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(71) Applicant (for all designated States except US): **FLOOR-
ING INDUSTRIES LIMITED, SARL** [IE/LU]; 10b, Rue
des Mérovingiens (ZI Bourmicht), L-8070 Bertrange (LU).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **THIERS, Bernard**
[BE/BE]; Stationsstraat 134, B-8780 Oostrozebeke (BE).
MEERSSEMAN, Laurent [BE/BE]; Beeklaan 33,
B-8500 Kortrijk (BE).

(74) Agent: **VAN HOOYDONCK, Guy**; Ooigemstraat 3,
B-8710 Wielsbeke (BE).

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(54) Title: FLOOR PANEL AND METHOD FOR MANUFACTURING SUCH FLOOR PANELS

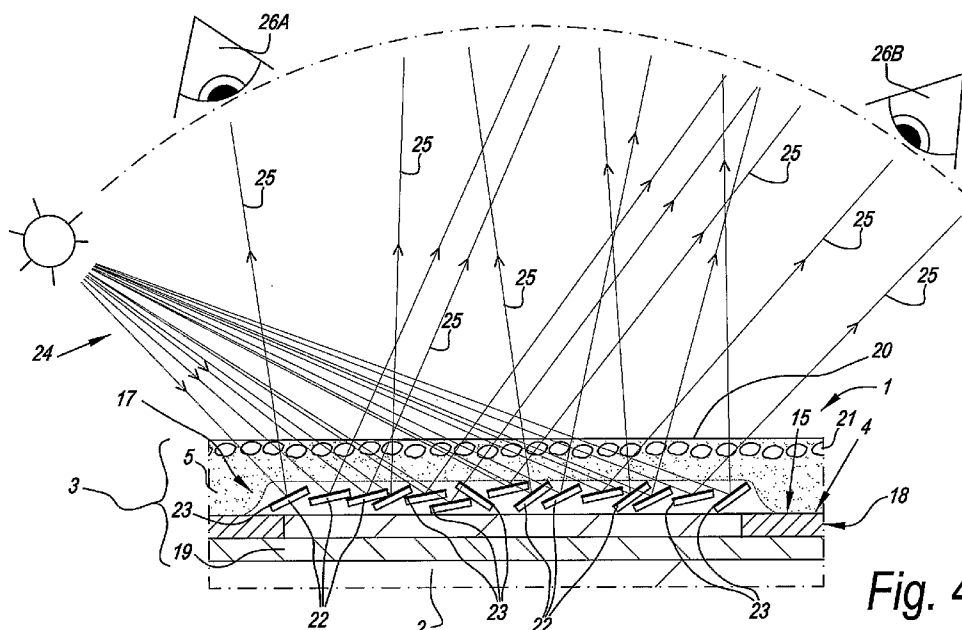


Fig. 4

(57) Abstract: Floor panel of the type comprising at least a substrate (2) and a top layer (3) located on this substrate (2), wherein said top layer (3) has a printed decor (4) and a synthetic layer (5) located on this decor (4), characterized in that the top layer (3) comprises pigments (22), which accomplish an angle-dependent optical effect visible at the surface (20) of the floor panel (1). The invention also relates to a method for manufacturing such floor panels (1).



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Floor panel and method for manufacturing such floor panels.

5 This invention relates to a floor panel and to a method for manufacturing such floor panels.

10 In particular, the invention relates to floor panels of the type comprising at least a substrate and a top layer situated on this substrate, wherein said top layer has a printed decor and a synthetic layer located on this decor. Such floor panels are known as such and can be manufactured by means of various techniques. In the following, two possible techniques known as such are discussed, wherein a difference is made according to the manner in which the printed decor is obtained.

15 According to a first possibility, the printed decor is formed on a material sheet, after which this material sheet is integrated as a decor layer in the top layer of the floor panel by means of a so-called DPL (Direct Pressure Laminate) process or a so-called HPL (High Pressure Laminate) process. In a DPL technique, one or more material sheets provided with resin, amongst which the aforementioned decor layer, are brought into a press together with a substrate, for example, a wood-based substrate, where, by means of a press element, they are subjected to an increased pressure and temperature and in this manner are connected with each other by means of the resin present in order to form a substrate covered with a top layer, which then can be manufactured into a floor panel. In a HPL technique, a plurality of material sheets provided with resin, amongst which the aforementioned decor layer, are consolidated by means of a press element by means of the resin present, before the obtained top layer as a whole is provided on a substrate, for example, is glued on this substrate.

30 According to a second possibility, the printed decor is printed on the substrate, possibly by the intermediary of other layers, such as primer layers, and is finished with a protective layer, such as with a lacquer or the like. With this second possibility, any printing technique may be applied. At present, primarily analogous printing techniques, such as offset printing, are applied, although digital printing techniques, such as inkjet printing, are gaining acceptance, too.

35 It is known that at the surface of floor panels of the above-mentioned type

structures of recesses and/or protrusions can be formed with the intention of imitating the structure of a material, such as wood or stone, or for forming a desired structure. For examples of such surface structures and techniques for realizing those, for floor panels manufactured according to said first possibility,
5 reference is made to WO 01/96689 and for floor panels manufactured according to said second possibility, reference is made to WO 01/47725.

