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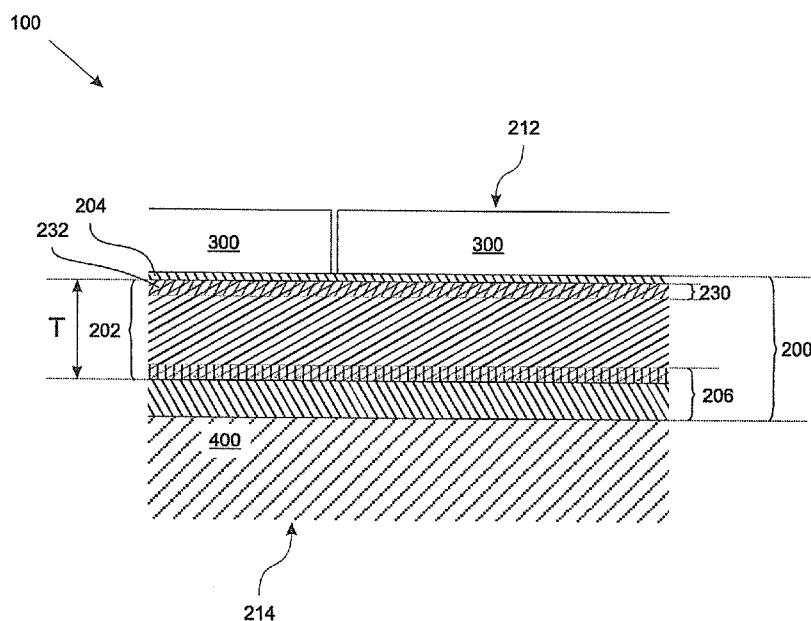


FIG. 1

(57) Abstract: A underlayment is provided, comprising a layered structure, wherein one of the layers is a first flexible foamed PVC layer, and comprising a first outer layer, which is a layer of adhesive, whether or not provided with a protective film.



UNDERLAYMENT

Technical field

5 The invention relates to underlayments, such as underlayments for vinyl-based floor elements such as LVTs, sheet vinyl, fitted carpet or carpet tiles, or laminate, parquet or ceramic tiles.

Prior art

10 Underlayments are generally known.

However, there is a need for fully recyclable underlayments with adequate dimensional stability so that, especially in conjunction with vinyl-based floor coverings, they display fewer problems with expansion and shrinkage. In particular, different expansion or shrinkage than the floor covering above, under the effect of temperature and/or heat, in comparison with the underlayment, may lead to unevenness and difficulties.

Summary of the invention

20 According to a first, independent aspect of the invention, a underlayment is provided, comprising a layered structure, wherein one of the layers is a first, flexible, foamed PVC layer, and wherein the underlayment comprises a first outer layer, which is a layer of adhesive, whether or not provided with a protective film.

25 In the context of the present invention, flexible means that the products, when a strip product is clamped on one side and can hang freely on the other opposite side, will sag under their own weight. "Flexible" then also means that a product will sag under its own weight more than 35 centimeters per meter of projecting length. Preferably a product will sag under its own weight more than 40 centimeters per meter of projecting length, such as more than 50 centimeters per meter of projecting length. On the other hand, 30 rigid or stiff signifies that a product will sag under its own weight less than 35 centimeters per meter of projecting length.

The underlayment is preferably flexible overall.

Underlayments are also well known as sublayers for floor covering, such as laminate, vinyl and parquet floors.

5 The layer of adhesive, also called adhesion layer or adhesive layer, serves for sticking the floor on the underlayment.

According to some embodiments, a protective film may be provided on the adhesive.

10 A protective film is a film that is applied on the adhesive and that has to be removed in order to allow the adhesive to exert its adhesive force. Protective film of this kind is also called "release film".

15 Preferably the first flexible foamed PVC polymer layer is made of PVC plastisol, and even more preferably it is made of flexible PVC. This PVC layer in foamed form may preferably have a thickness of between 0.3 and 1.6 mm, such as between 0.6 and 1.4 mm. Here, flexible PVC means PVC with at least 40 phr of plasticizer.

20 Within the context of the present invention, phr means "parts per hundred resin", it is the number of parts by weight of the component per hundred parts by weight of polymer, in this case per hundred parts by weight of PVC.

25 Furthermore, within the context of the present invention, flexible PVC means PVC that comprises 40 or more than 40 phr of plasticizers. Semirigid or semiflexible PVC means PVC that comprises between 10 and 40 phr of plasticizers, whereas rigid PVC comprises less than or exactly 10 phr.

30 According to some embodiments, the layer of adhesive may be located on a first side of the first PVC layer. According to some embodiments, a layer of fibers may be applied on the second side of the first PVC layer.

35 This layer of fibers may be a nonwoven, for example a spunbonded or needlefelt nonwoven. The layer of fibers is preferably made of polyester, polyamide or polyolefin fibers, or glass fiber. The layer of fibers may have a thickness which preferably varies between 0.1 and 1 mm, such as for example 0.7 mm. For example it is a nonwoven, for example needled polyester fiber layer, with a weight per unit area between 50 and

200 g/m², for example between 100 and 150 g/m², e.g. about 120 g/m². It is preferably a spunbonded polyester, for example a spunbonded polyester with a thickness between 0.1 and 0.3mm. This spunbonded polyester may have a weight per unit area of between 10 and 30 g/m², for example 20 g/m².

- 5 The layer of fibers may be attached to the PVC layer by means of adhesive, or may be embedded, whether or not partially, in the PVC material during production, so that the PVC has partly penetrated into the layer of fibers. PVC material may have penetrated more than half way through the thickness of the layer of fibers, for example to a depth of 0.5mm.

10

According to some embodiments, a textile reinforcing layer may be located between the first PVC layer and the layer of adhesive.

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According to some embodiments, the textile reinforcing layer may comprise a textile product that is embedded wholly or partly in the first PVC layer.

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"Wholly embedded" signifies that the PVC material of the first PVC layer has penetrated through the textile product completely, i.e. from the first side of the textile product that is oriented toward the first PVC layer, as far as and possibly beyond the opposite side of the textile product that is turned away from the first PVC layer. "Partly embedded" signifies that the PVC material of the first PVC layer has only penetrated to a certain depth of the textile product, i.e. from the first side of the textile product that is oriented toward the first PVC layer, in the direction of but not as far as the opposite side of the textile product that is turned away from the first PVC layer.

25

According to some embodiments, the textile reinforcing layer may comprise a textile product that is impregnated with polymer. Thus, a polymer-impregnated textile reinforcing layer may be located between the first PVC layer and the layer of adhesive.

30

According to some embodiments, the polymer-impregnated textile reinforcing layer may be in contact with the first side of the first PVC layer.

The polymer-impregnated textile reinforcing layer is preferably a PVC-impregnated textile layer. Flexible PVC is preferably used, which is PVC with at least 40 phr of plasticizer, for example phthalate.

The textile layer preferably comprises a glass-fiber textile, for example a nonwoven glass-fiber textile or a woven glass-fiber textile. This glass-fiber textile preferably has a weight per unit area from 15 to 80 g/m², for example such as between 35 and 60 g/m² or between 25 to 40 g/m².

5

The polymer-impregnated textile reinforcing layer preferably has a thickness of between 0.2 and 0.5 mm, more preferably between 0.3 and 0.4 mm.

According to some embodiments, a second polymer layer may be located between the textile reinforcing layer (optionally impregnated with polymer) and the layer of adhesive. Preferably this second polymer layer is attached to the layer of adhesive and to the textile reinforcing layer, if necessary to the polymer-impregnated textile reinforcing layer.

In the case when a textile reinforcing layer is present that comprises a textile product that is embedded wholly or partly in the first PVC layer, this second polymer layer will be located between the adhesive layer and this textile reinforcing layer. Preferably polymer of the second layer is the same as polymer of first layer.

According to some embodiments, the second polymer layer may be a second PVC layer.

Preferably the second polymer layer is made of PVC, more specifically of PVC plastisol, even more preferably made of flexible PVC, and more preferably foamed PVC. This second polymer layer in foamed or unfoamed form may have a thickness of between 0.1 and 1.3 mm, such as between 0.3 and 0.7 mm. In unfoamed form a thickness of 0.15 to 0.25 mm is preferred.

According to still further embodiments the underlayment may comprise a second textile reinforcing layer that comprises a textile product. This second textile reinforcing layer may for example be embedded in the depth of the first, foamed PVC layer, for example but not necessarily a good halfway through the thickness of this first PVC layer. An embedded second textile reinforcing layer of this kind may be obtained during the process for the making of the first, flexible foamed PVC layer, wherein a first sublayer of foamed or unfoamed PVC is provided, on which the textile reinforcing material is laid and optionally is wholly or partly embedded, and after which a second sublayer of

foamed or unfoamed PVC is provided. In the case when this takes place in unfoamed form, it is further foamed during the further production steps.

In the case when the underlayment comprises a second polymer layer, for example a second PVC layer, then this second textile reinforcing layer can be positioned between
5 the second polymer layer and the adhesive layer.

This textile layer preferably comprises a glass-fiber textile, for example a nonwoven glass-fiber textile or a woven glass-fiber textile. This glass-fiber textile preferably has a weight per unit area from 15 to 80 g/m², such as from 25 to 55 g/m². It may but need not necessarily be identical to the textile layer of the first reinforcing layer.

