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(54) **A FASTENING MEMBER FOR FASTENING ELONGATED ELEMENTS AND AN ARRANGEMENT COMPRISING THE SAME**

(57) There is disclosed a fastening member (1), comprising a foot part (1.1) adapted to attach the fastening member with a support rail (2); a supporting element (1.4) attached with the foot part (1.1) at a first end of the supporting element (1.4); a first locking section (1.10) attached with a second end of the supporting element (1.4), wherein the first locking section (1.10) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1); and a second locking section (1.11) attached with a second end of the supporting element (1.4). The second locking section (1.11) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1) at another side of the supporting element (1.4). There is also disclosed support rail (2) and a fastener (5).

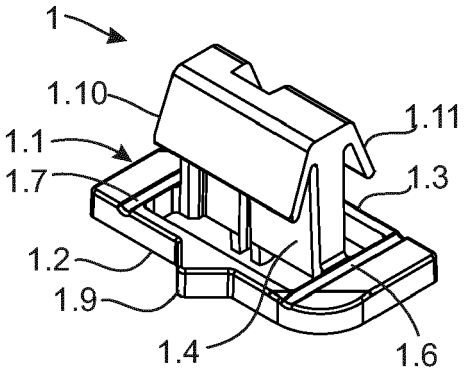


Fig. 1a

EP 3 282 066 A1

Description

Technical field

[0001] This invention relates to a fastening member for elements such as boards. In addition, the invention relates to an arrangement wherein the elements are fastened using such fastening members.

Background

[0002] Decking boards may be used as boards for flooring such as a terrace. The flooring may also be called as decking. Fastening of the decking boards and/or railstep boards may be implemented by screwing screws through the elements to a supporting structure. Such supporting structure may also be called as a substructure. Screws, while penetrating through the elements may both deteriorate the visual appearance and also provide a leakage for fluids, e.g. water, and moisture to penetrate into the element. This may reduce the service life of decking boards.

Summary

[0003] There is disclosed embodiments of a fastening member for fastening elongated elements. There is further disclosed an arrangement wherein elements, such as boards, are fastened using one or more fastening members. Additionally, there is disclosed a use of the fastening member for fastening elongated elements. The elongated element, such as a board may comprise one or more grooves. The fastening member comprises a respective extension, adapted to the groove. However, the manufacturing tolerance of the groove is reasonably large. Therefore, in order to fit the fastening member to many grooves have different heights, a part of the fastening member is deformable.

[0004] According to a first aspect there is provided a fastening member comprising

- a foot part adapted to attach the fastening member with a support rail;
- a supporting element attached with the foot part at a first end of the supporting element;
- a first locking section attached with a second end of the supporting element, wherein the first locking section is at an angle with respect to the supporting element and extends towards the foot part; and
- a second locking section attached with a second end of the supporting element, wherein the second locking section is at an angle with respect to the supporting element and extends towards the foot part at another side of the supporting element.

[0005] According to a second aspect there is provided a support rail comprising

- a first groove for receiving fastening members, the first groove comprising:
  - a bottom;
  - two or more longitudinal side walls; and
  - a tongue extending from one end of each side wall;
- a second groove for receiving a fastener, the second groove comprising:
  - a bottom;
  - two or more longitudinal side walls; and
  - a tongue extending from one end of each side wall; and
- one or more holes adapted to receive a protrusion of the fastening member.

[0006] According to a third aspect there is provided a fastener for fixing support rails to each other comprising:

- two side sections at an angle with each other, wherein each side section is adapted to be inserted in a second groove of the support rail;
- each side section comprising a threaded hole for a screw and the screw, wherein the screw is adapted to be screwed against a bottom of the second groove of the support rail to fix the fastener with the support rail.

[0007] According to a fourth aspect there is provided a method for fastening a fastening member to a support rail, the method comprising:

- setting the foot part of the fastening member to the groove of the support rail in a first position;
- rotating the fastening member so that the foot part moves in the groove to a second position and the foot part is partly between the tongue and the bottom of the groove.

[0008] According to a fifth aspect there is provided a flooring comprising:

- a support structure constructed from a plurality of support rails and a plurality of fasteners, said fasteners being adapted to connect two support rails with each other;
- a plurality of fastening members, wherein each fastening member is attached with one support rail; and
- a plurality of decking boards supported by the fastening members in connection with the support structure.

[0009] According to a sixth aspect there is provided a method for forming a flooring comprising:

- forming a support structure by:
    - attaching one or more fasteners to a first set of support rails by inserting a first side section of the fastener to a groove of one support rail of the first set of support rails and fixing the first side section to the groove by a first screw installed to a hole in the first side section of the fastener;
    - attaching the one or more fasteners to a second set of support rail by inserting a second side section of the fastener to a groove of one support rail of the second set of support rails and fixing the second side section to the groove by a second screw installed to a hole in the second side section of the fastener; and
    - inserting a plurality of fastening members to the first set of support rails
- attaching a plurality of decking boards to the support structure by using the fastening members.

Brief description of the drawings

[0010]

Fig. 1a depicts as a perspective view from one direction a fastening member, in accordance with an embodiment;

Fig. 1b depicts a top view of the fastening member of Fig. 1 a;

Fig. 1c depicts as a perspective view from another direction of the fastening member of Fig. 1 a;

Fig. 1d depicts a side view of the fastening member of Fig. 1 a;

Fig. 1e shows an end view of the fastening member of Fig. 1 a;

Fig. 1f depicts another side view of the fastening member of Fig. 1 a;

Fig. 1g depicts a bottom view of the fastening member of Fig. 1 a;

Fig. 2a depicts, in a perspective view, an example of a fastener for attaching two support rails of a support structure to each other and a part of the support rail, in accordance with an embodiment;

Figs. 2b and 2c depict an example of attaching an intermediate support rail between two support rails by using fasteners of Figure 2a, in accordance with an embodiment;

Fig. 2d depicts an example of a support structure for a flooring, in a perspective view, before attaching support rails to each other, in accordance with an embodiment;

Figs. 3a to 3d depict some construction steps of attaching a decking board to the support structure, in accordance with an embodiment;

Fig. 4 depicts a section of a flooring, in accordance with an embodiment;

Fig. 5a depicts as a perspective view, a finished flooring, in accordance with an embodiment;

Fig. 5b depicts a side view of the finished flooring of Figure 5a;

Fig. 6 depicts a support rail in accordance with another embodiment; and

Fig. 7 depicts an example of an anti-skid device attached with the support structure, in accordance with an embodiment.

Detailed description

[0011] In the following embodiments of a fastening member 1, support rails 2 and flooring 3 made by using the fastening members 1 and support rails 2 will be described in more detail. The fastening member 1 may be used for fastening, for example, elongated decking boards 4 such as terrace elements. An elongated terrace element may be used for terrace flooring 3, and may have a length that is considerably (at least ten times) larger than the width. Such elements are generally fastened to a support structure 6. The support structure 6 is generally on another level than the element 4 itself, i.e. the support may e.g. be located under the element 4. The element 4 may be e.g. a panel or a board such as a decking board or a railstep board. Such elements may comprise at least one groove, for example at least two grooves; one on a first edge and another on an opposite edge.

[0012] In accordance with an embodiment, the elements 4 or a part of them may be made of a composite comprising natural fibres and polymer, such as thermoplastic polymer, polyoxymethylen and/or polyolefin such as polyethylene, polypropylene, or copolymer thereof. However, instead of or in addition to composite material, the elements 4 or a part of them may be made of wood, metal or another appropriate material.

[0013] Figure 1a shows in a perspective view from a first direction a fastening member 1, in accordance with an embodiment. Figures 1b-1g show a top view, a perspective view from a second direction, a side view, an end view, another side view, and a bottom view of the fastening member of Fig. 1a, respectively. The fastening member 1 comprises a foot part 1.1 which is adapted to face a groove 2.1 of a support rail 2 when attached with the support rail 2. The foot part 1.1 may be a solid, sheet like structure or it may comprise one or more holes so that two or more bridge-like sections 1.2, 1.3 are formed, as is illustrated in Figures 1 a, 1b and 1 e. The bridge-like sections 1.2, 1.3 may increase flexibility of the foot part 1.1 when desired. In the embodiment of Figures 1a

to 1e of the fastening member 1 a wall 1.4 is formed in the middle of the foot part 1.1 extending upwards from the foot part 1.1. The wall 1.4 need not be a plate like element but may also be constructed of one or more pillars or other supporting elements. The wall 1.4 may have a curved section 1.5 preferably in the middle. Furthermore, in accordance with an embodiment the wall 1.4 is designed so that when the fastening member 1 is installed to a support rail 2 and there is a longitudinal element 4 on both sides of the fastening member 1, one side of the wall 1.4 provides two distant support points to one longitudinal element 4 and one support point (for example by the curved section 1.5) on the other side of the wall to an adjacent longitudinal element 4. Hence, this arrangement may improve flexibility of the wall 1.4 as will be explained later in this specification. The foot part 1.1 may also have two grooves 1.6, 1.7 near both longitudinal edges of the foot part 1.1, a protrusion 1.8 such as a pin, and a guide 1.9.

