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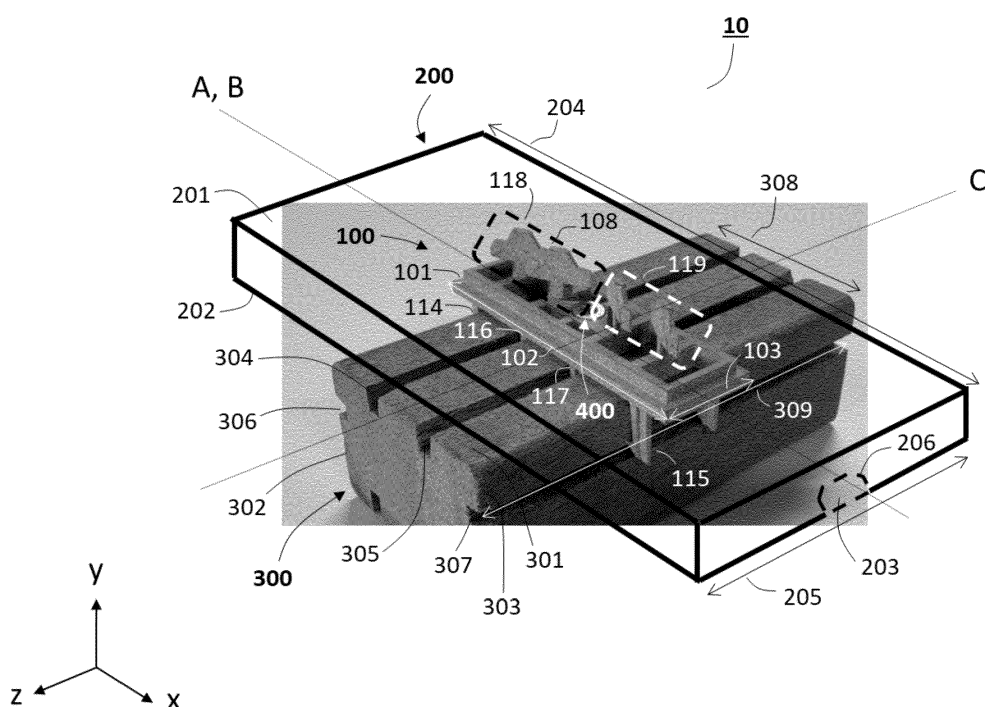
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(54) **INTERCONNECTING SYSTEM AND METHOD**

(57) A connector (100) for attaching a board (200) to a beam (300) of a support structure, in particular to form a platform comprising a plurality of juxtaposed boards, said connector (100) comprising a base (101) having a length (102), a width (103), two ends (104, 105) and two sides (106, 107), wherein on a first side (106) one or more protrusions (108) are provided for engaging with a corresponding clipping element such as an elongated slot

(203) of said board (200), and wherein on a second side (107) extensions (114, 115, 116, 117) are provided for engaging with a corresponding groove (304, 305, 306, 307) of said beam (300) or for clamping said beam (300), characterized in that said extensions comprise a first type of extensions (114, 115) and a second type of extensions (116, 117), wherein said first and second type of extensions are different.

Figure 1



Description

Technical field

[0001] This disclosure relates to an interconnecting system, in particular a connector and corresponding method for attaching boards or planks to a support structure. A plurality of planks or boards, for example made of wood, plastic or a wood-plastic composite material, can be arranged substantially parallel to each other to form a large extended surface e.g. for a flooring application, including for instance outdoor decks, floor coverings or floor claddings, walls or fences, wall coverings or cladding, ceiling claddings, etc.

Background of the invention

[0002] Traditional fasteners such as screws or bolts are often used to attach boards or planks to a support structure, which may be formed by interspaced beams extending parallel to each other and provided perpendicular or transverse to the boards. Holes are typically drilled into the boards before they are tightly screwed onto the beams of the support structure. Appropriate instruments are required, while the work itself is rather labor intensive and prone to errors. Such plank attachment by screwing is long and tedious, whereas the screwing operations having to be done individually. A lot of screws and thus screwing operations may be involved in order to avoid play leading to movement or for example rotation (around a screwing axis) of the boards or planks. Further drawback of this type of assembly is aesthetic. It often comprises imperfection in that for example the screws remain visible on the surface of the planking or resulting floor. Moreover, in some cases, screw heads or splinters from the drilling may even protrude which is highly unwanted.

[0003] However, alternative attachment systems have been proposed already in order to counteract one or more of the above mentioned issues of traditional planking. Traditional fasteners have been replaced by more invisible and/or embedded fasteners. Although they usually have a nicely improved appearance, they may require precise measurements and pre-drilling which still may lead to intensive work or activity.

[0004] Further evolved fasteners are for example snap-fit connectors, onto which boards having preformed channels or slots can be clipped. Such connectors can be made from an elastic material, intended to be fastened to the beams of the support structure, in addition to being connected with the boards. Although they may have serious advantages over the traditional systems and methods, the clipping can cause difficulties, e.g. whereas the boards may accidentally be pushed out of place in the longitudinal direction of the boards, which can be very dangerous.

[0005] In summary, the planking connecting system has to result in a well-fixed attachment without having

the risk to spontaneously detach after a while. On the other hand, it may be practical and even desirable to still be able to detach the boards and dismantle the planking again whenever appropriate, for example in case of terrace flooring applications (e.g. maintenance, change due to weather conditions winter/summer). As well as attaching, such detaching has to be simple and easy while maintaining a good fixture when the boards are assembled. Moreover, the material and design of the connecting system should be adapted to regularly attach and detach while being resistant to wear.

[0006] The following references from the art relate to modern planking connecting systems. For example, US2013025228 relates generally to deck fasteners for securing deck boards together and to a supporting member. More particularly, it relates to a deck fastener which does not protrude from the deck surface. In US2023235568, a fastening system is described for covering elements, wherein the fastening system comprises an anchoring profiled element that can be mounted to a substructure and a clip element that can be mounted to the covering element and latched to the anchoring profiled element. EP4245943 A1 concerns a system for fastening slats to a surface, which comprises an elongated guide with a support surface that can be positioned on top of such surface. The system also comprises sliders that are provided with a locking means (for locking with the slats), and that can slide or glide on and along the length of the guide, on the opposite side of the support surface.

[0007] The above cited documents demonstrate typical examples equipped with a kind of clamping and/or click system, comprising something protruding towards the covering planks or boards on the one hand, and further, something else extending towards the bottom surface on the other hand, such that the above lying planks can be connected to the bottom surface. However, particularly when considering protruding and/or extending elements as described herein, there is room for improvement in providing a simple but effective and solid solution for the interconnecting mechanism.

Aim of the invention

[0008] The aim of the invention is to provide a simple but firm interconnecting system and method for attaching boards to a support structure made of beams, while being able to also easily detach/re-attach the boards on a regular basis. Moreover, the aim is with such simple but firm interconnecting system to use a minimum of screws and hence screwing operations (related to hours of work or labor) while avoiding too much play and hence possible unwanted detach, movement or for example rotation of one or more of the components of the interconnecting system. The interconnecting system and method are intended for forming for example a deck, flooring or platform.

Summary of the invention

[0009] In a first aspect of the invention, a connector is provided for attaching a board to a beam of a support structure, in particular to form a (horizontal) platform comprising a plurality of juxtaposed boards. The connector comprises a base having a length, a width, two ends and two sides (along the length). It is particularly noted that, due to the design or configuration of the connector in accordance with the invention, the length, width, ends and sides of the connector's base can be practically the same or interpreted the same as the length, width, ends and sides of the connector itself. On a first side of the base (or of the connector) one or more protrusions are provided for engaging with a corresponding clipping element such as an elongated slot or channel or recess of the board, whereas on a second side of the base (or of the connector) extensions are provided for engaging with a corresponding groove of the beam or for clamping the beam. It is noted that in case of clamping the beam at least two extensions are provided, i.e. at least one extension at each of two different locations along the length of the connector. These two different locations can be chosen from one or both the ends of the connector, and/or one or two central locations (along the length) of the connector.

[0010] The extensions may comprise an elongated portion protruding from the second side of the base in a downward (vertical) direction. According to an embodiment, the elongated portion is extending in a hook for at least one of the extensions and has an extension axis being rotated with respect to the length of the base such that the hook gets anchored in the corresponding groove.

[0011] One or more of the extensions may be provided at one or both ends of the base or of the connector. One or more of the extensions may be provided at one or more central locations (substantially in the middle) of the base or of the connector. The extensions comprise a first type of extensions and a second type of extensions, wherein the first and second type of extensions are different. It should be noted that the difference in type primarily refers to a different functionality. The variety in functionalities ensure that not only good adhesion and clamping is achieved, but also that the construction is durable and heavy forces or loads are inherently absorbed by the configuration of the connector. It is although not excluded that the extensions also clearly differ in appearance or shape (e.g. in shape such as thick or thin, rod-like or cylinder-like, and/or size such as large or small). The first type of extensions can be large or small extensions but are typically large extensions, and the second type of extensions can be small extensions.

[0012] According to an embodiment, the connector comprises a plurality of extensions, wherein a set of one or two first type of extensions is provided at each end of the base, and/or a set of one or two second type of extensions is provided each at a first central location and at a second central location of the base respectively,

wherein the first and second location are at a distance (along the length of the base) from each other. The first type of extensions can be provided for engaging with a side groove of a side surface of the beam, and/or the second type of extensions can be provided for engaging with an upper groove of an upper surface of the beam.

[0013] The one or more protrusions may comprise an axle portion extending in a (triangular or trapezium-like) fastening portion, wherein the axle portion is protruding from the first side of the base in an upward (vertical) direction, and wherein the axle portion has a protrusion axis being rotated with respect to the length of the base such that the fastening portion of the one or more protrusions gets anchored in the clipping element.

[0014] Parallel with the length of the base, and halfway its width, a central longitudinal axis of the base can be virtually seen or interpreted. According to an embodiment, the connector comprises a plurality of protrusions, each of which comprising a protrusion axis, wherein a first set of protrusions being oriented with their protrusion axis at a first angle with respect to the central longitudinal axis of the base, and a second set of protrusions being oriented with their protrusion axis at a second angle being distinct (or different) from the first angle. The first set of protrusions being oriented with their protrusion axis at the first angle, could be achieved by means of rotating the protrusion axis of each of the protrusions of the first set. For the second set of protrusions each of the protrusion axes are not rotated until the first angle, but instead are rotated until a second angle. Hence, the second angle being distinct (or different) from, or in view of, the first angle. In other words, the second angle being distinct is e.g. a direct consequence of the fact that the protrusion axis of each of the protrusions of the second set is rotated differently as compared to the protrusion axis of each of the protrusions of the first set. It is herewith understood that each of the protrusions axes can be rotated either clockwise or counter clockwise. A convention is made that, whenever rotation is initiated e.g. counter clockwise, we keep rotating counter clockwise, and hence both first and second angles are the result of rotating counter clockwise in this case. Alternatively, a convention could also be made for rotating clockwise instead. The degree of distinction (in angle) or difference in rotation (of protrusion axis) could be for example such that the protrusions of the second set are mirrored (or the second set protrusions appear mirrored) with respect to the protrusions of the first set (or the first set protrusions) in view of the central longitudinal axis. Hence, the second angle for example equals 360° minus the first angle (or equals (in magnitude) the first angle being rotated in the other direction (opposite from the first angle)), or for example equals 180° minus the first angle (in case the protrusions show symmetry with respect to the protrusion axis). However, another difference between the first and second angle is also possible. Having a difference in orientation angle (of the protrusions and protrusion axes) may further emphasize the anchoring of the protrusions in the

clipping element of the board.

[0015] The base can be screwed to the beam. The connector can be detachable from the board by means of disengaging the one or more protrusions from the corresponding clipping element of the board.