10

According to some embodiments, the first PVC layer may comprise plasticizers in an amount from 15 to 120 phr. In the case of a second PVC layer, PVC material of this second PVC layer may comprise plasticizers in an amount from 15 to 120 phr. Preferably the PVC material of the first and/or if applicable the second PVC layer comprises 20 to
15 100 phr of plasticizers.

15

Generally in the context of the present invention, plasticizers are among other things esters of carboxylic acids (for example esters of phthalic acid, iso- or terephthalic acid, trimellitic acid and adipic acid), for example diisononyl phthalate (DINP), dioctyl
20 terephthalate (DOTP), diisononyl-1,2-cyclohexanedicarboxylate (DINCH), esters of phosphoric acid, for example triaryl- or trialkaryl phosphates, for example tricresyl phosphate, chlorinated or nonchlorinated hydrocarbons, ethers, polyesters, polyglycols, sulfonamides, or combinations of these.

20

25 This second polymer layer, preferably PVC layer, may be waterproof.

The PVC of the first and/or if applicable second PVC layer may comprise fillers between 10 and 70 wt%.

Fillers may be, among other things, glass fibers, calcium hydroxide (slaked lime),
30 calcium carbonate and calcium hydrogen carbonate, and/or CaMg(CO₃)₂, talc, or also lightweight fillers such as hollow microspheres (Expancel). The aforementioned percentage by weight (wt%) is expressed as the weight of the filler relative to the weight of the polymer, if applicable PVC, in which the filler is located.

30

The PVC of the first and/or if applicable second PVC layer may further comprise additives such as pigments and coloring matter, preservatives, antifungal agents, thermal stabilizers, UV-stabilizers, blowing agents, viscosity regulators, and the like.

- 5 The PVC of the first and/or second layer of PVC may be an extruded PVC layer, or a combination of different coextruded or noncoextruded PVC layers, or may be formed from one or more layers of PVC plastisol by a coating process.

10 PVC is typically polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate. The K value is preferably between 50 and 90.

The PVC of the first flexible layer of PVC is foamed. The PVC of the second flexible layer of PVC may also be foamed. A "foamed layer" means a layer that contains hollow spaces, preferably in an amount such that the density of the material is reduced by at least 10%, and preferably even at least 25% relative to the weight of an identical volume of thermoplastic material without hollow spaces. Preferably it relates to so-called "closed cell" foam. "Unfoamed layer" means a layer without hollow spaces, or at most with a proportion of hollow spaces such that the density of the material is not reduced, or not more than 10%, and preferably even not more than 2%.

20 The PVC of the first and/or second foamed layer of PVC preferably has a density from 200 to 1200 kg/m³, such as from 300 to 700 kg/m³.

The PVC may be chemically or mechanically foamed.

25 According to a first possibility the foamed layer is obtained at least by means of a mechanical foaming process. This means that cavities are formed in the layer in question by pushing the thermoplastic material away and replacing it with a gas (for example air), often under the influence of a mechanical action or by injecting a gas (for example air) under pressure. Or it may be obtained by using expanding granules in a PVC-based layer.

35 According to a second possibility the foamed layer is obtained at least by means of a chemical foaming process. This means that in the layer in question, cavities are formed by means of a gaseous reaction product. For example, azodicarbonamide may be used.

On being heated, this material releases nitrogen gas, which remains present in the foamed layer in the form of bubbles.

According to a third possibility, the foamed layer is obtained at least by means of fillers, wherein these fillers comprise one or more cavities in themselves. It is possible for example to make use of the expanded state of the microspheres mentioned above. More especially use may be made of the microspheres known from WO 2013/178561.

According to some embodiments, the underlayment may have a thickness between 1.25 and 2.5 mm. Preferably the underlayment has a thickness between 1.4 and 2.2 mm, for example between 1.7 and 1.9 mm.

Preferably the underlayment has a density between 400 and 1800 g/m³, such as between 600 and 1200 kg/m³.

According to some embodiments, the underlayment may have a "punctual conformability" that is greater than 0.5. The "punctual conformability" or PC is defined by CEN/TS 16354:2013 and is calculated from the formula

$$PC = (100 - \text{shoreA}) / \text{thickness}$$

wherein "thickness" is the thickness of the underlayment and this thickness is set at 2.5mm in the case when the effective thickness of the underlayment is less than 2.5mm. According to the standard, shoreA is measured on the underside of the underlayment.

According to some embodiments, the adhesive may be an adhesive selected from the group that consists of PSA adhesives and acrylate adhesives. PSA adhesives are "pressure sensitive adhesives".

According to some embodiments, the adhesive may be present in an amount from 5 to 90 g/m². Preferably the adhesive is present in an amount from 25 to 75 g/m².

According to embodiments, a waterproof film, for example a polymer film, such as a PET film, may be provided under the adhesive. This film is preferably located between the adhesive layer and the next layer of the underlayment. This polymer film may for example be glued to the next layer of the underlayment with a further adhesive layer.

According to some embodiments, the sublayer is provided on a first edge with a recess on the side where the adhesive is present, and wherein the sublayer is provided on a second edge, opposite the first edge, with a recess on the side opposite the side where the adhesive is present, so that in the case when the recess on the first side of a first sublayer for floor covering is brought into contact with the recess on the second side of a second sublayer for floor covering, the two sublayers for floor covering are substantially coplanar.

Preferably the underlayment is built up from one or more strips of underlayment, for example strips with a width between 0.5 and 2 m. In order to provide such strips, rolls of underlayment may be provided. Such rolls may have a length up to 10 meters, even up to 15 meters. Preferably the rolls have a length between 5 and 10 meters, for example 5, 6, 7, 8, 9 or 10 meters. In order to provide a strip of underlayment, a roll is unwound and cut off to length, after which a further, adjacent strip is provided in a similar manner. The sides are preferably placed tightly abutting against one another.

A underlayment according to the first aspect of the invention has the advantage that the underlayments substantially are fully recyclable and/or have above-average stability and/or have good resistance to residual impression and/or can cause an improvement of the acoustic properties of the floor covering lying thereon. The underlayments according to the invention may display a greater flatness than the known underlayments. The underlayments may contribute to better acoustic performance of the floor, i.e. greater sound damping. The underlayments according to the invention also display better water resistance at the level of the joints between two adjoining underlayments.

According to a second independent aspect, a floor covering is provided, comprising at least one underlayment according to the first aspect of the invention, and at least one floor element, which is glued to the adhesive layer of the underlayment, wherein the at least one underlayment is laid on a floor to be covered.

According to some embodiments, different underlayments may be laid next to one another on the floor to be covered.

According to some embodiments, at least one floor element may be a PVC floor element. The PVC or vinyl floor element may be an LVT. Here, LVT signifies "luxury

vinyl tile", being a floor element with smaller dimension, preferably rectangular, which mainly consists of polyvinyl chloride and may be flexible or rigid. The at least one floor element may be a vinyl-based floor element such as LVT or sheet vinyl. Optionally the at least one floor element may also be a fitted carpet or carpet tile, or laminate, parquet or ceramic tiles. The floor elements may be provided on one or more sides with a coupling means in order to couple two floor elements to each other. This coupling means may be any coupling means as known in the prior art, for example tongue and groove coupling means, coupling means comprising click systems, coupling means comprising fall-down systems, coupling means comprising turning profiles, and similar.

The sheet vinyl used in this second aspect as floor element is typically built up in layers, and comprises

- optionally a back layer of flexible PVC,
- a flexible or semirigid PVC layer, to or in which optionally a reinforcing layer is attached or embedded, and
- a finishing layer typically comprising a decorative layer, a wearing layer and optionally a coating on the outer side.

Optionally, the flexible or semirigid PVC layer comprises a reinforcing layer, for example a textile reinforcing layer, for example reinforcing layers as described for the reinforcing layers of the underlayment according to the first aspect of the invention.

The optional back layer consists of flexible PVC and typically has a thickness of more than 0.5mm, for example between 0.5mm and 5mm, for example between 0.75mm and 2.5mm. The material of which this back layer consists comprises, in addition to PVC, also fillers (up to 60 wt% relative to total PVC material, for example about 50 wt%) and additives, and preferably more than 40 phr of plasticizer, more specifically more than 50 phr of plasticizer. The back layer may or may not be foamed, and may have a density between 0.3 g/cm³ and 1.9 g/cm³.

The flexible or semirigid PVC layer, to or in which optionally a reinforcing layer is attached or embedded comprises or is preferably a fibrous web that is impregnated with PVC. The PVC used in order to impregnate the glass-fiber web partially or preferably completely is preferably flexible PVC. The PVC comprises, in addition to the polymer, also fillers (up to for example 75 wt% or up to 50 wt% relative to total PVC material, for

example up to about 40 wt%) and additives, and preferably more than 40 phr of plasticizer, more specifically more than 50 phr of plasticizer. The thickness of this layer may be up to 0.6mm but is preferably between 0.20mm and 0.40mm, such as about 0.30mm. The density of the PVC used is preferably under 1.9 g/cm³, for example such
5 as between 1.4 g/cm³ and 1.7g/cm³, for example between 1.5g/cm³ and 1.6g/cm³. As fleece, preferably a glass-fiber web (nonwoven) is used that has approximately the same thickness as this layer. The preferred fleece has a thickness of 0.3 mm and a weight per unit area of 35 g/m².

10 According to some embodiments, the total weight per unit area of the one or more reinforcing layers may be at least 30 g/m², such as at least 50 grams per m² of floor element, more preferably at least 60 g/m².

