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(54) FLOORING ENGINEERED PLANK HAVING 3D EFFECT AND ITS MANUFACTURING METHOD

(57) The present invention provides an engineered flooring plank (1) comprising a base layer (2) of wood substitute material, a real wood veneer layer (3) adherent to the top of the base layer (2) of the wood substitute material, and a bonding adhesive layer (4) provided to bond the real wood veneer layer to the base layer; and wherein the real wood veneer layer (2) is provided with at least one recess (5) selected from one or more of the following; a wood knot (12), a wood pore (13), a wood crack (14) or a wood nerve (15), and at least one recess (5) on the real wood veneer layer (2) exposes an underlying layer (2,6), which underlying layer comprises at least one dark-coloured pigment substantially absorbing light in the visible spectrum.

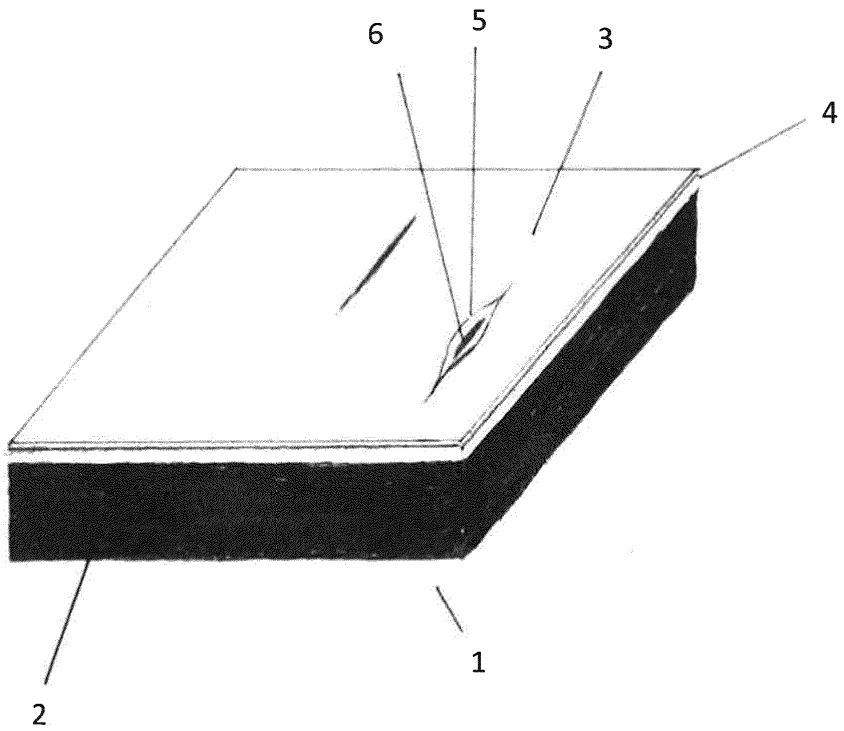

FIG 1

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Description

FIELD OF TECHNOLOGY

[0001] The invention relates to flooring. In particular, the invention relates to a new and improved flooring engineered plank having a realistic 3D effect, and its time and cost efficient manufacturing method.

BACKGROUND OF THE INVENTION

[0002] In the flooring industry there is a significant need for engineered planks presenting the appearance of real wood. Natural wood planks for flooring, particularly of oak and other hard woods, have been employed for centuries. Since already some decades, more economical laminate flooring is available. Nevertheless, the appearance and comfort of wooden flooring is highly desirable. Appearance and comfort closer to the ones of natural wood planks reside in wood veneer flooring, a flooring made of wood substitute material presenting at its surface a thin layer of real wood. Even though wood veneer flooring is in appearance real wood, the mechanical properties of a thin wood veneer put a limit to the type of wood used, and to the manufacturing process of wood veneer flooring.

[0003] US9156233B2 describes a waterproof flooring utilizing bamboo and plastic. US9156233B2 describes an engineered waterproof plank comprising a veneer layer positioned on top of a plastic core.

[0004] A disadvantage of US9156233B2 is that the waterproof flooring does not have the appearance of natural wood with a rough surface having a 3D effect. WO2013050910 describes a floor panel comprising a print on top of a wood based core, such as a wood print.

[0005] A disadvantage of WO2013050910 is that the floor panel thereby described does not have the texture of natural wood, with its complex reliefs. This is because the print on top of the wood based core is not made of wood veneers with real wood knots, wood cracks, wood pores or wood nerves.

[0006] There is a need for new planks for flooring. The object of the present invention is to provide a flooring engineered plank presenting the appearance of thick natural wood planks that is economical, easy to install, easy to produce, and greener to produce.

SUMMARY OF THE INVENTION

[0007] The present invention provides a flooring engineered plank comprising: a base layer of wood substitute material, a real wood veneer layer adherent to the top of the base layer of the wood substitute material, and a bonding adhesive layer provided to bond the real wood veneer layer to the base layer; and wherein the real wood veneer layer is provided with at least one recess selected from one or more of the following; a wood knot, a wood crack, a wood pore or a wood nerve, and at least one recess on the real wood veneer layer exposes an underlying layer, which underlying layer comprises at least one dark-coloured pigment substantially absorbing light in the visible spectrum.

[0008] An advantage of the present embodiment is that the flooring engineered plank is of good quality and has the texture and appearance of a thicker natural wood plank, which flooring engineered plank according to the present embodiment is easier and cheaper to manufacture.

[0009] According to a preferred embodiment of the present invention the at least one dark-coloured pigment has an L* value in the L*a*b system that is lower than 80, preferably lower than 50, more preferably lower than 30.

[0010] An advantage of the present embodiment is that a variety of light absorption effects of can achieved from different visual angles.

[0011] According to a preferred embodiment of the present invention the at least one dark-coloured pigment comprises one or more components selected from the group consisting of iron oxides, cobalt oxides, nickel oxides, vanadium oxides, tin oxides, copper oxides, antimony oxides, chromium oxides, titanium oxides, manganese oxides, lead sulfides, copper sulfides, antimony sulfides, zinc sulfides, molybdenum sulfides, graphite, carbon nanotubes, black earth, graphite, carbon black, bone black, ivory black, vine black, lamp black, azine, perylene, hematein, haematoxylin, aluminium silicates, and mixtures thereof.

