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(54) **Fastening device**

(57) The invention relates to a fastening device comprising at least one holding portion (1), at least one spacing portion (2) and at least one hollow shaft (3), so that the spacing portion is located between the holding portion and the hollow shaft. The fastening device according to the present invention may for example be used to fix for example planks/boards to a support substructure like for example a girder substructure to get a plank/board flooring, which may be used for example on sunroofs, on terraces, in bathrooms, spa areas or around swimming pools.

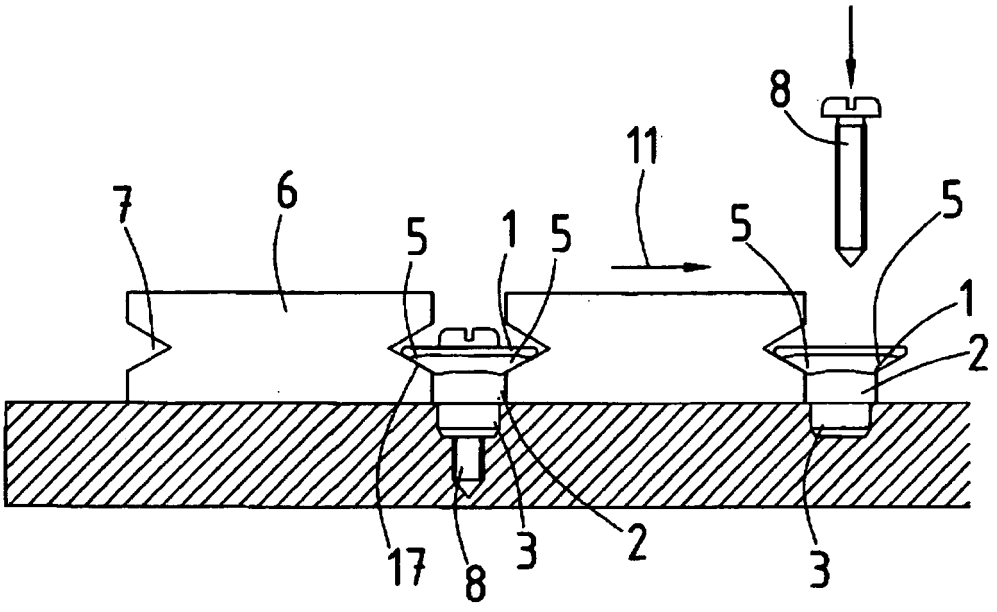

Fig.5

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Description

[0001] The invention relates to a fastening device comprising at least one holding portion, at least one spacing portion and at least one hollow shaft, so that the spacing portion is located between the holding portion and the hollow shaft. The fastening device according to the present invention may for example be used to fix planks/boards to a support substructure like for example a girder substructure to get a plank/board flooring, which may be used for example on sunroofs, on terraces, in bathrooms, spa areas or around swimming pools.

[0002] Several fastening devices used for the same purpose are already known from the art.

[0003] W02006066727 discloses for example a fixing clip for interconnecting wooden elements and for fixing them to a substructure. The clip comprises two tabs extending to opposite sides at right angles from a strut. The tabs of the clip may be inserted in grooves of wooden boards. The base of the strut may then be fixed to the substructure by screws through screw holes provided on the base of the clip.

[0004] W0033009138 describes for example a similar fixing clamp comprising two nails extending perpendicularly from a strut formed by two L-shaped elements. The nails may be inserted into word boards to fix the boards to the clamp. The base of the clamp may be fixed to a substructure by screws passing through screw holes arranged on the base of the clamp.

[0005] EP1524385 discloses for example a fastening element comprising a holding portion and a guiding portion. The holding portion of the fastening element may thereby be introduced in notches of the boards to be fixed to a substructure. The fastening element may be fixed to the substructure by a screw passing through the fastening element.

[0006] EP1600579 describes for example a wooden board fixation system using a clip comprising holding portion with two blades, which extend laterally to opposite sides of the clip, and a guiding portion. The clip is fixed to a support structure using a screw which passes through the clip, so that the blades of the holding portion reside in notches of the wooden boards.

[0007] However, the planks or boards used to get a plank/board flooring, which may be used for example on sunroofs, on terraces, in bathrooms, spa areas or around swimming pools may in most case not be completely straight.

[0008] For various reasons depending for example on the production method, on the material and specially on the aging properties of the material, on the storing conditions and so on, the planks/boards may actually be slightly curved or undulating, preferably along its length. Slightly curved or undulating may thereby preferably mean slightly curved along its length or undulating along its length in the sense of the present invention

[0009] This means that to place the planks/boards in a straight and preferably parallel way one may have to bend them to get them straight before fixing them to a substructure.

[0010] This is actually done by one workman bending the planks/boards to get them straight and holding them in a straight arrangement while another workman fixes them to a substructure using fastening devices and/or fixing elements like for example nails or screws.

[0011] Nevertheless, as at least two workmen as well as serious efforts are required to fix planks/boards to the substructure, so that the planks/boards are straight especially when the boards/planks may be inherently slightly curved or undulating, this is not really a convenient way to fix planks/boards to a substructure to get a plank/board flooring.

[0012] The objective of the present invention is therefore to provide a convenient, simple, quick and easy way to fix planks/boards to a substructure, even if these planks/boards may not be perfectly straight, but may actually be slightly curved or undulating.

[0013] According to the invention, this objective is achieved by a fastening device having the features of the independent claim 1. Advantageous refinements of the fastening device are set forth in the subordinate claims 2 through 17. This objective is also achieved by the method for fastening planks/boards to a substructure having the features of the independent Claim 18. Advantageous refinements of the method for fastening planks/boards to a substructure are set forth in the subordinate claim 19.

[0014] The advantage of the fastening device and of the method for fastening planks/boards to a substructure according to the invention lies in the effective, reliable and very convenient way to fix planks/boards to a substructure, especially if these planks/boards may not be perfectly straight but may actually be slightly curved or undulating.

[0015] Additional advantages, special features and practical refinements of the invention can be gleaned from the subordinate claims and from the presentation below of preferred embodiments making reference to the figures.

[0016] The fastening device according to the present invention may comprise at least one holding portion, at least one spacing portion and at least one hollow shaft, so that the spacing portion is located between the holding portion and the hollow shaft.

[0017] Moreover, the fastening device may comprise at least channel or hole passing through the fastening device extending from the top of holding portion to a hollow shaft of the fastening device , while passing through the holding portion and through the spacing portion. Each channel or hole may thereby preferably be aligned with a hollow shaft, so that the hole or channel and the hollow shaft are arranged along one and the same axe. This/these channel(s) or hole(s) passing through the fastening device may thereby be provided to house a fixing element like for example a nail or screw.

[0018] This may allow a fixing element like for example a nail or a screw to be introduced into a hole or channel

of the fastening device, so that passing through a channel or hole of the fastening device it may also pass through the holding portion, through the spacing portion and within the hollow shaft and through the hollow shaft, which is open at its bottom end. As the fixing element(s) may extend beyond the open bottom end of the hollow shaft, it/they may penetrate within the substructure and may therefore be used to fix the fastening device to the substructure.

[0019] The holding portion of the fastening device according to the present invention may be designed, so that the fastening device may hold at least one plank/board and preferably at least two planks/boards fixed to a support substructure like for example a girder substructure, when the fastening device is fixed to the substructure using a fixing element like for example at least one screw or nail.

[0020] The holding portion of the fastening device according to the present invention may thus comprise/provide for example at least one blade and preferably at least two blades extending preferably laterally away from and beyond the spacing portion. Such a blade may thereby extend laterally away from and beyond the spacing portion preferably in a nearly perpendicular way or with angle, preferably for example of more than 90 degrees even more preferred for example of about 135 degrees measured relatively to the a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it may preferably point upside. This may thus mean that the blade(s) may preferably be arranged nearly perpendicular to a channel or hole passing through the fastening device or with angle, preferably for example of more than 90 degrees even more preferred for example of about 135 degrees measured relatively to the a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it/they may preferably point upside. However, in some other embodiment of the fastening device according to the present invention, the blade(s) may be extending laterally away from and beyond the spacing portion with angle of less than 90 degrees, so that it/they may point downside.

