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(54) **SUPPORTING STRUCTURE FOR A WALL PANEL**

(57) The present invention relates to a supporting structure (200) for a wall panel (2000) having a top edge (202), a bottom edge (201) and a pair of side edges (203), said supporting structure (200) comprising: a bottom section bar (201), defining the bottom edge (210) and extending between the side edges (203), configured to connect the supporting structure (200) of the wall panel (2000) at its bottom to the supporting structure (200) of

another wall panel (2000) or to a structural floor element (100); an top section bar (220), defining the top edge (202) and extending between the side edges (203), configured to connect the supporting structure (200) of the wall panel (2000) at its top to the supporting structure (200) of another wall panel (2000); and a pair of tubular bodies (230) each parallel to a respective side edge (203) joining the top section bar (220) to the bottom one (210).

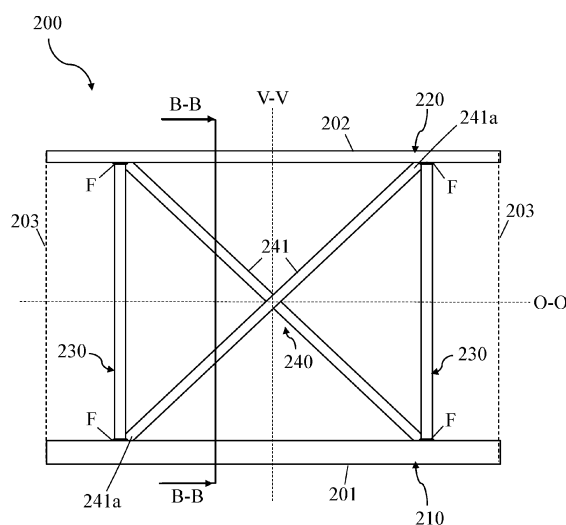


Fig. 6

Description

Technical Field

[0001] The present invention relates to a supporting structure for a wall panel, in particular for the construction of prefabricated dry buildings, i.e. without the need for binders such as cement mortars, resins and the like.

[0002] This supporting structure for a wall panel is used in the construction industry, particularly in the production of components for prefabricated buildings and building structures in general

State of the Art

[0003] Building prefabrication has been known for some time, that is the process for the construction of buildings by means of elements made, on site or in industry, and then mounted with strongly codified procedures.

[0004] This way of constructing buildings makes it possible to speed up the process for the construction of building structures, anticipating part of the operations that are traditionally carried out on the building site.

[0005] It is therefore evident that building prefabrication allows to obtain greater construction speeds and less uncertainty in construction times compared to traditional construction techniques on site.

[0006] Typically, building prefabrication is carried out by realising individual building components, such as beams, columns, trusses, closure panels and the like, which are then assembled on site using hydraulic binders to form the supporting and closing framework of the building.

[0007] Prefabricated construction elements require finishing interventions, on site, in order to adapt the prefabricated construction element to the particular building under construction.

[0008] For example, the use of prefabricated panels for wall construction is well known in the state of the art.

[0009] These panels, typically rectangular in shape, are of the multilayer sandwich type, i.e. they comprise a plurality of layers of different materials that are adapted to cooperate in order to provide the desired mechanical strength, the sound and thermal insulation.

[0010] In detail, these prefabricated panels have a perimeter edge adapted to abut against the perimeter edge of other panels, adjacent to them, to define a wall of a building.

[0011] However, prior to installation, these prefabricated panels require finishing operations so that they can be correctly installed and locked onto the appropriate structural support elements, such as beams and columns.

[0012] Disadvantageously, such finishing and preparation operations for the installation of the prefabricated panels increase the construction times on the building site.

[0013] Also, disadvantageously, the finishing operations increase the uncertainty of lead times because, like all the operations on the building site, they are subject to delays.

[0014] Also, disadvantageously, such prefabricated panels are not configured to interact mechanically with the other elements of the prefabricated building to increase their indeformability, as they are simply glued to the supporting structure by means of adhesives such as cement mortars, resins and the like.

Object of the invention

[0015] In this context, the technical task underlying the present invention is to propose a supporting structure for a wall panel and a relative wall panel which overcome the drawbacks of the prior art mentioned above.

[0016] In particular, it is an object of the present invention to make available a supporting structure for a wall panel and a wall panel for prefabricated buildings which is both quick and easy to install, i.e. which does not require finishing and preparation operations for the installation on the building site.

[0017] Furthermore, it is an object of the present invention to make available a wall panel configured to interact with the other structural elements of the building in order to increase the non-deformability and the mechanical performance of the building.

SUMMARY OF THE INVENTION

[0018] The technical task specified and the purposes specified are essentially achieved by a supporting structure for a wall panel and a wall panel that overcomes the drawbacks of the prior art mentioned above.

[0019] In particular, the supporting structure object of the present invention has a top edge, a bottom edge, and a pair of side edges.

[0020] This supporting structure comprises a bottom section bar defining the bottom edge, and an top section bar defining the top edge; wherein, each profile extends between the pair of side edges.

[0021] In addition, the supporting structure object of the present invention comprises a pair of tubular bodies parallel to, but not coinciding with, the side edges.

[0022] The object of present invention is also a wall panel comprising a plurality of layers having thermal and/or acoustic insulating properties, and the aforementioned supporting structure.

[0023] In detail, the supporting structure is integrated between the plurality of layers of the wall panel, i.e. it is arranged between them.

[0024] Advantageously, the bottom and top section bar are configured to interact and be connected with other structural elements of the building, so that on the building site the supporting structure and the wall panel comprising it can be directly installed on the building under construction, without the need for any finishing or gluing op-

erations.

[0025] In addition, the pair of tubular bodies, thanks to their hollow conformation, allows to accommodate reinforcing elements adapted to connect the supporting structure and the relative wall panel to a structural floor element and/or to a supporting element of a building, thus making the different elements of the building collaborate, increasing its indeformability and mechanical performance.

LIST OF FIGURES

[0026] Further characteristics and advantages of the present invention will become clearer from the indicative, and therefore non-limiting, description of a preferred but not exclusive embodiment of a supporting structure for a wall panel, as illustrated in the accompanying drawings, wherein:

- Figure 1 shows a top view of a structural floor element;
- Figure 2 shows a sectional view of the structural floor element of Figure 1 along line A-A;
- Figure 3 shows a detail of the sectional view of the structural floor element in Figure 2;
- Figure 4 shows a sectional view of a floor comprising the structural floor element of Figure 1;
- Figure 5 shows a top view of a component of the structural floor element of Figure 1;
- Figure 6 shows a front view of a supporting structure for a prefabricated wall panel;
- Figure 7 shows a sectional view of the supporting structure of Figure 6 taken along line B-B;
- Figure 8 shows a top view of the supporting structure of Figure 6;
- Figure 9 shows a view from the side of a prefabricated wall built by means of a pair of prefabricated panels including the supporting structure in Figure 6;
- Figure 10a shows a side sectional view of a wall construction kit comprising the prefabricated wall of Figure 9 and a reinforcing element;
- Figure 10b shows a detail of Figure 10a;
- Figure 10c shows a detail of Figure 10a;
- Figure 11 shows a frontal view of the reinforcing element of Figure 10a;
- Figure 12a shows a sectional view of a prefabricated building comprising the wall construction kit of Figure 10a and the structural floor element of Figure 1;
- Figure 12b shows a detail of Figure 12a;
- Figure 13 shows a frontal sectional view of a two-storey prefabricated building;

DETAILED DESCRIPTION

[0027] With reference to the appended figures, the object of the present invention is a supporting structure 200 for a wall panel 2000, and a relative wall panel 2000 for the construction of prefabricated buildings 1.

[0028] In the context of the present invention, prefabricated buildings are understood to be all those building constructions made by assembling, preferably but not necessarily dry, a plurality of components.

[0029] It should be noted that in the context of the present invention, the term "dry" means without the use of binders such as cement mortars, resins and the like.

[0030] Such prefabricated buildings 1 comprise a plurality of load-bearing beams 3000 that are interconnected to form the load-bearing framework. As shown in Figure 13, at least part of these load-bearing beams 3000 are arranged parallel to a support plane 1a of the prefabricated building 1.

[0031] The prefabricated building 1 comprises at least one structural floor element 100 configured to be arranged on at least one pair of load-bearing beams 3000, oriented parallel to the support plane 1a, to define at least part of the floor of a prefabricated building 1.

[0032] In particular, the structural floor element 100 is configured to be interposed between at least two load-bearing beams 3000 so as to be at least partially recessed between the latter, as shown in Figure 13.

[0033] With reference to Figures 1 - 4, the structural floor element 100 comprises a frame 110 configured to abut on the load-bearing beams 3000 to support the structural floor element 100.

[0034] Preferably, but not necessarily, such a frame 110 is made of metal, more preferably steel, or aluminium.

[0035] In addition, the structural floor element 100 has a seat 120 extending between an upper plane S and a lower plane I that are parallel to each other. The seat 120 is configured to accommodate one or more layers 130 of a floor.

[0036] As shown in Figure 1, the frame 110 is arranged peripherally with respect to the seat 120, i.e. the frame 110 surrounds the seat 120, limiting it laterally.

[0037] Preferably, the frame 110 has a plurality of sides L which are interconnected and peripherally delimiting the seat 120. Even more preferably, the frame 110 comprises four sides L, optionally parallel to each other, i.e. it has a quadrangular shape. Consequently, the seat 120 delimited laterally by the frame defines a volume in the form of a parallelepiped, usually quadrangular but potentially with a plurality of sides and angles, within which the one or more layers 130 constituting the floor can be placed.

