Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2634883 A1 2008/12/19

(21) 2 634 883

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 2008/06/12

(41) Mise à la disp. pub./Open to Public Insp.: 2008/12/19

(30) Priorité/Priority: 2007/06/19 (DEDE 10 2007 028 603.3)

(51) Cl.Int./Int.Cl. *B32B 27/10* (2006.01), *B32B 38/14* (2006.01), *B44C 5/04* (2006.01)

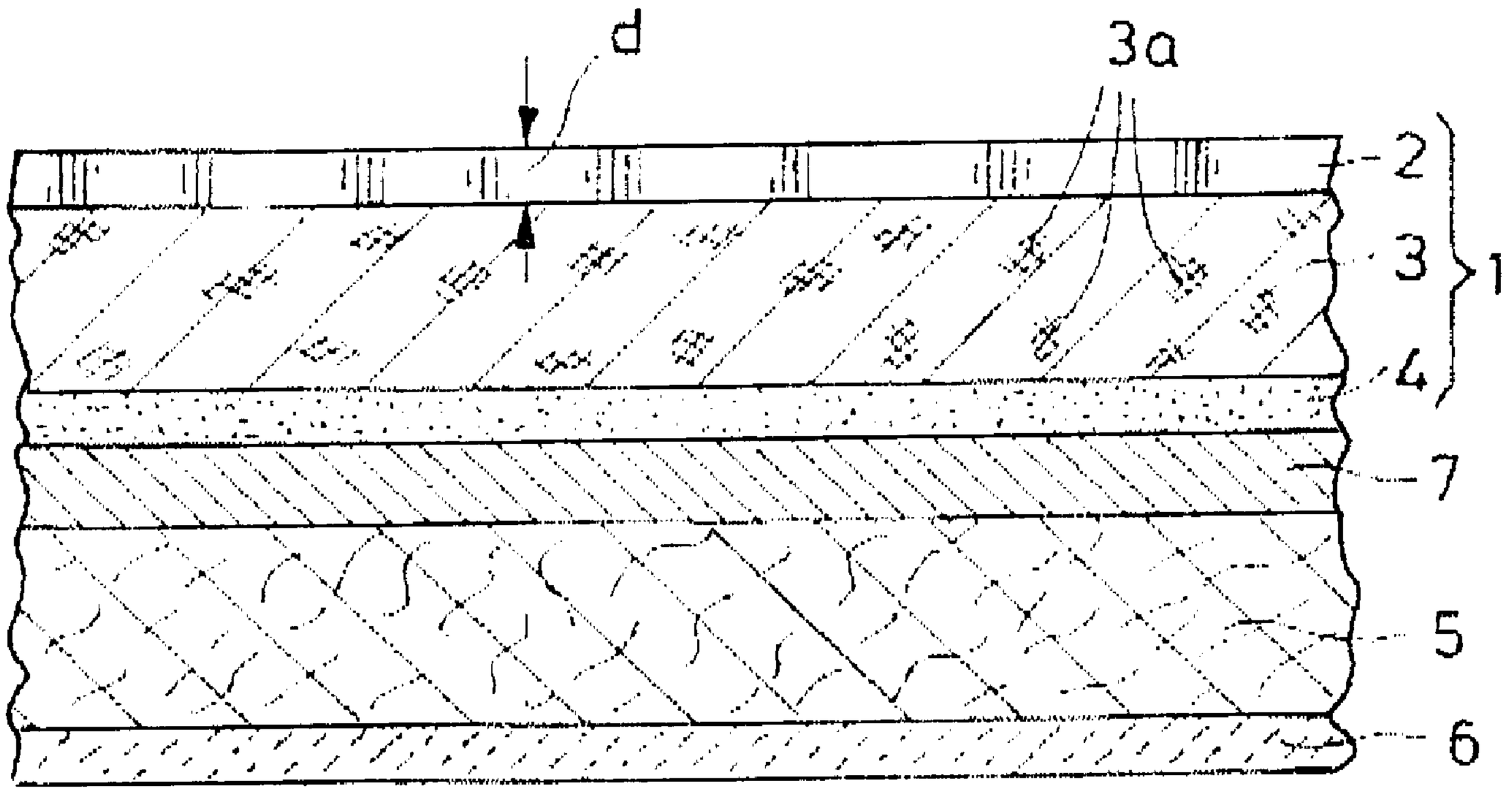
(71) Demandeur/Applicant:
DAKOR MELAMIN IMPRAEGNIERUNGEN GMBH, DE

(72) Inventeurs/Inventors:
BARWICH, STEFAN, DE;
BECK, ELMAR, DE

(74) Agent: SMART & BIGGAR

(54) Titre : FEUILLE DECORATIVE RESISTANT A L'ABRASION, EN PARTICULIER REVETEMENT PRESENTANT UN EFFET VISUEL PARTICULIER

(54) Title: ABRASION-RESISTANT DECORATIVE SHEET, IN PARTICULAR OVERLAY HAVING A PARTICULAR OPTICAL EFFECT



(57) Abrégé/Abstract:
The invention relates to an abrasion-resistant decorative sheet, in particular an overlay for the production of a laminate floor or of an abrasion-resistant furniture surface, comprising a paper layer provided on one side with a print layer, comprising an impregnation formed from a first plastic mixture and comprising a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material. In order to provide such a decorative sheet which meets the high requirements in line with standards with regard to its abrasion resistance and permits a high-quality and clear printed image and has an appealing optical impression or an optical special effect, such as a metallic or nacreous appearance, it is proposed to apply the layer formed from the second

CA 2634883 A1 2008/12/19

(21) 2 634 883

(13) A1

(57) Abrégé(suite)/Abstract(continued):
plastic mixture and containing particulate abrasion-reducing material to that side of the paper layer which is opposite the print layer. A production process for the decorative sheet, a laminate formed from the decorative sheet and a use for the production of laminate floors or abrasion-resistant furniture surfaces are likewise claimed.