[0012] An advantage of the present embodiment is that the selected components allow for light adsorption properties suitable for the flooring industry.

[0013] According to a preferred embodiment of the present invention, the base layer of wood substitute material comprises the following components:

i) at least about 10% in weight of polyvinyl chloride, preferably 20 to 30%, more preferably approximately 25%; and

ii) at least about 20% in weight of limestone, preferably 60% to 75%, more preferably approximately 67,5%; and

iii) at least about 0,1% in weight of dark-coloured pigment, preferably carbon black from 1% to 3,5% in weight, preferably 1,5% to 2,5%, more preferably approximately 1,75%.

[0014] An advantage of the present embodiment is that the components allow for an flooring engineered plank having mechanical and physical properties providing an engineered plank stable to different ambient conditions and efficient manufacture.

[0015] According to a preferred embodiment of the present invention, the real wood veneer layer has a thickness from 0,5 mm to 1,5 mm, preferably 0,7 mm to 1,3

mm, more preferably approximately 1 mm.

[0016] An advantage of the present embodiment is to provide a more environmentally friendly flooring engineered plank, which is also stable.

[0017] According to a preferred embodiment of the present invention, the base layer has a thickness from 2 mm to 6 mm, preferably approximately 4 mm.

[0018] An advantage of the present embodiment is to provide a stable and with good quality flooring engineered plank.

[0019] According to a preferred embodiment of the present invention, the real wood veneer layer is made of heartwood.

[0020] An advantage of the present embodiment is to provide a flooring engineered plank exposing a real wood veneer plank with wood knots, wood cracks, wood pores or wood nerves allowing for a rustic and natural look and light absorption characteristics similar to the ones of a natural wood plank.

[0021] According to a preferred embodiment of the present invention, the bonding adhesive layer comprises an adhesive composition having a viscosity from 13000 to 28000 cps and is used in an amount from approximately 50 grams to 250 grams per square meter of flooring surface.

[0022] An advantage of the present embodiment is to provide a flooring engineered plank with strongly bound layers and not filled recesses.

[0023] According to a preferred embodiment of the present invention, the flooring engineered plank comprises at least one dark-coloured pigment comprised in one or more of the following; a coating underlying the real wood veneer layer under the real wood veneer, the bonding adhesive layer.

[0024] An advantage of the present embodiment is to allow the tuning of the light absorption properties of the flooring engineered plank.

[0025] A further preferred embodiment according to the present invention is a method of manufacturing of a real wood veneer layer wherein the method comprises the following steps:

i) Slicing real wood to obtain a real wood veneer layer;

and wherein the real wood veneer layer has a thickness from 0,5 mm to 1,5 mm, more preferably 0,7 mm to 1,3 mm, more preferably approximately 1 mm, and wherein the method further comprises:

ii) Drying the real wood veneer layer in a drying tunnel;

iii) Cold pressing the real wood veneer layer;

iv) Vacuum drying the real wood veneer layer in a vacuum oven.

[0026] An advantage of the present embodiment is to provide a qualitative product efficiently made, which components are stable after time and exposure to temperature cycles and humidity.

[0027] According to a preferred embodiment of the present invention, the method of manufacturing comprises the step of drying the real wood veneer layer in a drying tunnel at a temperature from approximately 100 °C to 110 °C for approximately 3 to 8 minutes, more preferably approximately 5 minutes.

[0028] An advantage of the present embodiment is to provide the desired mechanical integrity to real wood veneer layer.

[0029] According to a preferred embodiment of the present invention, the method of manufacturing comprises the step of cold pressing the real wood veneer layer at a pressure from approximately 0,1 MPa to approximately 1 MPa for approximately 4 hours to 8 hours, preferably approximately 6 hours.

[0030] An advantage of the present embodiment is to provide the desired mechanical integrity to real wood veneer layer.

[0031] According to a preferred embodiment of the present invention, the of manufacturing of a real wood veneer layer comprises the step of vacuum drying the real wood veneer layer at a temperature of approximately 70°C to 90 °C for approximately 10 to 12 hours at a vacuum in the range of 20 kPa to 40 kPa, preferably approximately 24 kPa.

[0032] An advantage of the present embodiment is to provide a stable real wood veneer layer having a moisture content suitable for flooring applications.

[0033] A further preferred embodiment according to the present invention is the use of the flooring engineered plank.

[0034] An advantage of the present embodiment is provide advantages of a flooring engineered plank having good quality, natural appearance and rustic texture.

BRIEF DESCRIPTION OF THE FIGURES

[0035] In the drawings:

FIG 1 depicts a flooring engineered plank according to one or more embodiments of the present invention, which flooring engineered plank is drawn in perspective to show the real wood veneer layer, the base layer, the bonding adhesive layer, and a dark-coloured pigment comprised in the base layer.

FIG 2 depicts an flooring engineered plank according to one or more embodiments of the present invention, which is drawn from a top view, and shows the real wood veneer layer and an underlying layer respect to real wood veneer layer, which underlying layer comprises a dark-coloured pigment, and which underlying layer is visible through at least one recess (a wood knot, a wood crack, a wood nerve or a wood

pore).

FIG 3 depicts a lateral view of the flooring engineered plank according to one or more embodiments of the present invention. The lateral view shows the real wood veneer layer, which lies on top of the bonding adhesive layer, which bonding adhesive layer lies on top of the base layer, which base layer comprises a dark-coloured pigment. On the real wood veneer layer, recesses exposing the underlying layer are present.

FIG 4 depicts lateral views of flooring engineered planks according to one or more embodiments of the present invention. The lateral view at the top end of FIG 4 depicts a flooring engineered plank having a bonding adhesive layer comprising a dark-coloured pigment, whereas the lateral view at the bottom end of FIG 4 depicts a flooring engineered plank comprising a dark-coloured pigment in a coating layer underlying the real wood veneer layer.

FIG 5 depicts the steps in method of manufacturing of a real wood veneer layer according to the present invention.

DETAILED DESCRIPTION

[0036] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the embodiments may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

[0037] Reference throughout this specification to "embodiment", "embodiments", "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout his specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0038] In case the term approximately refers to a temperature measurement, what is meant is that the temperature measurement has a tolerance of ± 5 °C.