[0038] With particular reference to Figure 3, it should be noted that the frame 110 comprises a first flange 111 projecting into the seat 120 and lying in the lower plane I. In other words, the first flange 111 extends into the seat 120 at the lower plane I by realising a cantilevered shelf adapted to receive, by resting, one or more layers 130 of the floor, as shown in Figure 4. The first flange 111 is therefore configured to support the one or more layers of floor 130 which are inserted into the seat 120.

[0039] The frame 110 further comprises a second flange 112 projecting outwards from the seat 120, i.e. in

the opposite direction with respect to the first flange 111. The second flange 112 is configured to rest on at least one load-bearing beam 3000 to support the structural floor element 100.

[0040] It is therefore evident that the structural floor element 100, by means of the first and second flange 111, 112, allows to contain and support the one or more layers of the floor.

[0041] With reference to Figure 3, preferably, the second flange 112 lies in the upper plane S, so that when it abuts on the support beam 3000 the structural floor element 100 is completely recessed. This allows to reduce the thickness of the floor of the prefabricated building, so as to place the one or more layers of the floor between the load-bearing beams 3000.

[0042] Again with reference to Figure 3, preferably, the frame has an S-shaped section; that is, it has main portion 110a extending between the lower I and the upper S plane by connecting the first and second flange 111, 112 which project from the main portion 110a in opposite directions.

[0043] With reference to Figure 1, preferably, the first flange 111 comprises a plurality of first flange portions 111a, each of which is associated with a respective side L of the frame 110. In other words, the plurality of first flange portions 111a peripherally surround the seat 120. The first flange portions 111a are configured to simultaneously contact the one or more layers 130 of the floor to support them stably and arrange them inside the seat 120.

[0044] Further, preferably, the second flange 112 comprises a plurality of second flange portions 112a, each of which is associated with a respective side L of the frame 110. In other words, the plurality of second flange portions 112a peripherally surround the seat 120. The second flange portions 112a are configured to abut on respective load-bearing beams 3000 to stably support the structural floor element 100 and firmly fix it to the load-bearing framework of the prefabricated building 1.

[0045] Preferably, the structural floor element 100 comprises first stiffening means 140 adapted to increase its mechanical performance, in particular its stiffness and non-deformability. In detail, as shown in Figure 1, the first stiffening means 140 are configured to connect two adjacent sides L of the frame 110, i.e. two adjacent sides L having a common end.

[0046] In more detail, the first stiffening means 140 comprise a plurality of plates 141 connected to the frame 110. In particular, each plate is arranged in the lower plane I and is connected to two respective adjacent sides L of the frame 110. Even in more detail, each plate is triangular in shape and has a pair of catheters respectively solidly connected to first flange portions 111a associated with adjacent sides of the frame 110.

[0047] Furthermore, the structural floor element 100 preferably comprises second stiffening means 150 adapted to further increase its mechanical performance. In particular, the second stiffening means 150 are con-

figured to increase the load-bearing capacity of the structural floor element 100, i.e. the maximum load it is capable of supporting. In detail, as shown in Figures 1 and 2, the second stiffening means 150 are configured to connect two sides L of the frame 110 arranged on opposite sides of the seat 120. Preferably, the sides L connected by the second stiffening means 150 are parallel.

[0048] It is worth noting that the second stiffening means 150 comprise a plurality of bars 151 arranged in the seat 120 and extending between two opposite sides L of the frame 110. In more detail, each bar 151 has a pair of ends 151a connected to respective opposite L sides of the frame. Preferably, the ends 151a of each bar are solidly connected to respective first flange portions 111a associated with opposite sides L of the frame 110a.

[0049] Preferably, in accordance with what is shown in Figure 1, the bars 151 are arranged parallel to each other and equidistant. Even more preferably, the bars 151 are arranged parallel to one side L of the frame 110. It is worth noting that the greater the desired load-bearing capacity of the structural floor element 100, the greater the number of bars 151 required, and consequently the smaller the spatial distancing between one bar 151 and another.

[0050] Preferably, the structural floor element 100 comprises an anchoring element 160 connected to the second flange 112 and projecting from the upper plane S on the opposite side with respect to the lower plane I. Said anchoring element 160 is configured to be coupled to a prefabricated wall panel 2000. More details about the wall panel 2000 and the connection to the structural floor element 100 will be provided in a later part of the description.

[0051] With reference to Figures 1-3, the anchoring element 160 extends mainly along a respective side L of the frame 110 and is fixed to the respective portion of the second flange 112a. Preferably, the anchoring element 160 is solidly connected to the respective portion of the second flange 112a.

[0052] Preferably, in accordance with what is shown in Figure 3, the anchoring element 160 comprises an internally hollow box-shaped profile 161 having a bottom wall 162 fixed to the second flange 112 of the frame 110, a pair of side walls 163 projecting from the upper plane S on the opposite side with respect to the lower plane I, and an upper wall 164.

[0053] With reference to Figure 5, preferably, said anchoring element 160 has an opening 165 configured to allow the coupling of a reinforcing element 300 adapted to fix a wall panel 2000 to the structural floor element 100. More details on the reinforcement element 300 and the wall panel 2000 will be provided in a later part of the description.

[0054] Still with reference to Figure 5, preferably, the opening 165 extends along a main extension direction P-P and has: an insertion section 165a, configured to allow the introduction of the reinforcing element 300 into the opening 165; and a locking section 165b, configured

to lock the movement of the reinforcing element 300 along a direction orthogonal to the upper surface S as well as along the one transversal to the direction P-P.

[0055] The insertion section 165a has an extension perpendicular to the main extension direction P-P of the opening 165 greater than the locking section 165b. Therefore, the insertion section 165a has a larger cross section than that of the locking section 165b, to allow inserting the reinforcing element 300 into the opening 165.

[0056] Even more preferably, the insertion section 165a and the locking section 165b are arranged in series along the main extension direction P-P and connected to each other. In this way, when the reinforcing element 300 is inserted into the insertion section 165a of the opening 165 and subsequently translated along the main extension direction P-P inside the locking section, it is constrained along a direction orthogonal to the surface S, given the smaller cross section of the locking section 165b.

[0057] The prefabricated building 1, shown in section in Figures 12 and 13, further comprises at least one wall panel 2000 configured to be connected to the structural floor element 100 and other wall panels 2000, in order to make the closing framework of the prefabricated building 1.

[0058] Such a wall panel 2000 shown in Figure 6 extends along a vertical direction V-V between an top edge 2002 and a bottom edge 2001; and along a horizontal direction O-O, perpendicular to the vertical direction V-V, between a pair of side edges 2003.

[0059] The wall panel 2000 also has a pair of surfaces 204, shown in Figure 9, arranged on opposite sides of the panel 2000 and joining the bottom and top edge 2001, 2002 along the vertical direction V-V, and the pair of side edges 2003 along the horizontal direction O-O.

[0060] Preferably, the lower and top edge 2001, 2002 extend parallel to the horizontal direction O-O and the pair of side edges 2003 extend parallel to the vertical direction V-V. In other words, preferably, the wall panel 2000 is mainly rectangular but may assume a different shape if the edges 201, 202 and 203 do not extend parallel to the horizontal O-O and vertical V-V direction. Thus, the wall panel 2000 may assume different geometric shapes with 3 or more sides.

[0061] Said wall panel 2000 comprises a plurality of layers 2100 having thermal and/or sound insulating properties arranged between the pair of surfaces 204.

[0062] It is worth noting that the person skilled in the art is able to select the number and the material of the plurality of layers 2100 of the panel according to the technical design characteristics of the prefabricated building 1. Examples of materials used to make the plurality of layers can be laminated wood, solid wood, fibre cement, metal sheet, polymeric industrial panels, plasterboard, wood-concrete, different coupled sheets, panels in polymeric or natural or glass fibre. The interspace can be filled with loose, compact or cast materials, whether nat-

ural or synthetic, such as mineral, vegetable or glass fibres, volcanic stones, polymers, conglomerates or combinations thereof.

[0063] The wall panel 2000 further comprises a supporting structure 200 arranged between the pair of surfaces 204 delimiting the panel. In other words, the supporting structure 200 is integrated into the plurality of layers 2100 and is thus at least partially covered by the latter.

[0064] This supporting structure 200, in addition to the intrinsic function of stiffening the wall panel 2000, is configured to facilitate and speed up the construction operations of the prefabricated building. In fact, the supporting structure 200 is configured to connect the wall panel 2000, inside which it is integrated, to the other structural elements of the prefabricated building 1, such as structural floor elements 100 and other wall panels 2000, without the need to use adhesives.

[0065] The supporting structure 200 for prefabricated wall panels 2000 will be described in detail below. This supporting structure 200 is shown individually in Figures 6-8, and integrated into the wall panel in Figures 9-10 and 12-13.

[0066] The supporting structure 200 extends along the vertical direction V-V between the top edge 202 and the bottom edge 201; and along the horizontal direction O-O between the pair of side edges 203. The bottom edge 201, the top edge 202, and the side edges 203 coincide with the respective edges of the wall panel 2001, 2002 and 2003 when the supporting structure 200 is integrated into the wall panel 2000.

[0067] As shown in Figures 6-7, the supporting structure 200 comprises a bottom section bar 210 defining the bottom edge 201. In detail, the bottom section bar 210 extends along the entire bottom edge 201 between the pair of side edges 203.

[0068] The bottom section bar 210 is configured to connect the supporting structure 200 at the bottom, and thus the wall panel 2000, to another wall panel 2000 or a structural floor element 100, as shown in Figure 12a.

[0069] The supporting structure 200 also comprises an top section bar 220 defining the top edge 202. In detail, the top section bar 220 extends along the entire top edge 202 between the pair of side edges 203.

[0070] The top section bar 220 is configured to connect the supporting structure 200 at the top, and thus the wall panel 2000, to the supporting structure 200 of another wall panel 2000 or a load-bearing beam 3000.