Abstract

The invention relates to an abrasion-resistant decorative sheet, in particular an overlay for the production of a laminate floor or of an abrasion-resistant furniture surface, comprising a paper layer provided on one side with a print layer, comprising an impregnation formed from a first plastic mixture and comprising a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material. In order to provide such a decorative sheet which meets the high requirements in line with standards with regard to its abrasion resistance and permits a high-quality and clear printed image and has an appealing optical impression or an optical special effect, such as a metallic or nacreous appearance, it is proposed to apply the layer formed from the second plastic mixture and containing particulate abrasion-reducing material to that side of the paper layer which is opposite the print layer. A production process for the decorative sheet, a laminate formed from the decorative sheet and a use for the production of laminate floors or abrasion-resistant furniture surfaces are likewise claimed.

"Abrasion-resistant decorative sheet, in particular overlay having a particular optical effect"

The present invention relates to an abrasion-resistant decorative sheet, in particular an overlay, for the production of a laminate floor or a furniture surface, comprising a paper layer provided on one side with a print layer, comprising an impregnation formed from a first plastic mixture and comprising a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material.

Furthermore, the present invention relates to a process for the production of an abrasion-resistant decorative sheet, in particular of an overlay for manufacturing a laminate floor, the paper layer being imprinted at least on one side with a print layer, then being provided with an impregnation formed from a first plastic mixture and thereafter being laminated with a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material.

A similar sheet and a similar process are disclosed in the European patent EP 1 068 394 B1. This document relates to a process for impregnating decorative papers used for the production of highly abrasion-resistant laminate floor materials, in which process the decorative paper is first moistened with an amino resin and impregnated thereby, the amount of the resin being regulated by means of metering rolls, and a layer of an amino resin in a special dispersion then additionally being sprayed onto the top of the moistened wet decorative paper.

The product of the known process, a decorative paper having a uniform coating which comprises an amino resin with particulate silicon carbide, corundum or alumina and

comprises no cellulose derivatives, can - as described in the patent - be pressed onto an HDF substrate board on a short-cycle press at 180°C while maintaining a press time of 20 s. In an abrasion test corresponding to the standard DIN EN 13329, this board had an abrasion value of IP 12 000.

The abrasion test corresponding to the standard DIN EN 13329 envisages that two friction wheels equipped with emery paper strips are used in a special test apparatus in the holder of which the test specimens are clamped, where they are brought into contact with the friction wheels. After 100 revolutions in each case, the test specimens are checked for abrasion, and the emery paper is replaced by fresh emery paper after 200 revolutions in each case. The test is continued until the so-called initial abrasion point (IP) is reached. This is understood as meaning the point at which a decorative print present in the test specimen is worn through for the first time in a clearly detectable manner under the conditions defined in detail in the standard. The number of revolutions required for reaching this point is recorded and is a measure of the abrasion resistance. The resistance of a laminate floor to abrasion is then stated in abrasion classes according to the table below.

Table 1: Allocation of the abrasion classes according to DIN EN 13329

Abrasion class	Requirement (IP value) Number of revolutions	Application
AC1	at least 900	Bedroom
AC2	at least 1500	Living room
AC3	at least 2000	Lobby Small office
AC4	at least 4000	Hotel
AC5	at least 6000	Department store

A similar classification is also found in the standard DIN EN 438 "High-pressure decorative laminates (HPL) - sheets based on curable resins (laminates) - Part 2: Determination of the properties".

In the said European patent EP 1 068 394 B1, no print layer on the decorative paper is mentioned for the product of the process described since less importance is obviously attached to this in relation to the process described. However, it is customary in practice, in addition to unprinted, for example tinted, papers, also to use printed papers whose printed image is then covered by the particle-containing abrasion-resistant layer, it being possible for the optical impression of the decorative sheet to suffer in a disadvantageous manner. Any special optical effects strived for are thus reduced or lost or are not achievable at all.

