EUROPEAN PATENT SPECIFICATION

(54) DECORATIVE SHEET AND PROCESS FOR PRODUCING THE SAME

DEKORFOLIE UND VERFAHREN ZU DEREN HERSTELLUNG

FEUILLE DECORATIVE ET SON PROCEDE DE FABRICATION

(84) Designated Contracting States:
DE ES FR GB IT

(30) Priority: 30.05.1997 JP 14229297

(43) Date of publication of application: 22.03.2000 Bulletin 2000/12

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(51) Int Cl.7: B44C 1/17, B44C 1/10, B41M 7/00

(86) International application number: PCT/US98/10515


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(56) References cited:
EP-A- 0 765 763

• PATENT ABSTRACTS OF JAPAN vol. 018, no. 301 (C-1210), 9 June 1994 & JP 06 063219 A (SANKYO KK), 8 March 1994

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According to the decorative sheet of the present invention, in particular, by virtue of its three-dimensional decorative effect, can be advantageously used as labels, stickers, emblems, and other similar articles.

Various decorative sheets have hitherto been proposed for providing three-dimensional decoration. In most of these decorative sheets, a thermal expandable microcapsule or a similar expandable material is used in areas, of the sheets, to be decorated, and the desired decorative effect is attained as a result of expansion of the microcapsule or the like.

For example, JP-A-60-246878 discloses a pattern print leather. This pattern print leather is formed by printing a pattern on the surface of a substrate film using a printing ink containing a microcapsule with a foaming agent expandable upon heating. The claimed advantage of this technique is that the need to perform embossing can be eliminated and, at the same time, it is possible to avoid misregistration, between the printed pattern and the concave or convex portions, which unavoidably occurs due to the embossing.

JP-A-63-273673 discloses a three-dimensional ink comprising a binder, a colorant and a foamed microcapsule. The claimed advantage of this technique is that letters, figures or the like can be provided using the color of the ink per se.

JP-A-2-295730 discloses a decorative material prepared by forming a film of a resin composition containing not more than 4% by weight, based on the total solid content, of a microcapsule type foaming agent on an opaque substrate and foaming the microcapsule type foaming agent. The claimed advantage of this technique is that the surface of the substrate is dimly seen through the film to impart mohair effect while maintaining the features, such as the three-dimensional decorative effect attained by the foamed film.

JP-A-3-50274 discloses a foamable ink. This foamable ink is characterized in that ultrafine particles having high thermal conductivity or the like are incorporated into an ink containing microspheres of thermal expandable microcapsules having a particle diameter of 10 to 30 mm. The claimed advantage of this technique is that a three-dimensional image can be readily formed by mere rapid drying utilizing high frequency, resulting in enhanced profitability.

The above and other decorative sheets having irregularities, however, involve problems, to be solved, attributable to the layer construction. Specifically, a decorative sheet 20 of the above conventional type, as shown in Fig. 1 (cross-sectional view), generally has a layer construction comprising: a substrate 21; and, provided thereon in the following order, an expandable layer 23 containing a foamed microcapsule 24, a color layer 22, and a clear layer 27 or a transparent protective layer. A pressure-sensitive adhesive layer 25 with a release liner 26 is provided on the surface of the substrate 21 remote from the decoration side. According to such a layer construction, however, the color layer 22 and the clear layer 27, which protect the foamed, expanded layer 23, have no satisfactory thickness, posing a problem that, despite low cohesive force of the foamed, expanded layer 23, the decorative sheet 20 in its decorated areas (areas corresponding to the expanded layer), when it undergoes abrasion or impact during use or the like, is cracked or separated from the sheet, resulting in remarkable deterioration in appearance.


An object of the present invention is to solve the above problems of the prior art and to provide an improved decorative sheet which can offer a three-dimensional decorative effect and is free from creation of defects, such as cracks, or separation of the decorated area from the sheet upon being exposed to abrasion, impact or other conditions.

Another object of the present invention is to provide a process for producing the above improved decorative sheet.

