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(54) **WALL BLOCK SYSTEM**

(57) A wall block system is disclosed. The wall block system comprises a plurality of wall blocks (4a, 4b, 4c) configured to be stacked onto each other for building at least part of a wall (2). Each wall block (4a, 4b, 4c) out of the plurality of wall blocks (4a, 4b, 4c) cA wall block system is disclosed. The wall block system comprises a plurality of wall blocks (4a, 4b, 4c) configured to be stacked onto each other for building at least part of a wall (2). Each wall block (4a, 4b, 4c) out of the plurality of wall blocks (4a, 4b, 4c) omprises a front panel (20), a back panel (22), a first set of one or more cross elements (24a) extending between and connected to the front panel (20) and the back panel (20), a second set of one or more cross elements (24b) extending between and connected to the front panel (20) and the back panel (22), and a third set of one or more cross elements (24c) extending between and connected to the front panel (20) and the back panel (22). Each set out of the first set, second set and third set of cross elements (24a, 24b, 24c) comprises at a top side of the wall block (4a, 4b, 4c) one or more top side protrusions (28) extending vertically and/or one or more top side recesses (30) and comprises at a bottom side of the wall block, for each top side protrusion (28), a bottom side recess (30) and/or, for each top side recess (30), a bottom side protrusion (28) extending vertically. Further, of each wall block (4a, 4b, 4c), the top side protrusions (28) and/or, respectively, the top side recesses (30) are configured to interlock with the bottom side recesses (30) and/or, respectively, the bottom side protrusions (28) of any other wall block (4a, 4b, 4c) out of the plurality of wall blocks (4a, 4b, 4c) such that vertical movement of the wall block (4a, 4b, 4c) relative to said any other wall block (4a, 4b, 4c) is restricted, preferably prevented.

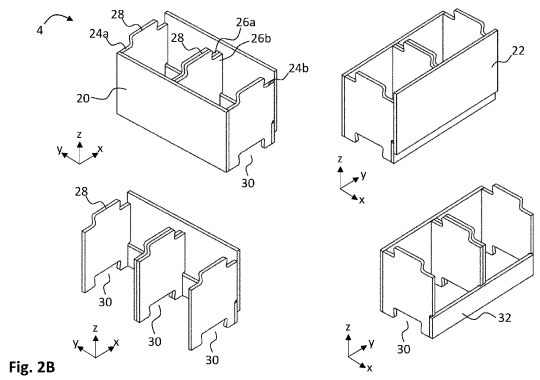

Fig. 2B

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Description

FIELD OF THE INVENTION

[0001] This disclosure relates to a wall block system comprising a plurality of wall blocks configured to be stacked onto each other for building at least part of a wall. This disclosure in particular relates to a wall block system wherein each wall block comprises top side protrusions and/or top side recesses that are configured to interlock with bottom side recess and/or, respectively, with bottom side protrusions of any other wall block out of the plurality of wall blocks. This disclosure further relates to a wall comprising the wall block system disclosed herein.

BACKGROUND

[0002] Circular building is an approach to design and construction that aims to reduce the environmental footprint of buildings by minimizing waste and maximizing resource efficiency. It involves designing buildings to be adaptable, modular and easily disassembled, so that components can be reused or recycled at the end of their life. Additionally, the used components are preferably made out of renewable material, such as wood, that can be grown and replenished naturally, and that can be sustainably harvested.

[0003] Of course, when a building is designed and constructed, it is important that it meets all the building physics and energetic requirements that are typically laid down in a building decree. Such decree contains the technical regulations that represent the minimum requirements for any building. These requirements relate to safety, health, usability, energy efficiency and the environment.

[0004] It is an object of this disclosure to provide a wall block system comprising a plurality of wall blocks for easily building a wall that can be disassembled in a simple manner that allows to reuse the plurality of wall blocks for building another wall, and that also meets the relevant technical requirements.

SUMMARY

[0005] To that end, a wall block system is disclosed. The wall block system comprises a plurality of wall blocks configured to be stacked onto each other for building at least part of a wall. Each wall block out of the plurality of wall blocks comprises a front panel, a back panel, a first set of one or more cross elements extending between and connected to the front panel and the back panel, a second set of one or more cross elements extending between and connected to the front panel and the back panel, and a third set of one or more cross elements extending between and connected to the front panel and the back panel. As will be explained in more detail below, the first set of one or more cross elements may be embodied as a first cross panel, the second set of one or more cross elements may be embodied as a second cross panel, and the third set of one or more cross elements may be embodied as a third cross panel. Each set out of the first set, second set and third set of cross elements comprises at a top side of the wall block one or more top side protrusions extending vertically and/or one or more top side recesses and comprises at a bottom side of the wall block, for each top side protrusion, a bottom side recess and/or, for each top side recess, a bottom side protrusion extending vertically. Further, of each wall block, the top side protrusions and/or, respectively, the top side recesses are configured to interlock with the bottom side recesses and/or, respectively, the bottom side protrusions of any other wall block out of the plurality of wall blocks such that vertical movement of the wall block relative to said any other wall block is restricted, preferably prevented.

[0006] Such wall block system is advantageous in that it allows to construct a wall that can, at least to some extent, cope with bending moments acting on the wall that may be caused by a horizontal wind load perpendicular to the wall. This is due to the interlocking of the protrusions and recesses of wall blocks lying on top of each other. Further, the interlocking mechanism obviates the need to use screws which eases constructions and deconstruction and prolongs the lifetime of the building blocks. Due to the separate sets of cross elements, for example due to the separate cross panels, each having its own protrusion(s), the wall block does not have a single protrusion extending laterally along the full width, or significant part thereof, of the wall block. This eases assembling the wall blocks on top of each other. For a wall block to interlock with another wall block beneath it, the wall block namely only need to be slid over a relatively short distance before it reaches its intended position. This will be explained in more detail below. Hence, the disclosed wall block system enables to easily build a wall that can be disassembled allowing reuse of the wall blocks and can withstand bending torques.

[0007] As a side note, as referred to herein, a width of the wall block may be understood to refer to a dimension of the wall block that (if the wall block would be part of a wall) extends in a horizontal direction that is parallel to the front panel. This direction may also be referred to as a sideways direction. Further, as referred to herein, a height of the wall block may be understood to refer to a dimension of the wall block that (if the wall block would be part of a wall) extends in the vertical direction. Also, terms like "top side of the wall block" and "bottom side of the wall block" may be understood to refer to the top side and, respectively, bottom side of the wall block if the wall block would be part of a wall.

[0008] It should be appreciated that the plurality of wall blocks may be similar, e.g. identical.

[0009] Preferably, the front panel and the back panel are parallel to each other. Further, the front panel and the back panel may have the same width and the same height. Preferably, the cross elements are perpendicular

to the front panel. The wall block may be symmetric around a cross sectional plane that has a normal vector in a horizontal direction that is parallel to the front plane.

[0010] The set of one or more cross elements being connected to the front panel and to the back panel may be understood as that these are fixed to front panel and back panel, for example by screws.

[0011] Preferably, the top side protrusions extend higher than the front panel and/or the bottom side protrusions extend lower than the front panel.

[0012] In case there are more, e.g. two, cross elements in a set of cross elements, then these cross elements are preferably arranged straight below each other.

[0013] The protrusions of the wall blocks preferably all have the same shape. The recesses of the wall blocks may preferably al have the same shape. Further, the shape of the protrusions may be complementary to the shape of the recesses, however, this is not a strict requirement.

[0014] As already indicated, in an embodiment, the first set of one or more cross elements is a first cross panel extending between and connected to the front panel and the back panel, and the second set of one or more cross elements is a second cross panel extending between and connected to the front panel and the back panel, and the third set of one or more cross elements is a third cross panel extending between and connected to the front panel and the back panel. In this embodiment, each cross panel out of the first cross panel, second cross panel and third cross panel comprises at its top side the one or more top side protrusions extending vertically and/or the one or more top side recesses and comprises at its bottom side, for each top side protrusion, the bottom side recess and/or, for each top side recess, the bottom side protrusion extending vertically.

[0015] This embodiment is advantageous in that it allows to easily fabricate the wall blocks. Only three cross panels may need to be fixed between the front panel and the back panel instead of (many) more cross elements.

[0016] Preferably, the cross panels are perpendicular to both the front panel and the back panel.

[0017] The first and second cross panel may each form a lateral side of the wall block in question. The two outer lateral sides of each wall may be without protrusions or recesses, such as grooves, so that the two outer lateral sides of two neighboring wall blocks in the wall sit flush against each other.

[0018] The one or more recesses may be cut-outs out of the panels at a top and/or bottom side of the panels.

[0019] It should be appreciated that a panel as referred to herein may consist of several sub-panels, for example two or more sub-panels that are secured to each other somehow.

[0020] In an embodiment, each of the top side protrusions and/or each of the bottom side protrusions comprises a proximal portion and a distal portion, the distal portion sitting closer to an extremity of the protrusion than the proximal portion. In an embodiment, as viewed in a horizontal direction that is parallel to the front panel, the proximal portion is narrower than the distal portion.

[0021] In this embodiment, preferably, each of the top side recesses and/or each of the bottom side recesses comprises a shallow portion and a deep portion, wherein, as viewed in the horizontal direction parallel to the front panel, the shallow portion is narrower than the deep portion.

[0022] This embodiment provides a relatively simple shape for the protrusions and recesses that can function to interlock together wall blocks that lie on top of each other. The wider distal portion of a protrusion may then prevent two wall blocks from vertically moving relative to each other in that the wider distal portion of one wall block's protrusion cannot vertically move through the narrower shallow portion of another wall block's recess.

[0023] An example of such embodiment would be an embodiment wherein the top side protrusions and bottom side recesses have a dovetail shape and/or wherein the top side recesses and bottom side protrusions have a dovetail shape.

[0024] In an embodiment, the third set of one or more cross elements sits halfway between the first set of one or more cross elements and the second set of one or more cross elements, e.g. as viewed in a vertical direction.

[0025] In an embodiment, the third cross panel sits, as viewed in a vertical direction, halfway between the first cross panel and second cross panel. Therefore, the third cross panel may also be referred to as the intermediate cross panel.

[0026] In an embodiment, of each wall block, as viewed in a vertical direction, a width of the one or more cross elements out of the first set is equal to a width of the one or more cross elements out of the second set and a width of the one or more cross elements out of the third set is larger than the width of the one or more cross elements out of the first set, preferably twice as large.

[0027] Thus, in an embodiment wherein the respective sets of cross elements are cross panels, the first cross panel is substantially as thick as the second cross panel and the third cross panel is thicker than the first cross panel, preferably twice as thick.

[0028] Width of the cross panel may be understood to refer to the dimension extending in a horizontal direction that is perpendicular to the cross panel and/or to refer to the dimension extending in a horizontal direction that is parallel to the front panel.

[0029] This embodiment is especially advantageous if the wall blocks are going to be stacked onto each other in a running bond fashion. If this is the case, then the thicker third cross panel of one wall block may allow two side panels of two respective wall blocks lying on top of the one wall block, to interlock with it.

[0030] In an embodiment, the front panel has a higher vapor permeability than the back panel. In this embodiment the front panel preferably also has a higher vapor permeability than the cross elements, e.g. than the cross

panels.

[0031] This embodiment is advantageous in that it allows to easily construct a wall that has the appropriate characteristics in terms of breathability. Because the front panel has a higher vapor permeability than the back panel, living moisture will not accumulate in the interior of the wall. Living moisture is moisture that is caused by people, pets, cooking, drying the laundry, the dishwasher, etc.

[0032] Vapor permeability can be understood as a material's ability to allow water vapor to pass through it. To be more precise, it may be understood as a measure of how much vapor is transmitted through a material (or compound object) under a given set of circumstances. The higher the value of the permeability of the material, the more rapidly vapor can pass through it. Vapor permeability is the rate at which vapor passes through a material.

[0033] The vapor resistance of a material is a measure of the material's reluctance to let water vapor pass through and is typically expressed by a dimensionless water vapor resistance factor referred to as the "mu-value". The front panel having a higher vapor permeability than the back panel, can also be referred to as the front panel having a lower vapor resistance than the back panel.

[0034] Preferably, the front panel essentially consists of a material having a first vapor resistance and the back panel essentially consists of material having a second vapor resistance, wherein the first vapor resistance is lower than the second vapor resistance.

[0035] The front panel is preferably rainproof so that rain will not enter from the outside into the wall that is formed by the wall blocks. The front panel preferably complies with EN 14964.

[0036] The back panel, and/or the material of which the back panel essentially consists, for example has a water vapor resistance factor of at least 20, for example 30 or 50. The front panel, and/or the material of which the front panel essentially consists, has a water vapor resistance factor of less than 15, for example 3 or 11.

[0037] In an embodiment, the back panel is a wooden back panel. In this embodiment, optionally, the one or more cross elements out of the first set and the one or more cross elements out of the second set and the one or more cross elements out of the third set are wooden cross elements.

[0038] Wooden panels are easily fabricated and aid to reduce the footprint on the environment.

[0039] Preferably, the back panel and/or the cross elements, e.g. the cross panels, are made out of engineered wood, such as plywood, oriented strand board, fibreboard, preferably dry process fibreboard, particle board. Examples of fibreboard are medium-density fibreboard (MDF) and high-density fibreboard (HDF).

[0040] When the back panel is a wooden back panel, then preferably the back panel is made of wooden cladding. Optionally, the one or more cross elements out of the first set and/or the one or more cross elements out of the second set and/or the one or more cross elements out of the third set are also made of wooden cladding. Wooden cladding is advantageous in that it can be easily processed and can be easily milled in various shapes using for example Computer Numerical Control (CNC)milling machines.

[0041] In an embodiment, the front panel is a wooden panel, for example a wood fibreboard, preferably dry process wood fibreboard, such as a resin-bonded, medium-density wood fibreboard, for example of the type MDF.RWH according to EN 622-5. The front panel is for example made out of the board described in environmental product declaration EPD-EGG-20200247-IBD1-EN.

[0042] In an embodiment, the back panel and/or the cross elements, e.g. the cross panels, are made out of a polymer material, e.g. polystyrene. Additionally of alternatively, the front panel is made out of a polymer material, e.g. polystyrene.

[0043] In an embodiment, the front panel and the back panel are vertically offset with respect to each other so that an upper or lower part of the back panel forms a tongue of the wall block and so that a recess, preferably a rabbet, is formed at a lower or, respectively, upper part of the back panel. In this embodiment, of each wall block, as viewed in a horizontal direction parallel to the back panel, the tongue is configured to substantially fill the recess of any other wall block out of the plurality of wall blocks.

[0044] This embodiment is advantageous because the tongue-in-groove construction of two wall blocks lying on top of each other serves horizontal gap sealing.

[0045] A bottom or, respectively, top surface of the back panel may form a first surface of the rabbet. A second surface of the rabbet may be at least partially formed by back surface of the cross panels and back surface of seal panels. These seal panels may extend between the cross panels.

[0046] In an embodiment, as viewed in a direction perpendicular to the front panel, each of the front panel and back panel have a left edge and a right edge. In such embodiment, as viewed in the direction perpendicular to the front panel, the left edge of the front panel and the left edge of the back panel may lie on a first line and the right edge of the front panel and the right edge of the back panel may lie on a second line. Preferably, each of the first line and second line is a vertical line.