The finishing layer typically comprises a decorative layer, a wearing layer and optionally
15 a coating on the outer side.

The decorative layer typically comprises flexible PVC with a thickness of between 0.09mm and 0.6mm, for example between 0.2mm and 0.6mm. It may be a PVC layer (for example a film) that is printed with a decorative pattern. The PVC used may be flexible PVC. Besides polymer, this PVC layer also comprises additives and fillers (up
20 to 50 wt% relative to the whole PVC composition), and plasticizers preferably more than 40 phr, more specifically more than 50 phr of plasticizer. The PVC may or may not be foamed, but is preferably foamed. If a foamed PVC material is used, the PC layer may have a density under 1 g/cm³, such as between 0.5 and 0.8 g/cm³. In the case of unfoamed PVC the density is preferably between 1 g/cm³ and 1.6 g/cm³, such as
25 between 1.2 g/cm³ and 1.4 g/cm³. The layer may be supplied as film, whether or not pre-printed, as emulsion or (micro-) suspension polymerization layers, by calendaring or as plastisol layer.

On this decorative layer, a wearing layer is provided, which may be selected in thickness
30 for example between 0.15 mm and 1.0 mm, for example between 0.2 mm and 0.55mm. It may preferably be a flexible or semirigid PVC layer, for example a film. Preferably no fillers are added or used, and the layer is transparent. Besides polymer, this PVC layer also comprises additives and plasticizers preferably more than 20 phr, more specifically more than 30 phr of plasticizer. Plasticizers up to 40 phr may be provided in this PVC.
35 Preferred ranges for plasticizers are 20 to 45 phr, more preferably 35 to 40 phr. The

PVC may have a density preferably between 1 g/cm³ and 1.5 g/cm³, such as between 1.2 g/cm³ and 1.3 g/cm³.

The wearing layer is optionally provided with wearing particles, for example Al₂O₃ particles. The PVC is typically free from fillers. The layer may be supplied as film or as
5 emulsion or (micro-) suspension polymerization layers, by calendering or as plastisol layer.

As finishing layer, the sheet vinyl may further comprise a varnish coat or coating on top of the wearing layer, which consists of polyurethane (PU), for example a UV-curing PU
10 layer. The thickness may be up to 20, even 30µm, but is preferably about 10µm thick.

According to some embodiments, one reinforcing layer may be attached or embedded in the sheet vinyl floor elements, in the flexible or semirigid PVC layer.

15 The at least one, but preferably two or more reinforcing layers are preferably textile reinforcing layers. The textile layer preferably comprises a glass-fiber textile, for example a nonwoven glass-fiber textile or a woven glass-fiber textile. This glass-fiber textile preferably has a weight per unit area from 15 to 80, such as from 25 to 55 g/m². Preferably a woven glass-fiber textile has an open structure, for example a gauze
20 structure or gauze fabric. Preferably the open space between successive warp or weft yarns may be between 1 mm and 1 cm.

The total sum of weights per unit area in the sheet vinyl floor element may together preferably have a weight per unit area of more than 30 g/m², more preferably more than
25 50 g/m², such as between 30 and 180 g/m².

According to embodiments the at least one reinforcing layer of the floor elements may comprise a first and a second reinforcing layer, which in each case has a weight per unit area of at least 15 g/m², and preferably in each case have a weight per unit area of at
30 least 25 g/m².

According to embodiments, in the sheet vinyl floor elements, the one or more reinforcing layers of the floor elements may be glass-fiber webs or glass-fiber fabrics.

All the aforementioned PVCs are preferably obtained by emulsion or (micro-) suspension polymerization or plastisols and have a K value between 50 and 90.

Luxury vinyl tiles or "LVTs" are PVC floor elements that consist of a layered structure.

5 They comprise a top layer, which is also layered per se, and typically comprises a decorative layer, on which a wearing layer and optionally a coating is applied.

The decorative layer may be a PVC layer, optionally a film, which is provided with decoration. The decorative layer, for example films, with thickness between 0.08mm and 0.3mm of flexible or semirigid PVC or rigid PVC are decorative layers of this kind. In the
10 case of thinner decorative layers (with thicknesses up to about 0.15mm), preferably semirigid or rigid PVC is used with relatively little or no fillers (up to 25 wt% relative to total PVC), whereas for thicker layers, for example films, (above 0.15mm) preferably flexible PVC is used with fillers up to 150 phr. Thinner decorative layers are preferably PVC films, whereas thicker decorative layers preferably emulsion or (micro-) suspension
15 polymerization layers are used.

The wearing layer is typically a rigid or semirigid transparent PVC layer with thickness between 0.15mm and 1mm (for example between 0.2mm and 0.55mm) and optionally provided with wearing particles, for example Al_2O_3 particles. Plasticizers up to 40 phr
20 are provided in this PVC. Preferred ranges for plasticizers are less than 40 phr, more preferably 25 to 35 phr. The PVC is typically free from fillers. The layer may be supplied as film or as emulsion or (micro-) suspension polymerization layers, by calendaring or as plastisol layer.

25 On this wearing layer, a coating may be provided, for example a PU layer, for example a UV-curing PU layer. The thickness may be up to 20, even up to 30 μm , but is preferably about 10 μm thick.

30 These PVC floor elements comprise a core layer under the top layer. Depending on the choice of polymer and reinforcing layers, this core layer will ensure that these floor elements are flexible LVT floor elements, or rigid LVT floor elements.

In the context of the present invention, flexible and rigid also means here that the floor elements, when a strip product is clamped on one side and can hang freely on the other
35 opposite side, will or will not sag much under its own weight. Flexible then also signifies

that a product will sag under its own weight more than 35 centimeters per meter of projecting length. Preferably a product will sag under its own weight more than 40 centimeters per meter of projecting length, such as more than 50 centimeters per meter of projecting length. Rigid or stiff then also signifies that a product will sag under its own weight less than 35 centimeters per meter of projecting length.

For rigid LVT floor elements, the core layer will mainly comprise rigid or semiflexible PVC. The core layer may comprise one or more, for example two, reinforcing layers which is embedded on or between the rigid or semiflexible PVC layer or layers. The reinforcing layer or layers comprise a fibrous web, generally a glass-fiber web, in which the rigid or semirigid PVC is partly or wholly impregnated. Glass-fiber webs with a weight per unit area between 25 and 150 g/m² may be used, for example webs with a weight per unit area between 30 and 75 g/m².

According to some embodiments, the total weight per unit area of the one or more reinforcing layers may be at least 60 g/m², such as at least 80 grams per m² of floor element, more preferably at least 100 g/m².

The core layer comprises rigid or semirigid PVC, which in total is between 2mm and 6mm thick, for example between 3mm and 4.5mm, in or onto which the reinforcing layers are inserted. Thus, for example, one of the reinforcing layers may provide the underside of the floor element.

A part of the PVC may be present in the core layer above the topmost of the one or more glass-fiber webs. The thickness of this PVC layer above the topmost of the one or more glass-fiber webs may be between 0.3mm and 0.7mm. The thickness of the PVC layer between the topmost and lowest glass-fiber web, in the case when several glass-fiber webs are provided, may vary between for example 2 and 4 mm. A part of the PVC may be present in the core layer under the lowest of the one or more glass-fiber webs. The thickness of this PVC layer under the lowest of the one or more glass-fiber webs may be between 0.3mm and 0.7mm. In the case when one reinforcing layer is provided, this layer may be positioned centrally or eccentrically from the layer of rigid or semirigid PVC.

The rigid or semirigid PVC preferably comprises up to 15phr of plasticizer, preferably between 7 and 10 phr. The rigid or semirigid PVC preferably comprises up to 70 wt% of fillers (relative to total weight of the PVC composition).

On the side of the core layer that is in contact with the top layer, in addition a layer of flexible or semirigid PVC may be present, preferably with a thickness between 0.25 and 0.75 mm, for example such as between 0.35mm and 0.55mm. This PVC preferably
5 comprises more than 30 phr of plasticizer (for example between 30 and 50 phr of plasticizer) and may comprise more than 50 wt% of fillers. The thickness of this layer may vary between 0.3 and 1mm, for example between 0.35mm and 0.75 mm.

For flexible LVT floor elements, the core layer will mainly comprise flexible PVC or
10 semirigid PVC. The core layer may comprise one or more, for example two, reinforcing layers, which are embedded on or between the flexible PVC layer or layers. The reinforcing layer or layers comprise a fibrous web, generally a glass-fiber web, in which the flexible or semirigid PVC is partly or wholly impregnated. Glass-fiber webs with a weight per unit area between 25 and 150 g/m² may be used, for example webs with a
15 weight per unit area between 30 and 75 g/m². In some embodiments the core layer comprises a reinforcing layer comprising a glass-fiber web, which will form the side of the core layer that comes into contact with the top layer, i.e. in contact with the decorative layer.

The core layer comprises flexible or semirigid PVC, which in total is between 1.2mm and
20 6mm thick, for example between 1.2mm and 4.5mm, in or onto which the reinforcing layers are inserted.

A part of the PVC may be present in the core layer above the topmost of the one or more glass-fiber webs. The thickness of this PVC layer above the topmost of the one or more glass-fiber webs may be between 0.3mm and 2mm. The thickness of the PVC
25 layer between the topmost and lowest glass-fiber web, in the case when several glass-fiber webs are provided, may vary between for example 2 and 4 mm. A part of the PVC may be present in the core layer under the lowest of the one or more glass-fiber webs. The thickness of this PVC layer under the lowest of the one or more glass-fiber webs may be between 0.75mm and 3mm. In the case when one reinforcing layer is provided,
30 this layer may be positioned centrally or eccentrically from the layer of flexible PVC.

