprise a hot melting substance, whereas the step of attaching or laminating is performed by means of elevated heat and pressure under which conditions the coating melts and flows so as to adhere to the substrate. Such a coating is for example a resin. In this case the coating itself forms a glue to attach the substrate and the coated carrier to each other. The characteristics of the carrier, the hot melting substance and substrate can be selected such that after attaching the adherence of the coating to the substrate is stronger than to the carrier such that the carrier can be removed easily from the coated substrate.

[0018] It is noted that the substrate may comprise a dry decorative paper onto which the coated carrier is placed. During the step of attaching or laminating at elevated heat and pressure the resin of the coating flows into the decorative paper. The advantage of the method is that the decorative paper needs no or less impregnation before laminating. In particular, in case of embossing in register it is known that impregnation before laminating adversely effects the relative position of the decorative paper and the embossed pressing surface due to expansion of the impregnated material; in this case the embossed pressing surface is possibly the textured surface of the carrier.

[0019] The coating may be applied onto the carrier in liquid state and at least partly dried and/or cured before the step of attaching or laminating. Alternatively, the coating may be liquefied on the carrier if it is applied in solid state. In liquid state the coating flows on the carrier surface and if this is a textured surface the coating will be textured without mechanical pressure. This also allows relatively deep texture in comparison with panels embossed by means of mechanical pressure because of possible damage to the substrate and/or coating in case of embossing a deep texture. For example, an underlying decorative sheet including an ink pattern thereon may be deformed and/or damaged due to mechanical embossing. The method according to the invention allows a surface texture of the panel which is deeper than 1 mm.

[0020] Drying en/or curing of the coating may be performed by air flow, UV radiation, IR radiation, electron beam technology, and may be dependent on the type of coating or additives therein.

[0021] In a preferred embodiment anti-wear and/or anti-scratch particles are added to the coating. In general, anti-wear particles are larger than anti-scratch particles, whereas the shape of anti-scratch particles are often more flat. The selected sizes and shapes are also dependent on the type of resin in which they are present. The particles may be added to the coating before, during or after applying the coating onto the carrier. In this respect an advantage of the method according to the invention is that upon pressing during the step of attaching or laminating the wear-resistant particles are separated from a press plate by the carrier. This reduces the tendency to wear of the press plate.

[0022] The coating may comprise a resin, which preferably contains anti-wear particles. The resin may be melamine, phenol, polyester, ionomer, poly-urethane, amino, epoxy, silicone, acryl or the like, or a combination thereof. Additional materials may be added for certain functions like anti-scratching, anti-static, or improving acoustical or transparency properties.

[0023] It is noted that the method according to the invention allows to make panels having a higher concentration of wear-resistant particles than conventional panels having a similar level of transparency. This is achieved by using the room of improved transparency to increase the concentration of particles which normally reduce the transparency.

[0024] The coating may be multi—layered, preferably comprising layers of different compositions providing different properties for different functions. The layers may be applied simultaneously or after each other, for example by means of co-extrusion. For example, a first coating layer may be provided with a resin including anti-scratch particles, for example nano-particles of 5-60 μm, and a second layer may be provided on top of the first layer with anti-wear particles, for example corundum of 60-150 μm. One or more of the layers of the coating may be sheet-shaped material.

[0025] In a specific embodiment the coating comprises an ionomer, which is preferably applied onto the carrier through an extrusion process. If the ionomer contacts the carrier, the upper surface of the resulting panel will be made of ionomer, which is advantageous in terms of wear resistance.

[0026] The ionomer may be coated with a tie layer, after which a decorative sheet is adhered to the tie layer. In this case the multi-layered coating comprises a layer of ionomer, a tie layer and a decorative sheet. The layers may be applied onto each other by means of a co-extrusion process and covered by the decorative sheet.

[0027] Before adhering the tie layer and the decorative sheet to each other, the tie layer and/or the decorative sheet may be activated for improved adherence to each other. For example, the tie layer may be activated by means of infrared radiation, whereas the decorative sheet may be treated by a surface tension treatment such as corona discharge, possibly extended by applying a

primer, for example Mica 131 X. A suitable tie layer is a blend of 30-50% Fusabond M603 and 50-70% Elvax 315LG, but alternative blending ratios are possible, as well.