[0021] The blade(s) may thus be placed for example on top of the plank(s)/board(s) to be fixed to the substructure, so that the blade(s) may be pressed against the plank/board to hold the plank(s)/board(s) in place when the fastening device is fixed adjacent/next to the plank(s)/board(s) to the substructure.

[0022] In some preferred embodiment of the fastening device according to present invention, the holding portion may comprise at least two blades extending laterally away from and beyond the spacing portion. These blades may moreover preferably extend laterally away from and beyond the spacing portion in at least two opposite directions. This may allow to hold and to fix two adjacent planks/boards to a substructure using one fastening device.

[0023] Alternatively the blade(s) may also be inserted in a notch or groove of the plank(s)/board(s) so that the blade(s) may be pressed against the plank/board within this notch or groove to hold the plank(s)/board(s) in place when the fastening device is fixed to the substructure. Since the holding portion may be inserted into the notch(es) or groove(s) between two planks/boards, the planks/boards may be fixed to a substructure while the fastening device remains nearly invisible because it may nearly completely be hidden between and partially under the planks/boards.

[0024] In some other preferred embodiment of the fastening device according to present invention, the holding portion may comprise a rim extending preferably laterally away from and beyond the spacing portion, so that the rim may comprise/provide at least one blade, preferably extending laterally away from and beyond the spacing portion in opposite directions in a nearly perpendicular way, thus being nearly perpendicular to the channel or hole passing through the fastening device, or with an angle of preferably for example more than 90 degrees and even more preferred for example about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that they may preferably point upside. The rim may thereby preferably go round the whole spacing portion, thus providing/comprising a blade going also round the whole spacing portion. However, in some other embodiment of the fastening device according to the present invention, the rim and/or the blade(s) comprised/provided by the rim may be extending laterally away from and beyond the spacing portion with angle of less than 90 degrees, so that it/they may point downside. Moreover, parts of the blade comprised provided by the rim of the holding portion may be extending laterally away from and beyond the spacing portion in opposite directions, so that these parts may be considered as analog to two blades extending laterally away from and beyond the spacing portion in opposite directions. This may also allow to hold and to fix at least two adjacent planks/boards to a substructure using one fastening device. The rim may thereby preferably comprise a slant and/or be slanted, so that it gets thinner as it extends away from the spacing portion. In an other embodiment of the fastening device according to the present invention, the rim may preferably point upside, so that it actually may define at least one slant, preferably starting at the spacing portion and going up preferably laterally away from the spacing portion.

[0025] Furthermore, a holding portion comprising a rim may allow to realize to different spacings between the planks/boards with the same fastening device as the rim runs round the length and the width of the spacing portion, so that both planks/boards arranged adjacent and preferably parallel to the length of the spacing portion and planks/boards arranged adjacent and preferably parallel to the width of the spacing portion may be held and fixed to a substructure by the fastening device. Since the length of the spacing portion may differ from the width of this

portion the spacing between planks/boards arranged adjacent and preferably parallel to the length of the spacing portion may differ from the spacing between planks/boards arranged adjacent and preferably parallel to the width of the spacing portion. This means that depending of the arrangement of the planks/boards either adjacent and preferably parallel to the length of the spacing portion or adjacent and preferably parallel to the width of the spacing portion, different spacings between the fixed planks/boards may be obtained when the holding portion comprises a rim going round the length and the width of the spacing portion, since the length and the width of the spacing portion may differ.

[0026] In some other preferred embodiment of the fastening device according to present invention, the holding portion may comprise a slant, so that at least one blade or a rim extending away from and beyond the spacing portion may comprise a slant and/or be slanted. The slant may thereby be located preferably on the side of the blade (s) or of the rim directed toward the spacing portion of the fastening device and thus facing the plank(s)/board (s) when the fastening device is used to fix plank(s)/board (s) to a substructure. When the blade(s) and or the rim comprised by the holding portion extend(s) preferably laterally away from and beyond the spacing portion in opposite directions with an angle of preferably for example more than 90 degrees and even more preferred for example about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it/they may preferably point upside, the blade(s) and/or the rim comprised by the holding portion may define (a) slant(s) starting at the spacing portion and going up preferably laterally away from the spacing portion, as the blade(s) and/or the rim comprised by the holding portion may preferably point upside. The slant(s) may thereby preferably be defined, so that it may be facing the plank(s)/board (s) when the fastening device is used to fix plank(s)/board (s) to a substructure. The slant(s) may thereby facilitate the straight and preferably parallel arrangement of the planks/boards fixed with fastening devices according to the present invention, as the fastening devices may be placed with the slant(s) on and/or directed toward a plank/board and/or preferably into a groove or notch of a plank/board.

An inherently slightly curved or undulating plank/board slightly bended to be straight may exert a force against the fastening device to get back to its initial slightly curved or undulating state and may thereby due to the slant be slightly pushed sideways toward the spacing portion following the slant, as the slant may go up preferably laterally away from the spacing portion and/or as the thickness of the slanted part of the holding portion may increase when approaching the spacing portion. The plank(s)/board(s) may thereby get placed and pressed against and adjacent to parallel walls of the spacing portion. This may allow parallel sidewalls of the spacing portion to guide the plank(s)/board(s) to get them arranged in a completely straight and preferably parallel way.

[0027] In some preferred embodiment of the fastening device according to present invention, the blade(s) of the holding portion may comprise at least one protuberance like for example a spike or a semi-sphere, which may help to hold the plank(s)/boards(s) to be fixed to the substructure with the holding portion especially with at least one blade or with a rim of the holding portion. These protuberances may be preferably arranged on a side of the holding portion directed toward the spacing portion and/or preferably so that they face the plank(s)/board(s) when the fastening device is used to fix plank(s)/board (s) to a substructure. Actually, the protuberances like for example spikes or semi-spheres may penetrate the plank (s)/board(s) more or less or at least they may increase the friction between the plank(s)/board(s) and the holding portion when one tries to pull on the plank(s)/board(s), so that they may help to hold the plank(s)/board(s) with the holding portion.

[0028] The spacing portion of the fastening device according to the present invention may have any design, which may permit to get the right spacing between to plank(s)/board(s) placed side by side. The right spacing between two plank(s)/board(s) placed side by side may preferably be selected, so that a fastening device placed between the planks/boards preferably with its holding portion inserted in a groove or notch of each plank/board, so that the main part of the fastening device may be hidden between and/or under the planks/boards, while a fixing element like a nail or a screw may still be introduced between the planks/boards into the fastening device. The spacing portion may thereby permit to get the right spacing between two planks/boards simply by placing the fastening device between two planks/boards, preferably with at least one part of its holding portion inserted in a groove or notch of each plank/board, and by pushing both planks/ boards against the spacing portion of the fastening device before fixing it to a substructure, so that each plank/board rests against one of two opposite sides of the spacing portion of the fastening device, which may thus serve as spacer between the plank(s)/board(s) determining the spacing between them.

[0029] Beside of this, the spacing portion may also serve as guide to help to get a parallel and preferably completely straight orientation of the planks/boards once fixed side by side with the fastening device. The spacing portion should thus preferably comprise at least one rectangular and preferably two rectangular faces arranged perpendicular to a channel or hole passing through fastening device. This/these rectangular face(s) of the spacing portion may preferably be oriented parallel and/or opposite one to another, so that by placing the fastening device between two planks/boards, preferably with at least one part of its holding portion inserted in a groove or notch of each plank/board, and by pushing both planks/boards against the spacing portion of the fastening device before fixing it to a substructure, each plank/board may rest against one of the preferably two opposite par-

allel rectangular sides of the spacing portion of the fastening device, which may thus serve as guide between the plank(s)/board(s) to help to arrange them in a parallel way.