Both with stone as with wood decors, the obtained imitations, which consist of the printed decor and matching structure, still leave a lot to be desired. For example,
10 imitating silver grains in wood or glittering stone parts in a realistic manner is difficult. In respect to attempts of imitating silver grains, for floor panels manufactured by means of said first possibility, several are known already. In WO 2006/063803, it is proposed to interrupt the structure of impressions, which are applied with the intention of imitating wood pores, at the height of the silver
15 grains, to alter the gloss degree and/or the printed color at that location. In WO 2007/072198, it is proposed using, at the height of the silver grains, impressions, the surface of which is composed of facet-shaped smaller surfaces. The here-described techniques still strongly deviate from the appearance of a real silver grain and moreover have the risk that their effects will disappear under the
20 influence of wear and/or scratches at the surface of the floor panel.

The present invention aims at a floor panel, the composition of which allows imitating, for example, silver grains in an alternative manner. According to preferred embodiments, herein a more realistic imitation of such silver grains is
25 obtained and/or a more long-lasting imitation thereof is obtained. However, the invention is not restricted to floor panels having wood decors and/or silver grains, but the composition of the floor panels of the present invention also offers in general new technical possibilities when designing floor panels in general, and in particular the appearance thereof. To this aim, the invention relates to a floor panel
30 of the type comprising at least a substrate and a top layer located on this substrate, wherein said top layer has a printed decor and a synthetic layer located on this decor, with the characteristic that the top layer comprises pigments, which accomplish an angle-dependent optical effect at the surface of the floor panel. Said angle-dependent optical effect preferably relates at least to an angle-dependent
35 reflection of light and/or at least an angle-dependent representation of color. Herein, the angle-dependency of course relates to the angle under which the

surface of the floor panel is seen.

Pigments accomplishing such effects are known as such in entirely different technical domains. For example, they are applied for securing value documents or passports, or for manufacturing glossy cosmetic articles, such as lipstick. In this
5 respect, reference is made to EP 0 657 297, US 4,151,666 and US 6,858,072. However, the inventor has realized that such pigments can also be applied for obtaining special effects, which, according to certain preferred embodiments of the invention, are close to the optical effects which can be present in a natural
10 material, such as wood or stone, for example, marble. The inventor has also found that according to preferred embodiments, such effects can be obtained in a long-lasting manner, even if the pigments are applied in floor panels with much walked-upon surfaces, which consequently are strongly subjected to wear and/or scratches.

15 Preferably, said printed decor has a pattern, such as a wood or stone pattern, and preferably said pigments are concentrated in regions which, in respect to position and/or size, correspond to forms occurring in the pattern of the printed decor. In case of a stone pattern, the contour or the surface of gleaming or glossy portions,
20 as may be present, for example, in natural stone species, such as marble or granite, can be depicted in the printed decor, and the pigments may be used, for example, for obtaining effectively glossy or gleaming portions on the locations corresponding to the printed decor. It is evident that the pattern may also be a fantasy pattern, in which then certain forms can be accentuated by means of said
25 angle-dependent optical effect.

Preferably, thus for the pigments a so-called application in register with the printed decor is used, although the correspondence of the pigments with the decor does not necessarily have to be obtained over the entire surface. It is noted that such
30 correspondence can be obtained easily by blending the pigments into one or more of the colorants which are used for printing the decor. However, the pigments may also be provided in a separate step, possibly by means of a printing technique. Further, it is noted that according to a variant such application in register may also be limited to globally following a contour depicted in the decor, without obtaining a
35 complete or partial correspondence of the pigments with the actual contour concerned.

According to a particular preferred embodiment of the invention, said printed decor has a wood pattern and said pigments are used at least for imitating the angle-dependent mirroring effect and/or the angle-dependent color representation of a silver grain. Herein, said effect for imitating a silver grain preferably is situated in a region which, in respect to position and/or size, corresponds to a silver grain represented in the pattern of the printed decor. Providing an angle-dependent optical effect for the imitation of a silver grain by means of said pigments leads to a more realistic imitation of such silver grains. Of course, the effect of the present invention can be combined with methods known in the state of the art for imitating such silver grains. For example, at the height of the imitated silver grain the structure of impressions which imitates wood pores and/or wood nerves can be interrupted or at this location an adapted, preferably higher gloss degree and/or a corresponding impression, the surface of which either is or is not composed of smaller facet-formed surfaces, can be used.

Imitating silver grains in a realistic manner is particularly interesting, for example, when the printed pattern is a representation of oak wood. Natural oak wood contains many relatively large silver grains, and the absence of a proper imitation thereof quickly leads to a synthetic-like appearance of the floor panel concerned. Of course, such silver grains also can occur in other wood species, for example, in beech, wengé or maple.

According to another particular preferred embodiment of the present invention, the printed decor has a wood pattern and said pigments are applied as least in order to obtain an angle-dependent representation of colors which is comparable to phenomena occurring in real wood. Some wood species, such as merbau, namely may have portions which, depending on the angle of the incidence of the light, may have another color or another tint. The pigments of the present invention allow imitating such phenomenon.