[0028] In a specific embodiment a decoration pattern may be applied onto the coating before placing the coated carrier and the substrate onto each other. For example, the coating may be dried and on the upper side of the coated carrier opposite to the carrier a pattern is printed on the coating. In case of a transparent coating the pattern will be visible after the coated and printed carrier and the substrate are attached to each other and the carrier is removed. This method may be called reverse printing. It is possible that a decorative sheet is omitted in this case. Furthermore, it is possible that one or more additional layers are applied onto the printed coating before placing the coated carrier and the substrate onto each other.

[0029] In an alternative embodiment the coating is applied onto the carrier by applying solid resin particles or a mixture of solid resin particles and anti-wear and/or anti-scratch particles, after which the coating is at least partly melted.

[0030] The substrate may comprise a decorative sheet covered with hot melting particles, wherein the decorative sheet and the coating contact each other after placing the substrate and the coated carrier onto each other, wherein the step of attaching is performed in a heated press. It is also possible that the decorative sheet is omitted and that a decoration pattern is printed on the coated carrier, whereas the substrate is formed by hot melting particles or granulates.

[0031] The carrier may have an anti-stick surface for easily releasing the carrier from the panel. The carrier may also be provided with a release agent at the side onto which the coating is to be applied, for example silicon or PTFE. After the step of attaching the release agent may be removed together with the carrier or separately from the resulting panel.

[0032] It is noted that the method as described hereinbefore can be performed separately from the steps of providing a substrate, placing the coated carrier and the substrate onto each other and the steps of attaching and removing the carrier. In that case it is a method of manufacturing an intermediate layer which is suitable to be laminated on a substrate, including the steps of providing a carrier, applying a coating onto at least one side of the carrier so as to form a coated carrier, wherein the coating is releasable from the carrier. In a specific case the coating comprises at least a resin which is releasable from the carrier under influence of heat and pressure.

[0033] The invention is also related to a panel, which is made by a method as described hereinbefore and which is provided with locking means for locking at least two panels to each other.

[0034] The panel to be manufactured may be a floor panel, a wall panel, a furniture panel, a ceiling panel or the like.

[0035] The substrate may be made of wood or wood—based material, for example, plywood, WPC, MDF, HDF, PVC or ceramic. Alternatively, the substrate may be made of a polymer composite or engineered polymer. The mentioned materials may be mixed with fillers, binders or the like. The substrate as well as the resulting panel may be rigid or flexible.

[0036] The invention will hereafter be elucidated with reference to the very schematic drawings showing embodiments of the invention by way of example.

Figs. 1-3 are schematic side views of a carrier and layers, illustrating steps of an embodiment of the method of manufacturing a panel according to the invention.

Fig. 4 is a similar view as Figs. 1-3, illustrating an alternative embodiment.

Figs. 5-8 and 9-12 are similar views as Figs. 1-3, illustrating alternative embodiments, respectively.

Fig. 13 is a schematic view of a manufacturing process, illustrating a particular step in an alternative embodiment.

Figs. 1-3 illustrate an embodiment of the method of manufacturing a panel according to the invention. After providing a carrier 1 a coating 2 is applied onto the carrier 1. In this embodiment the coating 2 comprises two layers: a first resin layer 3 and a second resin layer 4. It is also possible that only a single layer of an alternative substance is applied onto the carrier 1. Several alternative layers on the carrier 1 are conceivable, for example a layer or layers of melamine, phenol, polyester, ionomer, polyurethane, or mixtures thereof or blends with other substances.

[0037] The first and second resin layers 3, 4 have different compositions in this embodiment. The first resin layer 3 contains scratch resistant particles which may have a size in the range of 5-60 μm, for example. The second resin layer 4 contains wear resistant particles which may have a size in the range of 60-100 μm, for example.

[0038] The first and second resin layers 3, 4 in this embodiment are applied in liquid state and may be applied onto the carrier 1 in several ways, for example by means of roller-coating, curtain-coating, casting, spraying, printing or the like. Additives may be mixed in the resin before, during or after applying the first and second resin layers 3, 4 onto the carrier 1. For example, anti-wear and anti-scratch particles may be scattered, sprinkled or powdered onto the wet resin which is already present on the carrier 1.

[0039] The first and second resin layers 3, 4 may contain different additives for different purposes such as wear resistance, scratch resistance, anti-static additives, antibacterial additives, elastic material, pigments or the like.