[0071] As shown in Figure 7, preferably, the bottom and top section bar 210, 220 define a respective cavity 210a, 220a configured to connect the supporting structure 200 to a structural floor element 100 or to another supporting structure 200. More preferably, the bottom and top section bar 210, 220 have a U-section.

[0072] With reference to Figure 12a, the bottom section bar 210 has a shape complementary to the anchoring element 160 of the structural floor element 100 described above. In this way, it is possible to insert the anchoring element 160 inside the cavity 210a defined by the bottom

section bar 210 to connect the supporting structure 200, and thus the wall panel 2000, to the structural floor element 100.

[0073] Preferably, the supporting structure 200 comprises an insert 211 arranged in the cavity 210a defined by the bottom section bar 210 and configured to damp vibrations. In detail, such an insert 211 is made of a polymeric material, such as solonic lactic rubber. In even greater detail, when the bottom section bar 210 is inserted into the anchoring element 160 of the structural floor element 100, the insert 211 is interposed between the bottom section bar 210 and the anchoring element 160 to damp the vibrations between the bottom edge 201 defined by the bottom section bar 210 and the structural floor element 100. Preferably, the insert 211 has a U-section that can be inserted inside the U-section of the bottom section bar 210 as shown in Figure 7.

[0074] With reference to Figure 6, the supporting structure 200 comprises a pair of tubular bodies 230 each associated with a respective side edge 203 and joining the bottom section bar 210 to the top section bar 220.

[0075] In detail, each tubular body 230 is fixed to the bottom and top section bar 210, 220 at a plurality of fixation points F. Preferably, each tubular body 230 is welded to the lower and top section bar 210, 220 at the plurality of fixation points F.

[0076] As shown in Figure 6, the tubular bodies extend parallel to the vertical direction V-V and are arranged perpendicular to the horizontal direction O-O so that each of them is parallel to a respective side edge 203.

[0077] Each tubular body comprises an internal channel 231 extending along the vertical direction V-V between the bottom and top section bar 210, 220, as shown in Figure 8. In detail, each channel 231 is configured to accommodate in its inside a reinforcing element 300 adapted to connect the supporting structure 200, and thus the wall panel 2000, to a structural floor element 100 and/or a load-bearing beam 3000 of a prefabricated building 1. More details on the reinforcing element 300 will be provided in a later part of the description.

[0078] Preferably, as shown in Figure 6, the supporting structure 200 comprises wall stiffening members 240 adapted to increase the mechanical performance of the wall panel 2000 inside which the supporting structure 200 is integrated. In particular, the stiffening members 240 are configured to increase the mechanical resistance of the wall panel 2000 to both tangential forces and forces acting along a direction transverse to the side surfaces 204.

[0079] These wall stiffening members 240 extend between the pair of tubular bodies 230 joining them mutually. In detail, the stiffening members 240 comprise a pair of bars 241 arranged between and connected to the tubular elements 230. Even in more detail, the pair of bars 241 are arranged in an X or St Andrew's cross pattern and each bar 241 is connected on opposite sides to each tubular body 230. In other words, each bar 241 comprises two ends 241a each of which is integrally connected to

a respective tubular body 230. It is worth specifying that the cross section of the bars 241 is specially selected based on the required mechanical strength.

[0080] Preferably, the pair of rods 241 of the stiffening members 240 is connected to each tubular body 230, to the bottom section bar 210 and to the top section bar 220 at the plurality of fixation points F. Even more preferably, the pair of bars 241 is welded to each tubular body 230, to the bottom section bar 210 and to the top section bar 220 at the plurality of fixation points F.

[0081] The prefabricated building 1, shown in section in Figures 12a and 13, further comprises at least one reinforcing element 300 which, as mentioned in an earlier part of the description, is insertable into the channel 231 of the tubular body 230 of the panel 2000.

[0082] Figure 11 shows the reinforcing element 300 individually, while Figures 10a, 10b, 10c, 12 and 13 show the reinforcing element 300 arranged inside the channel 231 of the tubular body 230.

[0083] The reinforcing element 300, when inserted into the channel 231 of the tubular element 230, extends between the bottom edge 201 and the top edge 202 of the relevant supporting structure 200, and thus of the panel 2000. In particular, said reinforcing element 300 extends along a longitudinal direction L-L, between a lower end 301 and an upper end 302 configured to be anchored to load-bearing beams 3000 and/or to a structural floor element 100.

[0084] As shown in Figure 12a, the upper end 302 is configured to be fixed to a load-bearing beam 3000 arranged above the wall panel 2000 inside which the reinforcing element 300 is arranged; whereas the lower end 301 is configured to be connected to the anchoring element 160 of a structural floor element 100. In even greater detail, the lower end 301 is configured to be inserted in the insertion section 165a of the opening 165 of the anchoring element 160, and subsequently translated along the main extension direction P-P of the opening 165 inside the locking section 165b.

[0085] Preferably, the lower end 301 comprises an stopper 323 extending transversely to the longitudinal direction L-L and configured to constrain the lower end 301 along the longitudinal direction L-L when it is arranged inside the locking section 165b of the opening 165. Even more preferably, the stopper 323 comprises a plate fixed to the lower end 301 of the tensioning member 300.

[0086] The lower end 301 of the tensioning member 300 when arranged in the locking section 165b of the opening 165 is constrained along the longitudinal direction L-L to the anchoring element 160. In fact, the stopper 323 having a transversal extension to the longitudinal direction L-L greater than that of the locking section 165b along the direction perpendicular to the main extension direction P-P of the opening 165, constrains the lower end 302 along the longitudinal direction L-L, stopping in abutment on a perimeter edge (not shown in the figures) of the locking section 165b.

[0087] Preferably, the reinforcing element 300 comprises at least a first rod 320 available inside the channel 231 of a wall panel 230. In detail, the first rod 320 when inserted inside the wall panel 2000 extends at least between its bottom edge 2001 and its top edge 2002.

[0088] As shown in Figure 11, the first rod 320 extends along the longitudinal direction L-L between a first end 321, defining the lower end 301 of the reinforcing element 300, and a second end 322 available at the top edge 2002 of the wall panel 2000.

[0089] Preferably, the first end 321 of the first rod 320 comprises the stopper 323. When the first end 321 is inserted into the opening 165 of the anchoring element 160 and arranged in the locking section 165b, the stopper 323 prevents its displacement along the longitudinal direction L-L in the direction that goes from the first end 321 to the second end 322.

[0090] Preferably, as shown in Figure 11, the first rod 320 comprises a shoe 324 sliding along the longitudinal direction L-L. When the first end 321 is inserted into the opening 165 and arranged in the locking section 165b, the shoe 324 is configured to press the gripping element 160 on the opposite side of the stopper 323, preventing the first rod 320 from moving along the longitudinal direction L-L in the direction that goes from the second end 322 to the first end 321.

[0091] In other words, as shown in Figure 12b, the stopper 323 and the shoe 324, when the first end 321 of the first rod is arranged in the locking section 165b, press the upper wall 164 of the anchoring element 160 on opposite sides, locking the first rod 320 along the longitudinal direction L-L.

[0092] As shown in Figures 11, 10a and in particular in the enlargement of Figure 10c, a tensioning member 310 is applicable to the reinforcing element 300 between the lower end 301 and the upper end 302. Said tensioning member 310 is configured to vary the distance between the lower and upper end 301 and 302 of the reinforcing element 300. The tensioning member 310 therefore allows the wall panel 2000 to be compressed between the load-bearing beam 3000 arranged above it and the structural floor element 100 connected to it at the bottom.

[0093] It is worth noting that the reinforcing element 300, when placed under tension by the tensioning member 310 is configured to make the different components of a prefabricated building 1 collaborate, thereby increasing its non-deformability and the mechanical performance.

[0094] As shown in Figure 11 and detailed in Figure 10c, the tensioning member 310 comprises an anchor body 311 configured to be fixed to a load-bearing beam 3000 and defining the upper end 302 of the reinforcing element 300.

[0095] Preferably, the anchor body 311 comprises a first hollow body 311a fixed to the load-bearing beam 3000, and a second body 311b arranged inside the first body 311a so as to be constrained along the longitudinal direction L-L. Even more preferably, the first body 311a

has an abutment wall 311c configured to lock the second body 311b along the longitudinal direction L-L, as shown in Figure 10c.

[0096] In addition, the anchor body 311 comprises a pin 312 extending along the longitudinal direction L-L and connected to the second end 322 of the first rod 320. Preferably, the pin 312 is threaded.

[0097] It is worth noting that, preferably, in the case where a prefabricated wall comprises a pair of wall panels 2000a, 2000b arranged along the longitudinal direction L-L one on top of the other, the pin 312 of the anchor body 311 is connected to the second end 322 of the first rod 320 by means of a second rod 330. In other words, in the case where the wall comprises a pair of wall panels 2000, the pin 312 of the anchor body 311 is indirectly connected to the second end 322 of the first rod 320. More details on the arrangement of the pair of wall panels 2000a, 2000b and on their interaction with the reinforcing element 300 will be provided in a later part of the description.

[0098] In greater detail and with reference to Figure 11, the second rod 330 extends along the longitudinal direction L-L between a third end 331, connected to the second end 322 of the first rod 320, and a fourth end 332 arranged in proximity to the pin 312.

[0099] In addition, the tensioning member comprises a bushing 313 adapted to connect the pin 312 to the second rod 320. In detail, as shown in Figure 10c, the bushing 313 is configured to be connected to the fourth end 332 and to the pin 312. In even greater detail, the bushing 313 has a threaded through hole 313a extending along the longitudinal direction L-L connected on one side to the pin 312 and on the other side to the fourth end 332 of the second rod 330.