[0014] In accordance with an embodiment, the curved section 1.5 and the protrusion may be located at the same location but directed to opposite directions with respect to the foot part 1.1. This is illustrated in Figures 1d-1f.

[0015] In the embodiment of Figures 1a to 1d the outer circumference of the foot part 1.1 has two curved sections at opposite corners and two angular sections at other two opposite corners. One purpose of the curved sections is to only allow limited rotation of the fastening element in a groove 2.1 of a support rail 2 (Figures 3a and 3b). For example, the fastening element may only be rotated about 90° in a groove 2.1 of a support rail 2. In other words, when the fastening element 1 is inserted into the groove 2.1, the form and dimensions of the outer circumference of the fastening element 1 may allow rotation in only one direction to set the fastening element 1 from an installation position into a locking position. This is illustrated in Figure 3b. The fastening member 1 on the left is in the installation position and the fastening member 1 on the right is in the locking position. The diagonal from a first corner 1.12 (Figure 1g) to a third corner 1.14 may be sized so that it is longer than the distance between walls 2.3 of the groove 2.1 and the other diagonal from a second corner 1.13 to a fourth corner 1.15 may be sized so that it is shorter than the distance between walls 2.3 of the groove 2.1 but longer than the distance between edges of the tongues 2.4 of the support rail 2. This may be achieved by forming curved corners or by some other means.

[0016] However, the diagonal from a first corner 1.12 to a third corner 1.14 and the other diagonal from a second corner 1.13 to a fourth corner 1.15 may be sized so that they are shorter than the distance between walls 2.3 of the groove 2.1. Hence, even 360° rotation of the fastening element in a groove 2.1 of a support rail 2 may be possible This may be achieved by, for example, forming curved sections at each corner 1.12-1.15.

[0017] Dimensions of the foot part 1.1 of the fastening member 1 are such that in a first position the foot part 1.1 is able to be entered in the groove 2.1 of the support rail 2 and in a second position the foot part 1.1 is not able to be drawn away from the groove 2.1 of the support rail 2. In Figure 3a the fastening element 1 on the top-right corner illustrates this first position and the fastening element 1 on the bottom-left corner illustrates this second position, in accordance with an embodiment.

[0018] The fastening member 1 also comprises a first locking section 1.10 and a second locking section 1.11 at the top of the wall 1.4. The first locking section 1.10 and the second locking section 1.11 are adapted to lock a decking board 4 with the support rail 2. The wall 1.4 keeps the foot part 1.1 at a distance from the first locking section 1.10 and the second locking section 1.11. This distance may depend on the thickness of longitudinal elements 4 for which the fastening member 1 has been designed. In this embodiment the second locking section 1.11 is divided into two parts to improve flexibility of the second locking section 1.11 (marked with references 1.11 a and 1.11 b in Figure 1f). In other words, the locking sections 1.10, 1.11 need not form a single entity but one or both of the first locking section 1.10 and the second locking section 1.11 may comprise two or more subsections. Furthermore, when the curved section 1.5 is located between the subsections 1.11 a, 1.11 b of the second locking section 1.11, the subsections 1.11 a, 1.11 b may be able to bend more compared to the situation in which the second locking section 1.11 were a single-part locking section. In other words, bending of the second locking section 1.11, when not divided into two (or more) parts, could be restricted by the curved section 1.5.

[0019] However, in accordance with another embodiment, the second locking section 1.11 may be formed so that it only comprises one of the two subsections 1.11 a, 1.11b of Figure 1f (.e.g. only the first subsection 1.11a or only the second subsection 1.11 b), wherein the curved section 1.5 may not restrict bending of the second locking section 1.11.

[0020] The second locking section 1.11 is preferably on the same side of the wall 1.2 than the curved section 1.5. The first locking section 1.10 and the second locking section 1.11 are resilient so that they can be bent by an external force and when the force is released they will bend backwards towards the original position. The locking sections 1.10, 1.11 may also be called as claw couplings because they function is similar to a claw coupling when they are used to lock longitudinal elements 4 to support rails 2, as will be explained later in this specification.

[0021] Next, some details of the support rail 2 will be described in more detail with reference to Figures 2a and 2b, in accordance with an embodiment. The support rail 2 has a groove 2.1 for receiving fastening members 1. The groove 2.1 is formed of a bottom 2.2, two longitudinal side walls 2.3 and tongues 2.4 extending from one end of the side walls 2.3. The tongues 2.4 are, for example, substantially parallel to the bottom 2.2 whereas the side walls 2.3 may be perpendicular to the bottom 2.2 or at

another angle with respect to the bottom 2.2. In other words, the side walls 2.3 are not parallel to the bottom 2.2. The side walls 2.3 continue beneath the bottom 2.2 to give more stiffness to the support rail 2 in a longitudinal direction and to make the support rail 2 higher. There may also be a wall 2.5 between another end of the side walls 2.3. The cross section of the support rail 2 need not be exactly similar to the form depicted in Figure 2a. The tongues 2.4 may have a longitudinal shoulder ridge 2.6 for example near the edge of the tongue 2.4. The bottom 2.1 may have through holes 2.7, pits or other such formations at regular intervals. One or both of the tongues 2.4 may have notches 2.11 which may be adapted to receive an edge of the wall 1.4 of the fastening member 1 when the fastening member 1 has been installed in connection with the support rail 2 as illustrated in Figures 3a and 3b. In other words, the edge may be partly in the notch when the fastening member 1 is in the locking position.

[0022] The interval between the holes 2.7 may be selected to correspond the mutual distance of the longitudinal elements 4 in the finished flooring 3. For example, the width of the longitudinal element may be 90 mm, 120 mm or 150 mm and a slit between two adjacent longitudinal elements may be about 5 mm. Hence, the distance between the holes 2.7 might be 95 mm, 125 mm or 155 mm, respectively. In accordance with another embodiment, support rails 2 may be provided with two or more different sets of holes so that each set is meant to be used with different widths of longitudinal elements 4. As an example, one set may comprise holes having mutual distance of 95 mm and another set may comprise holes having mutual distance of 125 mm.

[0023] The holes 2.7 may be formed during manufacturing of the support rails 2 or at a later stage. In the latter case, it may be possible to form small indications on the surface of the groove of the support rail 2 to indicate correct locations for the holes to be drilled later.

[0024] Fastening elements 1 may be attached with the support rail 2 as follows, for example. The fastening element 1 is put above the groove 2.1 at a location of a hole 2.7 of the support rail 2 in the first position. In this example the first position may be deduced on the basis of the direction the guide 1.9 is pointing. For example, the guide 1.9 may point towards a first side wall 2.3 when the fastening member 1 is in the first position. Now, the fastening member 1 can be put on the surface of the groove 2.1 so that the protrusion 1.8 of the fastening member 1 enters the hole 2.7 of the support rail 2. Then, the fastening member 1 can be rotated to a first direction until the fastening member 1 is in the second position. This is illustrated in Figure 3b, where the fastening element on the left is in the first position and the arrow indicates the rotation direction, and the fastening element 1 on the right illustrates a fastening element 1 rotated to the second position, in accordance with an embodiment. In the example of Figures 1a-1e, 3a and 3b the rotation direction is clockwise and the amount of rotation is approximately 90 degrees. In accordance with an embodiment, in the second position the grooves 1.6, 1.7 of the fastening member 1 are at the same location than the shoulder ridges 2.6 of the support rail 2. Thus, the grooves 1.6, 1.7 and the shoulder ridges 2.6 may make it easier to detect when the fastening member 1 is correctly in the second position. For example, they may produce a sound such as a click when the fastening member 1 enters the second position. In this second position both longitudinal edges of the foot part 1.1 are located below the tongues 2.4 of the support rail 2 which prevent drawing the fastening member 1 away from the groove 2.1.

