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SPACER DEVICE AND LEVELLING DEVICE FOR LEVELLING TILES

(57) A spacer device (1) for a levelling device (100) for levelling two or more adjacent tiles, the spacer device (1) comprising: a bottom base (10) comprising two or more surfaces (11, 12) for placing the tiles to be levelled; an intermediate spacer element (20) perpendicularly connected to the bottom base (10) and comprising an upper portion (21) and a lower portion (22); and an elongated top body (30) connected to the upper portion (21) of the intermediate spacer element (20) and comprising a male connector (31) configured to be connected to an external female connector (2) of a levelling device (100); wherein the lower portion (22) of the intermediate spacer element (20) comprises two lateral columns (23, 24) and a central column (25), the central column being arranged between the two lateral columns (23, 24), each comprising a main body (231, 241, 251) and a lower end (232, 242, 252).

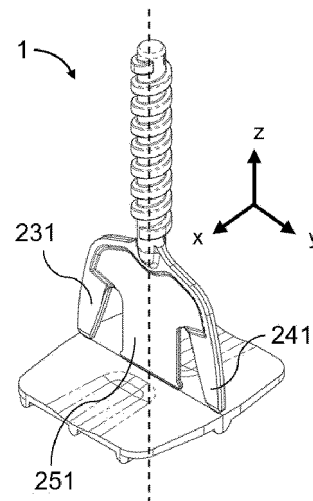


FIG. 3A

Description

TECHNICAL FIELD

[0001] The present invention relates to a spacer device for a levelling device for levelling two or more tiles, and to a levelling device comprising such a spacer device.

PRIOR ART

[0002] Tile installation is a common process in the construction industry, and a crucial step in achieving an aesthetically pleasing and functional result is to ensure that the tiles are level. Levelling devices have been developed to assist in this process, and various types of levelling devices have been proposed.

[0003] A typical levelling device normally comprises a nut and a spacer device, which are used to adjust the height of adjacent tiles. The spacer device typically comprises a base, a spacer plate perpendicularly connected to the base and an upper threaded portion (e.g. a threaded stem or similar) connected to an upper part of the spacer plate, wherein the threaded portion is normally perpendicularly arranged with respect to the base and is configured to be connected to the nut. The tiles to be levelled are typically arranged over a bottom base of the spacer device such that, when the nut is screwed onto the threaded portion of the spacer device, the lower faces of the tiles are pressed by the base while the upper faces of the tiles are pressed by the nut, thereby levelling the tiles.

[0004] Thus, the main technical purpose of levelling devices is to apply force and displacement on two or more tiles in order to make their surfaces even and level. Further, levelling devices have the secondary technical purpose of ensuring that the space between the one or more tiles is kept constant and determined by the thickness of the spacer plate.

[0005] However, existing levelling devices suffer from several drawbacks when it comes to achieving both of the above purposes.

[0006] For example, in conventional levelling devices the problem is attempted to be solved by providing a single section that attempts to pursue both purposes. This single section typically corresponds to a spacer plate being configured as a single column plate. In some cases, the spacer plate further comprises a small opening in an area of the spacer plate in contact with the base of the spacer devices, such that the spacer plate comprises a main body configured as a single column plate having two mini columns connecting the main body with the base. Since these known configurations have to deal with a double purpose, they are typically designed to favour one of them, thereby causing some problems derived, for example, from an excess of mass, a reduced performance under load conditions, poor levelling and/or spacing of the tiles, etc. In particular, a typical problem with these known solutions is that, as the nut is screwed tighter and

tighter onto the threaded portion of the spacer device, an undesired torque is transmitted to the spacer plate, so that the spacer plate twists slightly, causing a gap between the tiles to be greater than the thickness of the spacer plate.

[0007] Therefore, there is a need for an improved levelling spacer device for a levelling device with an improved effectiveness in achieving a level tile installation with an improved control over the space between the tiles.

SUMMARY OF THE INVENTION

[0008] The present invention addresses the problem of levelling one or more adjacent tiles with an improved control of the space between said adjacent tiles. This problem is solved by a spacer device for a levelling device as set out in the claims, and by a levelling device comprising said spacer device as set forth in the claims.

[0009] A first aspect of the invention refers to a spacer device for a levelling device intended to level adjacent tiles, wherein said spacer device is preferably made as a monolithic part and may be made of plastic. The spacer device comprises a bottom base for placing the two or more tiles to be levelled, an intermediate spacer element perpendicularly connected to the bottom base, and an elongated top body. The bottom base comprises one, two or more surfaces for placing the tiles to be levelled. The intermediate spacer element is arranged between the bottom base and the elongated top body, wherein an upper portion of the intermediate spacer element is connected to the elongated top body, and wherein a lower portion (or at least a part of said lower portion) of the intermediate spacer element is perpendicularly connected to the bottom base. The elongated top body is longitudinally (i.e. the term longitudinal indicates the direction of elongation of the elongated top body, which corresponds to a height direction) arranged along a central geometrical axis (a geometrical axis not being a part of the invention per se, but an external auxiliary spatial reference), wherein the central geometrical axis is perpendicular to the bottom base (i.e. is configured to extend along a first direction being perpendicular to the bottom base). The elongated top body may be configured as a stem. At least a part of the elongated top body (e.g. a stem) is configured as a male connector (e.g., threaded portion or locking teeth) configured to be connected to an external female connector (e.g. a knob or nut of a levelling device, said levelling device comprising said knob/nut and a spacer device according to the invention).

[0010] The intermediate spacer element comprises two opposing surfaces or sides (e.g. a front side/surface/face and a rear side/surface/face) for separating the tiles to be levelled (i.e. the one or more adjacent tiles to be levelled). It is noted that said two opposing surfaces or sides (e.g. a front side/surface/face and a rear side/surface/face) are applicable/compatible with any sub-element comprised by the intermediate spacer element (i.e.

the parts comprised by the intermediate spacer element - such as the lateral columns, the central column and the upper and lower portions described below - may also have respective front and rear faces).

[0011] For the purpose of clarifying the terms used along the present disclosure, throughout the current description, the term "height" refers to a distance measured along the first direction (i.e. the direction along which the central axis extends), the term "width" refers to a distance measured in a second direction being perpendicular to the first direction. The term "thickness" is not indicating per se any direction, but has to be interpreted in a case-by-case basis. For example, a thickness related to any part/element belonging to the intermediate spacer element is measured along a third direction being perpendicular to both the first and the second direction (e.g. a thickness of the intermediate spacer element may be measured between its front and rear faces/sides in the third direction), while a thickness of the bottom plate may be measured along the first direction (i.e. along the central geometrical axis (C)).

[0012] The intermediate spacer element comprises an upper portion and a lower portion. The upper portion is connected to the elongated top body. The lower portion comprises two lateral columns and a central column, the central column being arranged between the two lateral columns. Each column comprises a respective main body and a respective lower end, wherein each main body is configured to extend from the upper portion of the intermediate spacer element to the respective lower end of the respective column. The lower end of each column is connected to the bottom base, such that the intermediate spacer element is connected to the bottom base at least by means of the respective lower ends of the two lateral columns and of the central column. The lower ends may be configured as a predetermined breakable zones such that, when a predetermined force is applied to the upper portion and/or to the elongated top body (e.g. by kicking said elements after having levelled the two or more tiles), then the lower ends are easily broken, thereby separating the intermediate spacer element from the bottom base.

[0013] The main bodies of the two lateral columns may be configured to be in contact with the main body of the central column. In preferred embodiments, the intermediate spacer element may further comprise at least one or two separation areas, wherein each separation area is arranged between one of the lateral columns and the central column (e.g. between the respective main bodies of the columns). Each area may be configured to extend along the first and the second directions. Preferably, at least one of the separation areas may be configured as an opening (e.g. an opening devoid of any material); and/or at least one of the separation areas may be configured as an opening being at least partially (i.e. partially or totally) covered by a covering layer (e.g. a layer of the same material than the rest of the intermediate spacer element) having a thickness being smaller than the maximum

thickness of each of the lateral columns. In some embodiments, said covering layer may have a thickness being configured to be smaller than a thickest part of the central column.

[0014] The maximum thickness of each lateral column may be in the range 0.5 to 4 mm (or 0.5 to 5 mm), preferably 1 to 3 mm and more preferably 1.5 to 2 mm. It is noted that the maximum thickness of a lateral column may correspond to a thickness of the respective main body or (where protrusions according to the description provided below are arranged over a part of the respective main body) to a sum of a thickness of the respective main body with a thickness of an overlapping protrusion.

[0015] The central column may be arranged such that a part of the length of the geometrical central axis is coincidentally arranged with the central column (e.g. with a height of the central column), wherein preferably the central column may be centred with respect to the geometrical central axis, such that the elongated top body is connected to a central part of the upper portion of the intermediate spacer element. The intermediate spacer element may be construed as extending along a height in the first direction, extending along a width in the second direction and having a thickness measurable in the third direction.