[0030] In a preferred embodiment of the fastening device according to the present invention, the spacing portion may comprise and/or have a cuboid shape or a cuboid shape with at least one and preferably four rounded edge(s). Such a design for the spacing portion may be very simple to produce for example by techniques like for example extrusion molding, while they may provide at least two parallel and opposite preferably nearly rectangular sides, arranged perpendicularly to the hole or channel passing through the fastening device, with a right spacing between them, which may depend on the width and/or of the length of the cuboid, so that two planks/boards fixed using the fastening device may be oriented parallel one to another thanks to at least two parallel sides of the cuboid, while the spacing between may depend on the length and/or width of the cuboid defining the spacing portion. Moreover, such a design for the spacing portion may provide four preferably nearly rectangular faces arranged perpendicularly to a hole or channel passing through the fastening device, so that opposite faces arranged respectively along the width and along the length of the cuboid are parallel. This may guide plank(s)/board(s) to get a straight and preferably parallel arrangement both when it/they may be placed adjacent to the width and/or to the length of the spacing portion.

[0031] The hollow shaft of the fastening device according to the present invention may extend vertically away from and beyond the spacing portion of the fastening device according to the present invention, while the spacing portion is located between the holding portion and the hollow shaft of the fastening device according to the present invention. The hollow shaft may thereby have any form or design, which allows the hollow shaft to be introduced and/or to penetrate into holes provided within the substructure. The hollow shaft may thus preferably for example have a polygonal, cubic, rectangular or circular cross-section.

[0032] Actually a hollow shaft may thus be for example a hollow dowel, a hollow lug, a hollow spigot or any other type of hollow casing, which may be introduced and/or may penetrate into holes made within the support substructure to fix the fastening device at least temporarily.

[0033] The fastening device according to the present invention may thus be simply fixed to the support substructure by being pushed with its hollow shaft into holes provided within the substructure. The fastening device is thus held in the holes provided within the substructure since the hollow shaft penetrates within these holes until a certain depth.

[0034] Introducing the hollow shaft of the fastening device into holes provided within the substructure may help providing an anchoring point for pressing the fastening device against a plank/board to get the plank/board fixed in a completely straight way even if the plank/board may be slightly curved or undulating. Actually, once the bottom end of the hollow shaft has been introduced in a hole made within the support substructure, the hollow shaft of the fastening device may provide an anchoring point for pushing the fastening device against a plank/board, to be slightly bended to get it straight, and into the hole made within the substructure. An anchoring point may thereby be provided as the fastening device may not slip away because it is held in the hole by at least one part of its hollow shaft introduced into the hole. It may thus become easier to push the fastening device against a plank/board, to be slightly bended to get it straight, and into the hole made within the substructure. Moreover, this may allow to hold the plank(s)/board(s) at least temporary fixed to the substructure even without using a fixing element. This may also allow to get a very effective and convenient way to fix planks/boards to a substructure, especially if these planks/boards may not be perfectly straight but may actually be slightly curved or undulating. Actually, this may even permit to reduce the number of workmen required for the placement and the fixation of the planks/boards to a substructure for example from two to one.

[0035] The planks/boards may indeed be placed by only one workman using the fastening device according to the present invention, even if the planks/boards are slightly curved or undulating, as the workman may push the fastening device against the substructure and against the plank/board until the hollow shaft of the fastening device reaches a hole made within the substructure and may enter this hole to fix the fastening device in the hole. By pushing the fastening device against the plank/board and against the substructure, the workman may slightly bend the plank/board to get it straight, even if it may be inherently slightly curved or undulating, so that the plank/board may be fixed to the substructure in a straight arrangement.

[0036] Once the hollow shaft has been preferably completely pushed into a hole made within substructure, the fastening device may thus be fixed in the hole, so that the workman may take his hands of the fastening device and of the plank/board, which is kept straight by the fastening device, to get some fixing element(s) like for example a nail or a screw and to fix the fastening device to the substructure using the fixing element(s).

[0037] It may thus be useful to provide holes within the substructure, which have the right spacing, so that the plank(s)/board(s) are straight and preferably parallel when they are held and/or fixed the fastening device according to the present invention.

[0038] However, the holes made within the substructure may be made for example by drilling, by cutting some pieces out, by die cutting or by any other technique which may be appropriated to make holes.

[0039] In some preferred embodiment of the fastening device according to the present invention, the hollow shaft may be a cylindrical hollow shaft, having preferably for example a circular cross-section. This may be useful

if the holes made in the substructure are made by drilling into the substructure, as a cylindrical hollow shaft, may very well fit in a round borehole made by drilling. Beside of this, a cylindrical hollow shaft may easily guide and house a fixing element like for example a nail or screw due to its inherent form, as a cylindrical hollow shaft may closely wrap around the fixing element, so as to limit the movements of the fixing element within the hollow shaft, thus providing an efficient fixing.

[0040] In some other preferred embodiment of the fastening device according to the present invention, the length of the hollow shaft is comprised between 1 mm and 20 mm, preferably between 2 mm and 15 mm, even more preferred 2,5 mm and 10 mm, specially preferred between 3 mm and 7 mm. The hollow shaft may thereby preferably not be too long to allow the shaft to be easily introduced into a hole made within the substructure, preferably without bending the hollow shaft. On the other hand, the hollow shaft may preferably be long enough to fix the fastening device firmly in a hole made within the substructure.

[0041] It should be noted that the hollow shaft may preferably be completely inserted into a hole made within the substructure once the fastening device fixes the planks/boards to the substructure using at least one fixing element, so that at least one part of the spacing portion may rest on the substructure. The hollow shaft may thereby preferably be shorter than the thickness of the support substructure.

[0042] The outer diameter of the hollow shaft may be selected, so that the shaft fits exactly in the holes made in the substructure. The outer diameter may however be selected slightly bigger, for example about between 0,05 % and 15 % bigger, preferably between 0,1 %and 7,5 % bigger, even more preferred between 0,5 % and 1,5 % bigger than the diameter of the holes made in the substructure so that some effort and/or pressure may be required to introduce the hollow shaft in the holes made in the substructure. Nevertheless, this may be done, so that the effort or pressure required to introduce the hollow shaft into the holes made in the substructure may preferably not excess the effort or pressure, which may be exerted by one workman preferably without requiring any tool.

[0043] In some preferred embodiment of the fastening device according to the present invention, the bottom end of the hollow shaft may comprise a slant and/or be slanted, so that the insertion of the hollow shaft into the holes provided in a substructure may be facilitated as its outer diameter of the hollow shaft may be lowered at its bottom end due to the slant, which may be arranged, so that the slant may have his thinnest part located at the bottom end of the hollow shaft, and that the diameter of the hollow shaft may increase going up from the bottom end of the hollow shaft along the slant. This may allow to introduce the hollow shaft easily in a hole made in the substructure even if the outer diameter of the hollow shaft is slightly bigger than the diameter of the hole, since the very end of the hollow shaft may due to the shaft easily penetrate in the hole by its thinnest end, that may preferably fit the dimensions of the hole in the substructure. Upon pushing on the fastening device, the hollow shaft may then penetrate easily further in the hole as the increase of the diameter of the hollow shaft occurs very progressively along the slant going up from the bottom end of the hollow shaft. A slanted bottom end of the hollow shaft or a bottom end of the hollow shaft comprising a slant may thus permit an easy engagement of the fastening device into a hole made within the substructure. This may be even more useful when the diameter of the hollow shaft is slightly bigger than the diameter of the hole(s) provided in the substructure.

[0044] On the other hand the inner diameter of the hollow shaft may preferably be selected, so that a fixing element like for example a nail or screw may pass within the hollow shaft through the hollow shaft, while the shaft may guide the fixing element as the hollow shaft preferably wrapping around the fixing element, so as to limit the movements of the fixing element within the hollow shaft, thus providing an efficient fixing.

[0045] In some other preferred embodiment of the fastening device according to the present invention, the inner diameter of the hollow shaft may thereby be selected, so that a fixing element may pass inside the hollow shaft trough the hollow shaft, while the hollow shaft may be easily introduced in a hole made in the substructure. This may allow to fix the fastening device easily in a hole made within the substructure and to pass a fixing element like for example a nail or a screw within and through the hollow shaft.

[0046] In some other preferred embodiment of the fastening device according to the present invention, the fastening device may be made of a polymeric material. The material selected for producing the fastening device may thus be a polymeric material like for example polypropylene, polyethylene or PET, polymethylmethacrylate, polystyrene and polyamide. This may be useful as this kind of material may be easily processed to produce fastening devices using techniques like for example injection molding, while they also may provide the desired mechanical resistance.

