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(54) Title: MULTI-PURPOSE TILE SYSTEM, TILE COVERING, AND TILE

(57) Abstract: The invention relates to a multi-purpose tile system, in particular a floor tile system, comprising a plurality of multi-purpose tiles, in particular floor tiles, wall tiles, or ceiling tiles. The invention also relates to a tile covering, in particular floor covering, ceiling covering, or wall covering, consisting of mutually coupled tiles according to the invention. The invention further relates to a tile for use in multi-purpose tile system according to the invention.

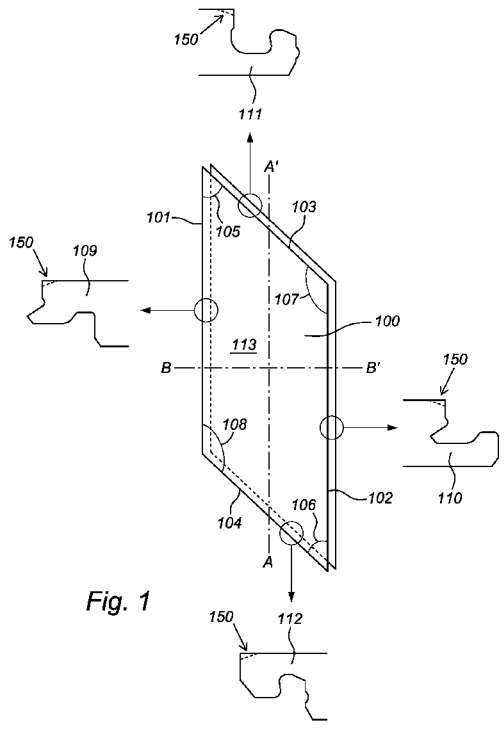

Fig. 1

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MULTI-PURPOSE TILE SYSTEM, TILE COVERING, AND TILE

FIELD

The invention relates to a multi-purpose tile system, in particular a floor tile system, comprising a plurality of multi-purpose tiles, in particular floor tiles, wall tiles, or ceiling tiles. The invention also relates to a tile covering, in particular floor covering, ceiling covering, or wall covering, consisting of mutually coupled tiles according to the invention. The invention further relates to a tile for use in multi-purpose tile system according to the invention.

BACKGROUND

Chevron pattern had appeared in art as design around 4.000 years ago, on the recovered pottery found in Crete, ancient Greece. Chevron has become one of the main pattern designs for art, architecture and flooring later on. Chevron is derived from the French word chèvre (‘goat’), translated from the Latin word ‘capra’ and referring to the famous V-shaped constellation Capricornus (‘horned goat’) of the zodiac. Obviously, this V-shaped has been the inspiration source of the V-shaped chevron pattern flooring it is still known today. The chevron patterns are typically used in the field of parquet wood flooring, wherein parquet panels are glued or nailed to a subfloor. The chevron floor tiles have the shape of a parallelogram, which is cut from an ordinary rectangular parquet plank, wherein usually both end surfaces of the panel are cut to enclose an angle of 45 degree with a longitudinal axis of the tiles. After installation, the chevron pattern is characterized by a straight separation line dividing the created V-shaped (herringbone) layout in two identical layout parts leading to an elegant, spacious, and even prestigious appearance. A drawback of the known chevron floor tiles is that these tiles are quite vulnerable at their pointed vertex (connecting two edges together). There is a need, however, to develop an interconnectable chevron floor panel, which can be installed relatively easily.

SUMMARY

It is a first preferred aim to provide a multi-purpose floor system comprising a plurality of interconnectable tiles for realizing a chevron pattern.

It is a second preferred aim to provide a multi-purpose floor system comprising a plurality of relatively invulnerable interconnectable tiles for realizing a chevron pattern.

There is disclosed herein, a multi-purpose tile system, in particular a floor tile system, comprising a plurality of multi-purpose tiles, in particular floor tiles, wherein said tiles are configured to being joined in a chevron pattern, wherein each tile comprises: a first pair of opposing edges consisting of a first edge and an opposite second edge; a second pair of opposing edges consisting of a third edge and an opposing fourth edge, wherein: the first edge and the third edge enclose a first acute angle, and wherein the second edge and the fourth edge enclose a second acute angle opposing said first acute angle, and wherein the second edge and the third edge enclose a first obtuse angle, and wherein the first edge and the fourth edge enclose a second obtuse angle opposing said first obtuse angle, and wherein the first pair of opposing edges have pairs of opposing first mechanical coupling means for locking together said tiles at least vertically, and preferably also horizontally, comprising: a first coupling profile comprising a sideward tongue extending in a direction substantially parallel to the upper side of the tile, and an opposing second coupling profile comprising a recess configured for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip, wherein said first mechanical coupling profiles allow locking together said tiles by inward angling whereby at least a part of the sideward tongue is received by the recess, and wherein the second pair of opposing edges have pairs of opposing second mechanical coupling means for locking together said tiles vertically and horizontally, comprising: a third coupling profile, comprising an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, and a fourth coupling profile, comprising a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein the second mechanical coupling profiles allow locking together said tiles during inward angling of the first coupling profile of a tile and the second coupling profile of another tile, wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward the third coupling profile of yet another tile, leading to locking of the third coupling profile and the fourth coupling profile, wherein each tile comprises a substantially rigid base layer at least partially made of a foamed composite comprising at least one plastic

material and at least one filler, wherein the composite and/or the plastic material is preferably a closed cell foam.

Preferably, at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank, and/or at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank.

At least a part of a side of the upward tongue facing away from the upward flank optionally comprises at least one first locking element, which (optional) first locking element preferably makes an integral part of the upward tongue, and the downward flank optionally comprises at least one second locking element, which (optional) second locking element preferably makes an integral part of the downward flank, and is adapted for co-action with the at least one first locking element (if applied) of yet a further tile.

The tile system according to a preferred embodiment comprises tiles having the shape of a parallelogram, and preferably a rhombus or a rhomboid, which in a joined state will form a chevron pattern. Installation of the tile system by interconnecting said tiles in order to create a tile covering can be realized by inward angling of a sideward tongue of a first tile to be installed into a recess of an already installed second tile, which is typically – though not necessarily – realized by angling down the tile to be installed with respect to the already installed tile, which will lock the first tile and the second tile at least in vertical direction, but preferably also in horizontal direction. During this inward angling of the first tile and the second tile, commonly the fourth coupling profile of the first tile to be installed will be connected (simultaneously) to the third coupling profile of another already installed third tile, which is typically realized by lowering the first tile with respect to the third tile during which the third coupling profile and the fourth coupling profile will be scissored (zipped) into each other, which results in a locking of the first tile with respect to the third tile both in horizontal and vertical direction. Due to the parallelogrammatic shape of the tiles, a chevron pattern can be realized in this manner in a relatively simple and efficient manner compared to the installation of conventional parquet wood tiles. The multi-purpose tiles of the tile system are relatively inexpensive to manufacture and do not require special skills or training to handle and install, making it attractive for do-it-yourself individuals who have had no previous experience installing tiles. The substantially rigid base layer of each tile is at least partially composed of a foamed composite, preferably a closed cell composite, comprising at least one plastic

material and at least one filler, which provides sufficient rigidity and impact strength to the tile as such, including the vulnerable pointed vertexes. This makes this composite ideally suitable to be applied in parallelogrammatically shaped tiles to realize a durable and undamaged chevron pattern, even by unskilled persons. Conventional materials, like HDF and MDF, are weaker than the aforementioned foamed composite, and will easily lead to breakage and/or damaging of the pointed vertexes, which render these conventional materials to be unsuitable for the purpose of realizing chevron patterns. Hence, the substantially rigid, preferably closed cell foam, plastic material as used as component of the foamed composite in the base layer provides the tile as such a desired rigidity and robustness preventing damaging, and in particular breakage, of the coupling profiles and/or the pointed vertexes (during normal use). An additional advantage of using a foam plastic material is that the presence closed cells not only leads to improved rigidity and improved impact resistance, but also to reduced density and lighter weight in comparison with dimensionally similar non-foam plastic material and in comparison with conventional materials like HDF and MDF. It is imaginable, although commonly less preferred that the substantially rigid base layer is at least partially made of an open cell foam plastic material, or a combination of an open cell foam plastic material and a closed cell foam plastic material. The rigidity of the composite of the base layer may further be improved by applying a toughening agent, wherein the base layer of closed cell foam plastic material may contain, for example, approximately 3% to 9% by weight of the toughening agent. Because the coupling profiles are given a specific form, the substantially complementarily formed first and second coupling profiles and the substantially complementarily formed third and fourth coupling profiles of adjacent tiles can be coupled to each other relatively simply, but durably and efficiently. During coupling of adjacent tiles a force will here be exerted on one or both complementary third and fourth coupling profiles, whereby the one or both coupling profiles will slightly and temporarily (resiliently) deform to some extent, as a consequence of which the volume taken up by the downward groove and/or upward groove will be increased such that the upward tongue and the downward tongue can be arranged relatively simply in respectively the downward groove and the upward groove. By subsequently allowing the forced coupling profiles to move back (resiliently) to the original position a reliable, locked coupling will be realized between the third and fourth coupling profiles, and thereby between the two tiles. Hence, the third coupling profile and/or fourth coupling profile may be considered as a substantially rigid coupling profiles with a restricted degree of resiliency to allow coupling. Due to the rigidity of the base layer, and due to

the fact that the at least a part of the coupling parts will typically be integrated with said base layer (at least in some embodiments), the resiliency of the coupling parts will be commonly be very restricted though sufficient to allow tiles to be coupled and uncoupled. This locked coupling, wherein both coupling parts mutually engage in relatively reliable manner, and which commonly results in a locking effect between two tiles both in horizontal direction and in vertical direction, will preferably be without play, which counteracts the risk of the occurrence of creaking noises. Hereby, it is aspired to reduce this risk by a suitable design of the profiles of the coupling parts, such that the risk of said undesired noises is reduced even if no sliding agent is applied, which, however, does not exclude that a sliding agent still can be applied on the coupling parts of the tiles. Moreover, an additional advantage of the foamed composite of the base layer is that this composite has waterproof properties, which makes the tiles suitable both for indoor and outdoor use. Conventional HDF/MDF absorb water and will further weaken during wettening, which will further decrease the rigidity of the tiles, and in particular the rigidity of the (even more) vulnerable pointed vertexes. An additional property of the foamed composite is the relatively low density compared to conventional materials, leading to light-weight tiles, which is not only advantageous from an economic point of view, but which also expands the applicability of the floor system, for example in or on aircrafts, vehicles and vessels, in particular ships. The tile system can thus be used for different purposes. Typically, the light-weight multi-purpose tiles are used to realize a ceiling covering, a wall covering, and/or a floor covering, or, for example, as covering of a piece of furniture.

The tiles of the tile system may also be referred to as panels. The base layer may also be referred to as core layer. The coupling profiles may also be referred to as coupling parts or as connecting profiles. By “complementary” coupling profiles is meant that these coupling profiles can cooperate with each other. However, to this end, the complementary coupling profiles do not necessarily have to have perfectly complementary forms. By locking in “vertical direction” is meant locking in a direction perpendicular to the plane of the tile. By locking in ‘horizontal direction' is meant locking in a direction perpendicular to the respective coupled edges of two tiles and parallel to or falling together with the plane defined by the tiles. In case in this document reference is made to a “floor tile” or “floor panel”, these expressions may be replaced by expressions like “tile”, “wall tile”, “ceiling tile”, “covering tile”. In the context of this document, the expressions “foamed composite” and “foamed plastic material” (or “foam

plastic material") are interchangeable, wherein in fact the foamed composite comprises a foamed mixture comprising at least one (thermos)plastic material and at least one filler. Typically, the plastic material technically allows the foam to be formed, though wherein the formed foam as such is formed by a foam matrix comprising both at least one (thermos)plastic material and at least one filler.

When realizing a chevron pattern, it is advantageous in case the system comprises two different types of tiles (A and B respectively), and wherein the first mechanical coupling means of one type of tile along the first pair of opposite edges are arranged in a mirror-inverted manner relative to the corresponding first mechanical coupling means along the same first pair of opposite edge portions of the other type of tile. An advantage of identical and mirror-inverted tiles to be used in the tile system is that the tiles can be produced easily, wherein, for example, the second mechanical coupling means of both the A and B type tiles can be machined, for instance, in a first machine. Then the A type tiles proceed to another machine where the first mechanical coupling means is machined. The boards that are to be provided with mirror-inverted first mechanical coupling means, for instance the B type tiles, are however rotated through 180 in the same plane before machining of the first mechanical coupling means. Thus the two types of board A and B can be manufactured using the same machines and the same set of tools. Distinctive visual markings, for example coloured labels, symbolic labels, (pre-attached) differently coloured backing layers, and/or text labels, may be applied to different tile types to allow a user to easily recognize the different tiles types during installation. Preferably the visual markings are not visible in a coupled condition of the tiles (from a top view). A visual marking may, for example, be applied onto the upper side of the upward tongue and/or inside the upward groove and/or inside the downward groove. It is imaginable that the system comprises more than two different types of tiles.

In a preferred configuration, at least one tile has a configuration wherein: the first coupling profile is arranged at the first edge; the second coupling profile is arranged at the second edge; the third coupling profile is arranged at the third edge; and the fourth coupling profile is arranged at the fourth edge. This tile could, for example, be referred to as an A type tile. In another preferred configuration, at least one tile has a configuration wherein: the first coupling profile is arranged at the second edge; the second coupling profile is arranged at the first edge; the third coupling profile is arranged

at the third edge; and the fourth coupling profile is arranged at the fourth edge. This tile could, for example, be referred to as a B type tile.

In a preferred embodiment of a tile of the tile system, the first coupling profile comprises a sideward tongue extending in a direction substantially parallel to the upper side of the tile, the bottom front region of said sideward tongue, the bottom back region of said tongue being configured as bearing region, wherein the bottom back region is located closer to the level of the upper side of the tile than a lowest part of the bottom front region, and wherein the second coupling profile comprises a recess for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip, said lower lip being provided with a upwardly protruding shoulder for supporting and/or facing the bearing region of the sideward tongue, wherein the sideward tongue being designed such that locking takes place by an introduction movement into the recess of the sideward tongue a further tile and a angling down movement about an axis parallel to the first coupling profile, as a result of which a top side of the sideward tongue will engage the upper lip and the bearing region of the sideward tongue will be supported by and/or will be facing the shoulder of the lower lip, leading to locking of adjacent tiles at the first and second edges in both horizontal direction and vertical direction. At the first and second edges, a locking in horizontal direction between two tiles is established by the presence of the upwardly protruding shoulder, which prevents the bottom front region of the sideward tongue (male part) to be displaced in a horizontal direction with respect to the complementary recess (female part) and the upwardly protruding shoulder. Hence, the shoulder locks the bottom front region of the sideward tongue in place. Preferably, the shoulder has a substantially flat upper surface. An upper surface of the shoulder is preferably oriented substantially horizontally, though may also be inclined, either such that this upper surface faces the upper lip or that this upper surface faces away from the upper lip. A shoulder (side) wall facing or directed towards the tile core is preferably sufficiently inclined (steep) to act as locking surface for locking connected tiles in horizontal direction. Preferably, at least an upper end part of said (inner) shoulder wall, connecting to an upper shoulder surface, extends in a direction of at least 45 degrees, more preferably at least 60 degrees with respect to a horizontal plane, which will secure a firm locking in horizontal direction. Said shoulder wall can be flat though is preferably curved, since a curved shoulder wall facilitates insertion of a sideward tongue of a first tile into the recess of the second edge of a second tile. Preferably, a bottom region of the lower lip extending between the core

and the shoulder is at least partially curved (rounded), wherein more preferably the shape of said bottom region of the lower lip is substantially complementary to the shape of the at least partially rounded bottom front region of the sideward tongue. The complementary rounded surfaces will act as sliding surfaces during coupling of the tiles. The upper surface has a substantially complementary shape with respect to a corresponding bottom region of the lower lip. A locking in vertical direction at the first and second edges of two tiles is established by the engagement of a top surface of the sideward tongue to a bottom surface of the upper lip acting as locking surface. In fact, the upper lip prevents the inserted sideward tongue to be displaced in vertical direction. After coupling, a top surface of the sideward tongue preferably at least partially engages a bottom surface of the upper lip. After coupling, a top surface of the sideward preferably engages the complete bottom surface of the upper lip. This partial or complete engagement prevents play between coupled tiles. Hence, tiles can be coupled free of play at the first edge and the second edge.

In a preferred embodiment of a tile of the tile system, the third coupling profile comprises an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, wherein at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank, and wherein at least a part of a side of the upward tongue facing away from the upward flank comprises at least one first locking element, which preferably makes integral part of the upward tongue, and wherein the fourth coupling profile comprises a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank, and wherein the downward flank comprises at least one second locking element, which preferably makes integral part of the downward flank, and adapted for co-action with the at least one first locking element of the third coupling profile of yet a further tile, the third and fourth coupling profiles being designed such that locking takes place during angling down of a tile to be coupled at the first coupling profile to the second coupling profile of a further tile, wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward a third coupling profile of yet another tile, such that the downward tongue of the fourth coupling profile of the tile to be coupled will be forced into the upward groove of the third coupling profile of said other tile and the upward

tongue of said other tile will be forced into the downward groove of the tile the be coupled, by deformation of the third coupling profile and/or the coupling profile edge, leading to locking of adjacent tiles at the third and fourth coupling profiles in both horizontal direction and vertical direction.

Typically, the length of the first edge and the length of the second edge of a tile are substantially identical. It is also typical that the length of the third edge and the length of the fourth edge of a tile are substantially identical. It is imaginable that the length of the first edge and the length of the second edge of a tile are substantially identical to the length of the third edge and the fourth edge of said tile. This configuration will lead to a rhombically shaped tile. However, it is commonly more preferred that the length of the first edge and the length of the second edge of a tile are greater than the length of the third edge and the fourth edge of said tile. This configuration will lead to an oblong tile with a parallelogrammatic shape.

The first acute angle and the second acute angle of each tile of the tile system are preferably situated between 30 and 60 degrees, more preferably between 40 and 50 degrees, and are in particular preferably equal to approximately 45 degrees (+/- 1 or 2 degrees). The first obtuse angle and the second obtuse angle of each tile of the tile system are preferably situated between 120 and 150 degrees, more preferably between 130 and 140 degrees, are in particular preferably equal to approximately 135 degrees (+/- 1 or 2 degrees).

Each tile preferably comprises an upper substrate affixed to an upper side the base layer, wherein said substrate preferably comprises a decorative layer. The upper substrate is preferably at least partially made of at least one material selected from the group consisting of: metals, alloys, macromolecular materials such as vinyl monomer copolymers and/or homopolymers; condensation polymers such as polyesters, polyamides, polyimides, epoxy resins, phenol-formaldehyde resins, urea formaldehyde resins; natural macromolecular materials or modified derivatives thereof such as plant fibres, animal fibres, mineral fibres, ceramic fibres and carbon fibres. Here, the vinyl monomer copolymers and/or homo-polymers are preferably selected from the group consisting of polyethylene, polyvinyl chloride (PVC), polystyrene, polymethacrylates, polyacrylates, polyacrylamides, ABS, (acrylonitrile-butadiene-styrene) copolymers, polypropylene, ethylene-propylene copolymers, polyvinylidene chloride,

polytetrafluoroethylene, polyvinylidene fluoride, hexafluoropropene, and styrene-maleic anhydride copolymers, and derivates thereof. The upper substrate most preferably comprises polyethylene or polyvinyl chloride (PVC). The polyethylene can be low density polyethylene, medium density polyethylene, high density polyethylene or ultra-high density polyethylene. The upper substrate layer can also include filler materials and other additives that improve the physical properties and/or chemical properties and/or the processability of the product. These additives include known toughening agents, plasticizing agents, reinforcing agents, anti- mildew (antiseptic) agents, flame-retardant agents, and the like. The decorative layer of the one or more upper substrates is preferably formed by an ink layer digitally printed onto a supporting layer, such as the base layer or a primer layer applied onto the base layer. It is also conceivable that the decorative layer of the one or more upper substrates is formed by a printed synthetic film, such as a printed PET film or a printed PVC film.