According to the invention these objects are solved by a decorative sheet as defined in claim 1 and a process for producing such a decorative sheet as specified in claim 6. The subclaims relate to various embodiments of the invention.

According to one aspect of the present invention, the above objects can be attained by a decorative sheet having irregularities, comprising: a transparent substrate; and, laminated thereon in the following order, a color layer, an expandable layer, and a pressure-sensitive adhesive layer.

According to another aspect of the present invention, there is provided a process for producing the above decorative sheet having irregularities, comprising the steps of:

successively laminating a color layer and an expandable layer on a transparent substrate and drying the laminate; applying thereon a pressure-sensitive adhesive layer with a release liner provided on the surface of the pressure-sensitive adhesive layer remote from the substrate and pressing the pressure-sensitive adhesive layer against the underlying layer including the color layer; and heating the whole laminate to foam the expandable layer.

According to the decorative sheet of the present invention, in particular, by virtue of partial provision of the
expansible layer, that is, provision of the expansible layer in a pattern form, a three-dimensional decorative effect can be attained, and, in addition, since the color layer and the expansible layer underlies the substrate, inadvertent separation of the decorated area from the decorative sheet can be prevented upon being exposed to unfavorable external action, for example, abrasion or impact conditions.

[0015] Further, in the decorative sheet of the present invention, there has not been adopted a structure in which a substrate is disposed below an expansible layer as in the prior art-sheet, however, the substrate itself, if it is positioned above the expansible layer, has a strength sufficient to eliminate a lower support.

[0016] The invention will be described in more detail referring to the drawing in which

Fig. 1 is a cross-sectional view showing one example of the conventional decorative sheet (already referred to) and

Fig. 2 is a cross-sectional view showing one preferred embodiment of the decorative sheet according to the present invention.

[0017] Fig. 2 is a cross-sectional view of one preferred embodiment of the decorative sheet according to the present invention. A decorative sheet 10, as shown in the drawing, comprises: a transparent substrate 1; and, laminated thereon in the following order, a color layer 2, an expansible layer 3 containing a thermal expansible microcapsule 4, and a pressure-sensitive adhesive layer 5. A release liner 6 is provided on the surface of the pressure-sensitive adhesive layer 5 remote from the color layer 2. Further, a clear layer 7 is provided on the surface of the substrate 1 (viewer side of the decorative sheet 10). The decorative sheet of the present invention will be described in more detail based on this embodiment.

[0018] In the decorative sheet having irregularities according to the present invention, the transparent substrate serving as a base of the decorative sheet is not limited so far as it has excellent transparency and good adhesion to the underlying color layer and the clear layer covering the surface of the substrate remote from the expansible layer 3. Specifically, for the substrate, any material may be suitably selected from transparent, naturally occurring or synthetic substrate materials commonly used in the art. The substrate material, which may be advantageously used, is a resin composition which preferably has a softening point below the thermal expansion temperature of the foaming agent used in the expansible layer. Suitable resin compositions include, for example, resins such as polyvinyl chloride (PVC) and polyurethane. Especially, thin films or sheets of polyvinyl chloride and polyurethane can be advantageously used as the substrate. Although the layer thickness of the substrate is not particularly limited, it is usually about 30 to 400 μm, preferably about 50 to 300 μm. When the thickness of the substrate is smaller than 30 μm, the production of the decorative sheet per se is difficult. On the other hand, when it exceeds 400 μm, the created irregularities are inconspicuous, resulting in indistinct three-dimensional decorative effect.

[0019] The color layer, which is first laminated on the substrate, may be constructed in the same manner as that commonly used in the field of the decorative sheet. In the practice of the present invention, preferably, the color layer is constructed of a colored resin composition. The softening point of the colored resin is preferably below the thermal expansion temperature of the foaming agent used in the expansible layer: Suitable colored resin compositions include, for example, colored polyurethane and other resins. Colorants commonly used in the art, for example, organic or inorganic pigments or dyes may be used, either alone or in any combination thereof, for coloring of the resin. The layer thickness of the color layer is not particularly limited. It, however, is generally about 5 to 50 μm, preferably about 10 to 30 μm. When the thickness of the color layer is smaller than 5 μm, the covering power of the color layer is deteriorated and, consequently, the color of the underlying layer adversely affects the decorative effect. On the other hand, when it exceeds 50 μm, the formation of the color layer per se becomes difficult.