[0016] Preferably, at least a part of the main body of the central column may be configured to have a thickness being smaller than a maximum thickness of each of the lateral columns, said maximum thickness of each of the lateral columns may also be configured to be a maximum thickness of the intermediate spacer element. Said referred thicknesses are measurable in the second direction, i.e. between the respective front and rear sides/faces. Preferably, the thickness of the at least one part of the main body of the central column may be configured to be smaller than a maximum thickness of each of the lateral columns, such that the thickness of said at least one part corresponds to a percentage of said maximum thickness being in the range 10 to 90%, preferably 25 to 80%, more preferably 0.35 to 0.55%. Preferred thicknesses for said at least one part of the main body of the central column are in the range 0.4 to 1.5 mm, preferably 0.45 to 0.8 mm.

[0017] Accordingly, no part of the main body of the central column may be configured to have a thickness being greater than the maximum thickness of each of the lateral columns (i.e. any thickness of the main body of the central column may be configured to be smaller than or equal to the maximum thickness of each of the lateral columns, said maximum thickness being preferably the maximum thickness of the intermediate spacer element); and/or at least a part of the main body of the central column may be configured to have a thickness being smaller than a maximum thickness of each lateral column (i.e., being smaller than a part of each of the lateral columns having a greatest thickness, said maximum thickness being preferably the maximum thickness of the intermediate spacer element). In some embodiments, a part/portion of the

main body of the central column having a maximum thickness (of said main body) may be configured to have a thickness being equal to a part of the respective main body of each lateral column having a maximum thickness of the respective lateral columns, and at least a part/portion of the main body of the central column may be configured to have a thickness being smaller than said maximum thickness of the respective lateral columns. These features of the invention are broadly compatible with the embodiments described below.

[0018] Hence, having at least a part of the main body of the central column configured to have a thickness being smaller than a maximum thickness of each of the lateral columns has the effect that the space between the two (or more) adjacent tiles to be levelled (i.e. each tile being arranged in a respective opposing side of the intermediate spacer element) is determined/controlled by a thickest part (i.e. by a part having a maximum thickness) of each of the lateral columns, wherein preferably both lateral columns are configured to have identical thicknesses (e.g., by one column being a mirror copy of the other). The part (or whole) of the main body of the central column having a smaller thickness than a maximum thickness of each of the lateral columns may therefore be (slightly) spaced apart from the tiles (i.e. in the third direction), thereby enabling a twist movement of the central column. Thus, the central column may be configured such that, when an external knot/nut with a female connector (e.g. a female threaded portion of a knob/nut of a levelling device) is connected (i.e. engaged) to the male connecting portion (i.e. male connector) of the elongated top body such that the lower faces of the tiles are pressed against the bottom base while the upper faces of the tiles are pressed by the knob/nut, thereby causing a rotational/torsional force that is transmitted to the intermediate spacer element, then the central column is allowed to slightly twist around the central geometrical axis, thereby minimising the effect of the rotational/torsional force in/against the lateral columns. This configuration has the effect of separating the technical purposes of the lateral columns and the central columns to obtain a synergistic technical effect, wherein the central column is configured to transmit (along a straight force path) a compression force for levelling the tiles along the central geometrical axis and to dissipate at least partially resulting rotational/torsional forces, while the lateral columns are configured to control/ensure that the space between the one or more tiles is kept constant despite the rotational forces received by the intermediate spacer element.

[0019] In some embodiments, the intermediate spacer element may be configured as a plate (e.g. a planar plate), wherein this configuration is compatible with having areas/zones of different thicknesses. In some embodiments, the upper portion of the intermediate spacer element may be configured to comprise at least a part being substantially planar. Further, in some embodiments, the upper portion may be configured as a part being substantially planar (e.g. as a plate).

[0020] The intermediate spacer element may be arranged in a first plane perpendicular to the bottom base, the first plane extending along a first direction being perpendicular to the bottom plate (e.g. a longitudinal direction coinciding with the direction of the central geometrical axis) and along a second direction being perpendicular to the first direction. The intermediate spacer element may be configured to have a height (total height) in the first direction, and a width in the second direction.

[0021] The lower portion of the intermediate spacer element may be configured to extend along a height along the central geometrical axis (i.e. in the first direction) corresponding to a percentage of a total height of the intermediate spacer element in the range 10 to 90%, preferably 20 to 80%, more preferably 45 to 60% (wherein the range 48% to 57% is especially advantageous). This has the effect of reducing the transmission of torsional efforts/forces towards the lateral columns. It is noted that the total height of the intermediate spacer element is measured between the respective lower ends and the part of the upper portion to which the elongated top body is connected.

[0022] In preferred embodiments, the lower end of at least one of the lateral columns and/or of the central column may be configured to have less torsional strength (i.e. may be configured to be a kind of soft zone) than the rest of the respective column. This less torsional strength may be achieved by configuring the lower end(s) to have a smaller thickness and/or width than the main body (e.g. the respective lower end may have a smaller thickness than any part of the respective main body) of its respective column.

[0023] Preferably, the lower end of the central column may comprise one or two lateral shoulders. The lateral shoulders may be arranged to increase a width (i.e. in the second direction by arranging one should on each lateral side of the central column) of said lower end. Thus, the shoulders are configured to locally increase the width of said lower end, thereby increasing the torsional strength/resistance of the lower end to reduce an undesired transmission of torsional efforts to the bottom base.

[0024] Preferably, at least a part of the upper portion may be configured to have a thickness being smaller than a maximum thickness of each of the lateral columns, wherein said maximum thickness of each of the lateral columns may also be configured to be a maximum thickness of the intermediate spacer element. Preferably, no part of the upper portion of the intermediate spacer element may be configured to have a greater thickness than a maximum thickness of each of the lateral columns (i.e. any thickness of the upper portion may be configured to be smaller than or equal to the maximum thickness of each of the lateral columns); and/or at least a part of the upper portion of the intermediate spacer element may be configured to have a thickness being smaller than a maximum thickness of each lateral column (i.e. than a part of each the lateral columns having a maximum thickness).

[0025] In some embodiments, said part of the upper portion of the intermediate spacer element configured to have a thickness being smaller than the maximum thickness of the lateral columns (e.g. this maximum thickness being arranged in the main bodies of the lateral columns) extends along a width of the upper portion such that extends at least partially over a part of the upper portion that is connected to the respective lateral column. In other words, said part of the upper portions extends outwardly from the central axis (i.e. along the second direction) such that said part of the upper portion extends over a part of the upper portion being at least partially arranged above (in the first direction - i.e. the direction of the central geometrical axis) at least one of the lateral columns (e.g. above a part of the upper portion being connected to the respective lateral column).

[0026] Alternatively or additionally with respect to the embodiment of the preceding paragraph, said part of the upper portion of the intermediate spacer element configured to have a thickness being smaller than the maximum thickness of each of the lateral columns may be further configured to have a thickness being equal to the thickness of the at least one part of the main body of the central column being configured to have a thickness smaller than the maximum thickness of each of the lateral columns.

[0027] In some embodiments, in a manner compatible or alternative with the features of the upper portion described in the four preceding paragraphs, said part of the upper portion of the intermediate spacer element configured to have a thickness being smaller than a maximum thickness of each of the lateral columns may be at least partially delimited by a peripheral edge of the upper portion.

[0028] In some embodiments, the main body of at least one of the lateral columns may comprise a protrusion (or more than one protrusion) arranged on at least one of the front or rear faces of the respective main body of the intermediate spacer element, said protrusion being configured to selectively increase a thickness of the respective lateral column (i.e. in an area where a protrusion is arranged, the thickness of the lateral column for this area is the sum of the thickness of the main body for this area with the thickness of the protrusion). Thus, a protrusion may be arranged to provide the maximum thickness of a lateral column. Preferably, the two lateral columns may be configured to be symmetrical, such that each lateral column comprises a protrusion being symmetrical with respect a protrusion of the other lateral column. In some embodiments, each protrusion may be configured to have a thickness in the range 0.1 to 3 mm, preferably 0.5 to 2.5 mm, and more preferably 1.5 to 2.0 mm.

[0029] In preferred embodiments, the protrusions may be arranged only on the front face or only on the rear face of the intermediate spacer element (and therefore only in the front or only in the rear face of the respective lateral columns).

[0030] Each protrusion may be configured to extend along at least a part of a total length of the respective

main body, wherein the total length is comprised between the respective lower end and the upper portion. It should be noted that the length of a lateral column may be different from its height, since the lateral columns may be arranged at an angle from the upper portion towards the bottom base. Therefore, the length of total length may extend partially along the first direction and partially along the second direction. Preferably, each protrusion may be configured to extend along a percentage of the total length of the respective main body in the range 10 to 90%, preferably 30 to 80%, more preferably 50 to 70%.