DE 103 34 008 A1 describes a process for coating substrate materials of different gloss zones and a substrate material produced by said process. In this application, it is clear that imprinting and the method of its formation are of considerable importance owing to the decorative effect achievable with them. According to the known process, the substrate material is subjected in succession to a plurality of printing processes with matt and glossy coating, colorless or colored. In particular, a decorative sheet having different gloss zones is to be produced thereby. In order to achieve an improvement of the printed image and reliably to avoid creasing, it is intended first to apply a primary coating to the substrate material and then to place the printing ink exactly over the desired regions of the decorative printed image in the subsequent printing in at least two printing units by appropriately designed impression cylinders and the adjustment thereof in exact register. In an embodiment, impregnated paper which has been

impregnated with combinations of melamine resin, urea resin, acrylate dispersion, acrylate copolymer dispersion, polyester resins or the like or has already been provided with resin feeds on the paper machine is intended as a substrate material for this purpose. Direct or indirect gravure printing, flexographic printing, offset printing or rotary screen printing can be used as printing process which is effected in particular by means of a curable varnish which can be adjusted with a high-hiding pigment preparation and acquires a desired coloration with colored pigment preparations. Since the known substrate material is intended for lamination with furniture sheets, said process does not - like EP 1 068 394 B1 - envisage the application of a layer which contains particulate abrasion-reducing material.

During work carried out in the development of the invention with the aim of enabling the optical impression of furniture surfaces and in particular laminate floors with metallic or mother of pearl effects to be better represented, it was also found that, with the currently used printing technology, a desired "iridescent" or similar special effect can be achieved on printing on a decorative paper in particular so that this is lost when an overlay which is intended simultaneously with the decorative function also to represent the function of an abrasion-resistant useful layer is pressed onto the decoration side of a substrate board, e.g. of an HDF substrate board.

It is the object of the present invention to provide a decorative sheet of the type mentioned at the outset, which meets the requirements of the standards DIN EN 13329 and DIN EN 438 with regard to its abrasion resistance and which has a high-quality clear printed image with appealing optical impression. This means in particular that, with the aid of the imprinted overlay,

additional special optical effects are to be achieved - without falsifying the printed image of a decorative paper underneath. It is also intended to provide a correspondingly suitable process of the type mentioned at the outset for producing the sheet.

According to the invention, this is achieved if the layer formed from the second plastic mixture and containing particulate abrasion-reducing material is applied to that side of the paper layer which is opposite the print layer or is applied according to the process.

The print layer of the decorative sheet according to the invention thus forms the uppermost layer of the laminated finished product, it being possible for the impregnation formed from the first plastic mixture and carried out in particular after the printing to have a strengthening effect not only on the paper but advantageously also on the print layer, in particular if the paper layer has a specific base paper mass in the range from 15 to 35 g/m^2, as is characteristic for so-called overlay papers. The print layer itself can preferably be produced by gravure printing.

Gravure printing is a printing process in which printing elements are in the form of depressions in a printing plate. A print support which is in particular cylindrical and metallic, at least on the surface, such as one provided with a copper layer, dips with a part of its circumference into a trough containing low-viscosity ink. The ink is scraped off the raised, nonprinting areas of the print support by means of a doctorblade. Webs which cover the cylinder like a waffle-like net have the function of guiding the doctorblade cleanly even over large areas to be printed. The printing ink is then present in the depressions, so-called wells. The material to be printed - preferably paper but also plastic sheets

- and the print support are then pressed mechanically against one another, the material taking up the ink from the wells. By means of more or less deep wells, ink layers of different thickness can be printed in gravure printing, with the result that the tonal values "light/dark" change. This is not possible in other printing processes. In this way, gravure printing also delivers very intense - saturated - colors which are not achievable, for example, in flexographic and offset printing. The advantage of gravure printing is therefore that it is possible to achieve color prints which are distinguished by outstanding brilliance, a saturated color effect in the shadows and at the same time a fine gradation of tonal value in the bright parts.

Depending on the size and depth of the wells which can be produced by an etching process, by electromechanical engraving or with a laser beam, it is possible to make a distinction in gravure printing between conventional, semihalftone and halftone processes. In the conventional process, the wells are of the same size and different depth. In the semihalftone process, the wells are of different size and depth. In the halftone process, the wells vary in depth but not in size. In electromechanical engraving, a pyramidal diamond needle dips into the surface of the printing plate, consisting in particular of copper, and cuts out a well. Depending on the depth of penetration, it also produces another surface. The process is therefore both area-variable and depth-variable (semihalftone). The ink acceptance capacity of a well determines the dimensions of the printed dot, it being necessary for the dot to have larger dimensions for deeper shades than for lighter shades and accordingly it being necessary for the print density in the region of deeper shades to be greater overall. The dimensions of the dot are decided not only by the surface dimensions of the respective well but by its ink acceptance capacity or

its scoop volume. From these points of view, a screen in the range from 40 to 60 per cm, i.e. a number of wells in the range from 1600 to 3600 per cm^2, is preferred according to the invention. The wells have a spacing in the range from about 165 to 250 µm. The thickness of the applied ink layer may vary in the range from 4 µm in bright areas to 40 µm in dark areas.