[0039] In case the term approximately refers to the percentage of components in a composition, what is meant is that the % value has a tolerance of $\pm 0{,}05\%$.

[0040] In case the term approximately refers to the moisture content expressed as a percentage, what is meant is that the % value has a tolerance of $\pm 1\%$.

[0041] In case the term approximately refers to the L* value, what is meant is that the tolerance of the L* value is ± 1.

[0042] In case the term approximately refers to the measurement of a distance in mm, what is meant is that the measurement of the distance in mm has a tolerance of $\pm 0{,}1$ mm.

[0043] In case the term approximately refers to a time measurement in hours, what is meant is that the time measurement in hours has a tolerance of $\pm 0{,}5$ hours (30 minutes).

[0044] In case the term approximately refers to a time measurement in minutes, what is meant is that the time measurement in minutes has a tolerance of $\pm 0{,}5$ minutes (30 seconds).

[0045] In case the term approximately refers to the measurement of viscosity in centipoise (cps), what is meant is that the viscosity measurement has a tolerance of ± 10 cps.

[0046] In case the term approximately is referred to the measurement of a pressure in MPa for the vacuum drying step, what is meant is that the measurement of pressure in kPa has a tolerance of ± 1 kPa.

[0047] In case the term approximately is referred to the measurement of a pressure in MPa for the cold pressing step, what is meant is that the measurement of pressure in MPa has a tolerance of $\pm 0{,}05$ MPa.

[0048] In case the term approximately refers to measurement of mass in grams, what is meant is that the mass measurement in grams has a tolerance of ± 1 grams.

[0049] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

[0050] Where in embodiments of the present invention reference is made to L*, reference is made to the lightness value L* expressing colours in the CIELAB colour space. L*=0 represents the darkest black, while L*=100 represents the brightest white.

[0051] Where in embodiments of the present invention reference is made to the visible spectrum, what is intended is the range of wavelengths from about 380 to 700 nanometers.

[0052] Where in embodiments of the present invention reference is made to light reflectance value (LRV), reference is made to the measure of light reflected by a surface. The more light is reflected, the higher the LRV, the less light reflected, the lower the LRV. Light reflectance values can be measured or calculated according to different techniques well-known in the state of the art. For example, LRV can be measured according to the ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS) standard E 1477 - 98a. According to this invention, the LRV values were measured by means of a

spectrophotometer. Light Reflectance Value (LRV) is the total quantity of visible and useable light reflected by a surface in all directions and at all wavelengths when illuminated by a light source, (ref. British Standard BS 8300:2001/A1:2005). The light reflectance value is expressed as a percentage.

[0053] Where in embodiments of the present invention reference is made to a recess (5) on the real wood veneer layer (3), reference is made to an indentation on the real wood veneer layer (3), being a wood knot (12), a wood crack (14), a wood pore (13) or a wood nerve (15), making visible a layer underlying the real wood veneer layer (3).

[0054] Where in embodiments of the present invention reference is made to an underlying layer (6), reference is made to any layer laying beneath the real wood veneer layer (3). Therefore, an underlying layer (6) can be for example the bonding adhesive layer (4), the base layer (2), and any coating layer (10, 11). Which coating layer (11) is be beneath the base layer, or the coating layer (10) is above the base layer (2) but beneath the real wood veneer layer (3).

[0055] FIG 1 illustrates a flooring engineered plank (1) according to one or more embodiments of the present invention, which flooring engineered plank (1) comprises: a base layer (2) of wood substitute material, a real wood veneer layer (3) adherent to the top of the base layer (2) of the wood substitute material, and a bonding adhesive layer (4) provided to bond the real wood veneer layer (3) to the base layer (2); and wherein the real wood veneer layer (3) is provided with at least one recess (5) selected from one or more of the following; a wood knot (12), a wood crack (14), a wood pore (13) or a wood nerve (15), and at least one recess (5) on the real wood veneer layer (3), the at least one recess (5) provided to expose an underlying layer (6), which underlying layer (6) comprises at least one dark-coloured pigment substantially absorbing light in the visible spectrum. The present invention allows for saving in material costs because the presence of an underlying layer (6) substantially absorbing light in the visible spectrum permits the use of a real wood veneer layer (3) with a thickness lower than the thickness required by a real wood plank or real wood veneer layer (3) to give the same depth visual effect as the flooring engineered plank according to the present invention. Moreover, according to the present invention, it is not necessary to fill with a filler a wood knot (12), wood crack (14), wood pore (13) or wood nerve (15) present on the surface of the real wood veneer layer (3), because such recesses have to be left open to expose the underlying layer (6) through the at least one recess present on the real wood veneer (3). Not having to fill the wood knots, wood cracks, wood pores or wood nerves with a filler reduces the materials to be used and the work to be done on the flooring engineered plank (1). When a filler is applied to fill in recesses on the real wood veneer layer (3), part of the filler might smear the real wood veneer layer (3) extending outside the recesses to be filled in, because of the difficulty limiting the zone of application of the filler to the recess only. Therefore, a further step of removing the smear from the real wood veneer layer (3) is required. Removing the smear can be done for example by sanding further the real wood veneer layer (3), but this step decreases the thickness of the real wood veneer layer (3) and makes to real wood veneer layer (3) too thin to be used and with an appearance that might differ from the one for which the real wood veneer layer (3) was selected. According to the present invention, no further step is required because no filler is used. The use of an underlying layer (6) substantially absorbing light in the visible spectrum provides light absorption properties similar to the ones at the inner part of a wood knot (12), wood crack (14) or wood nerve (15) or wood pore (13) in a much thicker natural wood plank, or much thicker real wood veneer layer (3). It has to be understood that **FIG 1** illustrates only part of the flooring engineered plank (1) according to an embodiment of the present invention. Flooring engineered planks according to the present invention are adapted to have connection means to connect with adjacent flooring engineered planks to cover a floor surface. The flooring engineered planks according to the present invention are generally rectangular in shape, and are advantageously provided with click-lock edge systems. In a click-lock edge system, a protrusion on the edge of a flooring engineered plank (1) is angled so to enter in a channel at one edge of another flooring engineered plank (1), so to have two edges of the flooring engineered planks in contact, and then rotating the second flooring engineered plank (1) downward until the engineered planks are locked together. According to the present invention, the real wood veneer layer (3) is positioned above the bonding adhesive layer (4), the base layer (2) and any other layer that is suitable to comprise at least one dark-coloured pigment. According to a specific embodiment of the present invention, the dark-coloured pigment has an L* value in the L*a*b system (CIELAB colour space) that is lower than 80, preferably lower than 50, more preferably lower than 30. This allows for light absorption properties for a depth visual effect proper of a much thicker natural wood plank or real wood veneer layer (3) from different visual angles and light conditions. According to another embodiment, the at least one dark-coloured pigment comprises one or more components selected from the group consisting of iron oxides, cobalt oxides, nickel oxides, vanadium oxides, tin oxides, copper oxides, antimony oxides, chromium oxides, titanium oxides, manganese oxides, lead sulfides, copper sulfides, antimony sulfides, zinc sulfides, molybdenum sulfides, graphite, carbon nanotubes, black earth, graphite, carbon black, bone black, ivory black, vine black, lamp black, azine, perylene, hematein, haematoxylin, aluminium silicates, and mixtures thereof. These dark-coloured pigments, and especially carbon black, have been found to be the most suitable to be used in an underlying layer (6) substantially absorbing light in the visible spectrum to be used in the flooring industry because of their chemical properties.