It is clear that the floor panel of the invention can also be provided at its surface with a structure of impressions or a structure of recesses and/or protrusions obtained in any other manner. Such structure may or may not be made in register with the printed decor and, in the case of a wood decor, it may imitate, for example, wood pores and/or wood nerves.

Preferably, said pigments comprise at least pigments which consist of platelet-shaped flakes (English: platelet flakes), whether or not built up from several layers. By platelet flakes, an angle-dependent optical, for example, mirroring, effect can be achieved in a relatively simple manner. Due to their platelet shape, it is possible that such pigments for the greater part orient themselves automatically and adopt substantially the same orientation, even if simple application techniques are used. So, for example, the pigments described in US 6,858,072 described pigments can be used, which are modified in order to obtain an as good as possible common orientation. The modification shown there relates to the provision of polymer particles at the surface of the pigments. It is clear that such pigments can be usefully applied within the scope of the present invention. In general, it is noted that from the moment that a certain degree of common orientation is achieved, already a relatively good angle-dependent optical effect can be achieved. It is also possible that the pigments form groups having a practically common orientation, whereas the pigments in the different groups mutually differ in orientation.

Preferably, the pigments have an average particle size between 0.1 and 100 micrometers and still better between 10 and 45 micrometers.

Preferably, the pigments have an average thickness between 0.1 and 1 micrometer.

Fine pigments mostly have a silk gloss, whereas coarser pigments accomplish a rather glittering effect. The dimensions mentioned above allow providing the pigments concerned in the top layer of the floor panel according to a plurality of methods. The distribution of pigments with these dimensions on the floor panel can be performed by means of methods known as such. Thus, a distribution corresponding to the printed decor is feasible.

According to a preferred embodiment of the invention, said pigments comprise at least pigments which, whether or not with intermediate layers, such as primer layers or the actual printed decor, are provided on the substrate by means of a printing technique. By a printing technique, an excellent distribution of the pigments corresponding to the, whether or not already printed, decor can be obtained. As will become clear in the following, the invention also relates to a

method for manufacturing floor panels, wherein the pigments are provided by means of a printing technique.

Of course, within the scope of the present invention the pigments may be provided
5 in the floor panel in any manner. For example, they may also be provided on the substrate and/or the printed decor by means of rolls, such as raster rolls. In the case of a DPL or HPL process, they can be provided on the decor layer or another material sheet, for example, by printing these pigments on this material sheet and/or by blending these pigments into the resin, or other synthetic material, which
10 is to be provided on the respective material sheet.

Said pigments preferably contain at least metal effect pigments. Those may be chosen from the group of aluminum, aluminum-bronze, copper, brass and zinc. With such pigments, a metal effect can be achieved due to light reflection on the
15 surface thereof. Of course, any metal or metal alloy can be applied to this aim. As aforementioned, these pigments preferably are made as platelet-shaped flakes. These can be obtained, for example, by mechanically reducing the size of metal particles or by depositing the respective metal on a fabric or other carrier by vacuum, chemically or electronically.

20 Said pigments preferably contain at least pigments based on natural or synthetic mica (English: mica). Although mica as such can be employed as a pigment, it is preferably used as a carrier upon which an optically effective covering, for example, a layer-shaped covering, is provided. For example, such carriers may be
25 coated with a, whether or not layer-shaped, metal oxide coating, preferably of titanium oxide and/or iron oxide. Such layer-shaped covering may be provided at one side as well as at both sides of a platelet-shaped carrier. Other carriers, too, may be provided with such optically effective covering and can be employed as a whole in a floor panel with the characteristics of the invention. For example, other,
30 preferably transparent or translucent, mineral or synthetic stone species or other materials can be used as a carrier.

In the most preferred embodiment of the present invention, a platelet-shaped mica-based pigment, which is provided with a metal oxide covering, is used. For
35 example, in particular the pigment can be used which is commercialized by the Merck company under the denomination "Iriodine".

According to a particular possibility, it may be opted for pigments having a high magnetic permeability, such as pigments comprising at least a ferromagnetic material, for example, consisting substantially of this ferromagnetic material or
5 having an optically effective portion or covering which is ferromagnetic. For example, iron, cobalt or nickel can be used as a ferromagnetic material. With such pigments, it is possible to adjust the orientation and/or the position by means of magnetic fields. Preferably, such orientation or positioning is performed while the synthetic material of said top layer is still soft or is only partially solidified.

10

Further possible pigments are pigments, whether or not provided with a layer-shaped covering, said pigments being on the basis of monocrystalline bismuth oxychloride or polycrystalline titanium oxide. These materials can crystallize as thin flakes and thus can be employed as such as a pigment, or can be provided with a
15 covering in order to form thus a layer-like composed pigment.

Preferably, said printed decor is printed at least partially and preferably completely, whether or not with intermediate layers, such as primer layers, on the substrate. For this purpose, analogous printing techniques, such as offset printing and screen
20 printing, as well as digital printing techniques, such as inkjet printing, can be applied. Of course, according to the invention it is not excluded that said printed decor is provided on a material sheet which is taken up into the top layer as a decor layer, for example, by means of the also above-mentioned DPL or HPL technique.