The flexible PVC or semirigid PVC preferably comprises more than 30phr of plasticizer. The flexible or semirigid PVC preferably comprises up to 65 wt% of fillers (relative to total weight of the PVC composition).

LVT floor elements, both flexible and rigid, generally have a limited surface dimension. They may be made as "planks", preferably being rectangular surfaces with a width between 8 and 50 cm and length between 50 and 200 cm, preferably between 1.0 and 1.2 m long and between 0.12 and 0.23 m wide.

5

The different layers may be manufactured by means of PVC plastisol. In an alternative form, the layers are extruded PVC layers, or they are formed by melting PVC particles together or they are formed by calendering or extrusion.

10 In the case when sheet vinyl is used as floor element or elements, these sheet vinyl elements generally have a larger area, and are supplied in rolls of between 0.5 and 4.5 m wide and 2.5 to 40m long, for example 2.5 to 25m long, for example about 20 m long. However, smaller rolls with a limited width from 0.5 to 1.5 m, for example about 1 meter, may be used. However, the use of relatively small sheets of sheet vinyl is not
15 excluded, which are laid next to one another in order to provide a floor covering. The small sheets of sheet vinyl may be sheet vinyl, preferably being rectangular surfaces with a width between 8 and 50 cm and length between 50 and 200 cm.

The floor elements may be provided on their upper side with a relief, which may be
20 impressed therein during production by embossing.

A floor covering according to the second aspect of the invention has the advantage that, certainly in the case when the floor elements consist of PVC, the underlayment and the floor elements have similar expansion under rising or falling temperature. As a result,
25 detaching of the floor elements from the underlayment is reduced or limited.

According to a third, independent aspect of the invention, a underlayment is provided that is provided with an adhesive layer, which is provided with a sheet vinyl in order to obtain a floor covering.

30

This third independent aspect provides a floor covering comprising at least one underlayment and a floor element, the underlayment comprising a layered structure comprising at least one first flexible, foamed polymer layer, and an adhesive layer located on the outer side, the sheet vinyl comprising at least one reinforcing layer, the
35 underlayment and the sheet vinyl are joined to one another by means of the adhesive

layer. According to preferred embodiments the underlayment comprises at least one reinforcing layer.

A flexible polymer layer in the context of this aspect must be understood as when a strip product is clamped on one side and can hang freely on the other opposite side, it will sag under its own weight. Flexible then also signifies that a product will sag under its own weight more than 35 centimeters per meter of projecting length. Preferably a product will sag under its own weight more than 40 centimeters per meter of projecting length, such as more than 50 centimeters per meter of projecting length.

The underlayment is preferably flexible overall.

According to this independent aspect, both the sheet vinyl and optionally the underlayment comprise at least one reinforcing layer, preferably textile reinforcing layer, such as a glass-fiber reinforcing layer. These may, independently of each other, be a glass-fiber web or a glass-fiber fabric. Preferably a glass-fiber fabric has an open structure, for example a gauze structure or gauze fabric. Preferably the open space between successive warp or weft yarns may be between 1 mm and 1 cm.

The underlayment of this third aspect has a layered structure, wherein one of the layers is a first, flexible foamed polymer layer, and wherein the underlayment comprises a first outer layer, which is a layer of adhesive, whether or not provided with a protective film. For example, according to one embodiment, the underlayment comprises a layered structure, wherein one of the layers is a first, flexible foamed PVC (polyvinyl chloride), PU (polyurethane) or PVB (polyvinylbutyral) layer, and wherein the underlayment comprises a first outer layer, which is a layer of adhesive, whether or not provided with a protective film.

The polymer layer in foamed form may preferably have a thickness of between 0.3 and 1.6 mm, such as between 0.6 and 1.4mm.

The sheet vinyl used in this third aspect is a sheet vinyl that comprises at least one reinforcing layer.

This sheet vinyl may be the same as used in relation to the second aspect of the invention.

The sheet vinyl used in this third aspect preferably has at least one reinforcing layer. Typically this sheet vinyl is built up layered, and comprises an optional back layer of
5 flexible PVC, a flexible or semirigid PVC layer to or in which optionally a reinforcing layer is attached or embedded, and a finishing layer typically comprising a decorative layer, a wearing layer and optionally a coating on the outer side.

The underlayment used for this third aspect of the invention may be a underlayment
10 according to the first aspect of the invention, which is provided with at least one reinforcing layer.

Optionally the layer of adhesive may be located on a first side of the first polymer layer, wherein a layer of fibers is applied to the first polymer layer on the second side.

15 This layer of fibers may be a nonwoven, for example a spunbonded or needlefelt nonwoven. The layer of fibers is preferably made of polyester, polyamide or polyolefin fibers, or glass fiber. The layer of fibers may have a thickness that preferably varies between 0.1 and 1 mm, such as for example 0.7mm. For example, it is a nonwoven, for
20 example needled polyester fiber layer, with a weight per unit area between 50 and 200 g/m², for example between 100 and 150 g/m², e.g. about 120 g/m². It is preferably a spunbonded polyester, for example a spunbonded polyester with a thickness between 0.1 and 0.3mm. This spunbonded polyester may have a weight per unit area of between 10 and 30 g/m², for example 20 g/m².

25 The layer of fibers may be attached to the first polymer layer by means of adhesive, or may be embedded in the foamed material during production, so that the foamed material has partly penetrated into the layer of fibers. The polymer material may have penetrated more than half way through the thickness of the layer of fibers, for example to a depth of 0.5mm.

30 According to this third aspect the underlayment may comprise a reinforcing layer, for example a reinforcing layer, for example a textile reinforcing layer, may be located between the first polymer layer and the layer of adhesive.

According to some embodiments, the textile reinforcing layer may comprise a textile product that is embedded wholly or partly in the first polymer layer.

"Wholly embedded" signifies that the polymer material of the first polymer layer has penetrated through the textile product completely, i.e. from the first side of the textile product that is oriented toward the first polymer layer, as far as and possibly beyond the opposite side of the textile product that is turned away from the first polymer layer. "Partly embedded" signifies that the polymer material of the first polymer layer has only penetrated to a certain depth of the textile product, i.e. from the first side of the textile product that is oriented toward the first polymer layer, in the direction of but not as far as the opposite side of the textile product that is turned away from the first polymer layer.

According to some embodiments, the textile reinforcing layer may comprise a textile product that is impregnated with an identical or different polymer. A polymer-impregnated textile reinforcing layer may thus be located between the first polymer layer and the layer of adhesive. According to some embodiments, the polymer-impregnated textile reinforcing layer may be in contact with the first side of the first polymer layer.

Preferably the polymer-impregnated textile reinforcing layer is a polymer-impregnated textile layer, the impregnating polymer being identical to the polymer of the first polymer layer, for example PVB, PU or PVC. Preferably flexible polymer is then used, for example a polymer with sufficient plasticizer, for example phthalate.

The reinforcing layers may preferably comprise a glass-fiber textile, for example a nonwoven glass-fiber textile or a woven glass-fiber textile. This glass-fiber textile preferably has a weight per unit area from 15 to 80, such as from 25 to 40 g/m².

The reinforcing layer preferably has a thickness of between 0.2 and 0.5 mm, more preferably between 0.3 and 0.4 mm.

According to some embodiments, a second polymer layer may be located between the reinforcing layer and the layer of adhesive. Preferably this second polymer layer is attached to the layer of adhesive and to the textile or nontextile reinforcing layer, if necessary to the polymer-impregnated reinforcing layer.

In the case when a textile reinforcing layer is present that comprises a textile product that is embedded wholly or partly in the first polymer layer, this second polymer layer may be located between the adhesive layer and this textile reinforcing layer.

5 In the case when a reinforcing layer is present that comprises a textile product that is impregnated with polymer, this second polymer layer will preferably be located between the adhesive layer and this reinforcing layer.

10 According to further embodiments, the underlayment may comprise a second, textile or nontextile, reinforcing layer, for example a reinforcing layer that comprises a textile product. This second textile reinforcing layer may for example be embedded deep in the first, foamed polymer layer, for example but not necessarily a good halfway through the thickness of this first polymer layer. An embedded second textile reinforcing layer of this kind may be obtained during the process for the making of the first, flexible and foamed polymer layer, wherein a first sublayer of foamed or unfoamed polymer is provided, on
15 which the textile reinforcing material is laid and optionally is wholly or partly embedded, and after which a second sublayer of foamed or unfoamed polymer is provided. If this takes place in unfoamed form, further foaming is carried out during the further production steps.

20 In the case when the underlayment comprises a second polymer layer, for example a second PVC, PVB or PU layer, then this second textile reinforcing layer may be positioned between the second polymer layer and the adhesive layer.

This textile layer preferably comprises a glass-fiber textile, for example a nonwoven glass-fiber textile or a woven glass-fiber textile. This glass-fiber textile preferably has a weight per unit area from 15 to 80, such as from 25 to 55 g/m². It may but need not
25 necessarily be identical to the textile layer of the first reinforcing layer.

This second polymer layer may be waterproof.