In a preferred embodiment, at least one tile comprises a plurality of strip shaped upper substrates affixed, either directly or indirectly, to an upper side the base layer, wherein said upper substrates are arranged side by side in the same plane, preferably at least two upper substrates in a parallel configuration, and wherein facing longitudinal edges of at least two strip shaped upper substrates are provided, near the top side, with a bevel. Preferably, each upper substrate, preferably each strip shaped upper substrate comprises: a decorative layer and an abrasion resistant wear layer covering said decorative layer, wherein a top surface of said wear layer is the top surface of said tile, and wherein the wear layer is a transparent and/or translucent material, such that decorative layer is visible through the transparent wear layer. Preferably, facing longitudinal edges of at least two strip shaped upper substrates are (each) provided, near the top side, with a bevel. The bevel is applied to prevent visible seam formation, and secures a seamless engagement of adjacent upper substrates. Said bevel is preferably formed by a cut-away portion and/or imprinted portion and/or chamfered portion of a wear layer covering the decorative layer. Preferably, the bevel is positioned above the decorative layer. Preferably, the bevel leaves the decorative layer intact. Preferably, a transparent finishing layer situated in between the decorative layer and the wear layer. This finishing layer may be made of thermoplastic material, such as PVC or PET. Preferably, each strip shaped upper substrate comprises a back layer situated in between the base layer and the decorative layer. The back layer is preferably made of thermoplastic material, such as PVC or PET. Preferably, the back layer thickness is

at least 50% of the thickness of the upper substrate. The back layer is preferably glued, fused, or welded to the base layer or to an intermediate layer, such as a primer layer, affixed to the top surface of the base layer. Preferably, the width of a top portion of the back layer is larger than the width of a bottom portion of the back layer, typically as seen in cross-section. Preferably, by cutting-away (trimming) and/or deforming said bottom portion of the longitudinal edge, an improved seamless and tight engagement of adjacent upper substrates, at least near the top surface(s), can be obtained. Preferably, the bottom portion of opposing longitudinal edges of the back layer is chamfered. Said chamfer is preferably more inclined towards a (vertical) plane perpendicular to the plane defined by the tile than towards a (horizontal) plane parallel to the plane defined by the tile. The chamfer is preferably inclined inwardly in downward direction (towards the base layer). During production, the upper substrates will be affixed, directly or indirectly, to the upper surface of the base layer, wherein the upper substrate are preferably positioned rather tightly next to each other. In case said narrowing width of the bottom portion of the upper substrate(s) is/are applied, it is imaginable to small air channels are formed in between adjacent upper substrates, at or near the bottom side of said upper substrates. It is imaginable, and it may also be preferable, that short edges of the upper substrates together form a pair of opposing edges of the tile, preferably a pair of long edges of the tile. Here, it is preferred that the short edges of the upper substrate(s) is/are also provided with a bevel, near the top surface, which allows or facilitates adjacent tiles to engage seamless to each other.

The upper substrate typically comprises a decorative layer and an abrasion resistant wear layer covering said decorative layer, wherein a top surface of said wear layer is the top surface of said tile, and wherein the wear layer is a transparent material, such that decorative layer is visible through the transparent wear layer.

The thickness of the upper substrate typically varies from about 0.1 to 3.5 mm, preferably from about 0.5 to 3.2 mm, more preferably from about 1 to 3 mm, and most preferably from about 2 to 2.5 mm. The thickness ratio of the foam base layer to the upper substrate commonly varies from about 1 to 15 : 0.1 to 3.5, preferably from about 1.5 to 10 : 0.5 to 3.2, more preferably from about 1.5 to 8 : 1 to 3, and most preferably from about 2 to 8 : 2 to 2.5, respectively.

Each tile may comprise an adhesive layer to affix the upper substrate, directly or indirectly, onto the base layer. The adhesive layer can be any well-known bonding agent or binder capable of bonding together the upper substrate and the foam base layer, for example polyurethanes, epoxy resins, polyacrylates, ethylene-vinyl acetate copolymers, ethylene-acrylic acid copolymers, and the like. Preferably, the adhesive layer is a hot-melt bonding agent.

The decorative layer or design layer, which may be part of the upper substrate as mentioned above, can comprise any suitable known plastic material such as a known formulation of PVC resin, stabilizer, plasticizer and other additives that are well known in the art. The design layer can be formed with or printed with printed patterns, such as wood grains, metal or stone design and fibrous patterns or three-dimensional figures. Thus the design layer can provide the tile with a three dimensional appearance that resembles heavier products such as granite, stone or metal. The thickness of the design layer typically varies from about 0.01 to 0.1 mm, preferably from about 0.015 to 0.08 mm, more preferably from about 0.2 to 0.7 mm, and most preferably from about 0.02 to 0.5 mm. The wear layer that typically forms the upper surface of the tile can comprise any suitable known abrasion-resistant material, such as an abrasion-resistant macromolecular material coated onto the laver beneath it, or a known ceramic bead coating. If the wear layer is furnished in layer form, it can be bonded to the layer beneath it. The wear layer can also comprise an organic polymer layer and/or inorganic material layer, such as an ultraviolet coating or a combination of another organic polymer layer and an ultraviolet coating. For example, an ultraviolet paint capable of improving the surface scratch resistance, glossiness, antimicrobial resistance and other properties of the product. Other organic polymers including polyvinyl chloride resins or other polymers such as vinyl resins, and a suitable amount of plasticizing agent and other processing additives can be included, as needed.

In a preferred embodiment, at least one tile comprises a plurality of strip shaped upper substrates directly or indirectly affixed to an upper side the base layer, wherein said upper substrate are arranged side by side in the same plane. Here, preferably at least two upper substrates are oriented in a parallel configuration. Alternatively or additionally, at least two upper substrate are oriented in a perpendicular orientation. Preferably, at least one upper substrate is affixed to the upper side of the base layer, such that a longitudinal axis of said upper substrate is parallel with respect one pair of

opposing edges of the tile. Here, the plurality of upper substrates preferably substantially completely covers the upper surface of the base layer, and more preferably extend from the first edge to the second edge of the tile. Each of the plurality of upper substrates preferably comprises a decorative layer, wherein the decorative layers of at least two adjacently arranged upper substrates preferably have different appearances. The application of a plurality of strip shaped upper substrates, are arranged side by side in the same plane and directly or indirectly affixed to the base layer will create the attractive aesthetical effect that the chevron tiles is defined by the strip shaped upper substrates as such, while having the advantages that during installation merely the tiles as such will have to be coupled rather than the strip shaped upper substrate, which would be time-consuming and expensive.

Preferably, the base layer comprises at least one foaming agent. The at least one foaming agent takes care of foaming of the base layer, which will reduce the density of the base layer. This will lead to light weight tiles, which are lighter weight in comparison with tile which are dimensionally similar, and which have a non-foamed base layer. The preferred foaming agent depends on the (thermo)plastic material used in the base layer, as well as on the desired foam ratio, foam structure, and preferably also the desired (or required) foam temperature to realise the desired foam ratio and/or foam structure. To this end, it may be advantageous to apply a plurality of foaming agents configured to foam the base layer at different temperatures, respectively. This will allow the foamed base layer to be realized in a more gradual, and more controller manner. Examples of two different foaming agents which may be present (simultaneously) in the base layer are azidicarbonamide (ADCA) and sodium bicarbonate. These foaming agents are preferred to be used together due to their synergy. Both components exhibit very different decomposition behaviour. ADCA decomposes exothermically, and will lose the major mass over a narrow, but relatively high, temperature range of 190-210 degrees Celsius. This decomposition temperature can be, and is preferably, reduced by activating ADCA by using ADCA with an activator, also referred to as a kicker. Suitable activators for ADCA are e.g. dibasic lead phosphite, zinc oxide, zinc stearate, calcium carbonate, magnesium oxide, silica, and other mineral compounds. Sodium bicarbonate was found to decompose over a broader, but relatively low, temperature range of 100-140 degrees Celsius. The actual decomposition temperature can be, and is preferably, lowered by using e.g. citric acid, preferably anhydrous citric acid, as activator. The use of ADCA results in a rapid decrease of foam density. The synergism

between the two foaming agents results in the fact that the combination of ADCA and sodium bicarbonate leads to a relatively low foam density with a fine even cell structure. The generation of this fine cell structure has led to the conclusion that gas bubbles, in particular nitrogen gas, produced from the decomposition of ADCA act as sites for the nucleation of carbon dioxide bubbles resulting from the decomposition.

In this respect, it is often also advantageous to apply at least one modifying agent, such as methyl methacrylate (MMA) and/or butyl acrylate-methyl methacrylate (BAMMA), in order to keep the foam structure relatively consistent throughout the base layer. Preferably, the weight content of the modifying agent, preferably MMA or BAMMA, is situated between 2 and 5%, more preferably between 3 and 4%.

Foam plastic materials suitable for forming the foam base layer may include polyurethane, polyamide copolymers, polystyrene, polyvinyl chloride (PVC), polypropylene and polyethylene foamed plastics, all of which have good moulding processability. Preferably, chlorinated PVC (CPVC) and/or chlorinated polyethylene (CPE) and/or another chlorinated thermoplastic material is/are used to further improve the hardness and rigidity of the base layers, and of the tiles as such, reducing the vulnerability of the pointed vertexes of each tile, which makes the tile even more suitable to be used as parallelogrammatic/rhombic tile for realizing chevron patterns. Polyvinyl chloride (PVC) foam materials are especially suitable for forming the foam base layer because they are chemically stable, corrosion resistant, and have excellent flame-retardant properties. The plastic material used as foam plastic material in the base layer is preferably free of any plasticizer in order to increase the desired rigidity of the base layer, which is, moreover, also favourable from an environmental point of view. Preferably, the composite of the base layer comprises between 35 and 50%, and more preferably between 40 and 45%, thermoplastic material, in particular PVC.

The base layer may also at least partially be composed of a (PVC-free) thermoplastic composition. This thermoplastic composition may comprise a polymer matrix comprising (a) at least one ionomer and/or at least one acid copolymer; and (b) at least one styrenic thermoplastic polymer, and, optionally, at least one filler. An ionomer is understood as being a copolymer that comprises repeat units of electrically neutral and ionized units. Ionized units of ionomers may be in particular carboxylic acid groups that are partially neutralized with metal cations. Ionic groups, usually present in low amounts

(typically less than 15 mol % of constitutional units), cause micro-phase separation of ionic domains from the continuous polymer phase and act as physical crosslinks. The result is an ionically strengthened thermoplastic with enhanced physical properties compared to conventional plastics.

The composite of the base layer preferably comprises one or more fillers, wherein at least one filler is selected from the group consisting of: talc, chalk, wood, calcium carbonate, titanium dioxide, calcined clay, porcelain, a(nother) mineral filler, and a(nother) natural filler. The filler, preferably chosen from the above group, may be formed by fibres and/or may be formed by dust-like particles. Here, the expression "dust" is understood as small dust-like particles (powder), like wood dust, cork dust, or non-wood dust, like mineral dust, stone powder, in particular cement. The average particle size of the dust is preferably between 14 and 20 micron, more preferably between 16 and 18 micron. The primary role of (this kind of) filler, as mentioned in this paragraph, is to provide the base layer, and the parallelogrammatic/rhombic tile(s) as such, sufficient hardness. This will allow the tiles, including their – commonly relatively vulnerable – pointed vertexes, to realize chevron patterns in a reliable and durable manner. Moreover, this kind of filler will typically also improve the impact strength of the base layer and of the tile(s) as such. The weight content of this kind of filler in the composite is preferably between 35 and 75%, more preferably between 40 and 48%, most preferably between 45 and 48%, in case the composite is a foamed composite, and more preferably between 65 and 70% in case the composite is a non-foamed (solid) composite.

In a particular preferred embodiment, the composite of the base layer comprises 40-45% by weight PVC and 45-48% by weight mineral filler, in particular calcium carbonate (chalk). Research has shown that this combination of materials and material ranges provides excellent properties to the base layers in terms of hardness (robustness/rigidity) and flexibility to further reduce the risk of breakage of the panel during use, in particular during coupling. A higher content of calcium carbonate (>48%) will typically lead to a fragile composition which may break rather easily, while a lower content of calcium carbonate (<45%) typically leads to a composite which is too flexible and not sufficiently hard (rigid) to allow the panels to function in a proper manner. A lower content of PVC (<40%) will typically leads to a too rigid composite to allow the panels to function properly, and, moreover, as PVC acts as a binding agent (binding

matrix) such a relatively low content typically affects proper and stable binding of the composite as such. Preferably, the weight content of the modifying agent, preferably MMA, present in the composite, is situated between 2 and 5%, more preferably between 3 and 4%.

In an alternative configuration of the tile system, each tile comprises a substantially rigid base layer at least partially made of a non-foamed (solid) composite comprising at least one plastic material and at least one filler. A solid base layer may lead to an improved tile strength, and hence a reduced vulnerability of the pointed vertexes, and may further improve the suitability to use the tiles to realize a chevron pattern. A drawback of applying a solid composite in the base layer instead of a foamed composite in the base layer is that the tile weight will increase (in case base layers of identical thicknesses would be applied), which may lead to higher handling costs, and higher material costs.

Preferably, the composite of the base layer comprises at least one filler of the base layer is selected from the group consisting of: a salt, a stearate salt, calcium stearate, and zinc stearate. Stearates have the function of a stabilizer, and may act as foaming agent activator, and lead to a more beneficial processing temperature, and counteract decomposition of components of the composite during processing and after processing, which therefore provide long-term stability. Instead of or in addition to a stearate, for example calcium zinc or zinc oxide may also be used as stabilizer. The weight content of the stabilizer(s), in particular zinc stearate, in the composite will preferably be between 1 and 5%, and more preferably between 1.5 and 4%, most preferably between 1 and 2%.

The composite of the base layer preferably comprises at least one impact modifier comprising at least one alkyl methacrylates, wherein said alkyl methacrylate is preferably chosen from the group consisting of: methyl methacrylate, ethyl methacrylate, propyl methacrylate, isopropyl methacrylate, t-butyl methacrylate and isobutyl methacrylate. The impact modifier typically improves the product performance, in particular the impact resistance. Moreover, the impact modifier typically toughens the base layer and can therefore also be seen as toughening agent, which further reduces the risk of breakage. Often, the modifier also facilitates the production process, for example, as already addressed above, in order to control the formation of the foam with a relatively consistent (constant) foam structure. The weight content of the impact

modifier in the composite will preferably be between 1 and 9%, and more preferably between 3 and 6%. Preferably, the substantially complete base layer is formed by the foamed composite.

At least one plastic material used in the base layer is preferably free of any plasticizer in order to increase the desired rigidity of the base layer, which is, moreover, also favourable from an environmental point of view.

The density of the foam base layer typically varies from about 0.1 to 1.5 grams/cm^3, preferably from about 0.2 to 1.4 grams/cm^3, more preferably from about 0.3 to 1.3 grams/cm^3, even more preferably from about 0.4 to 1.2 grams/cm^3, even more preferably from about 0.5 to 1.2 grams/cm^3, and most preferably from about 0.6 to 1.2 grams/cm^3. Preferably, the foam has a relatively uniform (closed or open) cell distribution, at least in its center portion and possibly also at the upper portion and bottom portion. The upper portion and bottom portion of the foam base layer may have a larger density than the center portion of the foam base layer.

The plastic foam used in the base layer preferably has an elastic modulus of more than 700 MPa (at a temperature of 23 degrees Celsius and a relative humidity of 50%). This will commonly sufficiently rigidity to the base layer, and hence to the parallelogrammatic/rhombic tile as such.

The density of the base layer preferably varies along the height of the base layer. This may positively influence the acoustic (sound-dampening) properties of the tiles as such. Preferably, at a top section (top portion) and/or a bottom section (bottom portion) of the foamed base layer a crust layer may be formed. This at least one crust layer may form integral part of the base layer. More preferably, both the top section and the bottom section of the base layer form a crust layer enclosing the foam structure. The crust layer is a relatively closed (reduced porosity, or even free of bubbles (cells)), and hence forms a relatively rigid (sub)layer, compared to the more porous foam structure. Commonly, though not necessary, the crust layer is formed by sealing (searing) the bottom and top surface of the core layer. Preferably the thickness of each crust layer is between 0.01 and 1 mm, preferably between 0.1 and 0.8 mm, more preferably between 0.4 and 0.6 mm. A too thick crust will lead to a higher average density of the core layer which increases both the costs and the rigidity of the core layer. A center section (center

portion) of the foamed base layer is enclosed by both crust layers. Preferably the thickness of the center section is at least 40%, more preferably at least 50% of the thickness of a crust layer. In general, it is indicated that the average cell size of the foamed base layer, or at least a part thereof (e.g. within the center portion of the base layer) is preferably situated in between 60 and 140 micron, more preferably between 80 and 120 micron. Preferably, the cell size of the foamed base layer, or at least a part thereof (e.g. within the center portion of the base layer) has a relatively narrow cell distribution ranging from 60 to 140 micron, more preferably from 80 to 120 micron. This narrow cell distribution can, for example, be obtained by using a combination of foaming agents, wherein the decomposition temperatures of the foaming agents are mutually different.

The thickness of the base layer (core layer) as such is preferably between 2 and 10 mm, more preferably between 3 and 8 mm, and is typically approximately 4 or 5 mm. Preferably, a top section and/or a bottom section of the (composite) base layer forms a crust layer having a porosity which is less than the porosity of the closed cell foam plastic material of the base layer, wherein the thickness of each crust layer is preferably between 0.01 and 1 mm, preferably between 0.1 and 0.8 mm.

Preferably, each tile comprises at least one backing layer affixed to a bottom side of the base layer, wherein said at least one backing layer at least partially made of a flexible material, preferably an elastomer. The thickness of the backing layer typically varies from about 0.1 to 2.5 mm. Non-limiting examples of materials whereof the backing layer can be made of are polyethylene, cork, polyurethane and ethylene-vinyl acetate. The thickness of a polyethylene backing layer is for example typically 2 mm or smaller. The backing layer commonly provides additional robustness and impact resistances to each tile as such, which increases the durability of the tiles. Moreover, the (flexible) backing layer may increase the acoustic (sound-dampening) properties of the tiles. In a particular embodiment, the base layer is composed of a plurality of separate base layer segments affixed to said at least one backing layer, preferably such that said base layer segments are mutually hingeable. The lightweight features of the tiles are advantageous for obtaining a secure bond when installing the tile on vertical wall surfaces. It is also especially easy to install the tile at vertical corners, such as at inside corners of intersecting walls, pieces of furniture, and at outside corners, such as at entry ways. An

inside or outside corner installation is accomplished by forming a groove in the foam base layer of the tile to facilitate bending or folding of the tile.

At least one reinforcing layer may be situated in between the base layer and the upper substrate. This may lead to further improvement of the rigidity of the tiles as such. This may also lead to improvement of the acoustic (sound-dampening) properties of the tiles. The reinforcement layer may comprise a woven or non-woven fibre material, for example a glass fibre material. They may have a thickness of 0.2 – 0.4 mm. It is also conceivable that each tile comprises a plurality of (commonly thinner) base layers stacked on top of each other, wherein, optionally, at least one reinforcing layer is situated in between two adjacent base layers. Preferably, the density of the reinforcing layer is preferably situated between 1.000 and 2.000 kg/m^3, preferably between 1.400- and 1.900 kg/m^3, and more preferably between 1.400-1.700 kg/m^3.

It is also imaginable that the base layer comprises a laminate of composite layers stacked on top of each other. Such a multi-layer base layer may, for example, be formed by co-extrusion. The different composite layers of the base layer may have a different composition. However, it is also imaginable that the composition of the different layer of the base layer is identical, though wherein the structure of different layer is different. It is, for example, imaginable that at least one composite layer of the base layer has a (rather) solid structure, while at least one other composite layer of the base layer has a foam structure. It is in particular imaginable, and this may also be preferably, that the multilayer base layer comprises at least two solid composite layer enclosing at least one foam composite layer.