[0047] Thus, in this embodiment, the front panel and back panel are not offset with respect to each other in a sideways direction. This is advantageous in that it reduces the number of types of special wall blocks that are required for correctly constructing the wall at corners.

[0048] In an embodiment, each wall block comprises one or more vertical passages through the wall block. In such embodiment, of each wall block, as viewed in a vertical direction, the one or more vertical passages may have a combined surface area that is larger than 50% of a total surface area enclosed by a perimeter of the wall

block, preferably larger than 60%, more preferably larger than 70%.

[0049] The blocks may thus be understood to be hollow blocks, which is beneficial because it allows to insert insulation material inside of the wall blocks. Preferably, even, the vertical passages of wall blocks lying on top of each other may be aligned, as viewed in the vertical direction, so that these passages form a long vertical passage extending through several wall blocks, for example a long passage extending from the top of the wall to the bottom of the wall. Insulation material can then be efficiently inserted in these long passages herewith filling the interior of the entire wall with insulation material. The vertical alignment of cross panels is also beneficial because it allows forces to be transferred to lower lying blocks and ultimately to the foundation.

[0050] In an embodiment, of each wall block, the first set of one or more cross elements and the front panel and the back panel and the third set of one or more cross elements define a first vertical passage through the wall block. Also, in this embodiment, of each wall block, the second set of one or more cross elements and the front panel and the back panel and the third set of one or more cross elements define a second vertical passage through the wall block. In this embodiment, of each wall block, as viewed in a vertical direction, the first vertical passage and second vertical passage have a combined surface area that is larger than 50% of a total surface area enclosed by a perimeter of the wall block, preferably larger than 60%, more preferably larger than 70%.

[0051] In an embodiment, each wall block is configured to become interlocked with any other wall block out of the plurality of wall blocks by placing, with a vertical movement, the wall block on the other wall block and sliding the wall block in a horizontal direction that is perpendicular to the front panel. This direction may also be referred to as sideways.

[0052] The position of the wall block right after it has been placed on the other wall block may be referred to as the initial position. In this initial position, as viewed in a vertical direction, the third set of one or more cross elements sit between the first or second set of one or more cross elements of another wall block and the third set of one or more cross elements of the other wall block.

[0053] In an embodiment, each wall block comprises a groove at a first lateral side and a tongue at a second lateral side. Further, in this embodiment, of each wall block, the tongue at the second lateral side is configured to fit into the first lateral side's groove of any other wall block out of the plurality of wall blocks such that the second lateral side of the wall block is adjacent the first lateral side of the other wall block and such that the tongue of the wall block limits draft flowing in between the second lateral side of the wall block and the first lateral side of the other wall block.

[0054] This embodiment advantageously limits draft through the vertical openings between neighboring wall blocks in the wall.

[0055] In an embodiment, the first set of one or more cross elements and the second set of one or more cross elements and the third set of one or more cross elements define, optionally together with the front panel, a horizontal passage, preferably parallel to the front panel, through the wall block for preventing a pressure build up in the wall when insulation material is blown into the wall.

[0056] As will be described with reference to figures 7A, vertical passages may be created in the interior of the wall. The above referenced horizontal passages may are beneficial because they can prevent a pressure build-up in such vertical passage when the vertical passage is filled with insulation material. Typically, such insulation materials are blown into the interior of a wall, e.g. into the vertical passages, under high pressure. Such high pressure may damage the internal structure of the wall if it cannot be released through the horizontal passages.

[0057] One distinct aspect of this disclosure relates to a wall comprising any of the wall block systems described herein.

[0058] One distinct aspect of this disclosure relates to a wall block system comprising a plurality of wall blocks configured to be stacked onto each other for building at least part of a wall, wherein each wall block out of the plurality of wall blocks comprises a front panel and a back panel and one or more cross elements extending between and connected to the front panel and the back panel, wherein the front panel has a higher vapor permeability than the back panel. In this distinct aspect, the wall block system may comprise any other feature of any of the other wall block system disclosed herein.

[0059] Elements and aspects discussed for or in relation with a particular embodiment may be suitably combined with elements and aspects of other embodiments, unless explicitly stated otherwise. Embodiments of the present invention will be further illustrated with reference to the attached drawings, which schematically will show embodiments according to the invention. It will be understood that the present invention is not in any way restricted to these specific embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0060] Aspects of the invention will be explained in greater detail by reference to exemplary embodiments shown in the drawings, in which:

FIG. 1 illustrates a wall according to an embodiment;
FIG. 2A shows a wall block according to an embodiment;
FIG. 2B shows a wall block according to an embodiment wherein each cross panel comprises a single protrusion and a single recess;
FIG. 3 shows different views of the wall block shown in FIG. 2;
FIG. 4 shows different views of the wall block shown in FIG. 2 yet without front panel and without one of the side panels;

FIG. 5 illustrate two wall blocks on top of each other;
FIG. 6 illustrate shapes for the protrusions and recesses according to different embodiments;
FIG. 7A and 7B illustrate a wall according to an embodiment;
FIG. 8 illustrates how a wall block can become interlocked with other wall blocks according to an embodiment;
FIG. 9 depicts a wall block according to an embodiment;
FIG. 10 shows different views of the wall block shown in FIG. 9;
FIG. 11 shows side views of two wall blocks according to embodiments having a horizontal passage;
FIG. 12 illustrates a half version of a wall block, according to embodiment;
FIG. 13 depicts a corner element according to an embodiment;
FIG. 14 illustrates a lintel according to an embodiment;
FIG. 15 shows two cover plates according to embodiments;
FIG. 16 shows two base plates according to embodiments;
FIG. 17 shows a cover plate according to an embodiment;
FIG. 18 shows a wall block according to an embodiment;
FIG. 19 shows a base plate according to an embodiment;
FIG. 20 shows the base plate of FIG. 17, wall block of FIG. 18 and the base plate of FIG. 19 in situ;
FIG. 21 shows a wall block according to an embodiment.

DETAILED DESCRIPTION OF THE DRAWINGS

[0061] In the figures, identical reference numbers indicate identical or similar elements.

[0062] Figure 1 illustrates a wall 2 that comprises, and has been constructed using, a wall block system as disclosed herein. The wall block system comprises a plurality of wall blocks 4a, 4b, 4c. For clarity, only three of these wall blocks are indicated with a reference number. Besides the wall blocks 4, the wall comprises a number of other constructional elements. Constructional element 6 is for example a cover tile, constructional element 8 is a lintel, constructional elements 10a, 10b, 10c are corner structures, constructional element 12 is a base plate onto which wall blocks can be stacked, and constructional element 14 is a half version of a wall block 4. The base plate 12 is also present beneath the lowest wall blocks, as can be seen more clearly in figure 7A.

[0063] The wall blocks 4 are stacked onto each other, preferably in a running bond fashion, and thus form at least part of wall 2. Preferably, the wall blocks, or at least their functional, constructional elements, are identical to each other.

[0064] It should be appreciated that a wall of a building should meet certain technical requirements, which are typically stipulated in a building decree. The wall block system disclosed herein aims to provide a building system that allows to easily build a wall that meets important physical requirements, for example in terms of forces and bending moments it can withstand. To illustrate, the wall that is formed by the wall blocks is preferably rainproof and meets the breathability requirements.

[0065] The y axis indicated in each figure indicates a horizontal direction that is parallel to the front panel of each wall block. A direction in the +y or -y direction may also be referred to as a sideways direction or lateral direction. The dimension of a wall or wall block described herein, which dimension extends in the y direction may be referred to as the width of the wall or wall block. The x axis is also a horizontal direction that is perpendicular to the front panel of each wall block. The dimension of a wall or wall block described herein, which dimension extends in the x direction may be referred to as the thickness of the wall or wall block. The z axis indicated in each figure indicates a vertical direction, in particular the upwards vertical direction. The dimension of a wall or wall block described herein, which dimension extends in the vertical direction may be referred to as the height of the wall or wall block.

[0066] A typical width of the wall block would be between 0.3 m and 0.6 m. A typical height of the wall block would be approximately 0.3 m. A typical thickness of the wall block would be approximately 0.3 m.

[0067] Figure 2A shows a wall block 4 according to an embodiment. The top left figure shows an isometric view as viewed in a first viewing direction. The bottom left figure shows the same view, yet in this figure the front panel 20 is hidden. The top right figure shows an isometric view of the same wall block as viewed in another viewing direction (see the indicate coordinate axes) in order to show the back side of the wall block 4. The bottom right figure shows the same view, yet in this figure the back panel 22 is not shown.

[0068] The wall block 4 comprises a front panel 20 and a back panel 22, a first set 24a of one or more cross elements extending between and connected to the front panel 20 and the back panel 22, a second set 24b of one or more cross elements extending between and connected to the front panel 20 and the back panel 22, and a third set 26 of one or more cross elements extending between and connected to the front 20 panel and the back panel 22. In the depicted, preferred embodiment, the first set 24a of one or more cross elements is a first cross panel 24a, the second set 24b a second cross panel 24b and the third set 26 a third cross panel 26. Further, the third cross panel sits, as viewed in a vertical direction, halfway between the first cross panel and second cross panel. Therefore, the third cross panel may also be referred to as the intermediate cross panel. All cross panels may be parallel to each other. Cross panel 24a and 24b may be referred to as side panels, because their outer

surface may form a lateral side of the wall block.

[0069] The cross panels 24a, 24b and 26 may be wooden cross panels and the back panel 22 may be a wooden back panel. The front panel 20 may also be a wooden front panel 20, however, preferably, the front panel 20 is made out of another material, such as vapour-permeable wood fiber board, that has a higher vapor permeability than the back panel 22. Preferably, of course, the front panel 20 has a vapor permeability such that the wall block meets physical requirements relating to breathability in order to prevent water vapor to condense in the interior of the wall block and thus in the interior of the wall.

[0070] Each of the cross panels 24a, 24b and 26 comprises at its top side two protrusions 28a and 28b and at its bottom side two recesses 30a and 30b. The protrusions 28a and 28b extend vertically, in particular upwards vertically from the cross panels. In the depicted embodiment, the recesses 30 and protrusions 28 are shaped such that the recesses 30 and protrusions 28 of different wall blocks can interlock with each other in order to restrict, preferably prevent, vertical movement of the wall blocks relative to each other. This ensures that the wall can be withstand bending moments and tensile forces. The interlocking provides for a cohesive structure that may even be suitably used for constructing a vault. As shown, the protrusions 28 as well as the recesses 30 have a dovetail shape.

[0071] Additionally or alternatively, though not shown in a figure, the cross panels comprise at their top sides one or more recesses and at their bottom sides one or more protrusions.

[0072] Seal panels 32a and 32b extend, at a lower back side of the wall block, between the cross elements and are connected thereto. As such, the seal panels 32 may, together with a bottom surface of the back panel 22 define a groove that can receive a tongue of another wall block which tongue is formed by a part of the other wall panel's back panel 22 that sits higher than the front panel 20. This will be explained in more detail with reference to figure 5.

[0073] Figure 2B shows a wall block 4 according to an embodiment. The top left figure shows an isometric view as viewed in a first viewing direction. The bottom left figure shows the same view, yet in this figure the front panel 20 is hidden. The top right figure shows an isometric view of the same wall block as viewed in another viewing direction (see the indicate coordinate axes) in order to show the back side of the wall block 4. The bottom right figure shows the same view, yet in this figure the back panel 22 is not shown.

[0074] The wall block 4 comprises a front panel 20 and a back panel 22, a first set 24a of one or more cross elements extending between and connected to the front panel 20 and the back panel 22, a second set 24b of one or more cross elements extending between and connected to the front panel 20 and the back panel 22, and a third set 26 of one or more cross elements extending between and connected to the front 20 panel and the back panel 22. In the depicted, preferred embodiment, the first set 24a of one or more cross elements is a first cross panel 24a, the second set 24b a second cross panel 24b and the third set 26 a third cross panel consisting of two adjacent sub-cross panels 26a and 26b adjacent to each other. Further, the third cross panel sits, as viewed in a vertical direction, halfway between the first cross panel and second cross panel. Therefore, the third cross panel may also be referred to as the intermediate cross panel. All cross panels may be parallel to each other. Cross panel 24a and 24b may be referred to as side panels, because their outer surface may form a lateral side of the wall block.

[0075] The cross panels 24a, 24b and 26 may be wooden cross panels and the back panel 22 may be a wooden back panel. The front panel 20 may also be a wooden front panel 20, however, preferably, the front panel 20 is made out of another material, such as vapour-permeable wood fiber board, that has a higher vapor permeability than the back panel 22. Preferably, of course, the front panel 20 has a vapor permeability such that the wall block meets physical requirements relating to breathability in order to prevent water vapor to condense in the interior of the wall block and thus in the interior of the wall.

[0076] Each of the cross panels 24a, 24b and 26 comprises at its top side one and only one protrusion 28 and at its bottom side one and only one recess 30. This may ease the milling process for fabricating the wall block and may reduce the milling time. The protrusion 28 extend vertically, in particular upwards vertically from the cross panels. In the depicted embodiment, the recesses 30 and protrusions 28 are shaped such that the recesses 30 and protrusions 28 of different wall blocks can interlock with each other in order to restrict, preferably prevent, vertical movement of the wall blocks relative to each other. This ensures that the wall can be withstand bending moments and tensile forces. As shown, the protrusions 28 as well as the recesses 30 have a dovetail shape.

[0077] Additionally or alternatively, though not shown in a figure, the cross panels comprise at their top sides one and only one recess and at their bottom sides one and only one protrusion.

[0078] Seal panel 32 extends, at a lower back side of the wall block, between the side panels 24a and 24b and are connected thereto. As such, the seal panel 32 may, together with a bottom surface of the back panel 22 define a groove that can receive a tongue of another wall block which tongue is formed by a part of the other wall panel's back panel 22 that sits higher than the front panel 20. This will be explained in more detail with reference to figure 5.

[0079] Figure 3 shows a top view (top center), front view (bottom left), side view (bottom center) and back view (bottom right) of the wall block that is also shown in figure 2.

[0080] The top view indicates the thickness d1 of the first cross panel 24a, the thickness d2 of the third cross panel 26 and the thickness d3 of the second cross panel

24b. Preferably, d1 equals d3. Also, preferably, d2 = 2 * d1. The top view also clearly shows that the wall block has two vertical passages 31a and 31b.

[0081] The front view illustrates that in the depicted embodiment of the wall block the left edges of both the front panel 20 and the back panel 22 lie on the same vertical line 27 and that the right edges of the front panel 20 and the back panel 22 lie on the same vertical line 29. Preferably, as illustrated in the front view, the outer surface of side panel 24a also lies on line 27 and the outer surface of side panel 24b lies on line 29. Preferably, as illustrated in the front view, the respective top sides, e.g. top surfaces, of the protrusions all lie on horizontal line 25. Also, preferably, the top surface of back panel 22 also lies on this same horizontal line 25. Further, preferably, as can be seen in the side view, the top surface of the front panel 20 lies on the same horizontal line 23 as the top surfaces of the cross panels (not considering the protrusions). As indicated, preferably, the protrusions 28 extend from their cross panels a distance d4 that is equal to the distance that, as viewed from the front view, the back panel 22 is vertically offset with respect to the front panel 22 or, in other words, that is equal to the height of the tongue that is formed by the back panel 22.