[0040] After the first and second resin layers 3, 4 are

applied onto the carrier 1, the layers 3, 4 are at least partly cured, dried or gelled to retain the layers 3, 4 in place on the carrier 1 during handling of the coated carrier 1, 2. In an alternative embodiment it is possible to cure the resin-coated carrier 1, 2 and wind it up on a roll for later use.

[0041] In a next step of this embodiment of the method a substrate 5 is provided. The coated carrier 1, 2 is turned upside down and placed onto the substrate 5. As a result, the coated side of the carrier 1 faces the substrate 5.

[0042] In the embodiment as shown in Fig. 2 the substrate 5 is built-up of a core 6, a decorative sheet 7 which is located on the upper side of the core 6 and a balancing sheet 8 which is located at the lower side of the core 6. The decorative sheet 7 may be provided with a pattern of a natural material such as wood or stone, but numerous alternative patterns are conceivable. It is also possible that the substrate 5 only contains the decorative sheet 7 or the decorative sheet 7 and the core 6.

[0043] In a next step the coated carrier 1, 2 and the substrate 5 are laminated to each other. The coated carrier 1, 2 can be fixed to the substrate 5 in many ways. In the embodiment as illustrated in Figs. 1-3 the stack of the substrate 5 and the coated carrier 1, 2 is pressed together between press plates (not shown) at elevated temperature. Due to the increased temperature the first and second resin layers 3, 4 will at least partly melt and adhere to the substrate 5, in this case at least to the decorative sheet 7. The decorative sheet 7 and the balancing sheet 8 may be resin-impregnated paper sheets in order to fix them to the core 6 during hot pressing.

[0044] After the pressing step the substrate 5 is coated by the coating 2 and the carrier 1 is removed from the coated substrate 2, 5 so as to form a panel 9, which is illustrated in Fig. 3. It can be seen that the carrier 1 functions as a release sheet or transfer sheet. Due to removing the carrier 1, only the coating 2 remains on the substrate 5 which provides the opportunity to maximize the transparency of the layer at the top of the decoration sheet 7. As a result, the upper surface of the panel is formed by a portion of the coating 2 that contacted the carrier 1 during the laminating step.

[0045] The panel 9 may be cut in smaller pieces and/or provided with locking members for coupling separate panel pieces to each other, for example for assembling a flooring from floor panels. The locking members may comprise tongues and grooves, but alternative locking means are conceivable.

[0046] The carrier 1 is made of a sheet of paper or a plastic like PET, polyester or the like. As shown in Figs. 1-3 the carrier 1 has a textured surface. The press plates (not shown) may have flat surfaces in this case. If the coating 2 is provided with wear-resistant and/or scratch-resistant material the press plates may be protected against impact of these materials due to the presence of the carrier 1. After use, the carrier 1 may be thrown away, re-used or recycled.

[0047] It is noted that the balancing sheet 8 may be a resin-impregnated paper sheet, but an alternative balancing layer is conceivable. The balancing layer may be minimized since the coating 2 does not comprise a resin impregnated paper sheet such as in conventional laminates.

[0048] The core 6 may be made of HDF, MDF, PVC, ceramic or engineered polymer such as a polymer composite like WPC, or the like.

[0049] It is possible that the carrier 1 and/or the first resin layer 3 have such properties that upon pressing at elevated temperature the adherence between the first resin layer 3 and the carrier 1 is reduced and the adherence between the second resin layer 4 and the decorative sheet 7 is increased so as to facilitate the removal of the carrier 1 from the coated substrate 2, 5 afterwards.

[0050] Regarding the application of anti-wear particles it is possible to provide the decorative paper sheet 7 with anti-wear particles of alumina or other type of abrasion resistant particles. The particles may be added to the decorative paper sheet 7 by means of an aqueous mixture of the abrasion resistant particles and micro-crystalline cellulose particles. The latter serve as a temporary binder and may be optimized with respect to the type of resin which is used in the coating 2. The micro-crystalline cellulose particles may be mixed with carboxyl methyl cellulose and/or silane in order to bind the particles to the resin matrix after curing. Silane appears to improve the bound of particles to melamine, for example, and stays in place under abrasive wear for a relatively long time. Alternative abrasion resistant particles may be zirconium oxide, cerium oxide, glass beads and diamond dust or mixtures thereof.