Preferably, the complete first mechanical coupling means and/or the complete second mechanical coupling means is/are integrally connected to the base layer. This may also be understood as that the first mechanical coupling means and/or the complete second mechanical coupling means is/are integrally formed within and/or formed by the base layer.

As already addressed above, although the third coupling profile and/or the fourth coupling profile are predominantly rigid, the third coupling profile and/or the fourth coupling profile allow (slight) deformation during coupling and uncoupling, which will facilitate coupling and uncoupling significantly.

During coupling and uncoupling the coupling parts will commonly be inclined to deform at or in their weakest section. To this end, at least one coupling part of the first coupling part and second coupling part preferably comprises a bridge connecting the tongue of said coupling element to the base layer, wherein the minimum thickness of the bridge is smaller than the minimum width of the tongue. This will force the bridge(s) rather than the tongue itself to be slightly deformed during coupling and uncoupling, which is commonly in favour of the durability (and shape stability) of the tongues, and hence of the durability and reliability of the coupling realized between two tiles.

A lower side (lower surface) of an upper bridge of the second coupling part defining an upper side (upper surface) of the downward groove may be at least partially inclined, and preferably extends downward towards the core of the tile. The upper side (upper surface) of the upward tongue may, as well, be at least partially inclined, wherein the inclination of this upper side of the upward tongue and the inclination of the upper bridge of the second coupling part may be identical, though wherein it is also imaginable that both inclinations for instance mutually enclose an angle between 0 and 5 degrees. The inclination of the bridge part of the second coupling part creates a natural weakened area of the bridge part, where deformation is likely to occur.

Each of the upward tongue and the downward tongue is preferably substantially rigid, which means that the tongues are not configured to be subjected to deformation. The tongues as such are relatively stiff and hence non-flexible. Moreover, the tongues are preferably substantially solid, which means that the tongues are substantially massive and thus completely filled with material and are therefore not provided with grooves at an upper surface which would weaken the construction of the tongue and hence of the tile connection to be realized. By applying a rigid, solid tongue a relatively firm and durable tongue is obtained by means of which a reliable and the durable tile connection can be realised without using separate, additional components to realise a durable connection.

In an embodiment of the tile, at least a part of the upward flank adjoining the upper side of the tile is adapted to make contact with at least a part of the downward tongue adjoining the upper side of another tile in a coupled state of these tiles. Engagement of these surfaces will lead to an increase of the effective contact surface between the coupling parts and hence to an increase of stability and sturdiness of the connection

between two tiles. In a favourable embodiment the upper side of the tile is adapted to engage substantially seamless to the upper side of another tile, as a result of which a seamless connection between two tiles, and in particular the upper surfaces thereof, can be realised.

In another embodiment the first locking element is positioned at a distance from an upper side of the upward tongue. This is favourable, since this will commonly result in the situation that the first locking element is positioned at a lower level than the upward aligning edge of the tile, which has the advantage that the maximum deformation of the second coupling part can be reduced, whereas the connection process and deformation process can be executed in successive steps. Less deformation leads to less material stress which is in favour of the life span of the coupling part(s) and hence of the tile(s). In this embodiment the second locking element is complementary positioned at a distance from an upper side of the downward groove.

In yet another embodiment the effective height of the downward aligned edge is larger than the effective height of the upward tongue. This commonly results in the situation that the downward aligning edge of a tile does not engage another tile in case of a pre-aligned state (intermediate state). The position-selective contactless pre-alignment does prevent or counteract forcing the downward aligning edge of a tile along the upper surface of another tile, which could damage the tiles.

In an embodiment the mutual angle enclosed by at least a part of a side of the upward tongue facing toward the upward flank and the upward flank (and/or the normal of the upper side of the base layer) is substantially equal to the mutual angle enclosed by at least a part of a side of the downward tongue facing toward the downward flank and the downward flank (and/or the normal of the lower side of the base layer). A close-fitting connection of the two tongue parts to each other can hereby be realized, this generally enhancing the firmness of the coupling between the two tiles. In an embodiment variant the angle enclosed by on the one hand the direction in which at least a part of a side of the upward tongue facing toward the upward flank extends and on the other the upward flank and/or the normal of the upper side of the base layer lies between 0 and 60 degrees, in particular between 0 and 45 degrees, more particularly between 0 and 10 degrees. In another embodiment variant the angle enclosed by on the one hand the direction in which at least a part of a side of the downward tongue facing toward the

downward flank extends and on the other hand the downward flank and/or the normal of the lower side of the base layer lies between 0 and 60 degrees, in particular between 0 and 45 degrees, more particularly between 0 and 10 degrees. The eventual inclination of the tongue side facing toward the flank usually also depends on the production means applied to manufacture the tile. In an embodiment inclination of the downward aligned edge is less than the inclination of at least an upper part of the upward flank, as result of which an expansion chamber will be formed between both surface which will be favourable to allow play and to compensate expansion, e.g. due to moist absorption by the tiles.

In a variant at least a part of an upper side of the upward tongue extends in a direction toward the normal of the upper side of the base layer. This has the result that the thickness of the upward tongue decreases in the direction of the side of the tongue facing away from the upward flank. By having the downward groove substantially connect to the upper side of the upward tongue, in a coupled position of two tiles wherein an upper side of the downward groove extends in the direction of the normal of the lower side of the base layer, a second coupling part can be provided which is on the one hand relatively strong and solid and can on the other guarantee sufficient resilience to enable a coupling to be realized to a first coupling part of an adjacent tile.

The aligning edges are preferably formed by a flat surface so as to allow guiding of another coupling part during the process of coupling two tiles to proceed be generally in as controlled a manner as possible. Application of a rounded aligning edge is, however, also imaginable. In another embodiment variant at least a part of the aligning edge of the second coupling part has a substantially flatter orientation than at least a part of the upward flank of the first coupling part. By applying this measure there is generally created in a coupled position an air gap between the aligning edge of the second coupling part and a flank of the first coupling part. This clearance intentionally created between the two coupling parts is usually advantageous during coupling of adjacent tiles, since this clearance does not prevent a temporary deformation of the coupling parts, this facilitating coupling of the coupling parts. Furthermore, the created clearance is advantageous for the purpose of absorbing expansion of the tile, for instance resulting from environmental temperature changes.

In an embodiment variant a part of the upward flank of the first coupling part connecting to the base layer forms a stop surface for at least a part of the side of the downward tongue facing away from the downward flank. In this way a close fitting of at least the upper side of the tiles can be realized, this usually being advantageous from a user viewpoint. A part of the upward flank of the first coupling part connecting to the base layer is here preferably oriented substantially vertically. At least a part of the side of the downward tongue facing away from the downward flank is here also preferably oriented substantially vertically. Applying substantially vertical stop surfaces in both coupling parts has the advantage that in the coupled position the coupling parts can connect to each other in relatively close-fitting and firm manner.

It is generally advantageous for the upward groove to be adapted to receive with clamping fit a downward tongue of an adjacent tile. Receiving the upward groove, or at least a part thereof, with clamping fit in the downward tongue has the advantage that the downward tongue is enclosed relatively close-fittingly by the upward groove, this usually enhancing the firmness of the coupled construction. The same applies for the embodiment variant in which the downward groove is adapted to receive with clamping fit an upward tongue of an adjacent tile.

In an embodiment variant the upward flank and the downward flank extend in a substantially parallel direction. This makes it possible to connect the flanks, as well as the locking elements, relatively closely to each other in a coupled position, this generally enhancing the locking effect realized by the locking elements.

In another embodiment variant the first locking element, if applied, comprises at least one outward bulge, and the second locking element, if applied, comprises at least one recess, which outward bulge is adapted to be at least partially received in a recess of an adjacent coupled tile for the purpose of realizing a locked coupling. This embodiment variant is generally advantageous from a production engineering viewpoint. The first locking element and the second locking element preferably take a complementary form, whereby a form-fitting connection of the locking elements of adjacent tiles to each other will be realized, this enhancing the effectiveness of the locking. Alternatively, the second locking element comprises at least one outward bulge, and the first locking element comprises at least one recess, which outward bulge is adapted to be at least partially received in a recess of an adjacent coupled tile for the purpose of realizing a locked

coupling. It is also conceivable that the first and second locking elements are not formed by a bulge-recess combination, but by another combination of co-acting profiled surfaces and/or high-friction contact surfaces. In this latter embodiment, the first locking element and/or the second locking element may be formed by a (flat of otherwise shaped) contact surface composed of a, optionally separate, plastic material configured to generate friction with the other locking element of another tile in engaged (coupled) condition. Examples of plastics suitable to generate friction include:

- Acetal (POM), being rigid and strong with good creep resistance. It has a low coefficient of friction, remains stable at high temperatures, and offers good resistance to hot water;
- Nylon (PA), which absorbs more moisture than most polymers, wherein the impact strength and general energy absorbing qualities actually improve as it absorbs moisture. Nylons also have a low coefficient of friction, good electrical properties, and good chemical resistance;
- Polyphthalamide (PPA). This high performance nylon has through improved temperature resistance and lower moisture absorption. It also has good chemical resistance;
- Polyetheretherketone (PEEK), being a high temperature thermoplastic with good chemical and flame resistance combined with high strength. PEEK is a favorite in the aerospace industry;
- Polyphenylene sulphide (PPS), offering a balance of properties including chemical and high-temperature resistance, flame retardance, flowability, dimensional stability, and good electrical properties;
- Polybutylene terephthalate (PBT), which is dimensionally stable and has high heat and chemical resistance with good electrical properties;
- Thermoplastic polyimide (TPI) being inherently flame retardant with good physical, chemical, and wear-resistance properties;
- Polycarbonate (PC), having good impact strength, high heat resistance, and good dimensional stability. PC also has good electrical properties and is stable in water and mineral or organic acids; and
- Polyetherimide (PEI), maintaining strength and rigidity at elevated temperatures. It also has good long-term heat resistance, dimensional stability, inherent flame retardance, and resistance to hydrocarbons, alcohols, and halogenated solvents.

The performance of many of the above polymers can also be enhanced using certain additives which reduce fiction (if desired). The high-friction polymer material may, for example, be applied as a (separate) material strip. Application of this high-friction polymer material allows the distant side (outer side) of the upward tongue and the downward flank to have a substantially flat design.

In an embodiment of the tile, the first locking element is positioned at a distance from an upper side of the upward tongue. Positioning the first locking element at a distance from the upper side of the upward tongue has a number of advantages. A first advantage is that this positioning of the first locking element can facilitate the coupling between adjacent tiles, since the first locking element will be positioned lower than (a lower part of) the aligning edge of the upward tongue, whereby the coupling between two coupling parts can be performed in stages. During the coupling process the tongue sides facing toward the associated flanks will first engage each other, after which the locking elements engage each other, this generally requiring a less great maximum pivoting (amplitude), and thereby deformation of a second coupling part of an adjacent tile, than if the first aligning edge and the first locking element were to be located at more or less the same height. A further advantage of positioning the first locking element at a distance from an upper side of the upward tongue is that the distance to the resilient connection between each coupling part and the base layer, generally formed by the resilient bridge of each coupling part, is increased, whereby a torque exerted on the coupling parts can be compensated relatively quickly by the locking elements, which can further enhance the reliability of the locking. In case the first locking element and second locking element would not be applied, it may be favourable that side of the upward tongue facing away from the upward flank is positioned at a distance from the downward flank in coupled condition of adjacent tiles.

In a preferred embodiment, a side of the downward tongue facing away from the downward flank is provided with a third locking element, and wherein the upward flank is provided with a fourth locking element, said third locking element being adapted to cooperate with a fourth locking element of another tile. This would result in an additional inner locking mechanism, which could further improve the stability and reliability of the coupling. Also in this embodiment, the third (or fourth) locking element may be formed by one or more bulges, wherein the fourth (or third) locking element may be formed by one of more complementary recesses adapted to co-act with said bulges in coupled

condition of adjacent tiles. Preferably, the co-action between the third locking element and the fourth locking element, in coupled condition of two tiles, defines a tangent T1 which encloses an angle A1 with a plane defined by the tile, which angle A1 is smaller than an angle A2 enclosed by said plane defined by the tile and a tangent T2 defined by a co-action between an inclined part of a side of the upward tongue facing toward the upward flank and an inclined part of a side of the downward tongue facing toward the downward flank. More preferably, the greatest difference between angle A1 and angle A2 is situated between 5 and 10 degrees. It is imaginable that shortest distance between an upper edge of the downward tongue and a lower side of the base layer defines a plane, wherein the third locking element and at least a part of the downward tongue are situated at opposite sides of said plane. In this case, the third locking element protrudes with respect to the tile edge defined by an upper section or upper surface of the tile. Here, the third locking element may protrude into an adjacent tile in a coupled condition which may further improve the tile coupling. It is advantageous in case the minimum distance between said locking surface and an upper side of the tile is smaller than the minimum distance between an upper side of the upward tongue and said upper side of the tile. This will reduce the maximum deformation of the second (or fist) coupling part, whereas the connection process and deformation process can be executed in successive steps. Less deformation leads to less material stress which is in favour of the life span of the coupling part(s) and hence of the tile(s).

The ordinal numbers used in this document, like “first”, “second”, “third”, and “fourth” are used only for identification purposes. The use of the expressions “third locking element” and “fourth locking element” does therefore not necessarily require the co-presence of a “first locking element” and a “second locking element”.

The disclosure also relates to a tile covering, in particular floor covering, wall covering, ceiling covering and/or furniture covering, consisting of mutually coupled tiles as described above. The disclosure also relates to a tile for use in multi-purpose tile system as described above.

Preferred embodiments of the invention are set out in the following non-limitative clauses:

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Clauses

1. Multi-purpose tile system, in particular a floor tile system, comprising a plurality of multi-purpose tiles, in particular floor tiles, wherein said tiles are configured to being joined in a chevron pattern, wherein each tile comprises:

- a first pair of opposing edges consisting of a first edge and an opposite second edge;
- a second pair of opposing edges consisting of a third edge and an opposing fourth edge,

wherein:

- the first edge and the third edge enclose a first acute angle, and wherein the second edge and the fourth edge enclose a second acute angle opposing said first acute angle, and wherein the second edge and the third edge enclose a first obtuse angle, and wherein the first edge and the fourth edge enclose a second obtuse angle opposing said first obtuse angle, and wherein
- the first pair of opposing edges have pairs of opposing first mechanical coupling means for locking together said tiles at least vertically, and preferably also horizontally, comprising:
  - o a first coupling profile comprising a sideward tongue extending in a direction substantially parallel to the upper side of the tile, and
  - o an opposing second coupling profile comprising a recess configured for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip, wherein said first mechanical coupling profiles allow locking together said tiles by inward angling whereby at least a part of the sideward tongue is received by the recess, and wherein
- the second pair of opposing edges have pairs of opposing second mechanical coupling means for locking together said tiles vertically and horizontally, comprising:
  - o a third coupling profile, comprising an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, wherein at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank, and wherein at least a part of a side of the upward tongue facing away from the upward flank optionally comprises at least one first locking element, which preferably makes integral part of the upward tongue, and

o a fourth coupling profile, comprising a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank, and wherein the downward flank optionally comprises at least one second locking element, which preferably makes integral part of the downward flank, and adapted for co-action with the at least one first locking element of yet a further tile, wherein the second mechanical coupling profiles allow locking together said tiles during inward angling of the first coupling profile of a tile and the second coupling profile of another tile, wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward the third coupling profile of yet another tile, leading to locking of the third coupling profile and the fourth coupling profile,

wherein each tile comprises a substantially rigid base layer at least partially made of a foamed composite comprising at least one plastic material and at least one filler.

2. Tile system according to clause 1, wherein the system comprises two different types of tiles (A and B respectively), and wherein the first mechanical coupling means of one type of tile along the first pair of opposite edges are arranged in a mirror-inverted manner relative to the corresponding first mechanical coupling means along the same first pair of opposite edge portions of the other type of tile.

3. Tile system according to clause 1 or 2, wherein at least one tile has a configuration wherein:

- the first coupling profile is arranged at the first edge;
- the second coupling profile is arranged at the second edge;
- the third coupling profile is arranged at the third edge; and
- the fourth coupling profile is arranged at the fourth edge.

4. Tile system according to one of the foregoing clauses, wherein at least one tile has a configuration wherein:

- the first coupling profile is arranged at the second edge;
- the second coupling profile is arranged at the first edge;
- the third coupling profile is arranged at the third edge; and
- the fourth coupling profile is arranged at the fourth edge.

5. Tile system according to one of the foregoing clauses, wherein:

- the first coupling profile comprises a sideward tongue extending in a direction substantially parallel to the upper side of the tile, the bottom front region of said sideward tongue, the bottom back region of said tongue being configured as bearing region, wherein the bottom back region is located closer to the level of the upper side of the tile than a lowest part of the bottom front region, and wherein

- the second coupling profile comprises a recess for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip, said lower lip being provided with a upwardly protruding shoulder for supporting and/or facing the bearing region of the sideward tongue, wherein the sideward tongue being designed such that locking takes place by an introduction movement into the recess of the sideward tongue a further tile and a angling down movement about an axis parallel to the first coupling profile, as a result of which a top side of the sideward tongue will engage the upper lip and the bearing region of the sideward tongue will be supported by and/or will be facing the shoulder of the lower lip, leading to locking of adjacent tiles at the first and second edges in both horizontal direction and vertical direction.

6. Tile system according to one of the foregoing clauses, wherein:

- the third coupling profile comprises an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, wherein at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank, and wherein at least a part of a side of the upward tongue facing away from the upward flank optionally comprises at least one first locking element, which preferably makes integral part of the upward tongue, and wherein

- the fourth coupling profile comprises a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank, and wherein the downward flank optionally comprises at least one second locking element, which preferably makes integral part of the downward flank, and adapted for co-action with the at least one first locking element of the third coupling profile of yet a further tile,

- the third and fourth coupling profiles being designed such that locking takes place during angling down of a tile to be coupled at the first coupling profile to the second coupling profile of a further tile, wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward a third coupling profile of yet another tile, such that the downward tongue of the fourth coupling profile of the tile to be coupled will be forced into the upward groove of the third coupling profile of said other tile and the upward tongue of said other tile will be forced into the downward groove of the tile the be coupled, by deformation of the third coupling profile and/or the coupling profile edge, leading to locking of adjacent tiles at the third and fourth coupling profiles in both horizontal direction and vertical direction.

7. Tile system according to one of the foregoing clauses, wherein the length of the first edge and the length of the second edge of a tile are substantially identical.

8. Tile system according to one of the foregoing clauses, wherein the length of the first edge and the length of the second edge of a tile are greater than the length of the third edge and the fourth edge of said tile.

9. Tile system according to one of the foregoing clauses, wherein the first acute angle and the second acute angle are situated between 30 and 60 degrees, and are preferably substantially 45 degrees.

10. Tile system according to one of the foregoing clauses, wherein the first obtuse angle and the second obtuse angle are situated between 120 and 150 degrees, and are preferably substantially 135 degrees.

11. Tile system according to one of the foregoing clauses, wherein at least one tile comprises at least one upper substrate affixed to an upper side the base layer, wherein said upper substrate preferably comprises a decorative layer.

12. Tile system according to clause 11, wherein the at least one upper substrate comprises:

- a decorative layer and
- an abrasion resistant wear layer covering said decorative layer, wherein a top surface of said wear layer is the top surface of said tile, and wherein the wear layer is a

transparent material, such that decorative layer is visible through the transparent wear layer,

- and, optionally, a transparent finishing layer situated in between the decorative layer and the wear layer.

13. Tile system according to one of the foregoing claims, wherein the at least one upper substrate comprises a back layer, preferably a thermoplastic back layer, situated in between the base layer and the decorative layer.

14. Tile system according to one of clauses 11-13, wherein the upper substrate is at least partially made of at least one material selected from the group consisting of: metals, alloys, macromolecular materials such as vinyl monomer copolymers and/or homopolymers; condensation polymers such as polyesters, polyamides, polyimides, epoxy resins, phenol-formaldehyde resins, urea formaldehyde resins; natural macromolecular materials or modified derivatives thereof such as plant fibres, animal fibres, mineral fibres, ceramic fibres and carbon fibres.