In relation to the invention, gravure printing can be realized both as a direct process and preferably also as an indirect process. In the indirect process, which is also referred to as pad printing, the ink is first applied to a so-called printing plate which contains the wells for receiving the printing ink. As described above for the direct process, the ink is then scraped off the raised, nonprinting areas of the print support by means of a doctorblade. At the same time, a so-called pad - for example preferably consisting of silicone rubber - moves over the printing plate filled with ink, is lowered there and is pressed onto the plate so that it takes over the printed image. The printed image is then transferred to the material to be imprinted, by a procedure in which the pad - like the printing plate itself in the direct process - is pressed onto the material to be imprinted. Here, virtually 100% ink transfer can be achieved. The imprinting can advantageously be carried out not only in the case of an irregularly shaped surface of the material to be imprinted, it being possible to also imprint mechanically sensitive surfaces, but multiple prints by the wet-in-wet process are also possible without intermediate drying, plates and ink can be changed within a few minutes and, depending on the ink type used, extremely high resistances to mechanical abrasion and chemicals can be achieved. The latter is true especially with the use of two-component inks which, prior to printing, are mixed with a curing agent which reacts chemically with the ink so that a crosslinked ink film

forms. According to the invention, plates to a depth of 20 to 35 µm can be used in pad printing, resulting in a printed ink film of about 7 µm with the use of conventional inks. However, this layer thickness can be increased by multiple printing.

In the production of effect sheets, the particle size of the colored pigments used also plays an important role. The effects achievable with the various particle sizes are very different. Thus, relatively opaque, silky glosses can be achieved with very fine fractions (particle size < 5 µm), while a more sparkling effect is established with increasing particle size (up to 125 µm), but the hiding power of the ink decreases. On printing, the screen rulings and well geometries should be adapted to the particle size of the pigments. The abovementioned screen ruling in the range from 40 to 60 per cm can be advantageously used for pigment particle sizes in the range from 10 to 125 µm. In the case of pigment particle sizes in the range from 5 to 25 µm, however, larger screen rulings in the range from 70 to 100 per cm are recommended.

In the electromechanical engraving process, with the same surface area of a well, the depth depends on the tip angle of the needle. With a relatively small tip angle, a larger well volume is cut than with a larger tip angle. This tip angle should be about 110° to 120°, i.e. smaller than the usual standard angle of 130°, particularly with the use of the solvent-based inks used according to the invention, so that a larger scoop volume is produced. In the case of water-based inks, which have a lower viscosity than solvent-based inks, the tip angle can be greater than the standard angle or just as large, i.e. 130° to 140°. Regarding the well shape, this should preferably be in the form of a so-called transverse well, which can be achieved by rotating the impression cylinder

more slowly during engraving. This gives a compressed rhombus in which the diagonal running along the cylinder is larger than the diagonal running in the circumferential direction of the cylinder.

In the case of etched wells, the depth of the wells may be from about 50 to 55 µm, whereby the ratio of the well width to the width of the webs located between the wells should be from about 6:1 to 12:1.

Further advantageous features are evident from the subclaims and from the following description. The invention is explained in more detail with reference to a working example illustrated by the attached drawing.

There,

Fig. 1 shows a schematic cross-sectional diagram of a preferred embodiment of an abrasion-resistant decorative sheet according to the invention, which is laminated with a substrate,

Fig. 2 shows an enlarged plan view of a printing plate which can be used according to the invention for producing a print layer of an abrasion-resistant decorative sheet according to the invention.

As initially evident from fig. 1, an abrasion-resistant decorative sheet 1, in particular an overlay 1 for the production of a laminate floor, comprises a paper layer 3 provided on one side with a print layer 2, an impregnation 3a which is formed from a first plastic mixture and with which the paper layer 3 is provided, and a layer 4 which is formed from a second plastic mixture and contains a particulate abrasion-reducing material.

The paper layer 3 may have a specific base paper mass in the range from 15 to 35 g/m^2 and is first imprinted with the print layer 2 in the gravure printing process. For this purpose, a printing plate 10 shown in fig. 2 can be used. The thickness d of the applied print layer 2 may be in the range from 4 µm to 40 µm.

The paper layer 3 provided with the print layer 2 is impregnated. A first synthetic resin used for this purpose can preferably be an amino resin which is in particular a melamine-formaldehyde oligomer present in liquid form. It is advantageously also possible to ensure that a polymer dispersion is mixed with the amino resin before the impregnation for making the impregnating resin flexible. Such a dispersion may consist, for example, of one or more acrylate or methacrylate or vinyl acetate homopolymer(s) and/or styrene-acrylate, styrene-methacrylate or polybutadiene-styrene copolymer(s) and leads advantageously to the treated impregnated material not only being more flexible but also having greater adhesion to the further layer 4 which is to be applied in the next process stage and which can be more readily applied thereby. In addition, a curing agent for promoting the crosslinking and optionally a wetting agent can be mixed with the amino resin before the impregnation. An impregnating auxiliary can also be mixed with the synthetic resin serving for the impregnation prior to the application. This brings about a reduction in the surface tension in the synthetic resin system, with the result that the penetration time of the resin into the pores of the paper is shortened and the homogeneity of the impregnation is promoted.

For the impregnation, the paper layer 3 is first saturated with the first synthetic resin mixture, in particular the synthetic resin first being allowed to wash over the back of the decorative paper 1, this

synthetic resin then penetrating into the decorative paper 3 without further application in a so-called breathing zone and thereafter the paper being laden again with the first synthetic resin in an immersion zone. For realizing this process stage, it is possible to use a customary impregnating unit, the amount of resin being regulated by means of metering rolls. The amount applied for the impregnation may be in the range from 40 to 120 g/m^2, preferably in the range from 60 to 90 g/m^2.