[0016] In a second aspect of the invention, a system is provided of attached boards to a support structure made of beams. The system comprises a connector, which is attachable and detachable from the boards. The connector comprises a base having a length, a width, two ends and two sides, wherein on a first side of the base, one or more protrusions are provided for engaging with a corresponding clipping element of the board, and wherein on a second side of the base, at least two different types of extensions are provided for engaging with a corresponding groove of the beam or for clamping the beam. The system is configured such that at least two boards are directly adjacent to each other attached to the support structure by means of the connector (herewith interconnecting), to form a continuous surface, in particular to form a platform, deck or flooring.

[0017] Again, for such system, the base can be screwed to the beam. The connector can be detachable from the board by means of disengaging the one or more protrusions from the corresponding clipping element of the board.

[0018] In a third aspect of the invention, a method is provided for installing a system of attachable and detachable boards to a support structure made of beams by means of a connector (or a plurality hereof). The method comprises (i) providing the connector comprising a base having a length, a width, two ends and two sides, and further comprising one or more protrusions on a first side of the base, and at least two different types of extensions on a second side of the base, (ii) providing the connector onto a beam of the support structure and engaging the one or more extensions with a corresponding groove of the beam and/or clamping the beam, (iii) screwing the connector to the beam, (iv) coupling the connector with a board of the system and engaging the one or more protrusions with a corresponding clipping element of the board, and (v) attaching the connector to the board such that the one or more protrusions are anchored in the clipping element.

[0019] In a fourth aspect of the invention, a use of the method in accordance with third aspect is provided to form a platform, deck or flooring of parallel boards being attached to the support structure, formed by interspaced parallel beams provided perpendicular to the parallel boards.

[0020] In a further aspect of the invention, a method is provided for manufacturing a connector for attaching a board to a beam of a support structure, in particular to form a (horizontal) platform comprising a plurality of juxtaposed boards. The method comprises extruding the connector comprising a base having a length, a width, two ends and two sides, wherein this extruding comprises (i) extruding one or more protrusions on a first

side of the base, and (ii) extruding one or more extensions on a second side of the base.

[0021] In a further aspect of the invention a connector is provided for attaching a board to a beam of a support structure, in particular to form a platform comprising a plurality of juxtaposed boards. The connector comprises a base having a length, a width, two ends and two sides. On a first side of the base protrusions are provided for engaging with a corresponding clipping element such as an elongated slot of the board, whereas on a second side of the base one or more extensions are provided for engaging with a corresponding groove of the beam or for clamping the beam. The base comprises a central longitudinal axis parallel with the length (halfway the width), and the protrusions comprise each a protrusion axis being perpendicular to the central longitudinal axis. Further, a first set of protrusions (or first set protrusions) is oriented with their protrusion axis at a first angle with respect to the central longitudinal axis of the base, and a second set of protrusions (or second set protrusions) is oriented with their protrusion axis at a second angle being distinct (or different) from the first angle. The first set of protrusions being oriented with their protrusion axis at the first angle, could be achieved by means of rotating the protrusion axis of each of the protrusions of the first set. For the second set of protrusions each of the protrusion axes are not rotated until the first angle, but instead are rotated until a second angle. Hence, the second angle being distinct (or different) in view of, or from the first angle. In other words, the second angle being distinct is for example a direct consequence of the fact that the protrusion axis of each of the protrusions of the second set is rotated differently as compared to the protrusion axis of each of the protrusions of the first set. It is herewith understood that each of the protrusions axes can be rotated either clockwise or counter clockwise. A convention is made that, whenever rotation is initiated, for example counter clockwise, we keep rotating counter clockwise, and hence both first and second angles are the result of rotating counter clockwise in this case. On the other hand, a convention could also be made for rotating clockwise instead.

[0022] According to an embodiment, the second angle being distinct from the first angle (i.e. degree of distinction in angle or difference in rotation of protrusion axis) is such that the second set protrusions are mirrored (or they appear mirrored) with respect to the first set protrusions in view of the central longitudinal axis. In other words, the second angle for example equals 360° minus the first angle (or equals (in magnitude) the first angle being rotated in the other direction (opposite from the first angle)), or for example equals 180° minus the first angle (in case the protrusions show symmetry with respect to the protrusion axis). However, another difference or distinction between the first angle and second angle is also possible, and not excluded from this aspect of the invention. Having a difference in angle (of orientation of the protrusion axes of the protrusions respectively) may

further emphasize the anchoring of the protrusions in the clipping element of the board.

[0023] In a further aspect of the invention, a method is provided for installing a system of attachable and detachable boards to a support structure made of beams by means of a connector (or a plurality hereof). The method comprises the following steps: (i) providing the connector comprising a base having a length, a width, two ends and two sides, and further comprising protrusions on a first side of the base, and one or more extensions on a second side of the base, (ii) providing the protrusions, each having a protrusion axis, such that a first set of protrusions is oriented with their protrusion axis at a first angle with respect to the length of the base, and a second set of protrusions is oriented with their protrusion axis at a second angle being distinct (or different) from the first angle, (iii) providing the connector onto a beam of the support structure and engaging the one or more extensions with a corresponding groove of the beam and/or clamping the beam, (iv) screwing the connector to the beam, (v) coupling the connector with a board of the system and engaging the protrusions with a corresponding clipping element of the board, and (vi) attaching the connector to the board such that the protrusions are anchored in the clipping element. The considerations previously made (e.g. see previous aspect of the invention) regarding the angles of orientation of the protrusions' protrusion axes, are herewith also understood.

[0024] Having earlier described the aim of the invention, it is again mentioned that with the invention is sought for a simple but firm way of connecting attachable boards or planks to a support structure made of beams, by means of using a connector or a plurality of connectors there in between. Moreover, the idea herewith is to prevent movement in particular rotation of one of the elements (e.g. connector, beam and/or board) and to prevent bending of the connector. The connector can therefore be provided with small extensions, to avoid rotation for example around an axis perpendicular to the beam and the board respectively, hence along the direction of the extensions. Large extensions with a hook are specifically or deliberately provided to avoid bending of the connector, in particular of its base, although such large extensions may also contribute to preventing rotation. Herewith is indicated that the two types of extensions mentioned (by means of example, meaning that there could be more than two as well according to other embodiments), are clearly differing in functionality, in addition to having them defined as small and large extensions, and hence herewith determining they are also different in appearance, e.g. visually being different in shape or format.

[0025] With the invention a solution is provided comprising one the one hand the codesign of the connector and the base without on the other hand jeopardizing the strength of the beam, herewith taking into account material strength properties and manufacturing possibility. Hence a trade-off has been made for acquiring the in-

ventive solution as herewith presented.

[0026] This disclosure provides various examples, embodiments, and features which, unless expressly stated or which would be mutually exclusive, should be understood to be combinable with other examples, embodiments, or features described herein.

Brief description of the drawings

[0027]

Figure 1 shows in perspective view an embodiment of an interconnecting system comprising a board, a support beam and a connector, in accordance with the invention.

Figure 2 shows in front view an embodiment of a connector provided onto a support beam, in accordance with the invention.

Figure 3 shows (a) an embodiment in side view of a connector attached to a board, and (b) an embodiment of side view technical drawing of such connector, in accordance with the invention.

Figure 4 shows (a) an embodiment of a connector in perspective view, and (b) an embodiment of part of the connector in top view, in accordance with the invention. Figure 4 (c) shows a schematic embodiment of the connector in top view, in accordance with the invention.

Figure 5 shows an embodiment of (a) front view technical drawing of a connector including zoom-in at an extension, and (b) side view technical drawing of the connector, in accordance with the invention.

Figure 6 shows an embodiment of part of an interconnecting system comprising a board, a support beam and a connector, here focusing on the extensions at the end of the connector engaging with a corresponding groove of the support beam, in accordance with the invention.

Figure 7 shows (a) an embodiment of a board provided at its bottom surface with an elongated slot along

a central longitudinal axis of the board, and (b) an embodiment of bottom view of a connector attached to a board, in accordance with the invention.

Figure 8 shows a schematic embodiment of part of the connector (in particular a protrusion thereof) in top view, rotated at (two) different angles, in accordance with the invention.

Detailed description of the invention

[0028] This invention relates to a fastener or connector for attaching or connecting a board, plank or strip of for example wood, or a collection thereof, to a support structure being made of one or more beams of e.g. wood. In a broader aspect, the aim of the invention is to form a deck, flooring, wall or the like including multiple juxtaposed boards or planks, tightly fixed together by means of

the fastener or connector. The design and configuration of the fastener or connector is such that everything is attached to each other firmly but with the necessary clearance. Therefore, the fastener or connector comprises a base portion having on one side one or more protrusions for engaging with slots in the boards or planks, and having on the other side one or more extensions for engaging with grooves in the support structure. The protrusions and extensions engaging in slots and grooves respectively enable a good and sturdy though simple construction of for example wooden flooring. The fastener or connector can be rigid, meaning that there are no intentionally moveable parts, except for the normal bending of the material e.g. related to its flexibility and elasticity. The fastener or connector is designed or configured to produce a detachable connection between on one hand the support structure, defined by one or more support beams, and on the other hand the boards e.g. made of wood. According to an embodiment, the detachable connection is exclusively made to or with the bottom surface of the boards, whereas the connector, in particular its base or base portion, is screwed onto the support structure. In order to avoid rotational movement of the screwed connector in view of the support beam (due to play), the one or more extensions of the connector are provided to engage with grooves of the support structure. In order to avoid bending of the connector, in particular of its base, the one or more extensions of the connector can be configured to clamp in the grooves e.g. by a hook provided at the end of the one or more extensions.

[0029] Alternatively formulated, the invention relates to an interconnecting system, and corresponding method, for use in forming a temporary or permanent surface from a collection of individual panels or boards on top of a support structure. Such surface can be meant for flooring, and hence can be a large extended surface. The interconnecting system can be dismountable or disengageable. The interconnecting system comprises at least one panel, board, plank or strip e.g. of wood, at least one support beam e.g. of wood, and at least one connector e.g. of plastic. In addition to the examples of material mentioned here, i.e. wood and plastic, out which the panel and the support beam, and the connector respectively can be manufactured, it is not excluded from the invention to use also other materials such as for example metal, composite, carbon fiber, fiberboard, cork, linoleum etc. The panel comprises a top surface and a bottom surface. The bottom surface is directed to the connector and the support beam, both provided there below. The panel or board also has one or more channels or slots formed in the bottom surface, wherein the channels or slots are shaped for receipt of the one or more protrusions from the connector. The support beam, further also referred to as beam, comprises an upper surface and two side surfaces, wherein the upper surface is directed to the connector and the panel. The support beam also has grooves formed in the upper surface and/or one or both of the side surfaces, wherein the grooves are shaped for

receipt of the one or more extensions from the connector. The connector comprises a (horizontally oriented) base, having a length and a width and two sides.

[0030] The protrusions are provided on one side of the connector, along its length and at a certain distance from each other. The protrusions are shaped to be received in a disengageable connecting fashion into the channels or slots of the bottom surface of the panels or boards, hence resulting in an anchoring function. According to an embodiment, the protrusions are designed and positioned in a particular configuration for better clamping function in the board slot. In an embodiment, the protrusions have an elongated portion which axis is slightly rotated with respect to the axis of the channels to be engaged with, for better clamping purposes. In a further embodiment thereof, there is a first set of protrusions oriented with their axis at a first angle in view of a central longitudinal axis of the connector and a second set of protrusions oriented with their axis at a second angle being distinct (meaning the protrusion axis has been rotated) in view of the first angle. The degree of distinction in angle (i.e. first angle differing from second angle) or difference in rotation of protrusion axis, could be for example such that the protrusions of the second set are mirrored (or they appear mirrored) with respect to the protrusions of the first set in view of the central longitudinal axis, although another difference (e.g. larger or smaller angle difference) between the angles is not excluded.