[0056] The underlying layer (6) absorbs light in the visible spectrum so to have a light reflectance value (LRV) lower than 50, preferably lower than 20, more preferably lower than 10. The presence of an underlying layer (6) having reflectance lower than 50, preferably lower than 20, more preferably lower than 10, allows for a depth visual effect proper of a much thicker natural wood plank from different visual angles and light conditions.

[0057] In **FIG 1** there are positioned on the top of the real wood veneer layer (3) two recesses, a wood nerve (15) and a wood knot (12), both exposing an underlying layer (6) comprising a dark-coloured pigment. The underlying layer (6) illustrated in the specific embodiment shown in **FIG 1** is the base layer (2), which comprises at least one dark-coloured pigment. Therefore, in **FIG 1** the underlying layer (6) exposed by the at least one recess (5) on top of the real wood veneer layer (3) is the base layer (2). The base layer (2) is exposed by one recess (5) on top of the real wood veneer layer (3) because the bonding adhesive layer (4), which is adapted to adhere the base layer (2) to the real wood veneer layer (3), is in this specific embodiment transparent or semi-transparent. As the bonding adhesive layer (4) is transparent or semi-transparent, light can reach the underlying layer (6) comprising at least one dark-coloured pigment and be absorbed by the dark-coloured pigments therein. In accordance to another embodiment of the present invention, the underlying layer (6) comprising the dark-coloured pigment can be the bonding adhesive layer (4), or a coating layer (10, 11), which coating layer (10, 11) can be positioned above the base layer (2) but beneath the bonding adhesive layer and beneath the base layer (2). It can be understood from the present invention that the layers on top of the underlying layer (6) comprising the dark-coloured pigment have to be transparent or semi-transparent in order to have light absorption by the underlying layer (6) comprising the pigment, because light passing through the at least one recess (5) on the real wood veneer layer (3) has to reach the underlying layer (6) and the dark-coloured pigment to be absorbed. According to the present invention, even more than one underlying layer (6) can comprise a dark-coloured pigment, so that more complex and 3D realistic depth effects can be accomplished. For example, a semi-transparent underlying layer (6), such as a bonding adhesive layer (4) brown in colour containing at least one dark-coloured pigment can be positioned on top of a base layer (2) dark in colour containing at least one dark-coloured pigment to create such complex and 3D realistic depth effects. The base layer (2) according to the present invention is made of a wood substitute material. It is hereby intended that any base layer composition suitable to carry out the invention can be used. The base layer (2) is made of a wood substitute material, whereas such material can be a plastic composite, it can be made of fiberboard (MDF, HDF), polyethylene, plastic wood dust composites, a plurality of paper sheet or the like. The base layer (2) according to a specific embodiment of the present invention is made of wood substitute material comprising polyvinyl chloride as plastic material, limestone and carbon black. It has been found that at least about 10% in weight of polyvinyl chloride (PVC), at least about 20% in weight of limestone, and at least about 0,1% in weight of dark-coloured pigment allow to achieve mechanical and physical properties making the base layer (2) adapted to execute the present invention. The components according to the present invention confers to the base layer (2) mechanical properties (e.g. flexibility) and physical properties (e.g. thermal expansion) that are ideal. An advantage of using the dark-coloured pigment in the base layer (2) makes possible to homogeneously distribute the dark-coloured pigment throughout the entire base layer (2) when the other components are mixed together. An advantage of using limestone in the base layer (2) is to provide ideal mechanical and physical properties to the base layer (2) while not affecting the light absorption properties of the base layer (2) due to the limestone being substantially white in colour. Therefore, another advantage of using the limestone is that the light absorption properties of the base layer (2) can be also advantageously adjusted altering the concentration of limestone to obtain the desired light absorption properties in light of the type and colour of the real wood veneer layer (3) to achieve the depth effect desired. The composition found allows for a uniform distribution of the dark-coloured pigment, which in a preferred embodiment of the present invention is carbon black, and it confers also to the base layer (2) water resistance, making it waterproof. In a preferred embodiment, the base layer (2) comprises polyvinyl chloride (PVC) at approximately 25% in weight; limestone at approximately 67,5% in weight; and carbon black at approximately 1,75% in weight. These values have been surprisingly found ideal to obtain a base layer (2) having mechanical properties and physical properties that are ideal for the use of such base layer (2) as a base layer (2) for flooring engineered planks according to the present invention. Such formulation for the base layer (2), is specifically good at allowing the flooring engineered plank (1) to expand due to temperature differences without affecting the bonding adhesive layer (4). The base layer (2) or the bonding adhesive layer (4) can contain also chemical additives such as anti-UV agents, coupling agents, anti-oxidation agents, stabilizers, anti-fungus agents, reinforcing agents, wear resistant agents, lubricants, colorants and waterproof agents. One or more of these chemical additives can also be positioned on top of the real wood veneer layer (3), to confer special properties. Specifically, coloured coating layers and UV coating layers can be deposed on top of the real wood veneer layer (3) to obtain the aesthetic characteristics and mechanical/physical characteristics desired.

