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(54) **SET OF TILES ADAPTED TO COVER A SURFACE SUCH AS A FLOOR**

(57) A set (1) of tiles (5) adapted to cover a surface (10) perpendicular to a thickness direction (V), each of the tiles comprising a core layer (22), the set comprising:
- at least one first tile (15) having a first edge (26) extending in a longitudinal direction (L), the core layer of the first tile defining a connecting groove (30) in the first edge,
- at least one second tile (20) having a second edge (28) extending in the longitudinal direction (L), the core layer of second tile defining a connecting tongue (34) protruding from the second edge, the connecting tongue being adapted to be received into the connecting groove in a locked configuration.

The connecting groove is delimited in the thickness direction by an upper contact surface (52) and a lower

contact surface (54), the lower contact surface being on the same side as the surface to be covered, and the upper contact surface being on the opposite side to the surface with respect to the connecting tongue in the thickness direction.

The core layer of the first tile defines at least one longitudinal recess (56) in one of the upper contact surface and the lower contact surface, and the first tile further comprises a rod (27) fixed on a wall (58) of the recess, the rod having a chemical composition distinct from a chemical composition of said wall.

The rod is configured to press on the connecting tongue in the locked configuration.

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Description

[0001] The present invention deals with a set of tiles adapted to cover a surface perpendicular to a thickness direction of the tiles, each of the tiles comprising a core layer comprising a thermoplastic material, the set comprising.

[0002] Such a surface is for example a floor or a wall.

[0003] The present invention also deals with a corresponding method of covering such a surface.

[0004] Such tiles may have various shapes, such as rectangular or square. They are based on synthetic materials, with a rigid core layer supporting at least one upper layer, usually several ones, intended to be visible by users once the tiles are in place. Such tiles are known as vinyl tiles, also called LVT (Luxury Vinyl Tiles).

[0005] The core layer brings rigidity to these tiles. In order to interconnect the tiles, it is known to provide them with a first kind of hooks, for example located on two consecutive edges of a rectangular tile, and a second kind of hooks on the two remaining edges. The hooks of the first kind cooperate with those of the second kind in order to lock the tiles next to each other.

[0006] However, tiles with a rigid core layer and hooks may be difficult to connect and disconnect, as the insertion and disconnection may require a huge effort. Example of what is considered as a tile with a rigid core layer in the sense of the present document are for example provided in WO 2017/133804.

[0007] Relying on a snap-fit locking system between the tiles is not an option, as the core layer is actually too stiff to allow a reasonable insertion effort. In other words, due to the rigidity of the core layer of such tiles, it would be mechanically too difficult for a user to snap-fit one tile in another, or to separate them.

[0008] Using a core layer made of a softer material, or implementing shapes that would soften the snap-fit connection would also inevitably lower the strength of the connection. Tiles in the locked configuration may become too easy to separate.

[0009] An aim of the invention is to provide a set of tiles that solves or reduces these problems, while remaining simple to produce, and cost effective.

[0010] To this end, the invention proposes a set of tiles adapted to cover a surface perpendicular to a thickness direction of the tiles, each of the tiles comprising a core layer, the set comprising:

- at least one first tile having a first edge extending in a longitudinal direction, the core layer of the first tile defining a connecting groove in the first edge,
- at least one second tile having a second edge extending in the longitudinal direction, the core layer of second tile defining a connecting tongue protruding from the second edge, the connecting tongue being adapted to be received into the connecting groove in a locked configuration of the first tile and the second tile,

the connecting groove being delimited in the thickness direction by an upper contact surface and a lower contact surface both configured to be at least partly in contact with the connecting tongue in the locked configuration, the lower contact surface being on the same side as the surface to be covered with respect to the connecting tongue in the thickness direction, and the upper contact surface being on the opposite side to the surface to be covered with respect to the connecting tongue in the thickness direction,

wherein the core layer of the first tile defines at least one longitudinal recess in one of the upper contact surface and the lower contact surface, and the first tile further comprises a rod fixed on a wall of the recess, the rod having a chemical composition distinct from a chemical composition of said wall, and

wherein the rod is configured to press on the connecting tongue in the locked configuration.