[0100] In a preferred embodiment, the fourth end 332 is threaded, and has a thread orientation opposite to that of the pin 312. For example, the second end 332 has a left-handed thread, while the pin 312 has a right-handed thread; or vice versa.

[0101] The bushing 313 if set in rotation along the longitudinal direction L-L when connected to the pin 312 and to the fourth end 332 moves the pin 312 and the second rod 330 in opposite directions. Thus, the bushing 313, when set in rotation about the longitudinal axis L-L, varies the distance between the lower and upper end 301, 302 of the reinforcing element 300. In doing so, the reinforcing element 300 allows the wall panel 2000 to be compressed between the load-bearing beam 3000 arranged above it and the structural floor element 100 connected to it at the bottom, thus increasing the non-deformability and the mechanical performance of the prefabricated building 1.

[0102] Preferably, to facilitate the construction process, a wall of a prefabricated building 1 is made by means of a first and a second wall panel 2000a, 2000b, in accordance with what is shown in Figures 10a, 12a and 13.

[0103] In detail, the first wall panel 2000a has the top edge 2002 arranged at the bottom edge 2001 of the second wall panel 2000b, so as to align the respective chan-

nels 231 of the tubular elements 230 along the longitudinal direction L-L.

[0104] The first rod 320 is associated with the first wall panel 2000a, while the second rod 330 is associated with the second wall panel 2000b. In detail, the first rod 320 is available in the tubular element 230 of the first wall panel 2000a, while the second rod 330 is available in the channel 231 of the tubular element of the second wall panel 2000b. In detail, the first rod 320 and the second rod 330, when arranged in the respective tubular elements 230, extend between the lower and top edge 2001, 2002 of the first panel 2000a and the second panel 2000b, respectively, along the longitudinal direction L-L.

[0105] The first and second rod 320, 330 are spaced from the respective channels 231 by means of a plurality of spring elements 360 extending radially in the longitudinal direction L-L between the respective rod 320, 330 and the respective channel 231.

[0106] As shown in Figure 10b, the first and second rod 320, 330 are connected by means of a connecting bushing 340.

[0107] Preferably, the second end 322 of the first rod 320 and the third end 331 of the second rod 330 are constrained to the connecting bushing 340 by means of a connection of the threaded type. In detail, the second end 322 of the first rod 320 and the third end 331 of the second rod 330 are threaded and coupled on opposite sides to a threaded through-hole 341 of the connecting bushing 340.

[0108] As shown in Figure 10b, a connection body 350 is arranged between the top edge 2002 of the first panel 2000a and the bottom edge 2001 of the second panel 2000b. In detail, the connection body 350 is configured to be arranged between the top section bar 220 of the first panel 2000a, and the bottom section bar 210 of the second panel 2000b. In even greater detail, the connection body 350 is configured to be at least partially arranged in the cavity 220a defined by the top section bar 220 of the first wall panel 2000a, and in the cavity 210a defined by the bottom section bar 210 of the second wall panel 2000b.

[0109] When the tensioning member 310 approaches the lower and upper end 301, 302 of the reinforcing element, the connection body 350 is pressed on opposite sides by the first and second wall panel 2000a, 2000b.

[0110] Preferably, the connection body 350 comprises a hollow profile having a rectangular box-shaped section, as shown in Figure 10b.

[0111] Such a connection body 350 is configured to accommodate inside it the connecting bushing 340. In detail, the connection body 350 has a pair of openings (not shown in the figures). These openings are aligned along the longitudinal direction L-L and arranged on opposite sides of the connection body 350. The connecting bushing 340 is configured to be arranged simultaneously in the pair of openings.

[0112] Preferably, the connecting bushing 340 has a shoulder 342 projecting along a direction radial to the

longitudinal direction L-L. Said shoulder 342, shown in Figure 10b, is configured to abut on a locking surface 351 of the connection body 350 to fix the latter to the top section bar 220 of the first panel 2000a.

Claims

1. A supporting structure (200) for a wall panel (2000) having a bottom edge (201), a top edge (202) and a pair of side edges (203); the supporting structure (200) comprising:

- a bottom section bar (210) defining the bottom edge (201) and extending between the side edges (203), the bottom section bar (210) being configured to connect the supporting structure (200) of the wall panel (2000) at its bottom to the supporting structure (200) of another wall panel (2000) or to a structural floor element (100);
- a top section bar (220) defining the top edge (202) and extending between the side edges (203), the top section bar (220) being configured to connect the supporting structure (200) of the wall panel (2000) at its top to the supporting structure (200) of another wall panel (200);
- a pair of tubular bodies (230) each associated with a respective side edge (203) joining the top section bar (220) to the bottom section bar (210).

2. A supporting structure (200) as claimed in claim 1, wherein each tubular body (230) comprises an internal channel (231) configured to receive a reinforcing member (300) adapted to connect the supporting structure (200) to a structural floor element (100) and/or to a load-bearing member (3000) of a building.

3. A supporting structure (200) as claimed in any of the preceding claims, comprising wall stiffening members (240) extending between the pair of tubular bodies (230) and joining them together, said wall stiffening elements (240) comprising a pair of bars (241) arranged between the tubular elements (230).

4. A supporting structure (200) as claimed in the preceding claim, wherein the pair of bars (241) of the wall stiffening member (240) cross to form a X shape, each bar (241) being connected on opposite sides to each tubular body (230).

5. A supporting structure (200) as claimed in the preceding claim, wherein each tubular body (230) is fixed to the bottom and top section bars (210, 220) at a plurality of fixation points (F), the pair of bars (241) of the stiffening members being connected to each tubular body (230) and to the bottom and top section bars (210, 220) at the plurality of fixation

points (F).

6. A supporting structure (200) as claimed in any of the preceding claims, wherein the bottom and top section bars (210, 220) define a respective cavity (210a, 220a) which is configured to connect the supporting structure (200) to a structural floor element (100) or to another supporting structure (200). 5
7. A supporting structure (200) as claimed in any of the preceding claims, comprising an insert (211) arranged in the cavity (210a) defined by the bottom section bar (210), said insert (211) being configured to damp vibrations between the bottom edge (201) and a structural floor element (100). 10 15
8. A wall panel (2000) for the construction of prefabricated buildings comprising:
 - a plurality of layers (2100) having thermal and/or acoustic insulating properties; 20
 - the supporting structure (200) as claimed in any of the preceding claims, the supporting structure being integrated between the plurality of layers (2100). 25
9. A wall panel (2000) as claimed in claim 9, comprising a pair of reinforcing elements (300) extending between the bottom and top edges (201, 202) of the supporting structure (200), each reinforcing element (300) being arranged in a respective internal channel (231) defined by a tubular body (230) of the supporting structure (200). 30

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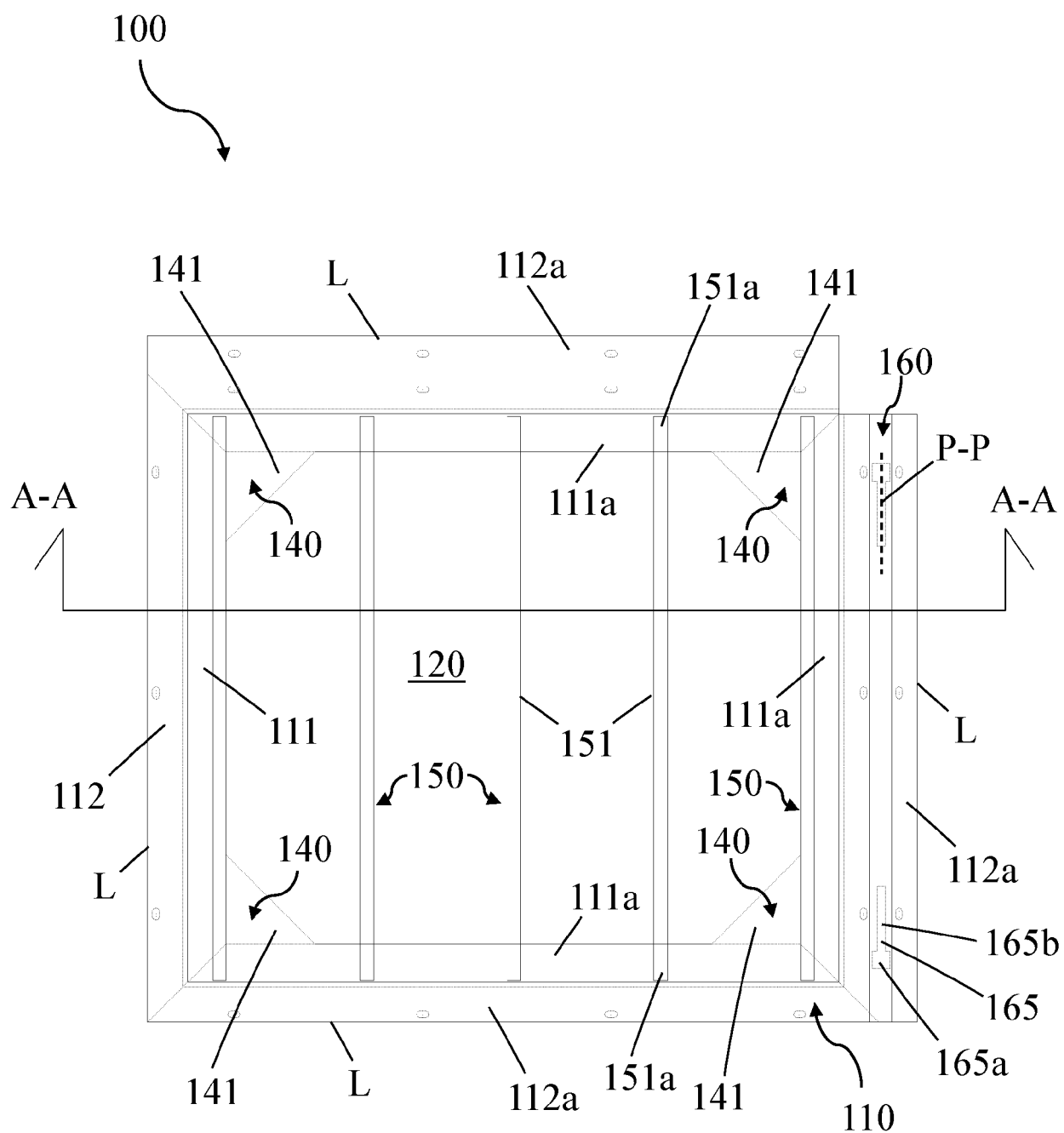