[0082] Figure 3 also indicates (see top right) a total surface area A that is enclosed by the perimeter of the wall block as viewed from the top view, and a surface area B of vertical passage 31a and a surface area C of vertical passage 31b. In the depicted embodiment, the combined surface area B+C is relatively large, namely larger than 50% of the surface area A. In fact, in the depicted embodiment, the combined surface area B+C as shown is larger than 70% of the total surface area A.

[0083] Figure 4 shows an isometric view (top left), front view (bottom left) and side view (bottom right) of the wall block that is also depicted in figure 3 with the exception that, for clarity purposes, the front panel is not shown.

[0084] Figure 5 serves to illustrate the tongue in groove construction that may be formed by two wall blocks lying on top each other wherein the wall front panel and back panel are vertically offset with respect to each other so that an upper (or lower) part of the back panel 22 forms a tongue 37 and so that a recess 35 is formed at a lower (or upper) part of the back panel 22.

[0085] Figure 5 shows an isometric view (left) and corresponding side view (right) wherein, for clarity, the front panel is not shown. The tongue 37 formed by each back panel 22 is indicated by the dashed part of the respective back panels 22. As can be seen in the side view, the tongue 37 of an underlying wall block is configured to substantially fill the recess 35 of the upper lying wall block.

[0086] In the depicted embodiment, the recess 35 is a rabbet. As indicated in the side view, a bottom surface 39' of the back panel 22' forms a first surface of the rabbet and a back surface 41' of the seal panel 32b' at least partially forms a second surface of the rabbet.

[0087] Because of the tong in groove construction, draft through the horizontal slit (indicated by the arrow) between two back panels 22 of two respective wall blocks lying on top of each other, is limited, preferably prevented.

[0088] Figure 6 illustrates side views of three cross panels and their protrusions and recesses according to three respective embodiments. Each of the protrusions comprises a proximal portion 42 and a distal portion 40 and each of the recesses comprises a shallow portion 46 and a deep portion 44. In each of these embodiment, the proximal portion 42 of the protrusion is narrower than the distal portion 40 and the shallow portion 46 of the recess of narrower than the deep portion 44.

[0089] Preferably, each shallow portion 46 is configured to accommodate the proximal portion 42 of any protrusion and each deep portion 44 is configured to accommodate the distal portion 40 of each protrusion. Additionally or alternatively, preferably, each distal portion 40 is wider than each shallow portion 46 of each recess so that the protrusions can interlock with the recesses.

[0090] Figure 7A illustrates at least part of a wall according to an embodiment which has been constructed using the system of wall blocks described herein. The vertical passages of wall blocks lying on top of each other are aligned so that vertical passages are created in the interior of the wall that extends through several wall blocks. These vertical passage are beneficial as these can be easily filled with insulation material 48 as shown.

[0091] Figure 7A also shows a base plate 12 onto which the lowest wall blocks of the wall can be placed. The base plate also comprises protrusions 12 (or recesses, not shown) that can interlock with the bottom side recesses and/or, respectively, the bottom side protrusions of any other wall block out of the plurality of wall blocks such that vertical movement of the base plate relative to the other wall block is restricted, preferably prevented.

[0092] Figure 7B shows the same wall that is shown in figure 7A, however, for clarity, the front panels of wall blocks 4, 4' and 4" are not shown. Figure 7B clearly shows that side panel 24b and side panel 24a' of respective wall blocks 4 and 4' are adjacent to each other and that the intermediate panel 26" of wall block 4" is thick enough so that its recesses can interlock with the protrusions of both side panel 24b and side panel 24a'.

[0093] Figure 7B also indicates positions 21 where two adjacent wall blocks can be secured together, for example by means one or more screws. Securing adjacent wall blocks together will prevent horizontal movement of the wall blocks with respect to each other. As such, the wall blocks that are screwed together may be understood to form a lateral stability system, in particular a braced wall, that is configured to transfer horizontal loads on the wall to the foundation of the building.

[0094] Figure 8 illustrates how wall block 4" may have been positioned onto underlying wall blocks 4 and 4'. The top of figure 8 shows an initial position of the wall block 4" relative to the underlying wall blocks 4 and 4'. In this initial position, the intermediate panel 26" of wall block

4" sits between the cross panel 24a' and cross panel 24b' of wall block 4'.

[0095] From this initial position, wall block 4" can be moved horizontally in the y direction in order to interlock the protrusions of intermediate panel 26 of wall block 4 with the recesses of side panel 24" of wall block 4", interlock the protrusions of both side panels 24b and 24a' with the recesses of intermediate panel 26", and interlock the protrusions of intermediate panel 26' with the recesses of side panel 24b".

[0096] As is clear from figure 8, from the initial position, wall block 4" has to be slid sideways only over a distance d. Hence, the wall blocks can be stacked onto each other easily and fast.

[0097] Figures 9 and 10 illustrate another embodiment of the wall block. Figure 9 shows four isometric views of the wall block, wherein for clarity, for the two views on the bottom, the front panel is not shown. Figure 10 shows a top views (top center), front view (bottom left), side view (bottom center) and back view (bottom right) of the wall block shown in figure 9.

[0098] In this embodiment, the first set of one or more cross elements and the second set of one or more cross elements and the third set of one or more cross elements define, together with the front panel 22, a horizontal passage 54 (see figure 10) through the wall block for accommodating one or more pipes. The passage 54 is formed by respective apertures or cut outs 52a, 52b, 52c out of the cross elements, e.g. out of the cross panels.

[0099] Figure 11 shows side views according to further respective embodiments. The embodiment shown at the top comprises a horizontal passage 54 that is formed by an aperture in the cross panels. In the embodiment shown at the bottom, each set of one or more cross elements consists of a first top cross element 58 and second bottom cross element 60 that are positioned straight above each other. Due to the separate cross elements in each set of one or more cross elements, the horizontal passage 54 through the wall block is formed.

[0100] The embodiment shown in figures 9 and 10 further comprises a groove 50a at a first lateral side and a groove 50b at a second lateral side. A slat can be placed in one of these grooves in order to form a tongue at one of the lateral sides (not shown).

[0101] This tongue at e.g. the second lateral side would then be configured to fit into the first lateral side's groove of any other wall block out of the plurality of wall blocks such that the second lateral side of the wall block is adjacent the first lateral side of the other wall block and such that the tongue of the wall block limits draft flowing in between the second lateral side of the wall block and the first lateral side of the other wall block.

[0102] Although figures 9 and 10 show an embodiment that comprises both the grooves (one of which can be used to easily form a tongue by insertion of a slat) and the horizontal passage, there are of course embodiments that comprise the grooves yet don't comprise the horizontal passage and embodiments that comprise the horizontal passage yet don't comprise the grooves.

[0103] Figure 12 shows a half version of a wall block that can be used at lateral ends of the wall (see e.g. figure 1.)

[0104] Figure 13 shows a corner element 10 that can be used to end the wall (also see figure 1).

[0105] Figures 14A, 14B and 14C show the same lintel element 8. Figure 14A shows all elements of the lintel 8. In figure 14B the front panel is not shown. In figure 14C further elements are not shown in order to reveal a beam 56 that extends across substantially the entire width of the lintel 8. The beam 56 may be understood to provide the required load-carrying capacity of the lintel 8. The lintel element 8 may be configured so that a roller blind housing can be easily attached to it from the outside.

[0106] Figures 15A and 15B respectively show two isometric views of a cover plate 6 that can be used to cover wall blocks and create an even top surface as also shown in figure 1.

[0107] Figures 15C and 15D respectively show two isometric views of another cover plate 6 that can be used cover wall blocks and create an even top surface. For clarity, in figure 15D, the front panel 61 of the cover plate 6 is not shown. The cover plates as the one shown in figures 15C and 15D can be stacked onto each other in a weatherboard fashion wherein each one partially overlaps a neighboring cover plate.

[0108] Figures 16A and 16B respectively show two isometric view of a base plate 12 according to an embodiment. (Also see figure 1.)

[0109] Figures 16C and 16D respectively show two isometric views of another base plate 12 according to an embodiment. Such base plate 12 is suitable for weatherboard stacking wherein each base plate overlaps a neighboring base plate. Note that the base plate of figure 16 comprises one or more channels 63 through which water that is present in the interior of the wall, can exit and flow into the ground. Such water may have gotten there, for example, because it was raining at the time that the wall was being constructed.

[0110] Figures 17A and 17B respectively show two views of a cover plate 62 that is configured to be placed on top of a wall made out of wall blocks as described herein. The cover plate 62 comprises, at its top, one row of protrusions instead of two.

[0111] Figures 18A and 18B respectively show two views of a wall block 64. The wall block 64 comprises at its bottom side recesses that are configured to engage with the protrusions on the top side of cover plate 62. In this embodiment, the wall block also comprises at its top side recesses.

[0112] Figures 19A and 19b respectively show two views of a base plate 66. The protrusions on the bottom side of base plate 66 are configured to engage with the recesses that are at the top side of wall block 64 shown in figures 18A and 18B.

[0113] As shown in figure 20, if the cover plate 62, wall blocks 64 and base plate 66 are stacked on top of each

other, they define a space at the interior side of the wall that can receive a floor element 68, such as a beam. The floor element 68 then rests at the top part of cover plate 62 that does not comprise protrusions.

[0114] Figure 21A and 21B show a wall block 4 according to an embodiment. In figure 21B, for clarity, the back panel 22 is not shown. In this embodiment, at least part 70 of at least one cross panel protrudes through the back panel 22. In a preferred embodiment, the protrusion is shaped as a hook. If a plurality, e.g. all, wall blocks of the wall would have such protrusion, then relatively long slats can be simply inserted behind these hooks. The slats will then be kept in place without having to screw them into the wall. Further cladding may then be provided on the inside of the wall by screwing cladding to these slats. Hence, the protrusions 70 enable to provide cladding at the interior of the wall without requiring to screw in the wall blocks, which would damage the wall blocks to some extent.

Claims

1. A wall block system comprising a plurality of wall blocks configured to be stacked onto each other for building at least part of a wall, wherein each wall block out of the plurality of wall blocks comprises

- a front panel, and
- a back panel, and
- a first set of one or more cross elements extending between and connected to the front panel and the back panel, and
- a second set of one or more cross elements extending between and connected to the front panel and the back panel, and
- a third set of one or more cross elements extending between and connected to the front panel and the back panel, wherein

each set out of the first set, second set and third set comprises at a top side of the wall block one or more top side protrusions extending vertically and/or one or more top side recesses and comprises at a bottom side of the wall block, for each top side protrusion, a bottom side recess and/or, for each top side recess, a bottom side protrusion extending vertically, wherein

of each wall block, the top side protrusions and/or, respectively, the top side recesses are configured to interlock with the bottom side recesses and/or, respectively, the bottom side protrusions of any other wall block out of the plurality of wall blocks such that vertical movement of the wall block relative to said any other wall block is restricted, preferably prevented.

2. The wall block system according to claim 1, wherein

- the first set of one or more cross elements is a first cross panel extending between and connected to the front panel and the back panel, and
- the second set of one or more cross elements is a second cross panel extending between and connected to the front panel and the back panel, and
- the third set of one or more cross elements is a third cross panel extending between and connected to the front panel and the back panel, wherein

each cross panel out of the first cross panel, second cross panel and third cross panel comprises at its top side the one or more top side protrusions extending vertically and/or the one or more top side recesses and comprises at its bottom side, for each top side protrusion, the bottom side recess and/or, for each top side recess, the bottom side protrusion extending vertically.

3. The wall block system according to any of the preceding claims, wherein

each of the top side protrusions and/or each of the bottom side protrusions comprises a proximal portion and a distal portion, the distal portion sitting closer to an extremity of the protrusion than the proximal portion, wherein

as viewed in a horizontal direction that is parallel to the front panel, the proximal portion is narrower than the distal portion.

4. The wall block system according to any of the preceding claims, wherein

the top side protrusions and bottom side recesses have a dovetail shape, and/or wherein

the top side recesses and bottom side protrusions have a dovetail shape.

5. The wall block system according to any of the preceding claims, wherein the third set of one or more cross elements sits halfway between the first set of one or more cross elements and the second set of one or more cross elements.

6. The wall block system according to any of the preceding claims, wherein

of each wall block, as viewed in a vertical direction, a width of the one or more cross elements out of the first set is equal to a width of the one or more cross elements out of the second set and a width of the one or more cross elements out of the third set is larger than the width of the one or more cross elements out of the first set, preferably twice as large.

7. The wall block system according to any of the pre-

ceding claims, wherein the front panel has a higher vapor permeability than the back panel.

8. The wall block system according to any of the preceding claims, wherein the back panel is a wooden back panel and the one or more cross elements out of the first set and the one or more cross elements out of the second set and the one or more cross elements out of the third set are wooden cross elements.

9. The wall block system according to any of the preceding claims, wherein

the front panel and the back panel are vertically offset with respect to each other so that an upper or lower part of the back panel forms a tongue of the wall block and so that a recess, preferably a rabbet, is formed at a lower or, respectively, upper part of the back panel, wherein
of each wall block, as viewed in a horizontal direction parallel to the back panel, the tongue is configured to substantially fill the recess of any other wall block out of the plurality of wall blocks.

10. The wall block system according to any of the preceding claims, wherein

as viewed in a direction perpendicular to the front panel, each of the front panel and back panel have a left edge and a right edge, and wherein
as viewed in the direction perpendicular to the front panel, the left edge of the front panel and the left edge of the back panel lie on a first line and the right edge of the front panel and the right edge of the back panel lie on a second line.

11. The wall block system according to any of the preceding claims, wherein
each wall block comprises one or more vertical passages through the wall block, wherein of each wall block, as viewed in a vertical direction, the one or more vertical passages have a combined surface area that is larger than 50% of a total surface area enclosed by a perimeter of the wall block.

12. The wall block system according to any of the preceding claims, wherein each wall block is configured to become interlocked with any other wall block out of the plurality of wall blocks by placing, with a vertical movement, the wall block on the other wall block and sliding the wall block in a horizontal direction that is parallel to the front panel.

13. The wall block system according to any of the preceding claims, wherein each wall block comprises a groove at a first lateral side and a tongue at a second lateral side, wherein
of each wall block, the tongue at the second lateral side is configured to fit into the first lateral side's groove of any other wall block out of the plurality of wall blocks such that the second lateral side of the wall block is adjacent the first lateral side of the other wall block and such that the tongue of the wall block limits draft flowing in between the second lateral side of the wall block and the first lateral side of the other wall block.

14. The wall block system according to any of the preceding claims, wherein the first set of one or more cross elements and the second set of one or more cross elements and the third set of one or more cross elements define, optionally together with the front panel, a horizontal passage through the wall block for preventing a pressure build up when insulation material is blown into the wall.