15. Tile system according to in clause 14, wherein the vinyl monomer copolymers and/or homo-polymers are selected from the group consisting of polyethylene, polyvinyl chloride, polystyrene, polymethacrylates, polyacrylates, polyacrylamides, ABS, (acrylonitrile-butadiene-styrene) copolymers, polypropylene, ethylene-propylene copolymers, polyvinylidene chloride, polytetrafluoroethylene, polyvinylidene fluoride, hexafluoropropene, and styrene-maleic anhydride copolymers.

16. Tile system according to one of clauses 11-15, wherein the at least one upper substrate is affixed to the upper side of the base layer by means of an adhesive.

17. Tile system according to one of clauses 11-16, wherein at least one tile comprises a plurality of strip shaped upper substrates affixed to an upper side the base layer, wherein said upper substrate are arranged side by side in the same plane, preferably in a parallel configuration.

18. Tile system according to clause 17, wherein the plurality of upper substrates substantially completely cover the upper surface of the base layer.

19. Tile system according to clause 17 or 18, wherein each of the plurality of upper substrates extends from the first edge to the second edge of the tile.

20. Tile system according to one of clauses 17-19, wherein each of the plurality of upper substrates comprises a decorative layer, wherein the decorative layers of at least two adjacently arranged upper substrates have different appearances.

21. Tile system according to one of clauses 17-20, wherein each strip shaped upper substrate comprises a back layer situated in between the base layer and the decorative layer.

22. Tile system according to clause 21, wherein the width of a top portion of the back layer is larger than the width of a bottom portion of the back layer.

23. Tile system according to clause 21 or 22, wherein opposing longitudinal edges of at least one strip shaped upper substrate are inclined inwardly, as seen in downward direction.

24. Tile system according to one of clauses 17-23, wherein facing longitudinal edges of at least two strip shaped upper substrates are provided, near the top side, with a bevel.

25. Tile system according to clause 24, wherein each bevel is formed by a cut-away portion and/or imprinted portion of a wear layer covering the decorative layer.

26. Tile system according to one of the foregoing claims, wherein each strip shaped upper substrate comprises a substantially transparent or translucent three-dimensional embossing structure at least partially covering said print layer.

27. Tile system according to one of the foregoing clauses, wherein the weight percentage of plastic material in the base layer is situated between 40% and 45%.

28. Tile system according to one of the foregoing clauses, wherein at least one filler is calcium carbonate, wherein the weight percentage of calcium carbonate in the base layer is between 45% and 48%.

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29. Tile system according to one of the foregoing clauses, wherein the base layer comprises a foaming agent.

30. Tile system according to clause 29, wherein the base layer comprises at least two different foaming agents configured to decompose at different decomposition temperatures.

31. Tile system according to clause 29 or 30, wherein the base layer comprises at least one activated foaming agent, preferably a plurality of activated foaming agents, more preferably at least two different activated foaming agents configured to decompose at different decomposition temperatures.

32. Tile system according to one of clauses 29-31, wherein the base layer comprises at least one endothermic foaming agent, preferably sodium bicarbonate, and at least one exothermic foaming agent, preferably azodicarbonamide (ACDA).

33. Tile system according to one of the foregoing clauses, wherein the plastic material of the foamed composite of the base layer is poly vinyl chloride (PVC).

34. Tile system according to one of the foregoing clauses, wherein the plastic material of the foamed composite of the base layer is at least one material selected from the group consisting of: ethylene vinyl acetate (EVA), polyurethane (PU), polyethylene (PE), polypropylene (PP), polystyrene (PS), poly vinyl chloride (PVC), or mixtures thereof.

35. Tile system according to one of the foregoing clauses, wherein at least one filler of the base layer is selected from the group consisting of: talc, chalk, wood, calcium carbonate, and a mineral filler.

36. Tile system according to one of the foregoing clauses, wherein at least one filler of the base layer is selected from the group consisting of: a salt, a stearate salt, calcium stearate, and zinc stearate.

37. Tile system according to one of the foregoing clauses, wherein the base layer comprises at least one impact modifier comprising at least one alkyl methacrylates,

wherein said alkyl methacrylate is preferably chosen from the group consisting of: methyl methacrylate, ethyl methacrylate, propyl methacrylate, isopropyl methacrylate, t-butyl methacrylate and isobutyl methacrylate.

38. Tile system according to one of the foregoing clauses, wherein the substantially rigid base layer is at least partially made of a closed cell foam plastic material, which plastic material is free of plasticizer.

39. Tile system according to any of the foregoing clauses, wherein the foamed composite has a density in the range of about 0.1 to 1.5 g/cm^3.

40. Tile system according to one of the foregoing clauses, wherein the foamed composite contains approximately 3% to 9% by weight of the toughening agent.

41. Tile system according to one of the foregoing clauses, wherein the foamed composite has an elastic modulus of more than 700 MPa.

42. Tile system according to one of the foregoing clauses, wherein the density of the base layer varies along the height of the base layer.

43. Tile system according to one of the foregoing clauses, wherein a top section and/or a bottom section of the base layer forms a crust layer having a porosity which is less than the porosity of a centre region of the base layer, wherein the thickness of each crust layer is between 0.01 and 1 mm, preferably between 0.1 and 0.8 mm.

44. Tile system according to one of the foregoing clauses, wherein each tile comprises at least one backing layer affixed to a bottom side of the base layer, wherein said at least one backing layer at least partially made of a flexible material, preferably an elastomer.

45. Tile system according to clause 42, wherein the thickness of the backing layer is at least 0.5 mm.

46. Tile system according to one of the foregoing clauses, wherein each tile comprises at least one reinforcing layer, wherein the density of the reinforcing layer is

preferably situated between 1000 and 2000 kg/m^3, preferably between 1400- and 1900 kg/m^3, and more preferably between 1400-1700 kg/m^3.

47. Tile system according to one of the foregoing clauses, wherein at least a part of the first coupling part and/or at least a part of second coupling part of each tile is integrally connected to the base layer.

48. Tile system according to one of the foregoing clauses, wherein the first coupling part and/or the second coupling part allows deformation during coupling and uncoupling.

49. Tile system according to any of the foregoing clauses, wherein at least one coupling part of the first coupling part and second coupling part comprises a bridge connecting the tongue of said coupling element to the base layer, wherein the minimum thickness of the bridge is smaller than the minimum width of the tongue.

50. Tile system according to any of the foregoing clauses, wherein the second coupling part comprises an upper bridge connecting the downward tongue to the base layer, wherein the upper bridge is configured to deform during coupling of adjacent tiles, to widen the downward groove, and wherein, preferably, a lower side of the upper bridge of the second coupling part is at least partially inclined.

51. Tile system according to clause 50, wherein the upper side of the upward tongue is at least partially inclined, wherein the inclination of the upper side of the upward tongue and the inclination of the bridge part of the second coupling part are substantially similar, wherein both inclinations for instance mutually enclose an angle between 0 and 5 degrees.

52. Tile system according to any of the foregoing clauses, wherein at least a part of the upward flank adjoining the upper side of the tile is adapted to make contact with at least a part of the downward tongue adjoining the upper side of another tile in a coupled state of these tiles.

53. Tile system according to clause 52, wherein the upper side of the tile is adapted to engage substantially seamless to the upper side of another tile.

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54. Tile system according to any of the foregoing clauses, wherein the first locking element is positioned at a distance from an upper side of the upward tongue.

55. Tile system according to any of the foregoing clauses, wherein the second locking element is positioned at a distance from an upper side of the downward groove.

56. Tile system according to any of the foregoing clauses, wherein the effective height of the downward aligned edge is larger than the effective height of the upward tongue.

57. Tile system according to any of the foregoing clauses, wherein the mutual angle enclosed by at least an inclined part of a side of the upward tongue facing toward the upward flank and the upward flank is substantially equal to the mutual angle enclosed by at least an inclined part of a side of the downward tongue facing toward the downward flank and the downward flank.

58. Tile system according to any of the foregoing clauses, wherein the angle enclosed by on the one hand the direction in which at least a part of a side of the upward tongue facing toward the upward flank extends and on the other the normal of the upper side of the base layer lies between 0 and 60 degrees, in particular between 0 and 45 degrees.

59. Tile system according to any of the foregoing clauses, wherein the angle enclosed by on the one hand the direction in which at least a part of a side of the downward tongue facing toward the downward flank extends and on the other the normal of the lower side of the base layer lies between 0 and 60 degrees, in particular between 0 and 45 degrees.

60. Tile system according to any of the foregoing clauses, wherein the first locking element comprises at least one outward bulge, and that the second locking element comprises at least one recess, which outward bulge is adapted to be at least partially received in a recess of an adjacent coupled tile for the purpose of realizing a locked coupling.

61. Tile system according to any of the foregoing clauses, wherein the first locking element is positioned at a distance from an upper side of the upward tongue.

62. Tile system according to any of the foregoing clauses, wherein a side of the downward tongue facing away from the downward flank is provided with a third locking element, and wherein the upward flank is provided with a fourth locking element, said third locking element being adapted to cooperate with a fourth locking element of another tile.

63. Tile system according to clause 62, wherein the co-action between the third locking element and the fourth locking element, in coupled condition of two tiles, defines a tangent T1 which encloses an angle A1 with a plane defined by the tile, which angle A1 is smaller than an angle A2 enclosed by said plane defined by the tile and a tangent T2 defined by a co-action between an inclined part of a side of the upward tongue facing toward the upward flank and an inclined part of a side of the downward tongue facing toward the downward flank.

64. Tile system according to clause 63, wherein the greatest difference between angle A1 and angle A2 is situated between 5 and 10 degrees.

65. Tile system according to one of clauses 62-64, wherein the shortest distance between an upper edge of the downward tongue and a lower side of the base layer defines a plane, wherein the third locking element and at least a part of the downward tongue are situated at opposite sides of said plane.

66. Tile system according to one of clauses 62-65, wherein the minimum distance between said third locking element and an upper side of the tile is smaller than the minimum distance between an upper side of the upward tongue and said upper side of the tile.

67. Tile system according to any of the foregoing clauses, wherein a side of the upward tongue facing away from the upward flank is positioned at a distance from the downward flank, in coupled condition of adjacent tiles.

68. Tile system according to any of the foregoing clauses, wherein at least a number of tiles is identical.

69. Tile system according to any of the foregoing clauses, wherein the tile system comprises different types of tiles (A and B respectively), wherein the size of a first type of tile (A) differs from the size of second type of tile (B).

70. Tile system according to one of the foregoing clauses, wherein distinctive visual markings are applied to different tile types, preferably for installation purposes.

71. Tile system according to clause 70, wherein distinctive visual markings are applied to the upward tongue of at least one first coupling element of each tile type.

72. Tile system according to one of the foregoing clauses, wherein at least one pair of opposing edges of a tile, preferably each tile, are provided, near the top side, with a bevel.

73. Tile system according to one of the foregoing clauses, wherein the decorative layer is formed by an ink layer digitally printed onto a supporting layer, such as the base layer or a primer layer applied onto the base layer.

74. Tile system according to one of the foregoing clauses, wherein the decorative layer is formed by a printed synthetic film.

75. Tile covering, in particular floor covering, ceiling covering, or wall covering, consisting of mutually coupled tiles according to any of the clauses 1-74.

76. Tile for use in multi-purpose tile system according to one of clauses 1-74.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be elucidated on the basis of non-limitative exemplary embodiments shown in the following figures. Herein shows:

figure 1 a schematic representation of a tile for use in multi-purpose tile system according to an embodiment of the invention;

figure 2a a first cross section of the tile shown in figure1;

figure 2b a coupled position of two tiles comprising coupling profiles as shown in figure 2a;

figure 2c an alternative configuration of the tile shown in figure 2a;

figure 2d a coupled position of two tiles comprising coupling profiles as shown in figure 2c;

figure 3a a second cross-section of the tile as shown in figure 1;

figure 3b a coupled position of two tiles as shown in figure 3a;

figure 3c-g alternative configuration of the coupling profiles of the tiles shown in figures 3a and 3b;

figure 4 a schematic representation of a side view of the laminate details of a first possible embodiment of a tile according to the invention;

figure 5 show a schematic representation of a side view of the laminate details of a second possible embodiment of a tile according to the invention;

figure 6a a schematic representation of a first type of tile for use in a multi-purpose tile system according to an embodiment of the invention;

figure 6b a schematic representation of a second type of tile for use in multi-purpose tile system according to an embodiment of the invention;

figure 7 a schematic representation of a first example of a multi-purpose tile system according to the invention;

figure 8 a schematic representation of a second example of a multi-purpose tile system according to the invention;

figure 9 a schematic representation of a third example of a multi-purpose tile system according to the invention;

figure 10 a schematic representation of a fourth example of a multi-purpose tile system according to the invention;

figure 11, a schematic cross-section of a tile according to an embodiment of the invention;

figure 12 a detailed cross-section of an upper substrate as used in the tile according to figure 11;

figure 13 another schematic cross-section of the tile as shown in figure 11;

figure 14 a cross-section of a multilayer base layer for use in a tile according to an embodiment of the invention; and

figure 15 a detailed cross-section of a foamed base layer for use in a tile according to an embodiment of the invention.

DETAILED DESCRIPTION

Figure 1 shows a schematic representation of the general configuration of a tile 101 for use in multi-purpose tile system according to an embodiment of the invention. The figure shows a tile 100 comprising a first pair of opposing edges consisting of a first edge 101 and an opposite second edge 102 and a second pair of opposing edges consisting of a third edge 103 and an opposing fourth edge 104. The first edge 101 and the third edge 103 enclose a first acute angle 105 and the second edge 102 and the fourth edge 104) enclose a second acute angle 106 opposing said first acute angle 105. The second edge 102 and the third edge 103 enclose a first obtuse angle 107, and the first edge 101 and the fourth edge 104 enclose a second obtuse angle 108 opposing said first obtuse angle 107. Both the first pair of opposing edges 101, 102 and the second pair of opposing edges 103, 104 comprise opposing mechanical coupling means for locking purposes. Figure 1 shows in an indicative way how the configuration of mechanical coupling means of the tile 100 can be performed. The first edge 101 comprises a first coupling profile 109 and the second edge comprises 102 comprises a second coupling profile 110. The first coupling profile 109 and the second coupling profile 110 will be elucidated in more detail in figures 3a and 3b. The third edge 103 comprises a third coupling profile 111 and the fourth edge 104 comprises a fourth coupling profile 112. The third coupling profile 111 and the fourth coupling profile 112 will be elucidated in more detail in figures 2a and 2b, and alternatives thereof in figures 2c and 2d. The tile 100 comprises a substantially rigid base layer 113 which is at least partially made of a foamed composite comprising at least one a closed cell foam plastic material and at least one filler. Cross-sections of lines A-A' and B-B' and alternatives thereof are schematically shown in figures 2a-3g. The tile 100 has the shape of a parallelogram, such that multiple tiles 100 can form a chevron pattern in a joined state. Optionally, the first pair of opposing edges 101, 102 and/or the second pair of opposing edges 103, 104 may be provided with a bevel near the top surface. In the figures discussed below, likewise one or more bevels may be applied. Additionally, the tile 101 may comprise a plurality of strip shaped upper substrates affixed to the upper side of a base layer (core layer) of the tile, as for example shown in figures 5, 6a, and 6b. Here, longitudinal edges

of at least two strip shaped upper substrates are preferably provided, near the top surface, with bevels.

Figure 2a shows a schematic representation of a cross-sections of line A-A' of the tile 100 shown in figure 1. The figure shows the third edge 103 comprising a third coupling profile 111 and the fourth edge 104 comprising a fourth coupling profile 112. Figure 2b shows a schematic representation of the coupled position of two tiles 100a, 100b comprising coupling profiles 111, 112 as shown in figure 2a. The third coupling profile comprises an upward tongue 113, an upward flank 114 lying at a distance from the upward tongue 113 and an upward groove 115 formed between the upward tongue 113 and the upward flank 114. The fourth coupling profile 112 comprises a downward tongue 116, a downward flank 117 lying at a distance from the downward tongue 116, and a downward groove 118 formed between the downward tongue 116 and the downward flank 117. A side 116b facing away from the downward flank 117 is diagonally oriented. The side 116b has a substantially straight design, where the complementary side 114a of the upward flank 114 has a rounded design. An air gap 119 is formed in the coupled position shown in figure 2b. The third coupling profile 111 comprises a first locking element 120 which is adapted for co-action with a second locking element 121 which is provided in the flank 117 of the fourth coupling profile 112. The first locking element 120 comprises an outward bulge, and the second locking element 121 comprises a recess, which outward bulge is adapted to be at least partially received in a recess of an adjacent coupled tile for the purpose of realizing a locked coupling. Figure 2b shows a tile 100b being coupled with an adjacent tile 100a, leading to locking of the third coupling profile 111 and the fourth coupling profile 112. The tongues 113, 116, flanks 114, 117 and grooves 115, 118 of the embodiments shown in figures 2a-b have a substantially rounded design. However, it is also possible that the tongues 113, 116, flanks 114, 117 and/or grooves 115, 118 have a more rectilinear design.

Figure 2c shows a schematic representation of an alternative configuration of the tile 100 equivalent to the tile 100 shown in figures 2a and 2b, wherein the figure shows a possible cross-section of line A-A' of the tile 100 shown in figure 1. Similar reference numbers show similar or equivalent technical features. The third edge 103 comprises a third coupling profile 111 and the fourth edge 104 comprises a fourth coupling profile 112. Figure 2d shows a schematic representation of the coupled position of two tiles

100a, 100b comprising coupling profiles 111, 112 as shown in figure 2c. The third coupling profile comprises an upward tongue 113, an upward flank 114 lying at a distance from the upward tongue 113 and an upward groove 115 formed between the upward tongue 113 and the upward flank 114. The fourth coupling profile 112 comprises a downward tongue 116, a downward flank 117 lying at a distance from the downward tongue 116, and a downward groove 118 formed between the downward tongue 116 and the downward flank 117. In the shown embodiment a side of the downward tongue 116 facing away from the downward flank 117 is provided with a third locking element 126, and the upward flank 114 is provided with a fourth locking element 127, said third locking element 126 being adapted to cooperate with a fourth locking element 127 of another tile 100. This would result in an additional inner locking mechanism, which could further improve the stability and reliability of the coupling. The co-action between the third locking element 126 and the fourth locking element 127, in coupled condition of two tiles, defines a tangent T1 which encloses an angle A1 with a plane defined by the tile, which angle A1 is smaller than an angle A2 enclosed by said plane defined by the tile and a tangent T2 defined by a co-action between an inclined part of a side of the upward tongue 113 facing toward the upward flank 114 and an inclined part of a side of the downward tongue 116 facing toward the downward flank 117. In general, the greatest difference between angle A1 and angle A2 is situated between 5 and 10 degrees.

Figure 3a shows a schematic representation of a second cross-section of the tile 100 shown in figure 1. The figure shown in particular a cross-section of line B-B'. The figure shows the first edge 101 comprising a first coupling profile 109 and the second edge 102 comprising a second coupling profile 110. Figure 3b shows a schematic representation of the coupled position of two tiles 100a, 100b comprising coupling profiles 109, 110 as shown in figure 3a. The first coupling profile 109 comprises a sideward tongue 122 extending in a direction substantially parallel to the upper side of the tile 100. The second coupling profile 110 comprises a recess 123 configured for accommodating at least a part of the sideward tongue 122 of a further tile, said recess 123 being defined by an upper lip 124 and a lower lip 125, wherein the first mechanical coupling profiles 109, 110 allow locking together of adjacent tiles 100 by inward angling whereby at least a part of the sideward tongue 122 is received by the recess 123. The bottom back region of the sideward tongue 122 of the first coupling profile 109 is configured as bearing region. The lower lip 125 of the second coupling profile 110 is

provided with a upwardly protruding shoulder for supporting and/or facing the bearing region of the sideward tongue 122. The sideward tongue 122 is designed such that locking takes place by an introduction movement into the recess 123 of a further tile and a angling down movement about an axis parallel to the first coupling profile 109, as a result of which a top side of the sideward tongue 122 will engage the upper lip 124 and the bearing region of the sideward tongue will be supported by and/or will be facing the shoulder of the lower lip 125, leading to locking of adjacent tiles 100a, 100b at the first and second edges 101, 102 in both horizontal direction and vertical direction.