[0025] The fastening member 1 may be released from the support rail 2 by rotating the fastening member 1 into the first position. If the foot part 1.1 of the fastening member 1 has the above described angular sections at two opposite corners, it may only be possible to rotate the fastening member 1 counter-clockwise from the second position to the first position. However, in accordance with an embodiment, the foot part 1.1. has a form which allows both clockwise and counter-clockwise rotation to move the fastening member 1 from the second position to the first position.

[0026] The material of the fastening member 1 may comprise polymer, such as thermoplastic polymer, spring metal or other material which may provide high enough stiffness and dimensional stability. For example, the fastening member 1 may comprise polyoxymethylen and/or polyolefin such as polyethylene, polypropylene, or copolymer thereof. The fastening member may be made of a composite comprising polyolefin and natural fibres. In accordance with an embodiment the whole fastening member is made of the same material.

[0027] Fig. 2a depicts, in a perspective view, an example of a fastener 5 for attaching two support rails 2 of a support structure to each other and Figure 2b shows how the fastener 5 may be installed in connection with the support rail 2, in accordance with an embodiment. The fastener 5 may, for example, be installed in connection with a second groove 2.8 of the support rail 2. The second groove 2.8 may comprise one of the side walls 2.3 as a bottom of the second groove 2.8, two or more longitudinal side walls 2.9 and a tongue 2.10 extending from one end of the side wall 2.9. The fastener 5 has two side sections 5.1 a, 5.1b at an angle with each other, preferably at a right angle. Both side sections 5.1 may have one or more threaded holes 5.2a, 5.2b for a screw 5.3a, 5.3b. The screw 5.3a, 5.3b may be, for example, an allen screw, but also another kinds of screws may be used. In accordance with an embodiment, the screws 5.3a, 5.3b may have been installed to the threaded holes 5.2a, 5.2b of the support rail 2 in connection with manufacturing the support rail 2 or before providing the support rail 2 for purchasing. Hence, construction persons need not install the screws 5.3 a, 5.3b at a construction site.

[0028] The fastener 5 may be made of steel, aluminium or plastics which is stiff enough so that the side walls 5.1 a, 5.1 b of the fastener 5 will not easily bend with respect

to each other. In other words, the angle between the side walls 5.1 a, 5.1 b of the fastener 5 should not easily change.

[0029] In the following the installation of the flooring 3 will be described in more detail with reference to Figures 2a to 5b, in accordance with an embodiment. Figure 2d shows an example of a support structure 6 for the flooring 3, in a perspective view, before attaching support rails 2 to each other, in accordance with an embodiment. For clarity, this example of Figure 2d shows only three support rails 2a, 2b, 2c with which longitudinal elements 4 will be fastened and two support rails 2d, 2d to be attached with both ends of the three support rails 2a-2c to form the support structure 6. In the following, those three support rails 2a-2c with which longitudinal elements 4 will be fastened will also be called as transversal support rails because they are substantially in a transversal direction with respect to the longitudinal elements 4, and, respectively, those support rails 2d, 2e which will be attached to the ends of the transversal support rails 2a-2c will also be called as longitudinal support rails.

[0030] It should be noted here that the number of transversal support rails 2a-2c may be different from three and the number of longitudinal support rails 2d, 2e may be different from two in practical implementations. Also the length and other dimensions of the parts of the support structure 6 and longitudinal elements 4 may vary.

[0031] The support rails 2a-2e may be prepared on a desk or on another applicable work stand so that the working position of a worker may be convenient for the worker. For example, fastening members 1 may be attached with the transversal support rails 2a-2c at appropriate locations and fasteners 5 may be fixed to the longitudinal support rails 2d, 2e at appropriate locations. Hence, the parts of the support structure may look like as is illustrated in Figure 2d. However, the fasteners 5 may alternatively be fixed at both ends of the transversal support rails 2a-2c.

[0032] Next, the prepared support rails 2a-2e may be positioned to the place where the flooring 3 will be located. There may be some kind of foundations on a ground or the support structure 6 may be located upon a ground, a floor or some other flat base. The support rails 2a-2e may be assembled to each other for example as follows. First, the transversal support rails 2a-2c are positioned to correct locations. Then, one longitudinal support rail 2d is attached with one end of the transversal support rails 2a-2c so that the other, free side section 5.1 of the fastener 5 will enter the groove of the transversal support rail 2a-2c. The screws 5.3 of the other side section 5.1 may now be screwed in so that the tip of the screws 5.3 become in contact with the bottom of the groove of the transversal support rail 2a-2c. The other longitudinal support rail 2e may be attached with the other end of the transversal support rails 2a-2c in the same way. Hence, the longitudinal support rails 2d, 2e are fixed with the transversal support rails 2a-2c and quite a stiff support structure 6 for the flooring 3 has been obtained. In accordance with an embodiment, the tip of the screw 5.3 is conical.

[0033] In the following the usage of the fastening member 1 to install elements 4 to support rails 2 will be described in more detail with reference to Figures 4, 5a and 5b. Setting-up of the longitudinal elements 4 may be started from one end of the support structure 6. There may be special fastening elements 8 (Figure 4) at this end because there will not be another longitudinal element 4 on the other side of the fastening member. Figure 4 shows examples of such fastening members 1 a, 1 b for a higher profile support rails and for a lower profile support rails, respectively, in accordance with an embodiment. One edge of a first longitudinal element 4a may be pushed at an angle towards the special fastening element 8. Then, the first longitudinal element 4a may be pushed downwards towards the transversal support rail 2a-2c. Due to the force created by pushing the first longitudinal element 4a towards the first locking section 1.10 of the fastening elements 1, the first locking section 1.10 bends and allows the other end of the first longitudinal element 4a fall down towards the surface of the transversal support rail 2a-2c. When the upper surface of the tongue 4.2 of the first longitudinal element 4a is below the lower edge of the first locking section 1.10, the first locking section 1.10 is not anymore affected by the force and thus may bend backwards to the original position. At this stage at least the lower edge of the first locking section 1.10 is inside the groove 4.1 of the first longitudinal element 4a and prevents the first longitudinal element 4a rising upwards. In other words, the first longitudinal element 4a is locked to the transversal support rail 2a-2c by the first locking section 1.10. This operation may be repeated to each fastening member 1 along the longitudinal element 4. For example, the operation described above may be started from one end of the longitudinal element 4 and after that the installer (or another person) may walk on the longitudinal element 4 to the other end, wherein due to the weight of the person the remaining part of the longitudinal element 4 will be pushed towards the support rails 2 and locked by the fastening members 1.

[0034] The next element 4 i.e. the second longitudinal element 4b may be installed beside the first longitudinal element 4a quite in the same way. One edge of the second longitudinal element 4b is pushed towards wall 1.4 of fastening members 1 so that the edge of the second longitudinal element 4b touches the wall 1.4. Then, the second longitudinal element 4a may be pushed downwards towards the transversal support rail 2a-2c. The first locking section 1.10 bends and allows the other end of the second longitudinal element 4b fall down towards the surface of the transversal support rail 2a-2c. When the upper surface of the tongue 4.2 of the second longitudinal element 4b is below the lower edge of the first locking section 1.10, the first locking section 1.10 is not anymore affected by the force and thus may bend backwards to the original position. At this stage the lower edge of the first locking section 1.10 is inside the groove 4.1

of the second longitudinal element 4b and the lower edge of the second locking section 1.11 is inside the other groove 4.2 of the second longitudinal element 4b and thus prevent the second longitudinal element 4b rising upwards. In other words, the second longitudinal element 4b is locked to the transversal support rail 2a-2c by the first locking section 1.10 and the second locking section 1.11.

[0035] The next element 4 i.e. the third longitudinal element 4c may be installed beside the first longitudinal element 4 quite in the same way. This procedure may be repeated until all longitudinal elements 4 has been installed to the support structure 6. The last element may be different from the other elements if the outer edge of the flooring 3 remains visible. Then, an element 7 having a top surface and a side surface may be used. An example of such element 7 is illustrated in Figures 5a and 5b. When such an element 7 is used, it may need to be fixed to the other support rail 2a with additional fastening member, which may differ from the fastening member 1. For example, a clip (not shown) may be used at the other (lower) edge of the element 7, which fixes the lower edge with the support rail 2a. It may also be possible to use this kind of a special element 7 or another kind of special element in one or more other ends of the flooring 3. For example, in the example of Figure 5a, the bottom and/or top ends of the elements 4 may be covers by such a special element 7, or they may remain visible as in Figure 5a.