25

Preferably, the portion of the synthetic layer which extends above the effective pigments is free of material sheets. Such material sheets have an influence on the light which is incident on the pigments and can destroy or minimize the desired optical effect, for example, in that the light is scattered or is broken over a large
30 distance and/or angle. According to the invention, it is generally preferred to provide as little material as much above the pigments.

The inventor has found that for the respective portion of the synthetic layer extending above the effective pigments, best a synthetic layer can be used
35 consisting substantially of lacquer. Therefore, said synthetic layer contains at least a lacquer, wherein this lacquer then preferably extends above said pigments and

wherein said portion of the synthetic layer preferably is free of material sheets. Of course, this portion of the synthetic lacquer may comprise, apart from lacquer, various additives, such as, for example, hard particles. Such hard particles may comprise, for example, mineral or ceramic particles, such as aluminum oxide, titanium oxide or silicon carbide, wherein these particles are situated above the printed decor. Preferably, particles with an average size between 20 nanometers and 200 micrometers are used. In the most preferred embodiment, the average size of such particles is smaller than 50 or even smaller than 10 micrometers. Preferably, these particles are located at least in the first 5 micrometers beneath the surface of the floor panel. Possibly, such smaller particles can be combined with particles with an average size of 60 micrometers or more, which then are located substantially beneath the smaller particles. However, it is also possible that acceptable results in respect to wear resistance and scratch resistance are also reached when working only with particles which are smaller than 50 micrometers or are smaller than 10 micrometers. Of course, the particles may also have an average particle size in the nanometer range and thus, on average, be smaller than 1 micrometer.

When a synthetic layer is used which contains at least lacquer, preferably an UV-curing or electron beam-curing lacquer is opted for. For example, an acrylic lacquer, an epoxy lacquer or a maleimide lacquer can be used. It is noted that such lacquers mostly have a better transparency than a resin, such as a melamine resin. Further, it is noted that according to the invention using a resin, such as a melamine resin, for the synthetic layer is not excluded.

As already mentioned above, the present invention also relates to a method for manufacturing floor panels, with the characteristic that this method is applied for manufacturing floor panels with the characteristics of the invention, wherein at least a portion of said pigments, whether or not with intermediate layers, is provided on the substrate by means of a printing technique. Preferably, the printed substrate is also provided on the substrate by means of a printing technique, whether or not the same or similar printing technique.

For printing the pigment, preferably one will start from a dispersion of this pigment. The dispersion can be water-based or solvent-based. The pigments can also be taken up in a colorant, such as in an ink or the like. It is also possible that the

pigments are provided in one and the same treatment as the printed decor. This is possible, for example, by dispersing the pigment in the colorants or inks required for the printed decor. This may relate, for example, to UV inks, whether or not being water-based or solvent-based.

5

With dispersions of such pigments, one may also consider dispersions of natural pigments, such as pigments obtained from fish scales. These pigments may also offer angle-dependent optical effects.

- 10 Preferably, the printing of the pigments is performed in a separate step, preferably when the printed decor already is provided at least partially or completely on the substrate. Preferably, the pigment is provided directly on the already printed portion of the decor; this is, without intermediate layers or intermediate agents. However, it is also not excluded that on top of the printed decor a portion of said
- 15 synthetic layer is provided before printing the pigments above this portion of the synthetic layer. In this manner, it is also possible to obtain particular depth effects, for example, by providing such pigment on various places over the thickness of the synthetic layer.
- 20 In the most preferred embodiment of a method according to the present invention, a digital printing technique, such as inkjet printing, is used for applying the pigments. Of course, it is not excluded that an analogous technique is used, such as offset printing, screen printing, pad printing and the like.
- 25 It is noted that the invention also relates to a floor covering comprising floor panels with the characteristics of the invention.

With the intention of better showing the characteristics of the invention, hereafter, as an example without any limitative character, some preferred embodiments are

30 described, with reference to the accompanying drawings, wherein:

Figure 1 represents a floor panel with the characteristics of the present invention;

Figure 2, in cross-section, represents a view according to the line II-II indicated in figure 1;

35

Figure 3, at a larger scale, represents a view on the area indicated by F3 in

figure 2; and

Figure 4, at a still larger scale, illustrates the working of the invention for a portion of the area shown in figure 3.

5 Figure 1 represents a floor panel 1 with the characteristics of the invention. To this aim, it concerns a floor panel 1 of the type which, as figure 2 clearly shows, comprises at least a substrate 2 and a top layer 3 present on this substrate 2. As figure 2 schematically shows, the top layer 3 comprises a printed decor 4 and a synthetic layer 5 located on this decor 4.