Figures 3c-g show different alternative embodiments of the first coupling profile 109c-g and the second coupling profile 110c-g which can be present at the first edge 101c-g and the second edge 102c-g of a tile 100c-g according to an embodiment of the invention. One or more of these coupling profiles 109c-g, 110c-g may be applied to the tile 101 as shown in figure 1. Figure 3c show that a front region of the sideward tongue 122c of the first coupling profile 109c is provided with a rounded bottom surface. An outer end of the rounded bottom surface adjoins an inclined locking surface. An opposite end of the rounded bottom surface adjoins a bearing surface making part of a back region of the sideward tongue 122c. The second coupling profile 110c comprises an upper lip 124c and a lower lip 125c defining a recess 123c. Both lips 124c, 125c are integrally connected to the base layer of the tile 100c. Figure 3d shows a first and second coupling profile 109d, 110d of a tile 100d, wherein, instead of a smoothly rounded bottom portion a more hooked (segmented rounded) bottom portion is shown. In figure 3e, an embodiment of a tile 100e is shown which is almost identical to the tile shown in figure 3c, though wherein the first and second coupling profiles 109e, 110e are provided with horizontal locking surfaces instead of inclined locking surfaces. In figure 3f, an alternative embodiment of a tile 100f is shown, wherein the first and second coupling profiles 109f, 110f are shaped such that a bottom contact portion between the two coupling profiles 109f, 110f is partially smoothly rounded and partially discontinuously rounded (segmented rounded). The locking surfaces of a sideward tongue 122f of the first coupling profile 109f and of an upper lip 124f of the second coupling profile 110f have a substantially horizontal orientation. In figure 3g, an embodiment of a tile 100g almost identical to the tile 100f as shown in figure 3f is shown, with the difference that a front bottom part of a sideward tongue 122g is not smoothly rounded, but flat giving a bottom portion of the sideward tongue 122g as such a segmented rounded (hooked) shape.

Figure 4 show a schematic representation of a side view of the laminate details of a first possible embodiment of a tile 200 according to the invention. The tile 200 comprises a substantially rigid base layer 201 at least partially made of a foamed composite comprising at least one a closed cell foam plastic material and at least one filler. The base layer 201 comprises a lower side or bottom surface 201b and an upper side 201a. The coupling profiles are generally provided at the rigid base layer 201. The tile 100 comprises an upper substrate 202 affixed to the upper side 201a of the base layer 201. An adhesive 203, which can be a layer or coating, is provided between the upper surface 201a of the rigid base layer 201 and the lower surface 202b of the upper substrate layer 202 to join the upper substrate layer 202 and the rigid base layer 201 together. The tile 200 can possibly include a design pattern or a decorative appearance of any selected type on or at the upper surface 202a of the substrate layer 202. The design pattern can be a wood grain design, a mineral grain design that resembles marble, granite or any other natural stone grain, or a colour pattern, colour blend or single colour to name just a few design possibilities. The decoration or design pattern can be printed onto or otherwise applied to the upper surface 202a of the upper substrate layer 202, but is preferably provided on a separate printing film or decorative layer 204 of any suitable known plastic material. The decorative layer 204 is covered by a transparent or semi-transparent abrasion resistant wear layer 205 of known material and fabrication through which the design layer 204 can be viewed. The top of the wear layer 205 is the top surface of the tile 100. Possibly a transparent finishing layer (not shown) can be situated in between the decorative layer 204 and the wear layer 205. The tile 100 can be provided with any of the coupling elements shown in the previous figures. The upper substrate layer 202, the design layer 204 and the wear layer 205 can be initially laminated together to form an upper substrate laminate subassembly 206. The laminate subassembly 206 and the base layer 201 can then be laminated together to form the tile 200. Coupling profiles are typically applied to one or both pairs of opposing edges of the tile 200, wherein examples of these coupling profiles are shown in figures 1-3g. The tile 200 shown in this figure 4 may be the same tile as shown in one of figures 1-3g.

Figure 5 show a schematic representation of a side view of the laminate details of a second possible embodiment of a tile 300 according to the invention. The tile 300 comprises a substantially rigid base layer 301 at least partially made of a composite of at least one plastic material and at least one filler, wherein the composite and/or the at

least one plastic material comprises and/or is formed by a closed cell foam. It is also possible that the substantially rigid base layer 301 is at least partially made of a non-foamed (solid) composite comprising at least one plastic material and at least one filler. The tile 300 comprises a plurality of strip shaped upper substrates 302a-e affixed to the upper side 301a of the base layer 301. The plurality of strip shaped upper substrates 302a-e can be pre-assembled before they are affixed to the base layer 301. The upper substrates 302a-e are affixed to the upper side 301a of the base layer 301 by means of an adhesive 303. However, it is also possible that the upper substrates 302a-e are affixed to the upper side 301a of the base layer 301 by means of a high pressure and high pressure treatment. The upper substrates 302a-e are covered by a transparent or semi-transparent abrasion resistant wear layer 305 of known material and fabrication. The upper substrates 302a-e have a parallel orientation. The profiling of a tile 300 is generally done after the laminating of the tile 300. The coupling profile will provided in the rigid base layer 301. If an underlayment 306 or backing 306 (shown in dotted lines) is used, the underlayment 306 is affixed to a lower side 301b of the base layer 301 after the profiling step. The underlayment 306 can for example be made of polyethylene (PE), polyurethane or cork.

Figure 6a and 6b show schematic representations of two different types of tile configurations, wherein the first mechanical coupling means of one type of tile (A) along the first pair of opposite edges are arranged in a mirror-inverted manner relative to the corresponding first mechanical coupling means along the same first pair of opposite edge portions of the other type of tile (B). The figures show a top view. Figure 6a shows a tile 600A wherein the first coupling profile 609 is arranged at the first edge 601, the second coupling profile 610 is arranged at the second edge 602, the third coupling profile 611 is arranged at the third edge 603 and the fourth coupling profile 612 is arranged at the fourth edge 604. Figure 6b, however, shows a tile 600B with a configuration wherein the first coupling profile 609 is arranged at the second edge 602, the second coupling profile 610 is arranged at the first edge 601, the third coupling profile 611 is arranged at the third edge 603 and the fourth coupling profile 612 is arranged at the fourth edge 604. The coupling profiles 609, 610, 611, 612 can be any of the coupling profiles as shown in the embodiments of figures 1-3g. For both A and B type of tiles the first edge 601 and the third edge 603 enclose a first acute angle 605, and wherein the second edge 602 and the fourth edge 604 enclose a second acute angle 606 opposing said first acute angle 605, and the second edge 602 and the third

edge 603 enclose a first obtuse angle 607, and wherein the first edge 601 and the fourth edge 604 enclose a second obtuse angle 608 opposing said first obtuse angle 607. Each tile 600A, 600B comprises a substantially rigid base layer at least partially made of a composite comprising a closed cell foam plastic material and at least one filler. Each tile 600A, 600B furthermore comprises a plurality of strip shaped upper substrates 620a-f affixed to an upper side of the base layer, wherein said upper substrates 620a-f are arranged side by side in the same plane in a parallel configuration. Both the tiles 600A, 600B and the strip shaped upper substrates 620a-f have the shape of a parallelogram. When interconnecting multiple tiles 600A, 600B as shown in figures 6a and 6b, the upper substrates 620a-f will form a chevron pattern. This will be shown in more detail in figure 8. The upper substrates 620a-f comprise a decorative layer and an abrasion resistant wear layer covering said decorative layer. From aesthetic point of view, it is desirable is the decorative layers of at least two adjacently arranged upper substrates 620a-f have different appearances as this may accentuate the chevron pattern. The plurality of upper substrates 620a-f substantially completely cover the upper surface of the base layer of the tiles 600A, 600B. Each of the plurality of upper substrates 620a-f therefore extends from the first edge 601 to the second edge 602 of the tile 600A, 600B. The upper substrates 620a-e have a parallel orientation wherein the longitudinal direction of each upper substrate 620a-e is in line with the third edge 603 and the fourth edge 604 of the tile 600A, 600B. The ideal number and dimensions of upper substrates 620a-f is amongst others dependent on the dimensions of the tile 600A, 600B. In the shown embodiments of tiles 600A, 600B is the length of the first edge 601 of a tile 600A, 600B substantially identical to the length of the second edge 602 of the tile 600A, 600B. This length is greater than the length of the third edge 603 and the fourth edge 604 of said tile 600A, 600B. The first acute angle 605 and the second acute angle 606 are situated between 30 and 60 degrees, and are preferably substantially 45 degrees. The first obtuse angle 607 and the second obtuse angle 608 are situated between 120 and 150 degrees, and are preferably substantially 135 degrees.

Figure 7 shows a schematic representation of a first example of a multi-purpose tile system 770 according to the invention comprising a plurality of multi-purpose tiles 700A, 700B. The figure shows a top view. The system 770 comprises two different types of tiles 700A, 700B. In the shown embodiments of tiles 700A, 700B are the lengths (L1) of the first edge 701 and the second edge 702 of a tile 700A, 700B significantly greater

than the length (L2) of the third edge 703 and the fourth edge 704 of said tile 700A, 700B. For this configuration it is beneficial if the first edge 701 and the second edge 702 comprise coupling profiles arranged for inward angling of adjacent tiles 700A, 700B and that the third edge 703 and the fourth edge 704 comprise coupling profiles arranged for further locking of the tiles 700A, 700B. Examples of the possible coupling profiles which can be applied are shown in figures 1-3g.

Figure 8 shows a schematic representation of a second example of a multi-purpose tile system 880 according to the invention comprising a plurality of multi-purpose tiles 800A, 800B. The figure shows a top view. The tiles 800A, 800B are equivalent to the tiles 600A, 600B shown in figures 6a and 6b, and having equivalent coupling profiles of which examples are also shown in figures 1-3g. The tiles 800A, 800B have the shape of a parallelogram, wherein opposing edges 801, 802, 803, 804 have a similar length and adjacent edges differ in length. Each tile 800A, 800B comprises a plurality of strip shaped upper substrates 820a-f affixed to an upper side of the base layer. The upper substrates 820a-f are parallel oriented. The longitudinal direction of each upper substrate 820a-f of a tile 800A, 800B is substantially parallel to the short edges of the tile 800A, 800B. The longitudinal direction of a tile 800A, 800B therefore differs from the longitudinal direction of an upper substrate 820a-e affixed thereto. When the tiles 800A, 800B are in a joined configuration, as is for example shown in the left side of the figure, the plurality of upper substrates 820a-e of a tile form a continuation of the upper substrates 820a-e of an adjacent tile in longitudinal direction of the tile. This means that the upper substrates 820a-e of an A-type of tile 800A are substantially parallel to the upper substrates of an adjacent A-type of tile 800A. The same applies to B-type of tiles 800B. Due to this configuration of upper substrates 820a-e, it will be difficult or even impossible to observe that the upper substrates 820a-e are not individual tiles which are mutually connected during formation of the tile system. It is a benefit of the configuration that not all the upper substrates 820a-e which visualize the chevron pattern have to be mutually joined. Due to the tiles 800A, 800B comprising a substantially rigid base layer at least partially made of a foamed composite comprising at least one plastic material and at least one filler, the tiles 800A, 800B have sufficient rigidity to have relatively large dimensions. The first edge 801 and second edge 802 can for example be up to 2 meter in length (L). The width (W) of the tile can for example be 30-50 centimetre. Therefore, the system according to this embodiment of the invention, can significantly reduce the required time for installation of the tile system

880 compared to a system comprising conventional tiles which are in the dimensions of an upper substrate 820a-e which conventional system visually seen looks similar.

Figure 9 show a schematic representation of a third example of a multi-purpose tile system 990 according to the invention comprising a plurality of multi-purpose tiles 900A, 900B. The figure shows a top view. The tiles 900A, 900B are equivalent to the tiles 700A, 700b shown in figure 7, however, the tiles 900A, 900B are joined in a different manner which results in different tile pattern of the tile system 990. The edges 901, 902, 903, 904 can be provided with coupling profiles as described in the previous figures. It is also possible that the tiles 900A, 900B have the shape of a rhombus or a rhomboid. Installation of the tile system 990 can be realized by inward angling of a sideward tongue of a first tile 900A, 900B to be installed into a recess of an already installed second tile 900A, 900B, which is typically – though not necessarily – realized by angling down the tile 900A, 900B to be installed with respect to the already installed tile 900A, 900B, which will lock the first tile 900A, 900B and the second tile 900A, 900B at least in vertical direction, but preferably also in horizontal direction. During this inward angling of the first tile 900A, 900B and the second tile 900A, 900B, commonly the fourth coupling profile of the first tile 900A, 900B to be installed will be connected (simultaneously) to the third coupling profile of another already installed third tile 900A, 900B, which is typically realized by lowering the first tile 900A, 900B with respect to the third tile 900A, 900B during which the third coupling profile and the fourth coupling profile will be scissored (zipped) into each other, which results in a locking of the first tile 900A, 900B with respect to the third tile 900A, 900B both in horizontal and vertical direction.

Figure 10 shows a schematic representation of a fourth example of a multi-purpose tile system 1100 according to the invention comprising a plurality of multi-purpose tiles 1000A, 1000B. The figure shows a top view. The tiles 1000A, 1000B are equivalent to the tiles shown in figures 6a and 6b having equivalent coupling profiles at the first, second, third and fourth edge 1001, 1002, 1003, 1004, of which examples are also shown in figures 1-3g. The multi-purpose tile system 1100 as shown in this figure has similarities with the systems 770, 880 as shown in figures 7 and 8. The main difference can be found in the non-uniformity of the upper substrates 10a, 10b, 10c of the tiles 1000A, 1000B. Each tile 1000A, 1000B comprises a plurality of strip shaped upper substrates 10a-c affixed to an upper side of the base layer. The upper substrates 10a-c are parallel oriented to each other. The number of upper substrates 10a-c can vary

per tile 1000A, 1000B as the width Wa, Wb, Wc of the upper substrates 10a-c can vary. The width Wa, Wb, Wc is defined in a longitudinal direction L of the tile 1000A, 1000B. When the tiles 1000A, 1000B are in a joined configuration, as is, for example, shown in the left side of the figure, the plurality of upper substrates 10a-c form a non-uniform pattern of upper substrates 10a-c. Despite the upper substrates 10a-c shown all have a parallelogrammatic shape, it is also possible that the shape of the upper substrate deviates thereof.

Figure 11 shows a schematic cross-section of a tile 1100 according to an embodiment of the present invention. The cross-section is comparable to the cross-sections of line A-A' of the tile 100 as shown in figure 1. The coupling profiles 1111, 1112 are equivalent to the coupling profiles shown in figures 2a and 2b, however, further possible examples of coupling profiles which can be used are shown in figures 1-3g. The tile 1100 comprises a substantially rigid base layer 1101 at least partially made of a composite of at least one plastic material and at least one filler, wherein the composite and/or the at least one plastic material comprises and/or is formed by a closed cell foam. The tile 1100 comprises a plurality of strip shaped upper substrates 1102a, 1102b affixed to the upper side 1101a of the base layer 1101. The plurality of strip shaped upper substrates 1102a, 1102b can be pre-assembled before they are affixed to the base layer 1101. The upper substrates 1102a, 1102b may, for example, be affixed to the upper side 1101a of the base layer 1101 by means of an adhesive. The upper substrates 1102a, 1102b are typically covered by a transparent or semi-transparent abrasion resistant wear layer. A backing layer 1106 is affixed to a lower side 1101b of the base layer 1101 after the profiling step. The upper substrates 1102a, 1102b have a parallel configuration, and facing longitudinal edges of the adjacent strip shaped upper substrates 1102a, 1102b are provided, near the top side, with a bevel 1170. Each bevel 1170 is provided at facing longitudinal edges of a shaped upper substrate 1102a, 1102b and is formed by a cut-away portion and/or imprinted portion of the wear layer. The bevels 1170 are applied to prevent visible seam formation, and secures a seamless engagement of adjacent upper substrates 1102a, 1102b. Each strip shaped upper substrate 1102a, 1102b typically comprises a back layer situated in between the base layer 1101 and the decorative layer of said upper substrate 1102a, 1102b. The width of a top portion of the back layer is in a preferred embodiment larger than the width of a bottom portion of the back layer, typically as seen in cross-section, as can also be seen in figure 12. This may result in improved seamless and tight engagement of adjacent

upper substrates 1102a, 1102b. The bottom portion of opposing longitudinal edges of the back layer is preferably chamfered. Figure 11 shows that the upper substrate 1102a, 1102b are positioned rather tightly next to each other, and since a narrowing width of the bottom portion of the upper substrates 1102a, 1102b are applied, a small air channel 1171 is formed in between the adjacent upper substrates1102a, 1102b, at the bottom side of said upper substrates.

Figure 12 shows a detailed cross-section of an upper substrate 1102 as used in the tile 1100 according to figure 11. The figure shows that the strip shaped upper substrate 1102 comprises: a decorative layer 1104 and an abrasion resistant wear layer 1105 covering said decorative layer 1104. A top surface of said wear layer 1105 is the top surface of the tile 1100. The wear layer 1105 is typically made of a transparent and/or translucent material, such that decorative layer 1104 is visible through the transparent wear layer 1105. The longitudinal edges of the strip shaped upper substrate 1102 is provided with a bevel 1170. The bevel 1170 is applied to prevent visible seam formation, and secures a seamless engagement of adjacent upper substrates 1102. The bevel 1170 is formed by a cut-away portion of the wear layer 1105. Hence, in the shown embodiment, the bevel 1170 is positioned above the decorative layer 1104, wherein the bevel 1170 leaves the decorative layer 1104 intact. The bevel 1170 typically has an angle (alpha) between 10 and 30 degrees below the horizontal surface as defined by the top surface of the tile. The angle of the bevel 1170 in the shown embodiment is about 15 degrees. It is conceivable that a transparent finishing layer situated in between the decorative layer 1104 and the wear layer 1105. The strip shaped upper substrate 1102 comprises a back layer 1180 situated in between the base layer of the tile (not shown) and the decorative layer 1104. The back layer 1180 is preferably made of thermoplastic material, such as PVC or PET. Preferably, the back layer 1180 thickness is at least 50% of the thickness of the upper substrate. It can be seen that the width (W) of a top portion of the back layer 1180 is larger than the width of a bottom portion of the back layer 1180.

Figure 13 shows another schematic cross-section of the tile as shown in figure 11. The cross-section is comparable to the cross-sections of line B-B' of the tile 100 as shown in figure 1. The coupling profiles 1111, 1112 are equivalent to the coupling profiles shown in figures 3a and 3b, however, further possible examples of coupling profiles which can be used are shown in figures 1-3g. It can be seen that the short edges of the

upper substrate 1102 is also provided with a bevel 1170s, near the top surface, which allows or facilitates adjacent tiles to engage seamless to each other.

Figure 14 shows a cross-section of a multilayer base layer 1401 for use in a tile according to an embodiment of the present invention. The figure shows that the base layer 1401 comprises basically three layers 1401a, 1401b, 1401c. The upper layer 1401a and the bottom layer 1401c enclose a foamed mid layer 1401b. Hence, a laminate of composite layers 1401a, 1401b, 1401c stacked on top of each other is formed. This a multilayer base layer 1401 may, for example, be formed by co-extrusion. It can be seen that the different composite layers 1401a, 1401b, 1401c of the base layer 1401 have a different composition. The upper layer 1401a and the bottom layer 1401c have a (rather) solid structure, while the mid layer 1401 has a foam structure. Therefore, a sandwiched structure wherein two substantially solid composite layers 1401a, 1401c enclosing a foam composite layer 1401b is obtained.

Figure 15 shows a detailed cross-section of a further example of a foamed base layer 1501 for use in a tile according to the present invention. It can be seen that curst layers (C) are formed within the foamed base layer 1501 both at a top section (top portion) and a bottom section (bottom portion) of the foamed base layer 1501. This crust layers form integral part of the base layer 1501. Further, the crust layers of the top section and the bottom section of the base layer 1501 enclosing the foam structure (F). Each crust layer has a relatively closed cell structure. It can be seen that the crust layers C have a reduced porosity compared to the more porous foam structure F. The center section of the foamed base layer 1501 is enclosed by both crust layers. The foamed center section has a larger thickness than the thickness of a crust layer. The center section has a substantially homogeneous cell size. The average cell size of the foamed section F of the foamed base layer 1501 is typically situated in between 60 and 140 micron, more in particular between 80 and 120 micron.