[0031] Each protrusion may be equidistantly arranged with respect to the respective lower end and the upper portion. However, in preferred embodiments each protrusion may be configured to extend from an end portion (i.e. a part) of the respective main body (i.e. a part being proximal to the respective lower end or even in contact with said lower end) towards the upper portion of the intermediate spacer element, thereby reducing an undesired transmission of torsional forces towards the protrusions, which enables a better stability in the control of the distance between the two or more adjacent tiles to be levelled.

[0032] Further, each protrusion may be configured to extend along at least a part of a width of the respective main body (i.e. along the second direction), wherein the width of the respective main body is measured between an edge of the main body proximal to the central column towards an edge of the main body distal to the central column. Preferably, each protrusion may be configured to extend from an edge (or an area close to this edge) of the main body proximal to the central column towards an edge of the main body distal to the central column; and/or wherein each protrusion extends along a percentage of the width of the respective main body in the range 10 to 100%, preferably 20 to 85%, more preferably 35 to 70%.

[0033] At least one of the lateral columns may be configured to extend from the upper portion of the intermediate spacer element to the bottom base such that a distance between the respective lateral column and the central geometrical axis (which is arranged along the first direction) is greater in a part of the lateral column being proximal to bottom base than in a part of the lateral column being proximal to the upper portion (thereby defining an angled configuration). This distance may be measured between the central axis and the edge of the respective lateral column being proximal to the central column (i.e., to the central geometrical axis). Preferably, said distance between the at least one lateral column and the central geometrical axis progressively increases linearly or geometrically (or a combination thereof) as the lateral column extends from the upper portion towards the bottom plate. The space between the central column and each of the lateral columns corresponds to a respective separation area as previously described.

[0034] In some embodiments, at least one of the lateral columns may be configured to extend from the upper portion of the intermediate spacer element to the bottom

base such that a width of the lateral column (i.e. measured along the second direction between two respective edges of the lateral column) is greater in a part of the lateral column being proximal to the upper portion than in a part of the lateral column being proximal to the bottom base. Thus, an upper part of the lateral column may be configured to have a greater width than a lower part of the respective lateral column. This is advantageous because it provides a greater torsional strength in an upper part of the respective lateral column. Preferably, the width of the at least one lateral column may be configured to progressively decrease (more preferably following a linear or a geometrical function or a combination thereof) as the lateral column extends from the upper portion towards the bottom plate. Hence, the cross-section of the lateral column (i.e. of the main body of the lateral column) may have a decreasing width as the lateral column extends from the upper portion to the bottom base.

[0035] In some embodiments, at least one of the two or more surfaces of the bottom base (i.e. the surfaces configured for placing the one or more tiles to be levelled) are configured to have a recess or depression downwards. This recess or depression is an area of the surface having a smaller thickness (the thickness here is measured in the first direction) than the rest of the surface. This feature is broadly compatible with the above provided embodiments of the invention. Preferably, said recess or depression is arranged in a centred position with respect to a width of the central column and/or is arranged at a distance from the lower end of the central column.

[0036] The spacer device may further comprise a front low wall and/or a rear low wall to divide each of the original two surfaces for placing the tiles to be levelled into two respective surfaces, thus enabling the spacer device to be used in a levelling device for levelling more than two tiles (e.g. three or four tiles). The front low wall may be perpendicularly arranged with respect to the bottom base (the front low wall being connected to the bottom base) and optionally with respect to the front face of the main body of the central column (wherein the front low wall may optionally be connected to the main body of the central column), wherein the front low wall may also be configured to extend from the bottom base towards the upper portion (i.e. along the first direction) along a height corresponding to a partial height of the lower portion. The rear low wall may be perpendicularly arranged with respect to the bottom base (the rear low wall being connected to the bottom base) and optionally with respect to the rear face of the main body of the central column (wherein the front low wall may optionally be connected to the main body of the central column), wherein the rear low wall may be configured to extend from the bottom base towards the upper portion along a height corresponding to a partial height of the lower portion.

[0037] The front low wall and/or the rear low wall may be configured to extend along height (in the first direction) corresponding to a percentage of the total height (in the first direction) of the lower portion of the intermediate

spacer element, said percentage being preferably in the range 5 to 70%, more preferably 15 to 50%, and even more preferably 25-30%. Preferably, the front and rear low walls may be configured to have a same height.

[0038] In some embodiments, the main body of the central column may be configured to have a smaller width (e.g. measured in the second direction) than the rest of the main body (and/or than the lower end of the central column) in a part corresponding to the height of the front low wall and/or to the height of the rear low wall. This smaller width (e.g. waisted portion/part) may be configured as an indentation or recess at each lateral edge (the central column comprises two lateral edges extending at least partially along the first direction and being separated along the second direction, thereby defining the width of the column) of the central column, such that each indentation/recess is arranged at one of the two lateral edges and is configured to extend from said respective lateral edge towards the central geometrical axis (e.g. forming a waist in the central column).

[0039] A second aspect of the invention refers to levelling device for levelling two or more adjacent tiles. The levelling device comprises a spacer device according to any of the embodiments described above and a female connector configured to engage with the male connector of said spacer device such that, when the female connector is engaged with (e.g. connected to) the male connector of the spacer device and is displaced towards the bottom base, then respective lower faces of the two or more tiles are pressed by (e.g. against) the bottom base of the spacer device and respective upper faces of the two or more tiles are pressed by the female connector, thereby levelling the tiles. In preferred embodiments, the female connector may be configured a knob and/or nut (or similar) having an internal thread and the male connector may be configured as an external thread arranged around at least a part of the elongated top body (e.g. the elongated top body of the intermediate spacer element may be configured as a threaded stem).

BRIEF DESCRIPTION OF THE FIGURES

[0040] Preferred embodiments of the invention are described below with reference to the attached drawings, in which:

Fig. 1 depicts four different views (Figs. 1A to 1D) of a first spacer device 1 according to embodiments of the invention.

Fig. 2 depicts four different views (Figs. 2A to 2D) different views of a second spacer device 1 element according to embodiments of the invention.

Fig. 3 depicts four different views (Figs. 3A to 3D) different views of a third spacer device 1 according to embodiments of the invention.

Fig. 4 depicts four different views (Figs. 4A to 4D) different views of a fourth spacer device 1 according to embodiments of the invention.

Fig. 5 depicts four different views (Figs. 5A to 5D) different views of a fifth spacer element 1 according to embodiments of the invention.

Fig. 6 depicts four different views (Figs. 6A to 6D) different views of a sixth intermediate spacer device 1 according to embodiments of the invention.

Fig. 7 shows in Figs. 7A and 7B two views of a female connector 2 connectable to the elongated top body 30 of a spacer device 1 according to any of the embodiments of the invention, and Figs. 7C and 7D show a levelling device 100 comprising a female connector 2 and a spacer device 1 according to embodiments of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0041] Fig. 1 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 1A shows a lateral an isometric view of the spacer device 1, Fig. 1B depicts a respective front view, while Figs. 1C and 1D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0042] The spacer device 1 comprises a bottom base 10 for placing the two or more tiles to be levelled, an intermediate spacer element 20 perpendicularly connected to the bottom base 10, and an elongated top body 30. The bottom base 10 comprises surfaces 11, 12 for placing the tiles to be levelled. The intermediate spacer element 20 is arranged between the bottom base 10 and the elongated top body 30, wherein an upper portion 21 of the intermediate spacer element 20 is connected to the elongated top body 30, and wherein a lower portion 22 (or at least a part of said lower portion) of the intermediate spacer element is perpendicularly connected to the bottom base 10. The elongated top body is longitudinally (i.e. extends along a height in the first direction, corresponding to the "z" direction) arranged along a central geometrical axis C (the geometrical axis C not being a part of the invention, but an external auxiliary spatial reference), wherein the central geometrical axis C is perpendicular to the bottom base 10. The elongated top body comprises a male connector configured to be connected to an external female connector (e.g. a nut of a levelling device, said levelling device comprising said nut and a spacer device according to the invention). It is noted that in Fig. 1, the elongated top body is configured as a stem comprising a threaded portion. However, the invention is compatible with other types of male connectors.

[0043] The intermediate spacer element 1 of Fig. 1 comprises two opposing surfaces or sides 201, 202 (e.g. a front side/surface/face 201 and a rear side/surface/face 202) for separating the tiles to be levelled (i.e. the one or

more adjacent tiles to be levelled). It is noted that said two opposing surfaces or sides (e.g. a front side/surface/face and a rear side/surface/face) are applicable/compatible with any sub-element comprised by the intermediate spacer element (i.e. the parts comprised by the intermediate spacer element may also have a front and a rear face). The front 201 and rear 202 faces extend along a height in the first direction "z" and along a width in the second direction "y".