[0047] In even another preferred embodiment of the present invention, the fastening device may be made of polyamide. Polyamide may be used as material for producing the fastening device, as polyamide provides an excellent mechanical resistance. An excellent mechanical resistance may thereby be desired since the fastening device fixed in a hole made within the substructure may have to hold back plank(s)/board(s), which may be slightly curved or undulating and has/have thus been bent to get them straight. This may mean that the fastening device may have to withstand the force exerted by plank(s) slightly bended to get them straight, which may want to get back to its/their initial slightly curved or undulating state.

[0048] Considering this, a high mechanical resistance

may be desired since the element which may preferably be able to hold the fastening device fixed in the hole(s) made within the substructure and to withstand the force (s) exerted by the plank(s)/board(s) preferably without breaking, may actually be a hollow shaft. As this hollow shaft may naturally be hollow, its mechanical resistance is mainly provided by its wall(s), which may thus preferably be made of a material providing a high mechanical resistance. Moreover as the mechanical resistance of the material used for the fastening device is high it may be possible to reduce the thickness of the wall(s) of the hollow shaft, while keeping the desired mechanical resistance. This may allow to use less polymeric material for the production of the fastening device, thus allowing to get a nicer and/or finer design, while also reducing the material costs of the fastening device according to the present invention.

[0049] In another preferred embodiment of the fastening device according to the present invention, may be made of a polymeric material reinforced with glass fibers. The material selected for producing the fastening device may thus be reinforced with glass fibers, for example with between 1 wt.-% and 99 wt.-%, preferably between 5 wt.-% and 90 wt.-% ., even preferred between 10 wt.-% and 75 wt.-%, even preferred between 15 wt.-% and 50 wt.-%, even preferred between 17,5 wt.-% and 40 wt.-%, especially preferred between 20 wt.-% and 30 wt.-% of glass fibers. This may allow to further increase the mechanical resistance of the material used for the fastening device according to the present invention. This may thus allow to get an even better resistance to the force(s) exerted on the fastening device and thus to get a more efficient fixation of the fastening device in hole made within the substructure. Moreover, as the mechanical resistance of the material is increased it may be possible to reduce the thickness of the wall(s) of the hollow shaft, while keeping the desired mechanical resistance. This may allow to use less polymeric material and specially less polyamide for the production of the fastening device, thus allowing to get a nicer and/or finer design, while it may also reduce the material costs.

[0050] In some other preferred embodiment of the fastening device according to the present invention, the hollow shaft may comprise at least one retention element like for example a retention spike, retention semi-sphere, retention pawl or a retention rim. This/these retention element(s) may preferably be located at the bottom end of the hollow shaft. Furthermore, it/they may preferably be arranged, so that it/they are placed on the side of the hollow shaft directed towards the outside of the fastening device . The retention element may thereby be any element having a design, which may improve the retention of the fastening device according to the present invention in a hole provided in the substructure. The retention element may thereby for example comprise at least one spike, semi-sphere, pawl, rim or other hook-like structure, which may improve the retention of the fastening device in a hole in the substructure. Using for example at least one but preferably two retention spike(s), retention semi-sphere(s), retention pawl(s) or a retention rim, the fastening device may allow to very efficiently fix the fastening device in a hole made in the substructure, since once the fastening device and specially its hollow shaft has been introduced in a hole it is held in this hole by the retention element(s), so that it may not easily be removed from the hole. The retention element(s) may thus increase the friction between the fastening device and especially the hollow shaft of the fastening device and the sidewalls of hole made in the substructure, when one tries to pull the fastening device out.

[0051] Moreover, the retention element may strongly anchor the fastening device in a hole made within the substructure for example, when a substructure made of hollow elements like for example hollow girders may be used. The fastening device(s) and especially its/their hollow shaft may in this case pass through a hole made in a hollow element of the substructure, so that it/they may pass completely through the wall of the hollow element of the substructure. Once a fastening device has been introduced in a hole of a wall of a hollow element of the substructure, so that the hollow shaft of the fastening device may pass through the wall of the hollow element of the substructure. The bottom end of the hollow shaft of the fastening device may thereby be placed behind the wall of the hollow element of the substructure and thus on the other side of the hole inside this hollow element. This means that a retention element arranged at/near the bottom end of the hollow shaft may also be located behind the wall of the hollow element of the substructure and thus on the other side of the hole inside this hollow element. This retention element may thus be anchoring the fastening device in the hole, as it may be hooked on the inside edge of the hole and/or hook from the inside to the wall of the hollow element of the substructure, so that the fastening device may be strongly anchored this hollow element of the substructure.

[0052] However, the efficiency of the fixation of the fastening device to the substructure may thus be improved using at least one retention element.

[0053] In some preferred embodiment of the fastening device according to the present, at least one retention element may be slanted and/or may comprise a slant. This may facilitate the insertion of hollow shaft comprising at least one slanted retention element into holes provided in the substructure, as the retention element, which may by its presence increase the outer diameter of the hollow shaft, may increase it progressively going up from the bottom end of the slanted retention element along the slant. This may allow to introduce a hollow shaft comprising at least one slanted retention element, which may by its presence increase its outer diameter of the hollow shaft, easily in a hole made in the substructure, even if the outer diameter of the hollow shaft comprising at least one slanted retention element is slightly bigger than the diameter of the hole, since the thin end of the slanted retention element may easily penetrate in the hole, be-

cause the hollow shaft comprising the thin bottom end of the retention element may fit the dimensions of the hole in the substructure. Upon pushing on the fastening device the hollow shaft comprising at least one slanted retention element may then penetrate easily further in the hole as the increase of the diameter of the hollow shaft occurs very progressively along the slant going up from the bottom end of the retention element. A slanted retention element or a retention element comprising a slant may thus permit an easy engagement of the fastening device comprising at least one retention element into a hole made within the substructure.

[0054] In even another preferred embodiment of the fastening device according to the present invention, the hollow shaft may comprise at least one slit and preferably two slits. This may allow the hollow shaft to open up a bit when a fixing element like for example a nail or a screw gets introduced in it. The hollow shaft may thus expand a bit as it opens up due to the introduction of a fixing element like for example a nail or a screw once it is in place inside a hole made within the substructure. The fastening device may thus be held in the hole provided within the substructure because of this slight expansion of the hollow shaft, which may occur when a fixing element is introduced in the hollow shaft in a similar way than a expansion anchor. The efficiency of the fixation of the fastening device to the substructure may thus be even further improved when the hollow shaft of the fastening device comprises at least one slit.

[0055] In some preferred embodiment of the fastening device according to the present invention, at least one, preferably two slit(s) and even more preferred four slits may be arranged so that it/they start at/from the bottom end of the hollow shaft. This may mean the slit(s) may be cut into the hollow shaft starting from its bottom end. If the hollow shaft thereby comprises two slits or even more preferred four slits, they may preferably be arranged opposed one to another or opposed one to another two by two. In addition, this may allow the hollow shaft to open up even a little bit more and/or easier when a fixing element like for example a nail or a screw gets introduced into it, as the hollow shaft is not joining any more at the bottom of the slit. The expansion or opening of the hollow shaft may thus be less hindered. Beside of this, specially such slit(s) may also allow the hollow shaft to slightly contract once pressure is applied on the hollow shaft, so that slit may get closed by the portions of the hollow shaft joining each other, because they may be squeezed together. This allows to reduce the outer and the inner diameter of the hollow shaft, so that it may be more easily inserted into a hole made within the substructure. As the hollow shaft is compressed inside the hole in this case and as the portions of the hollow shaft separated by the slit may want to get back to their initial position, they may be pressed against the wall of the hole thus increasing the friction between the hollow shaft and the wall of the hole once one tries to pull the fastening device out of the hole. The fixation of the fastening device in a hole made within the substructure may thus be improved using a slit, which starts at/from the bottom end of the hollow shaft.