10

In the present case, the floor panel 1 is provided with coupling means 8 at least at two opposite sides 6-7, said coupling means 8 allowing that two of such floor panels 1 can be coupled to each other, such that in the coupled condition a connection between these floor panels 1 is effected in a vertical direction V1
15 perpendicular to the plane of the floor panels 1, as well as in a horizontal direction H1 perpendicular to the respective coupled sides 6-7. Here, this concerns coupling means 8 which are integrated in the floor panel 1. In this case, they are even made in one piece with the floor panel 1, more particularly in one piece with said substrate 2. Of course, such coupling means 8 can also be present at the short
20 sides 9-10 of the floor panel 1. The coupling means 8 represented here substantially consist of a tongue and groove connection, wherein the tongue 11 and the groove 12 are provided with locking elements 13 effecting, in the coupled condition of two of such floor panels 1, said connection in horizontal direction H1.

25 As shown by the dashed lines at the right hand side of figure 2, the coupling means 8 shown here allow a connection by means of a horizontal shifting movement T towards each other of the floor panels 1 to be coupled, as well as by means of a turning movement W around the upper edges 14 of the floor panels 1 to be coupled. It is noted that the coupling means shown here are known as such
30 from WO 97/47834. It is not excluded that coupling means 8 are applied allowing only one of both said coupling manners, and/or coupling means 8 are applied allowing at least or only a coupling by means of a downward movement, also named "pushlock". For examples of coupling means allowing a coupling by means of a downward movement, reference is made to WO 01/02669 and
35 WO 03/016654.

Figure 1 clearly shows that the printed decor 4 of the floor panel 1 shows a wood pattern 15, wherein this pattern 15, amongst others, represents wood pores 16 and silver grains 17. As figure 3 shows, the printed decor 4 is formed as a print 18 on a primer layer 19 located on the substrate 2. Such primer layer 19 can realize, for example, the adherence between the substrate 2 and the printed decor 4 and/or can provide for a, whether or not neutral, background color for the print 18. It is noted that it is possible that other or several layers separate the printed decor 4 from the substrate 2. As a substrate 2, preferably a wood-based substrate is applied, such as MDF or HDF (Medium Density Fiberboard or High Density Fiberboard). Of course, other substrates 2, such as substrates substantially consisting of synthetic material, are not excluded.

In the example of figure 3, the surface 20 of the floor panel 1 is formed by said synthetic layer 5, which, for example, as here, may consist substantially of a lacquer, however, still containing, as close as possible to the surface 20, for example, within 5 micrometers beneath the surface 20, hard particles 21, such as corundum (Al_2O_3), possibly in the form of nano-corundum. According to a not-represented variant, as mentioned in the introduction, also larger corundum particles may be used, whether or not in combination with said nano-corundum. When they are used in combination, the majority of the larger particles preferably is situated beneath the majority of the smaller particles, but still above the printed decor 4.

As a non-limiting example of the present invention, figure 3 greatly enlarged and schematically shows a cross-section of such imitated silver grain 17. Apart from being represented in the print 18 of the decor 4, said silver grain 17 is accentuated by means of pigments 22 located on the printed decor 4, said pigments effecting an angle-dependent optical effect at the surface 20 of the floor panel 1. In the example, the pigments 22 consist of platelet-shaped flakes, which are provided with a layer-shaped covering 23 at one side. This may relate, for example, to mica flakes coated with titanium oxide. It is noted that figure 3 shows an example of pigments 22 provided in conformity with the printed decor 2. This may be obtained, for example, by means of a method with the characteristics of the invention.

Figure 4 schematically illustrates the working principle of the present invention. Under the influence of impinging light 24, reflections 25 are created on the

mirroring surface of the pigments 22 applied here. As in the example there is at least a certain common orientation of the platelet-shaped pigments 22, said thrown-back light or reflections 25 have preferred directions. From reflections 25 having the same or approximately the same direction, the intensity is added up at a large viewing distance. Under the influence of the light 24 impinging in an inclined manner of figure 4, for example, the eye 26A represented at the left hand side of the figure will receive a smaller light intensity than the eye 26B represented at the right hand side of the figure, as less reflections 25 have a direction corresponding to the observation angle of the eye 26A. In other words, a user of the respective floor panel 1, according to the angle under which he or she observes the floor panel 1, will observe a different light intensity at the height of said imitated silver grain 17. Such differences in intensity can be noticed, for example, when walking on a floor covering composed of such floor panels, or when sitting down or standing up in the adjacency of or on such floor covering.

It is also noted that for simplicity's sake, in figure 4 a possible light refraction at the height of the synthetic layer 5 and the hard particles 21 is not represented. As noted earlier in the introduction, in order to prevent the occurrence of overly large light refractions, it is best avoided to apply a material layer, such as a paper sheet, above the pigments 22.

From figure 4, it is clear that already with a small deviation of a random mutual orientation of the platelet-shaped pigments 22, thus, already with a small tendency to common orientation, in whatever manner this is achieved, beneficial effects can be obtained. Therefore, the application of such pigments 22 in a floor panel may have various beneficial effects. Therefore, according to a second independent aspect the invention also relates to a floor panel 1 of the type comprising at least a substrate 2 and a top layer 3 located on this substrate, wherein said top layer 3 has a printed decor 4 and a synthetic layer 5 located on this decor 4, with the characteristic that the top layer 3 comprises pigments 22, wherein said pigments 22 are present in the top layer 3 in the form of platelets and wherein said pigments 22 are or are not provided with a layer-shaped coating 23, without herein necessarily obtaining an angle-dependent optical effect visible at the surface 20 of the floor panel 1. It is clear that the platelet-shaped pigments mentioned in the introduction are considered for the floor panels 1 with the characteristics of the present independent aspect. Further, it is clear that the floor panel 1, as

represented in figures 1 to 4, also shows the features of this second independent aspect. It is also clear that preferably there is a certain extent of, whether or not group-wise, common orientation between said platelet-shaped pigments and that the floor panel of this second independent aspect possibly can also show the
5 characteristics mentioned in connection with the first aspect of the invention.