[0011] In other embodiments, the set of tiles comprises one or several of the following features, taken in isolation or any technically feasible combination:

- the rod comprises at least one plastic material;
- the rod comprises a silicone plastic material, a plastic material based on polyalkylene, wherein the polyalkylene is preferably PVC, PE, or PP, or a hot-melt adhesive or a hot sealing adhesive, wherein the hot-melt adhesive or the hot sealing adhesive is preferably based on ethylene vinyl chloride, PA, PU or EVA;
- the rod comprises one or several of a thermoplastic material, wherein the thermoplastic material preferably comprises a polyolefin, a vinyl polymer, a polyamide, a polyester, a polyurethane or a ionomer, an elastomer, wherein the elastomer preferably comprises a rubber, or a thermoplastic elastomer, wherein the thermoplastic elastomer preferably comprises TPE, TPR, TPO, SPS, TP-Q or TP-U ;
- the connecting tongue is adapted to be snap-fit into the connecting groove in the locked configuration ;
- the rod is configured to latch the connecting tongue in a latching direction approximately perpendicular to the thickness direction and to the longitudinal direction ;
- the rod is configured to latch the connecting tongue in the thickness direction with respect to first tile ;
- the rod comprises an latent adhesive, preferably a polymer adhesive, adapted for adhering to the connecting tongue

in the locked configuration after the latent adhesive has been moistened with water;

- the first tile has a thickness in the thickness direction, the rod having a substantially uniform thickness in the thickness direction, preferably comprised between 5% and 40% of the thickness of the first tile ;
- said thickness of the rod is comprised between 0.3mm and 1.5mm, preferably between 0.6mm and 0.8mm ;
- the rod forms a bulge protruding from a mouth of the recess ;
- the recess is located in the lower contact surface of the connecting groove ; and
- the core layer of the first tile includes a lower part defining the lower contact surface and a lower part of said first edge, and an upper part defining the upper contact surface and an upper part of said first edge, the lower part of the core layer of the first tile protruding more than the upper part of the core layer of the first tile from a bottom of the connecting groove in a latching direction approximately perpendicular to the thickness direction and to the longitudinal direction.

[0012] The invention also deals with a method of covering a surface with tiles, the surface being perpendicular to a thickness direction of the tiles, comprising at least the following steps:

- providing a set as described hereabove, and
- putting the first tile and the second tile in the locked configuration by introducing the connecting tongue into the connecting groove, wherein the rod presses on the connecting tongue in the locked configuration.

[0013] In a particular embodiment of the method, the step of putting the first tile and the second tile in the locked configuration comprises:

- angling the second tile with respect to the first tile, and inserting the connecting tongue in the connecting groove in a connection direction forming an angle with the thickness direction around the longitudinal direction, wherein the angle is comprised between 15° and 70°, preferably between 30° and 60°, and
- pivoting the second tile with respect to the first tile around the longitudinal direction, and further inserting the connecting tongue in the connecting groove until the locked configuration is reached.

[0014] The invention and its advantages will be better understood upon reading the following description, given solely by way of example and with reference to the appended drawings, in which the only Figure is a schematic cross-sectional view of a set of tiles according to the invention.

[0015] A set 1 of tiles 5 according to the invention will now be described with reference to the Figure.

[0016] The set 1 comprises a plurality of tiles 5, of which only two are partially shown. The set 1 is for example adapted to cover a surface 10, such as a floor, which is approximately perpendicular to a thickness direction V of the tiles 5 and vertical in the example.

[0017] In a variant (not shown), the surface 10 is defined by a wall.

[0018] The tiles 5 comprise a first tile 15 and a second tile 20 adapted to be connected to each other in a locked configuration (not shown). In the Figure, the first tile 15 and the second tile 20 are in an unlocked configuration.