[0036] Figure 3c illustrates when an element 4 is pushed towards the fastening member 1, and Figure 3d illustrates when the element 4 has been pushed between two fastening members 1 to the surface of the support rail 2.

[0037] Instead of the groove 1.6, 1.7 in the fastening element 1 and the shoulder ridge 2.6 in the support rail 2, the fastening element may comprise a shoulder ridge and the support rail 2 may comprise a corresponding groove. Furthermore, instead of or in addition to the groove and shoulder ridge -pair it may be possible to use a pit and a corresponding tip -pair in the fastening element 1 and the support rail 2 to provide similar mutual operation.

[0038] Releasing an elongated element 4 from the flooring 3 may be performed, for example, as follows. A screwdriver, a plate or another appropriate tool is put in the slit between the upper tongue of the longitudinal element 4 and the first locking section 1.10 of the fastening member 1 at one end of the longitudinal element 4. Another screwdriver, a plate or another appropriate tool is put in the slit between the upper tongue of the longitudinal element 4 and the first locking section 1.10 of the adjacent fastening member 1. Then, the edge of the longitudinal element 4 is lifted by the first tool and simultaneously the second tool is used to bent the first locking section 1.10 of the adjacent fastening member 1 so that the longitudinal element 4 is no longer locked by the first locking section 1.10 of the adjacent fastening member 1 and the edge of the longitudinal element 4 can be lifted upwards. This operation may be repeated to the remaining fastening members 1 along the length of the longitudinal element 4 until the longitudinal element 4 is fully released from the support structure.

[0039] By using the fastening members 1 described above it is possible to install and releasing the elements 4 without screwing. Only the construction of the support structure and possibly the foundations may need to use screws and screwing.

[0040] The fastening member 1 described above may also decrease possible effects due to thermal expansion of the elements 4. If an element 4 is slightly expanded due to temperature changes, the width of the element may change. If the width increases, the edge of the tongue 4.2 of the element 4 (Figure 3d) moves towards the fastening member 1 and may push the protrusion 1.9. Due to the flexibility of the protrusion and/or the wall 1.2, the protrusion 1.9 and/or the wall 1.2 may slightly move. However, the movement does not affect to the next element because the locking section 1.10, 1.11 which is towards the adjacent element is also capable of bending when necessary.

[0041] Thermal expansion may also affect the length of the elements 4. The fastening members 1 are not screwed or attached with an adhesive with the elements 4, wherein the fastening members 1 allow the elements to slightly "slide" in the longitudinal direction. To better assure that the mutual location of the longitudinal elements 4 does not significantly change in the long run due to the thermal expansion and shrinkage, some means may be provided. For example, a tape 9 (Figures 3a and 3b) having a frictional surface may be fixed on one transversal support rail 2a-2c, wherein the elements 4 are installed on the frictional surface of the tape 9. An advantageous location for such tape 9 is in the middle of the elements 4 in the longitudinal direction i.e. on the surface of the transversal support rail 2b in the middle of the support structure, a tape having a surface with less friction may be attached with the other transversal support rails 2a, 2c to improve the slideability of the elements 4 on the surface of the support rails 2. This kind of arrangement may assure that the middle of the elements 4 remains at substantially the same location despite of the thermal expansion whereas the ends of the elements 4 may move more easily.

[0042] The tape may also improve the locking effect because the tape may be slightly elastic so that it can be compressed when inserting an element under the locking section 1.10, 1.11 and decompressed when the element 4 has been inserted. Moreover, manufacturing tolerances of the elements 4 may cause that the height of the tongue of the element 4 may vary in the longitudinal direction of the element 4. Thus, the tape may reduce a possible effect of this variation.

[0043] In accordance with an embodiment, one or more pieces of tape may be installed on one or more support rails 2a-2c to dampen sound i.e. to be used as

a sound insulation irrespective of whether the above mentioned friction effect is utilized or not.

[0044] In accordance with an embodiment, one or more anti-skid devices 10 may be used to prevent or reduce sliding of the elements 4, as is illustrated in Figure 7. The anti-skid device 10 may comprise a bottom section 10.1 and one or more side sections 10.2a, 10.2b. The side section(s) 10.2a, 10.2b may have a toothed edge or similar structure which is adapted to make a contact with the element 4 which is installed above the anti-skid device 10. Hence, the toothed edge grips to the bottom surface of the element 4 and therefore prevents or at least reduces lateral movement of the element 4 with respect to the support rail 2. The anti-skid device 10 may be attached with the support rail 2 with one or more screws, for example.

[0045] In the following some examples will be provided.

[0046] In accordance with a first example there is provided a fastening member (1) comprising:

- a foot part (1.1) adapted to attach the fastening member with a support rail (2);
- a supporting element (1.4) attached with the foot part (1.1) at a first end of the supporting element (1.4);
- a first locking section (1.10) attached with a second end of the supporting element (1.4), wherein the first locking section (1.10) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1); and
- a second locking section (1.11) attached with a second end of the supporting element (1.4), wherein the second locking section (1.11) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1) at another side of the supporting element (1.4).

[0047] In some embodiments the second locking section (1.11) comprises at least two separate subsections.

[0048] In some embodiments the fastening member (1) further comprises:

- a protrusion (1.8) in the foot part (1.1) directed to an opposite direction than the supporting element (1.4) and adapted to be positioned in a hole (2.7) of the support rail (2).

[0049] In some embodiments of the fastening member (1) the foot part (1.1) comprises:

- a first section (1.2); and
- a second section (1.3);

wherein the first end of the supporting element (1.4) is located between the first section (1.2) and the second section (1.3), and further wherein the foot part (1.1) comprises one or more holes between the first section (1.2) and the first end of the supporting element (1.4) and between the first end of the supporting element (1.4) and the second section (1.3) to increase flexibility of the foot part (1.1).

[0050] In some embodiments of the fastening member (1) an outer circumference of the foot part (1.1) has two curved sections at diagonally opposite corners (1.12, 1.14) and two angular sections at other two diagonally opposite corners (1.13, 1.15).

[0051] In some embodiments of the fastening member (1) the supporting element (1.4) of the foot part (1.1) comprises:

- a curved section (1.5) to increase flexibility of the supporting element (1.4).

[0052] In some embodiments of the fastening member (1) the foot part (1.1) comprises:

- a groove (1.6, 1.7) near a longitudinal edge of the foot part (1.1) adapted to receive a tongue (2.4) of a side wall (2.3) of the support rail (2).

[0053] In accordance with a second example there is provided a support rail (2) comprising:

- a first groove (2.1) for receiving fastening members (1), the first groove comprising:
  - a bottom (2.2);
  - two or more longitudinal side walls (2.3); and
  - a tongue (2.4) extending from one end of each side wall (2.3);
- a second groove (2.8) for receiving a fastener (5), the second groove comprising:
  - a bottom (2.3);
  - two or more longitudinal side walls (2.9); and
  - a tongue (2.10) extending from one end of each side wall (2.9); and
- one or more holes (2.7) adapted to receive a protrusion (1.8) of the fastening member (1).

[0054] In some embodiments the support rail (2) comprises:

- a hole (2.7) adapted to receive a protrusion (1.8) of the fastening member (1).

[0055] In some embodiments of the support rail (2) one of the two or more longitudinal side walls (2.3) forms the bottom of the second groove (2.8).

[0056] In some embodiments of the support rail (2) at least one of the tongues (2.4) comprises:

- a notch (2.11) adapted to receive an edge of the wall (1.4) of the fastening member (1).

[0057] In accordance with a third example there is provided a fastener (5) for fixing support rails (2) to each other comprising:

- two side sections (5.1) at an angle with each other, wherein each side section (5.1) is adapted to be inserted in a second groove of the support rail (2);
- each side section (5.1) comprising a threaded hole (5.2) for a screw (5.3) and the screw (5.3), wherein the screw (5.3) is adapted to be screwed against a bottom of the second groove of the support rail (2) to fix the fastener with the support rail (2).