[0031] On its other side, the connector further comprises one or more extensions extending (vertically) from one side of the connector's base, and perpendicular to the length of the connector's base. Moreover, the extensions are extending (vertically) away from the panel and towards the beam. In an embodiment, wherein the panel and the beam have an elongated shape defined by their respective longitudinal axis, the extensions are also perpendicular to the longitudinal axis of both the panel and of the beam respectively. According to an embodiment, the extensions are shaped and configured to be received into the grooves of the support beam, and may clamp therein by e.g. providing a hook at the end of the extensions. For sake of clarity, it is noted that the protrusions are also extending (vertically) from one side of the connector's base, and perpendicular to the length of the connector's base. However, the protrusions are extending (vertically) towards the panel and away from the beam, hence the protrusions are extending in the opposite direction from the extensions. In a preferred embodiment, there are a plurality of extensions and/or protrusions provided on the connector.

[0032] In a first embodiment, the invention provides a connector for attaching a board on a support beam, for building for example a terrace floor. The connector can be made of plastic, for example being made by an injection molding process. Alternatively, other materials could also be used for the fabrication of the connector, such as for instance, steel, metal or carbon fiber. The board and the beam are typically made of wood, although not being

limited thereto. In general, the board and the beam both have an elongated shape, herewith defining for both of them a respective length and longitudinal axis. The board and corresponding beam are positioned perpendicularly relative to one another, in particular perpendicularly according to their respective longitudinal axis. The beam has at least one, i.e. one or more longitudinal grooves provided therein, meaning grooves along the length of the beam. The beam can be for example a rectangular shaped block, having four elongated surfaces along the length of the beam, and two smaller, rather squared surfaces at the two ends of the beam. The longitudinal grooves are thus provided in one or more of the elongated surfaces of the beam. Having the beam placed with one of its elongated surfaces on the ground floor or parallel therewith, the elongated surfaces can be defined as an upper and lower surface opposite to each other, and two side surfaces perpendicular therewith. The surface on the ground floor or parallel therewith being the lower surface. The grooves can be provided in one or both side surfaces of the beam, and hence be called side grooves. One or more grooves can also be provided in the upper (or lower) surface of the beam, and hence be called upper (or lower) grooves. All grooves being longitudinal have a length along the direction of the longitudinal axis of the beam, which means all grooves are perpendicular to the longitudinal axis of the board. It is noted that, according to an embodiment, the beam is symmetrical in that its upper surface and its lower surface, provided with upper grooves and lower grooves respectively, are identical.

[0033] The connector comprises an elongated base having two sides along its length. On one side, one or more protrusions are provided, whereas on the other side, one or more extensions are provided. The one or more protrusions on one side, are meant for engaging with a longitudinal slot provided in the board. The one or more protrusions can be trapezium or triangularly shaped, or alike. The protrusions generally have a regular geometric shape. The one or more extensions on the other side are usually meant for engaging with the longitudinal grooves in the beam, either in the upper surface, also referred to as upper grooves, or in one of the side surfaces, also referred to as side grooves. Alternatively, the one or more extensions can be meant for clamping the beam. The one or more extensions can be designed as legs, extending along a direction perpendicular to the longitudinal axis of the board, and perpendicular to the longitudinal axis of the beam. Extensions be can be large or small. At their end, extensions can be provided with a hook to enable clamping in one of the grooves. According to an embodiment, a first type of extension is provided for engaging in a first type of groove of the beam. For example, the first type of extension is a large extension and the first type of groove is a side groove. Preferably, according to an embodiment thereof, there are two first type of extensions provided for engaging in the first type of groove. These two first type of extensions, e.g. large extensions, can be provided for engaging in the same first

type side groove of one of the side surfaces. In this case, related to the first embodiment, the two first type of extensions are typically provided at the same end of the connector. For sake of clarity, along the direction of the beam, preferably two first type of extensions are foreseen, which means they are provided for engaging in the same side groove of one of the side surfaces. The extensions are provided for avoiding rotation around an axis perpendicular to the beam and the board respectively, hence along the direction of the extensions. Large extensions with a hook clamping in the side groove at one end of the connector are deliberately provided for avoiding bending of the base of the connector. It is noted that the first type of extension can also be a small extension. Small extensions typically have shorter legs and do not have a hook at their end (although not necessarily excluded). Moreover, small extensions provided at the end of the connector will be typically be used for clamping the beam. Whenever small extensions are provided at one end of the connector for clamping purposes, either further small extensions can be provided at another end, or else, further small extensions can be provided at another part of the connector, such that clamping between both ends, or between an end and other part of the connector can take place. In summary, according to a first embodiment a set of either large or small extensions are provided at one end of the connector. In case of large extensions at the connector's end, they can have a hook and are meant for engaging with corresponding side groove provided in a side surface of the beam. In case of small extensions at the connector's end, there is generally no groove in the side surface onto which the legs are extending.

[0034] Whenever one or more extensions are provided for clamping the beam, typically, there are at least two extensions, i.e. at least one at each of two different locations along the length of the connector. These two different locations can be the two ends of the connector where in between the beam gets then clamped. In this case, there are no longitudinal grooves needed in the beam. Or the two different locations can comprise one at one of the connector's ends of and another one at a central location along the length of the connector. In this case, only one longitudinal groove, in particular an upper groove, is required (in the vicinity of the central location) in the upper surface of the beam for engaging at least one extension at the central location in this groove. Or the two different locations can be two different central locations along the length of the connector. In this case, at least two longitudinal grooves, in particular upper grooves, are required (in the vicinity of the respective central locations) in the upper surface of the beam for engaging each of the at least two extensions in their corresponding groove. The two longitudinal upper grooves are parallel and separated at a distance comparable to the distance between the two different central locations where the at least two extensions are provided.

[0035] Alternatively, the two first type of extensions can also be provided for engaging in a different side groove

provided in another opposite side surface. In this case, the two first type of extensions are typically provided at another end or part of the connector, which leads us to a **second** embodiment defined by having a first type of extension at two different ends of the connector. Preferably, according to an embodiment thereof, there are two first type of extensions provided for engaging in the first type of groove at one end of the connector and at the other end of the connector respectively. For example, the first type of extension is a large extension and the first type of groove is a side groove. The beam has two side surfaces, and hence a side groove can be provided in both of the two side surfaces. The extensions at one end of the connector can be used for engaging in the side groove of one of the side surfaces, whereas the extensions at the other end of the connector can be used for engaging in the side groove of the other side surface. In other words, two first type of extensions, e.g. large extensions, at one end of the connector are provided for engaging in one first type side groove of one side surface, whereas another two first type of extensions, e.g. large extensions, at the other end of the connector are provided for engaging in another first type side groove of another side surface. As a result of this configuration, i.e. having extensions at both ends of the connector for engaging with corresponding side grooves in respective side surfaces, the width of the support beam fits exactly in between the extensions from the one end and the extensions from the other end of the connector. For sake of clarity, along the direction of the beam, preferably two sets of each two first type of extensions are foreseen, wherein one set being provided at one end of the connector, and another set being provided at the other end of the connector respectively. The extensions are provided for avoiding rotation around an axis perpendicular to the beam and to the board respectively, hence along the direction of the extensions. Large extensions with a hook clamping in the side grooves at both ends of the connector are deliberately provided for avoiding bending of the base of the connector. As mentioned before, the first type of extensions can also be small extensions, typically having shorter legs and not having a hook at their end (although not necessarily absent). It is noted that small extensions provided at both ends of the connector will be typically be used for clamping the beam. As an alternative embodiment of the invention, it can be that at one end the connector is provided with a set of large extensions and at the other end is provided with a set of small extensions. In summary, according to a second embodiment a set of either large or small extensions are provided at one or both ends of the connector. In case of large extensions, they can have a hook and are typically meant for engaging with corresponding side groove provided in a side surface of the beam. In case of small extensions, there is generally no groove in the side surface onto which the legs are extending.

[0036] In a **third** embodiment, a second type of extension is provided for engaging in a second type of groove of

the beam. For example, the second type of extension is a small extension and the second type of groove is an upper groove. Hence the second type of extensions are typically provided at a central location or position of the connector (and hence no longer at one of the outer ends, as is typically the case for the first type of extensions). Preferably, according to an embodiment thereof, there are two second type of extensions provided for engaging in the second type of groove. These two second type of extensions, e.g. small extensions, can be provided for engaging in one and the same second type upper groove of the upper surfaces. Hence, in this case, related to third embodiment, there is one longitudinal upper groove provided in the upper surface, wherein small extensions can be engaged. For sake of clarity, along the direction of the beam, preferably two second type of extensions are foreseen at one central location of the connector, which means they are provided for engaging in the same upper groove of the upper surface. The extensions are provided for avoiding rotation around an axis perpendicular to the beam and to the board respectively, hence along the direction of the extensions.

[0037] Alternatively, the two second type of extensions can also be provided for engaging in a different upper groove (i.e. parallel to the other one) provided in the upper surface. In this case, the two second type of extensions are typically provided at another, i.e. different central location or position of the connector, which leads us to a **fourth** embodiment defined by having a second type of extension at two different central locations of the connector. Preferably, according to an embodiment thereof, there are two second type of extensions provided for engaging in the second type of groove at a first central position of the connector and at a second central position of the connector respectively. For example, the second type of extension is a small extension and the second type of groove is an upper groove. The beam has one upper surface, which can be provided with one or more upper grooves, e.g. having two parallel upper grooves. In an embodiment, the small extensions, e.g. two, at a first central position of the connector can be used for engaging in a first (second type) upper groove of the upper surface, whereas the small extensions, e.g. two, at a second central position of the connector can be used for engaging in second (second type) upper groove of the upper surface. Hence, in this case, related to fourth embodiment, there are two parallel longitudinal upper grooves provided in the upper surface, wherein respective sets of small extensions can be engaged. As a result of this configuration, i.e. having small extensions at first and second central position of the connector respectively for engaging with corresponding first and second upper grooves in the upper surface, the geometry of the support beam, in particular between and beyond the upper grooves, fits exactly in between and around the small extensions at the first and second central position of the connector respectively. For sake of clarity, along the direction of the beam, preferably two sets of each two

second type of extensions are foreseen, wherein one set being provided at a first central position of the connector, and another set being provided at a second central position of the connector respectively. The first central position and the second central position are some distance apart. The extensions are provided for avoiding rotation around an axis perpendicular to the beam and to the board respectively, hence along the direction of the extensions.

[0038] In further embodiments the first, second, third and/or fourth embodiments can be combined.

Detailed description of the drawings

[0039] The invention is now further described by means of different drawings, for which is also referred to Figure 1 to 7.

[0040] Figure 1 shows an embodiment of an interconnecting system 10, in perspective view, comprising a board 200, a support beam 300 and a connector 100, in accordance with the invention. The board 200 is schematically drawn to clarify how it is to be assembled and attached together with the beam 300 via the connector 100. The board 200 has a top surface 201 and a bottom surface 202, wherein both surfaces have a rectangular shape. The board 200 has a length 204 and a width 205. At its bottom surface 202, the board 202 comprises an elongated slot 203 partially indicated by means of the dashed half circle 206. The elongated slot 203 functions as a clipping element for protrusions 108 being provided on the connector 100, such that the board 200 can be attached and detached thereto. Here, the elongated slot 203 is a channel or groove provided rather central along the length 204 of the board 200. Moreover, the elongated slot 203 follows or is parallel with a central axis. In particular the elongated slot 203 is provided along the central longitudinal axis B of the board 200. The connector 100 is shown in between the board 200 and the beam 300 for interconnecting them. The connector 100 comprises a base 101 having an elongated shape with a length 102 and a width 103. The base 101 (as its connector 100) has two ends 104, 105, i.e. a first end 104 and a second end 105, as indicated in Figure 2, illustrating the connector 100 being provided onto the beam 300, in front cross-sectional view. The base 101 (as its connector 100) also has two sides 106, 107, i.e. a first side 106 and a second side 107, as indicated in Figure 2. At the first side 106 of its base 101, the connector 100 is provided with protrusions 108. In this case, as depicted in Figure 1, four protrusions are provided. In general, the protrusions are provided for (interlockingly) engaging with a corresponding clipping element, being e.g. an elongated slot or recess, or in particular a dovetail groove, of the board. Each of the protrusions 108 comprise an axle portion 109 extending in a triangular or trapezium-like fastening portion 110, as indicated in Figure 2. The axle portion 109 is kind of a connecting axle or stalk to the fastening portion 110, which is particularly intended for fastening the con-