[0019] The tiles 5 have a same thickness E in the thickness direction V, advantageously comprised between 3.0mm and 8.0mm, for example approximately 5.5mm. Each of the tiles 5 comprises a core layer 22, and advantageously one or several upper layers 24 (represented as a group in the Figure), for example a decorative layer located on the core layer, and a wear layer located on the decorative layer.

[0020] "Upper" and "lower" here respectively mean "towards the surface 10" and "opposite the surface 10" in the thickness direction V.

[0021] The tiles 5, seen in the thickness direction V, are for example rectangular or square, possibly with the same dimensions.

[0022] The core layer 22, and the upper layers 24 are superimposed in the thickness direction V. Advantageously these layers are laminated to each other.

[0023] The core layer 22 is rigid.

[0024] The core layer 22 comprises at least one thermoplastic material, advantageously PVC (polyvinyl chloride), of which content is for example between 15wt% and 40wt%.

[0025] As an alternative, the core layer 22 does not contain PVC. In this case the at least one thermoplastic material is chosen among PVB (Polyvinylbutyrate), polyolefins.

[0026] The core layer 22 advantageously contains less than 5wt% of plasticizer, and for example no plasticizer at all.

[0027] The skilled person knows how to adjust the rigidity of the core layer 22, by selecting its components, particularly the amount of plasticizer.

[0028] For example, the core layer 22 has a composition as specified in the below table 1.

Table 1: composition of the core layer 22.

	Material	Name	Supplier	PHR	%
1	PVC	Vynova 5730	Vynova	100	27.8
2	CaCO3 Filler	OMYA VS35	OMYA	250	69.5
3	Stabilizer	Baeropan 90704P	Baerlocher	4.5	1.3
4	Processing aid (CPE)	Durastrength 200 or 3000	Arkema	3.0	0.8
5	Processing Aid	Plastistrength 530	Arkema	1.0	0.3
6	Processing aid (PE Wax)	A-C629	Honeywell	0.5	0.1
7	Processing aid (Stearic Acid)	Stearina RG	Brentag	0.5	0.1
			Total:	359.5	100.0

[0029] The decorative layer for example comprises a printed decor (not shown). The decorative layer for example comprises 90wt% of a thermoplastic material, for example PVC, 10% of additive, and no plasticizer.

[0030] The wear layer is adapted to protect the decorative layer. The wear layer for example comprises 80wt% of a thermoplastic material, for example PVC, 20% of additive, and no plasticizer.

[0031] The first tile 15 has a first edge 26 ("first" refers here to the first tile, and not to a number of edges of the tile) extending in a longitudinal direction L perpendicular to the thickness direction. The first tile 15 also has a lower surface S intended to be in contact with, and advantageously fixed to the surface 10 in the example. The first tile also comprises a rod 27.

[0032] The second tile 20 is advantageously analogous to the first tile 15 in terms of layers and composition of the layers. The second tile 20 differs in the shape of its core layer 22. The second tile 20 has a second edge 28 (same remark: "second" refers here to the first tile).

[0033] The core layer 22 of the first tile 15 defines a connecting groove 30 in the first edge 26.

[0034] The core layer 22 of the second tile 20 defines a connecting tongue 34 protruding from the second edge 28, and adapted to be received into the connecting groove 30 in the locked configuration.

[0035] The first edge 26 comprises an upper part 36 locate above the connecting groove 30, for example parallel to the thickness direction V, and adapted to abut against an upper part 38 of the second edge 28 in the locked configuration. The first edge 26 also has a lower part 40 located under the connecting groove 30.

[0036] With respect to the second edge 28, the connecting tongue 34 comprises a distal part 42 forming a nose, for example with a triangular profile in the longitudinal direction L, and a proximal part 44.

[0037] In a variant (not shown), the connecting tongue 34 is adapted to be snap-fit into the connecting groove 30 in order to obtain the locked configuration. The snap-fit effect is advantageously light, in order not to increase the insertion effort.

[0038] The proximal part 44 defines an upper surface 46 and a lower surface 48 which are for example substantially perpendicular to the thickness direction V.