[0058] In some embodiments of the fastener (5) a tip of the screw (5.3) is conical.

[0059] In accordance with a fourth example there is provided a method for fastening a fastening member (1) according to the first example to a support rail (2) according to the second example, the method comprising:

- setting the foot part (1.1) of the fastening member (1) to the groove (2.1) of the support rail (2) in a first position;
- rotating the fastening member (1) so that the foot part (1.1) moves in the groove (2.1) to a second position and the foot part (1.1) is partly between the tongue (2.4) and the bottom (2.2) of the groove (2.1).

[0060] In some embodiments of the method setting the foot part (1.1) to the groove (2.1) comprises:

- setting the protrusion (1.8) of the foot part (1.1) into a hole (2.7) of the support rail (2);

[0061] In some embodiments of the method rotating the fastening member (1) comprises:

- rotating the fastening member (1) until a groove (1.6, 1.7) of the foot part (1.1) is at the location of and parallel to a longitudinal shoulder ridge (2.6) of the support rail (2).

[0062] In accordance with a fifth example there is provided a flooring (3) comprising:

- a support structure (6) constructed from a plurality of support rails (2) according to the second example and a plurality of fasteners (5) according to the third example, said fasteners (5) being adapted to connect two support rails (2) with each other;
- a plurality of fastening members (1) according to any of the claims 1 to 7, wherein each fastening member (1) is attached with one support rail (2); and
- a plurality of decking boards (4) supported by the fastening members (1) in connection with the support structure (6).

[0063] In some embodiments of the flooring (3) the plurality of decking boards (4) comprises decking boards (4) made of a composite comprising natural fibres and polymer.

[0064] In some embodiments of the flooring (3) an upper surface of one or more support rails (2) has increased friction.

[0065] In some embodiments of the flooring (3) the upper surface of one or more support rails (2) has a tape the friction of which is higher than the friction of the upper surface of the one or more support rails (2).

[0066] In some embodiments of the flooring (3) an upper surface of one or more support rails (2) has decreased friction.

[0067] In some embodiments of the flooring (3) the upper surface of one or more support rails (2) has a tape the friction of which is smaller than the friction of the upper surface of the one or more support rails (2).

[0068] In some embodiments of the flooring (3) the flooring (3) is a flooring of a terrace.

[0069] In accordance with a sixth example there is provided a method for forming a flooring (3) comprising:

- forming a support structure (3) by:
  - attaching one or more fasteners (5) of the third example to a first set of support rails (2) of the second example by inserting a first side section (5.1 a) of the fastener (5) to a groove (2.8) of one support rail (2) of the first set of support rails (2) and fixing the first side section (5.1 a) to the groove (2.8) by a first screw (5.3a) installed to a hole (5.2a) in the first side section (5.1 a) of the fastener (5);
  - attaching the one or more fasteners (5) to a second set of support rail (2) by inserting a second side section (5.1b) of the fastener (5) to a groove (2.8) of one support rail (2) of the second set of support rails (2) and fixing the second side section (5.1b) to the groove (2.8) by a second screw (5.3b) installed to a hole (5.2b) in the second side section (5.1 b) of the fastener (5); and
  - inserting a plurality of fastening members (1) of the first example to the first set of support rails (2);
- attaching a plurality of decking boards (4) to the support structure (3) by using the fastening members (1).

[0070] In some embodiments of the method attaching a plurality of decking boards (4) comprises:

- pushing one edge of the decking board (4) towards the fastening member (1) so that an upper surface of a tongue (4.2) of the longitudinal element (4) is below a lower edge of a first locking section (1.10) of the fastening member (1); and
- pushing another edge of the decking board (4) to-

wards the support structure (3) so that an upper surface of another tongue (4.2) of the longitudinal element (4) is below a lower edge of a first locking section (1.10) of the another fastening member (1).

[0071] In some embodiments the method further comprises:

- inserting a tape (9) on an upper surface of one or more support rails (2), the tape (9) having friction higher than the friction of the upper surface of the one or more support rails (2).

[0072] In some embodiments the method further comprises:

- inserting a tape on an upper surface of one or more support rails (2), the tape having friction smaller than the friction of the upper surface of the one or more support rails (2).

Claims

1. A fastening member (1), comprising

- a foot part (1.1) adapted to attach the fastening member with a support rail (2);
- a supporting element (1.4) attached with the foot part (1.1) at a first end of the supporting element (1.4);
- a first locking section (1.10) attached with a second end of the supporting element (1.4), wherein the first locking section (1.10) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1); and
- a second locking section (1.11) attached with a second end of the supporting element (1.4), wherein the second locking section (1.11) is at an angle with respect to the supporting element (1.4) and extends towards the foot part (1.1) at another side of the supporting element (1.4).

2. The fastening member of claim 1, wherein the second locking section (1.11) comprises at least two separate subsections.

3. The fastening member (1) of claim 1 or 2 further comprising:

- a protrusion (1.8) in the foot part (1.1) directed to an opposite direction than the supporting element (1.4) and adapted to be positioned in a hole (2.7) of the support rail (2).

4. The fastening member (1) of claim 1, 2 or 3, the foot part (1.1) comprising:

- a first section (1.2); and
- a second section (1.3);

wherein the first end of the supporting element (1.4) is located between the first section (1.2) and the second section (1.3), and further wherein the foot part (1.1) comprises one or more holes between the first section (1.2) and the first end of the supporting element (1.4) and between the first end of the supporting element (1.4) and the second section (1.3) to increase flexibility of the foot part (1.1).

5. The fastening member (1) of any of the claims 1 to 4, wherein:

- an outer circumference of the foot part (1.1) has two curved sections at diagonally opposite corners (1.12, 1.14) and two angular sections at other two diagonally opposite corners (1.13, 1.15).

6. The fastening member (1) of any of the claims 1 to 5, the supporting element (1.4) of the foot part (1.1) comprising:

- a curved section (1.5) to increase flexibility of the supporting element (1.4).

7. The fastening member (1) of any of the claims 1 to 6, the foot part (1.1) comprising:

- a groove (1.6, 1.7) near a longitudinal edge of the foot part (1.1) adapted to receive a tongue (2.4) of a side wall (2.3) of the support rail (2).

8. A support rail (2) comprising

- a first groove (2.1) for receiving fastening members (1), the first groove comprising:
  - a bottom (2.2);
  - two or more longitudinal side walls (2.3); and
  - a tongue (2.4) extending from one end of each side wall (2.3);
- a second groove (2.8) for receiving a fastener (5), the second groove (2.8) comprising:
  - a bottom (2.3);
  - two or more longitudinal side walls (2.9); and
  - a tongue (2.10) extending from one end of each side wall (2.9); and
- one or more holes (2.7) adapted to receive a protrusion (1.8) of the fastening member (1).

9. The support rail (2) according to claim 8 comprising:

- a hole (2.7) adapted to receive a protrusion (1.8) of the fastening member (1).

10. The support rail (2) according to claim 8 or 9, wherein one of the two or more longitudinal side walls (2.3) forms the bottom of the second groove (2.8).

11. The support rail (2) according to claim 8, 9 or 10, wherein at least one of the tongues (2.4) comprising:

- a notch (2.11) adapted to receive an edge of the wall (1.4) of the fastening member (1).

12. A fastener (5) for fixing support rails (2) to each other comprising:

- two side sections (5.1) at an angle with each other, wherein each side section (5.1) is adapted to be inserted in a second groove (2.9) of the support rail (2);
- each side section (5.1) comprising a threaded hole (5.2) for a screw (5.3) and the screw (5.3), wherein the screw (5.3) is adapted to be screwed against a bottom (2.3) of the second groove (2.8) of the support rail (2) to fix the fastener (5) with the support rail (5).

13. A method for fastening a fastening member (1) according to any of the claims 1 to 7 to a support rail (2) according to any of the claims B1 to B4, the method comprising:

- setting the foot part (1.1) of the fastening member (1) to the groove (2.1) of the support rail (2) in a first position;
- rotating the fastening member (1) so that the foot part (1.1) moves in the groove (2.1) to a second position and the foot part (1.1) is partly between the tongue (2.4) and the bottom (2.2) of the groove (2.1).