Further, it is clear that the present invention, according to deviating variants of the first and the second aspect of the invention, instead of being used for floor panels 1 can also be used for any coated panel, such as a furniture panel, a ceiling panel,
10 a wall panel and the like. Of course, also the method of the invention, instead of being used for the manufacture of floor panels, can be used for manufacturing any coated panel.

It is noted that silver grains (English: silver grain) are formed by cutting through a
15 wood structure which fans out from in the center of the tree trunk towards the bark, and such transverse to the annual rings. This wood structure is also named medullary ray or medullary ray cells (English: medullary ray).

The present invention is in no way limited to the above-described embodiments, on
20 the contrary may such press elements and methods be realized according to various variants, without leaving the scope of the present invention.

Claims.

- 1.- Floor panel of the type comprising at least a substrate (2) and a top layer (3)
5 located on this substrate (2), wherein said top layer (3) has a printed decor (4) and
a synthetic layer (5) located on this decor (4), characterized in that the top layer (3)
comprises pigments (22), which accomplish an angle-dependent optical effect
visible at the surface (20) of the floor panel (1).
- 10 2.- Floor panel according to claim 1, characterized in that the printed decor (4)
shows a pattern (15) and that said pigments (22) are concentrated in areas
corresponding, in respect to position and/or size, to forms occurring in the pattern
(15) of the printed decor (4).
- 15 3.- Floor panel according to claim 1 or 2, characterized in that said angle-
dependent optical effect relates at least to an angle-dependent reflection of light.
- 4.- Floor panel according to any of the preceding claims, characterized in that
said angle-dependent optical effect relates at least to an angle-dependent
20 representation of color.
- 5.- Floor panel according to any of the preceding claims, characterized in that
said printed decor (4) shows a wood pattern (15) and that the pigments (22) are at
least applied for imitating the optical effect of a silver grain (17).
25
- 6.- Floor panel according to claim 5, characterized in that said optical effect for
imitating a silver grain (17) is situated in an area which, in respect to position
and/or size, corresponds to a silver grain (17) represented in the pattern (15) of the
printed decor (4).
30
- 7.- Floor panel according to any of the preceding claims, characterized in that
said pigments (22) comprise at least pigments consisting of platelet-shaped flakes,
whether or not constructed of multiple layers.
- 35 8.- Floor panel according to any of the preceding claims, characterized in that
the pigments have an average particle size between 0.1 and 100 micrometers and

still better between 10 and 45 micrometers.

9.- Floor panel according to any of the preceding claims, characterized in that the pigments (22) have an average thickness between 0.1 and 1 micrometer.

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10.- Floor panel according to any of the preceding claims, characterized in that said pigments (22) comprise at least metal effect pigments, which preferably are chosen from the group of aluminum, aluminum-bronze, copper, brass.

10 11.- Floor panel according to any of the preceding claims, characterized in that said pigments (22) comprise at least pigments (22) based on natural or synthetic mica.

12.- Floor panel according to claim 10, characterized in that said pigments
15 comprise at least pigments (22) consisting of natural or synthetic mica upon which a layer-shaped coating (23) of titanium oxide or iron oxide is provided.

13.- Floor panel according to any of the preceding claims, characterized in that the portion of the synthetic layer (5) which extends above the effective pigments
20 (22) is free of material sheets.

14.- Floor panel according to any of the preceding claims, characterized in that said printed decor (4) is printed on the substrate (2), whether or not with intermediate layers, such as primer layers (19).

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15.- Floor panel according to any of the preceding claims, characterized in that said pigments (22) comprise at least pigments (22) which are provided on the substrate (2) by means of a printing technique, whether or not with intermediate layers, such as primer layers (19).