[0058] **FIG 2** depicts a flooring engineered plank (1) according to one or more embodiments of the present invention, which flooring engineered plank (1) is drawn from a top view, and shows the real wood veneer layer (3) and an underlying layer (6) respect to real wood ve-

neer layer (3), which underlying layer (6) comprises a dark-coloured pigment that can be seen from the at least on recess (5) on top of the real wood veneer layer (3), which at least one recess can be a wood knot (12), a wood nerve (13), a wood crack (14) or a wood pore (16). The dark-coloured pigment is comprised in the underlying layer (6), which underlying layer (6) can be the base layer (2), the bonding adhesive layer (4) or any other underlying layer (6) visible through at least one recess (5) present on the real wood veneer layer (3).

[0059] **FIG 3** depicts a lateral view of part of a flooring engineered plank (1) according to one or more embodiments of the present invention. The lateral view shows the real wood veneer layer (3), which lies on top of the bonding adhesive layer (4), which bonding adhesive layer (4) lies on top of the base layer (2), which base layer (2) comprises a dark-coloured pigment. On the real wood veneer layer, at least one recess (5) exposing the underlying layer (6) is present. According to a preferred embodiment of the present invention, the real wood veneer layer (3) has a thickness from 0,5 mm to 1,5 mm, more preferably 0,7 mm to 1,3 mm, more preferably approximately 1 mm, and the base layer (2) has a thickness from 2 mm to 6 mm, most preferably approximately 4 mm. According to a preferred embodiment of the present invention, the real wood veneer layer (3) is made of heartwood. Heartwood is the inner core of the tree, and therefore it's 'heart'. The heartwood used to create the real wood veneer layers (3) according to the present invention can be oak or other wood types. Heartwood is characterised by comprising naturally ideal cracks, knots, pores, and nerves. According to a preferred embodiment of the present invention, the bonding adhesive layer (4) comprises an adhesive composition having a viscosity from 13000 to 28000 cps (centipoise) at room temperature. It is to be noted that 100 centipoise are equal to 1 mPa (milliPascal), and the adhesive composition is used in an amount from 50 to 250 grams per square meter of flooring surface. The amount of adhesive composition used and its viscosity have been found to be important in avoiding that the adhesive composition pours out, filling a wood pore (13), wood crack (14), wood knot (12) or wood nerve (15) present on the surface of the real wood veneer layer (3).

[0060] **FIG 4** depicts a lateral view of flooring engineered planks and layers according to one or more embodiments of the present invention. The lateral view of the flooring engineered plank (1) at the top end of **FIG 4** depicts a flooring engineered plank (1) having a bonding adhesive layer (9) comprising a dark-coloured pigment, whereas the lateral view of the flooring engineered plank (1) at the bottom end of **FIG 4** depicts a flooring engineered plank (1) comprising a dark-coloured pigment in a coating layer (10) beneath the real wood veneer layer (3) and/or a coating layer (11) beneath the base layer (2). The possibility of using different underlying layers (6) containing at least a dark-coloured black pigment allows to obtain several absorbing light effects, that can recreate the inside of a wood crack (14), knot (12), nerve (15) or pore (13) belonging to a much thicker real wood plank or a much thicker real wood veneer layer (3). The use of more than one underlying layer (6) comprising at least one dark-coloured pigment in the same flooring engineered plank (1), allows for much more variability in the light absorption effects obtained. In case it is required, in this embodiment the base layer (2) is comprising the dark-coloured pigment or not, and it can be transparent to allow light to reach a coating layer (11) beneath. If the coating layer (10) above the base layer (11) is dark enough to adsorb the light in the wanted amount, the base later (11) can be of transparent or of any colour, to let light pass through.

[0061] **FIG 5** depicts the steps in method (16) of manufacturing of a real wood veneer layer (3) according to the present invention. The method (16) comprises the step of i) Slicing real wood to obtain a real wood veneer layer (3); ii) Drying the real wood veneer layer (3) in a drying tunnel; iii) Cold pressing the real wood veneer layer (3); and iv) Vacuum drying the real wood veneer layer (3) in a vacuum oven. The step of drying the real wood veneer layer (3) in a drying tunnel, which drying funnel has a length of approximately 20 meters, is carried out at a temperature approximately in the range 100 °C to 110 °C. The real wood veneer layer (3) remains in the drying tunnel for approximately 3 to 8 minutes, more preferably approximately 5 minutes, after which the moisture content of the real wood veneer layer (3) is approximately in the range 20 to 30%. The step of cold pressing iii) the real wood veneer layer (3) is performed at a pressure from 0,1 MPa to 1,0 MPa for 4 hours to 8 hours, preferably approximately 6 hours. The step iv) of vacuum drying in a vacuum oven is carried out at approximately 70°C to 90 °C on the real wood veneer layer (3). This step is performed on the real wood veneer layer (3) at a temperature of approximately 70°C to 90 °C for approximately 10 to 12 hours, applying a vacuum in the range of 20 to 40 kPa, preferably approximately 24 kPa. After step iv) of vacuum drying in a vacuum oven, the real wood veneer layer (3) has a moisture content in the range 8% to 12 %. Even with a real wood veneer layer (3) presenting a wood crack (14), wood knot (12), wood pore (13) or a wood nerve (15), it has been surprisingly found that the method (16) allows for the obtainment of the mechanical integrity required to stand to further manufacturing steps with minimal breakage of the real wood veneer layer (3), and of the moisture content required to avoid the expansion of the real wood veneer layer (3), therefore leading to a product that is stable over time.

[0062] Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to the preferred embodiment of the invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of

the appended claims.

Claims

1. A flooring engineered plank (1) comprising:

   a base layer (2) of wood substitute material,
   a real wood veneer layer (3) adherent to the top of the base layer (2) of the wood substitute material, and
   a bonding adhesive layer (4) provided to bond the real wood veneer layer (3) to the base layer (2);
   and **characterised in that** the real wood veneer layer (3) is provided with at least one recess (5) selected from one or more of the following; a wood knot (12), a wood pore (13), a wood crack (14) or a wood nerve (15),
   and at least one recess (5) on the real wood veneer layer (3) exposes an underlying layer (6), which underlying layer (6) comprises at least one dark-coloured pigment substantially absorbing light in the visible spectrum.