[0044] The intermediate spacer element 1 comprises an upper portion 21 and a lower portion 22. The upper portion 21 (see dotted area in Fig. 1B) is connected to the elongated top body 30. The lower portion 22 comprises two lateral columns 23, 24 and a central column 25, the central column 25 being arranged between the two lateral columns 23, 24. Each column 23, 24, 25 comprises a respective main body 231, 241, 251 and a respective lower end 232, 242, 252, wherein each main body 231, 241, 251 is configured to extend from the upper portion 21 of the intermediate spacer element 20 to the respective lower end 232, 242, 252 of the respective column. The lower end 232, 242, 252 of each column 23, 24, 25 is connected to the bottom base 10, such that the intermediate spacer element 20 is connected to the bottom base 10 by means of the respective lower ends 232, 242, 252 of the two lateral columns 23, 24 and of the central column 25. Although it is not visible in Fig. 1, the lower ends 232, 242, 252 may be configured as a predetermined breakable zones such that, when a predetermined force is applied to the upper portion 21 and/or to the elongated top body 30 (e.g. by kicking said elements after having levelled the two or more tiles), the lower ends 232, 242, 252 broke, thereby separating the intermediate spacer element 20 from the bottom base 10.

[0045] Although not visible in Fig. 1, the main body 251 of the central column 25 may be configured to have a thickness being smaller than a maximum thickness of each of the lateral columns 23, 24. Said maximum thickness of each of the lateral columns 23, 24 may also be configured to be a maximum thickness of the intermediate spacer element 20. These thicknesses referred to are measurable in the third direction, i.e. between the respective front 201 and rear 202 sides/faces - i.e. along the third direction "x". In other compatible embodiments, the main body 251 of the central column 25 may be configured to have a thickness of the at least one part of the main body of the central column may be configured to have a being smaller than a maximum thickness of each of the lateral columns 23, 24, such that the thickness of said at least one part corresponds to a percentage of said maximum thickness being in the range 10 to 90%, preferably 25 to 80%, more preferably 0.35 to 0.55%. Preferred thicknesses for said at least one part of the main body 251 of the central column 25 are in the range 0.4 to 1.5 mm, preferably 0.45 to 0.8 mm. The maximum thickness of each lateral column 23, 24 may be in the range 0.5 to 4-5 mm, preferably 1 to 3 mm and more preferably 1.5 to 2 mm.

[0046] In Fig. 1, the intermediate spacer element 20 comprises two optional separation areas 234, 244, wherein each separation area 234, 244 is arranged between one of the lateral columns 23, 24 and the central column 25 (e.g. between the respective main bodies 231, 241, 251 of the columns 23, 24, 25). In the specific embodiment of Fig. 1, both areas 234, 244 are configured as respective openings (e.g. an opening devoid of any material). However, the configuration of Fig. 1 is also compatible with having at least one of the openings at least partially (i.e. partially or totally) covered by a covering layer (e.g. a layer of the same material than the rest of the intermediate spacer element) having a thickness being smaller than the maximum thickness of each of the lateral columns. In some embodiments, said covering layer may further have a thickness being smaller than a thickest part of the main body 251 of the central column 25. In other compatible embodiments, the main bodies 231, 241 of the two lateral columns 23, 24 may be configured to be in contact with the main body 251 of the central column 25, thereby not having separation areas 234, 244. The separation areas 234, 244 may be arranged such that the upper parts of the lateral columns and the central column are in contact, wherein the lower ends of the three columns are spaced apart (e.g. in the second direction). In some embodiments, the spacer device 1 of Fig. 1 may be configured such that there is no separation space between the lateral columns 23, 24 and the central column (e.g. by the lateral columns 23, 24 and the central column 25 being in contact along their respective lengths).

[0047] In the embodiment of Fig. 1, the lower portion 22 of the intermediate spacer element 20 is configured to extend along a height along the central geometrical axis C (i.e. in the first direction "z") corresponding to a percentage of a total height of the intermediate spacer element 20 equivalent to a range 50 to 60%, in the range 10 to 90%, preferably 20 to 80%, more preferably 30 to 60% (wherein the range 48% to 57% is specially advantageous). The remaining percentage (i.e. up to a 100%) corresponds to the height of the upper portion 21.

[0048] Although it is not visible in Fig. 1, the lower end 232, 242, 252 of at least one of the lateral columns 23, 24 and/or of the central column 25 may be configured to have less torsional strength than the rest of the respective column 23, 24, 25. This less torsional strength may be achieved by configuring the lower end(s) 232, 242, 252 to have a smaller thickness and/or width (this is indeed visible in Fig. 1B for the lateral columns 23 and 24) than the main body 231, 241, 251 (e.g. the respective lower end may have a smaller thickness than any part of the respective main body) of its respective column 23, 24, 25.

[0049] The embodiment of Fig. 1 further comprises optional recesses 15 arranged on the surfaces 11, 12 of the bottom base 10. This recess 15 or depression 15 is an area of the surface having a smaller thickness (the thickness here is measured in the first direction) than the rest of the respective surface 11, 12.

[0050] The reference signs shown in Fig. 1 are also applicable to the remaining figures with respect to the different parts having correspondence with those of Fig. 1 that have been previously identified.

[0051] Fig. 2 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 2A shows a lateral an isometric view of the spacer device 1, Fig. 1B depicts a respective front view, while Figs. 2C and 2D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0052] The spacer device 1 of Fig. 2 is based on the spacer device of Fig. 1, but comprising additional optional features that can be added independently of each other. Although the main body 251 of the central column 25 is configured to have a narrower width (in the second direction "y"), it is noted that all the embodiments are compatible with a plurality of widths.

[0053] Fig. 2 illustrates the optional feature in which the main body 251 (as a whole) of the central column 25 (i.e. below the dotted line) is configured to have a thickness being smaller than a maximum thickness of each of the lateral columns 23, 24. Said maximum thickness of each of the lateral columns 23, 24 being configured as the maximum thickness of the intermediate spacer element 20. Further, the two main bodies 231, 241 of the two lateral columns 23, 24 are configured to have the same thickness (i.e. maximum thickness of the spacer element 20), wherein the upper portion 21 is also configured to have the same thickness (i.e. maximum thickness of the spacer element 20) and being also the same thickness of the upper portion 21 of the intermediate spacer element 20.

[0054] The lower ends 232, 242 of the lateral columns 23, 24 are configured (optional feature) to have less torsional strength than the rest of the respective lateral columns 23, 24. In the present embodiment, this less torsional strength is achieved by configuring the lower end(s) 232, 242, to have a smaller thickness (visible in Figs. 2A and 2C) and width (this is indeed visible in Fig. 2B for the lateral columns 23 and 24) than the main body 231, 241 (e.g. the respective lower ends 232, 242 have a smaller thickness than any part of the respective main bodies 231, 241) of its respective column 23, 24.

[0055] Further, the lower end 252 of the central column 25 is also configured to have a smaller thickness (visible in Fig. 2A and 2C). In addition, the embodiment of Fig. 2 the lower end 252 of the central column 25 comprises two lateral shoulders, wherein this is an optional feature. The lateral shoulders are configured to increase a width (i.e. in the second direction) of said lower end 252. Thus, the shoulders are configured to locally increase the width of said lower end 252.

[0056] The embodiment of Fig. 2 does not comprise the at least one optional recess 15 shown in Fig. 1. However, this embodiment is also compatible with this feature.

[0057] The spacer device 1 of Fig. 2 further comprises two optional features (which can be considered inde-

pendently optional) that are also shown in respect of Fig. 1 (and in Figs. 3 to 6), but that have not been detailed therein. In particular, the way the lateral columns extend from the upper portion 21 to the bottom base 10, and the variable with of the lateral columns 23, 24 along their respective lengths.

[0058] In Fig. 2 the lateral columns 23, 24 are configured to extend from the upper portion 21 of the intermediate spacer element 20 to the bottom base 10 such that a distance between the respective lateral column 23, 24 and the central geometrical axis C is greater in a part of the lateral column 23, 24 being proximal to bottom base 10 than in a part of the lateral column 23, 24 being proximal to the upper portion 21 (thereby defining an angled configuration). The distance between each lateral column 23, 24 and the central geometrical axis C progressively increases as the lateral column 23, 24 extends from the upper portion 21 towards the bottom plate 10. The space between the central column 25 and each of the lateral columns 23, 24 corresponds to the separation spaces 234, 244 previously described for the embodiment of Fig. 1

[0059] Further, the lateral columns 23, 24 of Fig. 2 are configured to extend (e.g. along their respective length) from the upper portion 21 of the intermediate spacer element 20 to the bottom base 10 such that a width of each lateral column 23, 24 (i.e. measured along the second direction "y" between two respective edges of the lateral column 23, 24) is greater in a part of the lateral column 23, 24 being proximal to the upper portion 21 than in a part of the lateral column 23, 24 being proximal to the bottom base 10. Thus, an upper part of the lateral column 23, 24 is configured to have a greater width than a lower part of the respective lateral column 23, 24. Preferably, the width of the at least one lateral column 23, 24 may be configured to progressively decrease (more preferably following a linear or a geometrical function or a combination thereof) as the lateral column 23, 24 extends from the upper portion 21 towards the bottom plate 10. Hence, the cross-section of the lateral column 23, 24 (i.e. of the main body 231, 241 of the lateral column 25) may have a decreasing width as the lateral column 23, 24 extends from the upper portion 25 to the bottom base 10.