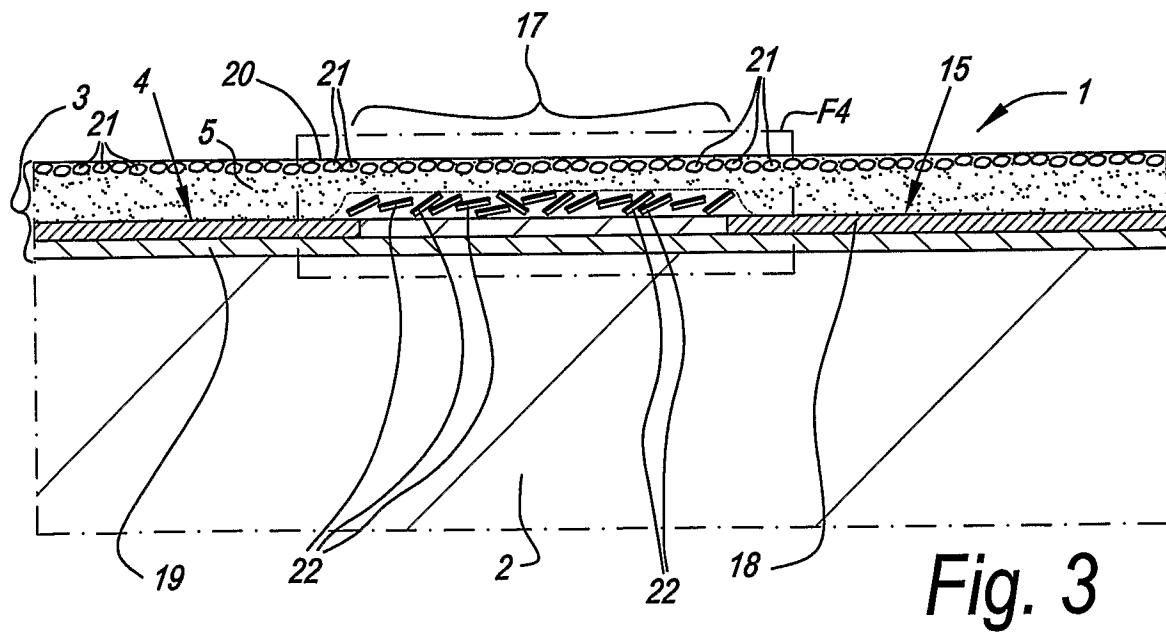
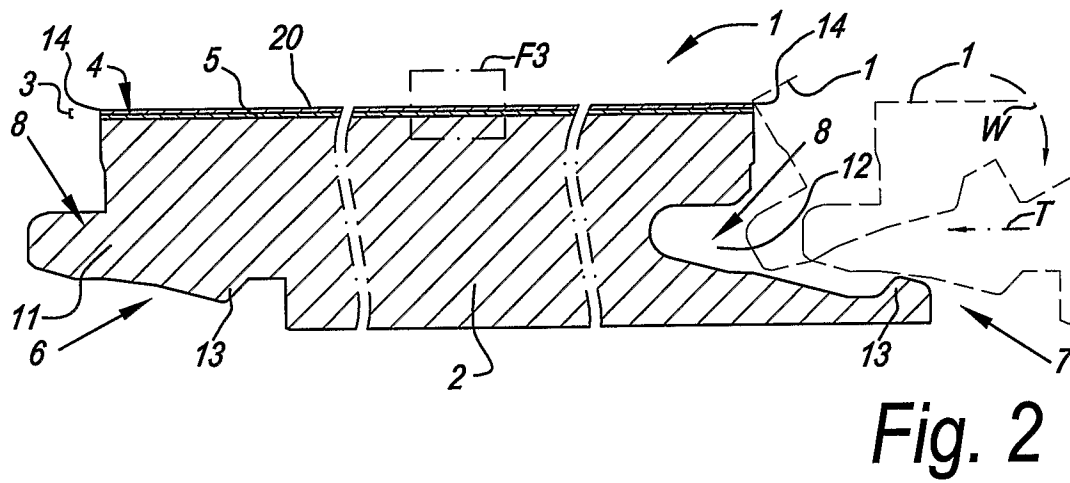
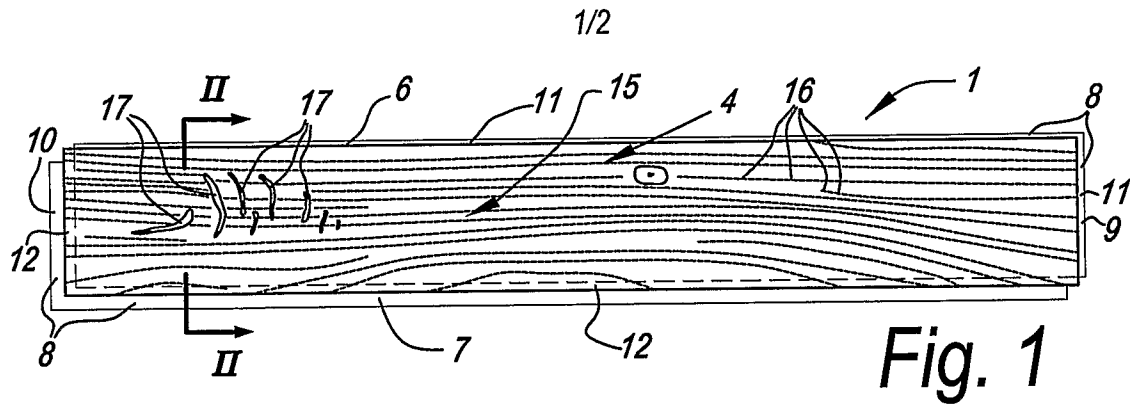
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16.- Floor panel according to any of the preceding claims, characterized in that said synthetic layer (5) comprises at least a lacquer.