It will be apparent that the invention is not limited to the working examples shown and described herein, but that numerous variants are possible within the scope of the attached claims that will be obvious to a person skilled in the art. Moreover, one or more details and technical features mentioned in the above description of various embodiments of the tile according to the invention may be incorporated in the tiles as shown in the figures and as described above. Hence, the above-described inventive concepts are illustrated

by several illustrative embodiments. It is conceivable that individual inventive concepts may be applied without, in so doing, also applying other details of the described example. It is not necessary to elaborate on examples of all conceivable combinations of the above-described inventive concepts, as a person skilled in the art will understand numerous inventive concepts can be (re)combined in order to arrive at a specific application.

The verb “comprise” and conjugations thereof used in this patent publication are understood to mean not only “comprise”, but are also understood to mean the phrases “contain”, “substantially consist of”, “formed by” and conjugations thereof.

Any reference to background art or other prior art in this specification is not an admission that such background art or other prior art is common general knowledge in Australia or elsewhere.

CLAIMS:

1. Multi-purpose tile system, in particular a floor tile system, comprising a plurality of multi-purpose tiles, in particular floor tiles, wherein said tiles are configured to being joined in a chevron pattern, wherein each tile comprises:

- a first pair of opposing edges consisting of a first edge and an opposite second edge;
- a second pair of opposing edges consisting of a third edge and an opposing fourth edge,

wherein:

- the first edge and the third edge enclose a first acute angle, and wherein the second edge and the fourth edge enclose a second acute angle opposing said first acute angle, and wherein the second edge and the third edge enclose a first obtuse angle, and wherein the first edge and the fourth edge enclose a second obtuse angle opposing said first obtuse angle, and wherein
- the first pair of opposing edges have pairs of opposing first mechanical coupling means for locking together said tiles at least vertically comprising:
    - a first coupling profile comprising a sideward tongue extending in a direction substantially parallel to the upper side of the tile, and
    - an opposing second coupling profile comprising a recess configured for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip,

wherein said first mechanical coupling profiles allow locking together said tiles by inward angling whereby at least a part of the sideward tongue is received by the recess, and wherein

- the second pair of opposing edges have pairs of opposing second mechanical coupling means for locking together said tiles vertically and horizontally, comprising:
    - a third coupling profile, comprising an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, and
    - a fourth coupling profile, comprising a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein the second mechanical coupling profiles allow

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locking together said tiles during inward angling of the first coupling profile of a tile and the second coupling profile of another tile,

wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward the third coupling profile of yet another tile, leading to locking of the third coupling profile and the fourth coupling profile,

wherein each tile comprises a substantially rigid base layer at least partially made of a foamed composite comprising at least one plastic material and at least one filler, and

wherein the system comprises two different types of tiles, and wherein the first mechanical coupling means of one type of tile along the first pair of opposite edges are arranged in a mirror-inverted manner relative to the corresponding first mechanical coupling means along the same first pair of opposite edge portions of the other type of tile.

2. Tile system according to claim 1, wherein at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank and/or wherein at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank.

3. Tile system according to claim 1, wherein at least one tile has a configuration wherein:

- the first coupling profile is arranged at the first edge;
- the second coupling profile is arranged at the second edge;
- the third coupling profile is arranged at the third edge; and
- the fourth coupling profile is arranged at the fourth edge.

4. Tile system according to any one of the foregoing claims, wherein at least one tile has a configuration wherein:

- the first coupling profile is arranged at the second edge;
- the second coupling profile is arranged at the first edge;
- the third coupling profile is arranged at the third edge; and
- the fourth coupling profile is arranged at the fourth edge.

5. Tile system according to any one of the foregoing claims, wherein:

- the first coupling profile comprises a sideward tongue extending in a direction substantially parallel to the upper side of the tile, the bottom front region of said sideward tongue, the bottom back region of said tongue being configured as bearing region, wherein the bottom back region is located closer to the level of the upper side of the tile than a lowest part of the bottom front region, and wherein
- the second coupling profile comprises a recess for accommodating at least a part of the sideward tongue of a further tile, said recess being defined by an upper lip and a lower lip, said lower lip being provided with a upwardly protruding shoulder for supporting and/or facing the bearing region of the sideward tongue, wherein the sideward tongue being designed such that locking takes place by an introduction movement into the recess of the sideward tongue a further tile and a angling down movement about an axis parallel to the first coupling profile, as a result of which a top side of the sideward tongue will engage the upper lip and the bearing region of the sideward tongue will be supported by and/or will be facing the shoulder of the lower lip, leading to locking of adjacent tiles at the first and second edges in both horizontal direction and vertical direction.

6. Tile system according to any one of the foregoing claims, wherein:

- the third coupling profile comprises an upward tongue, at least one upward flank lying at a distance from the upward tongue and an upward groove formed between the upward tongue and the upward flank, wherein at least a part of a side of the upward tongue facing the upward flank is inclined toward the upward flank, and wherein at least a part of a side of the upward tongue facing away from the upward flank optionally comprises at least one first locking element, which preferably makes integral part of the upward tongue, and wherein
- the fourth coupling profile comprises a downward tongue, at least one downward flank lying at a distance from the downward tongue, and a downward groove formed between the downward tongue and the downward flank, wherein at least a part of a side of the downward tongue facing the downward flank is inclined toward the downward flank, and wherein the downward flank optionally comprises at least one second locking element, which preferably makes integral part of the downward flank, and adapted for co-action with the at least one first locking element of the third coupling profile of yet a further tile,

- the third and fourth coupling profiles being designed such that locking takes place during angling down of a tile to be coupled at the first coupling profile to the second coupling profile of a further tile, wherein the fourth coupling profile of the tile to be coupled makes a scissoring movement toward a third coupling profile of yet another tile, such that the downward tongue of the fourth coupling profile of the tile to be coupled will be forced into the upward groove of the third coupling profile of said other tile and the upward tongue of said other tile will be forced into the downward groove of the tile the be coupled, by deformation of the third coupling profile and/or the coupling profile edge, leading to locking of adjacent tiles at the third and fourth coupling profiles in both horizontal direction and vertical direction.

7. Tile system according to any one of the foregoing claims, wherein the length of the first edge and the length of the second edge of a tile are substantially identical.

8. Tile system according to any one of the foregoing claims, wherein the length of the first edge and the length of the second edge of a tile are greater than the length of the third edge and the fourth edge of said tile.

9. Tile system according to any one of the foregoing claims, wherein the first acute angle and the second acute angle are situated between 30 and 60 degrees, and are preferably substantially 45 degrees.

19. Tile system according to any one of the foregoing claims, wherein the first obtuse angle and the second obtuse angle are situated between 120 and 150 degrees, and are preferably substantially 135 degrees.

11. Tile system according to any one of the foregoing claims, wherein at least one pair of opposing edges of a tile, preferably each tile, are provided, near the top side, with a bevel.

12. Tile system according to any one of the foregoing claims, wherein each strip shaped upper substrate comprises:

- a decorative layer and

- an abrasion resistant wear layer covering said decorative layer, wherein a top surface of said wear layer is the top surface of said tile, and wherein the wear layer is a transparent and/or translucent material, such that decorative layer is visible through the transparent wear layer, and wherein each bevel provided at facing longitudinal edges of at least two strip shaped upper substrates is formed by a cut-away portion and/or imprinted portion of said wear layer,
- and, optionally, a transparent finishing layer situated in between the decorative layer and the wear layer.

13. Tile system according to any one of the foregoing claims, wherein each strip shaped upper substrate comprises a substantially transparent or translucent three-dimensional embossing structure at least partially covering said print layer.

14. Tile system according to any one of the foregoing claims, wherein each of the plurality of upper substrates comprises a decorative layer, wherein the decorative layers of at least two adjacently arranged upper substrates have different appearances.

15. Tile system according to any one of the foregoing claims, wherein at least one filler of the base layer is selected from the group consisting of: talc, chalk, wood, calcium carbonate, and a mineral filler.

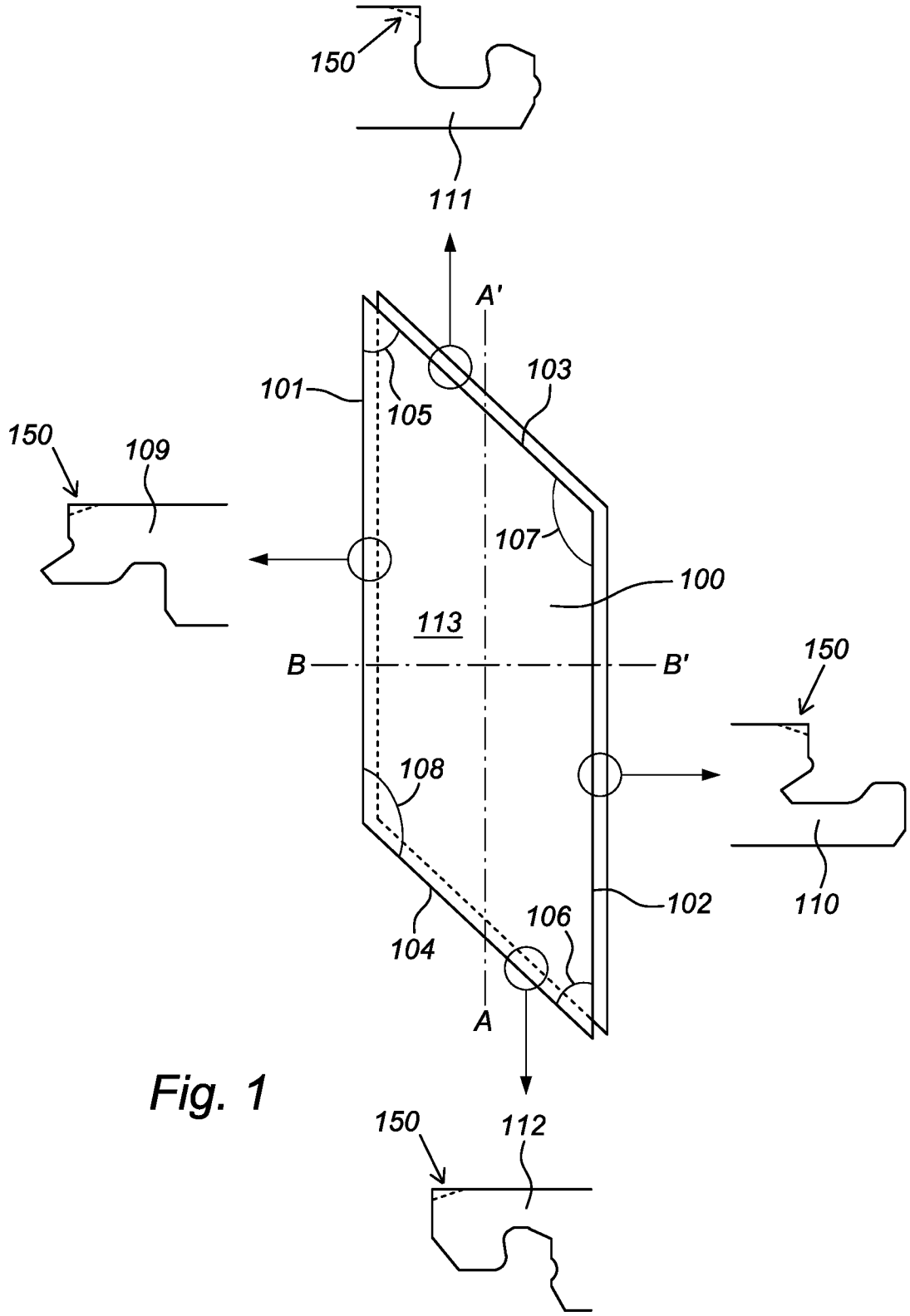
16. Tile system according to any one of the foregoing claims, wherein a side of the downward tongue facing away from the downward flank is provided with a third locking element, and wherein the upward flank is provided with a fourth locking element, said third locking element being adapted to cooperate with a fourth locking element of another tile.

17. Tile system according to any one of the foregoing claims, wherein distinctive visual markings are applied to different tile types, preferably for installation purposes.

18. Tile system according to any one of the foregoing claims, wherein the decorative layer is formed by an ink layer digitally directly printed onto a supporting layer, such as the base layer or a primer layer applied onto the base layer.

19. Tile system according to any of the preceding claims, wherein facing longitudinal edges of at least two strip shaped upper substrates are provided, near the top side, with a bevel.

20. Tile covering consisting of mutually coupled tiles of the tile system according to any one of the preceding claims.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111
A'
101
105
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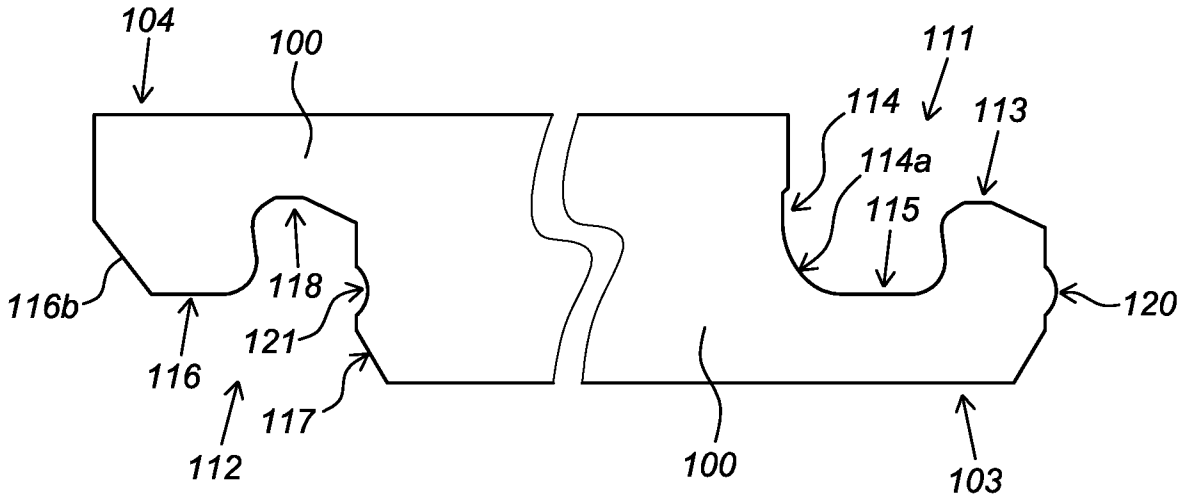
109
107
100
113
B
B'
150
108
102
110
106
104
A
150
112

Fig. 1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113
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116b
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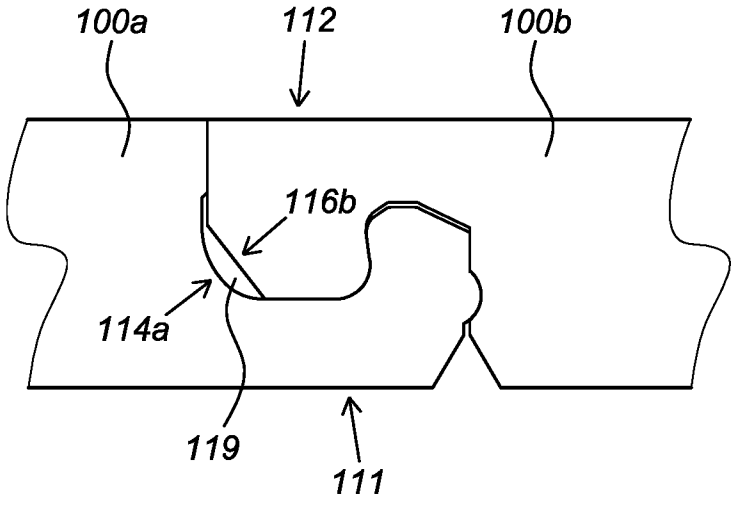
121
116
117
112
100
103

Fig. 2a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100b
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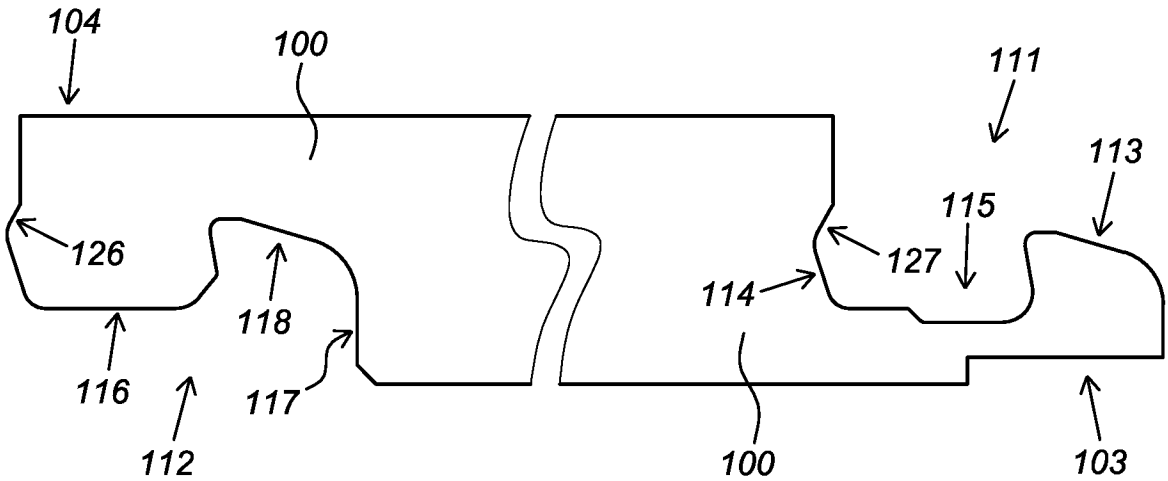
114a
119
111

Fig. 2b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100
111
113
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126
127
118
114
116
117
112
100
103