[0060] It is however noted that the above specific configuration for the way the lateral columns extend from the upper portion 21 to the bottom base 10, and the variable with of the lateral columns 23, 24 along their respective lengths, merely represent an embodiment. However, the embodiments depicted in the figures are broadly compatible with other configurations disclosed in the summary of the invention above.

[0061] Fig. 3 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 3A shows a lateral an isometric view of the spacer device 1, Fig. 3B depicts a respective front view, while Figs. 3C and 3D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0062] Fig. 3 illustrates the optional feature of having

at least a part of the upper portion 21 configured to have a thickness being smaller than a maximum thickness of each of the lateral columns 23, 24, wherein said maximum thickness of each of the lateral columns 23, 24 may also be configured to be a maximum thickness of the intermediate spacer element. It is noted that Fig. 3 is based on the example shown in Fig. 2 to further incorporate the different thickness in the upper portion 21, however, this feature is also compatible with the embodiment shown in Fig. 1.

[0063] The at least one part of the upper portion 21 of the intermediate spacer element 20 configured to have a thickness being smaller than the maximum thickness of the lateral columns 23, 24 extends along a width (i.e. in the second direction "y") of the upper portion 21 such that extends at least partially over a part of the upper portion 21 that is connected to the respective lateral column 23, 24. In other words, said part of the upper portion 21 extends outwardly from the central axis C (i.e. along the second direction "y") such that said part of the upper portion 21 extends over a part of the upper portion 21 being arranged at least partially above (in the first direction "z" - i.e. the direction of the central geometrical axis C) at least one of the lateral columns 23, 24 (e.g. above a part of the upper portion 21 being connected to the respective lateral column 23, 24).

[0064] In the embodiment of Fig. 3, the part of the upper portion 21 of the intermediate spacer element 20 configured to have a thickness being smaller than the maximum thickness of each of the lateral columns 23, 24 is further configured to have a thickness being equal to the thickness of the at least one part of the main body 251 of central column 25 being configured to have a thickness smaller than the maximum thickness of each of the lateral columns 23, 24. However, this is an optional feature that can be isolated.

[0065] In addition, Fig. 3 shows another optional feature of the embodiment: said part of the upper portion 21 of the intermediate spacer element 20 configured to have a thickness being smaller than a maximum thickness of each of the lateral columns 23, 24 is (at least partially) delimited by a peripheral edge 210 of the upper portion 21 (see Fig. 3B).

[0066] Fig. 4 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 4A shows a lateral an isometric view of the spacer device 1, Fig. 4B depicts a respective front view, while Figs. 4C and 4D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0067] Fig. 4 illustrates the optional feature of having protrusions 233, 243 for locally increasing the thickness of the lateral columns 23, 24. It is noted that Fig. 4 is based on the example shown in Fig. 3 to further incorporate the protrusions 233, 242. However, this feature is also compatible with the embodiments shown in Figs. 1 and 2.

[0068] The main body 231, 241 of each lateral columns 23, 24 (although in some embodiments this feature may

be present in at least one of the main bodies 231, 241) comprises a protrusion 233, 243 arranged on the front face of the respective main body 231, 241 of the intermediate spacer element 20. Said protrusions 233, 243 are configured to selectively increase a thickness of the respective lateral column 23, 24 (i.e. in an area where a protrusion 233, 242 is arranged, the thickness of the respective lateral column 23, 24 for this area is the sum of the thickness of the main body 231, 241 for this area with the thickness of the respective protrusion 233, 243). The two lateral columns 23, 24 are configured to be symmetrical (optional feature), such that each lateral column 23, 24 comprises a protrusion 233, 243 being symmetrical with respect a protrusion 233, 243 of the other lateral column 23, 24. The protrusions 233, 243 are compatible with being configured to have a thickness in the range 0.1 to 3 mm, preferably 0.5 to 2.5 mm, and more preferably 1.5 to 2.0 mm.

[0069] The two protrusions 233, 243 are configured to extend along a part of a total length of the respective main body 231, 241, wherein the total length is comprised between the respective lower end 232, 242 and the upper portion 21. Further, each protrusion 233, 243 extends along a percentage of the total length of the respective main body 231, 241 approximately in the range 50 to 70%.

[0070] Further, the two protrusions 233 and 243 are depicted in Fig. 4 as being configured to extend from an end portion of the respective main body 231, 241 being proximal to the respective lower end 232, 242 towards the upper portion 21 of the intermediate spacer element 20.

[0071] The protrusions 233, 243 shown in Fig. 4 are further configured to extend along a part of a width of the respective main body 231, 241 (i.e. along the second direction "y"), wherein the width of the respective main body 231, 241 is measured between an edge of the main body 231, 241 proximal to the central column 25 towards an edge of the main body 231, 241 distal to the central column 25. The preferred embodiment of Fig. 4 shows that each protrusion 233, 243 is configured (optional feature) to extend from an edge (or an area close to this edge) of the main body 231, 241 proximal to the central column 25 towards an edge of the main body 231, 241 distal to the central column 25.

[0072] The configuration of the protrusions 233, 242 is not limited to the specific configuration shown in Fig. 4, but it is broadly compatible with any of the configurations for the protrusions disclosed above in the summary of the invention (the configurations of the protrusions are transversely compatible with a plurality of embodiments, as those showed in the figures).

[0073] Fig. 5 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 5A shows a lateral an isometric view of the spacer device 1, Fig. 5B depicts a respective front view, while Figs. 5C and 5D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0074] Fig. 5 illustrates the optional feature of having a front low wall 13. It is noted that in some compatible embodiments, the spacer device 1 may comprise a front low wall 13 and/or a rear low wall (see Fig. 6). It is also noted that Fig. 5 is based on the example shown in Fig. 3 to further incorporate the feature of the front low wall 13. However, this feature is also compatible with the embodiments shown in Figs. 1, 2 and 4.

[0075] The front low wall 13 is perpendicularly arranged with respect to the bottom base 10 (the front low wall 13 being connected to the bottom base 10) and with respect to the front face 201 of the main body 251 of the central column 25 (optionally, the front wall 13 may be connected to the main body 251 of the central column 25). The front low wall 13 is configured to extend from the bottom base 10 towards the upper portion 21 (i.e. along the first direction "z") along a height corresponding to a partial height of the lower portion 22. The front low wall 13 may be configured to extend along a height corresponding to a percentage of the total height (in the first direction "z") of the lower portion 22 of the intermediate spacer element 20, said percentage being preferably in the range 5 to 70%, more preferably 15 to 50%, and even more preferably 25-30%.

[0076] A second optional feature shown in Fig. 5, which also broadly compatible with the preceding embodiments of Figs. 1 to 4, is that the main body 251 of the central column may be configured to have a smaller width 254 (e.g. measured in the second direction "y") than the rest of the main body 251 (and/or than the lower end 252 of the central column 25) in a part corresponding to the height of the front low wall and/or to the height of the rear low wall. This smaller width 254 (e.g. a waisted portion 254) may be configured as an indentation or recess 254 at each lateral edge (the central column 25 comprises two lateral edges extending at least partially along the first direction "z" and being separated along the second direction "y", thereby defining the width of the column) of the central column 25, such that each indentation/recess 254 is arranged at one of the two lateral edges of the central column 25 and is configured to extend from said respective lateral edge towards the central geometrical axis C (e.g. forming a waist in the central column 25).

[0077] Fig. 6 depicts four different views of a spacer device 1 according to embodiments of the invention. Fig. 6A shows a lateral an isometric view of the spacer device 1, Fig. 6B depicts a respective front view, while Figs. 6C and 6D respectively show a lateral and a top view of the same intermediate spacer device 1.

[0078] Fig. 6 illustrates the optional feature of having a front low wall 13 and a rear wall 14. It is noted that Fig. 6 is based on the example shown in Fig. 4 to further incorporate the feature of the front low wall 13 and the rear low wall 14. However, this feature is also compatible with the embodiments shown in Figs. 1, 2, 3 and 5.