Fig. 1

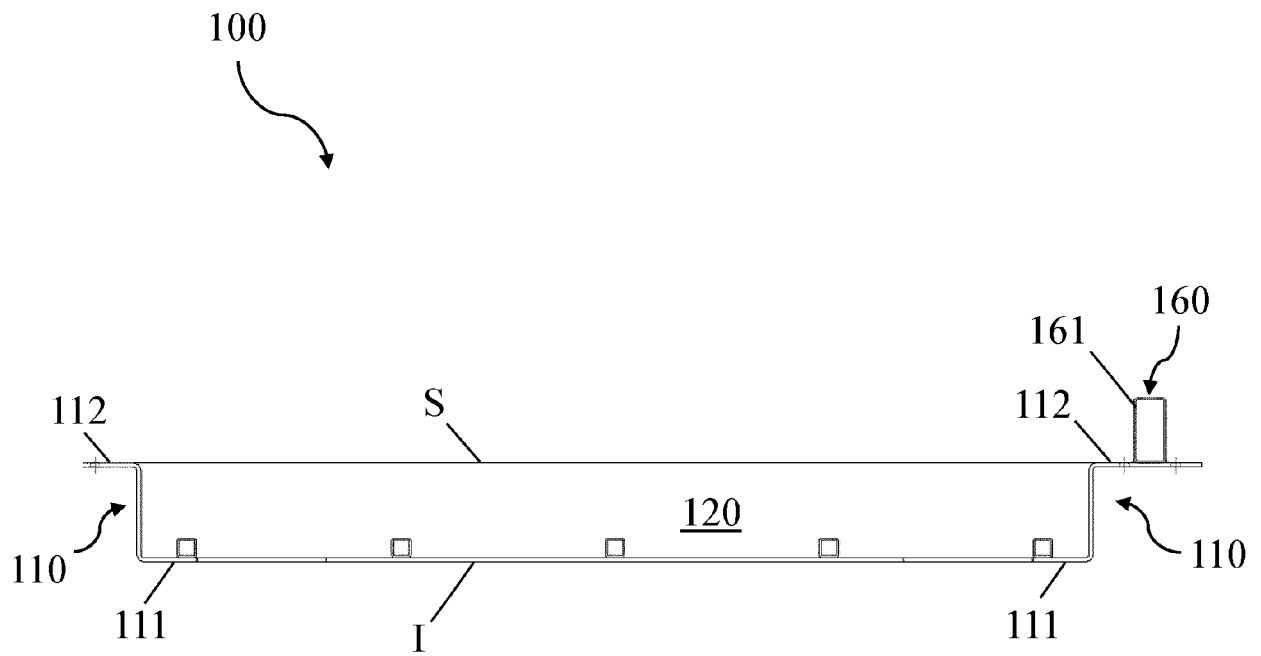


Fig. 2

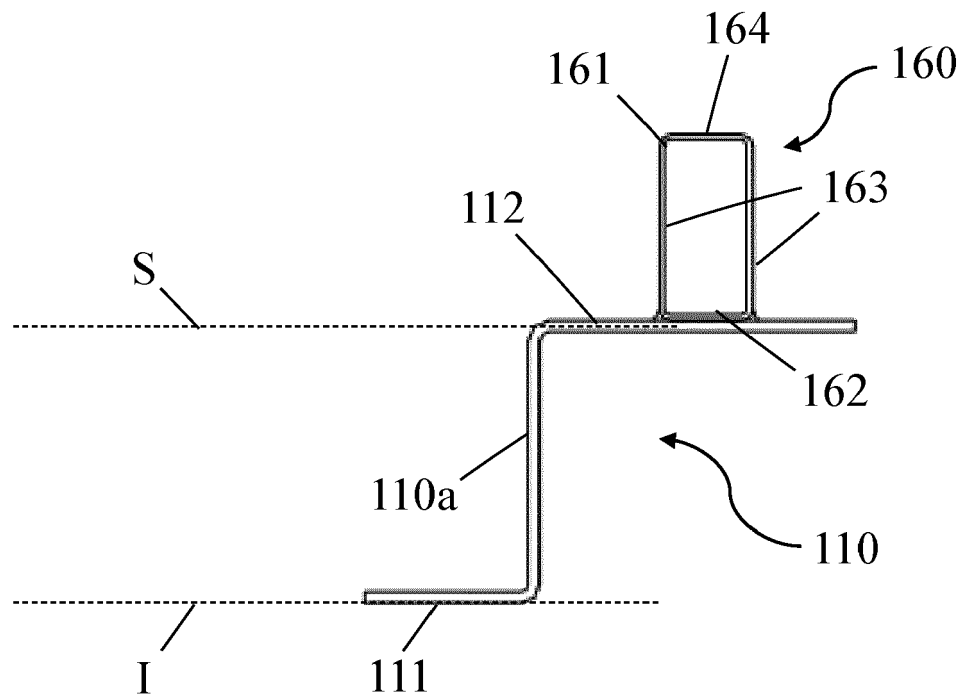


Fig. 3

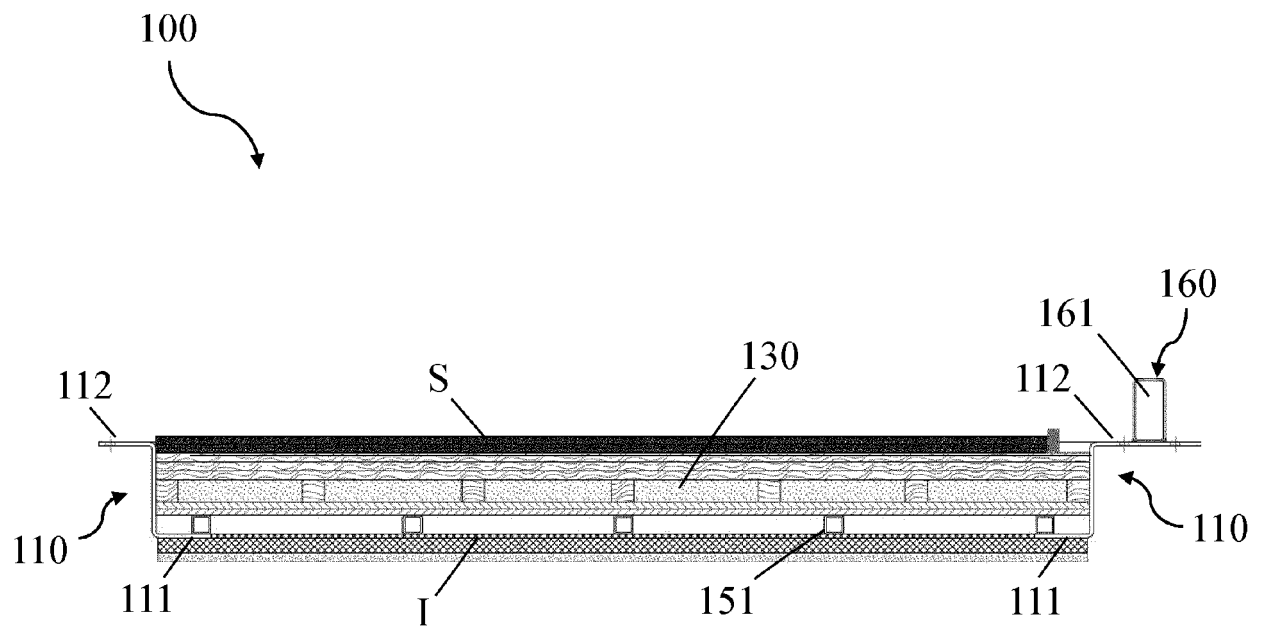


Fig. 4

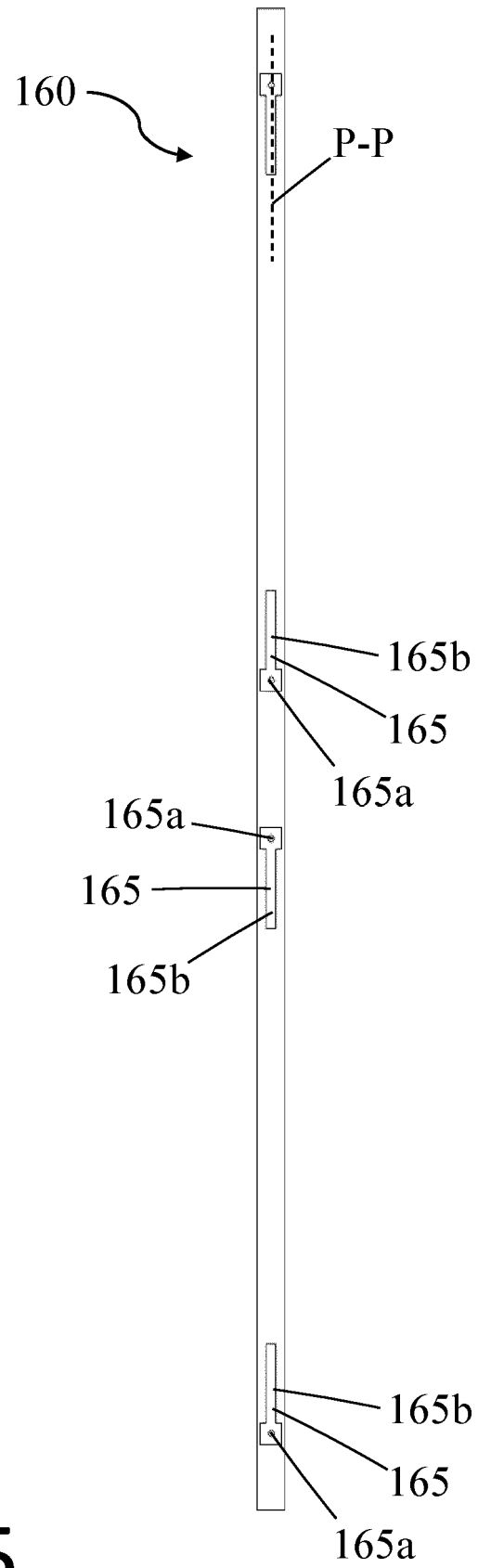


Fig. 5

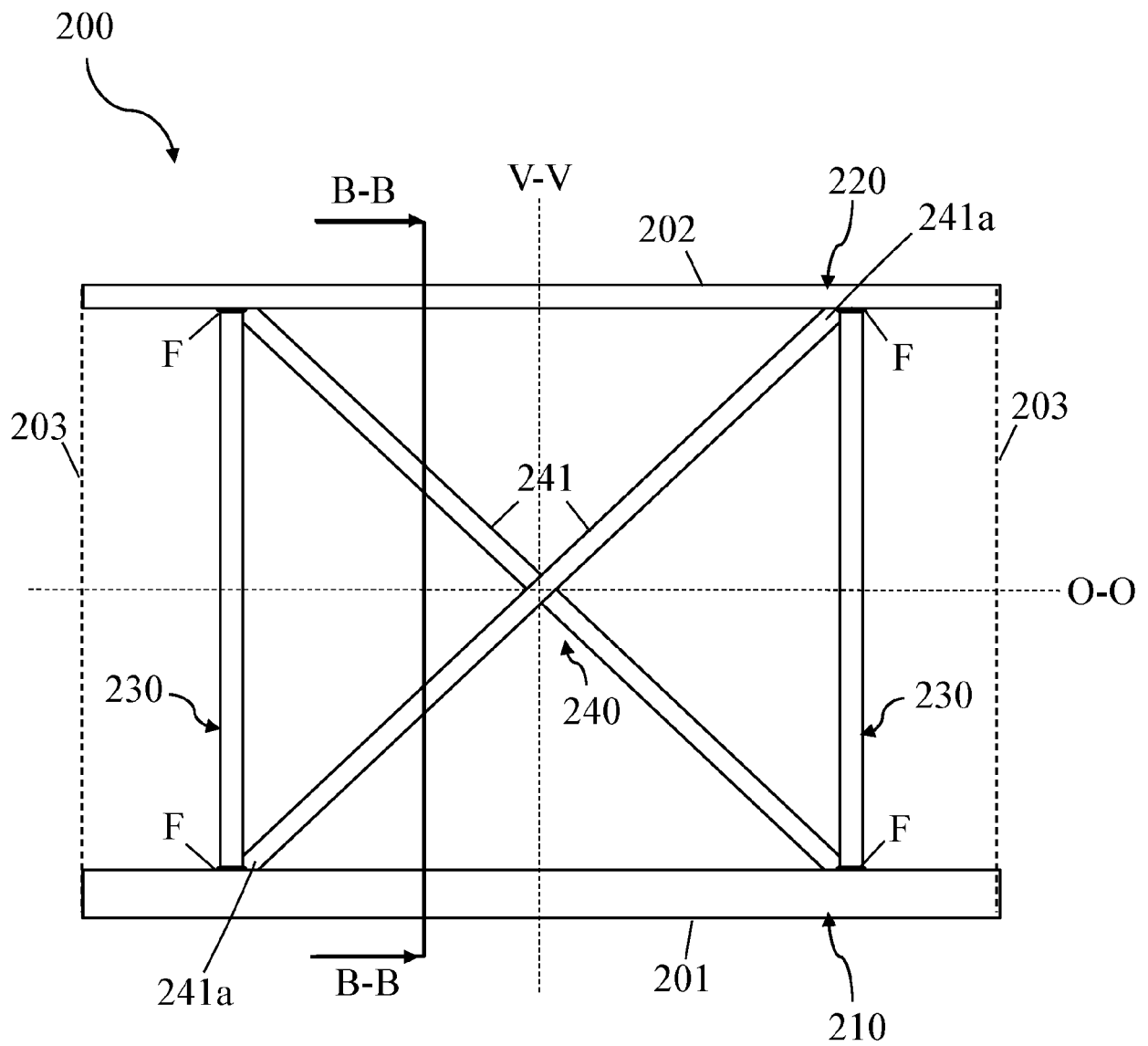


Fig. 6

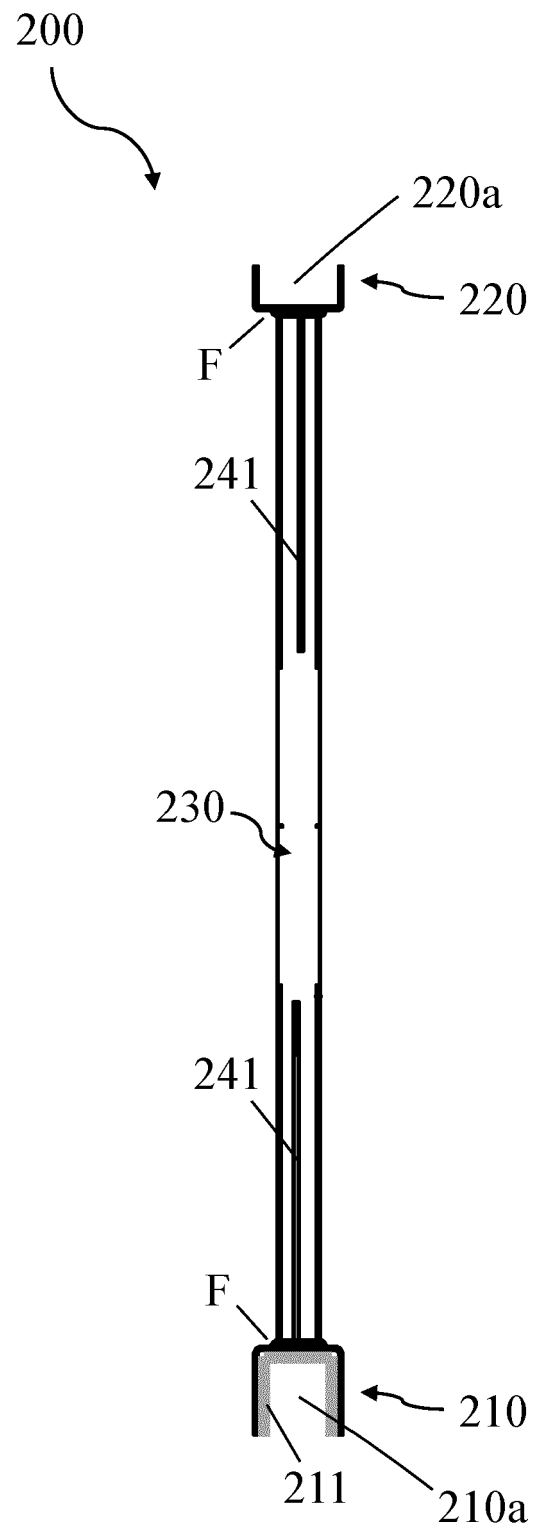


Fig. 7

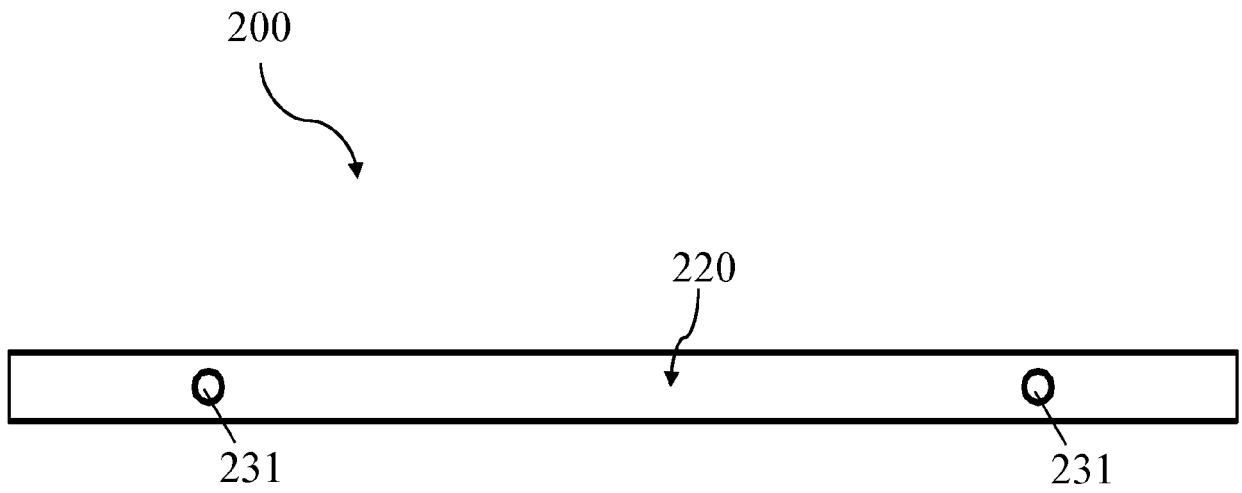