[0051] Fig. 4 illustrates an alternative embodiment of the method according to the invention. In this case the coating including the first and second resin layers 3, 4 are applied onto the carrier 1 so as to form the coated carrier 1, 2. Then the substrate 5 including the balancing sheet 8, the core 6 and the decorative sheet 7 as seen from top to bottom, is placed onto the coated carrier 1, 2. The resin layers 3, 4 may be at least partly cured or dried before the decorative sheet 7 contacts the second resin layer 4.

[0052] Fig. 4 shows that several layers can be built-up on the coated carriers 1, 2 without turning the coated carrier 1, 2 upside down. It is also possible, for example, to apply a layer of granulates onto the coated carrier 1, 2 and then hot-pressing the stack so as to melt the granulates to each other as well as to the coated carrier 1, 2. In the embodiment of Fig. 4 the core 6 may be a layer of granulates between the balancing sheet 8 and the decorative sheet 7.

[0053] The coating 2 may be applied as a liquid having a predetermined viscosity, for example a gel, or in a solid state, for example granulates or a sheet, or a mixture of liquid and solid particles dispersed in the liquid, or the like. Furthermore, a solid coating may be liquefied, flattened and dried or cured before or during the step of attaching.

[0054] Figs. 5-8 illustrate another alternative embodiment of the method according to the invention. In this case the coating 2 is applied onto the carrier 1 in a similar way as the embodiments as described hereinbefore, but between the carrier 1 and the first resin layer 3 a release agent 10 is applied. The release agent 10 may have such properties that it will be activated upon laminating the substrate 5 and the coated carrier 1, 2, but it may also have these properties without separate activation thereof.

[0055] Fig. 7 shows an intermediate condition during pressing. Fig. 8 shows that after pressing the carrier 1 including the release agent 10 is removed from the coated substrate 2, 5. It is conceivable that the release agent 10 partly remains on the coated substrate 2, 5 after removing the carrier 1. The remainder may then be removed by other means, for example brushing.

[0056] The embodiment as illustrated in Figs. 9-12 is more or less similar as illustrated in Figs. 5-8, but in this case the carrier 1 has a flat instead of a textured surface. Fig. 10 shows a press plate 11 which is provided with a textured surface so as to obtain a panel 9 with an embossed surface. Fig. 12 shows that the press plate 11 including the carrier sheet 1 and the release agent 10 are removed from the coated substrate 3, 4, 5.

[0057] In still another alternative embodiment the coating 2 comprises a sheet or film 17 as illustrated in Fig. 13. In this case the carrier 1 is provided by supplying a paper sheet which is unwound from a roll 13. An ionomer layer 14 is applied onto the carrier 1 by means of extrusion. The coating 2 is further built-up by applying a tie layer 15 onto the ionomer layer 14 by means of co-extrusion. Then, the tie layer 15 is activated by an infrared radiator 16, but alternative activation devices are conceivable. In a next step a decorative sheet 17 is applied onto the tie layer 15. As a result, a coated carrier comprising the carrier 1, the ionomer layer 14, the tie layer 15 and the decorative sheet 17 is prepared. The coated carrier can be placed onto a substrate, and the coated carrier and the substrate can be attached to each other. Finally, the carrier 1 can be removed from the coated substrate so as to form a panel as shown in the embodiments hereinbefore.

[0058] The decorative sheet 17 may be made of paper or a polymer. A decoration pattern may be provided on the decorative sheet 17, for example by contact printing or noncontact printing such as digital printing. Before applying the decorative sheet 17 onto the tie layer 15 a surface tension treatment to the decorative sheet 17 may be applied, for example a corona discharge treatment. In case of a polymeric decorative sheet 17 which is provided with an ink pattern a surface tension treatment before and/or after providing the ink pattern may be applied.

[0059] The ionomer layer 14 creates a high level of wear resistance of the resulting panel. An ionomer resin is a polymer that comprises repeat units of both electrically neutral repeating units and a fraction of ionized units. The ionomer resin layer may be selected from the group known as Surlyn®. Surlyn® is a commercial thermoplastic ionomer resin that was introduced by DuPont™ in the early 1960's. Surlyn® can be used in conventional extrusion/coextrusion, blown film, cast film, and extrusion coating equipment designed for polyethylene resins. Other characteristics of Surlyne® are sealing performance, formability, clarity, oil/grease resistance, and high hot draw strength, which makes the material quite suitable for application in the field of floor panels.