2. The flooring engineered plank (1) according to claim 1 wherein the dark-coloured pigment has an L* value in the L*a*b system that is lower than 80, preferably lower than 50, more preferably lower than 30.

3. The flooring engineered plank (1) according to any of the previous claims wherein the at least one dark-coloured pigment comprises one or more components selected from the group consisting of iron oxides, cobalt oxides, nickel oxides, vanadium oxides, tin oxides, copper oxides, antimony oxides, chromium oxides, titanium oxides, manganese oxides, lead sulfides, copper sulfides, antimony sulfides, zinc sulfides, molybdenum sulfides, graphite, carbon nanotubes, black earth, graphite, carbon black, bone black, ivory black, vine black, lamp black, azine, perylene, hematein, haematoxylin, aluminium silicates, and mixtures thereof.

4. The flooring engineered plank (1) according to any of the previous claims wherein the base layer (2) of wood substitute material comprises the following components:

   i) at least about 10% in weight of polyvinyl chloride, preferably 20 to 30%, more preferably approximately 25%; and
   ii) at least about 20% in weight of limestone, preferably 60% to 75%, more preferably approximately 67,5%; and
   iii) at least about 0,1% in weight of dark-coloured pigment, preferably carbon black from 1% to 3,5% in weight, preferably 1,5% to 2,5%, more preferably approximately 1,75%.

5. The flooring engineered plank (1) according to any of the previous claims wherein the real wood veneer layer (3) has a thickness from 0,5 mm to 1,5 mm, preferably 0,7 mm to 1,3 mm, more preferably approximately 1 mm.

6. The flooring engineered plank (1) according to any of the previous claims wherein the base layer (2) has a thickness from 2 mm to 6 mm, preferably approximately 4 mm.

7. The flooring engineered plank (1) according to any of the previous claims wherein the real wood veneer layer (3) is made of heartwood.

8. The flooring engineered plank (1) according to any of the previous claims wherein the bonding adhesive layer (4) comprises an adhesive composition having a viscosity from 13000 to 28000 cps and is used in an amount from approximately 50 to 250 grams per square meter of flooring surface.

9. The flooring engineered plank (1) according to any of previous claims wherein the underlying layer (6) is any combination of the following layers: the base layer (2), the bonding adhesive layer (4), a coating layer (10, 11).

10. A method (16) of manufacturing of a real wood veneer layer (3) according to any of the previous claims wherein the method (16) comprises the following steps:

    i) Slicing real wood to obtain a real wood veneer layer (3);

    and **characterized in that** the real wood veneer layer (3) has a thickness from 0,5 mm to 1,5 mm, preferably 0,7 mm to 1,3 mm, more preferably approximately 1 mm, and wherein the method (16) further comprises:

    ii) Drying the real wood veneer layer (3) in a drying tunnel;
    iii) Cold pressing the real wood veneer layer (3);
    iv) Vacuum drying the real wood veneer layer (3) in a vacuum oven.

11. The method (16) of manufacturing of a real wood veneer layer (3) according to claim 10 wherein the method (16) comprises the step of drying the real wood veneer layer (3) in a drying tunnel at a temperature from approximately 100 °C to 110 °C for approximately 3 to 8 minutes, more preferably approximately 5 minutes.

12. The method (16) of manufacturing of a real wood veneer layer (3) according to claim 10 wherein the method (16) comprises the step of cold pressing the real wood veneer layer (3) at a pressure from approximately 0,1 to approximately 1 MPa for approximately 4 hours to 8 hours, preferably approximately 6 hours.

13. The method (16) of manufacturing of a real wood veneer layer (3) according to claim 10 wherein the method (16) comprises the step of vacuum drying the real wood veneer layer (3) at a temperature of approximately 70°C to 90 °C for approximately 10 to 12 hours at a vacuum in the range of 20 to 40 kPa, preferably approximately 24 kPa.