30 The polymer of the first and/or if applicable second polymer layer may comprise fillers between 10 and 70 wt%.

Fillers may be, among others, glass fibers, calcium hydroxide (slaked lime), calcium carbonate and calcium hydrogen carbonate, and/or $\text{CaMg}(\text{CO}_3)_2$, talc, or also lightweight fillers such as hollow microspheres (Expancel). The aforementioned percentage by weight (wt%) is expressed as the weight of the filler relative to the weight
35 of the polymer, if applicable PVC, PU or PVB, in which the filler is located.

The polymer of the first and/or if applicable second polymer layer may further comprise additives such as pigments and coloring matter, preservatives, antifungal agents, thermal stabilizers, UV-stabilizers, blowing agents, viscosity regulators, and the like.

5

The polymer of the first flexible low is foamed. The polymer of the second flexible layer may be foamed. A "foamed layer" of polymer means a layer that contains hollow spaces, preferably in an amount such that the density of the material is reduced by at least 10%, and preferably even at least 25% relative to the weight of an identical volume of thermoplastic material without hollow spaces. Preferably it relates to so-called "closed cell" foam. "Unfoamed layer" means a layer without hollow spaces, or at most with a proportion of hollow spaces such that the density of the material is not reduced, or not more than 10%, and preferably even not more than 2%.

10

The polymer of the first and/or second foamed polymer layer preferably has a density from 200 to 1200, such as from 300 to 700 kg/m³.

15

The polymer may be chemically or mechanically foamed.

According to a first possibility the foamed layer is obtained at least by means of a mechanical foaming process. This means that in the layer in question, cavities are formed by pushing the thermoplastic material away and replacing it with a gas (for example air), often under the influence of a mechanical action or by injecting a gas (for example air) under pressure. Or it may be obtained by using expanding granules in a polymer-based layer.

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According to a second possibility the foamed layer is obtained at least by means of a chemical foaming process. This means that in the layer in question, cavities are formed by means of a gaseous reaction product. For example azodicarbonamide may be used. On being heated, this material releases nitrogen gas, which remains present in the foamed layer in the form of bubbles.

30

According to a third possibility the foamed layer is obtained at least by means of fillers, wherein these fillers comprise one or more cavities in themselves. Use may then for example be made of the expanded state of the microspheres mentioned above. More particularly, use may be made of the microspheres known from WO2013/178561.

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According to some embodiments, the underlayment may have a thickness between 1.25 and 2.5 mm. Preferably the underlayment has a thickness between 1.4 and 2.2 mm, for example between 1.7 and 1.9 mm.

5

Preferably the underlayment has a density between 400 and 1800 g/m³, such as between 600 and 1200 kg/m³.

According to some embodiments, the adhesive may be an adhesive selected from the group that consists of PSA adhesives and acrylate adhesives. PSA adhesives are "pressure sensitive adhesives".

10

According to some embodiments, the adhesive may be present in an amount from 5 to 90 g/m². Preferably the adhesive is present in an amount from 25 to 75 g/m².

15

According to embodiments, a waterproof film may be provided under the adhesive, for example a polymer film, such as a PET film. This film is preferably located between the adhesive layer and the next layer of the underlayment. This polymer film may for example be glued to the next layer of the underlayment with a further adhesive layer.

20

According to some embodiments, the sublayer may be provided on a first edge with a recess on the side where the adhesive is present, and wherein the sublayer is provided on a second edge, opposite the first edge, with a recess on the side opposite the side where the adhesive is present, so that in the case when the recess on the first side of a first sublayer for floor covering is brought into contact with the recess on the second side of a second sublayer for floor covering, the two sublayers for floor covering are substantially coplanar.

25

Preferably the underlayment is built up from one or more strips of underlayment, for example strips with a width between 0.5 and 2 m. In order to provide such strips, rolls of underlayment may be provided. Such rolls may have a length up to 10 meters, even up to 15 meters. Preferably the rolls are between 5 and 10 meters long, for example 5, 6, 7, 8, 9 or 10 meters. In order to provide a strip of underlayment, a roll is unwound and cut off to length, after which a further, adjacent strip is provided in a similar manner. The sides are preferably placed tightly abutting against one another.

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Sheet vinyl may be used or is used in the context of the second and third aspect of the invention. Preferably the sheet vinyl is built up from one or more strips of sheet vinyl, for example strips with a width between 0.5 and 4 m. In order to provide such strips, rolls
5 of sheet vinyl may be provided. Such rolls may have a length up to 2.5 meters, even up to 4 meters or up to 10 meters. In order to provide a strip of sheet vinyl, a roll is unwound and cut off to length, after which a further, adjacent strip is provided in a similar manner. The sides are preferably placed tightly abutting against one another.

Preferably the strips of sheet vinyl and the strips of underlayment have a different width,
10 certainly if they are displaced in the same longitudinal direction.

According to an alternative, use is made of several sheet vinyl pieces, preferably rectangular with width between 8 and 50 cm and length between 50 and 200cm.

When installing the floor covering, it is preferable to avoid having the seams between
15 two strips of underlayment and the seams between two strips or pieces of sheet vinyl coincide with each other. More preferably the strips of underlayment are laid square to the strips of sheet vinyl, for example at an angle of 90°.

As an alternative, the adhesive layer is not provided on the upper side of the
20 underlayment, but on the underside of the floor elements. Thus, a floor covering is also provided, comprising at least one underlayment and one floor element, the underlayment comprising a layered structure comprising at least one first flexible, foamed polymer layer and a reinforcing layer, the floor element comprising a sheet vinyl floor element comprising at least one reinforcing layer and an adhesive layer located on
25 the underside, the underlayment and the sheet vinyl are joined to one another by means of the adhesive layer.

The advantage of the floor covering according to the third aspect of the invention is that
30 owing to the presence of the reinforcing layers in both the underlayment and in the topmost sheet vinyl glued thereto, the thermal expansion of the whole is rather limited, whereas this is not always the case with a floor covering without these at least two reinforcements.

Characteristic features of one aspect of the invention may be combined with characteristic features of the other aspects of the invention, provided they do not contradict each other.

- 5 The independent and dependent claims present specific and preferred features of the embodiments of the invention. Characteristic features of the dependent claims may be combined with characteristic features of the independent and dependent claims, and in any suitable manner that would be obvious to a person skilled in the art.
- 10 The aforementioned and other features, properties and advantages of the present invention will be explained by means of the following examples of embodiments, optionally in combination with the drawings.

The description of these examples of embodiments is given as explanation, without the
15 intention of limiting the scope of the invention. The reference numbers in the following description given hereunder refer to the drawings. Identical reference numbers in optionally different figures refer to identical or similar elements.

Brief description of the figures

- 20 With the purpose of better illustrating the features of the invention, some preferred embodiments are described hereunder, as examples without any limiting character, referring to the appended drawings, in which:

- Fig. 1 is a schematic representation of a floor covering according to the invention.
- 25 • Figs. 2 is a schematic representation of a sublayer according to the invention.
- Fig. 3 is a schematic representation of a further floor covering according to the invention.
- Figs. 4A, 4B and 5 are examples of floor elements used for floor covering according to the invention.
- 30 • Fig. 6 is an implementation of a floor covering according to the invention.

Description of examples of embodiments

The present invention is described hereunder making use of specific embodiments.

It should be noted that the term "comprising", as used for example in the claims, may not be interpreted in a limiting sense, limiting to the subsequent elements, features and/or steps. The term "comprising" does not exclude the presence of other elements, features or steps.

5

Thus, the scope of an expression "an object comprising the elements A and B" is not limited to an object that only contains the elements A and B. The scope of an expression "a method comprising the steps A and B" is not limited to a method that only contains the steps A and B.

10

In the light of the present invention, these expressions only signify that the relevant elements or steps for the invention are the elements or steps A and B.

15

In the specification following hereunder, reference is made to "an embodiment" or "the embodiment". Such a reference signifies that a specific element or feature, described on the basis of this embodiment, is comprised in at least this one embodiment.

20

The occurrence of the terms "in an embodiment" or "in the embodiment" at various places in this description, however, does not necessarily refer to the same embodiment, although it may well refer to one and the same embodiment.

25

Moreover, the properties or the features may be combined in any suitable manner in one or more embodiments, as would be obvious to a person skilled in the art.

A cross section of a floor covering 100 according to the invention is shown schematically in Fig. 1.

30

The floor covering 100 comprises a underlayment 200 and some vinyl or PVC floor elements 300. Two adjacent floor elements 300 are shown in this embodiment. As an example, these floor elements are dryback elements.

The underlayment 200 is provided with a first flexible foamed PVC layer 202, which on a first side 212 is provided with the textile reinforcing layer 230. The textile reinforcing layer 230 comprises a textile product 232 that is completely embedded in the first PVC layer 202. A layer of adhesive 204 is provided on a first outer side of the underlayment.

On the second, opposite side 214, the underlayment is provided with a nonwoven structure 206. This nonwoven structure 206 is partly embedded in the first PVC layer 202.

The side 214 is in contact with the floor 400 on which the covering is applied.

5

The adhesive 204 of the adhesive layer is for example a pressure-sensitive glue (pressure-sensitive adhesive or PSA glue) applied in an amount of 70 g/m². As an alternative, an acrylate adhesive may be used, for example in an amount of 30 g/m². As a further alternative, a glue, for example an acrylate glue, with infinitely long open time, may be used.

10

In the textile reinforcing layer 230, a glass-fiber nonwoven is completely embedded in the first PVC layer 202. This glass-fiber web has a thickness of 0.3mm and a weight per unit area of 35 g/m²

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The first PVC layer 202 has a thickness of T of preferably between 0.6 and 1.4mm.