nector 100 to the board 200. The axle portion 109 is protruding from the first side 106 of the base 101 in an upward, vertical direction, along the y-axis of the xyz coordinate system given in the left corner. The axle portion 109 has a protrusion axis 111 which can be rotated or in a rotated position with respect to the length 102 or the central longitudinal axis A of the base 101, such that the surface of the triangular or trapezium-like fastening portion 110 is not coinciding or parallel with the central longitudinal axis A but rotated at an angle α therewith. This is clearly shown in Figure 4 (b) and (c), embodiments of the connector, or part thereof, in top view, in accordance with the invention. Such rotation is deliberately made or performed such that the fastening portion 110 of the protrusions 108 gets better anchored in the elongated slot 203 of the board 200, functioning as clipping element. Due to the rotated position of the protrusions, the elongated slot 203 gets better filled with the fastening portion 110 such that better anchoring is achieved. According to the embodiment shown in Figure 1, the connector 100 comprises a first set 118 of protrusions 108 oriented with their protrusion axis 111 at a first angle α in view of the central longitudinal axis A, and a second set 119 of protrusions 108 oriented with their protrusion axis 111 at a second angle β being distinct in view of (or different from) the first angle α . According to the embodiment, the second angle β being different is a direct consequence of the fact that the protrusion axis 111 of each of the protrusions 108 of the second set 119 is oriented differently, now at an angle β instead of being oriented at an angle α , as compared to the protrusion axis 111 of each of the protrusions 108 of the first set 118. Such difference in orientation could be the result of having rotated the protrusion axis. It is herewith understood that each of the protrusions axes can be rotated either clockwise or counter clockwise. A convention is made that, whenever rotation is initiated, for example counter clockwise, we keep rotating counter clockwise. Here, both first and second angles are the result of rotating counter clockwise. According to an embodiment, a convention could also be made for rotating clockwise instead. The second angle β being different from the first angle α , here in particular, is such that that the protrusions 108 of the second set 119 are mirrored (or second set protrusions appearing mirrored) with respect to the protrusions 108 of the first set 118 in view of the central longitudinal axis A, although another difference (e.g. larger or smaller angle difference) between the angles could also be applied. By means of example here, both first and second set 118, 119 of protrusions 108 comprise two protrusions each.

[0041] Further in Figure 1, and indicated more specifically in Figure 2, at the second side 107 of its base 101, the connector 100 is provided with extensions 114, 115, 116, 117. In general, the extensions are provided for engaging with a corresponding groove of the beam. Each of the extensions comprise an elongated portion 112, in some cases extending in a hook 113. The elongated portion 112 is protruding from the second side 107 of

the base 101 in a downward, vertical direction, along the y-axis of the xyz coordinate system given in the left corner. The elongated portion 112 has an extension axis 122. In an embodiment, the extension axis 122 has been rotated with respect to the length 102 or the central longitudinal axis A of the base 101, such that the hook 113 provided at some of the protrusions gets better anchored in or with corresponding groove. In Figure 1, two types of extensions are shown. A first type of extensions 114, 115 comprises large extensions provided at the ends 104, 105 of the connector 100 or its base 101. More specifically, here, a set of two first type extensions 114, i.e. being large extensions, is provided at the end 104 of the connector 100 or its base 101, whereas another set of two first type extensions 115, i.e. being large extensions, is provided at the end 105 of the connector 100 or its base 101. Per set, these two first type extensions 114, 115 are positioned at a distance from each other along the width 103 of the base 101. The first type of extensions 114, 115 are provided for engaging with a side groove 306, 307 provided in a side surface 302, 303 of the beam 300. Further referring to the beam 300, the side grooves 306, 307 are longitudinal channels, parallel to the length 309 of the beam 300, made in the side surfaces 302, 303 at a distance from the upper surface 301, along vertical direction or y-axis of the xyz coordinate system. A first set of large extensions 114 (two in total here) is provided for engaging with side groove 306 of side surface 302 of the beam 300. A second set of large extensions 115 (two in total here) is provided for engaging with side groove 307 of side surface 303 of the beam 300. With its hook 113, the large extension 114, 115 is anchoring in the side groove 306, 307. The beam 300 further has a width 308 and a length 309. A second type of extensions 116, 117 comprises small extensions provided at the central locations 120, 121 of the connector 100 or its base 101. More specifically, here, a set of two second type extensions 116, i.e. being small extensions, is provided at a first central location 120 of the connector 100 or its base 101, whereas another set of two second type extensions 117, i.e. being small extensions, is provided at a second central location 121 of the connector 100 or its base 101. Per set, these two second type extensions 116, 117 are positioned at a distance from each other along the width 103 of the base 101. The second type of extensions 116, 117 are provided for engaging with an upper groove 304, 305 provided in an upper surface 301 of the beam 300. Further referring to the beam 300, the upper grooves 304, 305 are longitudinal channels, parallel to the length 309 of the beam 300, made in the upper surface 301 at central location of the upper surface 301. The upper grooves 304, 305 are provided at a distance from each other, along the width 308 of the beam 300. One upper groove 304 is closer to one side surface 302, whereas another upper groove 305 is closer to the other side surface 303. A first set of small extensions 116 (two in total here) is provided for engaging with upper groove 304 of upper surface 301 of the beam 300. A second set of

small extensions 117 (two in total here) is provided for engaging with upper groove 305 of upper surface 301 of the beam 300.

[0042] In the embodiment of Figure 1, and indicated more specifically in Figure 2, is further shown that the connector 100 is connected with and attached to the beam 300. The extensions, i.e. large and small extensions of the connector 100 are engaging with corresponding grooves, i.e. side and upper grooves respectively. Having large extensions 114, 115 at both ends 104, 105 of the connector 100 engaging with corresponding side grooves 306, 307 in respective side surfaces 302, 303, the width 308 of the beam 300 fits exactly in between the large extensions 114 from the one end 104 and the large extensions 115 from the other end 105 of the connector 100. Having small extensions 116, 117 at first and second central location 120, 121 of the connector 100 respectively engaging with corresponding first and second upper grooves 304, 305 in the upper surface 301, the geometry of the beam 300, in particular between and beyond the upper grooves 304, 305, fits exactly in between and around the small extensions 116, 117 at the first and second central location 120, 121 respectively of the connector 100.

[0043] According to an embodiment, the connection 100 is configured such that it is attachable and detachable (iteratively on a regular basis) to the bottom surface 202 of the board 200. On the other hand, the connector 100, in particular its base 101, can be fixed onto the support beam 300 by means of a screw 400. It is again noted that, in order to avoid rotational movement of the screwed connector 100 in view of the support beam 300 (due to play), the extensions 116, 117 are provided for avoiding rotation for example around an axis perpendicular to the beam 300 and to the board 200 respectively, hence along the direction of the extensions. In addition, the extensions 114, 115 of the connector 100 are provided to engage with grooves 306, 307 of the support beam 300, and may also contribute to preventing rotation. Moreover, the extensions 114, 115 can be designed to clamp in the grooves 306, 307 e.g. by means of a hook 113, provided at the end of the extensions 114, 115, further avoiding bending of the base 101 of the connector 100.

[0044] Regarding the xyz coordinate system in Figure 1, it is noted that the x-axis is parallel to or along the length 204 of the board 200 and parallel to or along the length 102 of the connector 100 (or its base 101). It is further noted that the z-axis is parallel to or along the length 309 of the beam 300. Moreover, the y-axis, also referred to as vertical direction, is parallel to or along the extension axis 122 of the extensions 114, 115, 116, 117 of the connector 100. Furthermore, the y-axis is parallel to or along the protrusion axis 111 of the protrusions 108 of the connector 100.

[0045] Figure 2 shows an embodiment of a connector 100 provided onto a support beam 300, in front cross-sectional view, in accordance with the invention. As in

Figure 1, here is shown again that the connector 100 comprises a base 101 having a length 102 and two ends 104, 105, i.e. a first end 104 and a second end 105. The base 101 also has two sides 106, 107, i.e. a first side 106 and a second side 107. At the first side 106 of its base 101, the connector 100 is provided with protrusions 108, being provided for engaging with a corresponding elongated slot 203 of the board 200. Each of the protrusions 108 comprise an axle portion 109 extending in a triangular or trapezium-like fastening portion 110, as yet described in detail with Figure 1. In Figure 2, is clearly shown how the axle portion 109 is protruding from the first side 106 of the base 101 in a upward, vertical direction, along the y-axis of the xyz coordinate system given in the left corner. The protrusion axis 111 of the axle portion 109 is also indicated. Although the angle α or the angle β , for which the protrusion axis 111 can be rotated with respect to the length 102 (or parallel therewith, e.g. the longitudinal axis A) of the base 101, being not that visible here, nor indicated, it can be seen in Figure 2 that the one set 118 of protrusions 108, in particular the fastening portions 110, are oriented slightly differently from the other set 119 of protrusions 108. The slightly different orientation, and more particularly the rotation at a certain angle of the fastening portion surfaces, leads to better filling and hence better anchoring of the protrusions 108 in the elongated slot 203 of the board 200.

[0046] Further in Figure 2, at the second side 107 of its base 101, the connector 100 is provided with extensions 114, 115, 116, 117, being provided for engaging with a corresponding groove of the beam 300. Each of the extensions comprise an elongated portion 112, in some cases extending in a hook 113. The elongated portion 112, having an extension axis 122, is protruding from the second side 107 of the base 101 in a downward, vertical direction, along the y-axis of the xyz coordinate system given in the left corner. Again, two types of extensions are shown. A first type of extensions 114, 115 comprises large extensions provided at the ends 104, 105 of the connector 100 or its base 101. The first type of extensions 114, 115 are provided for engaging with a side groove 306, 307 provided in a side surface 302, 303, at a distance from the upper surface 301, along vertical direction or y-axis of the xyz coordinate system. A first set of large extensions 114 is provided for engaging with side groove 306 of side surface 302 of the beam 300. A second set of large extensions 115 is provided for engaging with side groove 307 of side surface 303 of the beam 300. With its hook 113, the large extension 114, 115 is anchoring in the side groove 306, 307. The beam 300 further has a width 308. A second type of extensions 116, 117 comprises small extensions provided at the central locations 120, 121 of the connector 100 or its base 101. The second type of extensions 116, 117 are provided for engaging with an upper groove 304, 305 provided in the upper surface 301 of the beam 300, at central location of the upper surface 301. The upper grooves 304, 305 are provided at a distance from each other, along the width 308 of the

beam 300. One upper groove 304 is closer to one side surface 302, whereas another upper groove 305 is closer to the other side surface 303. A first set of small extensions 116 is provided for engaging with upper groove 304 of upper surface 301 of the beam 300. A second set of small extensions 117 is provided for engaging with upper groove 305 of upper surface 301 of the beam 300.

[0047] In the embodiment of Figure 2, is further shown that the connector 100 is connected with and attached to the beam 300. This connection or attachment has already been discussed into detail with Figure 1, and this description is applicable also with the drawing of Figure 2. Regarding the xyz coordinate system in Figure 2, it is similar to the one of Figure 1 though represented differently because of the front cross-sectional view of Figure 2 (instead of perspective view in Figure 1). The x-axis being parallel to or along the length 102 of the connector 100, whereas the y-axis, perpendicular to the x-axis, is following the vertical direction meaning along the length or direction of the extension axis 122 and of the protrusion axis 111. The z-axis, perpendicular to both x-axis and y-axis, is coming out of the drawing (perpendicularly) of Figure 2, hence the encircled representation.