In a subsequent process stage which follows directly in the manner of a wet-in-wet application and requires no second machine pass, a layer 4 which contains a second synthetic resin and particulate abrasion-reducing material is then applied to the moist impregnated material. This is followed by a heat treatment for curing the synthetic resins and for removing the moisture from the moist coated impregnated material. Residual moisture present after curing and drying may be in particular in the range from 3% by mass to 9% by mass. For drying, a continuously operating convection belt dryer, in particular a lay-on-air dryer with time, temperature and circulated air control, can be used in a gentle treatment but an efficient and precise procedure.

The specific mass of the layer 4 containing particulate abrasion-reducing material may assume in particular a value in the range from 3 to 70 g/m^2 after drying, while the total decorative sheet 1 as a finished product can preferably have a specific mass in the range from 60 to 250 g/m^2.

The second synthetic resin used for applying the layer 4 can advantageously likewise be an amino resin, in particular an optionally methylated melamine-formaldehyde oligomer present in liquid form. Advantageously, high resistance to chemicals, good adhesion to the other

layers and low formaldehyde emission can be established thereby in the finished decorative sheet 1. During the processing, the system is distinguished by good leveling on the surface to be coated. During the impregnation and during the coating, an optimum viscosity of the synthetic resins used can advantageously be established by admixing water.

The particulate abrasion-reducing material used in the layer 4 can preferably be corundum, silica or silicon carbide. This material may be used in particular with a particle size distribution in the range from F 120 to F 280 according to the standard of the FEPA (Fédération Européene des Fabricants de Produits Abrasifs) for abrasive particle sizes. The mean value of the particle size in the case of the particle size distribution F 280 is in the range of 36.5 +/- 1.5 µm. However, it would also be possible to use comparable particle sizes subject to other standards (JIS R 6001, ANSI) or to form a bimodal particle size distribution curve by mixing two of these particle sizes in order to achieve a higher packing density of the particles.

The proportion of the particulate abrasion-reducing material and/or the amount applied in the layer can advantageously be established depending on the abrasion resistance (table 1) of the sheet 1 which is to be achieved. The higher the abrasion resistance to be achieved, the greater must be the chosen proportion of the particulate abrasion-reducing material and/or the chosen amount applied in the layer 4. Abrasion values in the classes AC3, AC4 and AC5 can be achieved without problems. This proportion of particulate abrasion-reducing material may be - based on 100 parts by mass of the second synthetic resin or synthetic resin mixture - in the range from 5 to 80 parts by mass, preferably in the range from 20 to 40 parts by mass. However, the

abrasion resistance is determined not only by the particle-containing layer 4 but by a synergistic cooperation with the impregnated paper layer 3 present on top and the print layer 2 present thereon.

The application of the layer 4 which contains the particulate abrasion-reducing material is effected according to the invention on that side of the paper layer 3 which is opposite the print layer 2, for example by means of a nozzle which has become known by the name ARP nozzle, it being possible in turn for the amount applied to be regulated with the aid of metering rolls.

The finished decorative sheet can then be laminated, together with an imprinted and impregnated decorative paper 7, for example for the production of a floor laminate, in a manner known per se with a substrate 5, for example pressed onto an HDF substrate board in a short-cycle press. Said HDF subtrate board can be provided on its underside with a so-called counteracting paper 6.

As illustrated in fig. 2, the print layer 2 can be produced by direct or indirect gravure printing, an electromechanically engraved printing plate 10 preferably being used.

The gravure printing can be effected in particular in a semihalftone and halftone process. That section of the surface of the printing plate 10 which is shown indicates a semihalftone process in which wells 11 engraved in the plate are of different size and depth. Consequently, a width b of webs 12 present between the wells 11 also varies.

Inks of different types, for example universal or standard inks or polymeric two-component inks which

contain a crosslinking curing agent, can be used for the printing; in particular, it is also advantageously possible to introduce effect pigments - such as those of the metal oxide-mica pigment types, based on metal, such as with aluminum particles, or based on microcrystalline glass prisms - into the ink.

These effect pigments are available in various particle sizes, the effects associated with the particle size differing - as already described above. They range from silk gloss through nacreous effects to metallic or glitter effects.

For example, special inks which can be used together with amino resins are available from Hartmann/SunChemicals for achieving a nacreous effect. On contact with formaldehyde and melamine, as may occur in the impregnation 3a of the paper layer 3, these inks are stable. They are preparations based on protein/acrylate, which contain pigments having a particle size in the range from 10 to 40 µm at a solids content of from 33 to 41% and are delivered in highly viscous form (> 1000 mPa·s). These inks are water-soluble and water-dilutable. When they are used, a value in the range from 40 to 60 per cm is advisable for the screen of a printed plate 10 used in gravure printing.

In the case of pigments in the region of the upper limit mentioned for the particle size, it is also possible to use the coarser screen of up to 32 per cm (about 1000 wells per cm^2) and in the case of pigments in the region of the lower limit, it is possible - as already mentioned - to use a finer screen of up to 80 or 100 per cm (6400 or 10 000 wells per cm^2).