[0020] An expansible layer is laminated onto the color layer. Preferably, the expansible layer is provided in a pattern form in association with the desired decorative effect and contains 10 to 50% by weight of a thermal expansible microcapsule.

[0021] More specifically, the expansible layer may have such a structure that the thermal expansible microcapsule is included and dispersed in the resin. The resin, in which the microcapsule is to be included, is not particularly limited. However, here again, the utilization of the above-described colored resin composition for constituting the color layer is recommended. The thickness of the expansible layer may vary depending upon various factors, such as the size, amount, and degree of expansion of the microcapsule to be dispersed within the expansible layer, the degree of the desired decorative effect and the like. The content of the thermal expansible microcapsule is preferably 10 to 50% by weight, more preferably 20 to 40% by weight, based on the total amount of the expansible layer. When the content of the microcapsule is excessively low, it is difficult to develop the three-dimensional effect in the decorated area. On the other hand, when it is excessively high, the adhesion of the expansible layer to the underlying color layer is unsatisfactory.

[0022] The thermal expansible microcapsule used in the foaming agent may be any one commonly used in the art. One example of suitable thermal expansible microcapsules is a thermal expansible microcapsule which has an ex-
pansion temperature of 100 to 180°C and comprises an outer shell comprising a vinylidene chloride/acrylonitrile co-polymer and isobutane enclosed in the outer shell. In such a microcapsule, upon heating, the outer shell is softened, and the isobutane in the interior of the shell is vaporized, causing expansion. As a result of the expansion, the area to be decorated is risen to offer the desired three-dimensional decorative effect. The above thermal expandable microcapsule is commercially available, for example, from Nihon Fillite Co., Ltd. under the trade designation “Expancel”™. The microcapsule "Expancel" has an average particle diameter of 10 µm in the unexpanded state and can be expanded to a size of about 40 µm.

[0023] Preferably, the expandable layer is formed in a pattern form on the color layer. The expandable layer may be formed on part of the color layer by various methods. However, use of screen printing, particularly silk screen printing, is advantageous. Depending upon the desired pattern, the screen used may be varied, and the mesh size thereof may also be regulated.

[0024] In the decorative sheet of the present invention, a pressure-sensitive adhesive layer is provided on the expandable layer so that the decorative sheet can be joined to an adherend. Preferably, the pressure-sensitive adhesive layer is formed of a pressure-sensitive adhesive having excellent adhesion to the expandable layer and adherends, for example, metals, plastics, woods, and resin paint surface. Suitable adhesives include, for example, acrylic resin pressure-sensitive adhesives. Although the thickness of the pressure-sensitive adhesive layer is not particularly limited, it is generally about 5 to 50 µm, preferably about 20 to 40 µm. When the thickness of the pressure-sensitive adhesive layer is excessively small, the adhesion is unsatisfactory, while when it is excessively large, it is difficult to form such a thin layer.

[0025] Provision of a release liner on the surface of the pressure-sensitive adhesive layer, which is a common practice in the art, is preferred. Release liners usable herein include a paper coated with a release agent, such as silicone resin, a substrate sheet or film of polyethylene terephthalate (PET) or the like. Preferably, the substrate sheet or film is not deformed upon expansion of the expandable layer by heating.