[0048] Figure 3 shows in side view in Figure 3 (a) an embodiment of a connector 100 attached to a board 200, and in Figure 3 (b) an embodiment of side view technical drawing of such connector 100, in accordance with the invention. Due to the cross-sectional side view of Figure 3 (a), it is clearly shown how the protrusion 108 of the connector 100 is fitting inside the elongated slot 203 of the board 200. The cross-section of the elongated slot 203 follows more or less the shape of the protrusion 108, i.e. of both its fastening portion 110 and of its axle portion 109. The protrusion axis 111 of the connector's protrusion 108, with its axle portion 109 and its fastening portion 110, is shown in Figure 3 (a) and (b). In this view, the fastening portion 110 doesn't show its symmetry, out of which it can be concluded that the surface of the fastening portion 110 is rotated, or else (as discussed yet above) the protrusion axis 111 has been rotated with respect to the length (or to the width 103 perpendicular therewith) of the connector's base 101. It is also clearly shown in Figure 3 (a) how the first side 106 of the connector's base 101 is pushed against the bottom surface 202 of the board 200. In both Figure 3 (a) and (b), it is clear that the first side 106 is also the side of the connector's base 101 onto which the protrusion 108 is provided, with its axle portion 109 protruding from the first side 106 of the base 101 in a upward, vertical direction. Onto the second side 107 of the connector's base 101, a set of small extensions 123 (two in total here) are extending vertically downward. The width 103 of the connector 100 is also indicated.

[0049] Figure 4 shows in Figure 4 (a) an embodiment of a connector 100 in perspective view, and in Figure 4 (b) an embodiment of part of such connector 100 in top view, in accordance with the invention. In addition, Figure 4 (c) shows a schematic embodiment of the connector 100 in top view, in accordance with the invention. The connector

100 in Figure 4 (a) is shown with its base 101, having length 102, width 103 and two ends 104, 105, and with four protrusions 108 and one extension 123. The four protrusions are in fact two sets 118, 119 of two protrusions, wherein the protrusions from the first set 118 are oriented slightly different, i.e. their axle portion and fastening portion surfaces having been rotated, from the protrusions from the second set 119. The central longitudinal axis A of the base 101 is also shown. According to an embodiment, the protrusions 108 represent some symmetry, which means that (here trapezium-like) fastening portion 110 and axle portion 109 both show symmetry respectively, having the same symmetry axis S as indicated in Figure 4 (a), which coincides with the protrusion axis 111, as drawn in Figure 4 (b). The symmetry axis S splits the protrusions 108, in particular fastening portion 110 and axle portion 109 thereof, respectively in two identical halves h1, h2. In Figure 4 (b), only part of the connector 100 is shown in top view, in particular part of the base 101 at a connector's end 105 and one of the protrusions 108 is shown. The central longitudinal axis A of the base 101 is again shown, as well as the width 103. The protrusion axis 111 is perpendicular to the drawing of Figure 4 (b). It is clearly shown here how the surface of the fastening portion 110 and the axle portion (not visible here) have been rotated for an angle α - here counter clockwise (as indicated by the arrow) - with respect to the central longitudinal axis A of the base 101, being parallel with the connector's length 102. In Figure 4 (c), a schematic representation of the connector 100 is shown in top view, having a base 101, a length 102 and a width 103. The connector 100 comprises four protrusions 108, in particular a first set 118 of two protrusions 108 and a second set 119 of two protrusions 108. In the first set 118, the protrusions 108 make an angle α with the central longitudinal axis A of the base 101, whereas the protrusions 108 of the second set 119 make an angle β with this central longitudinal axis A. For each of the protrusions 108, the surface of the fastening portion 110 and the axle portion (with protrusion axis 111) have been rotated for either an angle α (see first set protrusions 118), or else for an angle β (see second set protrusions 119) respectively - counter clockwise (as indicated by the angle arrow) - with respect to the central longitudinal axis A of the base 101, being parallel with the connector's length 102. As an example can be mentioned that, according to an embodiment, $\alpha = 45^\circ$ and $\beta = 135^\circ = 180^\circ - \alpha$. It is noted that an angle of 45° magnitude made with respect to the central longitudinal axis A (either clockwise or counter clockwise) is about the practical limit to be chosen for the connector design, whereas otherwise the protrusions will be extending too much (widely) for fitting (anchoring) within the corresponding clipping elements of the boards. Another exemplary embodiment could be for instance to have $\alpha = 30^\circ$ and $\beta = 330^\circ = 360^\circ - \alpha$. Whereas 360° in fact equals to zero, this latter example would mean that $\beta = -\alpha$, or else β is in magnitude the same angle as α but having the second set protrusion now rotated in the other direc-

tion, here clockwise instead of counter clockwise, in view of the central longitudinal axis A. For the resulting design or configuration, this means that the protrusions of the first set 118 have been mirrored in view of the central longitudinal axis A (for a rotation of the protrusions around the protrusion axis as referred to in Figure 4 (b)), as compared to the protrusions of the second set 119. Or in other words, the respective protrusions 108 of the first set 118 appear as the mirror image of the protrusions 108 of the second set 119, or vice versa. Due to the symmetry of the protrusions 108, in accordance with an embodiment of the invention as described above, this latter mirroring configuration of first and second set protrusions 118, 119 could also be achieved when for example $\alpha = 30^\circ$ and $\beta = 150^\circ = 180^\circ - \alpha$, as can be easily interpreted from Figure 4 (c). Other configurations, wherein the angle α and the angle β are differing in another manner are of course not excluded from the invention. Hence, embodiments of the invention exist, wherein the angles differ from each other in another way than the example given above.

[0050] Figure 8 shows a schematic embodiment of part of the connector, in particular a protrusion thereof, in top view, rotated at (two) different angles, in accordance with the invention. Having the protrusion shown in this rudimentary sketch in top view, implies that only the fastening portion is shown (as is for example also the case in Figure 4 (b)). For simplicity reasons, we consider again symmetry of the protrusions, and thus of the respective fastening portions and axle portions thereof, in accordance with an embodiment of the invention as described above. Two visualizations 110-1, 110-2 of the fastening portion are shown. For one visualization 110-1, the surface of the fastening portion and the axle portion (not visible here) have been rotated for an angle α - here counter clockwise (as indicated by the arrow) - with respect to the central longitudinal axis A of the base (not shown). By means of example, the angle α is about 45° . The protrusion axis 111 is perpendicular to the drawing of Figure 8. Further, here, four quadrants I, II, III, IV are indicated, wherein part of the fastening portion is lying in. For another visualization 110-2 of the fastening portion, the surface of the fastening portion and the axle portion have been rotated for an angle β - also counter clockwise (as indicated by the arrow) - with respect to the central longitudinal axis A of the base. The angle β as chosen here is differing 90° or a right angle from the angle α , and hence, by means of example, the angle β is about 135° . It is noted that, due to the symmetry considered, the configuration would be exactly the same in case $\beta = -\alpha = -45^\circ$. (For reasons mentioned above, the example of $\alpha = 45^\circ$ and $\beta = -\alpha = -45^\circ$ is about the practical limit.) As a result of this right angle difference between angle α and angle β , part of the fastening portion visualization 110-2 will be in the second quadrant II. Or, in other words, the outer ends of the fastening portion visualizations are pointing in opposite quadrants: I and III quadrant for (the outer ends of) the fastening portion visualization

110-1 versus II and IV quadrant for (the outer ends of) the fastening portion visualization 110-2. By means of the visualizations 110-1, 110-2 is shown that the fastening portions are crossing (and herewith pointing is crossed or opposite directions). Having such a crossed orientation of the fastening portions of first set and second set protrusions respectively, may lead to further improved anchoring and little friction caused. A crossing of symmetric fastening portions resulting in part of the first set fastening portions lying in the first quadrant I, and having part of the second set fastening portions lying in the second quadrant II, will typically occur whenever the angle α and the angle β relate in that $\beta = -\alpha$. This means that, the angles α and β are each other's mirror image, or are mirrored in view of the central longitudinal axis A. According to a preferred embodiment, the angle β , having a maximum magnitude of 45° , is the mirror angle from the angle α with respect to the central longitudinal axis A, in order to have a configuration with optimal anchoring while avoiding or eliminating friction (or reducing friction to a minimum).

[0051] It is noted that embodiments for the invention exist (and thus are not excluded from the invention) wherein there is no or less symmetry present in the protrusions. For such less symmetric or asymmetric protrusions, embodiments also exist with two (or more) sets of protrusions positioned under a different angle in view of the central longitudinal axis. Having no or less symmetry in the protrusions could mean that they no longer have a symmetric trapezium-like shape (resembling an isosceles trapezium), but that the trapezium-like shape rather resembles a non-isosceles or rectangular trapezium, wherein the halves of the fastening portion comprise e.g. a short half and a more elongated half. As a result of the absence of or reduced symmetry, the practical limit for the angle of 45° (for orienting the protrusions with respect to the central longitudinal axis) may be no longer required or applicable, and for example the practical limit could be either extended in magnitude, or has to be further limited to a smaller angle.

[0052] Figure 5 shows an embodiment of (a) front view technical drawing of a connector 100 including zoom-in of a large extension 114, and (b) side view technical drawing of the connector 100, in accordance with the invention. The connector 100 in Figure 5 (a) is shown with its base 101, its extensions 114, 115, 116, 117 and its protrusions 108, amongst which a first set 118 and a second set 119 can be distinguished. Again, the protrusions of the first set 118 are oriented slightly different, i.e. their axle portion and fastening portion surfaces having been rotated, from the protrusions of the second set 119. The base 101 has two ends 104, 105, and two central locations 120, 121 are indicated in the middle or at the center of the base 101. Amongst the extensions, there are large extensions 114, 115 at both ends 104, 105, as well as small extensions 116, 117 at the central locations 120, 121. The small extensions 116, 117 are at a distance d_1 positioned from each other, along the length 102 of the connector 100.

Between small extension 116, 117 and large extension 114, 115 respectively is a distance d_2 indicated. For the large extension 114 at the end 104, its elongated portion 112 and its hook 113 are also indicated, including in the zoom-in picture of this large extension 114. Although in Figure 5 (b) only one large extension 114, 115 is visible at each of the ends 104, 105, there in fact two large extensions 114, 115 or a set of two large extensions 114, 115 provided at each end 104, 105. In Figure 5 (b) this is clearly visible while showing the connector 100 in side view. Along the width 103 of the connector 100 or its base 101, there are two large extensions 114 shown at a distance d_3 from each other (along this width 103). In the side view of Figure 5 (b), one of the protrusions 108, with its axle portion 109 and its fastening portion 110, is also depicted.

[0053] Figure 6 shows a picture embodiment of part of an interconnecting system 10 comprising a board 200, a support beam 300 and a connector 100, here focusing on the extensions 114 at the end 104 of the connector 100 engaging with a corresponding groove 306 in a side surface 302 of the support beam 300, in accordance with the invention. Also clearly depicted here, are the bottom surface 202 and therein provided elongated slot 203 of the board 200. The support beam lying with its longitudinal axis L perpendicular relative to the central longitudinal axis A, B of both the connector 100 and the board 200 respectively. Figure 6 (a) and (b) are practically the same embodiment although seen from a viewing different angle. It is particularly noted here, that in this picture embodiment the beam 300 appears on the upper side of the picture, and the board 200 appears on the lower side of the picture, having the connector 100 provided in between those for interconnecting them. In practice, of a real installation of an interconnecting system 10, for example to form a platform, deck or flooring of attached boards, the boards 200 will appear on top and the support structure with the beams 300 there below, wherein the boards 200 and the beams 300 being interconnected via the connectors 100 in between. The upside down picture embodiment of Figure 6, is deliberately shown because of tensile strength tests that were performed having the interconnecting system 10 in this position or set-up, meaning by hanging up the beam 300 onto which the connector 100 and the board 200 are attached. The tensile strength of the connector, and of the interconnecting system as a whole was thus tested, including for example related to the amount of grooves and channels (provided in beams and boards), and the strength or quality of their design. Performing such tests, the advantage of having large extensions with a hook at the end of the connector for engaging in corresponding groove of the beam, was herewith also shown and confirmed. As mentioned before, this advantage is particularly related to avoiding bending of the connector's base.