Fig. 8

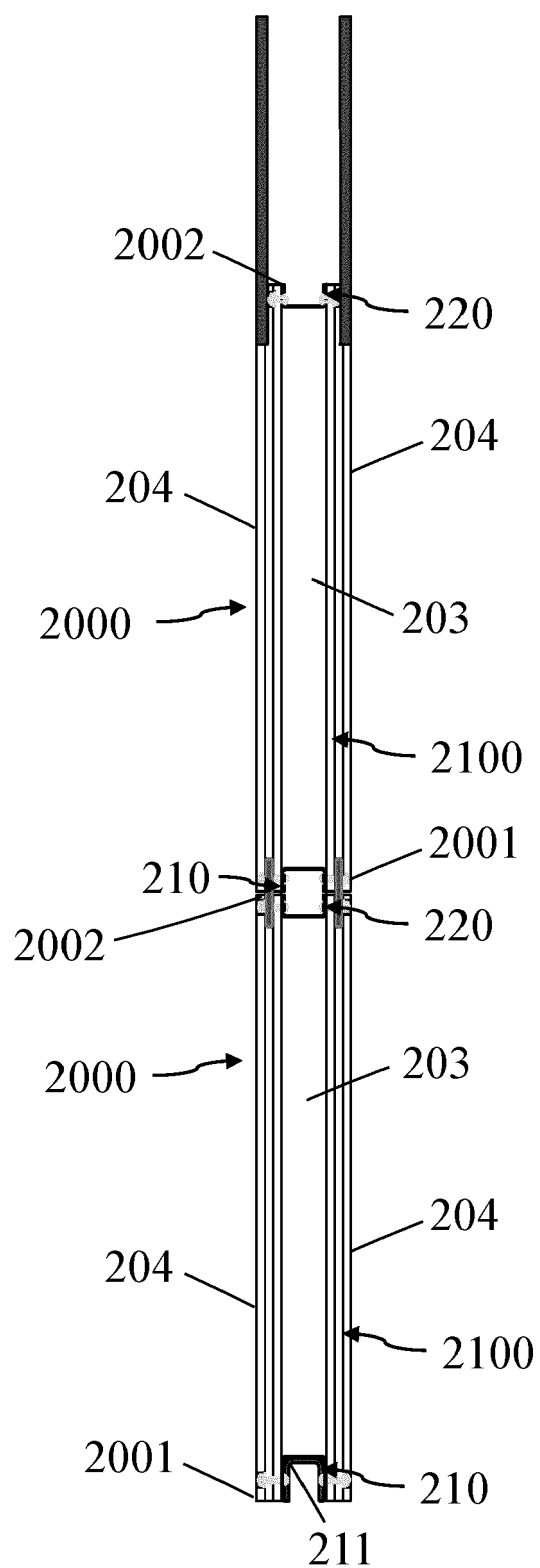


Fig. 9

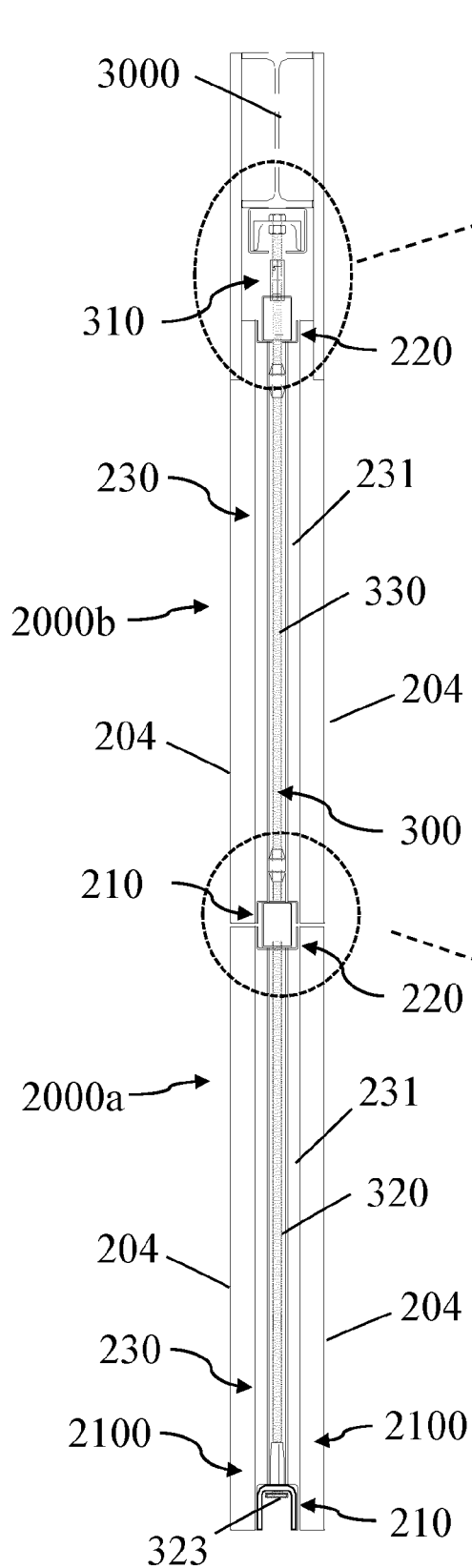


Fig. 10a

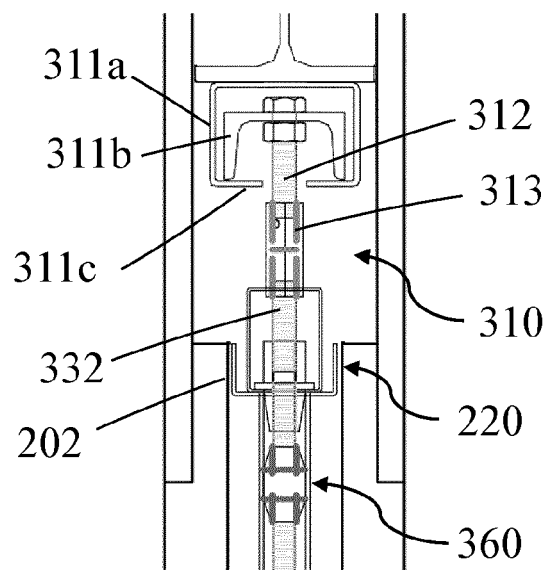


Fig. 10c

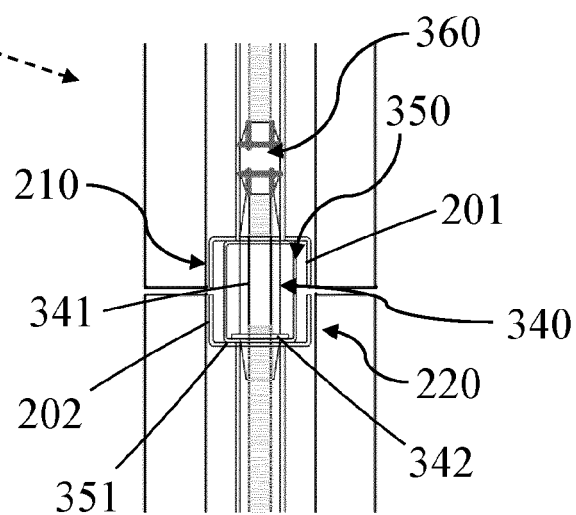


Fig. 10b

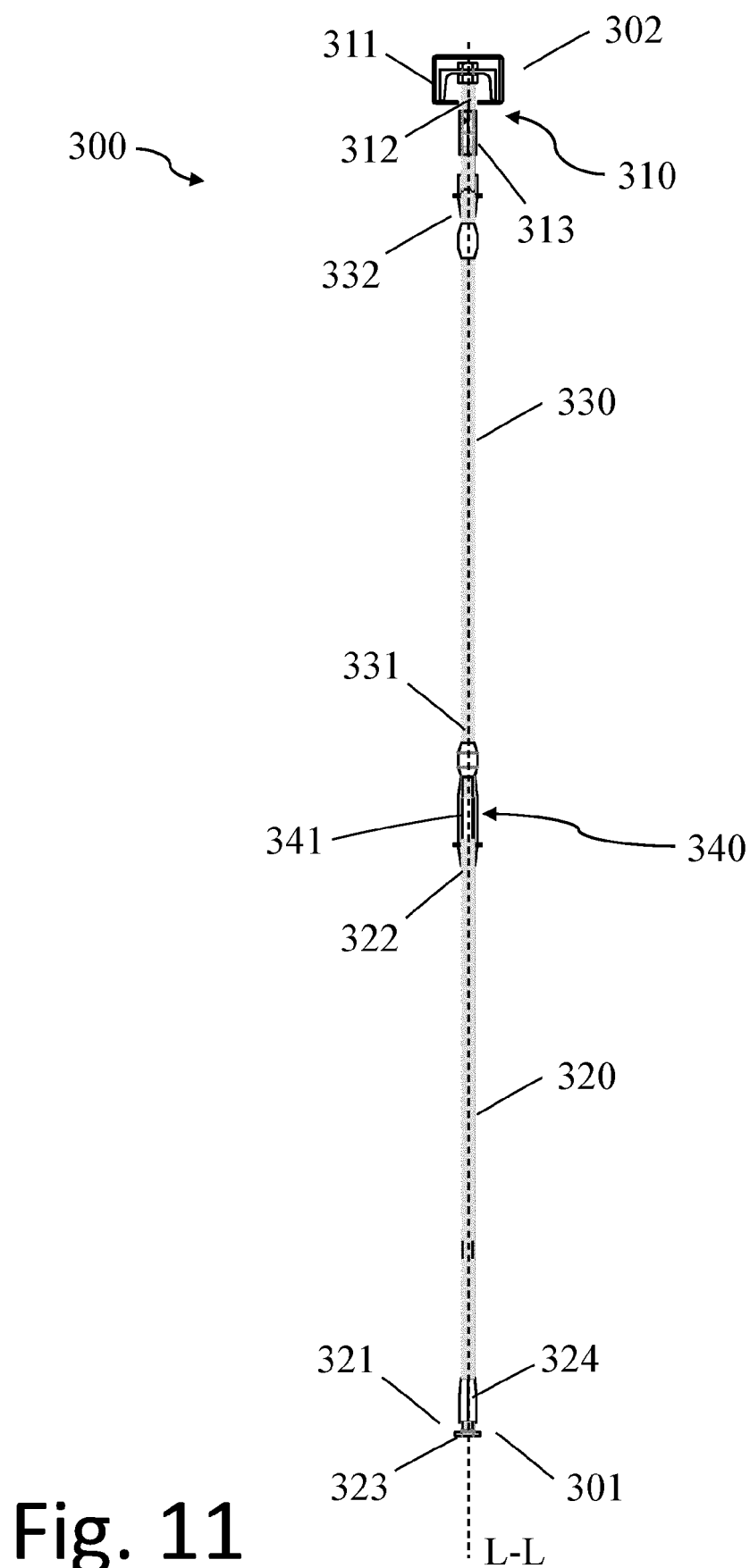


Fig. 11

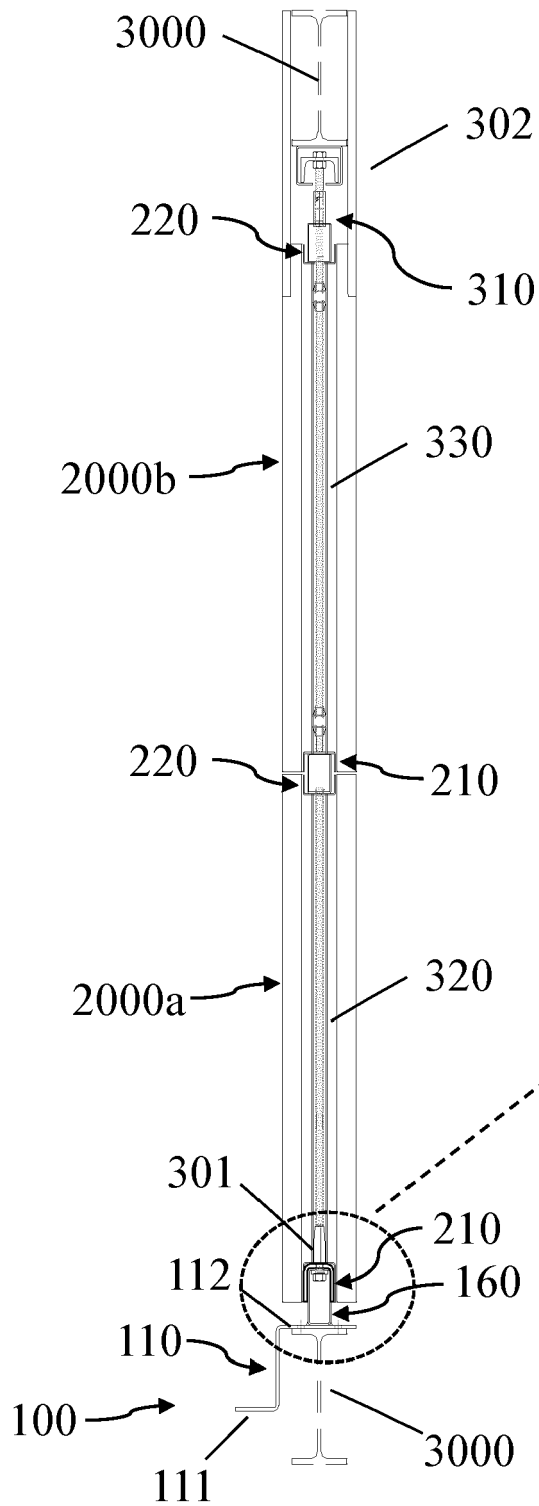


Fig. 12a

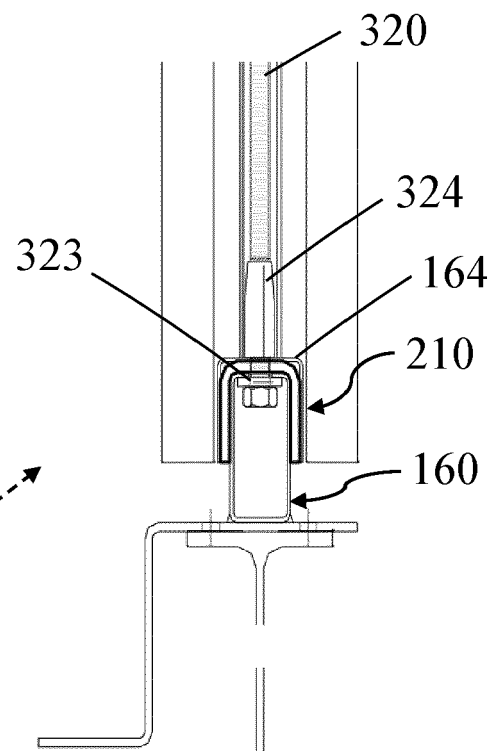