[0026] Further, according to the decorative sheet of the present invention, provision of a clear layer to cover the substrate on its side of a viewer is preferred for protection of the surface of the decorative sheet or other purposes. The clear layer as the outermost layer is preferably formed of a material having excellent weather resistance, water resistance and the like and good transparency. Materials suitable for the clear layer include materials having excellent adhesion to the underlying substrate, for example, colorless paints, such as fluororesin paints, thermosetting urethane paints, and ultraviolet-curable paints. The thickness of the clear layer is not particularly limited. It, however, is generally about 5 to 50 µm, preferably about 10 to 30 µm. When the thickness of the clear layer is excessively small, satisfactory weather resistance cannot be developed, while when it is excessively large, the formation of such a thick layer by coating is difficult.

[0027] By virtue of the above specific layer construction, the decorative sheet of the present invention can exhibit significant function and effect as compared with the conventional decorative sheet. For example, the conventional sheet comprises a substrate bearing an expandable layer, a color layer, and a clear layer in that order. Since the clear layer alone can function as the protective layer, the protective layer is thin, posing a problem of creation of cracking or separation in the decorated area upon being exposed to abrasion and impact conditions. In particular, such a problem is significant when the content of the thermal expandable microcapsule in the expandable layer is on a high level. By contrast, according to the present invention, the provision of the color layer and the expandable layer under the thermally softening substrate results in markedly improved protective effect and, therefore, enables the content of the thermal expandable microcapsule to be increased, realizing a better three-dimensional decorative effect.

[0028] Basically, the decorative sheet having irregularities according to the present invention may be produced by using a technique commonly used in the art, either as such or after modification according to the present invention.

[0029] More specifically, the decorative sheet of the present invention may be preferably produced by a process comprising the following steps:

1. preparation of a substrate comprising a transparent resin composition;
2. formation of a color layer on the substrate;
3. formation of an expandable layer on the color layer;
4. drying of the color layer and the expandable layer;
5. application of a pressure-sensitive adhesive layer with a release liner;
6. foaming of the expandable layer by heating; and
7. lamination of a clear layer.

[0030] A decorative sheet having an excellent three-dimensional effect can be produced via a series of steps described above. The sequence of the steps may be, if necessary, varied so far as this is not detrimental to the effect of the present invention.
Examples

[0031] The present invention will be described with reference to the following examples. However, it should be understood that the present invention is not limited to these examples only.

Example 1

Preparation of samples 1 to 7 (comparative samples)

[0032] In this example, for comparison, a decorative sheet having a layer construction as shown in Fig. 1 was prepared.

[0033] Scotchcal™ PU-295T (brand name of a product manufactured by Sumitomo 3M Ltd.) (layer thickness 150 µm) was provided as a substrate. An expandable layer was laminated on one side of the substrate. A thermal expandable microcapsule, Expancel™ 551DU (manufactured by Nihon Fillite Co., Ltd.), was provided as a foaming agent and mixed with a polyurethane resin toner, FL510 (trade name, manufactured by Sumitomo 3M Ltd.), to concentrations specified in Table 1 (5 to 50% by weight, weight ratio 2 to 50%), and the mixture was diluted with a thinner, S/C3911 (trade name, manufactured by Sumitomo 3M Ltd.), to a viscosity suitable for coating by silk screen printing. The resultant coating liquid was coated in a desired pattern on the substrate through a 100-mesh printing plate, and the print was dried at room temperature until it became dry to the touch. Thus, an expandable layer with a microcapsule dispersed therein was formed.

[0034] Thereafter, a color layer was formed on the expandable layer. Specifically, a polyurethane resin toner, FL545 (trade name, manufactured by Sumitomo 3M Ltd.), was diluted with a thinner, S/C3911 (trade name, manufactured by Sumitomo 3M Ltd.), to a viscosity suitable for coating by silk screen printing, and the coating liquid was printed on the substrate through a 260-mesh printing plate, and the print was then dried at 85°C or one hr. After the formation of the color layer, the laminate was dried at 120°C for 5 min. As a result, the expandable layer was risen to create irregularities on the color layers. Finally, a clear paint, GA-7 (trade name, manufactured by Sumitomo 3M Ltd.), was printed on the color layer, through a 150-mesh printing plate, and the print was dried at 85°C for one hr. Thus, contemplated samples 1 to 7 having a layer construction as shown in Fig. 1 were prepared.