[0056] In addition, the reduction of diameter, which may be obtained using at least one slit starting at/from the bottom end of the hollow shaft may preferably be reversible since the slit may open up again and the hollow shaft may expand again to increase its outer and inner diameter, when the pressure applied on the hollow shaft may stop or may at least be reduced. This may occur for example when the hollow shaft of the fastening device comprises both at least one slanted retention element like for example a slanted retention rim arranged at its bottom end and at least one slit starting at/from the bottom and of the hollow shaft, thus passing also through the slanted retention element. Moreover this may be particularly useful when hollow elements are used to build up the support substructure. In this case the presence of a slanted retention element may locally increase the outer diameter of the hollow shaft along the whole portion of the hollow shaft covered by the retention element and/or surrounded by a slanted retention rim. The outer diameter of the hollow shaft thereby increases along the slant of the retention element starting from the bottom end of the retention element until the top end of the slanted retention element. Beyond the top end of the slanted retention element, the outer diameter of the hollow shaft may get reduced again, as there is no more retention element to increase it. Upon engaging the bottom end of the retention element of the hollow shaft into a hole made within the substructure and pressing the fastening device with its hollow shaft into this hole made in the substructure, an increasing pressure is exerted on the hollow shaft since the outer diameter increases along the slant of the retention element starting from the bottom end of this element. The portions of the hollow shaft separated by the slit may thus get squeezed together, reducing the outer diameter of the hollow shaft to penetrate the hole further more easily. However, once the top end of the retention element has passed the hole and has reached the hollow inside of a hollow element like for example a hollow girder used to build the substructure, no pressure is exerted on the hollow shaft and on the squeezed together portions of the hollow shaft separated by the slit anymore, since the outer diameter of the hollow shaft gets reduced after the top end of the slanted retention element This means that once the top end of the retention element has passed the hole and has reached the hollow inside of a hollow element used to build up the substructure, the hollow shaft may expand again and the portion of the shaft separated by the slit , which were squeezed together to reduce the outer diameter of the hollow shaft, may get back to their initial position. The slanted retention element may thus be located inside the hollow element used to build up the substructure beyond the hole made in the wall of this element. Moreover, fastening device may be very well fixed to the substructure since the diameter of the hollow shaft comprising the slanted reten-

tion element, which was introduced in the hole by compressing the hollow shaft and by squeezing the portions of the hollow shaft separated by the slit together, may bigger than the diameter of the hole, so that the retention element strongly anchors to fastening device in the hole made in the substructure. The fixation of the fastening device in a hole made in the substructure may thus be improved using at least one slit, which starts at/from the bottom end of the hollow shaft in combination with at least one slanted retention element like for example a slanted rim.

[0057] Moreover, the invention may also concern a method for fastening planks/boards to a substructure comprising providing holes with a right spacing made within the support substructure used for the flooring and/or at least within at least one element of this substructure like for example girders used to build up the support substructure, so that planks/boards may be fixed to the substructure by pushing the fastening devices against the planks/boards and/or against the substructure and into these holes. This may be done for example by providing elements used for building up the substructure like for example girders, which comprise already holes with a right spacing. These holes may be obtained for example by die cutting or by automated drilling or by any other suitable technique. This may allow to use the fastening device according to the present invention to fix the planks/boards to a substructure, thus allowing a very easy, convenient and efficient fixation of the planks/boards to a substructure. The holes are thereby made within the substructure until a certain depth, which may preferably correspond to the length of the hollow shaft, so that the hollow shaft may be preferably completely inserted into the hole made in the substructure while a fixing element passing through the hole or channel passing through the fastening device and thus through the holding portion, the spacing portion and inside the hollow shaft through the hollow shaft may extend beyond the open end of the hollow to penetrate within the support substructure to fix the fastening device.

[0058] In some other embodiment of the method for fastening planks/boards to a substructure according to the present invention, these holes made within the support substructure used for the flooring and/or at least within ate least one element of this substructure like for example girders used to build up the support substructure may be provided by a workman drilling holes with a given right spacing into the substructure and/or into at least one element thereof. This may allow to keep the design of the elements used to build up the substructure very simple, so that the resources and the time required to produce the elements used to build up the substructure may be kept as low/short as possible.

[0059] In another embodiment of the method for fastening planks/boards to a substructure according to the present invention, the holes may be boreholes made for example by a workman using a mask providing the right spacing between the holes. The mask may thereby for example comprise holes with a right spacing, so that boreholes with a right spacing may be made in the substructure and/or in at least one element thereof by drilling through the holes of the mask.

[0060] The right spacing may thereby be the desired distance between the holes to allow to get a straight and preferably parallel arrangement of the planks/boards fixed to a substructure. The right spacing may thereby for example depend on the width of the planks/boards, which have to be fixed.

[0061] This allows to reduce the risk of bad measurements made by the workman since he has only to use the mask to determine the right spacing between two holes instead of measuring the distance between holes. It may thus help to guarantee a very accurate and straight placing and fixing of planks/boards.

[0062] Finally, the invention also concerns the use of a fastening device according to the present invention in the method according to the present invention. This helps to get all the advantages of both the fastening device according to the present invention and of the method according to the present invention.

The figures show the following:

[0063] The figures 1 and 2 show an example of a fastening device according to the present invention comprising one holding portion (1) actually being a rim extending laterally away from and beyond the spacing portion (2) with an angle of about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it points upside starting from the spacing portion (2) and thus defines a slant while going round the whole spacing portion (2), one spacing portion (2) having a cuboid shape with four rounded edges and one cylindrical hollow shaft (3), so that the spacing portion is located between the holding portion (1) and the hollow shaft (3). It may be noted that hollow shaft (3) of the fastening device according to the present invention extends vertically away from and beyond the spacing portion (2) of the fastening device according to the present invention. Moreover, it may be seen that the bottom end of the hollow shaft (3) is slanted, so that the insertion of the hollow shaft into the holes made in a substructure may be facilitated. The insertion of the hollow shaft into the holes made in a substructure may thereby be facilitated as the outer diameter of the hollow shaft (3) is lowered at its bottom end due to the slant, which is arranged, so that the slant has his thinnest part located at the bottom end of the hollow shaft, and that the outer diameter of the hollow shaft increases going up from the bottom end of the hollow shaft along the slant. This may allow to introduce the hollow shaft into a hole made in the substructure easily, even if the outer diameter of the hollow shaft is slightly bigger than the diameter of the hole, since the very end of the hollow shaft may easily penetrate in the hole by its thinnest end, that may preferably fit the dimen-

sions of the hole made in the substructure.

[0064] Figure 1 thereby shows a lateral view of the fastening device according to the present invention along its length. Figure 2, on the other hand, shows a view of the fastening device according to the present invention from a point of view located slightly on the right above the fastening device. The hole or channel (4) passing through the fastening device, which is provided to allow a fixing element like for example a nail or a screw to be introduced and/or housed in/by this hole or channel (4) and to pass through the fastening device and actually through the holding portion (1), the spacing portion (2) and inside through the hollow shaft (3) to fix the fastening device to a support substructure, may thus be seen from above.

[0065] Figure 3 shows a cross-section of fastening device already shown in the figures 1 and 2. The cross-section is made along the plane corresponding to the lines shown in the figures 1 and 2. One may see that the holding portion (1) of the fastening device is actually a rim comprising/providing a blade (5) extending laterally away from and beyond the spacing portion (2) with an angle of about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that they point upside starting from the spacing portion (2) thus defining a slant (17) going round the spacing portion (2). The parts of the blade (5) of the rim are extending laterally away from and beyond the spacing portion (2) in opposite directions, so that they may be considered as analog to two blades extending laterally away from and beyond the spacing portion (2) in opposite directions. Figure 3 also shows that the hole or channel (4) passing through the fastening device is aligned with the cylindrical hollow shaft, so that they are arranged along one and the same axe. This allows a fixing element like for example a nail or a screw to be introduced in the hole or channel (4) to pass through the fastening device and actually through the holding portion (1), the spacing portion (2) and inside through the hollow shaft (3) and to fix the fastening device to a support substructure. The fastening device may thereby be fixed to the substructure since the fixing element may extend within the substructure beyond the open bottom end of the hollow shaft (3). Finally, figure 3 also shows the rectangular cross-section of the cuboid shaped spacing portion (2) and the cylindrical hollow shaft having an open bottom end (3). The planks/boards may thereby be placed adjacent to the sidewalls of the spacing portion (2), along the length of the cuboid shaped spacing portion (2), so that they are guided by the sidewalls of the spacing portion (2) to help to get a straight and preferably parallel arrangement of the plank(s)/board(s) fixed with the fastening device.