15. A wall comprising the wall block system according to any of the preceding claims.

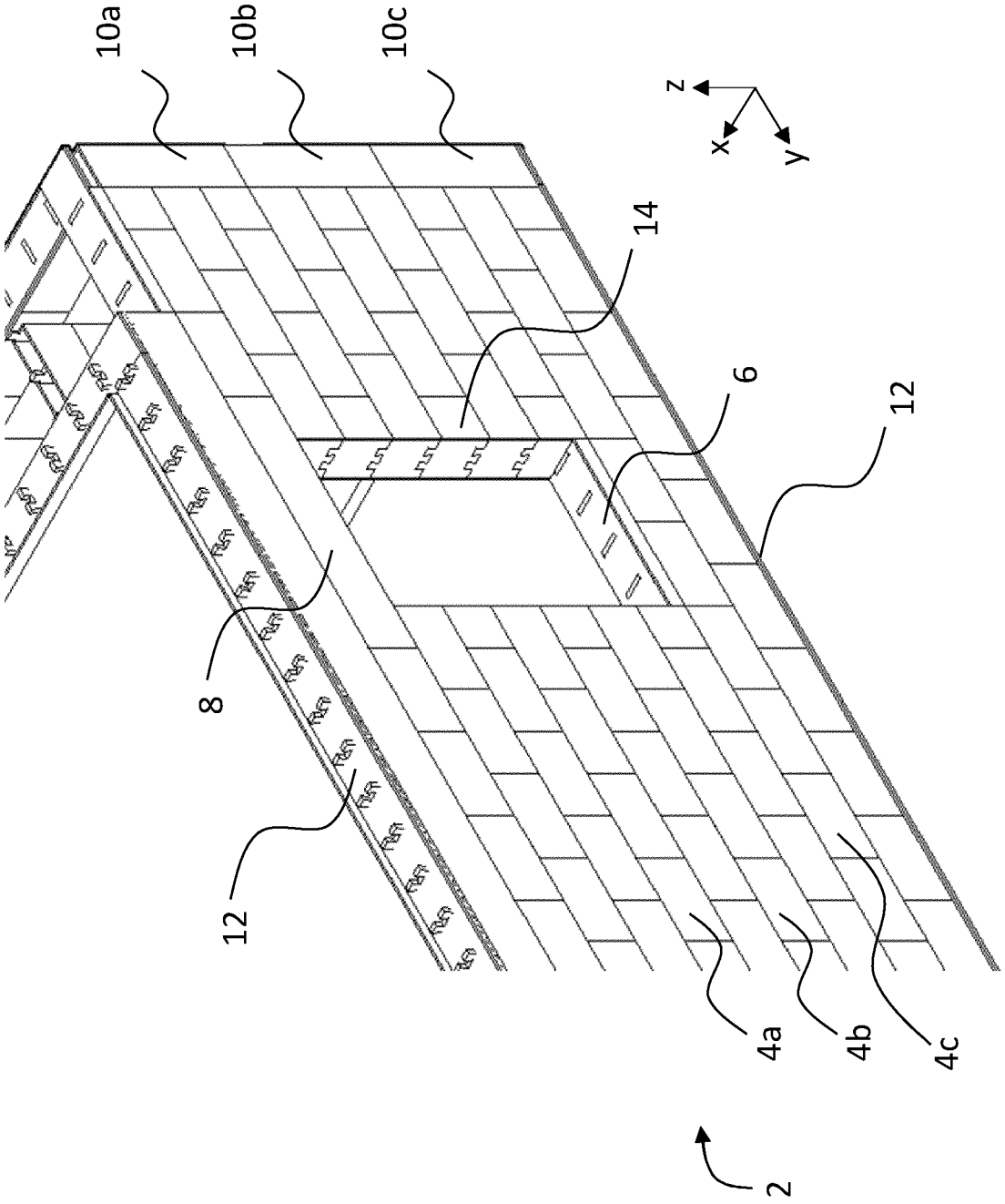
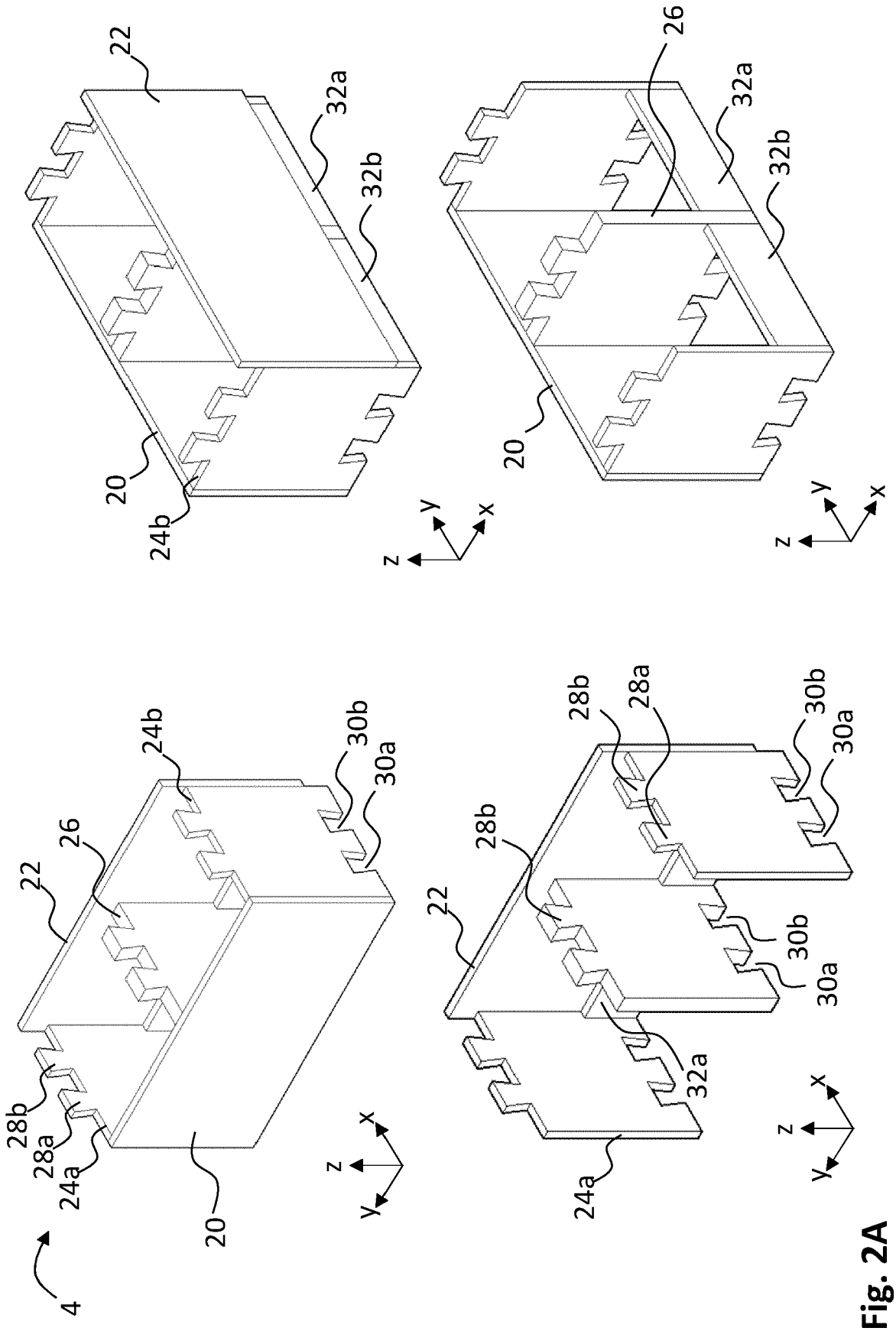


Fig. 1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22
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30b
30a
20
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x
y

Fig. 2A

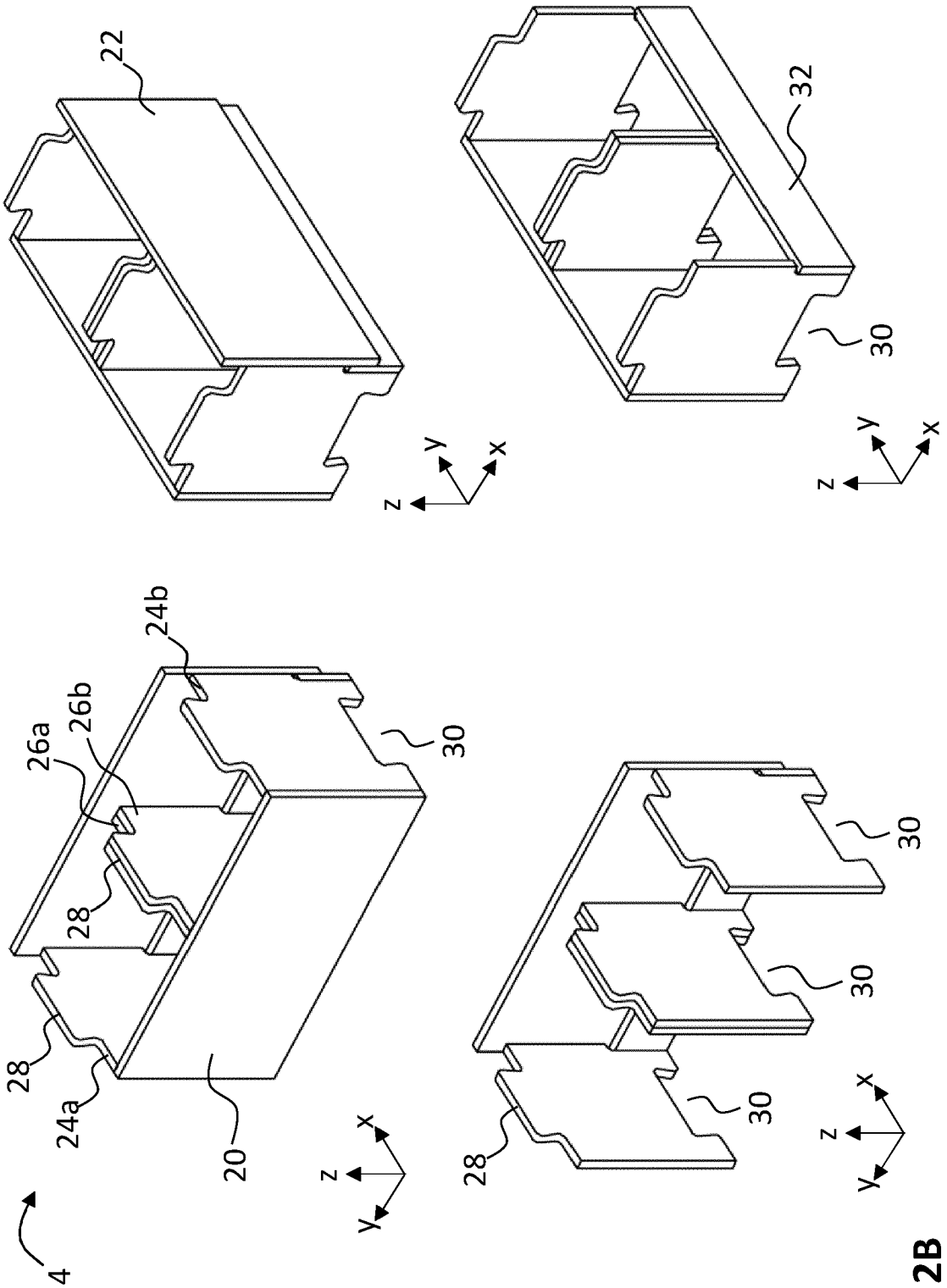
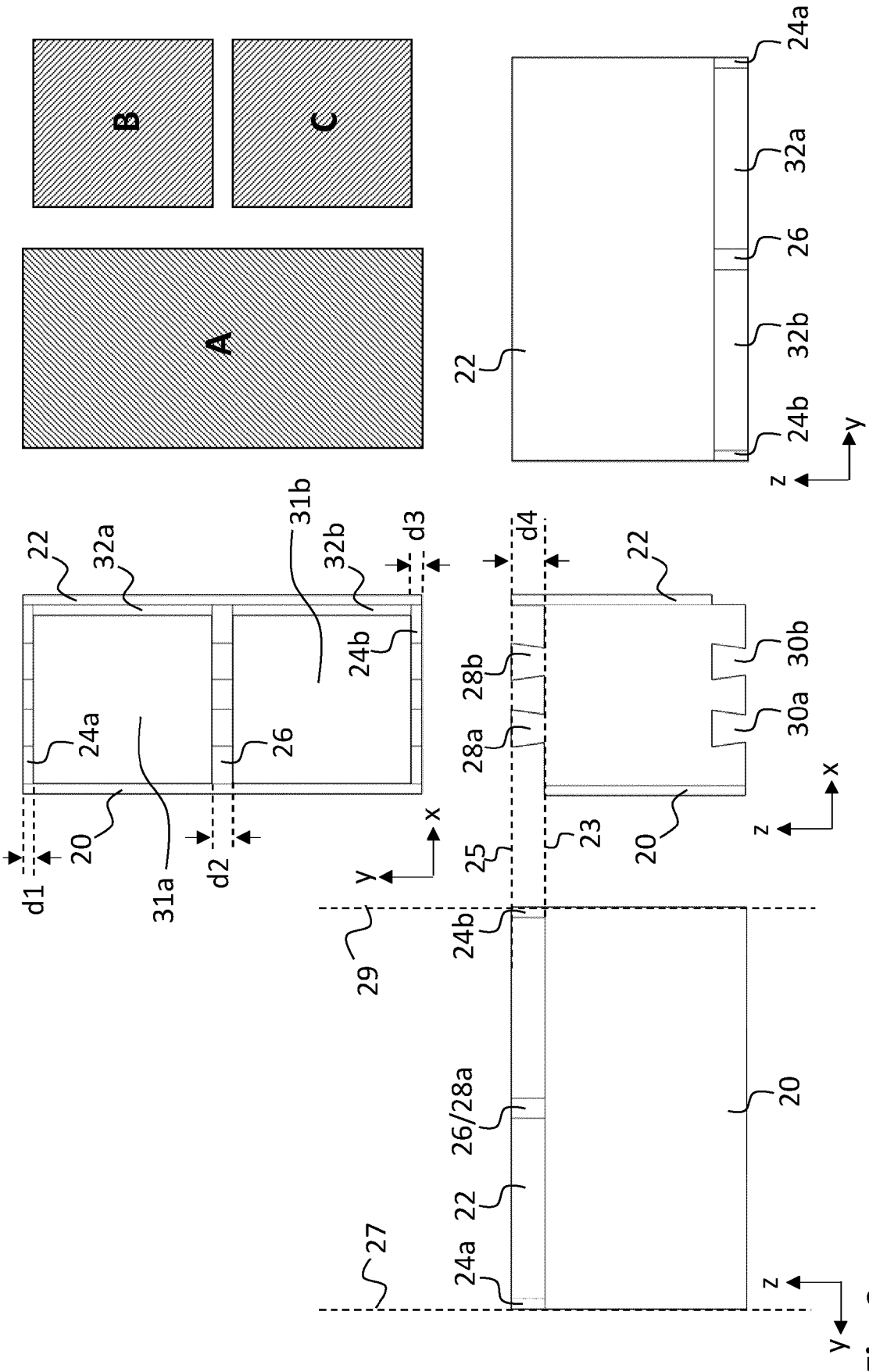


Fig. 2B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B
C
22
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32a
26
32b
24b
y
z
d1
d2
d3
d4
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31b
x
25
23
28a
28b
30a
30b
29
27
26/28a