[0035] The samples 1 to 7 thus prepared were visually inspected for appearance. As a result, a three-dimensional decorative effect could be confirmed. Then, in order to evaluate whether the samples in their decorated areas are separated upon abrasion of the clear layer, each sample was placed in an abrasion tester, a rotary abrasion tester (abrasion wheel: CS-10, rotating speed 60 rpm, load 500 g), the number of abrasion operations necessary for causing the separation of the decorated area was visually determined. The results are summarized in the following Table 1.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Concentration of foaming agent (wt%)</th>
<th>Number of abrasion operations necessary for causing separation of decorated area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>About 750 times</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>About 750 times</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>About 750 times</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>About 750 times</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>About 750 times</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>About 750 times</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>About 750 times</td>
</tr>
</tbody>
</table>

[0036] The results tabulated in the above Table 1 show that, for all the samples, the decorated area was unfavorably separated in a relatively early stage.

Example 2

Preparation of samples 8 to 14 (samples of the present invention)

[0037] In this example, a decorative sheet having a layer construction as shown in Fig. 2 was prepared.

[0038] A substrate was prepared from a thermoplastic urethane resin, Morthane PN 3429-215 (manufactured by Asahi Glass Co., Ltd.), similar to a substrate of Scotchcal™ PU-295T (brand name of a product manufactured by Sumitomo 3M Ltd.). In order to prepare the substrate, a thermoplastic urethane resin was molded by means of an
extruder into a film which was provided on a release liner, thereby a 150 µm-thick sheet.

[0039] A color layer was laminated onto one side of the substrate remote from the release liner. Specifically, a polyurethane resin toner, FL545 (trade name, manufacturer by Sumitomo 3M Ltd.), was diluted with a thinner, S/C3911 (trade name, manufactured by Sumitomo 3M Ltd.), to a viscosity suitable for coating by silk screen printing. The resultant coating liquid was printed on the substrate through a 260-mesh printing plate.

[0040] Subsequent to the lamination of the color layer, an expandable microcapsule, Expancel™ 551DU (manufactured by Nihon Fillite Co., Ltd.), as a foaming agent was provided mixed with a polyurethane resin toner, FL 510 (trade name, manufactured by Sumitomo 3M Ltd.) to concentrations specified in Table 2 (5 to 50% by weight, weight ratio 2 to 50%), and the mixture was diluted with a thinner, S/C3911 (trade name, manufactured by Sumitomo 3M Ltd.), to a viscosity suitable for coating by silk screen coating. The resultant coating liquid was printed in a desired pattern on the substrate through a 100-mesh printing plate, and the print was dried at 85°C for one hr. Thus, an expandable layer with a microcapsule dispersed therein was prepared.

[0041] Separately, a pressure-sensitive adhesive, RD-2738 (trade name, manufactured by Sumitomo 3M Ltd.), which is used in Scotchcal™ PU-295T (noted above), was coated by means of a bar coater on the release liner to a thickness on a dry basis of 45 µm, and the coating was dried at 100°C for 3 min. The pressure-sensitive adhesive layer with a release liner provided thereon was applied to the expandable layer, with a microcapsule dispersed therein, by means of a laminator. Thereafter, the release liner covering the substrate was separated and removed, followed by drying at 120°C for 5 min in the same manner as in Example 1 to expand the expandable layer. As a result, the expandable layer was risen to create irregularities on the color layer. Finally, a clear paint, GA-7 (trade name, manufactured by Sumitomo 3M Ltd.), was printed on the color layer through a 150-mesh printing plate, and the print was dried at 85°C for one hr. Thus, contemplated samples 8 to 14 having a layer construction as shown in Fig. 2 were prepared.