The PVC is made from an emulsion polymerization of PVC with a K value of between 57 and 86. The degree of filling (the weight of the filler relative to the weight of the whole formulation of the polymer, if applicable PVC, in which the filler is located) is between 10 and 70 wt%, wherein calcium carbonate is used as filler.

20

80 to 120 phr of plasticizer is used, of the DINP type.

The density of the first PC layer is about 650 kg/m³. Foaming took place with azodicarbonamide.

25

The textile product 206 need not be, but is preferably provided. The textile product 206 is a spunbonded or needlefelt nonwoven preferably of polyester, polyamide polyolefin or glass fiber, wherein the thickness may vary between 0.1mm and 1 mm, for example 0.7 mm, and a weight per unit area between 15 and 200 g/m² is preferably selected. The textile product is partly embedded in the first PVC layer. As an example, a polyester needlefelt with weight per area of 120 g/m² is selected. As an alternative, a polyester spunbonded web is used, with a thickness between 0.1 and 0.3mm and a weight per unit area of 20 g/m².

30

The dimensions of the sublayer are preferably about one meter width and 6 to 20 meters length. Typically this sublayer is supplied in rolled up form and this has to be unrolled

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on the floor to be covered 400, after which the release film (not shown in Fig. 1) should be removed and the floor elements should be applied.

Two adjacent sublayers 200 from Fig. 1 are shown in Fig. 2. A person skilled in the art
5 will understand that several further such sublayers may be laid next to one another. Here, the sublayers are still provided with their release film 3000.

The sublayer 2001 is provided on a first edge 2011 with a recess on the side 2021 where the adhesive is present. The sublayer 2001 is provided on a second edge 2012, opposite
10 to the first edge 2011, with a recess on the side 2022 opposite the side 2021 where the adhesive is present.

The sublayer 2002 is also provided with such recesses on its corresponding sides.

When the recess on the first side of a first sublayer 2001 for floor covering is brought
15 into contact with the recess on the second side of a second sublayer 2002 for floor covering, the two sublayers for floor covering are substantially coplanar and located in the plane 2200.

The floor elements 300 in Fig. 1 are dryback elements. For example, the floor elements
20 300 shown are two adjacent LVT elements, which have a cross section as shown in Fig. 4A or Fig. 4B.

A first embodiment in Fig. 4A has a top layer 420 consisting of a PU varnish coat 401 (UV-curing) with a thickness of 10µm, a wearing layer 402 located hereunder with
25 between 30 and 38 phr of plasticizer and without fillers. This layer 402 has a thickness between 0.2 and 0.55mm. The top layer 420 further comprises a decorative layer 403, being a PVC film printed with a decorative finish with a thickness 0.09mm. The PVC of this film comprises between 10 and 15phr of plasticizer and up to 15 wt% of filler.

Under this top layer there is a PVC extruded layer 404 PVC that has a thickness between
30 0.16 and 1.56 mm. The PVC comprises, besides about 35 phr of plasticizer, up to 75 wt% of filler. Under this layer 404 there is a reinforcing layer, being a glass-fiber web 405 with weight per unit area of about 60 g/m², which is embedded in the further underlying layer of PVC 406. This underlying layer 406 is obtained by compression with temperature rise above the glass transition temperature of the PVC granules from which
35 the layer 406 was built up. The glass-fiber web 405 was pushed into the softened PVC

during forming of the layer 406. The composition of the PVC granules is, besides PVC, about 40phr of plasticizer and up to 75 wt% of filler; the layer 406 obtained has a thickness between 1.4mm and 2.56mm. This floor element is a flexible LVT embodiment.

5

An alternative embodiment is built up roughly identically to that in Fig. 4A, and has a top layer consisting of a PU varnish coat (UV-curing) with a thickness of 10µm, a wearing layer located thereunder with between 30 and 38 phr of plasticizer and without fillers. This layer has a thickness between 0.2 and 0.55mm. The top layer further comprises a decorative layer, being a PVC film printed with a decorative finish with a thickness of 0.09mm. The PVC of this film comprises between 10 and 15phr of plasticizer and up to 15 wt% of filler.

10

Under this top layer there is a PVC extruded layer of PVC which has a thickness of between 0.3 and 0.7mm. The PVC comprises, besides about 35 phr of plasticizer, up to 75 wt% of filler.

15

Under this layer, but on top of the reinforcing layer, there is a layer of rigid PVC with a thickness of about 0.4 to 0.5 mm and comprising PVC with about 10phr of plasticizer and about 66 wt% of filler.

There then follow two reinforcing layers, being glass-fiber webs with weight per unit area of about 60 g/m² which are embedded in the further underlying rigid PVC layers. These underlying rigid PVC layers are obtained by compression with temperature rise above the glass transition temperature of the PVC granules. The glass-fiber webs were pushed into the softened PVC during the forming of the layer. The composition of the PVC granules is, besides PVC, about 10phr of plasticizer and up to 75 wt% of filler; the layer obtained has a thickness between 3mm and 4.25mm. The two glass-fiber webs are between 1.7 to 3mm apart. This floor element is a rigid LVT embodiment.

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25

A further embodiment of the floor element 300 is given in Fig. 4B. The same layers as in top layer 20 are provided.

30

Under this top layer 421 there is a core layer 422, which is built up from a number of calendered flexible PVC layers.

The core layer comprises a glass-fiber web 414 impregnated with flexible PVC. This glass-fiber web has a thickness of 0.35mm and comprises PVC with about 60 phr of plasticizer and up to 50 wt% of filler.

The core layer further comprises layers of flexible PVC. In this case a glass-fiber web 416 is inserted, which is positioned between a set 415 of top layers and a set 417 of sublayer. Glass-fiber web 416 is impregnated with flexible PVC. The core layer 422 has a thickness up to 5mm. The flexible PVC comprises about 35 phr of plasticizer and up to 66 wt% of filler. This floor element is a sheet vinyl floor element.

In yet another alternative embodiment, the floor elements 300 are sheet vinyl elements, a cross section of which is shown in Fig. 5.

In this embodiment the top layer 520 comprises 3 layers, being a wearing layer 501 and decorative layer 502, which may be similar or identical to that used in Figs. 4A and 4B. Under the decorative layer there is a layer of flexible PVC-impregnated glass-fiber web with weight per unit area of glass fiber of 60 g/m². Under this top layer 520 there is a core layer 504 of foamed flexible PVC with more than 30 phr of plasticizer.

The adhesive may, but need not necessarily be present on the surface of the recess 2012. The thicknesses on the remaining part of the PVC layer at the level of the recesses may be as shown in Fig. 2, but need not be of the same thickness.

An alternative embodiment of the underlayment 200 from Fig. 1 is shown in Fig. 3.

The underlayment 250 is provided with a first flexible foamed PVC layer 252, which on a first side 262 is provided with the textile reinforcing layer 280.

The textile reinforcing layer 280 comprises a textile product 282, which is completely impregnated with polymer, in this case PVC derived from a PVC plastisol 284.

Between the first PVC layer and the layer of adhesive there is thus a polymer-impregnated textile reinforcing layer.

This textile reinforcing layer is attached to the first PVC layer by attachment of the two PVC materials to each other, thus without the use of adhesive.

A layer of adhesive 254 is provided on a first outer side of the underlayment.

A second polymer layer 290, in this case a second PVC layer, is located between the textile reinforcing layer 280 and the layer of adhesive 254.

On the second, opposite side 264, the underlayment may be provided with a nonwoven structure 256, for example a polyester spunbonded. This nonwoven structure 256 is partly embedded in the first PVC layer 252.

- 5 The side 264 is in contact with the floor 400 on which the covering is applied.

The adhesive of the layer of adhesive 254 is the same as that of the layer of adhesive 204 from the embodiment in Fig. 1.

- 10 A second polymer layer 290, in this case a second PVC layer, is located between the textile reinforcing layer 280 and the layer of adhesive 254.

This PVC is made from an emulsion polymerization of PVC with a K value of between 57 and 86. The degree of filling (the weight of the filler relative to the weight of the whole formulation of the polymer, if applicable PVC, in which the filler is located) is between

- 15 20 and 70 wt%, wherein calcium carbonate is used as filler.

25 to 120 phr of plasticizer is used, of the DINP type.

The density of the second PC layer is about 650 kg/m³. Foaming took place with azodicarbonamide.

- 20 The second PVC layer 290 has a thickness of T2 between 0.15 and 0.7mm, for example 0.5mm.

In an alternative form, the PVC of this second layer is not foamed, and the thickness is preferably selected between 0.15 and 0.25mm.

- 25 In the textile reinforcing layer 280, a glass-fiber nonwoven 282 is completely impregnated with PVC 284. This glass-fiber web 282 has a thickness of about 0.3 to 0.4 mm and a weight per unit area of 35 g/m².

- 30 The PVC 284 used is made from an emulsion polymerization of PVC with a K value of between 57 and 86. The degree of filling (the weight of the filler relative to the weight of the whole formulation of the polymer, if applicable PVC, in which the filler is located) is between 20 and 70 wt%, wherein calcium carbonate is used as filler. 25 to 120 phr of plasticizer is used, of the DINP type.

The first PVC layer 252, which is not foamed, has a thickness T1 between 0.6 and 1.0 mm, for example 0.86 mm. In alternative embodiments this layer has a thickness of 0.6mm or 0.7mm.