14. The method according to claim 13, wherein setting the foot part (1.1) to the groove (2.1) comprises:

- setting the protrusion (1.8) of the foot part (1.1) into a hole (2.7) of the support rail (2);

15. The method according to claim 13 or 14, wherein rotating the fastening member (1) comprises:

- rotating the fastening member (1) until a groove (1.6, 1.7) of the foot part (1.1) is at the location of and parallel to a longitudinal shoulder ridge (2.6) of the support rail (2).

16. A flooring (3) comprising:

- a support structure (6) constructed from a plurality of support rails (2) of any of the claims 8 to 11 and a plurality of fasteners (5) of claim 12, said fasteners (5) being adapted to connect two support rails (2) with each other;
- a plurality of fastening members (1) according to any of the claims 1 to 7, wherein each fastening member (1) is attached with one support rail (2); and
- a plurality of decking boards (4) supported by the fastening members (1) in connection with the support structure (6).

17. The flooring (3) according to claim 16, wherein the plurality of decking boards (4) comprises decking boards (4) made of at least one of:

- a composite comprising natural fibres and polymer;
- wood;
- metal.

18. The flooring (3) according to claim 16 or 17, wherein an upper surface of one or more support rails (2) has increased friction.

19. A method for forming a flooring (3) comprising:

- forming a support structure (3) by:

  - attaching one or more fasteners (5) of claim 12 to a first set of support rails (2) of any of the claims 8 to 11 by inserting a first side section (5.1 a) of the fastener (5) to a groove (2.8) of one support rail (2) of the first set of support rails (2) and fixing the first side section (5.1 a) to the groove (2.8) by a first screw (5.3a) installed to a hole (5.2a) in the first side section (5.1 a) of the fastener (5);
  - attaching the one or more fasteners (5) to a second set of support rail (2) by inserting a second side section (5.1b) of the fastener (5) to a groove (2.8) of one support rail (2) of the second set of support rails (2) and fixing the second side section (5.1b) to the groove (2.8) by a second screw (5.3b) installed to a hole (5.2b) in the second side section (5.1 b) of the fastener (5); and
  - inserting a plurality of fastening members (1) of any of the claims 1 to 7 to the first set of support rails (2);

- attaching a plurality of decking boards (4) to the support structure (3) by using the fastening members (1).

20. The method according to claim F1, wherein attaching

a plurality of decking boards (4) comprises:

- pushing one edge of the decking board (4) towards the fastening member (1) so that an upper surface of a tongue (4.2) of the longitudinal element (4) is below a lower edge of a first locking section (1.10) of the fastening member (1); and
- pushing another edge of the decking board (4) towards the support structure (3) so that an upper surface of another tongue (4.2) of the longitudinal element (4) is below a lower edge of a first locking section (1.10) of the another fastening member (1).

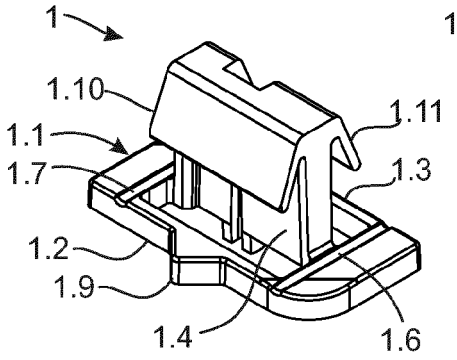


Fig. 1a

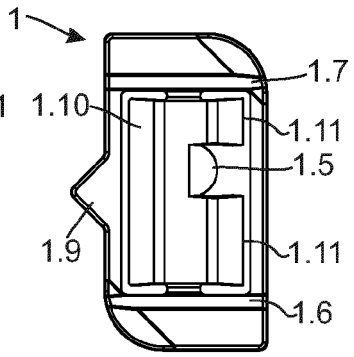


Fig. 1b

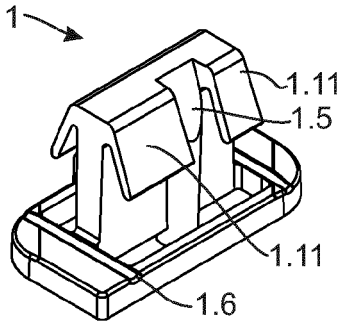


Fig. 1c

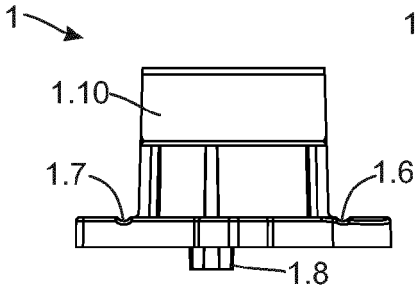


Fig. 1d

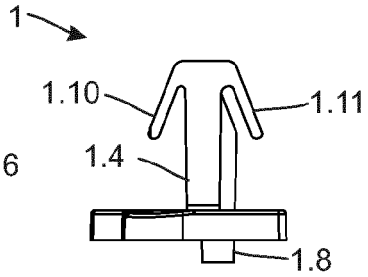


Fig. 1e

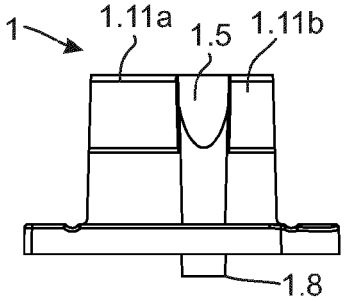


Fig. 1f

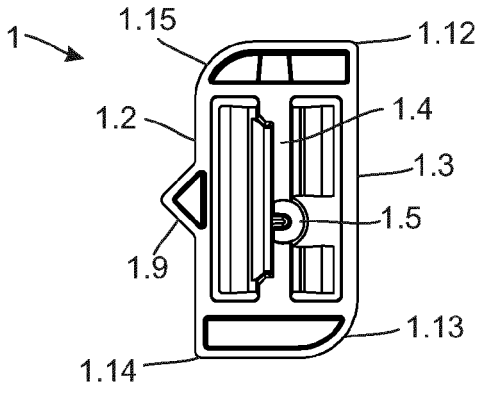
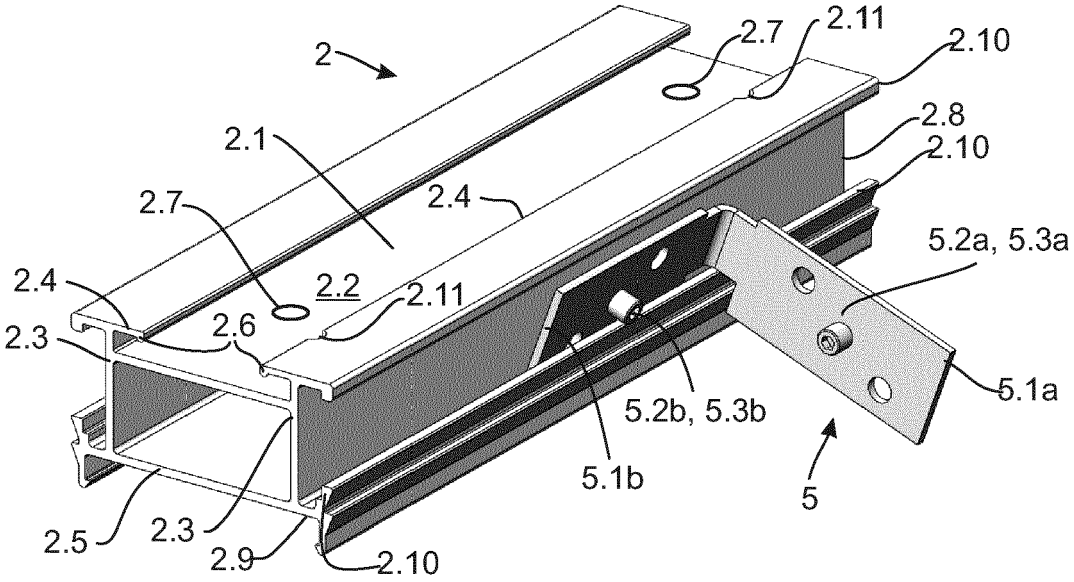