[0042] The samples 8 to 14 thus prepared were visually inspected. As a result, a three-dimensional decorative effect superior to that for the samples 1 to 7 could be confirmed. Then, in order to evaluate whether the samples in their decorated areas are separated upon abrasion of the clear layer, each sample was placed in an abrasion tester, a rotary abrasion tester (abrasion wheel: CS-10, rotating speed 60 rpm, load 500 g), the number of abrasion operations necessary for causing the separation of the decorated area was visually determined. The results are summarized in the following Table 2.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Concentration of foaming agent (wt%)</th>
<th>Number of abrasion operations necessary for causing separation of decorated area</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>5</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>11</td>
<td>20</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>12</td>
<td>30</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>13</td>
<td>40</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
<tr>
<td>14</td>
<td>50</td>
<td>Not separated after abrasion operation by 10,000 times or more</td>
</tr>
</tbody>
</table>

[0043] The results tabulated in the above Table 2 shows that, according to the present invention, the provision of a clear layer on an abrasion-resistant thick substrate prevents the decorated area from being separated from the decorative sheet even when exposed to severe abrasion conditions.

Example 3

[0044] The procedure of Example 2 was repeated, except that, in order to evaluate the influence of the layer thickness of the substrate on the decorative effect, as shown in the following Table 3, the layer thickness of the substrate was changed from 150 µm to 20 µm, 50 µm, 300 µm, and 450 µm. The results of the evaluation are summarized in Table 3.
<table>
<thead>
<tr>
<th>Layer thickness of substrate (μm)</th>
<th>Appearance (irregularities)</th>
<th>Preparation of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td>Substrate separated from release liner at the time of printing, making it impossible to prepare sample</td>
</tr>
<tr>
<td>50</td>
<td>Irregularities created in areas corresponding to expanded layer; good appearance</td>
<td>Possible to prepare sample without any problem</td>
</tr>
<tr>
<td>150</td>
<td>ditto</td>
<td>ditto</td>
</tr>
<tr>
<td>300</td>
<td>ditto</td>
<td>ditto</td>
</tr>
<tr>
<td>450</td>
<td>Indistinct border of expanded layer</td>
<td>ditto</td>
</tr>
</tbody>
</table>
As can be seen from the results tabulated in the above Table 3, the layer thickness of the substrate is preferably in the range of from about 50 to 300 µm. In the case of a layer thickness of 20 µm, the nerve of the substrate per se was unsatisfactory.

Effect of the Invention

As is apparent from the foregoing description, the present invention can provide a decorative sheet which, in use, can be freely applied to various places and, at the same time, exhibits an excellent three-dimensional decorative effect. Further, in this decorative sheet, the decorated area, which creates the decorative effect, is covered and protected by two layers, i.e., a transparent substrate and a clear layer, preventing not only creation of defects in the decorated area, such as cracks, but also separation of the decorated area upon being exposed to abrasion or impact conditions. Therefore, the decorative sheet of the present invention can be advantageously used in a wide variety of fields.

Claims

1. A decorative sheet having irregularities, comprising a transparent substrate (1), and laminated thereon in the following order, a color layer (2), an expandable layer (3), and a pressure-sensitive adhesive layer (5).

2. A decorative sheet according to claim 1, wherein the expandable layer (2) is provided in the form of a pattern and contains 10 to 50% by weight of thermal expandable microcapsules (4).

3. The decorative sheet according to claim 2, wherein the pattern of the expandable layer (2) is screen printed.

4. The decorative sheet according to any one of claims 1 to 3, wherein the substrate (1) has a layer thickness of 50 to 300 µm.

5. The decorative sheet according to any one of claims 1 to 3, which further comprises a clear layer (7) comprised of a transparent resin composition, the clear layer (7) being provided on the surface of the substrate (1) remote from the color layer (2).

6. A process for producing a decorative sheet having irregularities according to claim 1, comprising the steps of
   - successively laminating a color layer (2) and an expandable layer (3) on a transparent substrate (1) and drying the laminate, and
   - applying thereon a pressure-sensitive adhesive layer (5) with a release liner (6) provided on the surface of the pressure-sensitive adhesive layer (5) remote from the substrate (1) and pressing the pressure-sensitive adhesive layer (5) against the underlying layer including the color layer.