Fig. 3

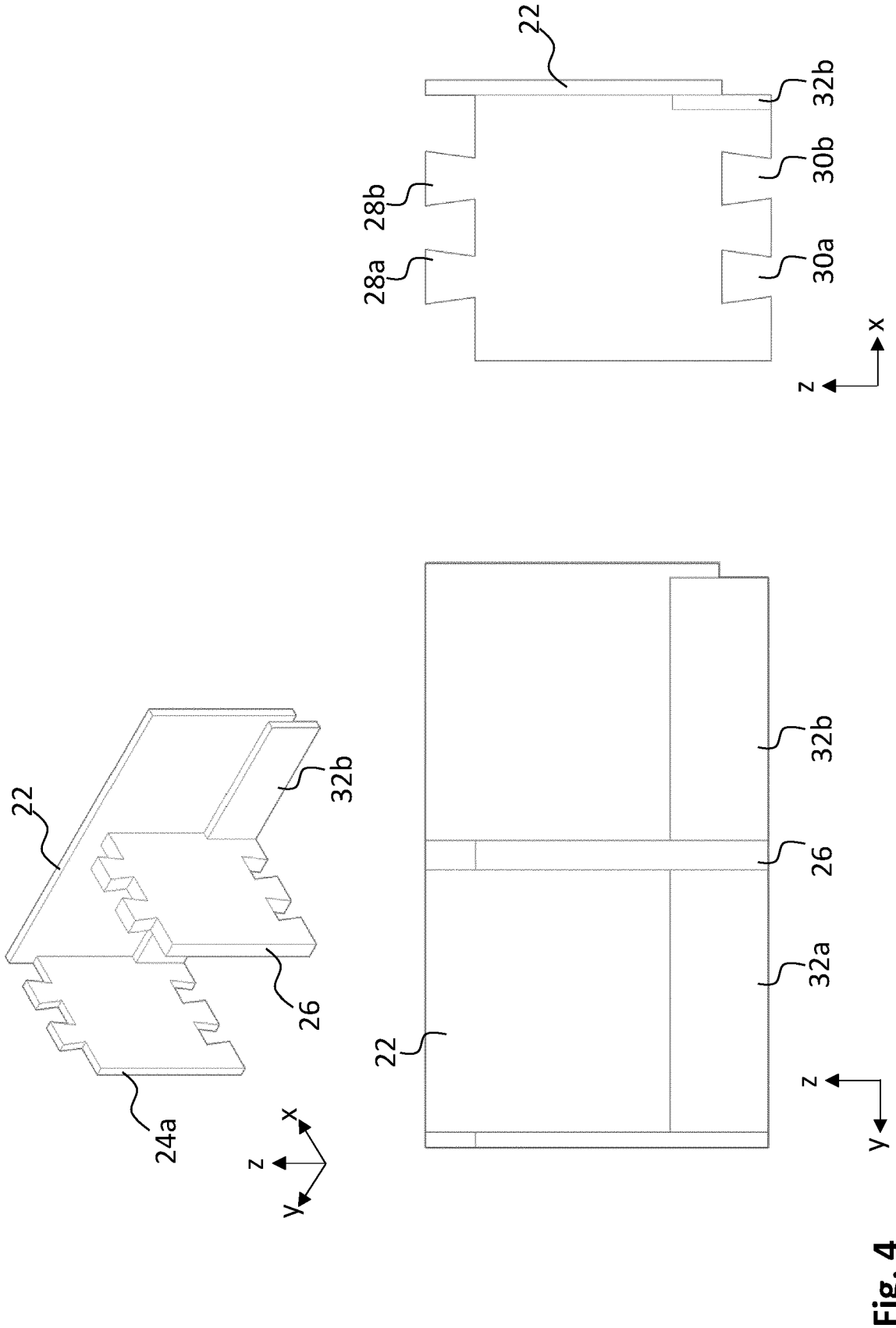
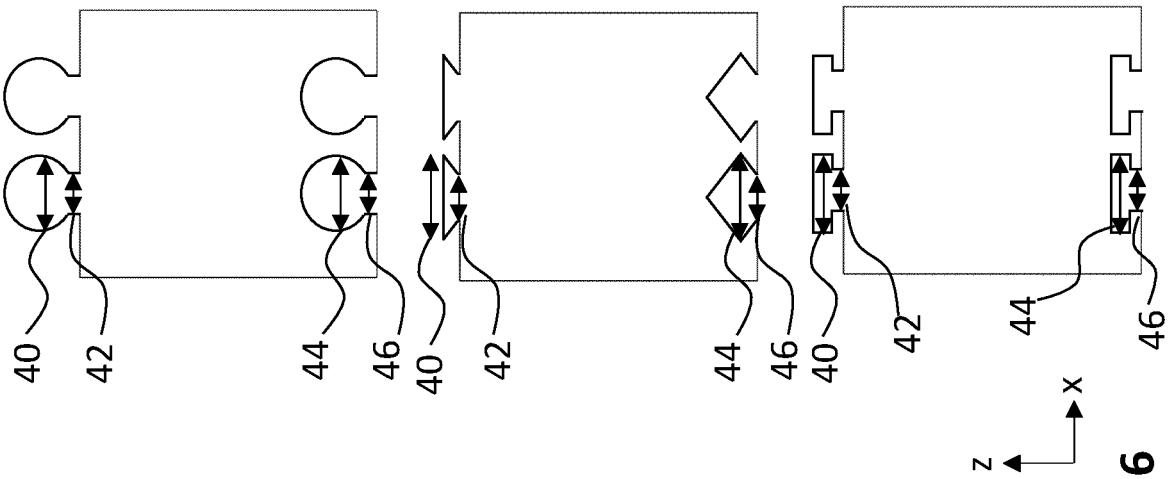


Fig. 4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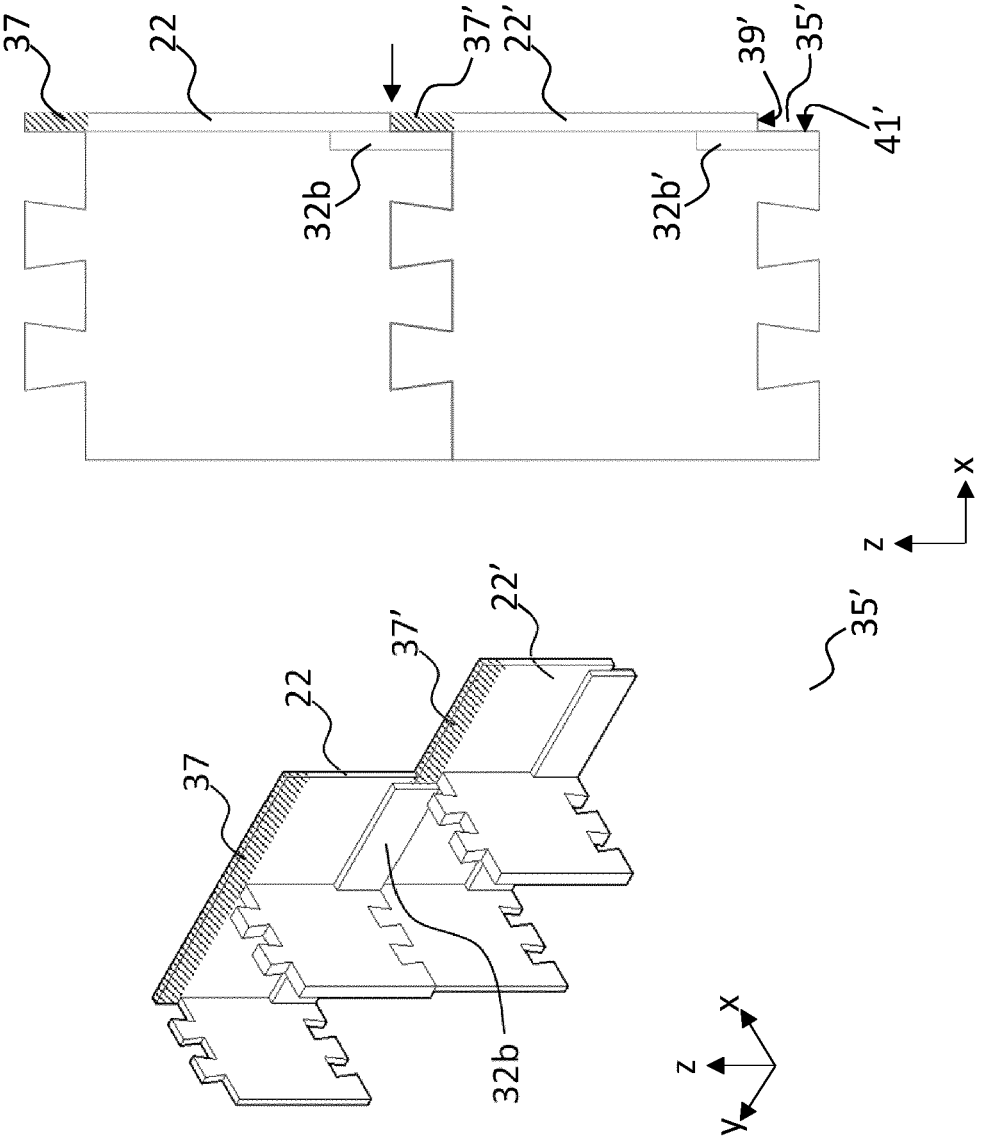
42
44
46
40
42
44
46
40
42
44
46
x
z

Fig. 6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37'
22'
39'
35'
41'
32b
32b'
x
z
35'
22'
37'
22
37
32b
z
x
y