[0060] Alternatively, the ionomer resin layer 14 may be fed as a sheet which is laminated to the decorative sheet 17 by means of the tie layer 15 between the ionomer resin layer 14 and the decorative sheet 17, wherein the tie layer 15 is preferably selected from the group known as Bynel®. Bynel® is a commercial adhesive resin that has been introduced by DuPont™, as well. Alternatively, the tie layer 15 may be a blend of 30-50% Fusabond M603 and 50-70% Elvax 315LG, or EVA.

[0061] In the process as illustrated in Fig. 13 it is possible to add wear-resistant particles to the ionomer layer 14 and/or the tie layer 15, for example by means of scattering particles onto the extruded layers or by mixing with the material to be extruded.

[0062] The invention is not limited to the embodiments as described above and shown in the drawings, which can be varied in several ways without departing from the scope of the invention.

Claims

1. Method of manufacturing a panel (9), including the steps of:

   providing a carrier (1),
   applying a coating (2) onto at least one side of the carrier (1) so as to form a coated carrier (1, 2),
   providing a substrate (5),
   placing the coated carrier (1, 2) and the substrate (5) onto each other such that said coated side faces the substrate (5),
   attaching the coated carrier (1, 2) and the substrate (5) to each other so as to fix the coating (2) to the substrate (5),
   removing the carrier (1) from the coated substrate (2, 5) so as to form the panel (9).

2. Method according to claim 1, wherein the carrier (1) comprises a textured surface on the side onto which the coating (2) is applied.

3. Method according to claim 1 or 2, wherein the carrier (1) is a flexible sheet, preferably made of paper, polymer, polymeric composite, or the like.

4. Method according to one of the preceding claims, wherein the coating (2) comprises a hot melting substance (3, 4), and the step of attaching comprises a

step of laminating which is performed by means of elevated heat and pressure under which conditions at least a part of the coating (2) melts and flows so as to adhere to the substrate (5).

5. Method according to claim 4, wherein the coating (2) is applied onto the carrier (1) in liquid state and at least partly dried and/or cured before the step of laminating.

6. Method according to one of the preceding claims, wherein anti-wear and/or anti-scratch particles are added to the coating (2).

7. Method according to one of the preceding claims, wherein the coating (2) is multi-layered, preferably comprising layers (3, 4, 14, 15, 17) of different compositions providing different properties for different functions.

8. Method according to one of the preceding claims, wherein the coating (2) comprises an ionomer (14), which is preferably applied onto the carrier (1) through an extrusion process.

9. Method according to claim 8, wherein the ionomer (14) is coated with a tie layer (15), preferably by means of an extrusion process, after which a decorative sheet (17) is adhered to the tie layer (15).

10. Method according to claim 9, wherein before adhering the tie layer (15) and the decorative sheet (17) to each other, the tie layer (15) and/or the decorative sheet (17) are activated for improved adherence to each other.

11. Method according to one of the preceding claims, wherein a decoration pattern is applied onto the coating (2) before placing the coated carrier (1, 2) and the substrate (5) onto each other.

12. Method according to one of the preceding claims, wherein the coating (2) is applied onto the carrier (1) by applying solid resin particles or a mixture of solid resin particles and anti-wear and/or anti-scratch particles, after which the coating (2) is at least partly melted.

13. Method according to claim 12, wherein the substrate comprises a decorative sheet covered with hot melting particles, wherein the decorative sheet and the coating contact each other after placing the substrate and the coated carrier onto each other, wherein the step of attaching is performed in a heated press.

14. Method according to one of the preceding claims, wherein the carrier (1) is provided with a release agent (10) at the side onto which the coating (2) is to be applied.

15. A panel, which is made by a method according to one of the preceding claims 1 and which is provided with locking means for locking at least two panels to each other.