[0066] Figure 4 shows fastening devices according to the present invention placed between plank(s)/board(s) (6) to fix them to the support substructure (19) or at least to an element like for example a girder used to build up the support substructure (19). It may be seen in figure 4 that the holding portion (1) of the fastening device and especially the blade (5) of the rim of the holding portion may by inserted into grooves or notches (7) of the planks/boards (6), so that the main part of the fastening device is hidden between and/or under the planks/boards. However, the width of spacing portion (2) of the fastening device provides a spacing between the planks/boards, so that a fixing element (8), like for example a nail or a screw may be inserted between the planks/boards into the hole or channel passing through the fastening device. It may be noted that the hollow shafts (3) is located inside the holes (9) made within the substructure. The fastening devices are furthermore fixed to the substructure using fixing elements (8) like for example nails or screws, which pass through the fastening device and thus through the holding portion (1), the spacing portion (2) and the hollow shaft (3), so that the fixing elements (8) extend beyond the open bottom end of the hollow shaft into the substructure (19). The planks/boards (6) are thereby held by the blade (5) of the rim of the holding portion (1), since the slant (17) defined by the blade (5) of the rim of the holding portion (1) arranged inside of the grooves or notches (7) of the planks/boards (6) are pressed against the planks/boards (6) inside these grooves or notches (7), so that the planks/boards (6) are fixed to the substructure (19). As one part of the blade (5) of a fastening device located between two planks/boards (6) is inserted and located into the groove or notch (7) of the plank/board (6) arranged on the right of the fastening device, while another part of the blade (5) is inserted and located into the groove or notch (7) of the plank/board (6) arranged on the left of the fastening device, one fastening device placed between two planks/boards (6) may hold and fix both of these planks/boards (6) to the substructure (19). The planks/boards are thereby placed adjacent against parallel and opposite sidewalls of the spacing portion (2), along and against the length of the cuboid shaped spacing portion (2), so that they are guided by the sidewalls of the spacing portion (2) to help to get a straight and preferably parallel arrangement of the fixed plank(s)/board(s). The fastening device (12) may be pushed against the substructure (19) and against the plank/board (6) following the arrow (10) until the hollow shaft (3) of the fastening device (12) reaches a hole (9) made within the substructure, so that the blade (5) of the rim of the holding portion (1) is inserted in the groove or notch (7) of the plank/board, while the spacing portion (2) gets pressed against the plank/board (6). Doing so the fastening device (12) and especially its hollow shaft (3) may enter the hole (9) to fix the fastening device (12) to the substructure (19). By pushing the fastening device (12) against the plank/board (6) and against the substructure (19), one may slightly bend the plank/board (6) along arrow (11) to get it straight, even if the plank/board (6) may be inherently slightly curved or undulating, so that it may be fixed to the substructure in a straight arrangement. Once the bottom end of the hollow shaft has been introduced in a hole made within the support substruc-

ture, the hollow shaft of the fastening device provides an anchoring point for pushing the fastening device against a plank/board, to be slightly bended to get it straight, and into the hole made within the substructure. An anchoring point may thereby be provided as the fastening device may not slip away because it is held in the hole by at least one part of its hollow shaft introduced into the hole. It may thus become easier to push the fastening device against a plank/board, to be slightly bended to get it straight, and into the hole made within the substructure.

[0067] Figure 5 shows the fastening device (12) with its hollow shaft (3) pushed into and completely inserted in a hole made in the substructure (19). The fastening device (12) is thus fixed in the hole with the blade (5) of the rim of its holding portion (1) inserted in the groove or notch (7) of the plank/board (6), so that the plank/board (6) is kept straight by the fastening device (12). Moreover, the fastening device has to withstand the force exerted (along the arrow shown above the right plank) by a plank/board slightly bended to be straight, which may want to get back to its initial slightly curved or undulating state. Moreover, a fixing element (8) like for example a screw or nail may be inserted (along the arrow shown over the fixing element (8)) into a hole or channel passing through the fastening device (12) fixed to the substructure (19) by its hollow shaft inserted in a hole made within the substructure to further fix the fastening device (12) to the substructure (19).

[0068] Figure 6 shows another exemplary embodiment of a fastening device according to the present invention comprising one holding portion (1) actually being a rim extending laterally away from and beyond the spacing portion (2) with an angle of about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it points upside starting from the spacing portion (2) and thus defines a slant (17) while going round the whole spacing portion (2), one spacing portion (2) having a cuboid shape with four rounded edges and one cylindrical hollow shaft (3), so that the spacing portion is located between the holding portion (1) and the hollow shaft (3). It may be noted that hollow shaft (3) of the fastening device according to the present invention extends vertically away from and beyond the spacing portion (2) of the fastening device according to the present invention. Moreover, it may be noted that the hollow shaft (3) of the fastening device comprises both four slits (13) starting at/from the bottom end of the hollow shaft and a slanted retention rim (14), actually divided in four retention pawl due to the slits. In fact, only one of the four slits (13) is shown in figure 6, as the another one is arranged on the opposite side of the hollow shaft, so that it may not be shown. The other two slits also arranged opposed one to another are arranged along an axe, that may be perpendicular to the axe along which the slit (13) shown in figure 6 and its opposed slit are arranged. In some other embodiment of the fastening device according to the present invention, the slits may extend higher along the hollow shaft as in the embodiment shown in figure 6. Moreover, only a half of the slanted retention rim (14) actually divided in four retention pawls by the four slits (13) is shown in figure 6. However, only two of these four retention pawls are shown, as the other two retention pawls are arranged on the opposite side of the hollow shaft. The presence of a slanted retention rim (14) may locally increase the outer diameter of the hollow shaft (3) comprising the slanted retention rim (14) along the whole portion of the hollow shaft (3) surrounded by a slanted retention rim (14). The outer diameter of the hollow shaft (3) comprising the slanted retention rim (14) thereby increases along the slant of the retention rim (14) starting from the bottom end of the retention rim (14) until the top end of the slanted retention rim (14). Beyond the top end of the slanted retention rim (14), the outer diameter of the hollow shaft (3) comprising the slanted retention rim (14) is reduced again, as there is no more retention rim (14) to increase it. This may be particularly useful when hollow elements are used to build up the support substructure. Upon engaging the bottom end of the slanted retention rim (14) of the hollow shaft (3) into a hole made in the substructure and pressing the fastening device with its hollow shaft into this hole made in the substructure, an increasing pressure is exerted on the hollow shaft along the arrow (15), since the outer diameter of the hollow shaft comprising the slanted retention rim (14) increases along the slant of the retention rim (14), starting from the bottom end of the slanted retention rim (14). The portions of the hollow shaft (3) separated by the slits (13) may thus get squeezed together along the arrow (15), reducing the outer diameter of the hollow shaft (3) comprising the slanted retention rim (14) to facilitate the penetration in the hole made within the substructure. The fastening device may thus be very well fixed to the substructure since the diameter of the hollow shaft (3) comprising the slanted retention rim (14), which was introduced in the hole by compressing the hollow shaft (3) and by squeezing the portions of the hollow shaft (3) separated by the slits (13) together, may be bigger than the diameter of the hole, so that the retention rim (14) strongly anchors to fastening device in the hole made within the substructure.