Fig. 5

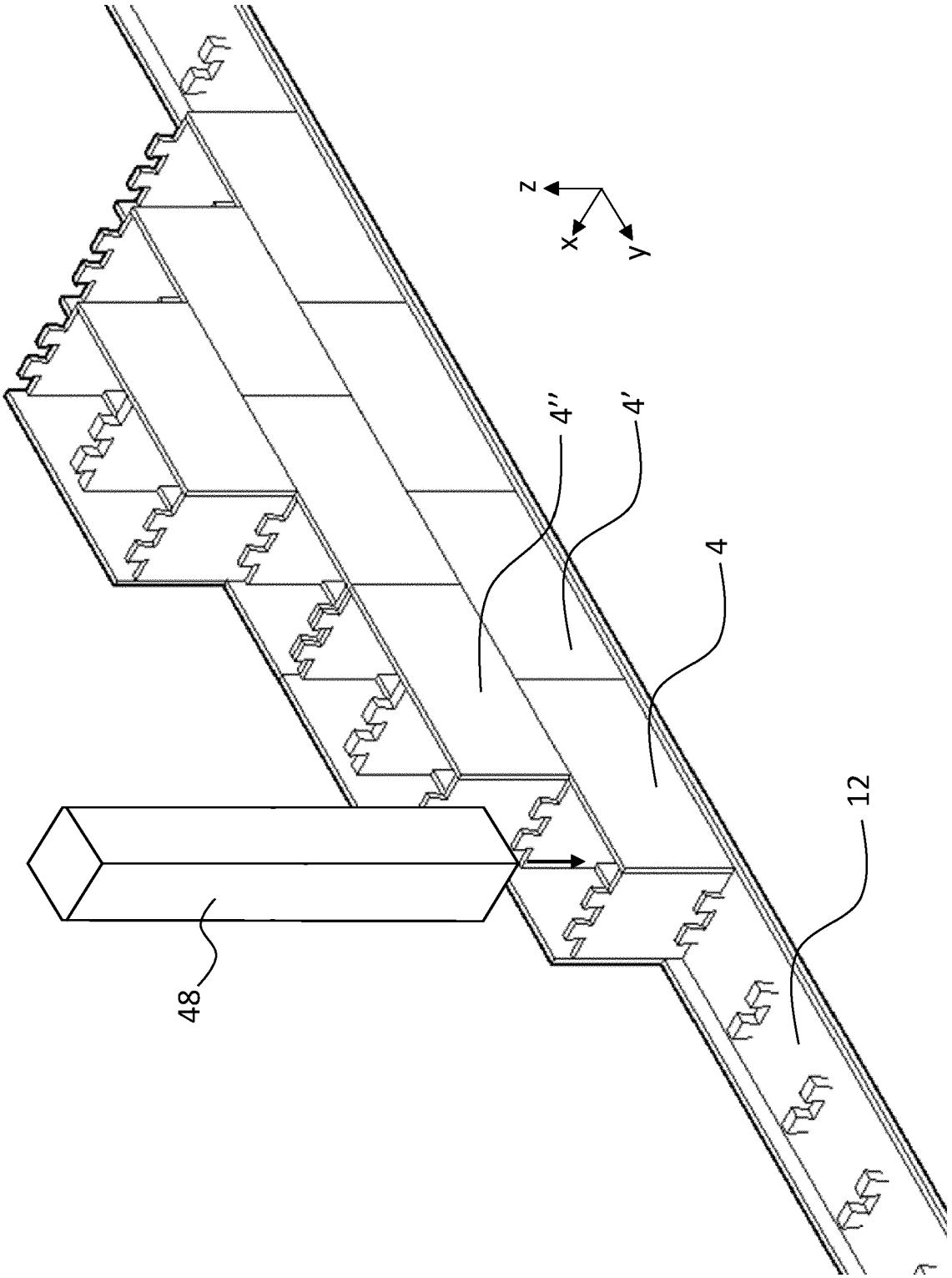

Fig. 7A

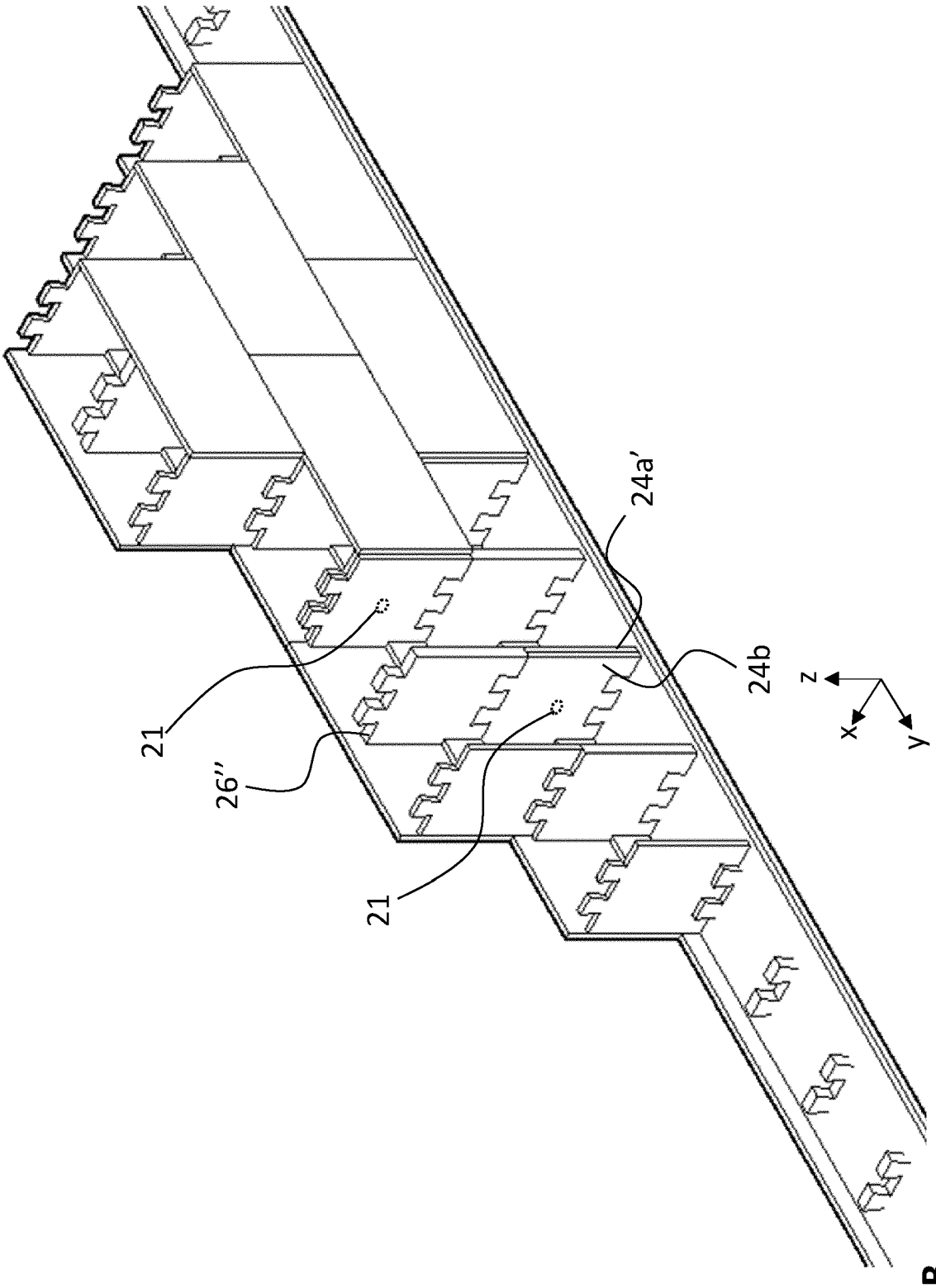

Fig. 7B

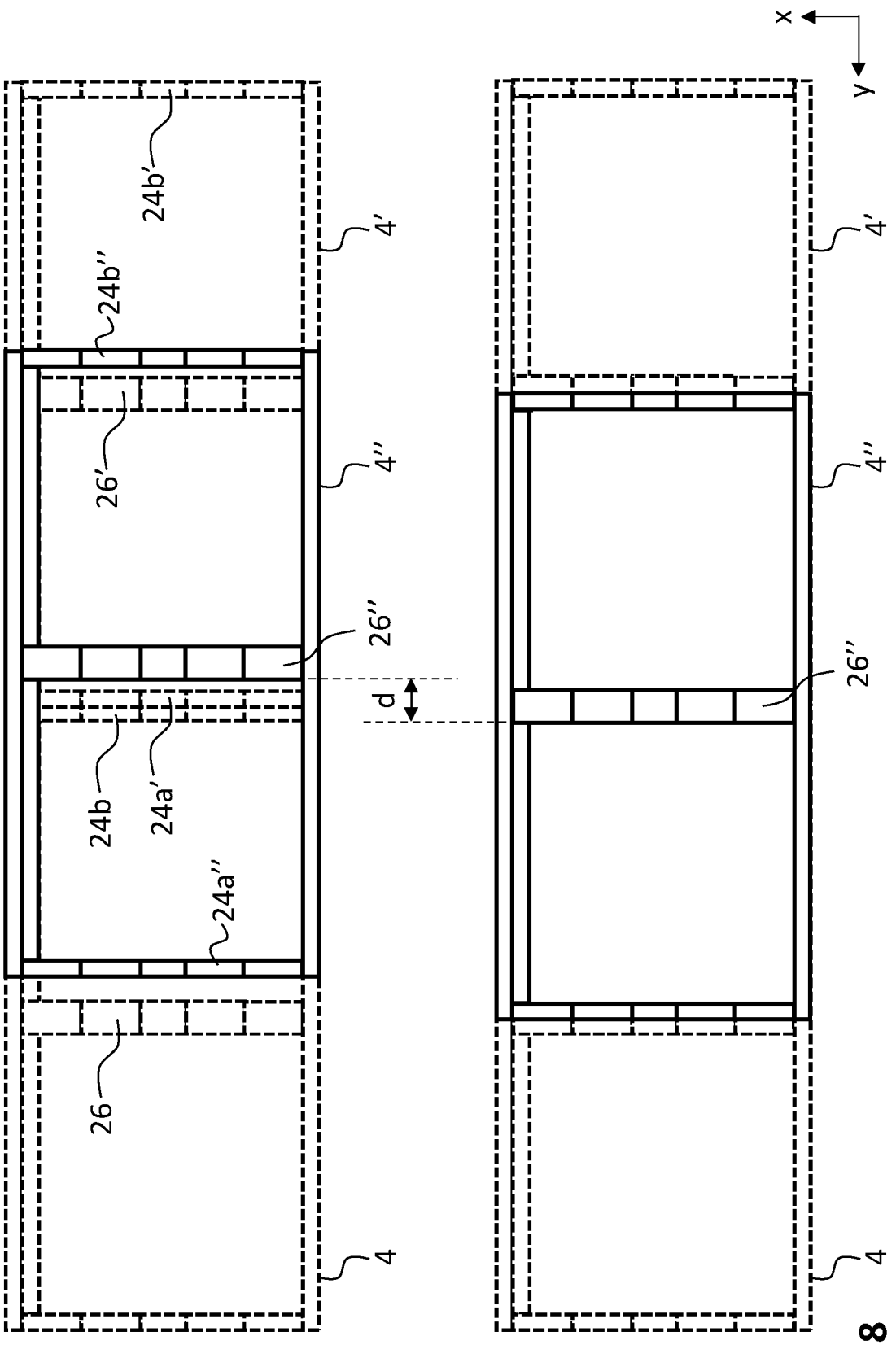

Fig. 8

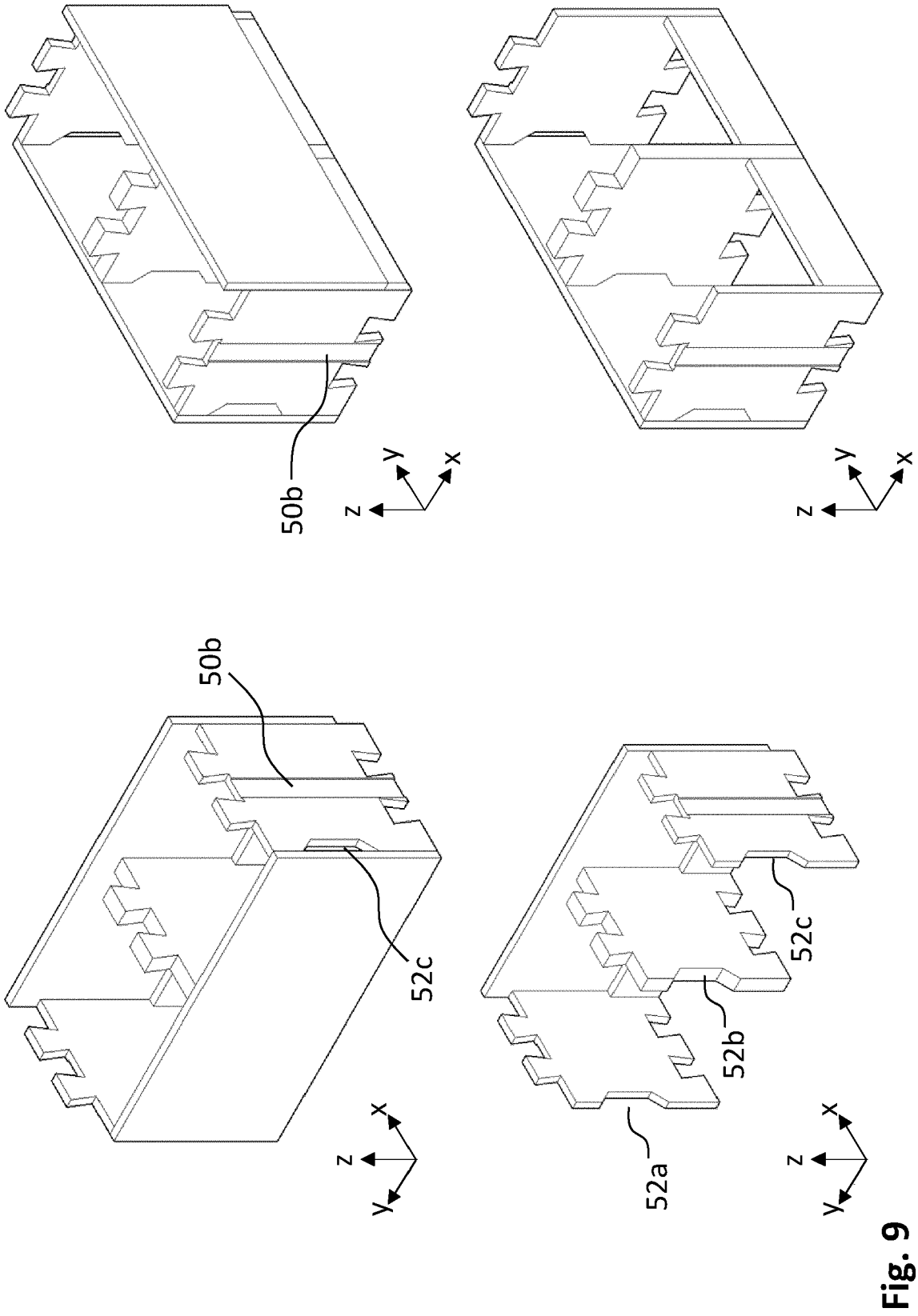

Fig. 9

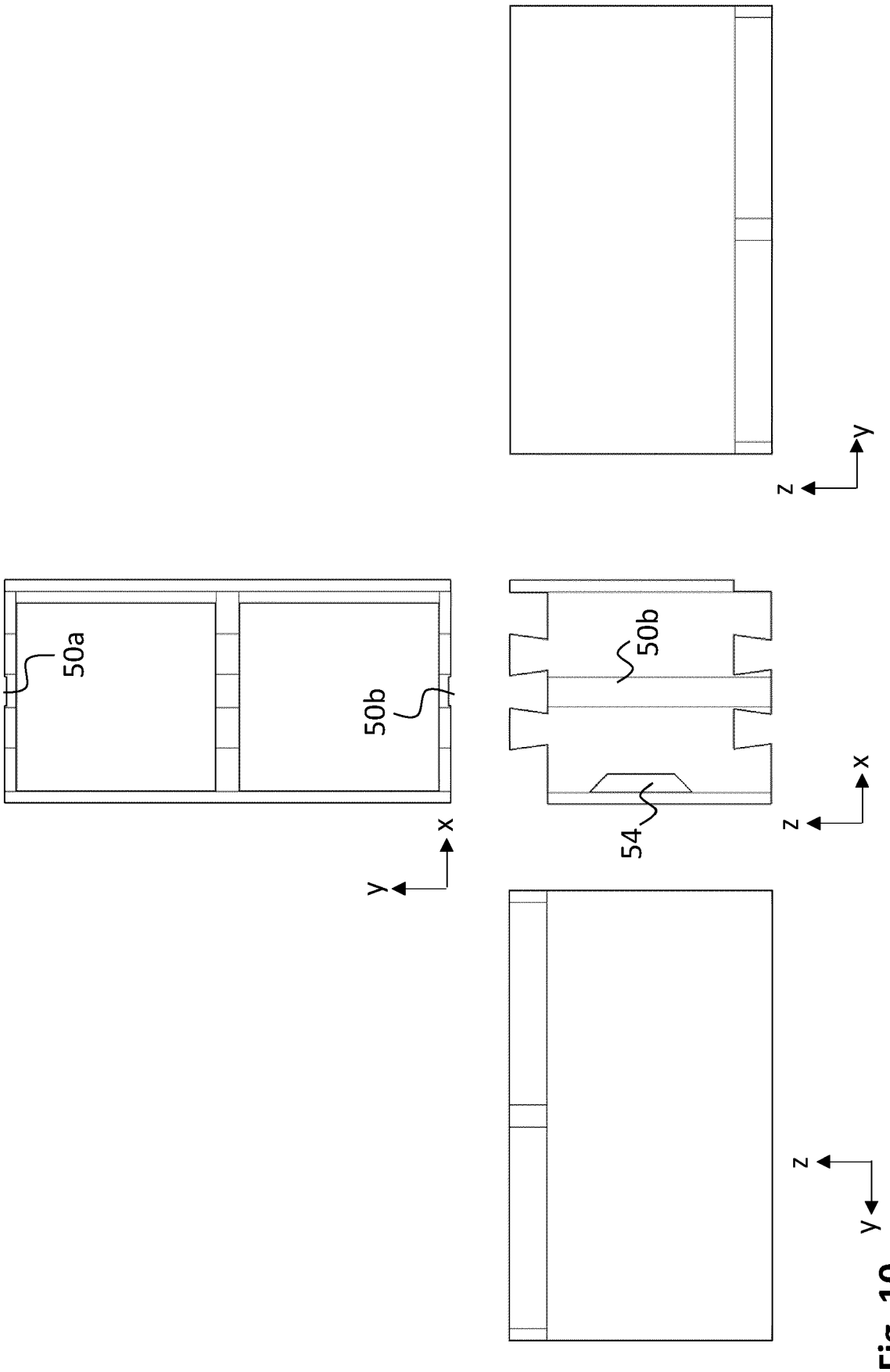

Fig. 10

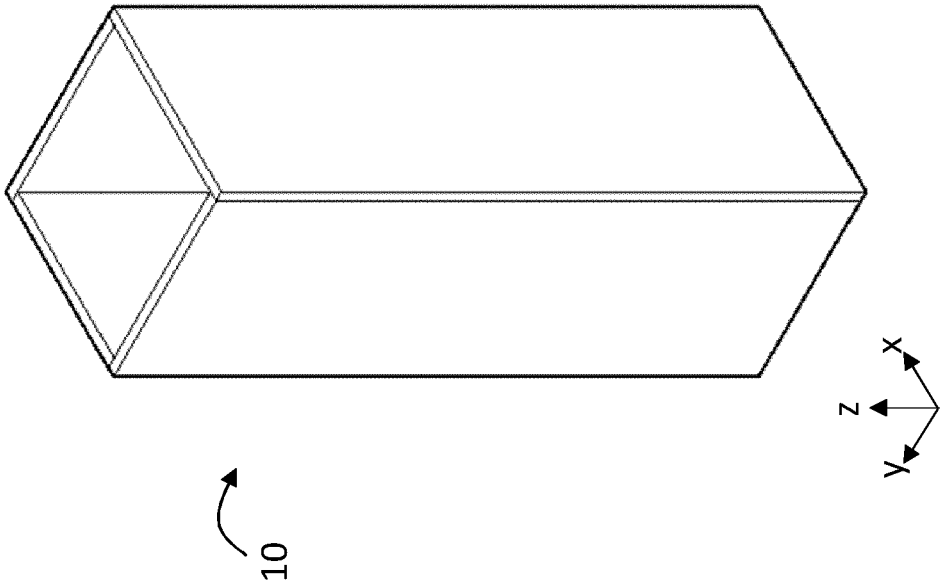

Fig. 13

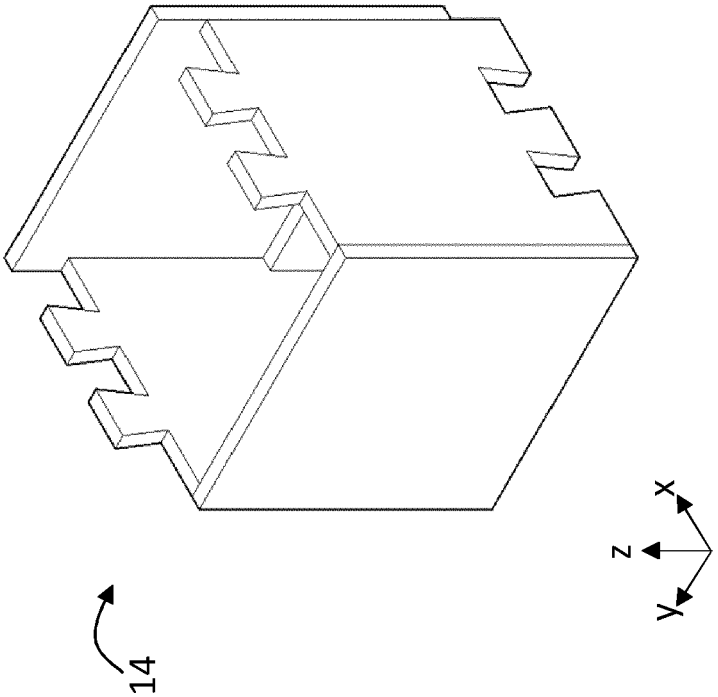

Fig. 12

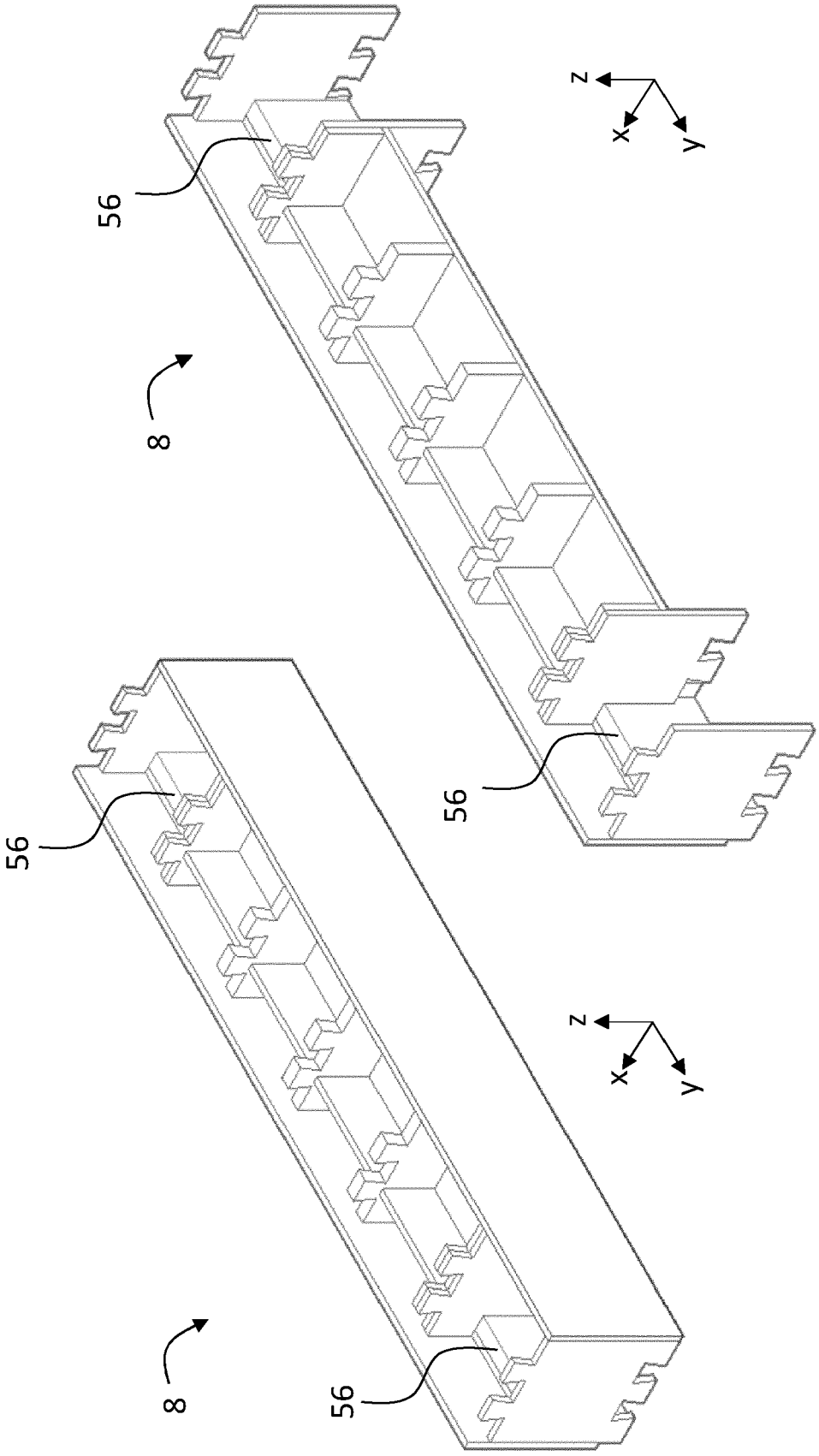

Fig. 14B

Fig. 14A