17.- Floor panel of the type comprising at least a substrate (2) and a top layer
35 (3) located on this substrate (2), wherein said top layer (3) has a printed decor (4) and a synthetic layer (5) located on this decor (4), characterized in that the top

layer (3) comprises pigments (22), wherein said pigments (22) are present in the top layer (3) in form of platelets and wherein said pigments (22) either are or are not provided with a layer-shaped coating (23).

- 5 18.- Floor panel according to claim 17, characterized in that this floor panel has the characteristics of any of the claims 1 to 17, wherein an angle-dependent optical effect does not necessarily have to be present at the surface (20) of the floor panel (1).
- 10 19.- Method for manufacturing floor panels, characterized in that this method is applied for manufacturing floor panels (2) with the characteristics of any of the preceding claims, wherein at least a portion of said pigments (22) is provided on the substrate (2) by means of a printing technique, whether or not with intermediate layers.
- 15 20.- Method according to claim 19, wherein at least for providing the pigments (22) use is made of a digital printing technique, such as inkjet printing.
- 20 21.- Floor panel, method, respectively, according to any of the preceding claims, wherein for the pigment (22) use is made of the pigment (22) commercially available under the denomination of "Iriodine".



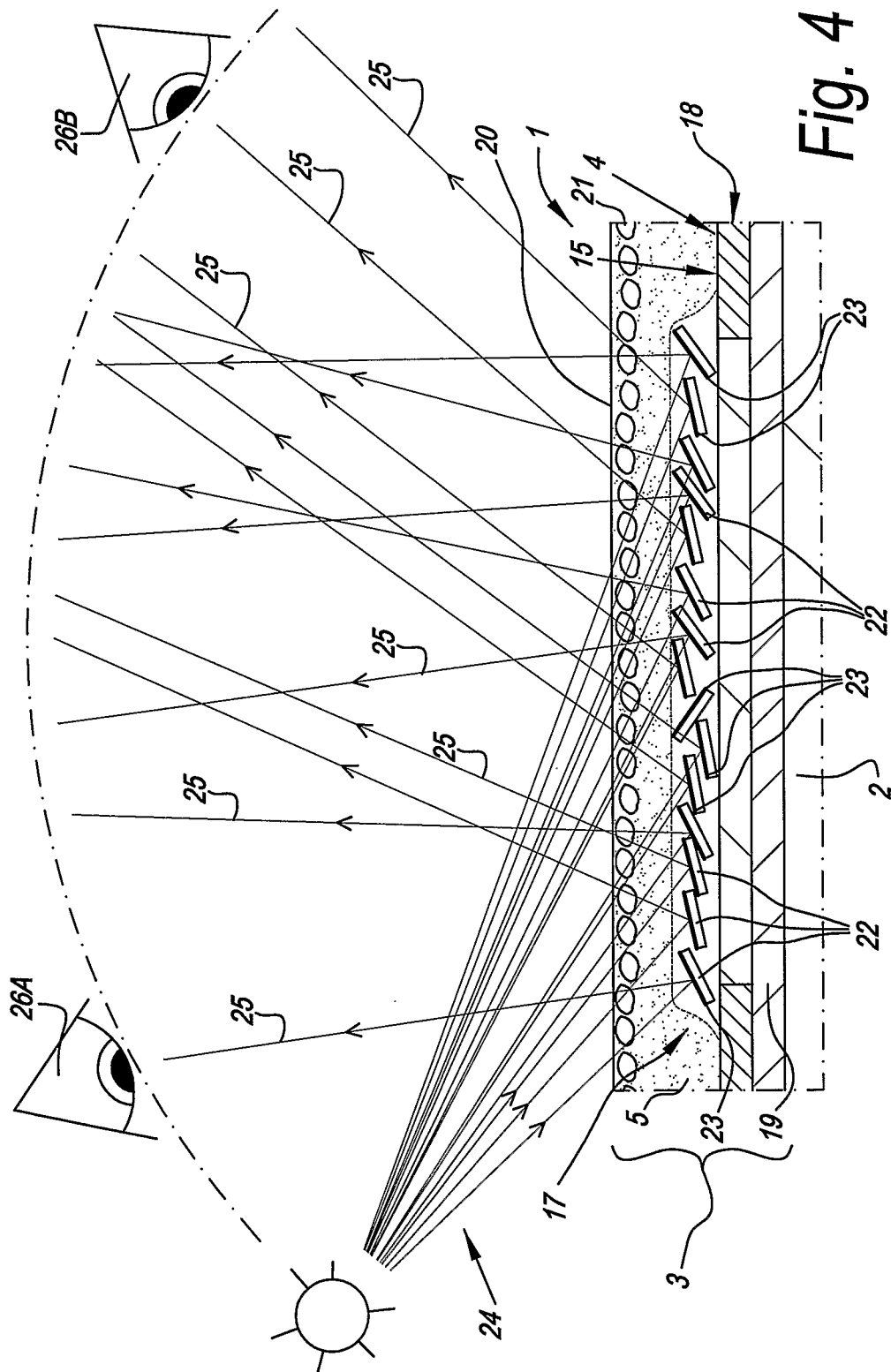


Fig. 4