[0054] In Figure 7 (a) an embodiment is drawn of a board 200 provided at its bottom surface 202 with an elongated slot 203 along (or parallel with) the central

longitudinal axis B of the board 200, in accordance with the invention. The board 200 further comprises a top surface 201, and has a length 204 and a width 203. Figure 7 (b) shows a picture embodiment of bottom view of a connector 100 being attached to a board 200, in accordance with the invention. Particularly visible is the bottom surface 202 of the board 200 and the elongated slot 203 provided therein, whereat the connector 100 is being attached. The connector 100 in bottom view is shown with its second side 107 visible, onto which extensions 123, 124 are provided at the ends 104, 105 of the connector 100. The protrusions 108 of the connector 100 are almost invisible as being embedded in the elongated slot 203 of the board 200.

Claims

1. A connector (100) for attaching a board (200) to a beam (300) of a support structure, in particular to form a platform comprising a plurality of juxtaposed boards, said connector (100) comprising a base (101) having a length (102), a width (103), two ends (104, 105) and two sides (106, 107), wherein on a first side (106) one or more protrusions (108) are provided for engaging with a corresponding clipping element such as an elongated slot (203) of said board (200), and wherein on a second side (107) extensions (114, 115, 116, 117) are provided for engaging with a corresponding groove (304, 305, 306, 307) of said beam (300) or for clamping said beam (300), **characterized in that** said extensions comprise a first type of extensions (114, 115) and a second type of extensions (116, 117), wherein said first and second type of extensions are different.
2. The connector (100) of claim 1, wherein said extensions (114, 115, 116, 117) comprise an elongated portion (112) protruding from said second side (107) of said base (101) in a downward direction.
3. The connector (100) of claim 2, wherein said elongated portion (112) is extending in a hook (113) for at least one of said extensions (114, 115) and said elongated portion (112) having an extension axis (122) being rotated with respect to the length (102) of the base (101) such that said hook (113) gets anchored in said corresponding groove (306, 307).
4. The connector (100) of claim 1 to 3, wherein one or more of said extensions (114, 115) are provided at one or both ends (104, 105) of said base (101).
5. The connector (100) of claim 1 to 4, wherein one or more of said extensions (116, 117) are provided at one or more central locations (120, 121) of said base (101).
6. The connector (100) of claim 1 to 5, wherein said first type of extensions (114, 115) are large or small extensions and/or said second type of extensions (116, 117) are small extensions.
7. The connector (100) of claim 1 to 6, wherein a set of one or two first type of extensions (114, 115) is provided at each end (104, 105) of said base (101), and/or a set of one or two second type of extensions (116, 117) is provided each at a first central location (120) and at a second central location (121) of said base (101) respectively, wherein said first and second location (120, 121) are at a distance (d1) from each other.
8. The connector (100) of claim 1 to 7, wherein said first type of extensions (114, 115) are provided for engaging with a side groove (306, 307) of a side surface (302, 303) of said beam (300), and/or said second type of extensions (116, 117) are provided for engaging with an upper groove (304, 305) of an upper surface (301) of said beam (300).
9. The connector (100) of claim 1 to 8, wherein said one or more protrusions (108) comprise an axle portion (109) extending in a fastening portion (110), said axle portion (109) protruding from said first side (106) of said base (101) in an upward direction, said axle portion (109) having a protrusion axis (111) being rotated with respect to the length (102) of the base (101) such that the fastening portion (110) of said one or more protrusions (108) gets anchored in said clipping element.
10. A system of attached boards (200) to a support structure made of beams (300), said system comprising a connector (100), which is attachable and detachable from the boards (200), said connector (100) comprising a base (101) having a length (102), a width (103), two ends (104, 105) and two sides (106, 107), wherein on a first side (106) of said base (101), one or more protrusions (108) are provided for engaging with a corresponding clipping element of said board (200), and wherein on a second side (107) of said base (101), at least two different types of extensions (114, 115, 116, 117) are provided for engaging with a corresponding groove (304, 305, 306, 307) of said beam (300) or for clamping said beam (300), **characterized in that** said system being configured such that at least two boards (200) are directly adjacent to each other attached to the support structure by means of said connector (100), to form a continuous surface, in particular to form a platform, deck or flooring.
11. The system of claim 10, wherein the base (101) is screwed to said beam (300) and/or said connector (100) being detachable from said board (200) by

means of disengaging the one or more protrusions (108) from said corresponding clipping element of said board (200).

12. A method for installing a system of attachable and detachable boards (200) to a support structure made of beams (300) by means of a connector (100), said method comprising

- providing said connector (100) comprising a base (101) having a length (102), a width (103), two ends (104, 105) and two sides (106, 107), and further comprising one or more protrusions (108) on a first side (106) of said base (101), and at least two different types of extensions (114, 115, 116, 117) on a second side (107) of said base (101),
- providing said connector (100) onto a beam (300) of said support structure and engaging said extensions (114, 115, 116, 117) with a corresponding groove (304, 305, 306, 307) of said beam (300) and/or clamping said beam (300),
- screwing said connector (100) to said beam (300),
- coupling said connector (100) with a board (200) of said system and engaging said one or more protrusions (108) with a corresponding clipping element of said board (200), and
- attaching said connector (100) to said board (200) such that the one or more protrusions (108) are anchored in said clipping element.

13. Use of the method of claim 12 to form a platform, deck or flooring of parallel boards (200) being attached to the support structure, formed by interspaced parallel beams (300) provided perpendicular to the parallel boards (200).

14. A connector (100) for attaching a board (200) to a beam (300) of a support structure, in particular to form a platform comprising a plurality of juxtaposed boards, said connector (100) comprising a base (101) having a length (102), a width (103), two ends (104, 105) and two sides (106, 107), wherein on a first side (106) protrusions (108) are provided for engaging with a corresponding clipping element such as an elongated slot (203) of said board (200), and wherein on a second side (107) one or more extensions (114, 115, 116, 117) are provided for engaging with a corresponding groove (304, 305, 306, 307) of said beam (300) or for clamping said beam (300), wherein said base (101) comprising a central longitudinal axis (A) parallel with the length (102), said protrusions (108) comprising each a protrusion axis (111), **characterized in that** a first set (118) of protrusions (108) is oriented with their protrusion axis (111) at a first angle (α) with respect to the central longitudinal axis (A) of the base (101), and

a second set (119) of protrusions (108) is oriented with their protrusion axis (111) at a second angle (β) being distinct from the first angle (α).

15. The connector (100) of claim 14, wherein the second angle (β) being distinct from the first angle (α) such that the protrusions of the second set (119) are mirrored with respect to the protrusions of the first set (118) in view of the central longitudinal axis (A).

Figure 1

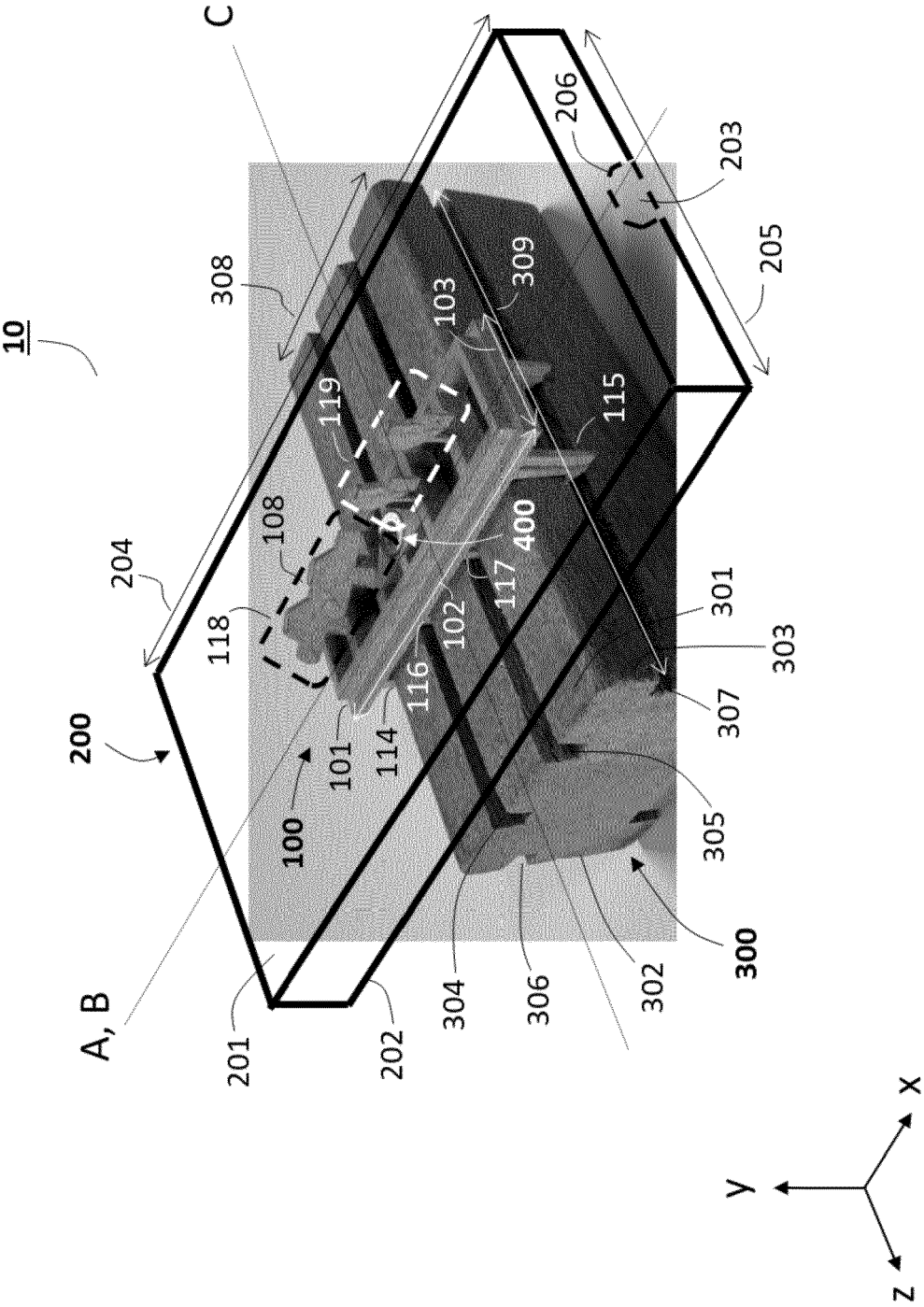
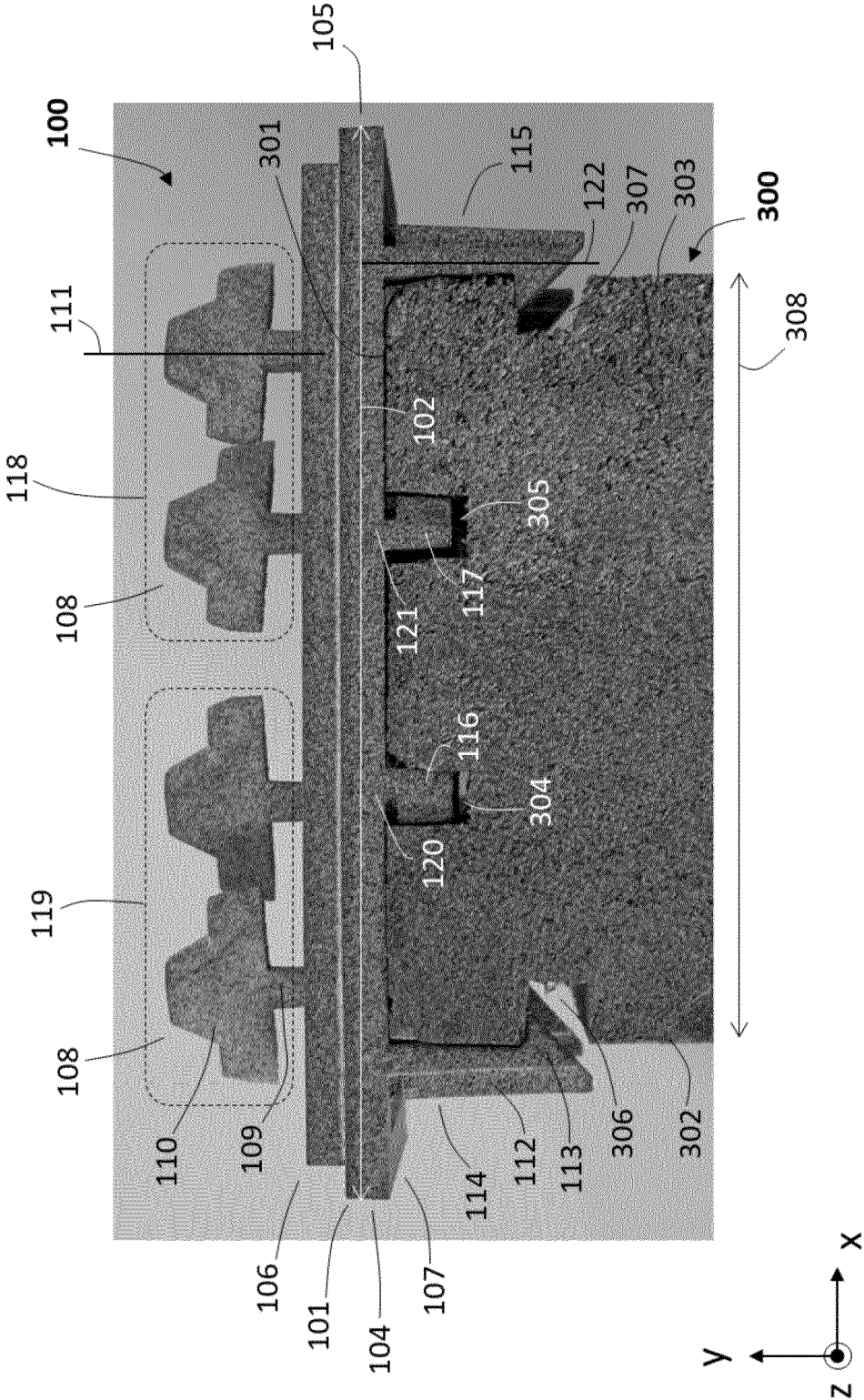