[0079] The rear low wall 14 is characterised in a similar way to the front low wall 13 depicted in Fig. 5, but is arranged facing the rear face 202, instead of the front

face 201. Accordingly, the rear low wall 14 is perpendicularly arranged with respect to the bottom base 10 (the rear low wall 14 being connected to the bottom base 10) and optionally with respect to the rear face 202 of the main body 251 of the central column 25, wherein the rear low wall 14 may be configured to extend from the bottom base 10 towards the upper portion 21 along a height corresponding to a partial height of the lower portion 22. The front low wall 13 and the rear low wall 14 may be configured to extend along height corresponding to a percentage of the total height (in the first direction "z") of the lower portion 22 of the intermediate spacer element 20, said percentage being preferably in the range 5 to 70%, more preferably 15 to 50%, and even more preferably 25-30%. Preferably, the front 13 and rear 14 low walls may be configured to have a same height.

[0080] Fig. 7 depicts four different views of the second aspect of the invention referring to a levelling device 100 for levelling two or more adjacent tiles according to any of the embodiments described. Fig. 7 shows in Figs. 7A and 7B two views of a female connector 2 connectable to the elongated top body 30 of a spacer device 1 according to any of the embodiments of the invention. Figs. 7C and 7D show a levelling device 100 comprising a female connector 2 and a spacer device 1 according to embodiments of the invention.

[0081] The female connector 2 of Figs. 7A and 7B is configured a knob or nut having an internal thread in its central portion (not visible). The female connector 2 is configured to be engaged/screwed onto/around the male connector 31 (which may be configured as a threaded portion, such as a threaded stem) of the spacer device 1.

[0082] The levelling device 100 for levelling two or more adjacent tiles of Figs. 7C and 7D comprises a spacer device 1 and a female connector 2, and is configured such that, when the female connector 2 is engaged with (e.g. connected to) the male connector 31 of the spacer device 1, respective lower faces of the two or more tiles are pressed by (e.g. against) the bottom base 10 of the spacer device 1 and respective upper faces of the two or more tiles are pressed by the female connector 2 (by a lower part/portion of the female connector 2), thereby levelling the tiles.

Claims

1. A spacer device (1) for a levelling device (100) for levelling two or more adjacent tiles, the spacer device (1) comprising:

a bottom base (10) comprising two or more surfaces (11, 12) for placing the tiles to be levelled; an intermediate spacer element (20) having a front face (201) and a rear face (202) and being configured for separating the tiles to be levelled, the intermediate spacer element (20) comprising an upper portion (21) and a lower portion

(22), wherein the intermediate spacer element (20) is perpendicularly connected to the bottom base (10) by means of the lower portion (22); and an elongated top body (30) connected to the upper portion (21) of the intermediate spacer element (20), such that the intermediate spacer element (20) is arranged between the bottom base (10) and the elongated top body (30), wherein the elongated top body (30) extends longitudinally along a central geometrical axis (C) being perpendicular to the bottom base (10), wherein at least a part of the elongated top body (30) is configured as a male connector (31) configured to be connected to an external female connector (2);

wherein the lower portion (22) of the intermediate spacer element (20) comprises two lateral columns (23, 24) and a central column (25), the central column being arranged between the two lateral columns (23, 24), wherein each column (23, 24, 25) comprises a main body (231, 241, 251) and a respective lower end (232, 242, 252), wherein each main body (231, 241, 251) extends from the upper portion (21) of the intermediate spacer element (20) to the respective lower end (232, 242, 252) of the respective column (23, 24, 25), wherein the intermediate spacer element (20) is connected to the bottom base (10) by means of the respective lower ends (232, 242, 252) of the two lateral columns (23, 24) and of the central column (25);

wherein preferably at least a part of the main body (251) of the central column (25) is configured to have a thickness being smaller than a maximum thickness of each of the lateral columns (23, 24), said maximum thickness of each of the lateral columns (23, 24) being preferably a maximum thickness of the intermediate spacer element (20).

2. The spacer device (1) of claim 1, wherein the intermediate spacer element (20) further comprises one or two separation areas (234, 244), wherein each separation area (234, 244) is arranged between one of the lateral columns (23, 24) and the central column (25), wherein preferably:

at least one of the separation areas (234, 244) is configured as an opening; and/or

at least one of the separation areas (234, 244) is configured as an opening being at least partially covered by a covering layer having a thickness being smaller than the maximum thickness of each of the lateral columns (23, 24), preferably having a thickness being configured to be smaller than a thickest part of the main body (251) of the central column (25)

3. The spacer device (1) of claims 1 or 2, wherein the lower end (232, 242, 252) of at least one of the lateral columns (23, 24) and/or of the central column (25) is configured to have less torsional strength than the rest of the respective column (23, 24, 25);
wherein preferably a said at least one lower end (232, 242, 252) is configured to have a smaller thickness and/or width than the main body (231, 241, 251) of the respective column (23, 24, 25), thereby providing less torsional strength.
4. The spacer device (1) of any of the preceding claims, wherein:

the lower end (252) of the central column (25) comprises one or two lateral shoulders (253) configured to locally increase a width of the lower end (252); and/or
wherein the lower portion (22) of the intermediate spacer element (20) extends along the central geometrical axis (C) corresponding to a percentage of a total height of the intermediate spacer element (20) in the range 10 to 90%, preferably 20 to 80%, more preferably 30 to 60%.
5. The spacer device (1) of any of the preceding claims, wherein at least a part of the upper portion (21) of the intermediate spacer element (20) is configured to have a thickness being smaller than a maximum thickness of each the lateral columns (23, 24);
wherein preferably:

said part of the upper portion (21) of the intermediate spacer element (20) configured to have a thickness being smaller than the maximum thickness of each of the lateral columns (23, 24) is further configured to extend outwardly from the central geometrical axis (C) such that said part of the upper portion (21) extends over a part of the upper portion (21) being at least partially arranged above at least one of the lateral columns (23, 24); and/or
said part of the upper portion (21) of the intermediate spacer element (20) configured to have a thickness being smaller than the maximum thickness of each of the lateral columns (23, 24) has a thickness being equal to the thickness of the at least one part of the central column (25) being configured to have a thickness smaller than the maximum thickness of each of the lateral columns (23, 24).
6. The spacer device (1) of any of the preceding claims, wherein the main body (231, 241) of at least one of the lateral columns (23, 24) comprises a protrusion (233, 243) arranged on at least one of the front and/or the rear faces of the respective main body (231, 241) of the intermediate spacer element (20), said protrusion being configured to selectively increase a thickness of the respective lateral column (23, 24);
wherein preferably the two lateral columns (23, 24) are configured to be symmetrical, such that each lateral column (23, 24) comprises a protrusion (233, 243) being symmetrical with respect a protrusion (233, 243) of the other lateral column (23, 24).
7. The spacer device (1) of claim 6, wherein each protrusion (233, 243) is configured to extend along at least a part of a total length of the respective main body (231, 241) of the respective lateral column (23, 24), wherein the total length is comprised between the respective lower end (232, 242) and the upper portion (21);
wherein preferably each protrusion (233, 243) extends along a percentage of the total length of the respective main body (231, 241) in the range 10 to 90%, preferably 30 to 80%, more preferably 50 to 70%.
8. The spacer device (1) of claims 6 or 7,

wherein each protrusion (233, 243) is equidistantly arranged with respect to the respective lower end (232, 242) and the upper portion; or
wherein each protrusion (233, 243) is configured to extend from an end portion of the respective main body (231, 241) being proximal to the respective lower end (232, 242) towards the upper portion (21) of the intermediate spacer element (20).
9. The device spacer of any of claims 6 to 8, wherein each protrusion (233, 243) is configured to extend along at least a part of a width of the respective main body (231, 241), wherein the width of the respective main body (231, 241) is measured between an edge of the main body (231, 241) proximal to the central column (25) and an edge of the main body (231, 241) distal to the central column (25);
wherein preferably:

each protrusion (233, 243) is configured to extend from an edge of the main body (231, 241) proximal to the central column (25) towards an edge of the main body (231, 241) distal to the central column (25); and/or
each protrusion (233, 243) extends along a percentage of the width of the respective main body (231, 241) in the range 10 to 100%, preferably 20 to 85%, more preferably 35 to 70%.
10. The spacer device (1) of any of the preceding claims, wherein at least one of the lateral columns (23, 24) is configured to extend from the upper portion (21) of the intermediate spacer element (20) to the bottom base (10) such that a distance between the lateral

column (23, 24) and the central geometrical axis (C) is greater in a part of the lateral column (23, 24) being proximal to bottom base (10) than in a part of the lateral column (23, 24) being proximal to the upper portion (21);

wherein preferably the distance between the at least one lateral column (23, 24) and the central geometrical axis (C) progressively increases as the lateral column (23, 24) extends from the upper portion (21) towards the bottom plate (10), wherein more preferably said distance increases linearly or geometrically as the lateral column (23, 24) extends from the upper portion (21) towards the bottom plate (10).