[0069] Figure 7 shows even another exemplary embodiment of a fastening device according to the present invention comprising one holding portion (1) actually being a rim extending laterally away from and beyond the spacing portion (2) with an angle of about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it points upside starting from the spacing portion (2) and defines a slant while going round the whole spacing portion (2), one spacing portion (2) having a cuboid shape with four rounded edges and one cylindrical hollow shaft (3), so that the spacing portion is located between the holding portion (1) and the hollow shaft (3). It may be noted that hollow shaft (3) of the fastening device according to the present invention extends verti-

cally away from and beyond the spacing portion (2) of the fastening device according to the present invention. Moreover, it may be noted that the hollow shaft (3) of the fastening device comprises two slanted retention pawls (18) arranged at the bottom end of the hollow shaft (3). However, only one slanted retention pawl (18) may be shown here as the other one is located outside the hollow shaft on the opposite side of the hollow shaft. The slanted retention pawls (18) are arranged, so that their thinnest ends are located at the bottom end of the hollow shaft (3). This may facilitate the introduction of the hollow shaft (3) comprising the retention pawls (18) in a hole made in the substructure. Moreover, the bottom end of the hollow shaft (3) is also slanted, so that the thinnest end of the slant is located at the bottom end of the hollow shaft (3). This may further facilitate the introduction of the hollow shaft (3) of the fastening device in a hole made in the substructure. The retention pawls (18) may thereby improve the fixation of the fastening device in a hole made in the substructure.

[0070] Figure 8 shows a cross-section of the same fastening devices shown in the figures 6 and 7. The cross-section is made along the plane corresponding to the lines shown in the figures 6 and 7. One may see that the holding portion (1) of the fastening device is actually a rim comprising/providing a blade (5) extending laterally away from and beyond the spacing portion (2) in opposite directions with an angle of about 135 degrees measured relatively to a sidewall of the spacing portion and/or to the hole or channel passing through the fastening device, so that it points upside starting from the spacing portion (2) thus defining a slant (17) going round the spacing portion (2). The parts of the blade (5) of the rim are extending laterally away from and beyond the spacing portion (2) in opposite directions, so that they may be considered as analog to two blades extending laterally away from and beyond the spacing portion (2) in opposite directions. Figure 8 also shows that the hole or channel (4) passing through the fastening device is aligned with the cylindrical hollow shaft, so that they are arranged along one and the same axe. This allows a fixing element like for example a nail or a screw to be introduced in the hole or channel (4) to pass through the fastening device and actually through the holding portion (1), the spacing portion (2) and inside through the hollow shaft (3) and to fix the fastening device to a support substructure. The fastening device may thereby be fixed to the substructure since the fixing element may extend within the substructure beyond the open bottom end of the hollow shaft. Furthermore, figure 8 also shows the rectangular cross-section of the cuboid shaped spacing portion (2) and the cylindrical hollow shaft having an open bottom end (3). The planks/boards may thereby be placed adjacent to the sidewalls of the spacing portion (2), along the length of the cuboid shaped spacing portion (2), so that they are guided by the preferably parallel sidewalls of the spacing portion (2) to help to get a straight and preferably parallel arrangement of the fixed plank(s)/board(s). Finally, figure 8 also shows a cross-sectional view of the slanted retention element(s) (16) like for example the retention rim and/or the retention pawls arranged outside the hollow shaft on opposite sides of the hollow shaft.

List of reference numerals

[0071]

1 Holding portion of the fastening device
2 Spacing portion of the fastening device
3 Hollow shaft of the fastening device
4 Hole or channel passing through the fastening device
5 Blade comprised/provided by the rim of the holding portion of the fastening device
6 Plank/board
7 Groove or notch of the plank/board
8 Fixing element
9 Hole made within the support substructure or at least within at least one element of the substructure
10 Direction along which the fastening device is pushed against the board/plank and against the substructure.
11 Direction along which the plank/board is bended to get it straight upon pushing the fastening device against it
12 Fastening device
13 Slit starting at/from the bottom end of the hollow shaft of the fastening device
14 Slanted retention rim
15 Direction along which pressure is exerted on the portions of the hollow shaft separated by the slit
16 Retention element
17 Slant defined by the blade(s) comprised/provided by rim comprised by the holding portion of the fastening device
18 Retention pawl
19 Support substructure or element of this substructure

Claims

1. Fastening device,
characterized in that,
it comprises at least one holding portion, at least one spacing portion and at least one hollow shaft, so that the spacing portion is located between the holding portion and the hollow shaft.

2. The fastening device according to claim 1,
characterized in that,
it comprises at least one hole or channel passing through the fastening device

3. The fastening device according to one or both of the claims 1 or 2,

characterized in that,
the holding portion comprises at least one blades extending laterally away from and beyond the spacing portion.

4. The fastening device according to one or more than one of the claims 1 to 3,
characterized in that,
the holding portion comprises at least two blade extending laterally away from and beyond the spacing portion.

5. The fastening device according to one or more than one of the claims 1 to 4,
characterized in that,
the blades extend laterally away from and beyond the spacing portion in at least two opposite directions.

6. The fastening device according to one or more than one of the claims 1 to 5,
characterized in that,
at least one blade comprise a slant or define a slant.

7. The fastening device according to one or more than one of the claims 1 to 6,
characterized in that,
the holding portion comprises a rim extending away from and beyond the spacing portion.

8. The fastening device according to claim 7,
characterized in that,
the rim may comprise a slant or define a slant.

9. The fastening device according to one or more than one of the claims 1 to 8,
characterized in that,
the spacing portion comprises a cuboid shape.

10. The fastening device according to one or more than one of the claims 1 to 9,
characterized in that,
the hollow shaft is a cylindrical hollow shaft.

11. The fastening device according to one or more than one of the claims 1 to 10,
characterized in that,
the bottom end of the hollow shaft comprises a slant.

12. The fastening device according to one or more than one of the claims 1 to 11,
characterized in that,
it is made of a polymeric material.

13. The fastening device according to one or more than one of the claims 1 to 12,
characterized in that,
it is made of a polymeric material reinforced with glass fibers.

14. The fastening device according to one or more than one of the claims 1 to 13,
characterized in that,
the hollow shaft comprises at least one retention element.

15. The fastening device according to one or more than one of the claims 1 to 14,
characterized in that,
the hollow shaft comprises at least one retention pawl.

16. The fastening device according to one or more than one of the claims 1 to 15,
characterized in that,
the hollow shaft comprises a retention rim.

17. The fastening device according to one or more than one of the claims 1 to 16,
characterized in that,
the hollow shaft comprises at least one slit.

18. A method for fastening planks/boards to a substructure,
characterized in that,
holes with a right spacing are provided within the support substructure or at least within at least one element of this substructure, so that planks/boards may be fixed to the substructure by pushing the fastening devices against the planks/boards and/or against the substructure and into these holes.

19. The method for fastening planks/boards to a substructure according to claim 19,
characterized in that,
the holes are boreholes made using a mask providing the right spacing between the holes.

20. Use of a fastening device according to one of the claims 1 to 17,
characterized in that,
it is used in a method according to one or both of the claims 19 and/or 20.