Figure 2



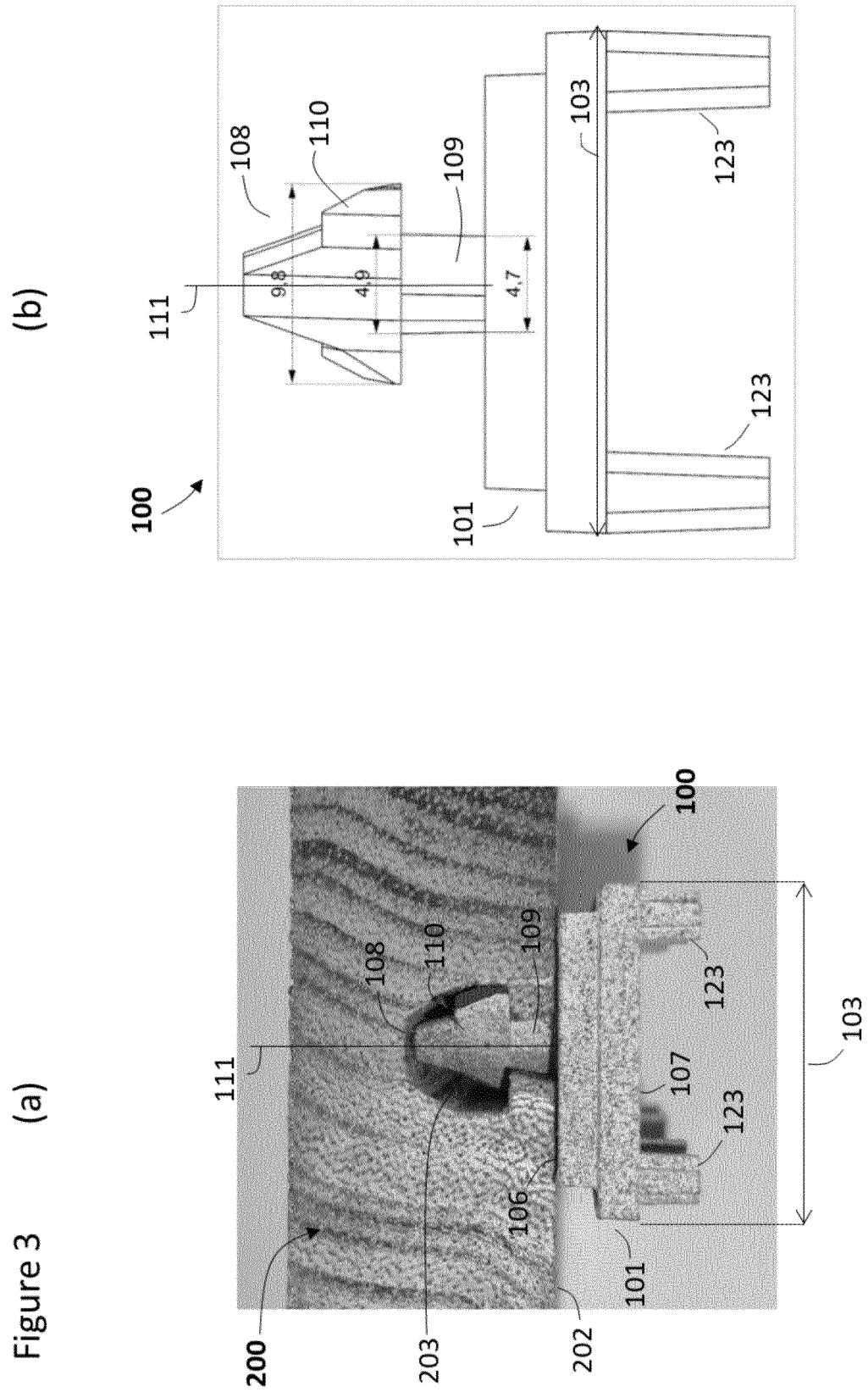


Figure 4 (b)

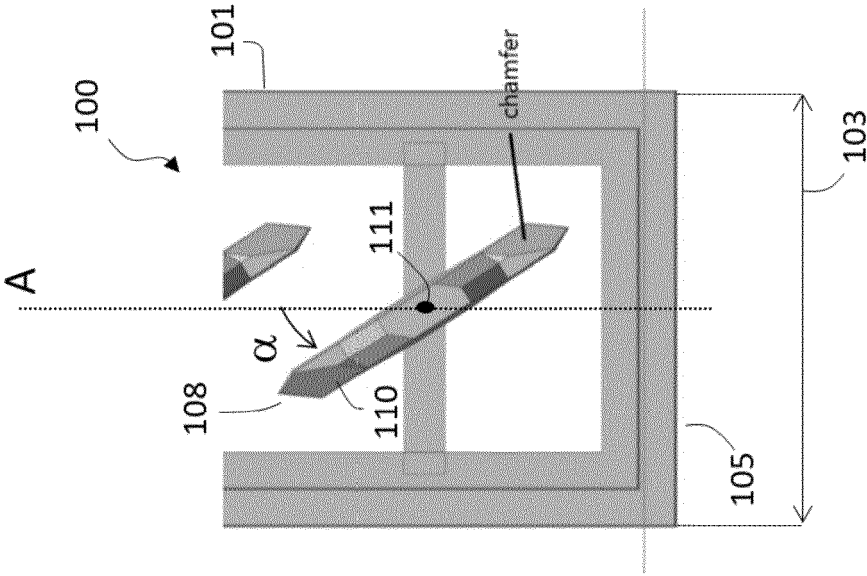


Figure 4 (a)

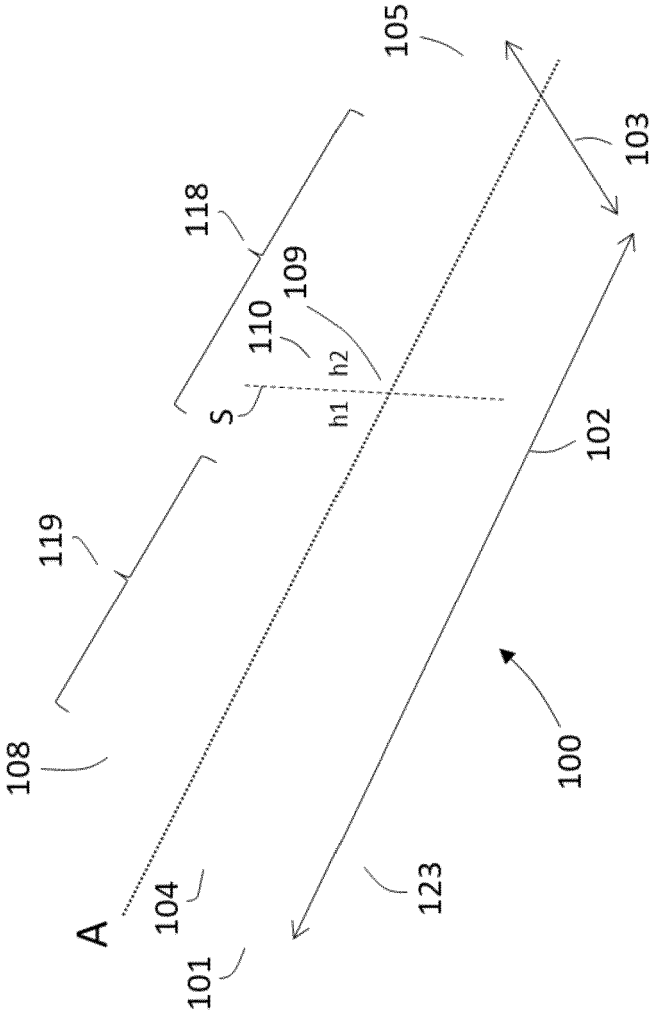


Figure 4 (c)