11. The spacer device (1) of any of the preceding claims, wherein at least one of the lateral columns (23, 24) is configured to extend from the upper portion (21) of the intermediate spacer element (20) to the bottom base (10) such that a width of the lateral column (23, 24) is greater in a part of the lateral column (23, 24) being proximal to the upper portion (21) than in a part of the lateral column (23, 24) being proximal to the bottom base (10);
- wherein preferably the width of the at least one lateral column (23, 24) progressively decreases as the lateral column extends from the upper portion (21) towards the bottom plate (10), wherein more preferably said width increases linearly or geometrically as the lateral column (23, 24) extends from the upper portion (21) towards the bottom plate (10).
12. The spacer device (1) of any of the preceding claims, wherein at least one of the two or more surfaces of the bottom base (10) for placing the tiles are configured to have a recess (15) or depression (15) downwards;
- wherein preferably said recess (15) or depression (15) is arranged in a centred position with respect to a width of the central column (25) and/or is arranged at a distance from the lower end (252) of the central column (25).
13. The spacer device (1) of any of the preceding claims, further comprising:

a front low wall (13) perpendicularly arranged with respect to the bottom base (10) and preferably with respect to the front face of the main body (251) of the central column (25), wherein the front low wall (11) is configured to extend from the bottom base (10) towards the upper portion (21) along a height corresponding to a percentage a height of the lower portion (22); and/or

a rear low wall (14) perpendicularly arranged with respect to the bottom base (10) and preferably with respect to the rear face of the main body (251) of the central column (25), wherein

the rear low wall (12) is configured to extend from the bottom base (10) towards the upper portion (21) along a height corresponding to a percentage of a height of the lower portion (22).

14. The spacer device (1) of claim 13, wherein the main body (251) of the central column (25) is configured to have a smaller width (254) than the rest of the main body (251) in a part corresponding to the height of the front low wall (13) and/or to the height of the rear low wall (14).

15. A levelling device (100) for levelling tiles for levelling two or adjacent more tiles, the device (100) comprising:

a spacer device (1) according to any of claims 1 to 13; and

a female connector (2) configured to engage with the male connector (31) of the spacer device (1) such that, when the female connector (2) is engaged with the male connector (31) of the spacer device (1) and is displaced towards the bottom base (10), then lower faces of the two or more tiles are pressed by the bottom base (10) of the spacer device (1) and upper faces of the two or more tiles are pressed by the female connector (2), thereby levelling the tiles;

wherein preferably the female connector (2) is configured a nut having an internal thread and the male connector (31) is configured as an external thread arranged around at least a part of the elongated top body (31).