5 The PVC is made from an emulsion polymerization of PVC with a K value of between 57 and 86. The degree of filling (the weight of the filler relative to the weight of the whole formulation of the polymer, if applicable PVC, in which the filler is located) is between 10 and 70 wt%, wherein calcium carbonate is used as filler.
25 to 120 phr of plasticizer is used, of the DINP type.

10 The density of the first PC layer is about 650 kg/m³. Foaming took place with azodicarbonamide.

The textile product 256 is identical to the textile product 206 of the embodiment in Fig. 1. It is applied in a similar manner and embedded in the first PVC layer.

15

The layer of adhesive and/or the protective film, and preferably both, are preferably transparent or translucent. Thus optional prints are made on the first layer under the layer of adhesive visible on the underlayment in unused state. This print may comprise cutting instructions and/or an indication of distance (for example a cutting grid) in order
20 to allow a skilled person to assist the underlayment cutting the underlayment to size.

20

Fig. 6 shows a floor covering according to the third aspect of the invention. The sheet vinyl 3000, being the element presented in Fig. 5, is attached via an adhesive layer 550 to two adjacent strips of underlayment 560. These strips of underlayment 560 each
25 comprise at least one layer of foamed flexible polymer 562 and a first reinforcing layer 564. These strips of underlayment may be identical to those described such as underlayments 200 and 250 in Figs. 1 and 2.

Alternatively it is a PU foamed flexible layer, on which an adhesive layer is applied, and with a glass-fiber web embedded in said PU.

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According to a further alternative it is a PVB foamed flexible layer, on which an adhesive layer is applied, and with a glass-fiber web embedded in said PVB.

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It is clear that, although the embodiments and/or the materials for the supply of embodiments according to the present invention have been discussed, various changes or modifications may be applied without departing from the scope and/or the spirit of the

present invention. The present invention is by no means limited to the embodiments described above, but may be carried out according to different variants without going outside the scope of the present invention.

Claims

1. A underlayment, comprising a layered structure, wherein one of the layers is a first, flexible foamed PVC layer, and comprising a first outer layer, which is a layer of adhesive, whether or not provided with a protective film.
2. A underlayment according to claim 1, wherein a protective film is provided on the adhesive.
3. A underlayment according to one of claims 1 to 2, wherein the layer of adhesive is located on a first side of the first PVC layer, and wherein a layer of fibers is applied on the second side of the first PVC layer.
4. A underlayment according to one of claims 1 to 3, wherein a textile reinforcing layer is located between the first PVC layer and the layer of adhesive.
5. A underlayment according to claim 4, wherein the textile reinforcing layer comprises a textile product that is embedded wholly or partly in the first PVC layer.
6. A underlayment according to claim 4, wherein the textile reinforcing layer comprises a textile product that is impregnated with polymer.
7. A underlayment according to claim 6, wherein the polymer-impregnated textile reinforcing layer is in contact with the first side of the first PVC layer.
8. A underlayment according to one of claims 1 to 7, wherein a second polymer layer is located between the textile reinforcing layer and the layer of adhesive.
9. A underlayment according to claim 8, wherein the second polymer layer is a second PVC layer.
10. A underlayment according to one of claims 1 to 9, wherein the first PVC layer comprises plasticizers in an amount from 15 to 120 phr.

11. A underlayment according to one of claims 1 to 10, wherein the underlayment has a thickness between 1.25 and 2.5 mm.
- 5 12. A underlayment according to one of claims 1 to 11, wherein the underlayment has a "punctual conformability" that is greater than 0.5.
13. A underlayment according to one of claims 1 to 12, wherein the adhesive is an adhesive selected from the group that consists of PSA adhesives and acrylate adhesives.
- 10 14. A underlayment according to one of claims 1 to 13, wherein the adhesive is present in an amount from 5 to 90 g/m².
- 15 15. A underlayment according to one of claims 1 to 14, wherein the sublayer is provided on a first edge with a recess on the side where the adhesive is present, and wherein the sublayer is provided on a second edge, opposite the first edge, with a recess on the side opposite the side where the adhesive is present, so that in the case when the recess on the first side of a first sublayer for floor covering is brought into contact with the recess on the second side of a second sublayer for floor covering, the two sublayers for floor covering are substantially coplanar.
- 20 16. A floor covering comprising at least one underlayment in accordance with one of the preceding claims, and at least one floor element, which is glued to the adhesive layer of the underlayment, wherein the at least one underlayment is laid on a floor to be covered.
- 25 17. A floor covering according to claim 16, wherein different underlayments are laid next to one another on the floor to be covered.
- 30 18. A floor covering according to one of claims 16 to 17, wherein at least one floor element is a PVC floor element.
- 35 19. A floor covering according to one of claims 16 to 18, wherein at least one floor element is sheet vinyl.

20. A floor covering according to one of claims 16 to 18, wherein at least one floor element is a Luxury Vinyl Tile (LVT).
- 5 21. A floor covering comprising at least one underlayment and a floor element, the underlayment comprising a layered structure comprising at least one first flexible, foamed polymer layer and an adhesive layer located on the outer side, the floor element comprising a sheet vinyl floor element comprising at least one reinforcing layer, the underlayment and the sheet vinyl floor element are joined
10 to one another by means of the adhesive layer.
22. A floor covering according to claim 21, wherein the underlayment comprises at least one first reinforcing layer.
- 15 23. A floor covering according to claim 21 or 22, wherein the first flexible, foamed polymer layer is a PU, PVB or PVC polymer layer.
24. A floor covering according to claim 23, wherein the first flexible, foamed polymer layer is a PU polymer layer.
20
25. A floor covering according to claim 23, wherein the first flexible, foamed polymer layer is a PVB polymer layer.
- 25 26. A floor covering according to claim 23, wherein the first flexible, foamed polymer layer is a PVC polymer layer.