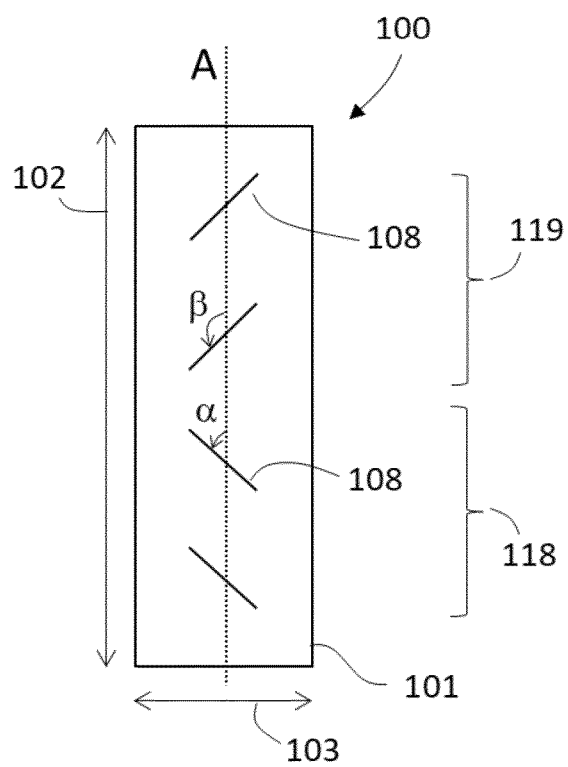


Figure 5

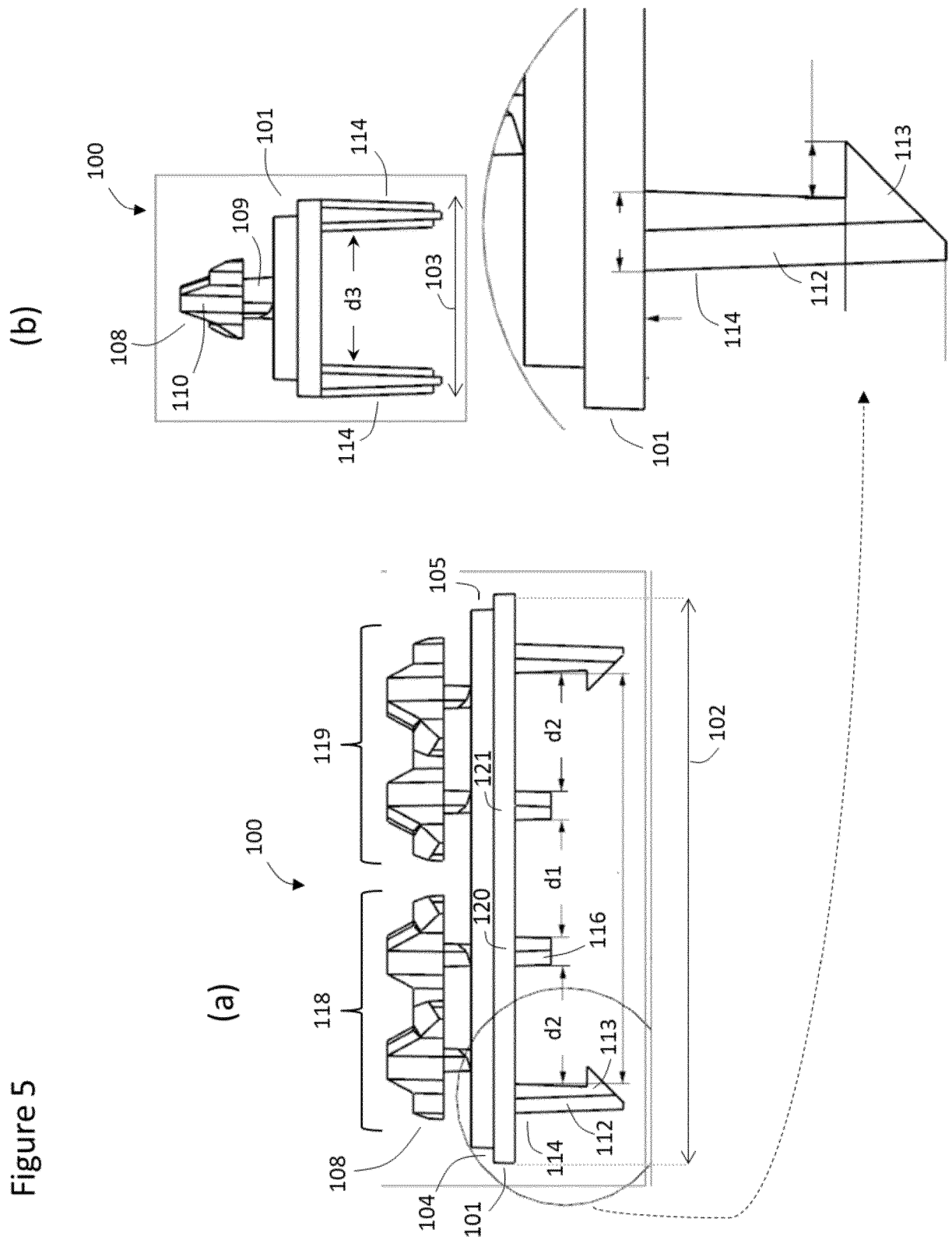
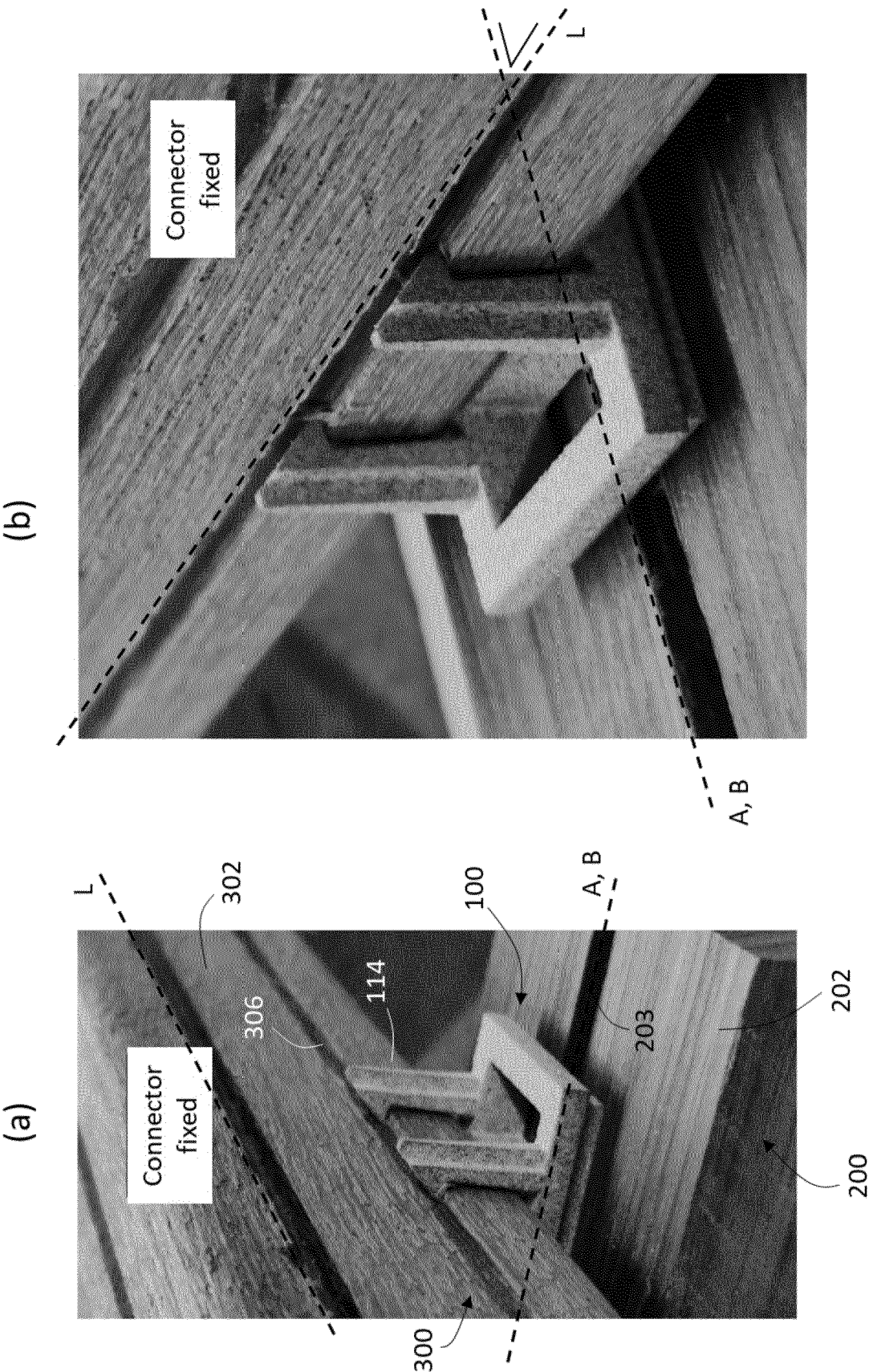


Figure 6



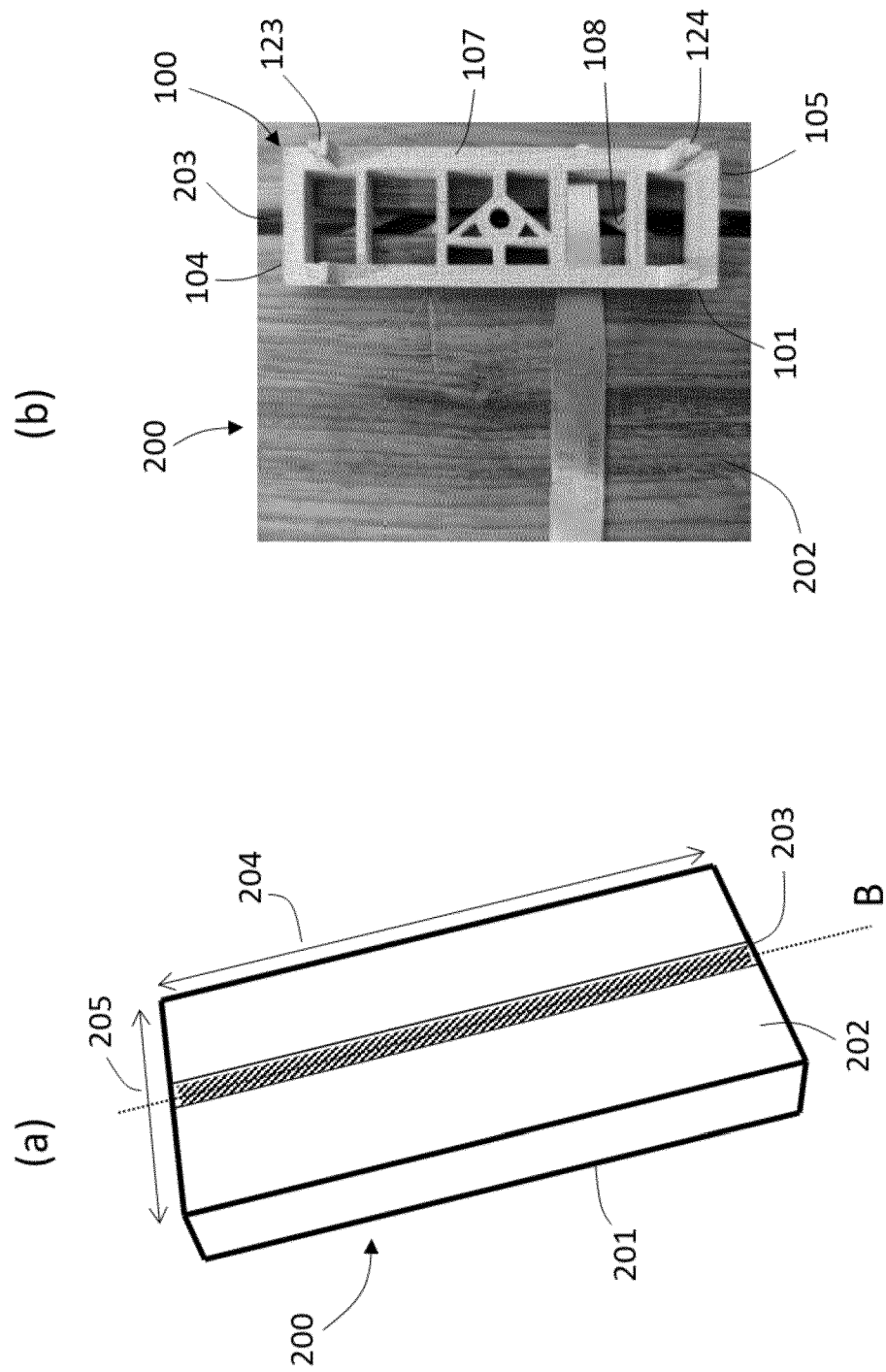
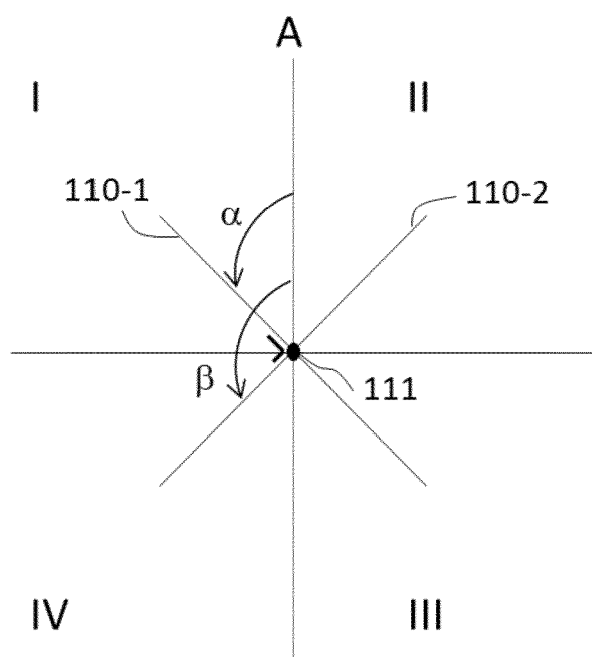


Figure 7

Figure 8



REFERENCES CITED IN THE DESCRIPTION

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