In the case of a printing plate 10 used in gravure printing, as shown in fig. 2, the depth of the wells 11

is determined by a tip angle of a needle used for engraving the printing plate 10. This angle, which is also determined by the viscosity of the ink used, may advantageously be, for example, 120°. The area predetermined by the screen dimensions, the well shape and the depth determine the scoop volume of a well 11. Here, it is advantageous if - as described - the shape of the wells 11 is described by a rhombus in which a diagonal DL running in the longitudinal direction of a cylindrical printing plate 10 is larger than a diagonal DQ running in the circumferential direction of the cylinder. Larger particles which exceed a depth of the well of, for example, 40 µm can, when aligned along the diagonal DL, easily be accommodated in the well 11 and can be applied to a pad or directly to the paper layer 3 on printing.

As is already evident from the above statements, the present invention is not limited to the working example described but includes all means and measures having the same effect in the context of the invention. Thus, for example, it is also within the scope of the invention if another printing process, such as, for example, flexographic printing, offset printing or rotary screen printing, is used.

Furthermore, the specific parameters of a gravure printing process, in particular of the printing plate 10 described by way of example, can differ from those described, in particular with regard to the geometry of the wells 11, without departing from the scope of the invention. It has not been mentioned so far that a needle which has the shape of a truncated pyramid can also advantageously be used for engraving the printing plate 10. The use of such a needle, which is indicated by the uniform base areas 13 in fig. 2, makes it possible to

vary the scoop volume in a desired manner by the creation of gentler or steeper walls 14 of the wells 11.

The distribution of mica or other effects in the decorative image of the decorative sheet 1 according to the invention may result from a structure or pattern of a printing cylinder which determines the printed image or may be printed as "all over" onto the paper layer 3, in the latter case the effect zones being arranged in an "uncontrolled" manner, i.e. without a pattern repeating itself in a structurally identical manner, on the surface of the decorative sheet 1. The first possibility, in which the decorative sheet 1 can also be provided with certain reference marks, is advantageous particularly when the decorative sheet 1 is to be cut into sheets of the same size in each case and, after this cutting, is to be processed on a short-cycle press or is to be processed without cutting on a continuous press to give laminates having a structurally identical decoration, whereby the effect zones of the transparent overlay 1 should be congruent - at least at defined points - with the printed image of decorated paper 7 present underneath.

Furthermore, the invention is not limited to those combinations of features which are defined in the independent claims - decorative sheet (claim 1), production process (claim 11), laminate produced from the decorative sheet (claim 22) and corresponding use (claim 24), but can also be defined by any desired other combination of certain features of all individual features disclosed altogether. This means that in principle virtually any individual feature of the independent claims can be omitted or can be replaced by at least one individual feature disclosed at another point in the application. In this respect, the claims are to be understood merely as an initial attempt at formulating an invention.

List of reference numerals

1 Decorative sheet
2 Print layer
3 Paper (decorative paper)
3a Impregnation of 3
4 Particle-containing layer
5 Substrate
6 Counteracting paper
7 Impregnated, optionally imprinted, decorative paper

10 Printing plate for 2
11 Wells of 10
12 Web between 10/10
13 Base area of 11
14 Wall of 11

b Width of 12
d Thickness of 2
DL Large diagonal of 11
DQ Small diagonal of 11

Claims

1. An abrasion-resistant decorative sheet, in particular an overlay for the production of a laminate floor or a furniture surface, comprising a paper layer provided on one side with a print layer, comprising an impregnation formed from a first plastic mixture and comprising a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material, wherein the layer formed from the second plastic mixture and containing particulate abrasion-reducing material is applied to that side of the paper layer which is opposite the print layer.

2. The decorative sheet as claimed in claim 1, wherein the paper layer has a specific base paper mass in the range from 15 to 35 g/m^2.

3. The decorative sheet as claimed in claim 1 or 2, wherein the first plastic mixture and/or the second plastic mixture consists of an amino resin, in particular of a melamine-formaldehyde resin applied in liquid form and then cured.

4. The decorative sheet as claimed in any of claims 1 to 3, wherein the particulate abrasion-reducing material is corundum or silicon carbide, in particular having a particle size distribution in the range from F 120 to F 280 according to FEPA standard.

5. The decorative sheet as claimed in any of claims 1 to 4, wherein the proportion of the particulate abrasion-reducing material - based on 100 parts by mass of the second plastic mixture, is in the range from 5 to 80 parts by mass, preferably in the range from 20 to 40 parts by mass.

6. The decorative sheet as claimed in any of claims 1 to 5, wherein the specific mass of the layer containing particulate abrasion-reducing material is in the range from 5 to 80 g/m^2.

7. The decorative sheet as claimed in any of claims 1 to 6, comprising a residual moisture present after curing and drying of from 3% by mass to 9% by mass.

8. The decorative sheet as claimed in any of claims 1 to 7, comprising a specific mass in the range from 60 to 250 g/m^2.

9. The decorative sheet as claimed in any of claims 1 to 8, wherein the thickness of the print layer is in the range from 4 µm to 40 µm.

10. The decorative sheet as claimed in any of claims 1 to 9, comprising an abrasion value of at least the class AC3 according to DIN EN 13329.

11. A process for the production of an abrasion-resistant decorative sheet, in particular of an overlay for manufacturing a laminate floor, a paper layer being imprinted on one side with a print layer, then being provided with an impregnation formed from a first plastic mixture and thereafter being laminated with a layer which is formed from a second plastic mixture and contains particulate abrasion-reducing material, wherein the layer formed from the second plastic mixture and containing particulate abrasion-reducing material is applied to that side of the paper layer which is opposite the print layer.