Fig. 2c

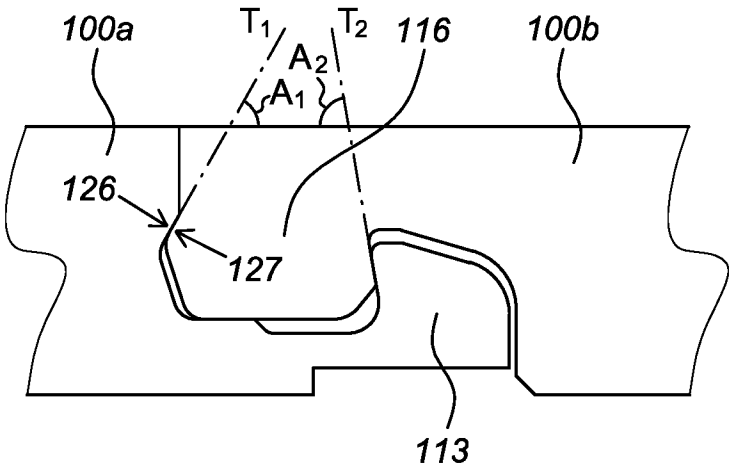

100a
T1
T2
116
100b
A2
A1
126
127
113

Fig. 2d

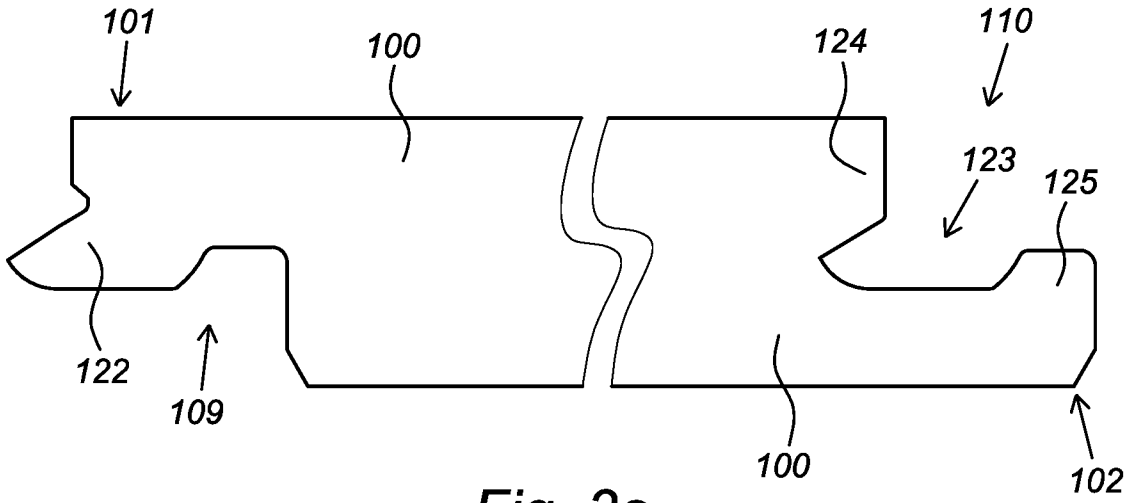

101
100
124
110
123
125
122
109
100
102

Fig. 3a

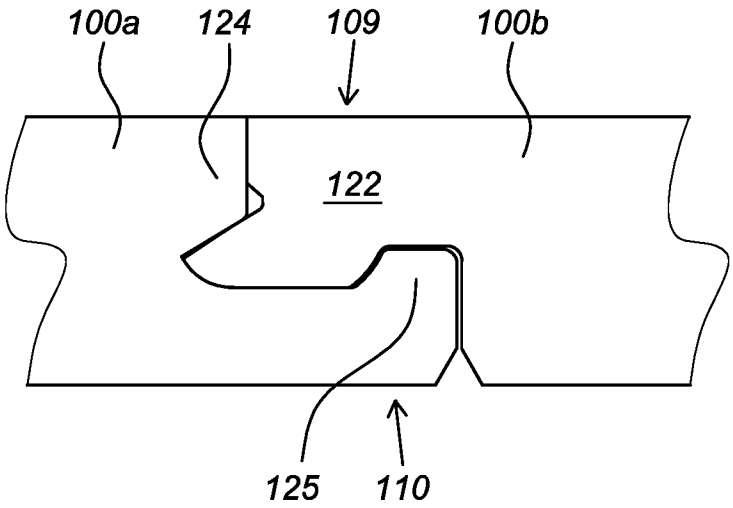

100a
124
109
100b
122
125
110

Fig. 3b

Fig. 3c

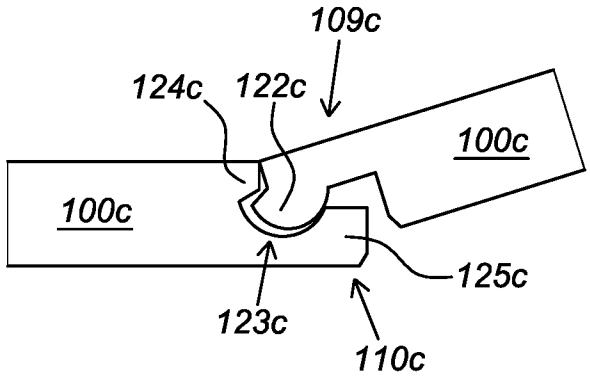


Fig. 3d

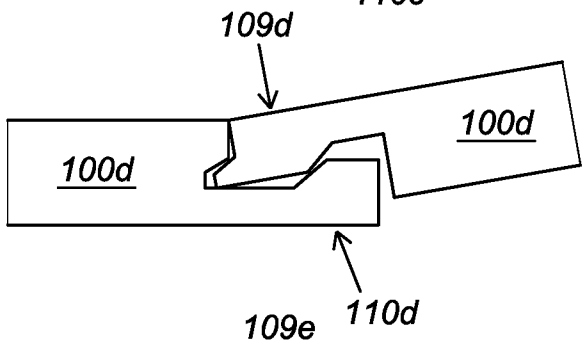


Fig. 3e

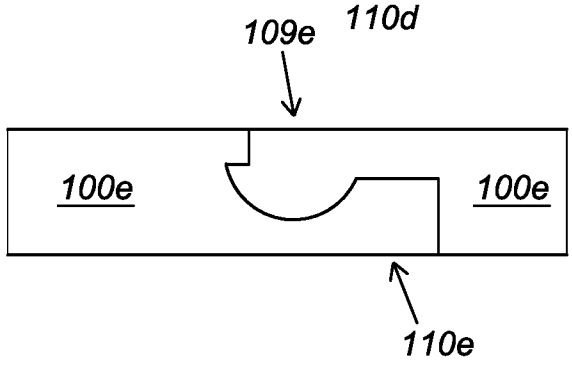


Fig. 3f

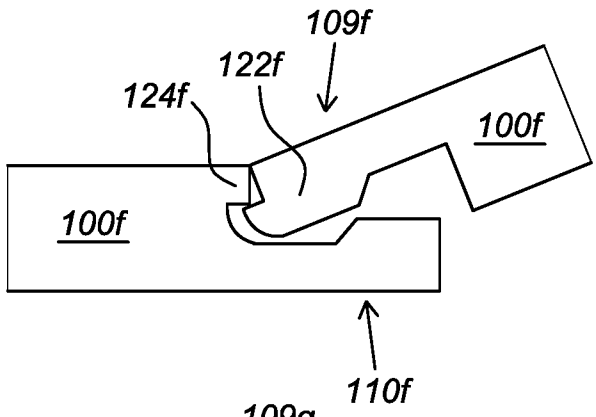
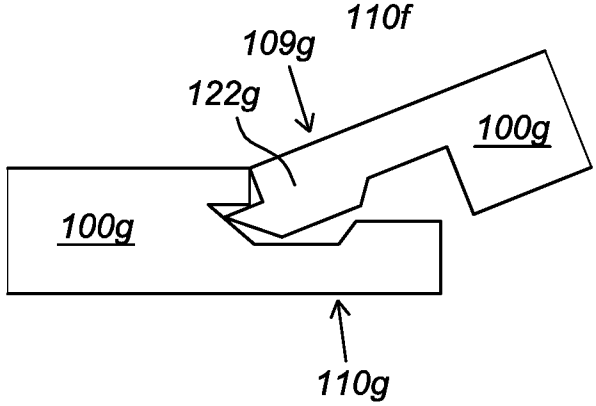


Fig. 3g



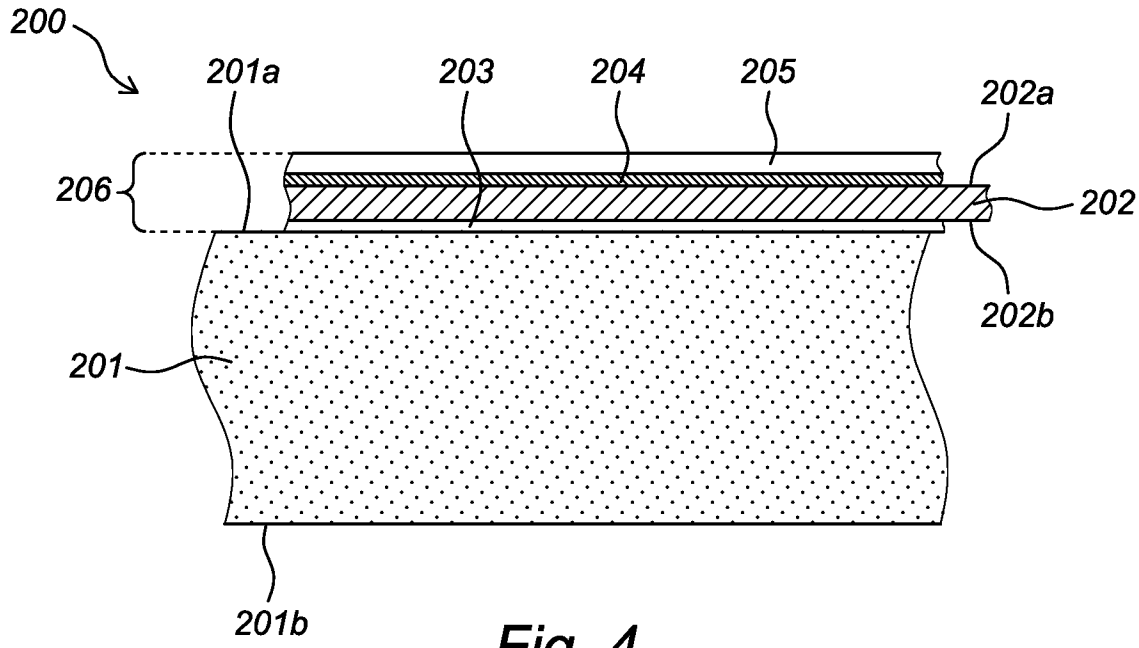

200
201a
203
204
205
202a
206
202
202b
201
201b

Fig. 4

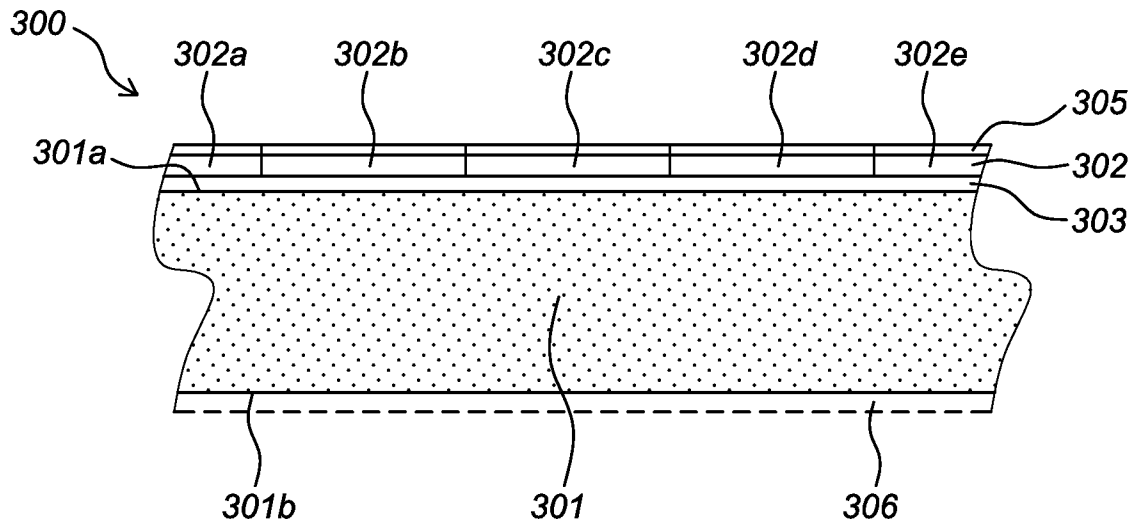

300
302a
302b
302c
302d
302e
305
301a
302
303
301b
301
306

Fig. 5

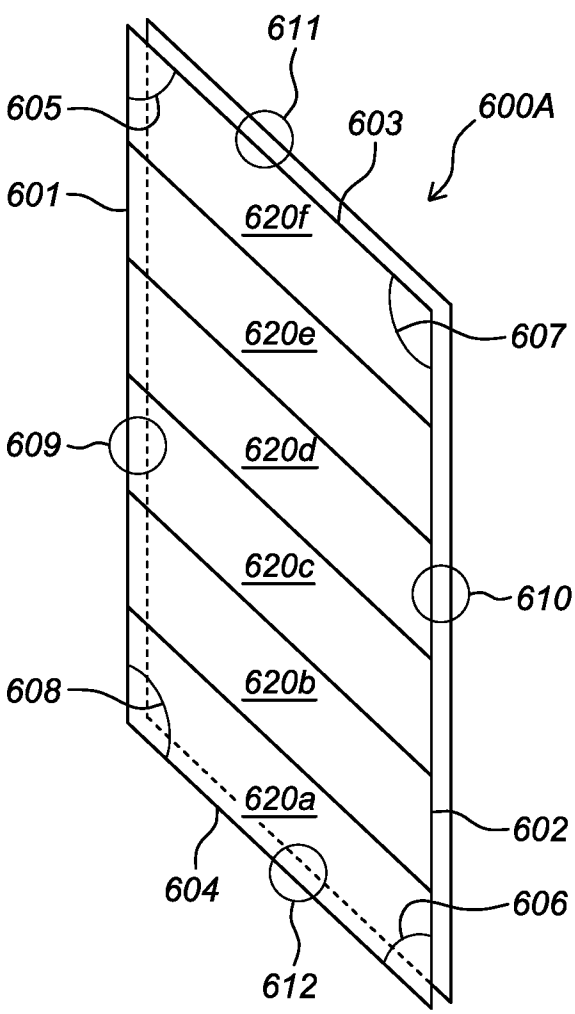

611
605
603
600A
601
620f
620e
607
609
620d
620c
610
608
620b
620a
602
604
606
612

Fig. 6a

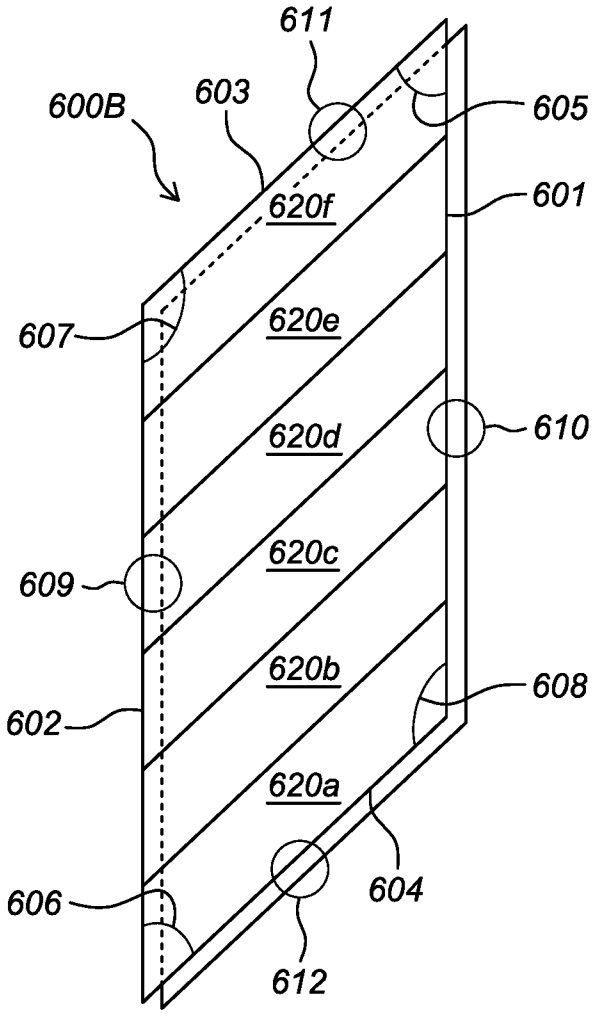

611
600B
603
605
601
620f
607
620e
610
620d
609
620c
620b
608
602
620a
604
606
612

Fig. 6b

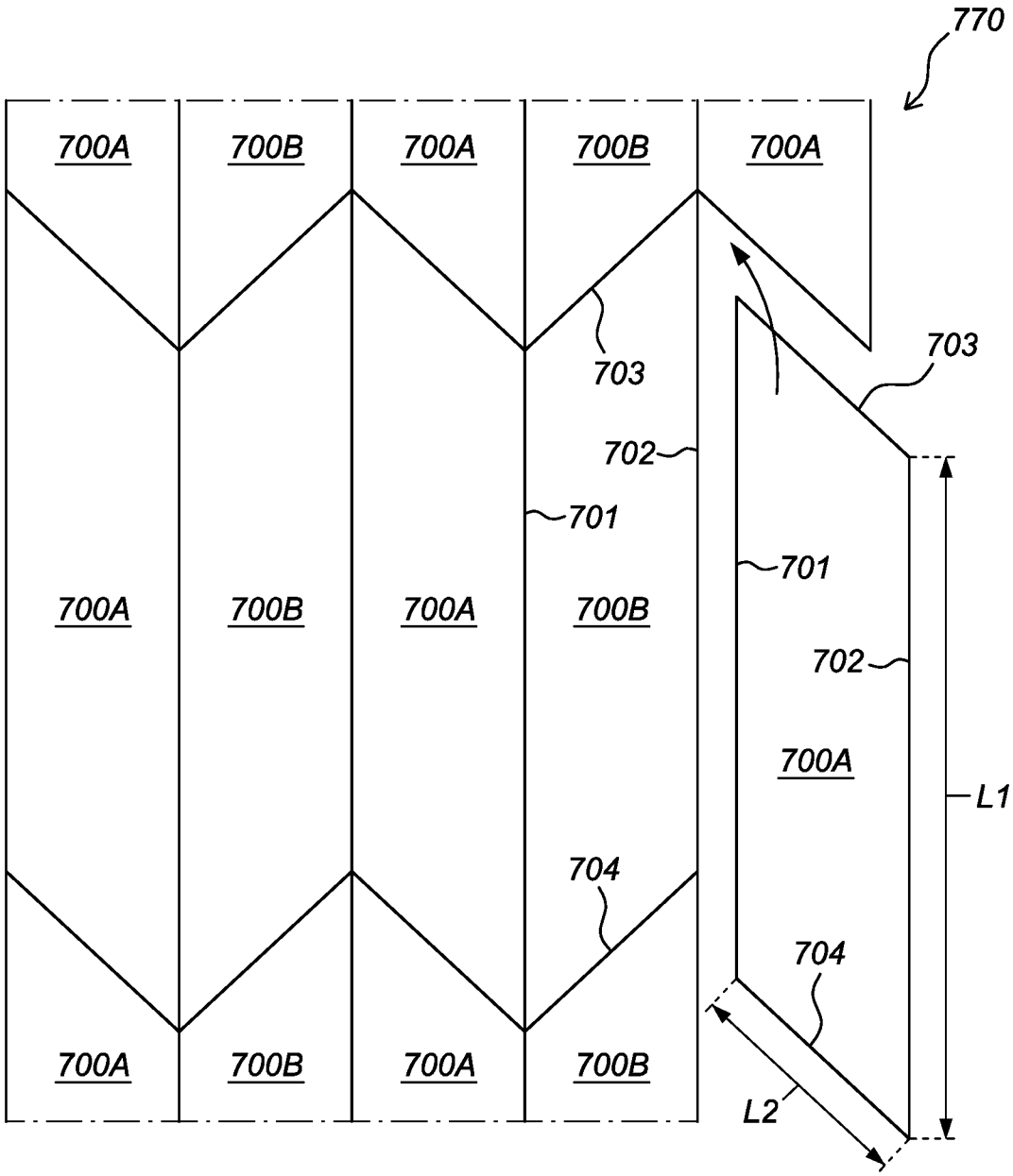

770
700A
700B
700A
700B
700A
703
703
702
701
701
700A
700B
700A
700B
702
700A
L1
704
704
700A
700B
700A
700B
L2

Fig. 7

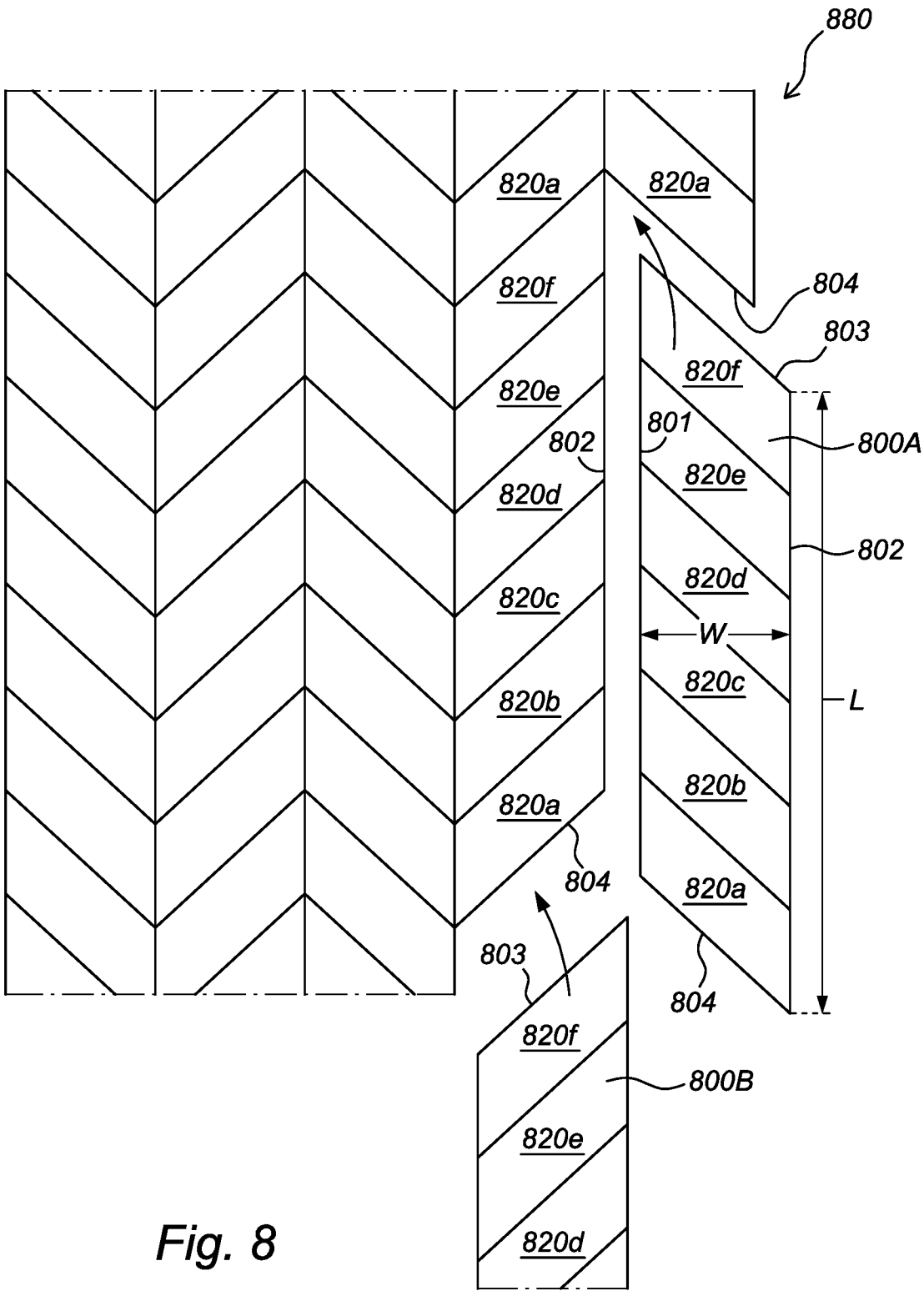

880
820a
820a
820f
804
803
820f
820e
801
800A
802
820e
802
820d
820d
820c
W
820c
L
820b
820b
820a
804
820a
804
803
820f
800B
820e
820d