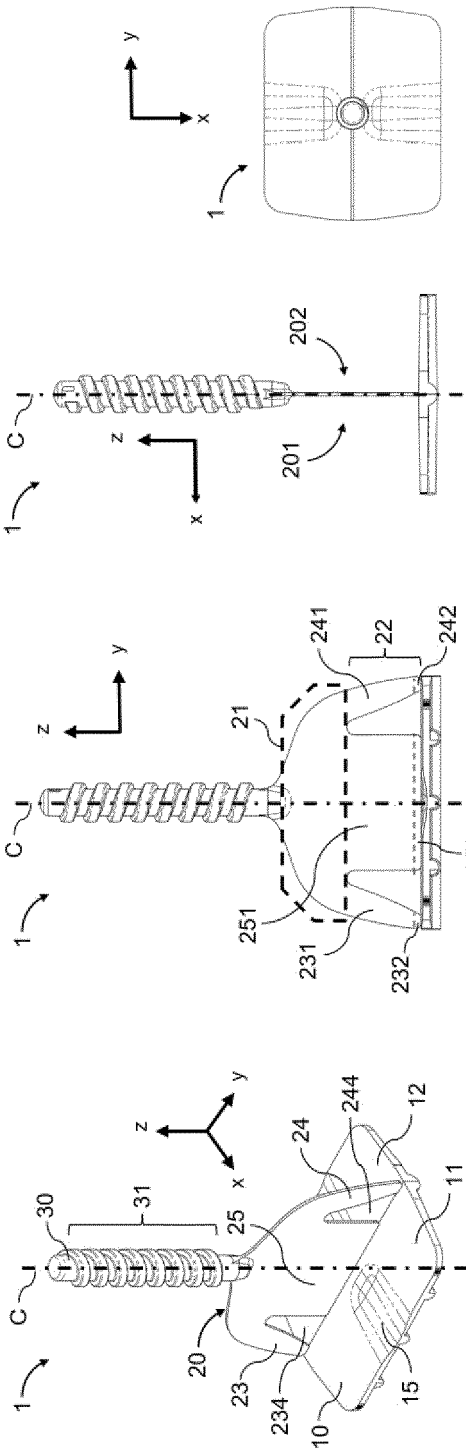


FIG. 1D

FIG. 1C

FIG. 1B

FIG. 1A

FIG. 1

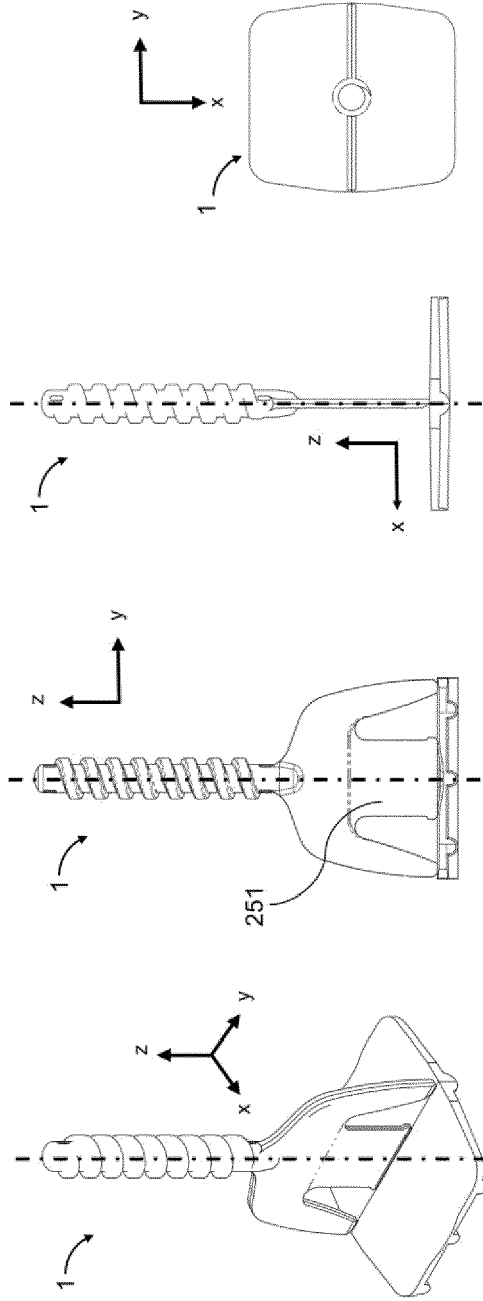


FIG. 2D

FIG. 2C

FIG. 2B

FIG. 2A

FIG. 2

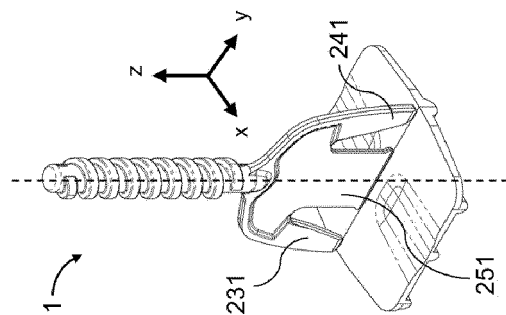


FIG. 3A

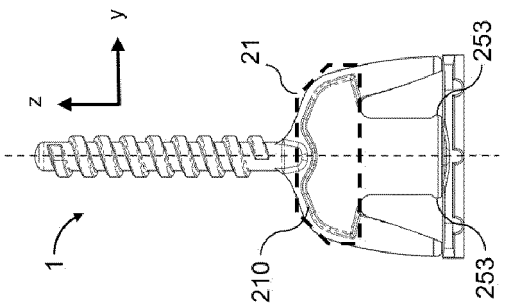


FIG. 3B

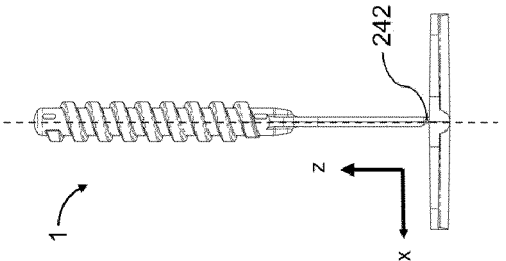


FIG. 3C

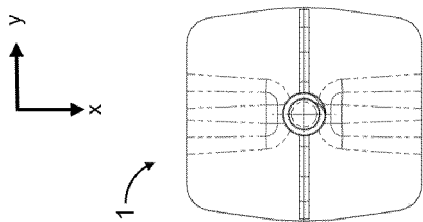


FIG. 3D

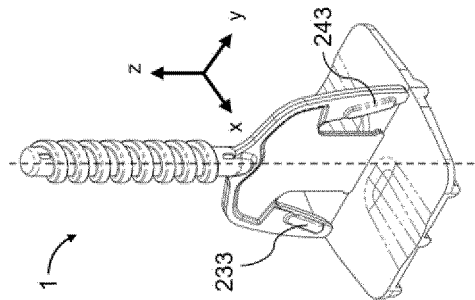


FIG. 4A

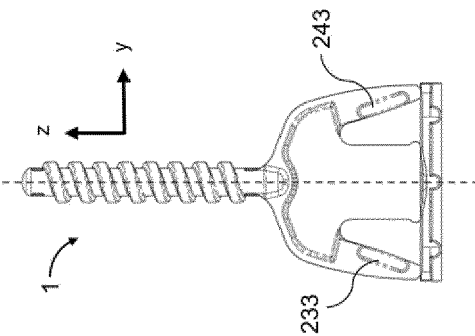


FIG. 4B

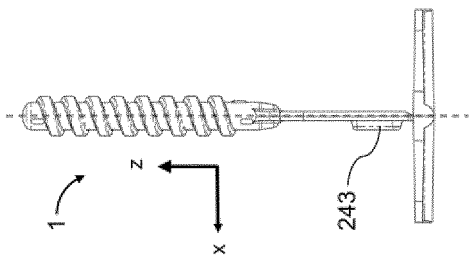


FIG. 4C

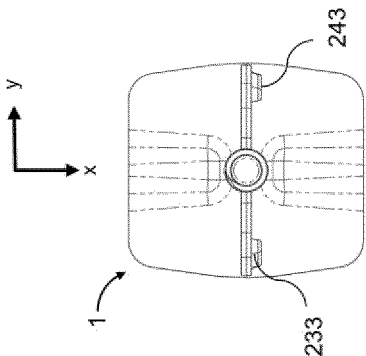
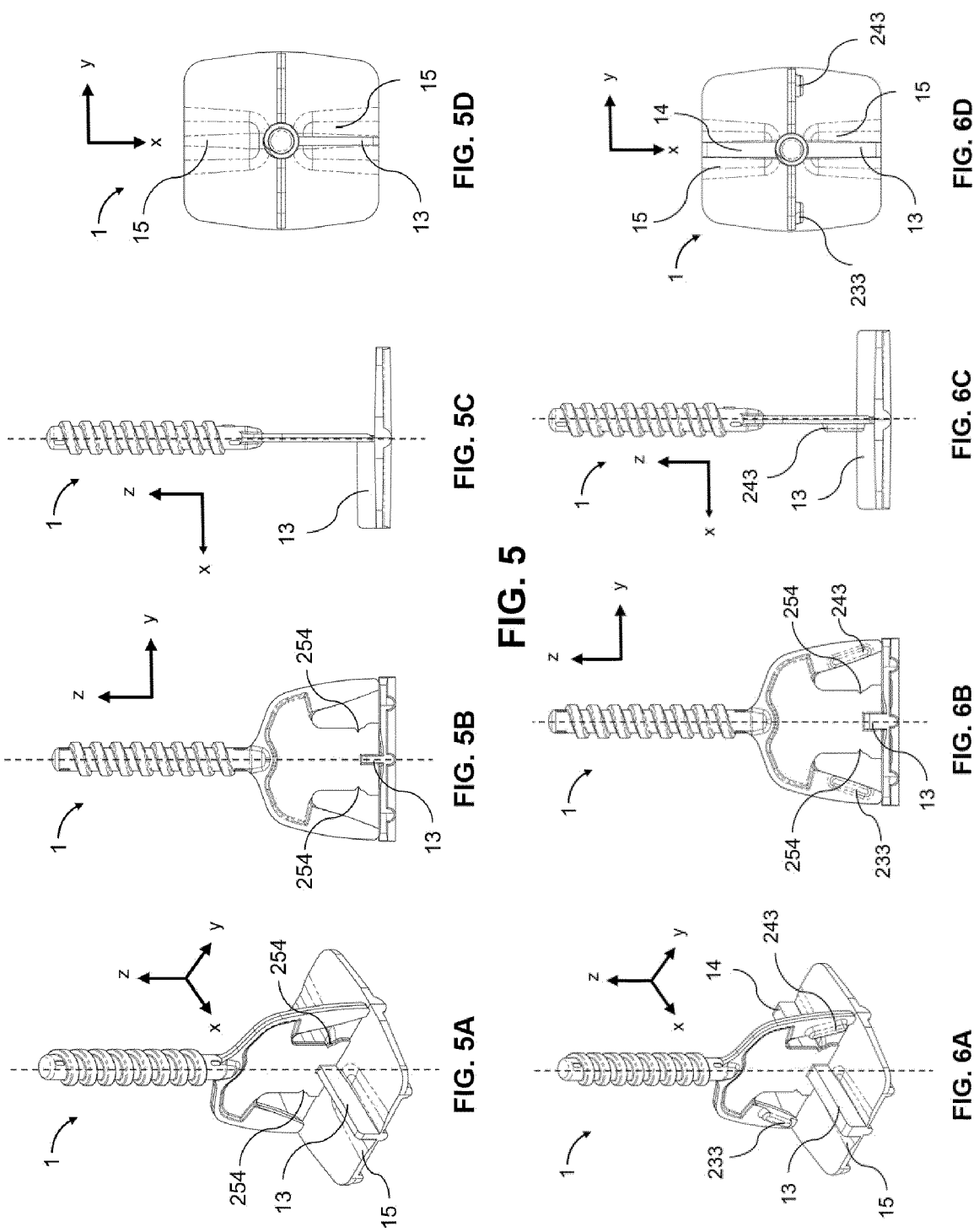


FIG. 4D

FIG. 3

FIG. 4



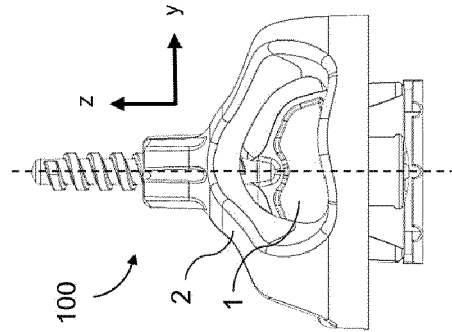


FIG. 7D

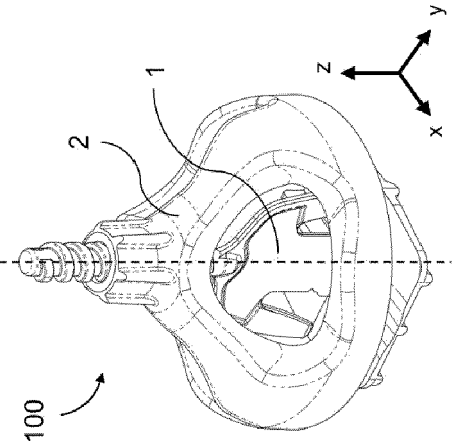


FIG. 7C

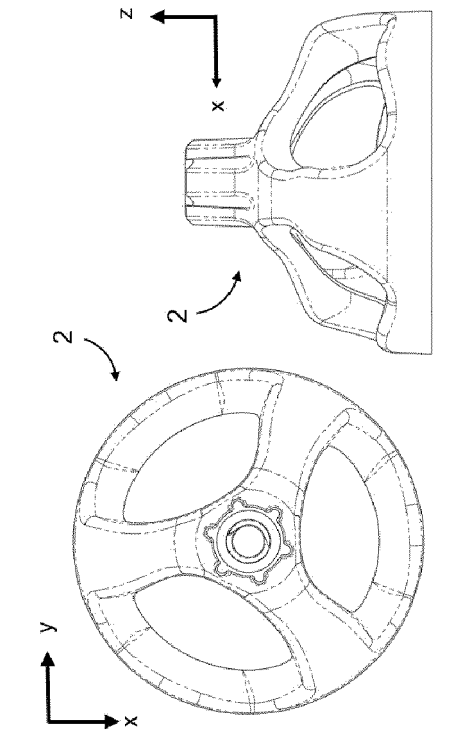


FIG. 7B

FIG. 7A

FIG. 7



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			TECHNICAL FIELDS SEARCHED (IPC)
			E04F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 August 2023	Examiner Arsac England, Sally
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