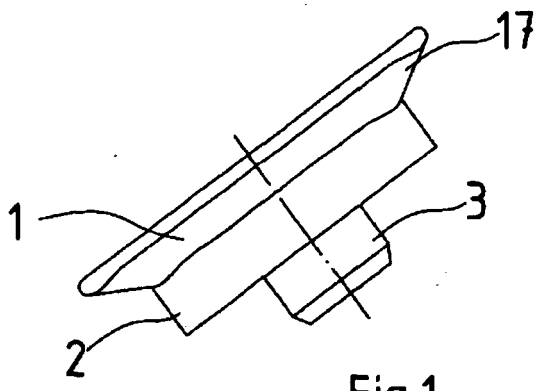

Fig.1

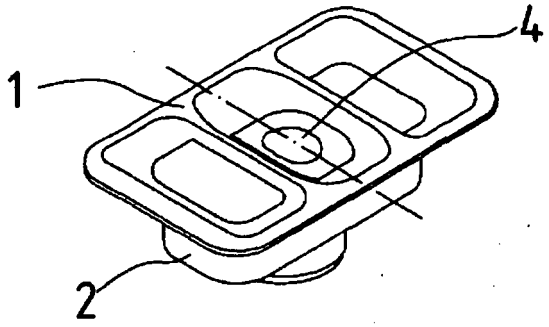

Fig.2

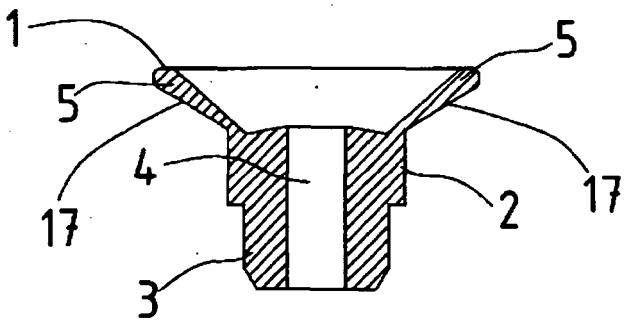

Fig.3

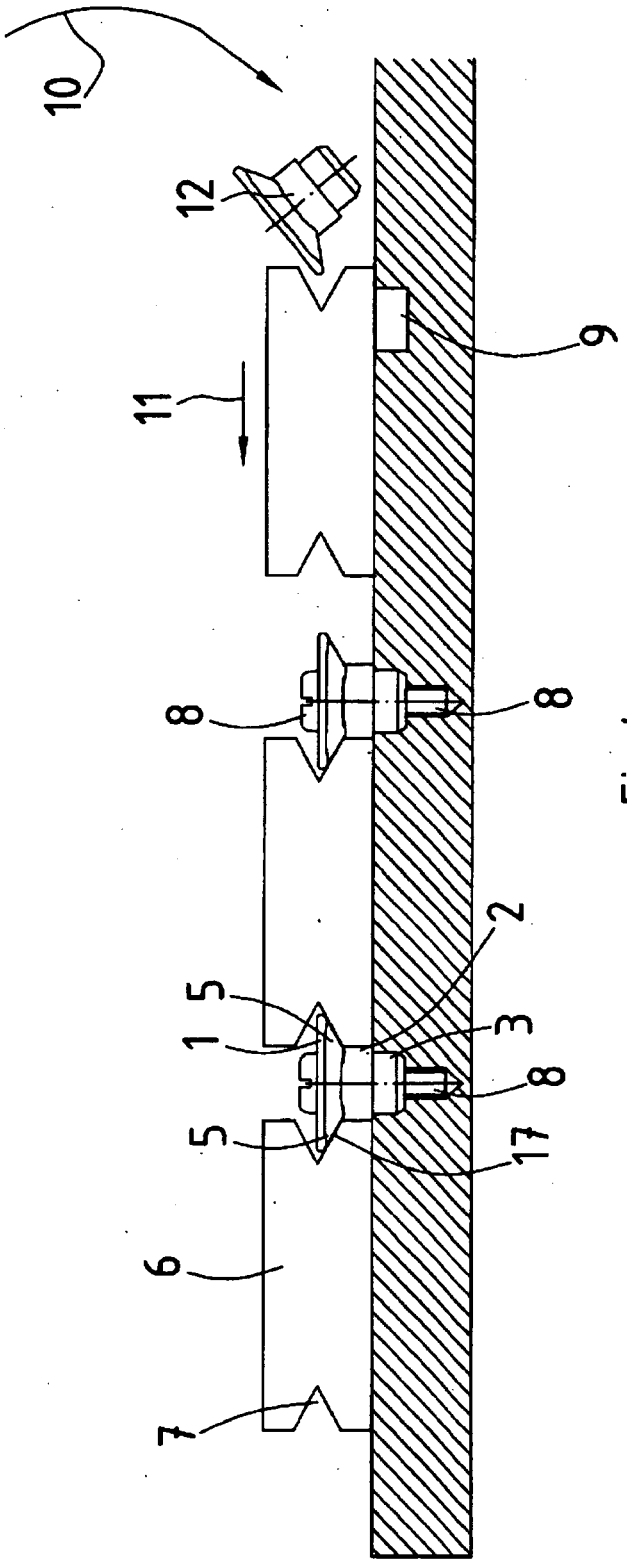

Fig.4

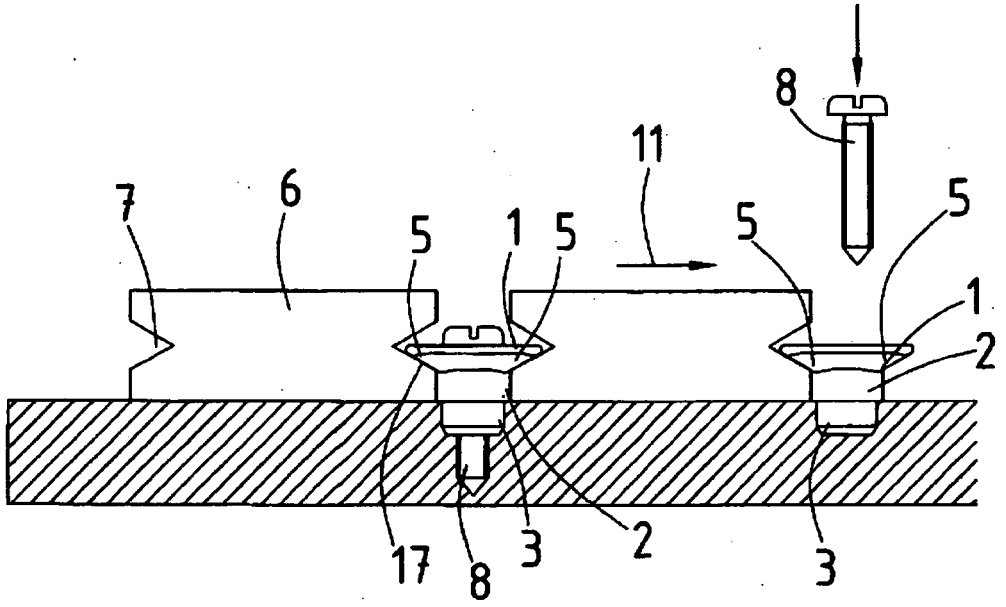

Fig.5

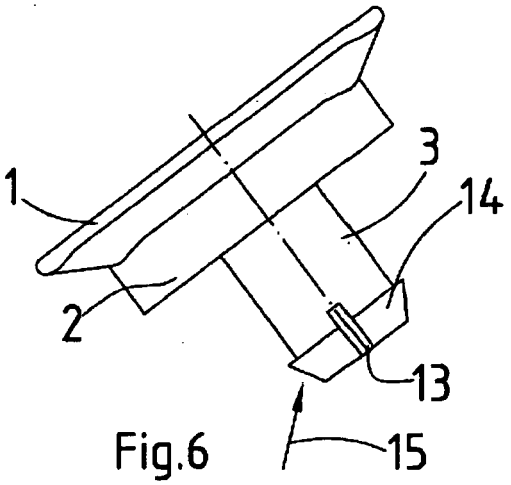

Fig.6

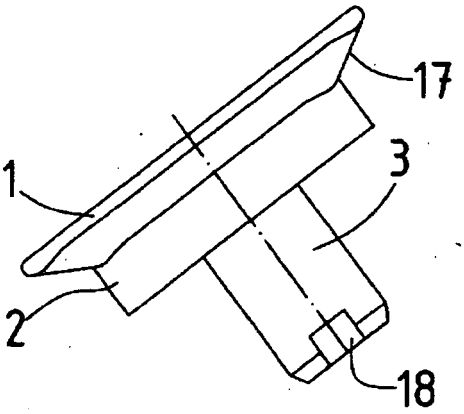

Fig.7

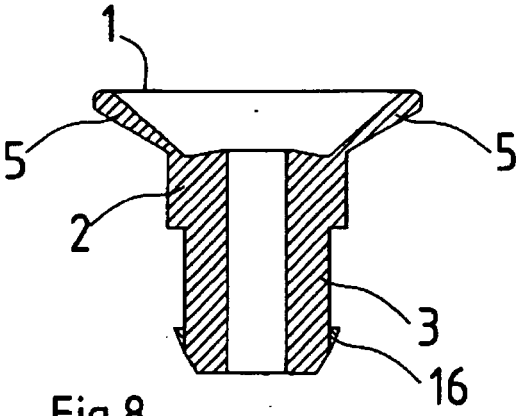

Fig.8

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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 July 2008	Severens, Gert

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