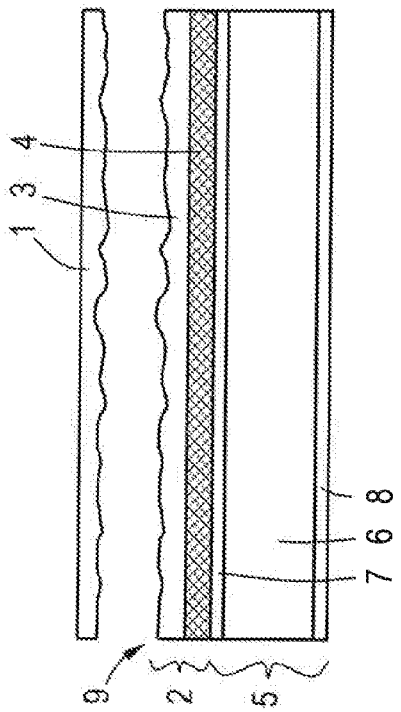

Fig.3

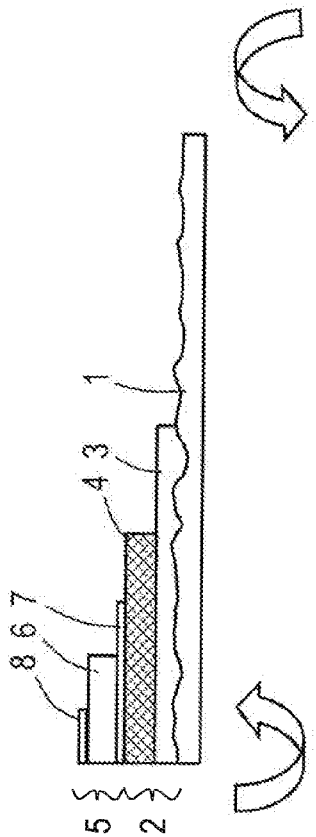

Fig.4

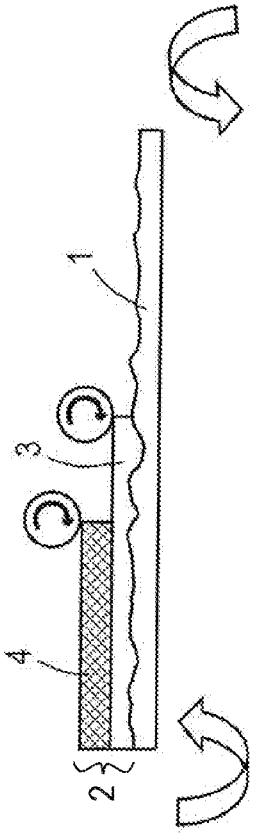

Fig.1

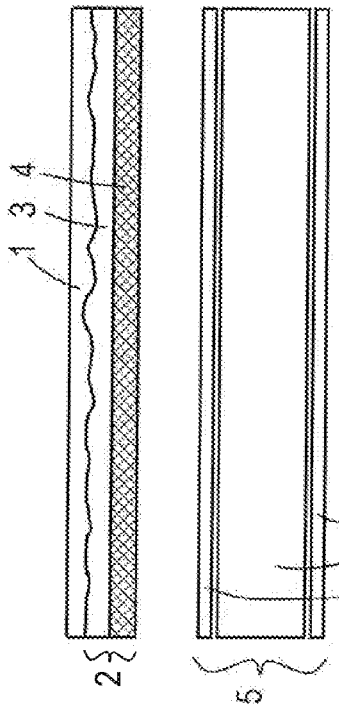

Fig.2

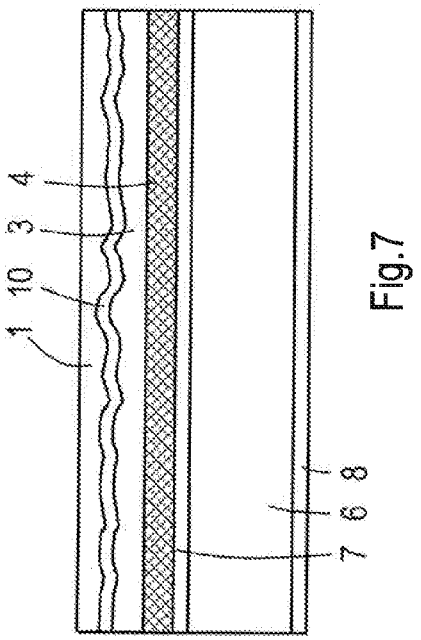

Fig.7

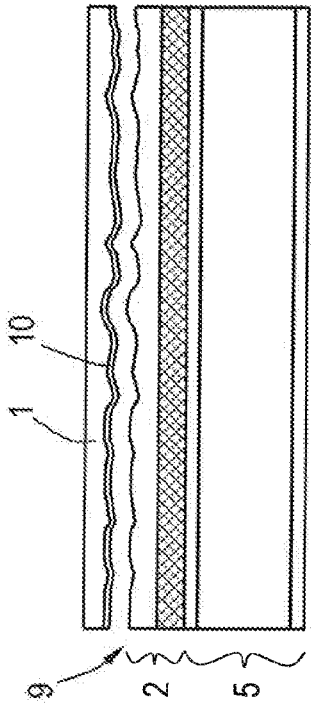