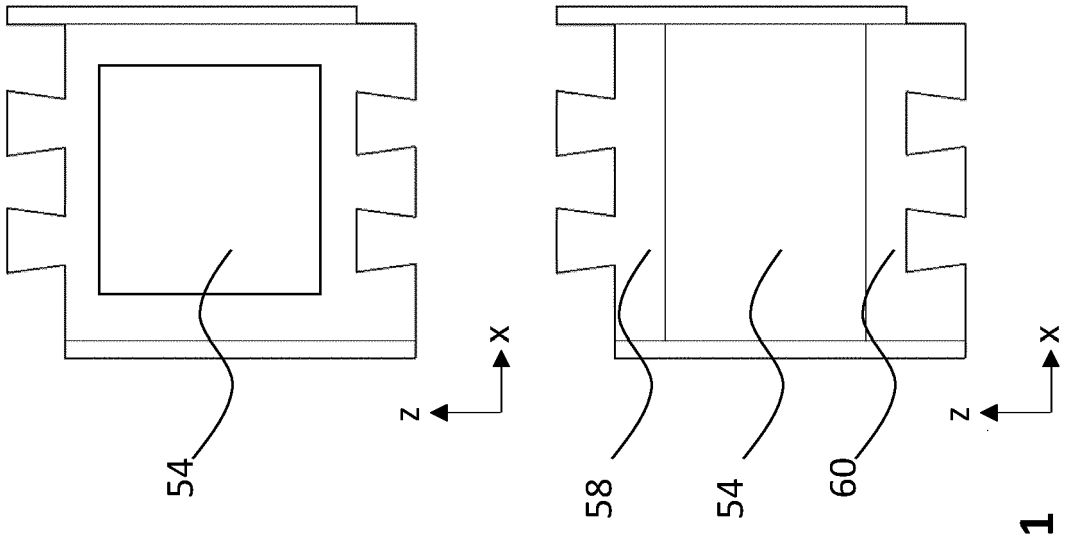

Fig. 11

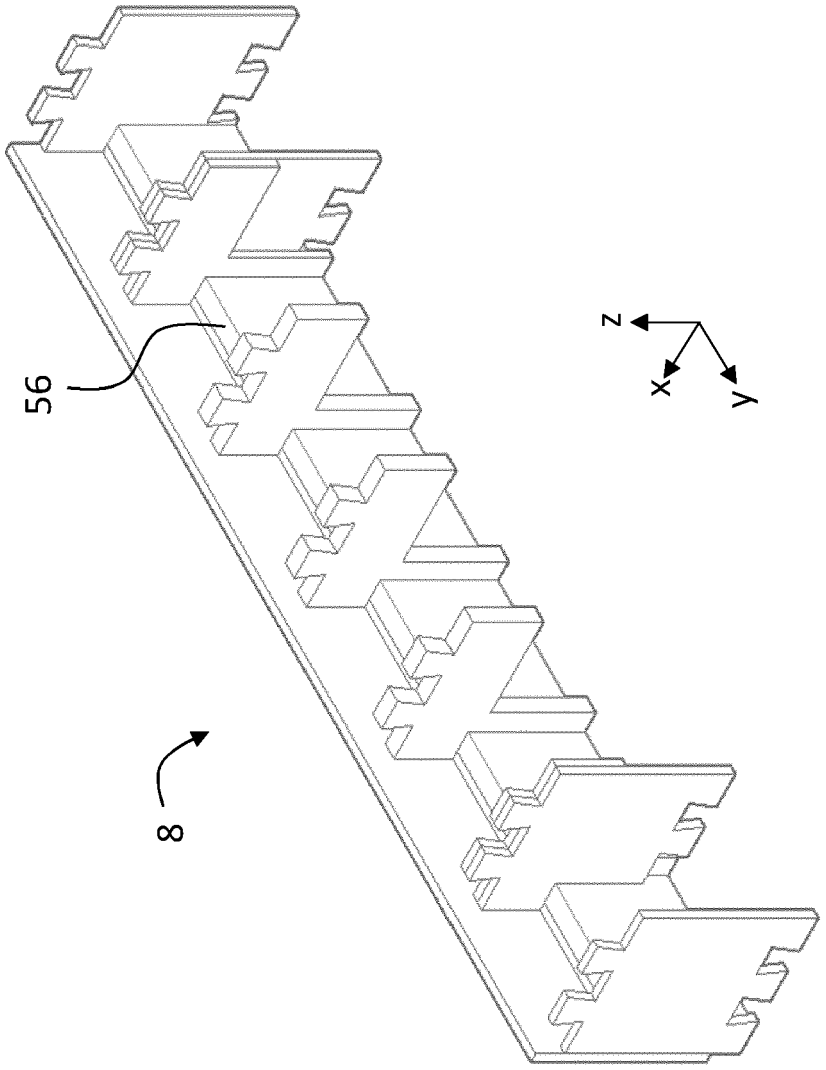

Fig. 14C

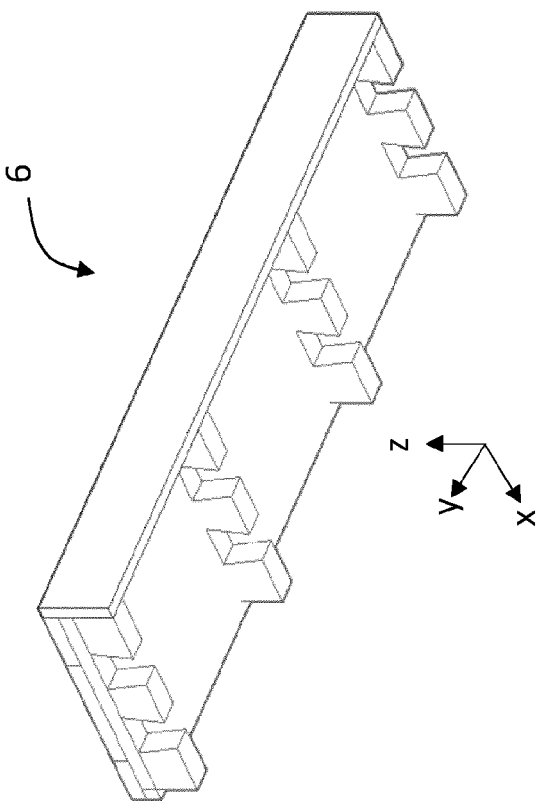

Fig. 15B

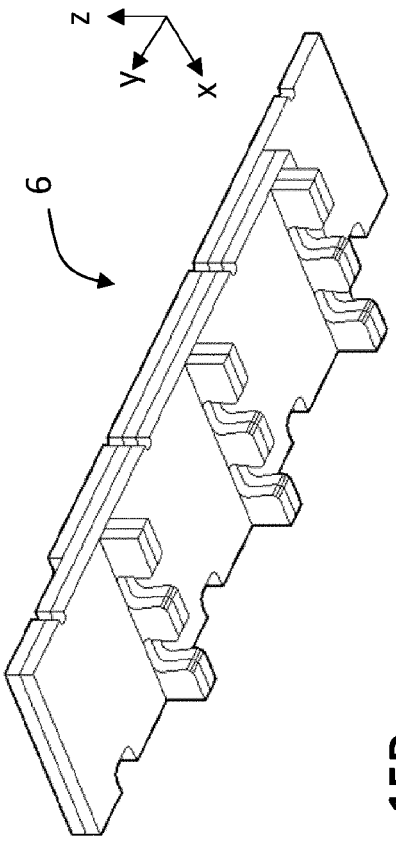

Fig. 15D

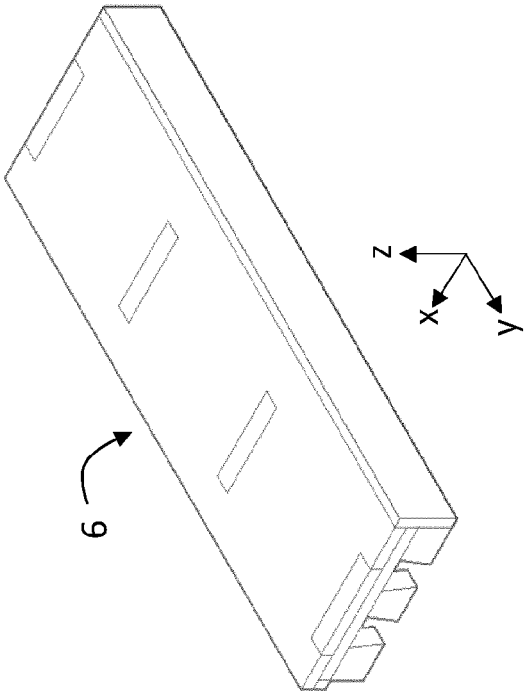

Fig. 15A

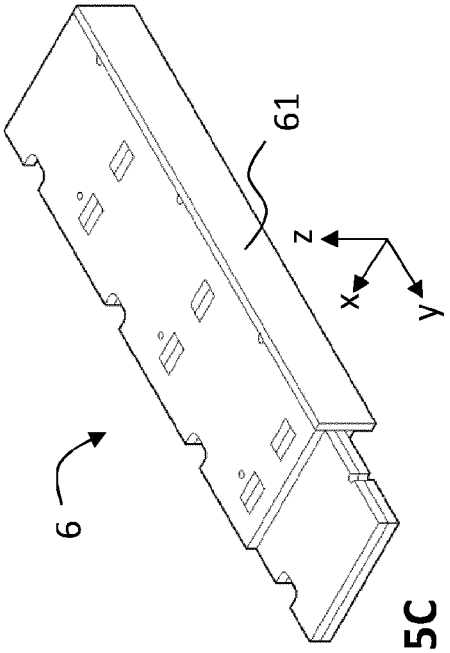

Fig. 15C

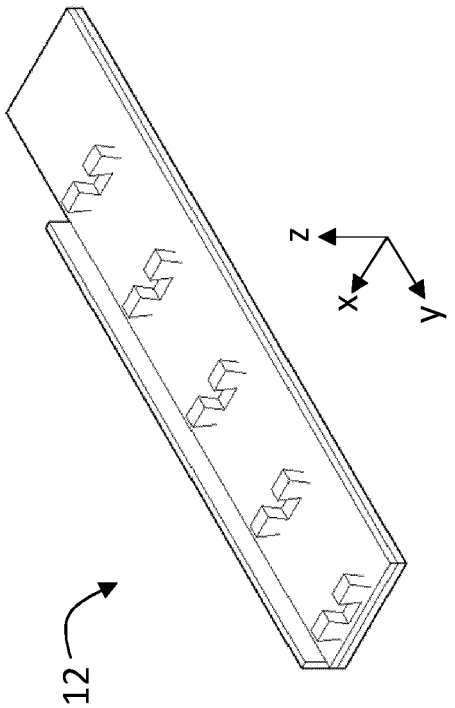

Fig. 16A

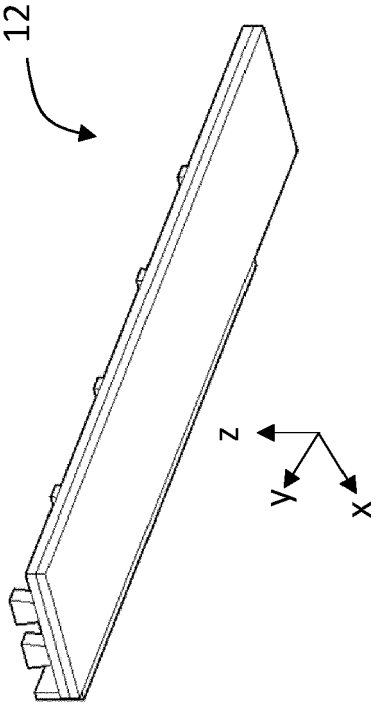

Fig. 16B

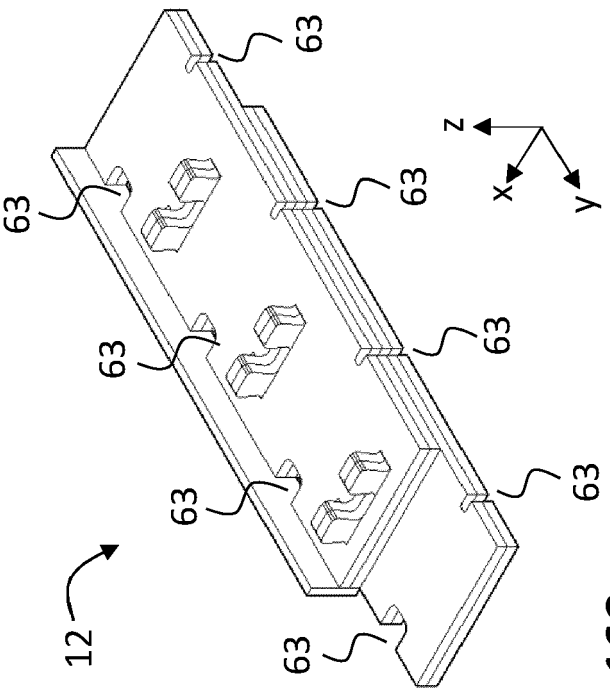