14. The use of the flooring engineered plank (1) according to claim 1.

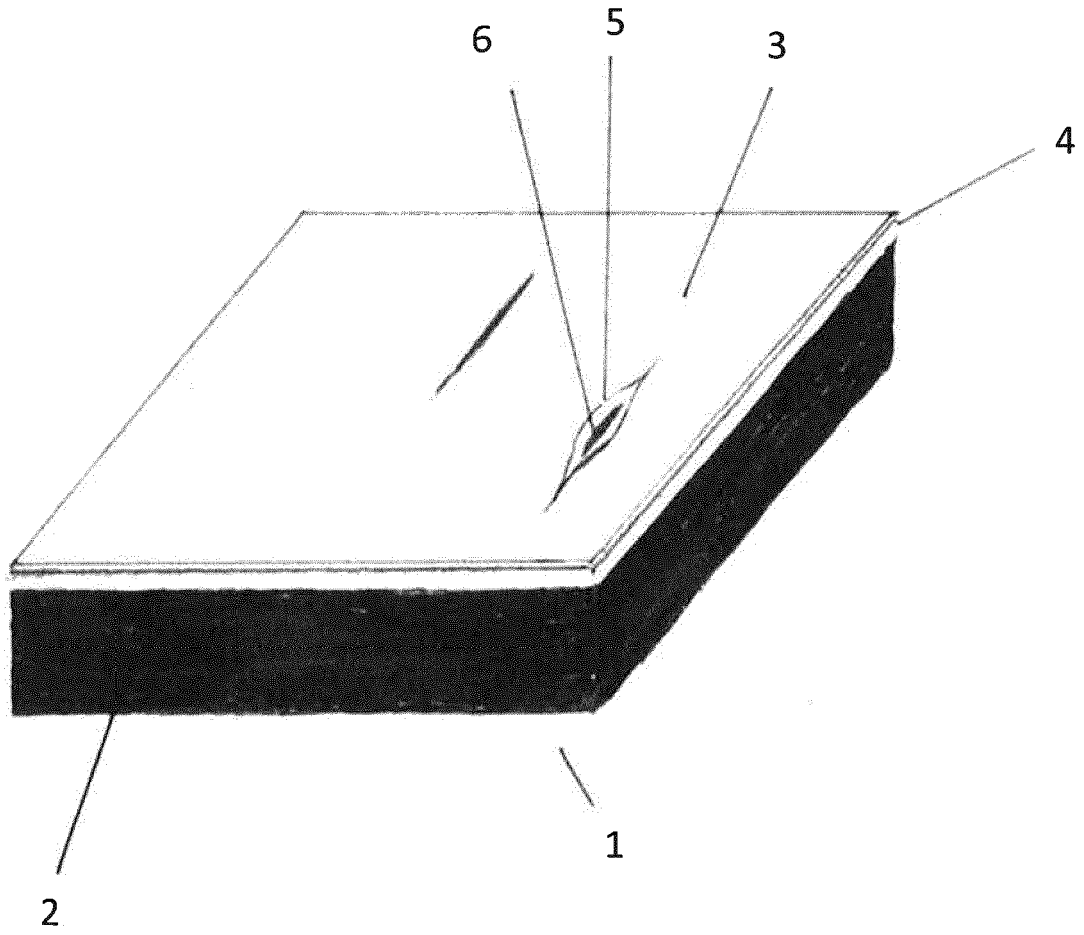

FIG 1

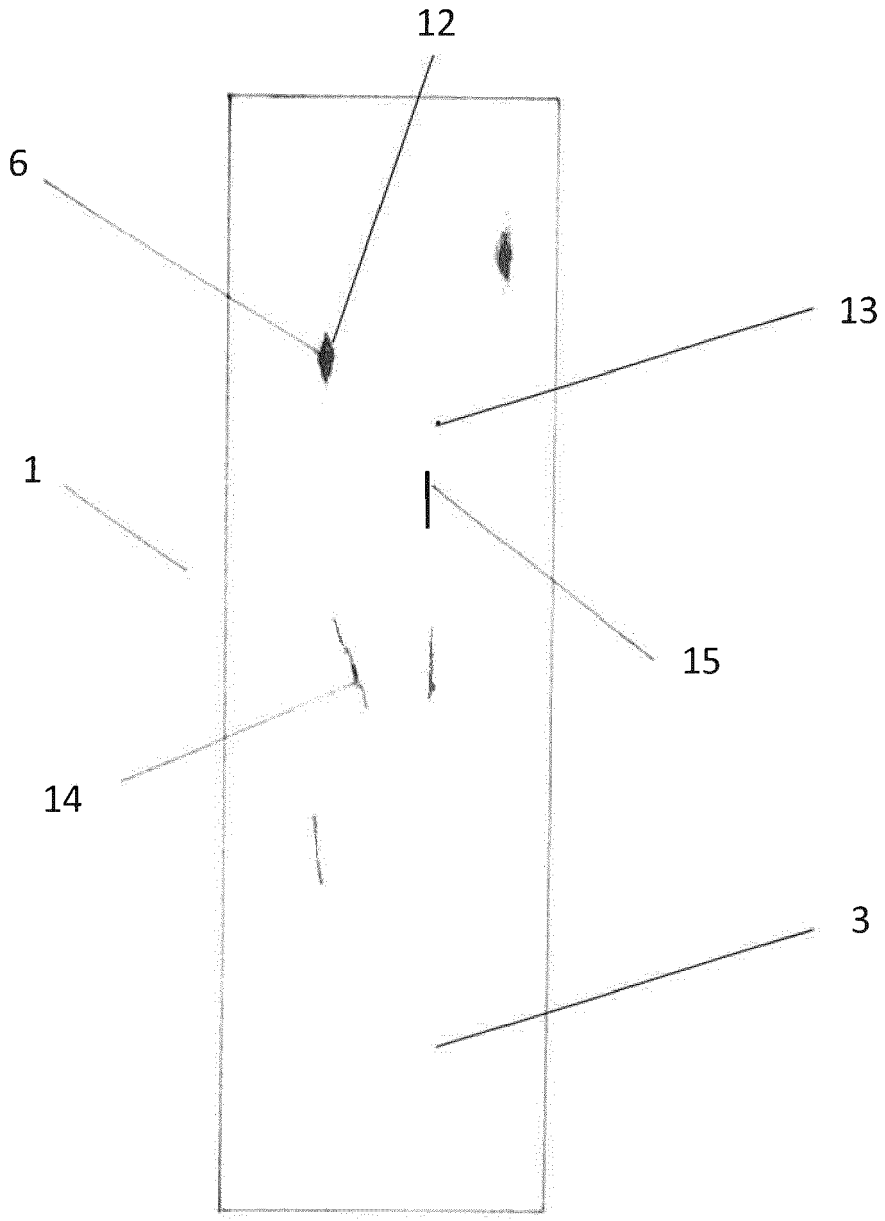

FIG 2

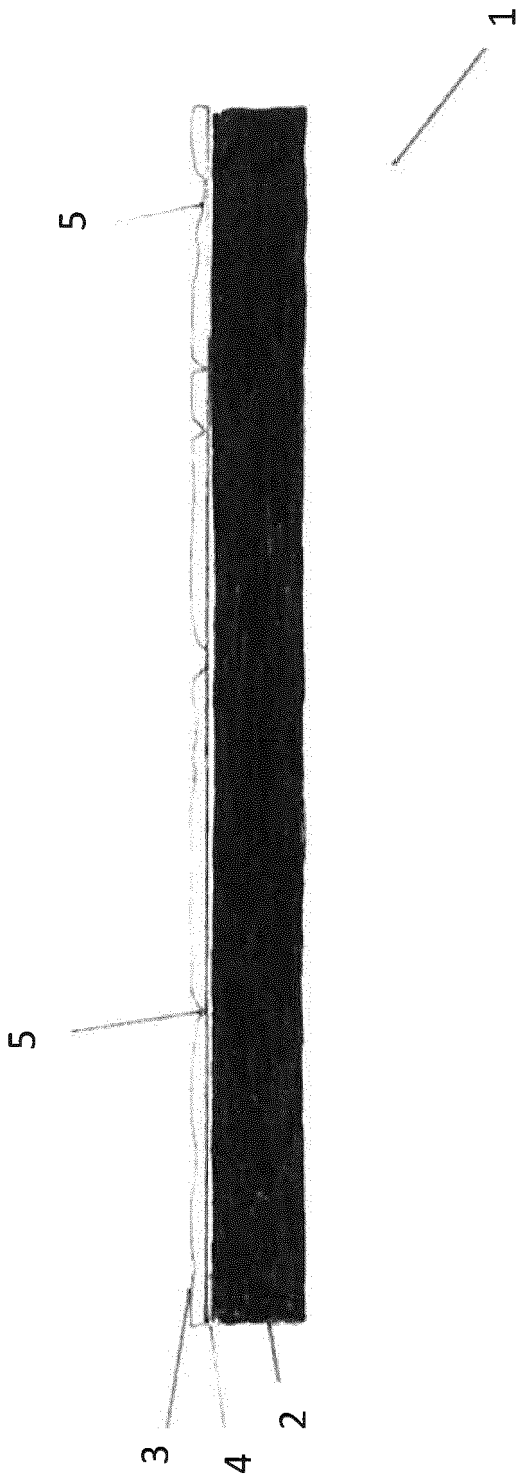

FIG 3

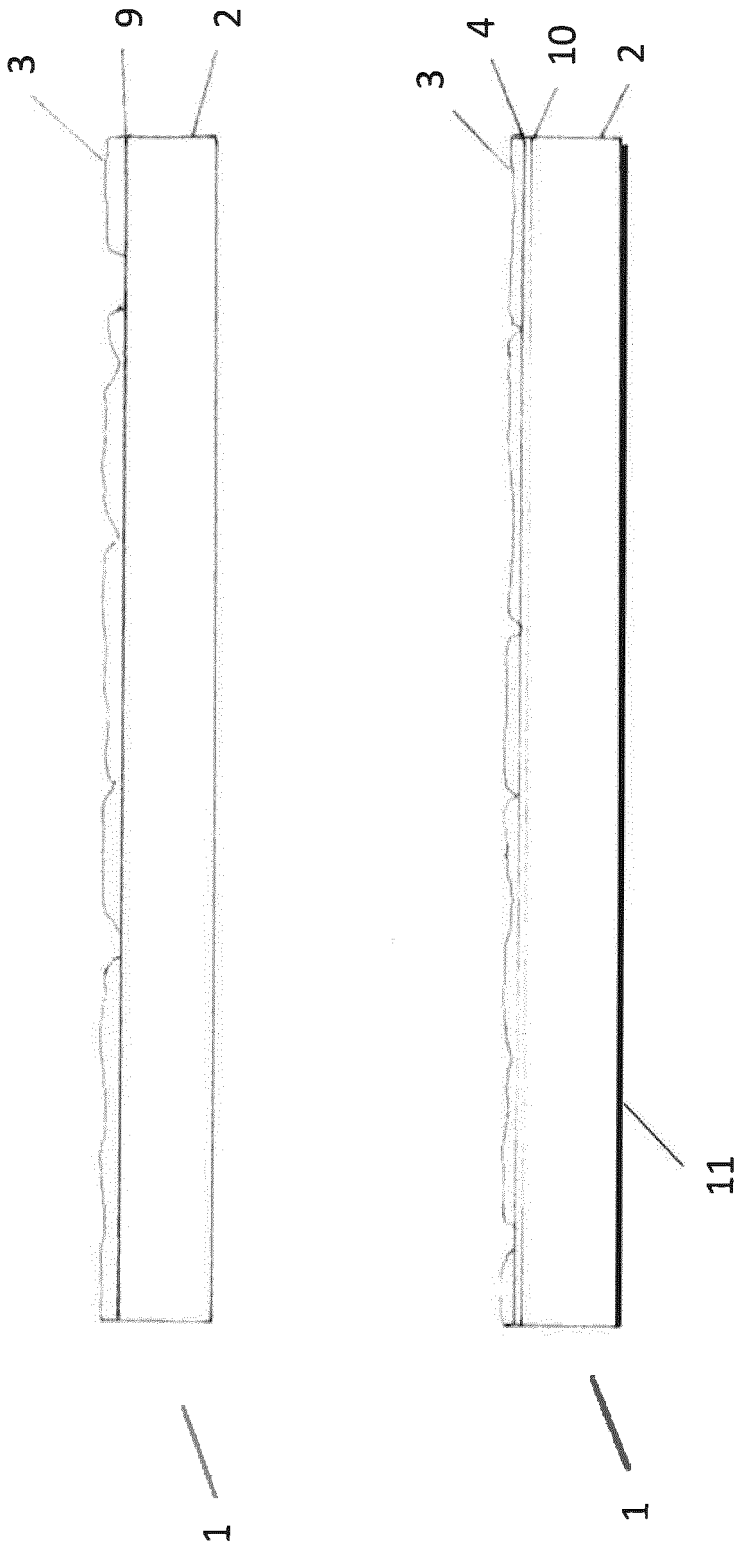

FIG 4

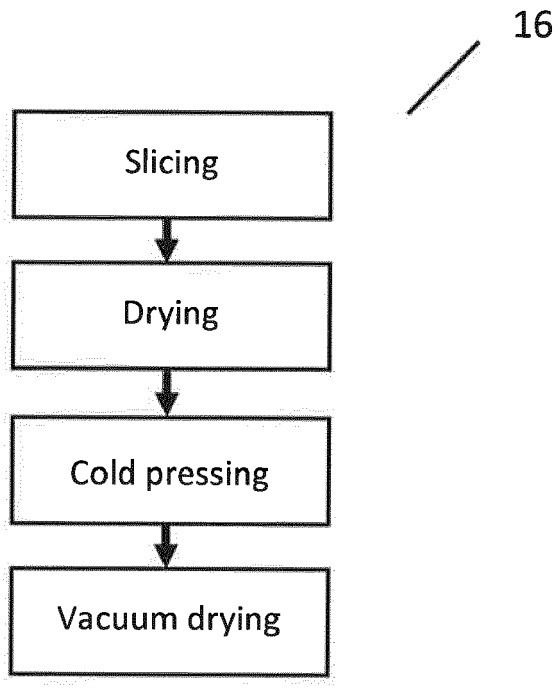

FIG 5

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EUROPEAN SEARCH REPORT

Application Number
EP 18 21 2145

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	15 May 2019	Huggins, Jonathan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 18 21 2145

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-9, 14

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 18 21 2145

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-9, 14

   A flooring engineered plank

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2. claims: 10-13

   A method of manufacturing a real wood veneer layer

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 21 2145

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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