[0039] The connecting groove 30 comprises a bottom 50. The connecting groove 30 is delimited in the thickness direction V by an upper contact surface 52 and a lower surface 54 configured to be at least partly in contact respectively with the upper surface 46 and the lower surface 48 of the connecting tongue 34 in the locked configuration.

[0040] The bottom 50 advantageously has a "U"-shaped profile in the longitudinal direction L, said "U" opening toward the first edge 26.

[0041] The upper contact surface 52 is on the opposite side to the surface 10 with respect to the connecting tongue 34 in the thickness direction V. The upper contact surface 52 is for example substantially perpendicular to the thickness direction V.

[0042] The lower contact surface 54 is on the same side as the surface 10 with respect to the connecting tongue 34 in the thickness direction V. The lower contact surface 54 comprises at least one longitudinal recess 56 defined by the core layer 22 of the first tile 15. Except for the recess 56, the lower contact surface 54 is adapted to be in contact with the lower surface 48 of the connecting tongue 34 and is for example substantially perpendicular to the thickness direction V.

[0043] The recess 56 for example has a rectangular profile in the longitudinal direction L. The recess 56 has a bottom wall 58 on which the rod 27 is fixed.

[0044] As a variant (not shown), the recess 56 is defined by the upper contact surface 52.

[0045] The core layer 22 of the first tile 15 includes a lower part 62 defining the lower contact surface 54 and the lower

part 40 of the first edge 26. The core layer 22 further comprises an upper part 64 defining the upper contact surface 52 and the upper part 36 of the first edge 26. Advantageously, the lower part 62 protrudes more than the upper part 64 in a latching direction C approximately perpendicular to the thickness direction V and to the longitudinal direction L. In the latching direction C, the lower part 40 advantageously is farther from the bottom 50 than the upper part 36. This allows placing the rod 27 also farther from the bottom 50 than the upper part 36. As a result, it is possible to avoid the rod 27 when inserting the connecting tongue 34 in connecting groove 30.

[0046] The rod 27 has a chemical composition distinct from the chemical composition of the wall 58, and in the example distinct from the composition of the whole core layer 22 which defines the recess.

[0047] The rod 27 is configured to press on the connecting tongue 34 in the locked configuration in the thickness direction V.

[0048] The rod 27 comprises at least one plastic material.

[0049] In particular embodiments, the rod 27 comprises:

- a silicone plastic material,
- a plastic material based on polyalkylene, wherein the polyalkylene is preferably PVC, PE, or PP, or
- or a hot-melt adhesive or a hot sealing adhesive, wherein the hot-melt adhesive or the hot sealing adhesive is preferably based on ethylene vinyl chloride, PA, PU or EVA.

[0050] Such plastics are deformable by heat or adhere by heat, and are advantageously selected to allow being extruded in rod form. They are able to solidify and adhere particularly firmly to the core layer 22. In use, they have an appropriate elasticity and viscosity in order to act as a locking element of the connecting tongue 34 in the connecting groove 30. The rod is viscoelastic or relative hard.

[0051] In particular embodiments, the rod 27 comprises one or several of:

- a thermoplastic material, wherein the thermoplastic material preferably comprises a polyolefin, a vinyl polymer, a polyamide, a polyester, a polyurethane or a ionomer,
- an elastomer, wherein the elastomer preferably comprises a rubber, or
- a thermoplastic elastomer, wherein the thermoplastic elastomer preferably comprises TPE, TPR, TPO, SPS, TP-Q or TP-U.

[0052] The plastic material comprised in the rod 27 may be present in the form of a polymer or copolymer. The plastic material present in the rod 27 may be present in a plasticized or non-plasticized formulation. The thermoplastic material used can advantageously be applied in the recess 56 with a nozzle (not shown).

[0053] The rod 27 for example comprises a latent adhesive, preferably a polymer adhesive, adapted for adhering to the connecting tongue in the locked configuration after the latent adhesive has been moistened with water.