7. The process according to claim 6, wherein the whole laminate is heated to foam the expandable layer (3).

8. The process according to claim 7, wherein the expandable layer (3) is formed as a pattern by screen printing.

Patentansprüche

1. Unregelmäßigkeiten aufweisende Dekorbahn mit einem transparenten Substrat (1) und, in der folgenden Reihenfolge daraufauflaminiert, einer Farbschicht (2), einer expandierbaren Schicht (3) und einer Haftkleberschicht (5).

2. Dekorbahn nach Anspruch 1, bei der die expandierbare Schicht (2) als Muster vorliegt und zu 10 bis 50 Gewichtsprozent thermisch expandierbare Mikrokapseln (4) enthält.

3. Dekorbahn nach Anspruch 2, bei der das Muster der expandierbaren Schicht (2) siebgedruckt ist.

4. Dekorbahn nach einem der Ansprüche 1 bis 3, bei der das Substrat (1) eine Schichtdicke von 50 bis 300 µm hat.

5. Dekorbahn nach einem der Ansprüche 1 bis 3, ferner mit einer klaren Schicht (7) bestehend aus einer transpa-
renten Harzzusammensetzung, wobei die klare Schicht (7) auf der der Farbschicht (2) abgewandten Oberfläche des Substrats (1) vorgesehen ist.

6. Verfahren zur Herstellung einer Dekorbahn mit Unregelmäßigkeiten nach Anspruch 1, mit den folgenden Schritten:
   - aufeinanderfolgendes Laminieren einer Farbschicht (2) und einer expandierbaren Schicht (3) auf ein transparentes Substrat (1) und Trocknen des Laminats, und

7. Verfahren nach Anspruch 6, bei dem das gesamte Laminat erwärmt wird, um die expandierbare Schicht (3) aufzuschäumen.

8. Verfahren nach Anspruch 7, bei dem die expandierbare Schicht (3) durch Siebdruck als Muster aufgeschäumt wird.

Revendications

1. Feuille décorative ayant des irrégularités, comprenant un substrat transparent (1), et stratifié dessus dans l’ordre suivant, une couche de couleur (2), une couche expansible (3), et une couche d’adhésif sensible à la pression (5).

2. Feuille décorative selon la revendication 1, dans laquelle la couche expansible (2) est déposée sous la forme d’un motif et contient de 10 à 50 % en poids de microcapsules expansibles thermiquement (4).

3. Feuille décorative selon la revendication 2, dans laquelle le motif de la couche expansible (2) est sérigraphié.

4. Feuille décorative selon l’une quelconque des revendications 1 à 3, dans laquelle le substrat (1) a une épaisseur de couche de 50 à 300 μm.

5. Feuille décorative selon l’une quelconque des revendications 1 à 3, qui comprend en outre une couche transparente (7) comprenant une composition de résine transparente, la couche transparente (7) étant déposée sur la surface du substrat (1) loin de la couche de couleur (2).

6. Procédé de production d’une feuille décorative ayant des irrégularités selon la revendication 1, comprenant les étapes consistant à :
   - successivement stratifier une couche de couleur (2) et une couche expansible (3) sur un substrat transparent (1) et sécher le stratifié, et
   - appliquer dessus une couche d’adhésif sensible à la pression (5) avec une couverture anti-adhérente déposée sur la surface de la couche d’adhésif sensible à la pression (5) éloignée du substrat (1) et à presser la couche d’adhésif sensible à la pression (5) contre la couche sous-jacente comprenant la couche de couleur.

7. Procédé selon la revendication 6, dans lequel l’ensemble du stratifié est chauffé pour mousser la couche expansible (3).

8. Procédé selon la revendication 7, dans lequel la couche expansible (3) est déposée sous la forme d’un motif par sérigraphie.
Fig. 1
Prior Art

Fig. 2