Fig. 1g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2.8
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2.1
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2.3
5.2a, 5.3a
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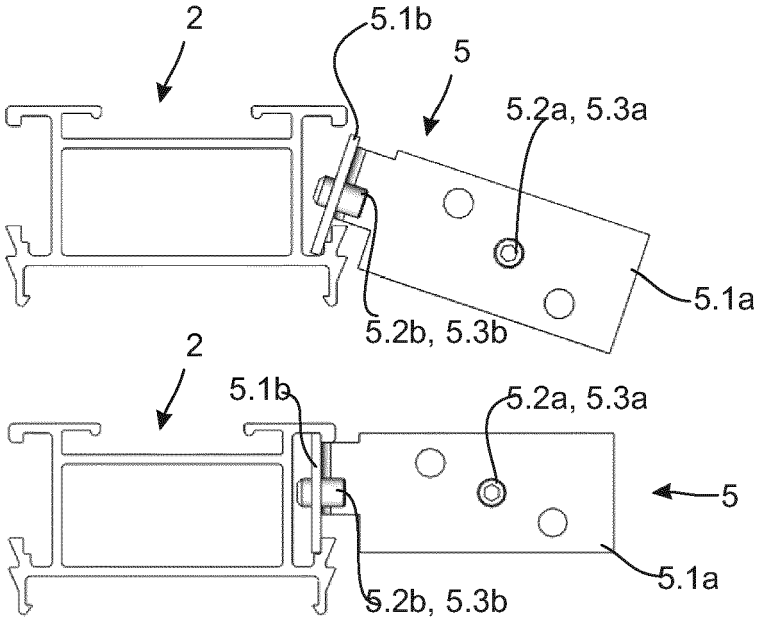
5.1b
5
2.5
2.3
2.9
2.10