Fig.8

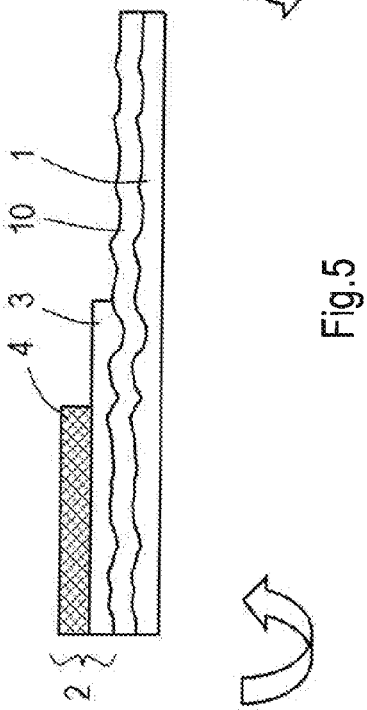

Fig.5

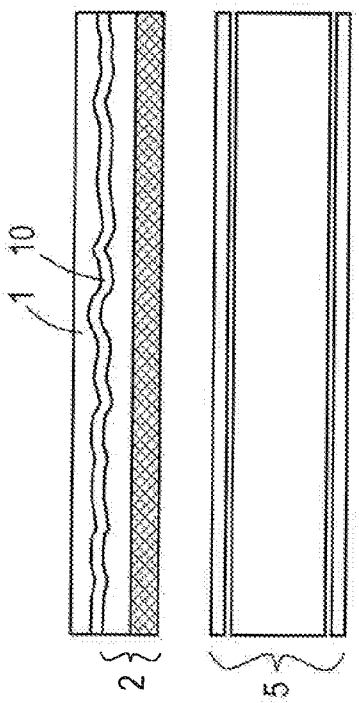

Fig.6

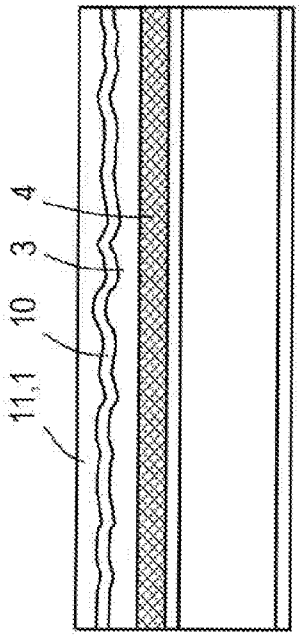

Fig.11

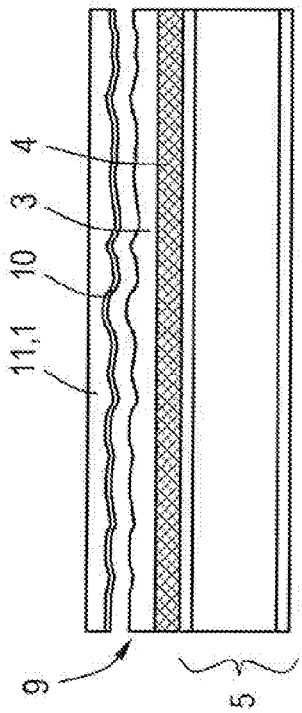

Fig.12

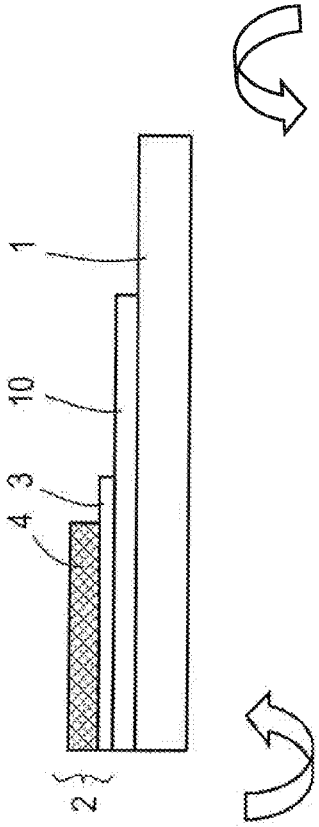

Fig.9

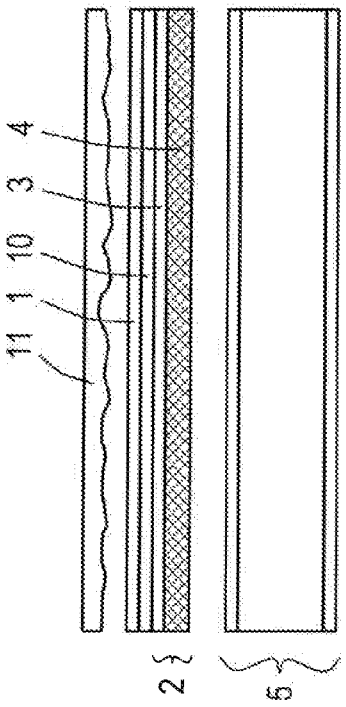