12. The process as claimed in claim 11, wherein the print layer is produced by direct or indirect gravure

printing, an electromechanically engraved printing plate preferably being used.

13. The process as claimed in claim 12, wherein the gravure printing is effected by a semihalftone and halftone process.

14. The process as claimed in any of claims 11 to 13, wherein the printing is effected as multiple printing, preferably by a wet-in-wet process without intermediate drying.

15. The process as claimed in any of claims 11 to 14, wherein a polymeric two-component ink which contains a crosslinking curing agent is used for the printing.

16. The process as claimed in any of claims 11 to 15, wherein an ink which contains pigments having particle sizes in the range from 5 to 125 µm is used for the printing.

17. The process as claimed in any of claims 11 to 16, wherein a number of wells of a printing plate used in gravure printing is in the range from 1000 to 6400 per cm^2, preferably from 1600 to 3600 per cm^2.

18. The process as claimed in any of claims 11 to 17, wherein, with the use of an ink having pigment particle sizes in the range from 10 to 125 µm, a screen of a printing plate used in gravure printing is in the range from 40 to 60 per cm.

19. The process as claimed in any of claims 11 to 18, wherein a depth of wells of a printing plate used in gravure printing is determined by a tip angle of 120° of a needle used for engraving the printing plate.

20. The process as claimed in any of claims 11 to 19, wherein the shape of wells of a cylindrical printing plate used in gravure printing is described by a rhombus in which preferably a diagonal running in the longitudinal direction of the cylinder is larger than a diagonal running in the circumferential direction of the cylinder.

21. The process as claimed in any of claims 11 to 20, wherein the maximum depth of a plate used in indirect gravure printing is from 20 to 35 µm.

22. A laminate comprising a substrate on the top of which an impregnated and optionally imprinted decorative paper is present, and a decorative sheet as claimed in any of claims 1 to 10, which is laminated with its layer containing particulate abrasion-reducing material with the top of the decorative paper, or a decorative sheet produced by a process as claimed in any of claims 11 to 21.

23. The laminate as claimed in claim 22, wherein a counteracting paper is laminated with the substrate on the side opposite the decorative sheet.

24. The use of a decorative sheet as claimed in any of claims 1 to 10 or of a decorative sheet produced by a process as claimed in claims 11 to 21 or of a laminate as claimed in claim 22 or 23 for the production of a laminate floor or of a furniture surface.