[0054] The rod 27 is configured to latch the connecting tongue 34 with respect to the first tile 15 in a latching direction C approximately perpendicular to the thickness direction V and to the longitudinal direction L. For obtaining the latching, relatively small quantities of thermoplastic material are sufficient. The effect of the rod 27 is obtained by contact with an area of the lower surface of the connecting tongue 34.

[0055] For obtaining the latching effect, the material of the rod is deposited in the recess 56 in a quantity sufficient to protrude from the mouth of the recess 56.

[0056] The rod 27 is advantageously configured to also latch the connecting tongue 34 in the thickness direction (V) with respect to first tile 15. The locking action is obtained when the rod 27 exerts a vertical pressure on the connecting tongue 34. When this pressure occurs, upper surface 46 of the connecting tongue 34 is pressed against the upper contact surface 52 of the connecting groove 30.

[0057] The rod 27 has a sufficient strength in order not to be removed or to be damaged, when the tongue is pushed into the groove.

[0058] The rod 27 for example has a substantially uniform thickness E1 in the thickness direction V, preferably comprised between 5% and 40% of the thickness E of the first tile 15.

[0059] The thickness E1 is larger than the thickness of the recess 56. The rod 27 for example forms a bulge 60 protruding from a mouth of the recess 56, that is to say protruding above the rest of the lower contact surface 54.

[0060] The thickness E1 is for example comprised between 0.3mm and 1.5mm, preferably between 0.6mm and 0.8mm.

[0061] In order to use the set 1 for covering the surface 10, the first tile 15 and the second tile 20 are put in the locked configuration by introducing the connecting tongue 34 into the connecting groove 30.

[0062] The rod 27 then presses on the connecting tongue 34 in the locked configuration. The connecting tongue 34 is blocked by the upper contact surface 52 and the rod 27.

[0063] The rod provides a latching action on the connecting tongue. The rod acts as a locking element when the tiles 15, 20 are joined.

[0064] Advantageously the step of putting the first tile 15 and the second tile 20 in the locked configuration comprises angling the second tile with respect to the first tile, and inserting the connecting tongue 34 in the connecting groove 30 in a connection direction C1 forming an angle α with the thickness direction V around the longitudinal direction L. This substep is symbolized with an arrow F1 in the Figure.

[0065] The step also includes a substep of pivoting (arrow F2 in the Figure) the second tile 20 with respect to the first tile 15 around the longitudinal direction L, and further inserting the connecting tongue 34 in the connecting groove 30 (arrow F3) until the locked configuration is reached.

[0066] The angle α is for example comprised between 15° and 70°, preferably between 30° and 60°.

[0067] The other tiles 5 (not shown) are connected to each other in the same manner, using connecting tongues and grooves.

[0068] Thanks to the above features, the connecting tongue 34 can be inserted in the connecting groove 30 with a reasonable insertion effort, despite the rigidity of the core layers 22. Then, in the locked configuration, the rod 27 acts as an efficient latching element. The set 1 is easy to use, while remaining simple to produce, and cost effective.

[0069] Advantageously, the rod 27 is applied in the recess 56 during production of the tiles 5 in a simple and durable way.

Claims

1. A set (1) of tiles (5) adapted to cover a surface (10) perpendicular to a thickness direction (V) of the tiles (5), each of the tiles (5) comprising a core layer (22), the set (1) comprising:

- at least one first tile (15) having a first edge (26) extending in a longitudinal direction (L), the core layer (22) of the first tile (15) defining a connecting groove (30) in the first edge (26),
- at least one second tile (20) having a second edge (28) extending in the longitudinal direction (L), the core layer (22) of second tile (20) defining a connecting tongue (34) protruding from the second edge (28), the connecting tongue (34) being adapted to be received into the connecting groove (30) in a locked configuration of the first tile (15) and the second tile (20),

the connecting groove (30) being delimited in the thickness direction (V) by an upper contact surface (52) and a lower contact surface (54) both configured to be at least partly in contact with the connecting tongue (34) in the locked configuration, the lower contact surface (54) being on the same side as the surface (10) to be covered with respect to the connecting tongue (34) in the thickness direction (V), and the upper contact surface (52) being on the opposite side to the surface (10) to be covered with respect to the connecting tongue (34) in the thickness direction (V),

wherein the core layer (22) of the first tile (15) defines at least one longitudinal recess (56) in one of the upper contact surface (52) and the lower contact surface (54), and the first tile (15) further comprises a rod (27) fixed on a wall (58) of the recess (56), the rod (27) having a chemical composition distinct from a chemical composition of said wall (58), and

wherein the rod (27) is configured to press on the connecting tongue (34) in the locked configuration.