Fig. 8

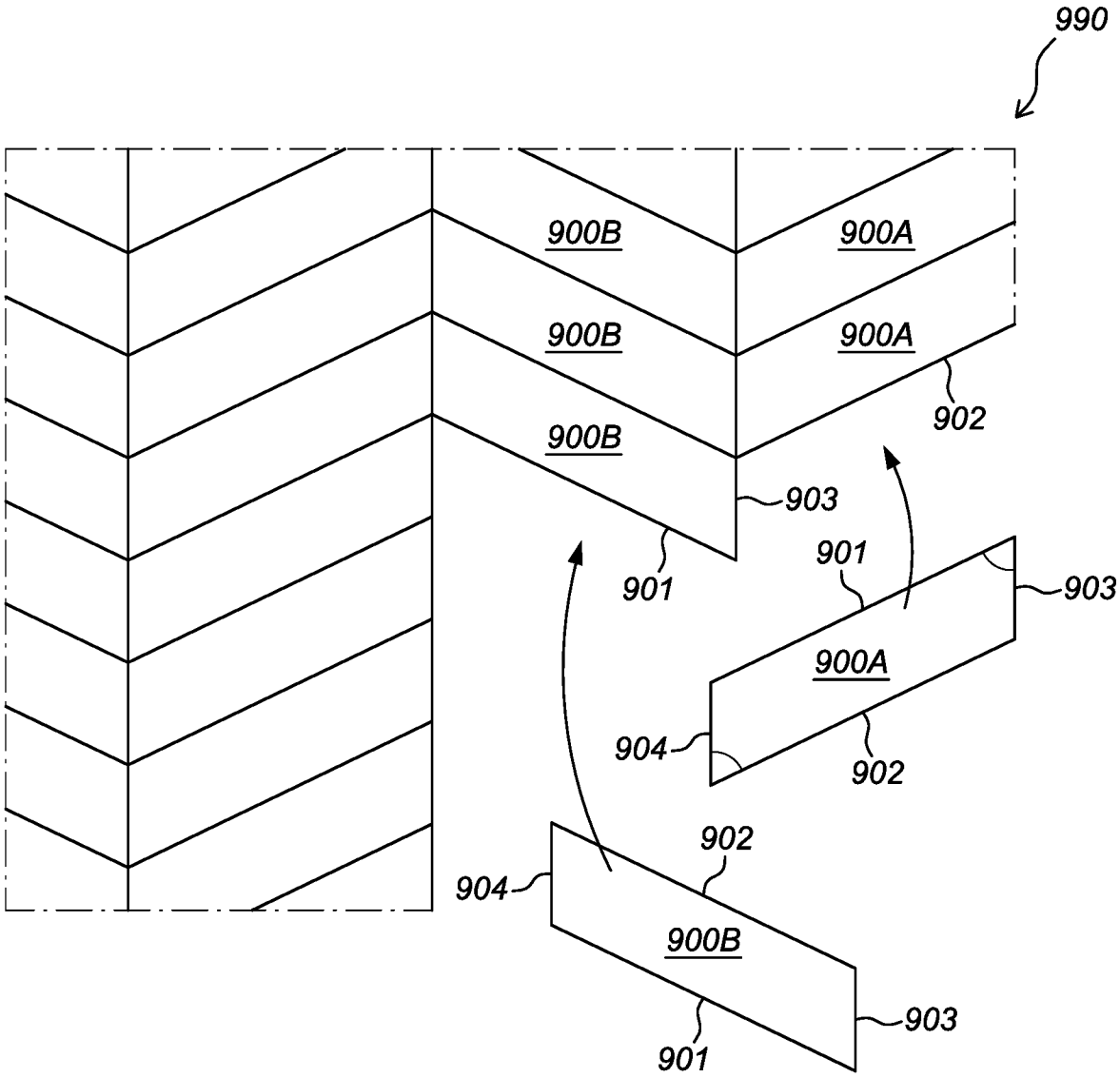

990
900B
900A
900B
900A
902
900B
903
901
901
903
900A
904
902
902
904
900B
903
901

Fig. 9

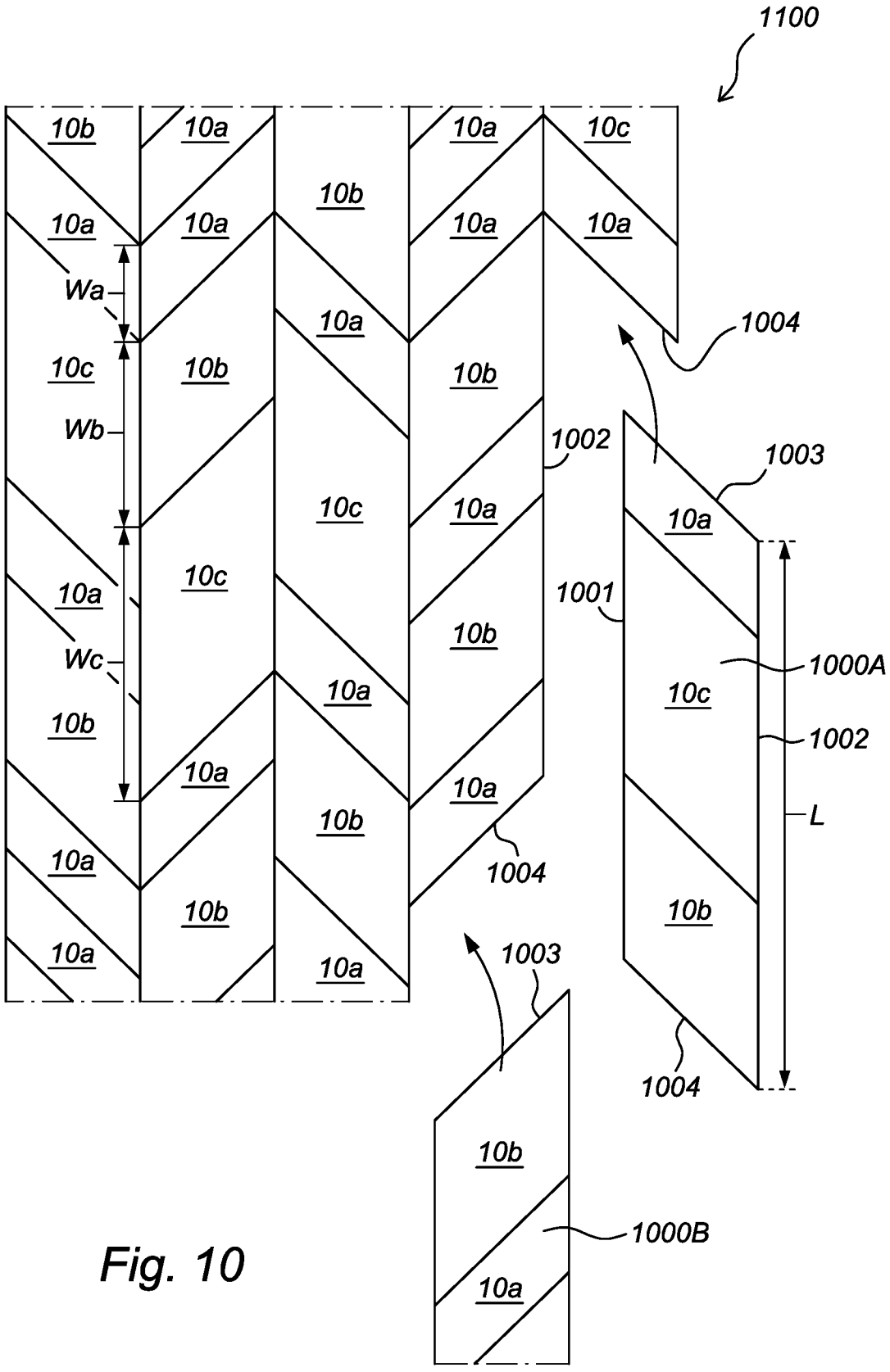

1100
10b
10a
10a
10c
10b
10a
10a
10a
10a
Wa
10a
1004
10c
10b
10b
Wb
1002
1003
10c
10a
10a
10c
1001
10a
10b
Wc
1000A
10a
10c
10b
1002
10a
10a
L
10b
10a
1004
10b
10a
1003
10b
1004
10b
1000B
10a

Fig. 10

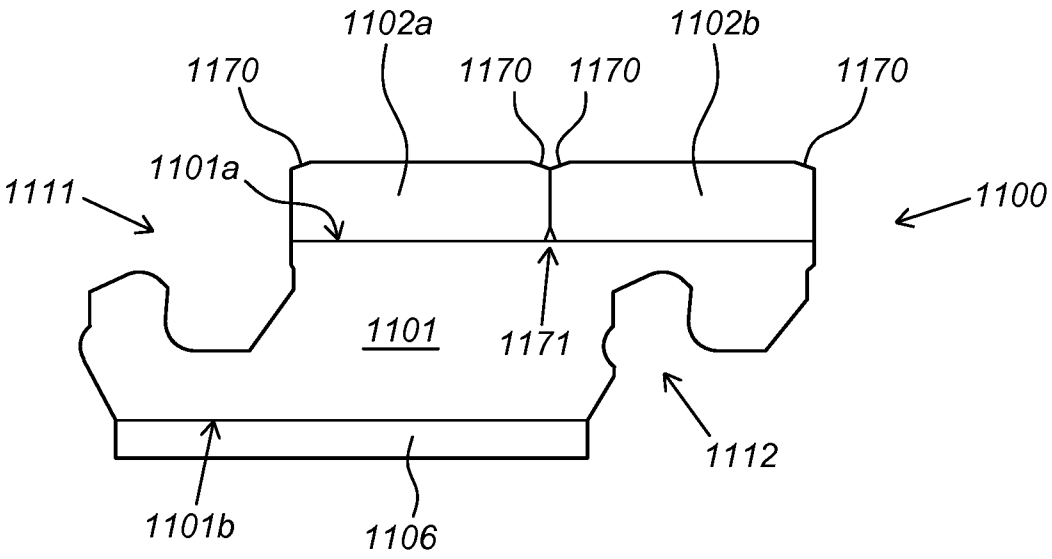

1102a
1102b
1170
1170
1170
1170
1101a
1111
1100
1101
1171
1112
1101b
1106

Fig. 11

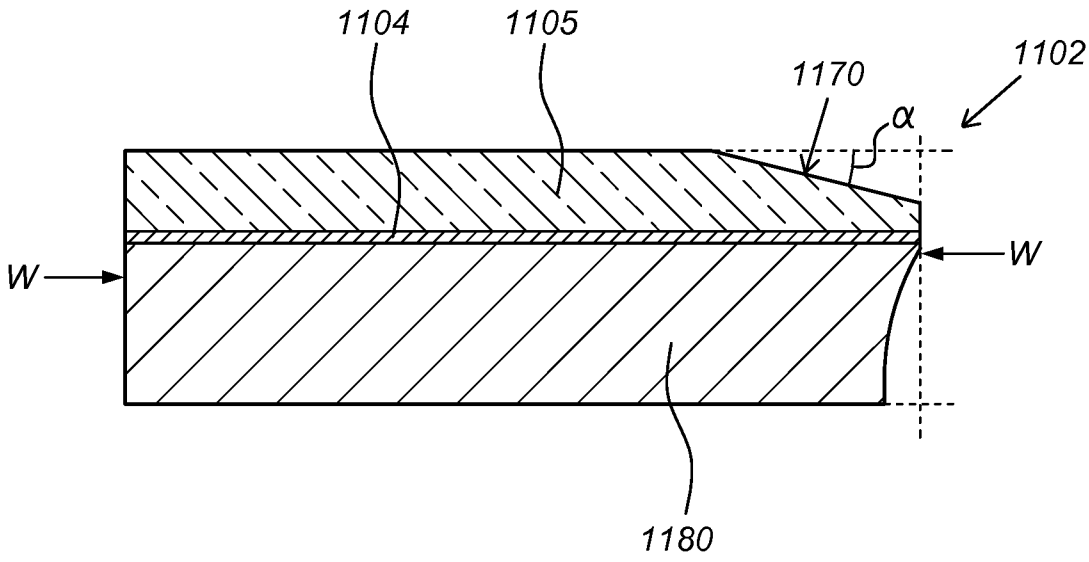

1104
1105
1170
1102
α
W
W
1180

Fig. 12

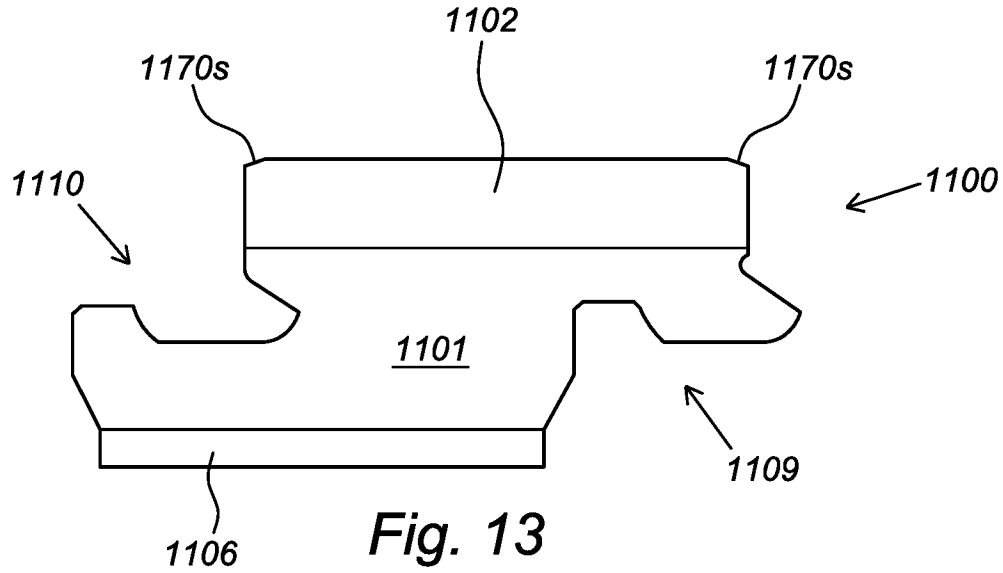


Fig. 13

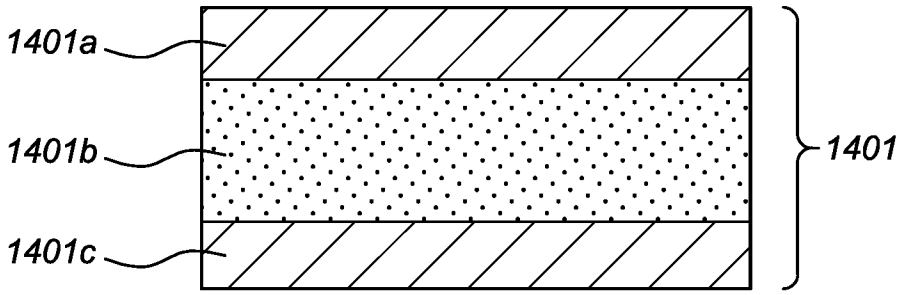


Fig. 14

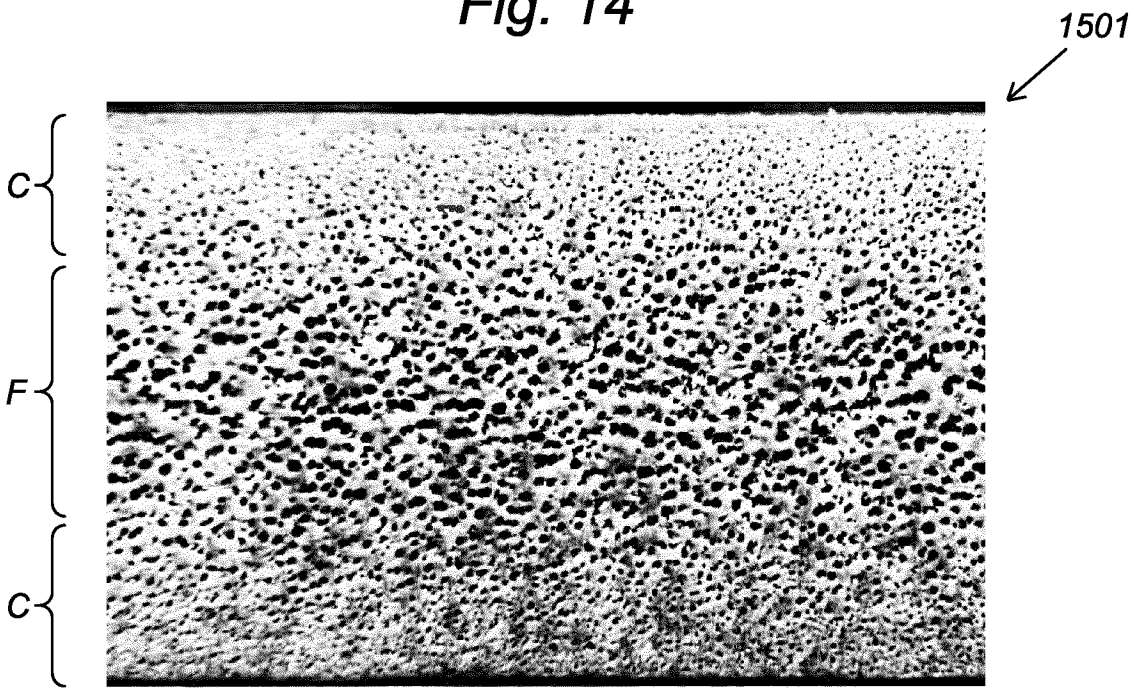


Fig. 15