Fig.1

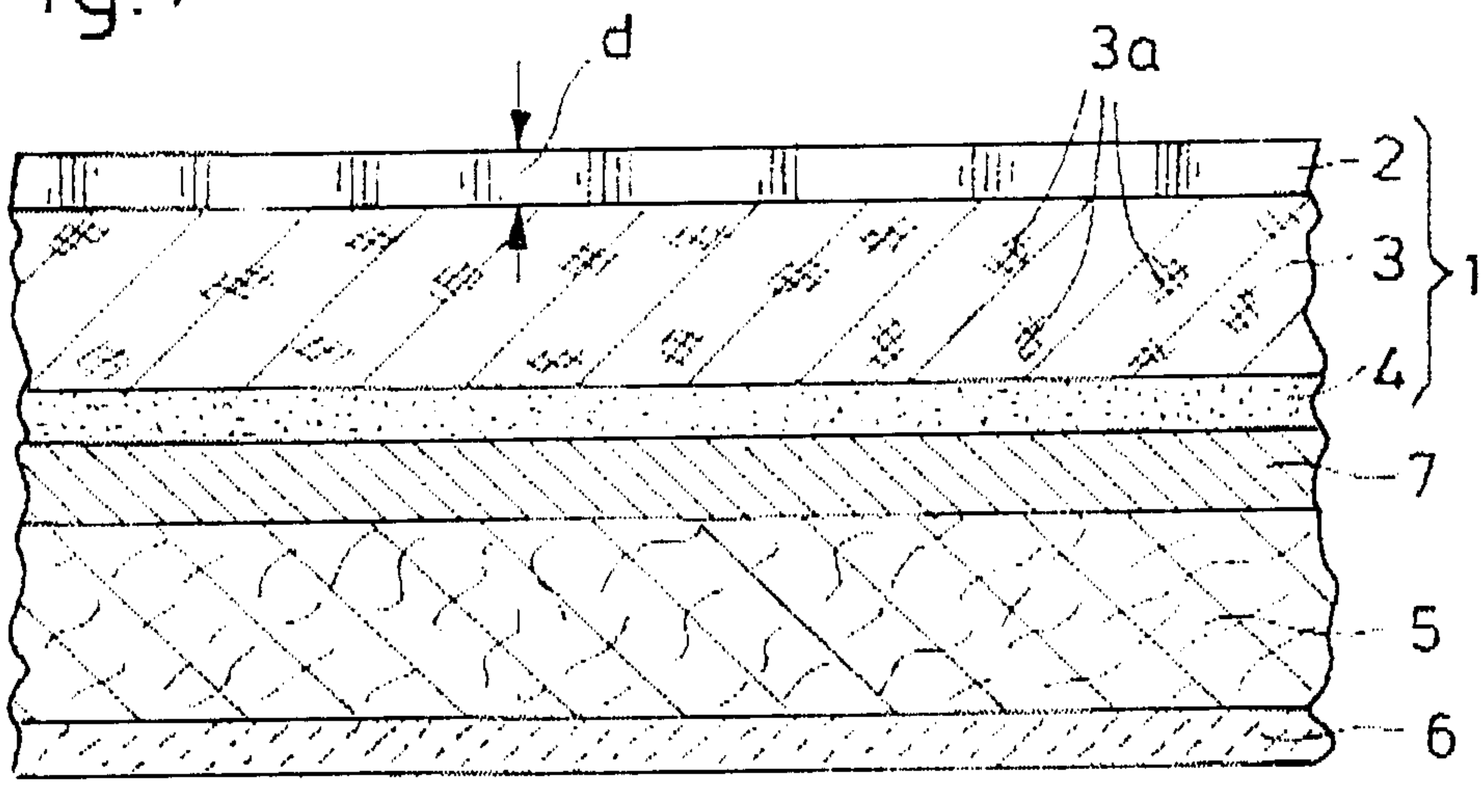
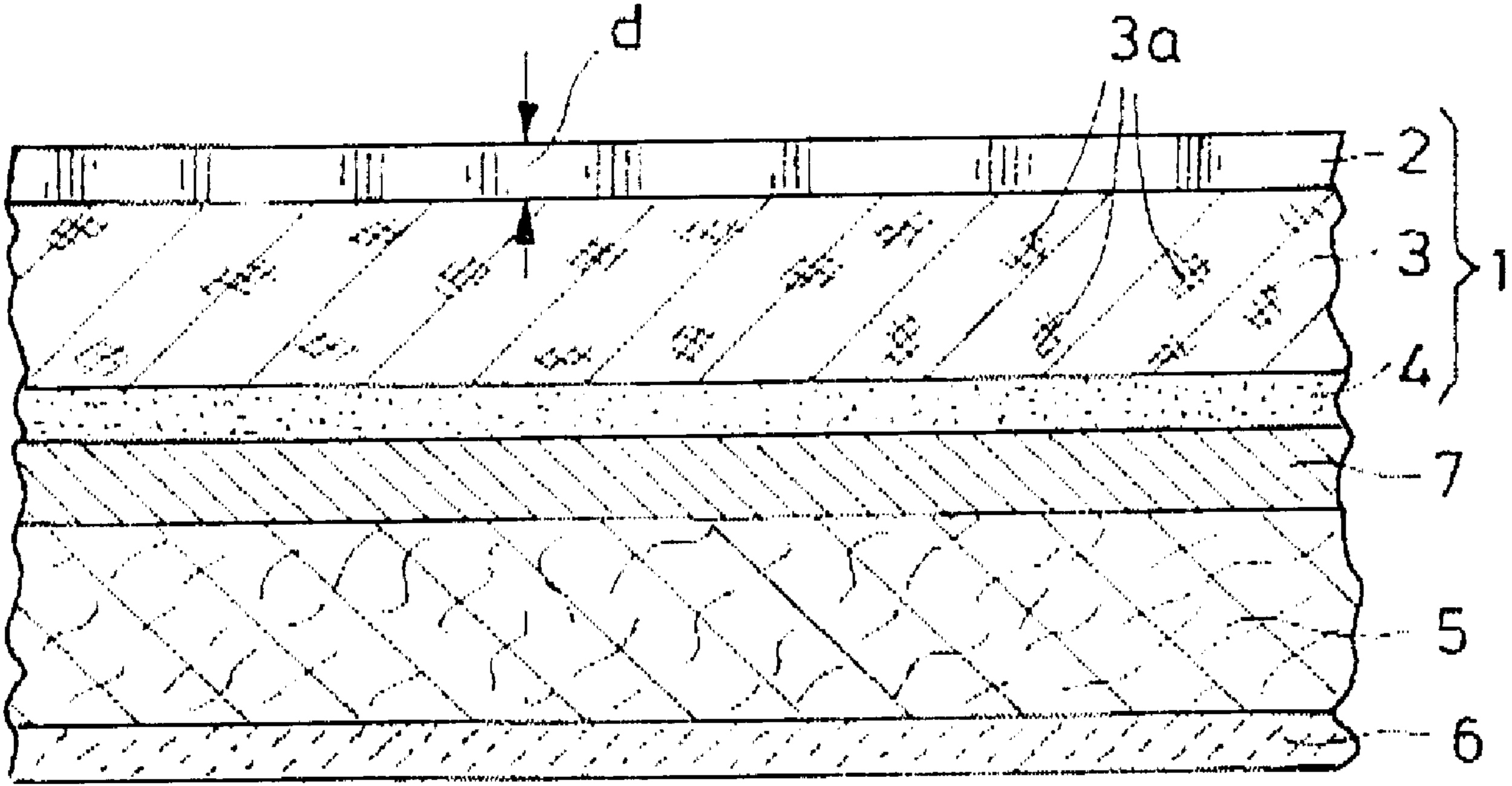


Fig.2

Patent Agents
Smart & Biggar


d
3a
2
3
4
1
7
5
6