Fig. 12b

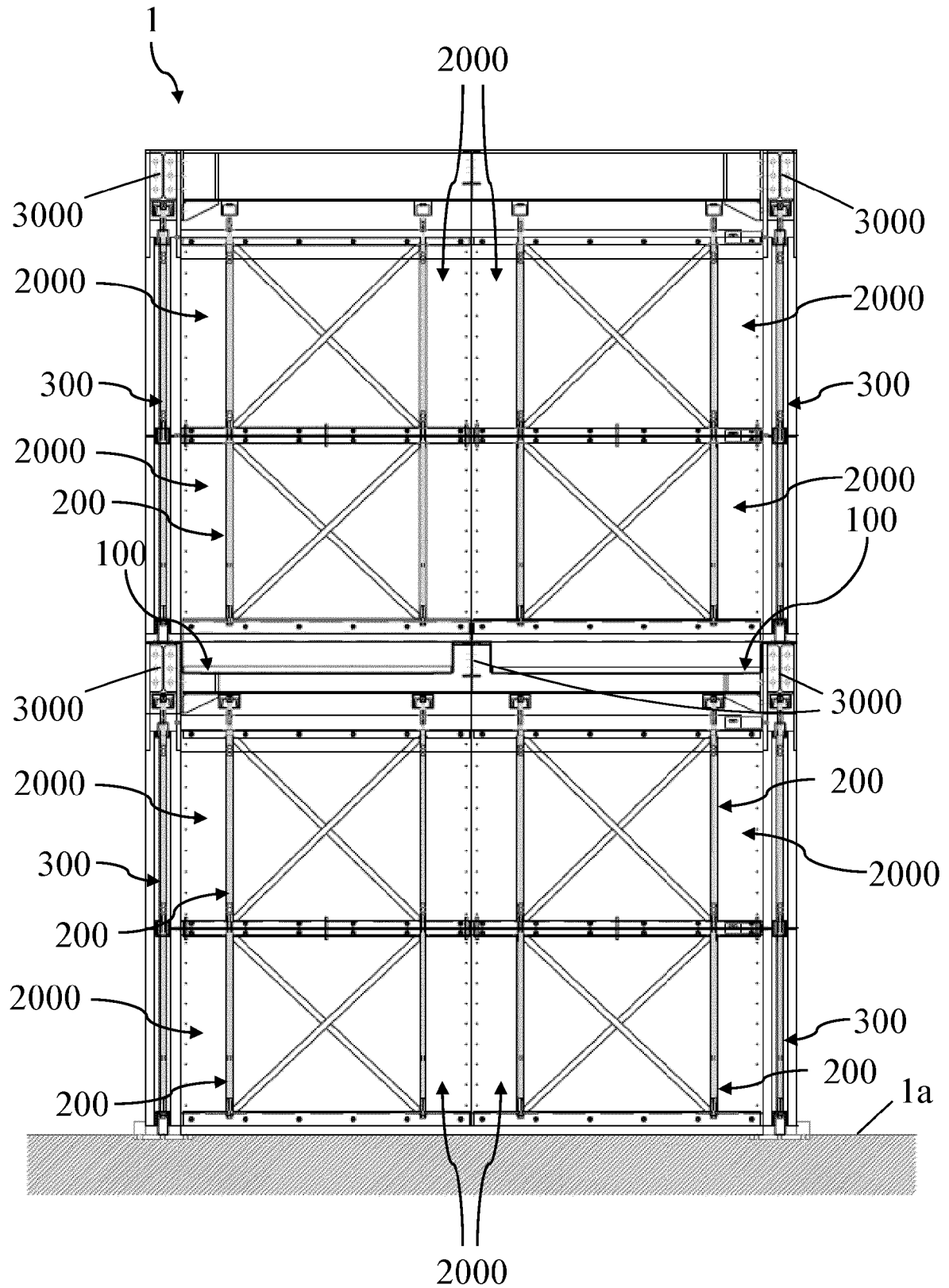


Fig. 13



EUROPEAN SEARCH REPORT

Application Number

EP 21 18 5076

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X	US 6 892 504 B1 (DIGIROLAMO EDWARD R [US] ET AL) 17 May 2005 (2005-05-17) * figures 1-18 *	1-9	ADD. E04B1/24
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X	DE 10 2005 045702 A1 (STRAEHLE WERNER [DE]) 22 March 2007 (2007-03-22) * figures 1-5 *	1-3, 6-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C E04B E04H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 December 2021	Examiner Petrinja, Etiet
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-12-2021

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