Fig. 2a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5.1a
5.2b, 5.3b

Fig. 2b

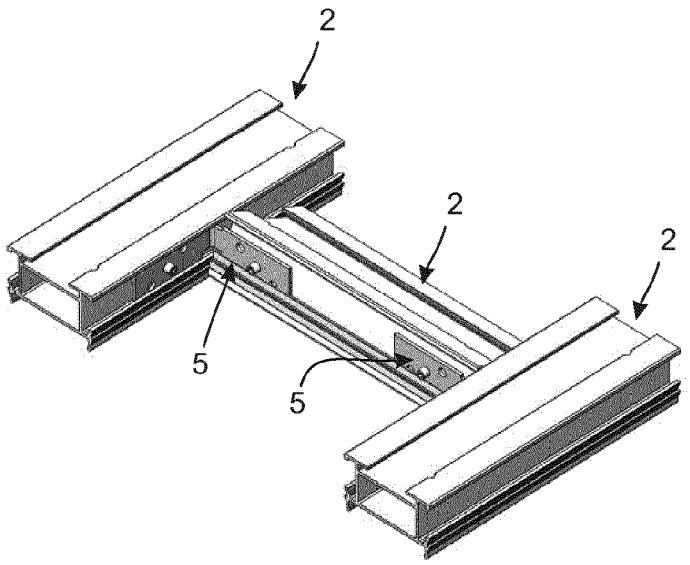

Fig. 2c

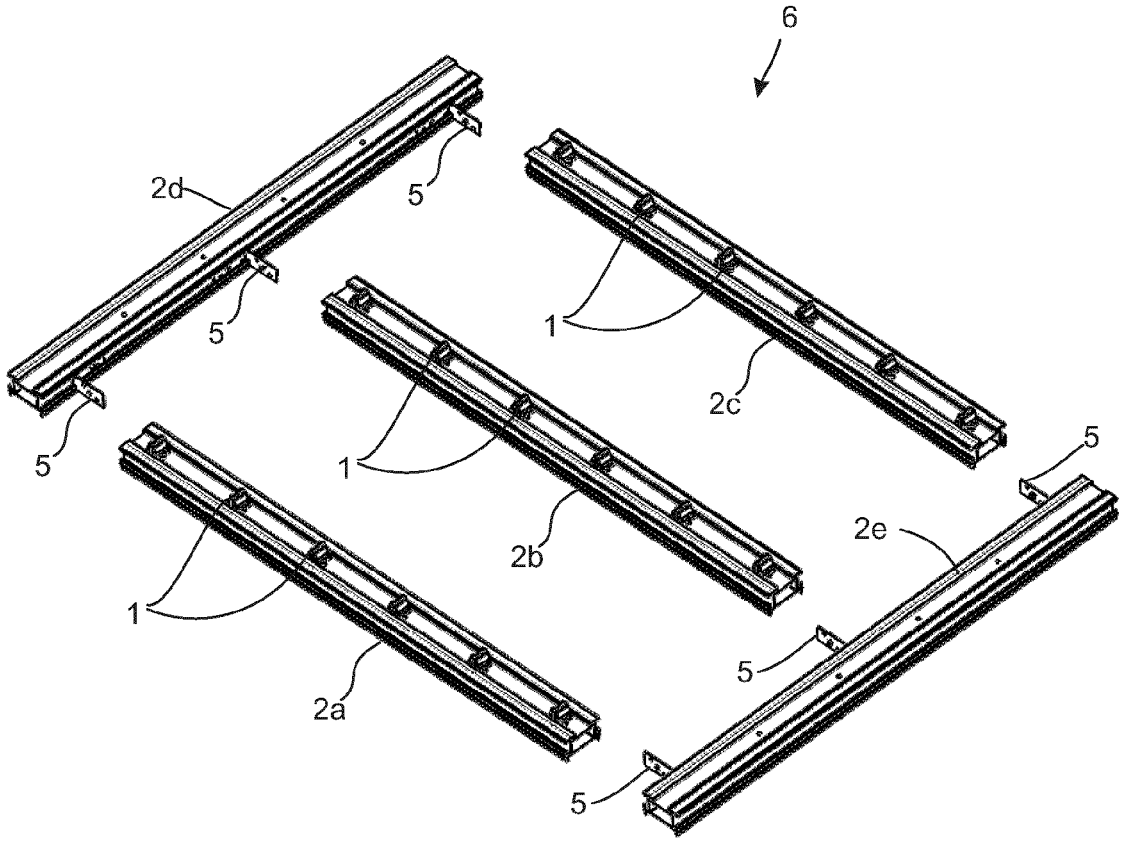

Fig. 2d

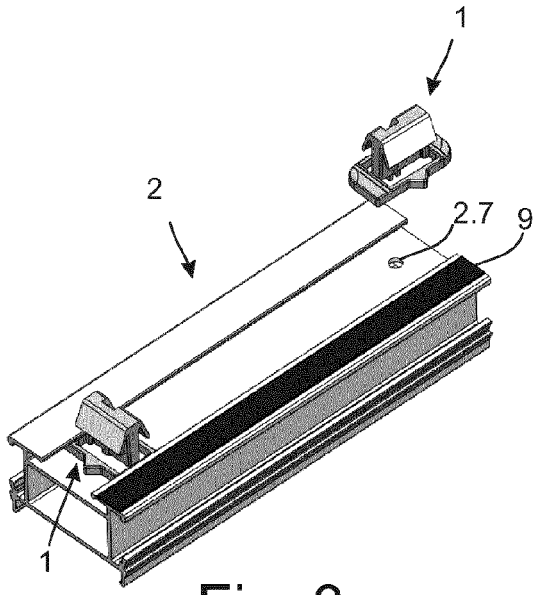

Fig. 3a

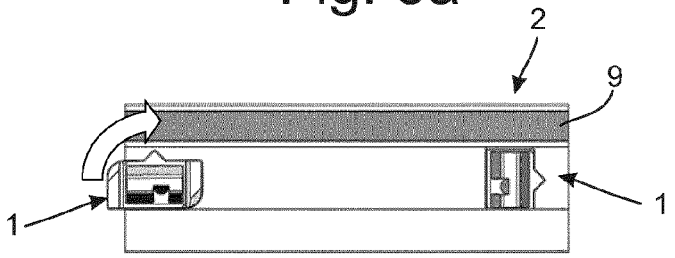

Fig. 3b

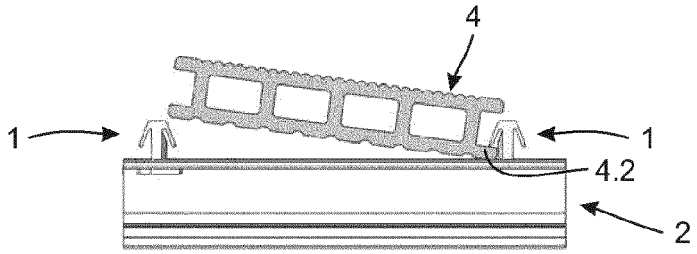

Fig. 3c

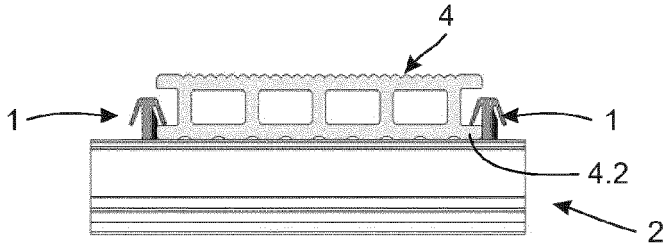

Fig. 3d

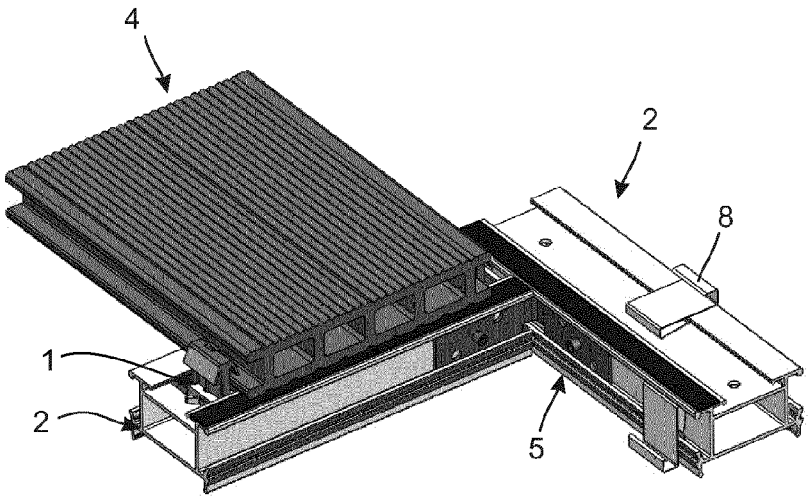

Fig. 4

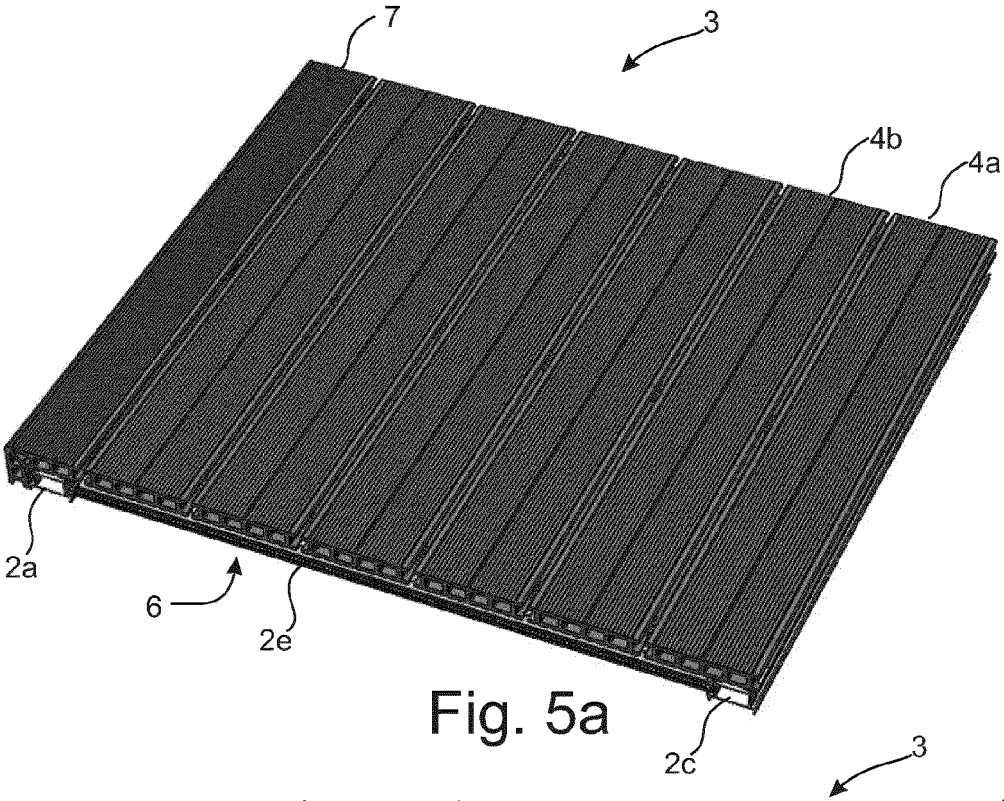

Fig. 5a

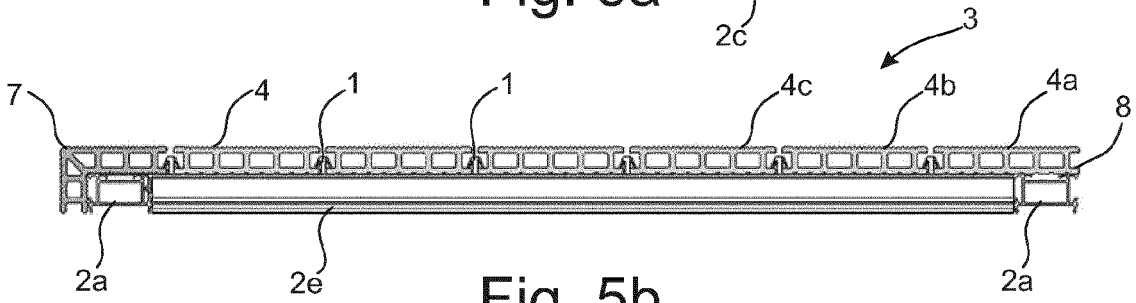

Fig. 5b

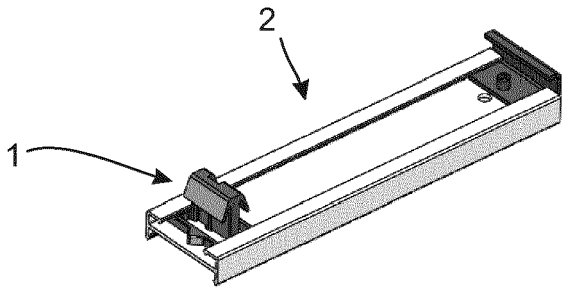

Fig. 6

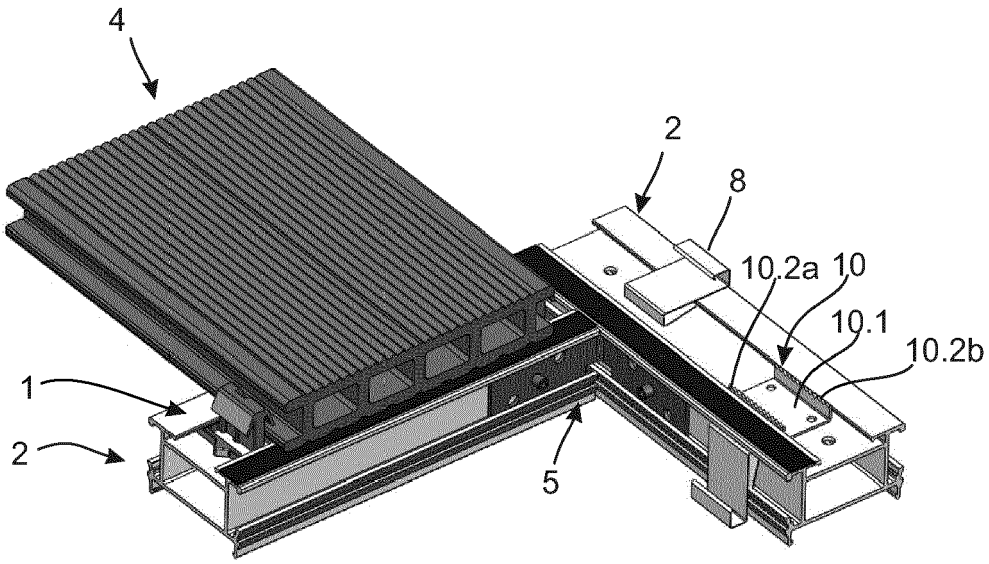

Fig. 7

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EUROPEAN SEARCH REPORT

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Place of search	Date of completion of the search	Examiner
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