Fig.10

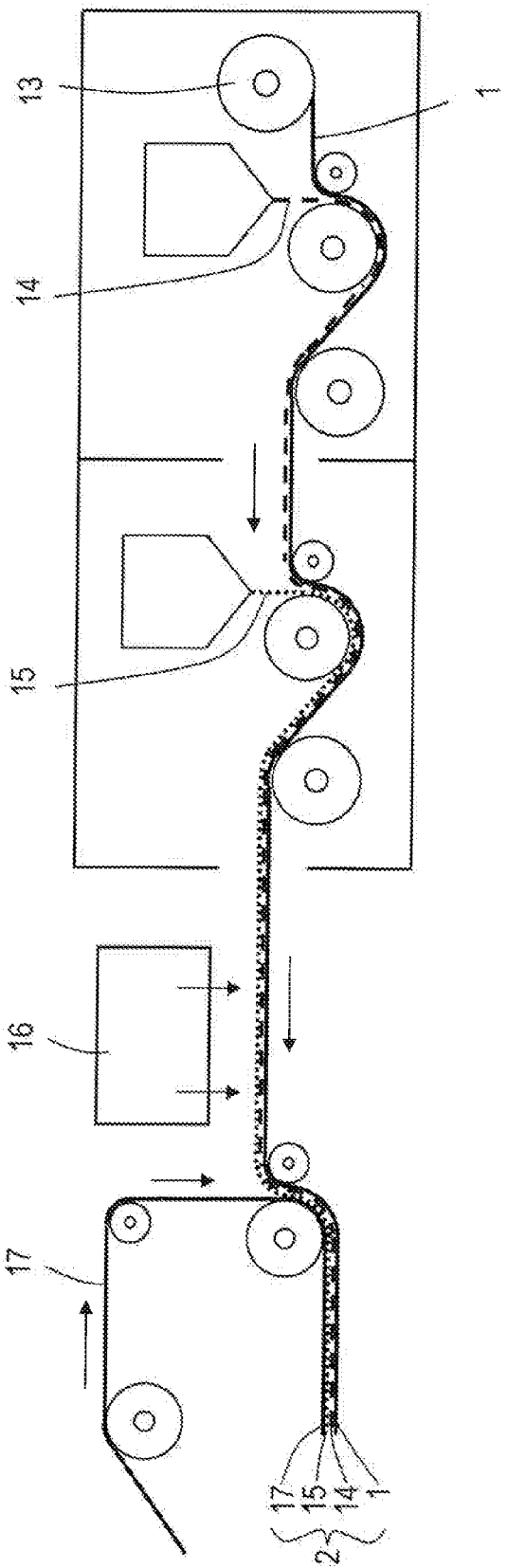

Fig.13

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Place of search	Date of completion of the search	Examiner
Munich	3 November 2011	Ziegler, Hans-Jürgen

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