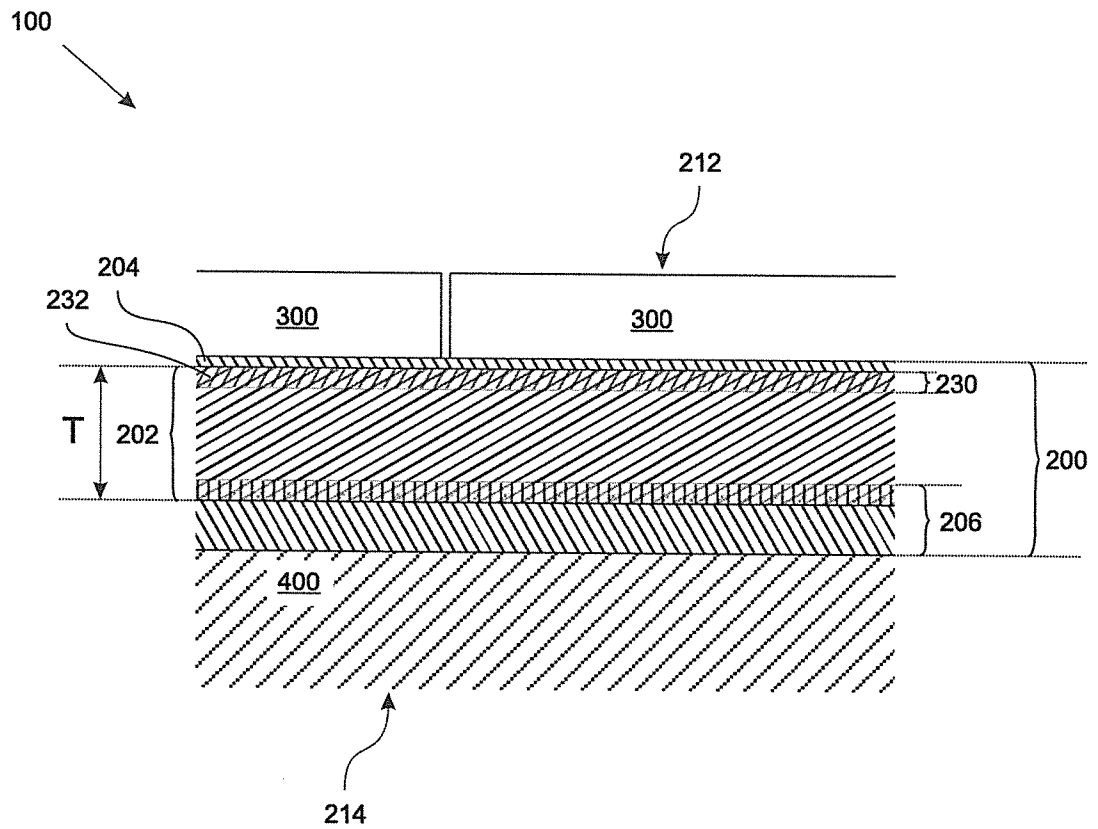


FIG. 1

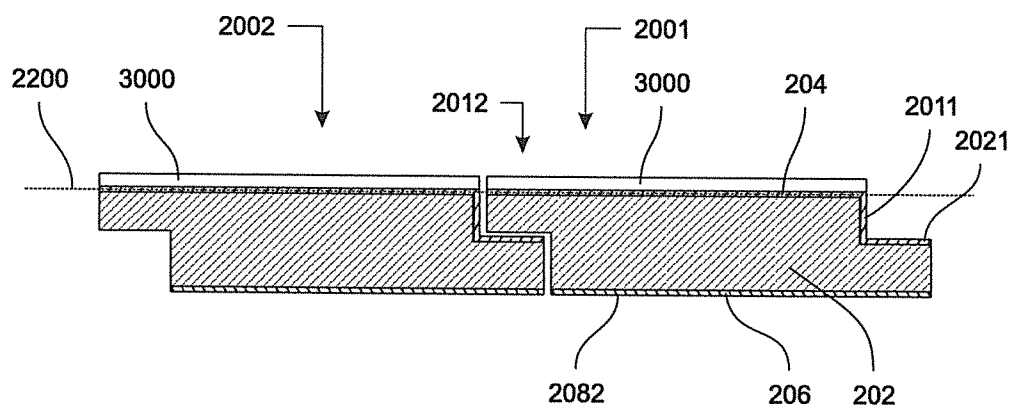


FIG. 2

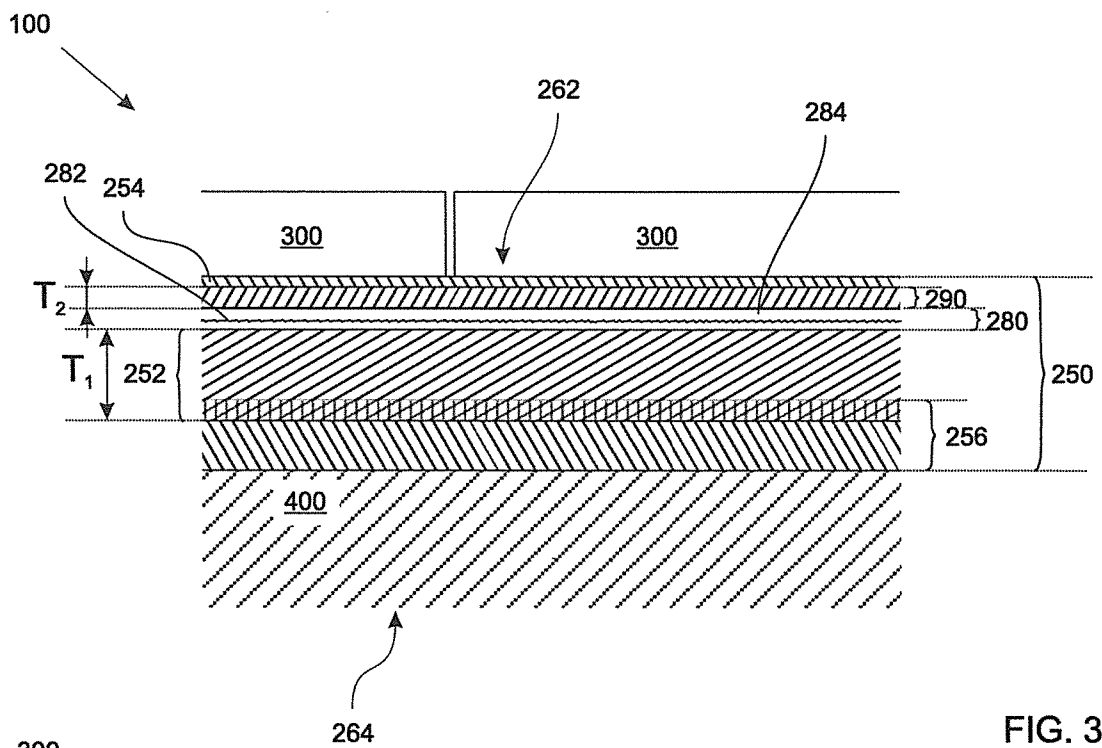


FIG. 3

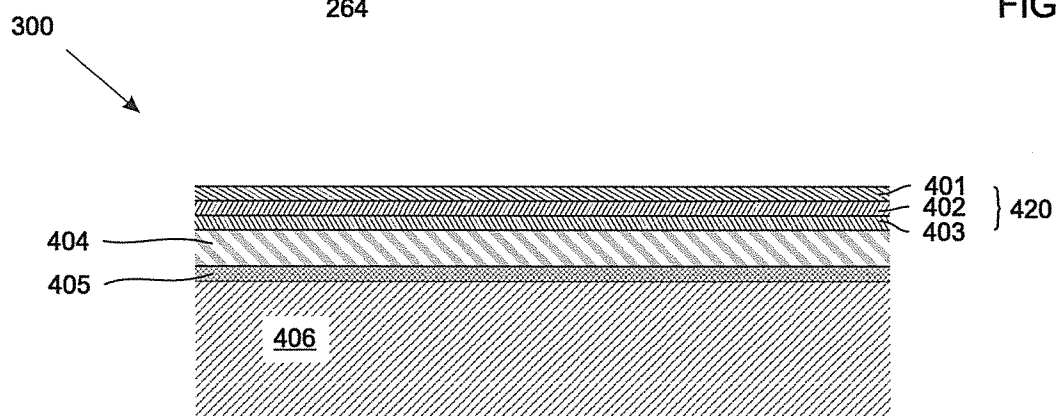


FIG. 4a

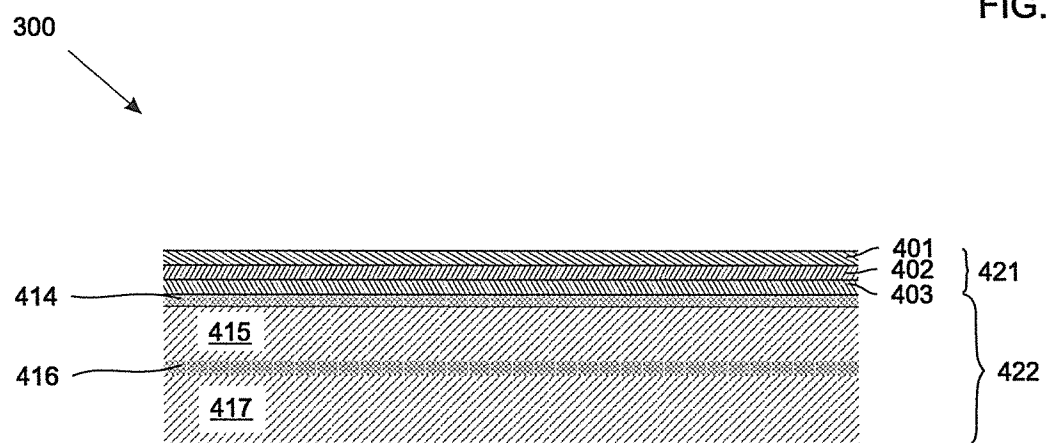


FIG. 4b

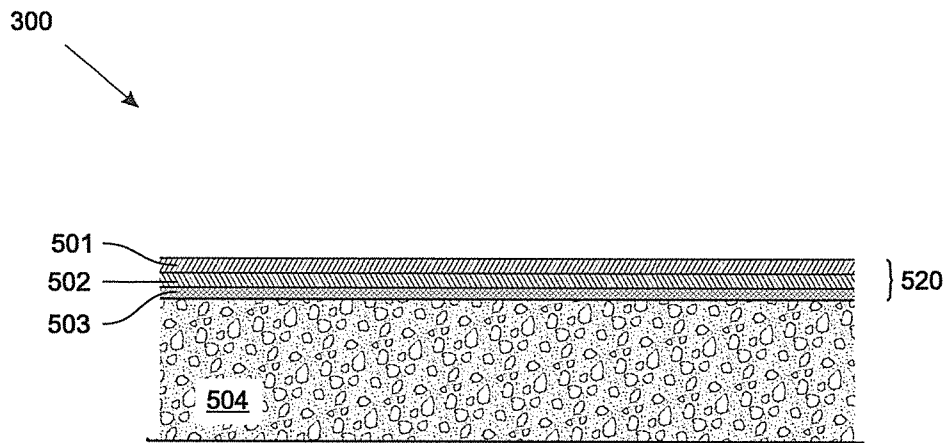


FIG. 5

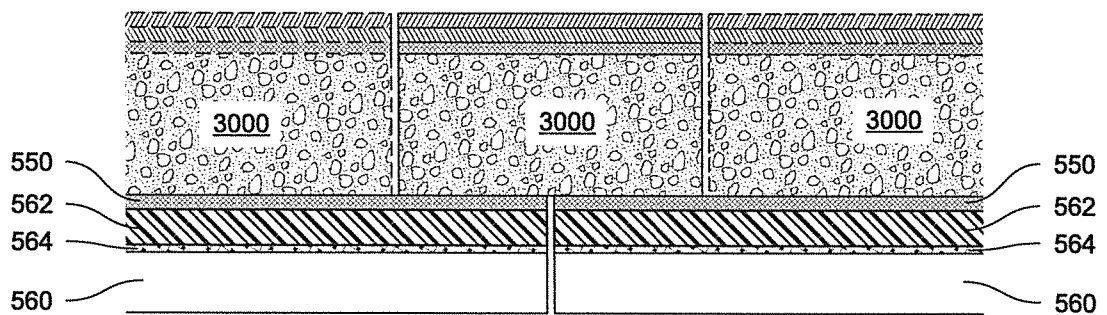


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2019/058655

A. CLASSIFICATION OF SUBJECT MATTER

INV. E04F15/18 E04F15/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 681 884 A1 (TARAFLEX [FR]) 2 April 1993 (1993-04-02) figures 1-3 -----	1,2,4, 6-9, 11-26
X	US 5 578 363 A (FINLEY BRENDA L [US] ET AL) 26 November 1996 (1996-11-26) figure 2 -----	1,3,5,8, 10,13, 16,18,19
X	WO 01/46534 A1 (BRODEUR EDOUARD A JR [US]) 28 June 2001 (2001-06-28) figures 1,2 -----	1,3,10, 13,16,17



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2019/058655

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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