2. The set (1) according to claim 1, wherein the rod (27) comprises at least one plastic material.

3. The set (1) according to claim 1 or 2, wherein the rod (27) comprises:

- a silicone plastic material,
- a plastic material based on polyalkylene, wherein the polyalkylene is preferably PVC, PE, or PP, or
- or a hot-melt adhesive or a hot sealing adhesive, wherein the hot-melt adhesive or the hot sealing adhesive is preferably based on ethylene vinyl chloride, PA, PU or EVA.

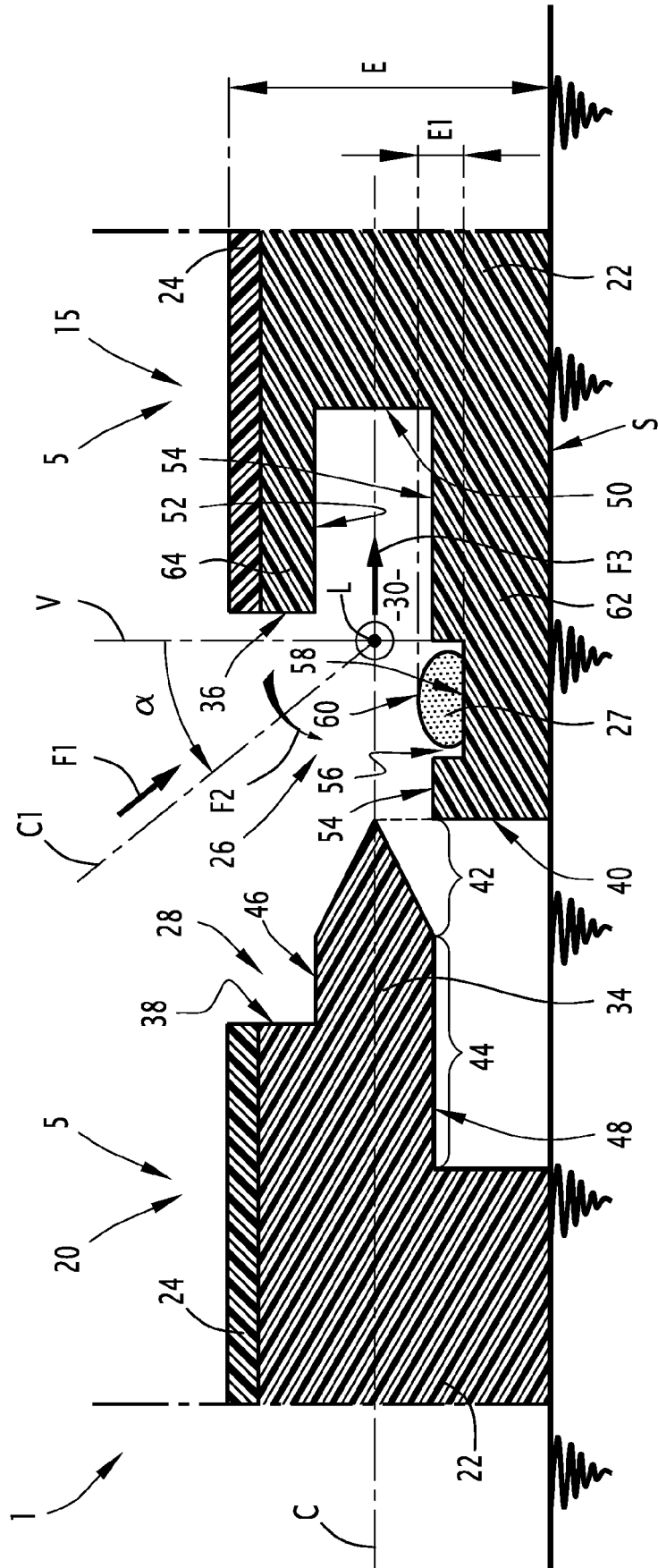
4. The set (1) according to claim 1 or 2, wherein the rod (27) comprises one or several of:

- a thermoplastic material, wherein the thermoplastic material preferably comprises a polyolefin, a vinyl polymer, a polyamide, a polyester, a polyurethane or a ionomer,
- an elastomer, wherein the elastomer preferably comprises a rubber, or
- a thermoplastic elastomer, wherein the thermoplastic elastomer preferably comprises TPE, TPR, TPO, SPS, TP-Q or TP-U.

5. The set (1) according to any of claims 1 to 4, wherein the connecting tongue (34) is adapted to be snap-fit into the

connecting groove (30) in the locked configuration.

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6. The set (1) according to any of claims 1 to 5, wherein the rod (27) is configured to latch the connecting tongue (34) in a latching direction (C) approximately perpendicular to the thickness direction (V) and to the longitudinal direction (L).
7. The set (1) according to any of claims 1 to 6, wherein the rod (27) is configured to latch the connecting tongue (34) in the thickness direction (V) with respect to first tile (15).
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8. The set (1) according to any of claims 1 to 7, wherein the rod (27) comprises an latent adhesive, preferably a polymer adhesive, adapted for adhering to the connecting tongue (34) in the locked configuration after the latent adhesive has been moistened with water.
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9. The set (1) according to any of claims 1 to 8, wherein the first tile (15) has a thickness (E) in the thickness direction (V), the rod (27) having a substantially uniform thickness (E1) in the thickness direction (V), preferably comprised between 5% and 40% of the thickness (E) of the first tile.
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10. The set (1) according to claim 9, wherein said thickness (E1) of the rod (27) is comprised between 0.3mm and 1.5mm, preferably between 0.6mm and 0.8mm.
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11. The set (1) according to any of claims 1 to 10, wherein the rod (27) forms a bulge (60) protruding from a mouth of the recess (56).
12. The set (1) according to any of claims 1 to 11, wherein the recess (56) is located in the lower contact surface (54) of the connecting groove.
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13. The set (1) according to any of claims 1 to 12, wherein the core layer (22) of the first tile (15) includes:
- a lower part (62) defining the lower contact surface (54) and a lower part (40) of said first edge (26), and
 - an upper part (64) defining the upper contact surface (52) and an upper part (36) of said first edge (26),
- the lower part (62) of the core layer (22) of the first tile (15) protruding more than the upper part (64) of the core layer (22) of the first tile (15) from a bottom (50) of the connecting groove (30) in a latching direction (C) approximately perpendicular to the thickness direction (V) and to the longitudinal direction (L).
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14. A method of covering a surface (10) with tiles (5), the surface (10) being perpendicular to a thickness direction (V) of the tiles (5), comprising at least the following steps:
- providing a set (1) according to anyone of claims 1 to 13, and
 - putting the first tile (15) and the second tile (20) in the locked configuration by introducing the connecting tongue (34) into the connecting groove (30), wherein the rod (27) presses on the connecting tongue (34) in the locked configuration.
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15. The method according to claim 14, wherein the step of putting the first tile (15) and the second tile (20) in the locked configuration comprises:
- angling the second tile (20) with respect to the first tile (15), and inserting the connecting tongue (34) in the connecting groove (30) in a connection direction (C1) forming an angle (α) with the thickness direction (V) around the longitudinal direction (L), wherein the angle (α) is comprised between 15° and 70°, preferably between 30° and 60°, and
 - pivoting the second tile (20) with respect to the first tile (15) around the longitudinal direction (L), and further inserting the connecting tongue (34) in the connecting groove (30) until the locked configuration is reached.
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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 September 2018	Examiner Khera, Daljit
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			

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ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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