Fig. 16C

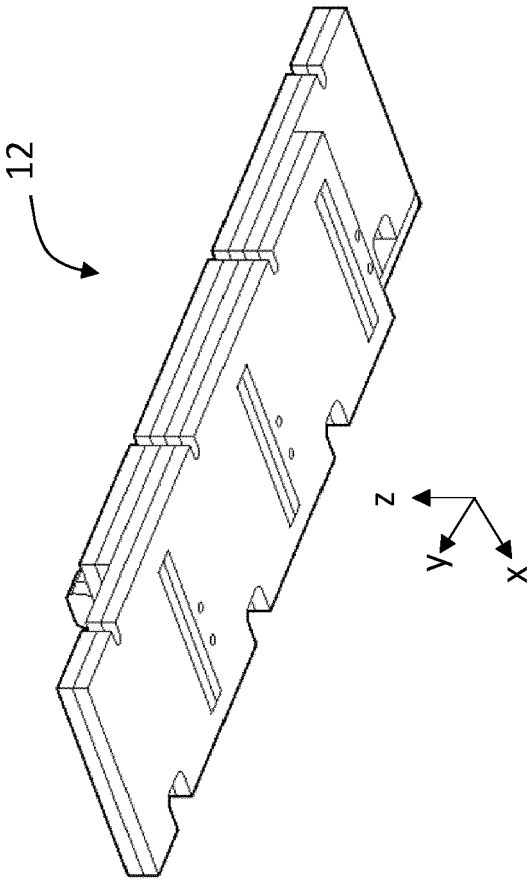

Fig. 16D

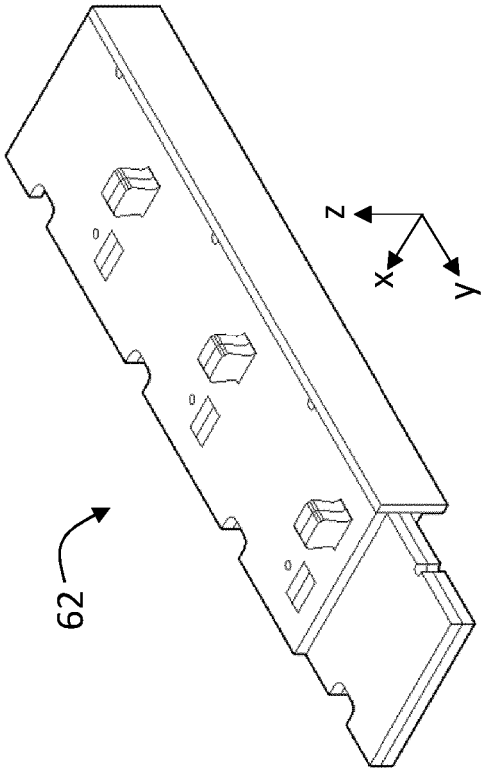

Fig. 17A

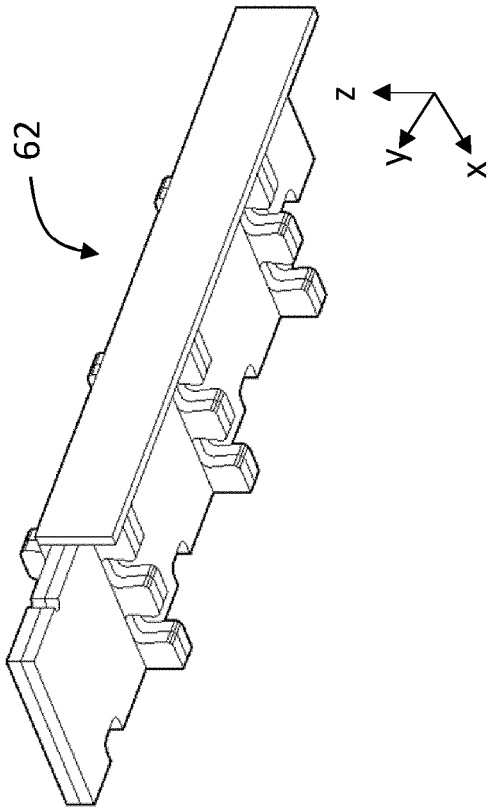

Fig. 17B

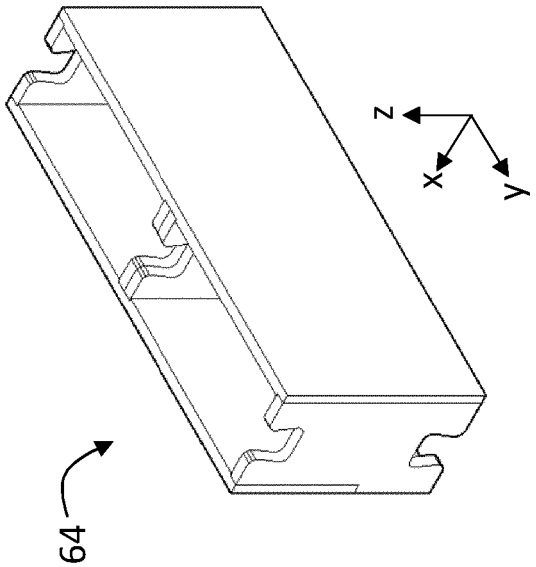

Fig. 18A

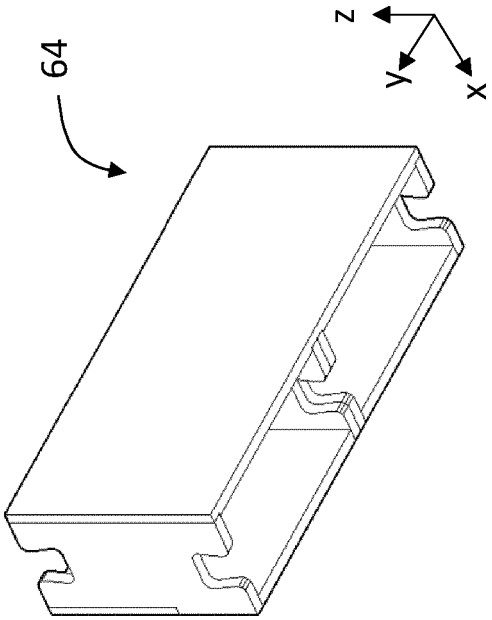

Fig. 18B

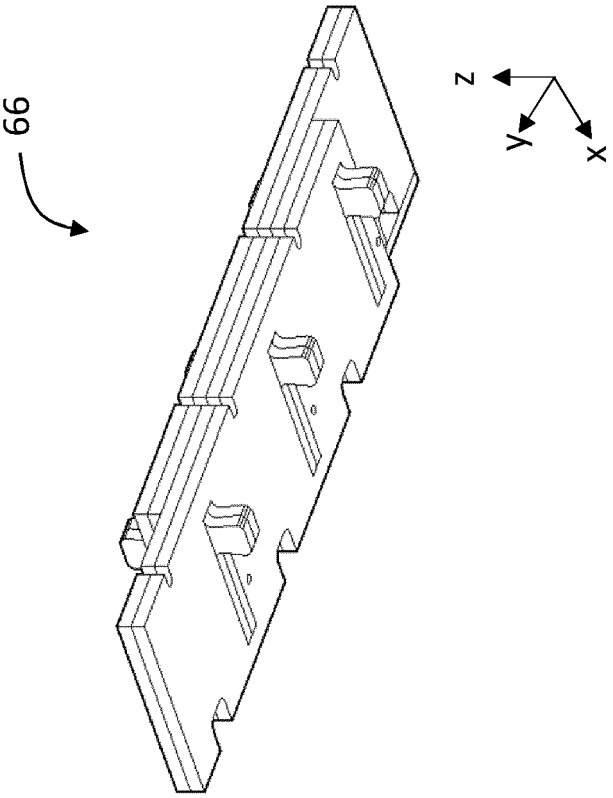

Fig. 19B

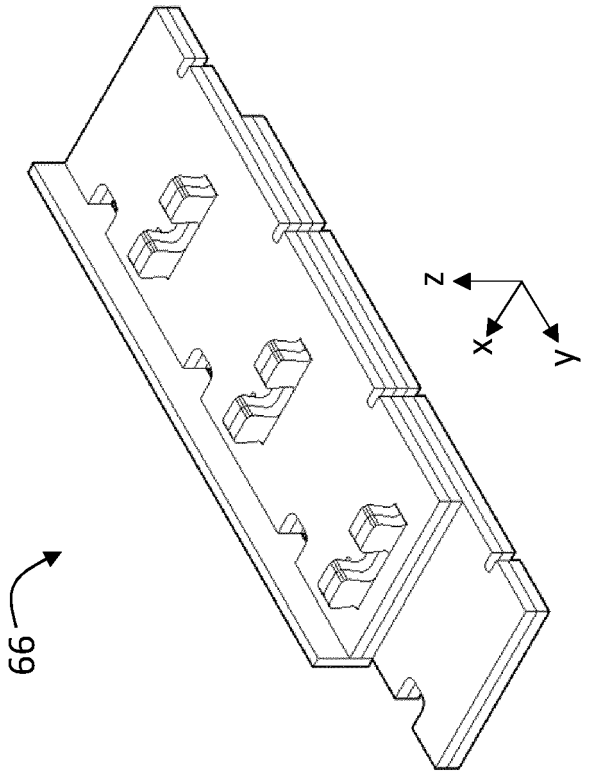

Fig. 19A

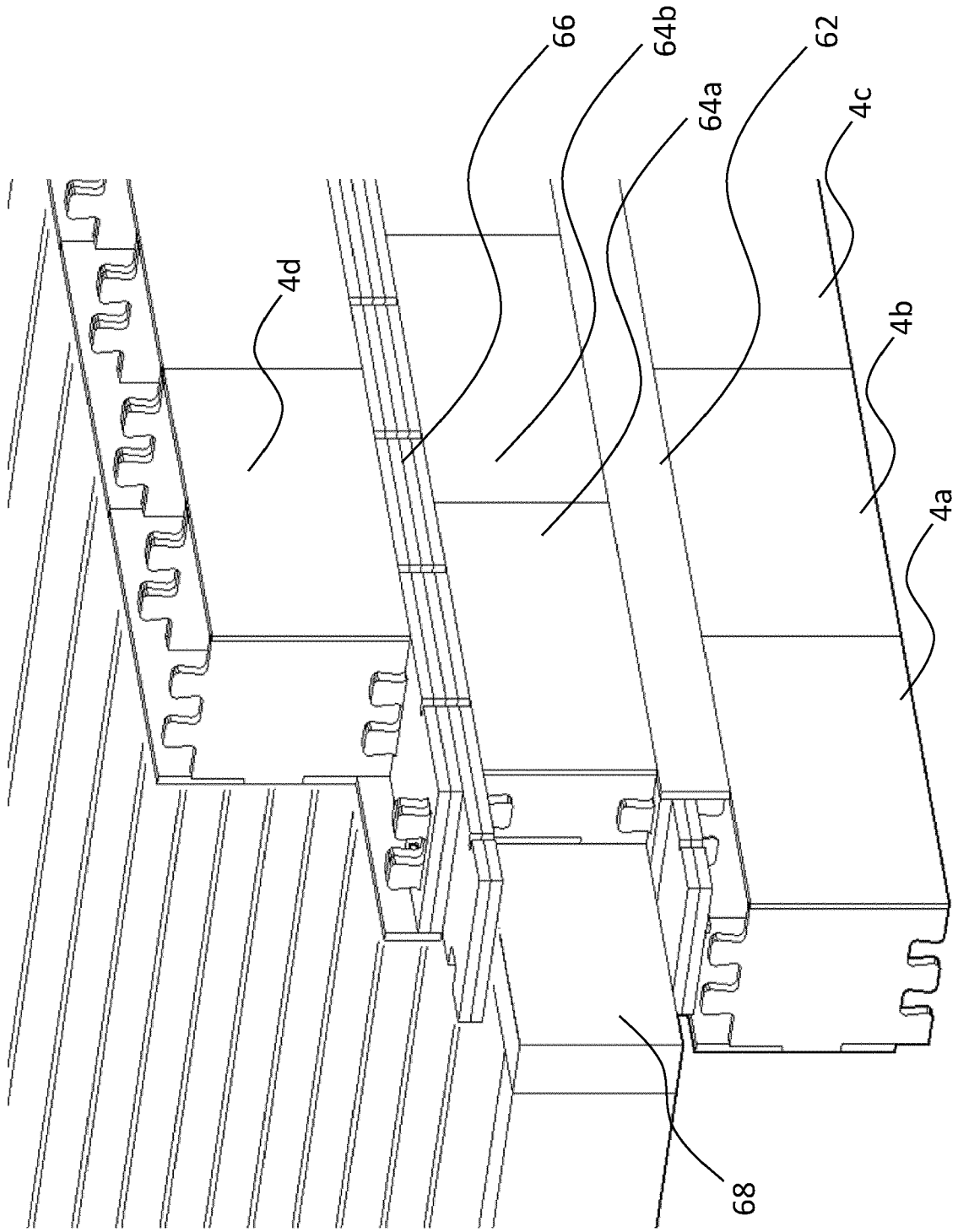

Fig. 20

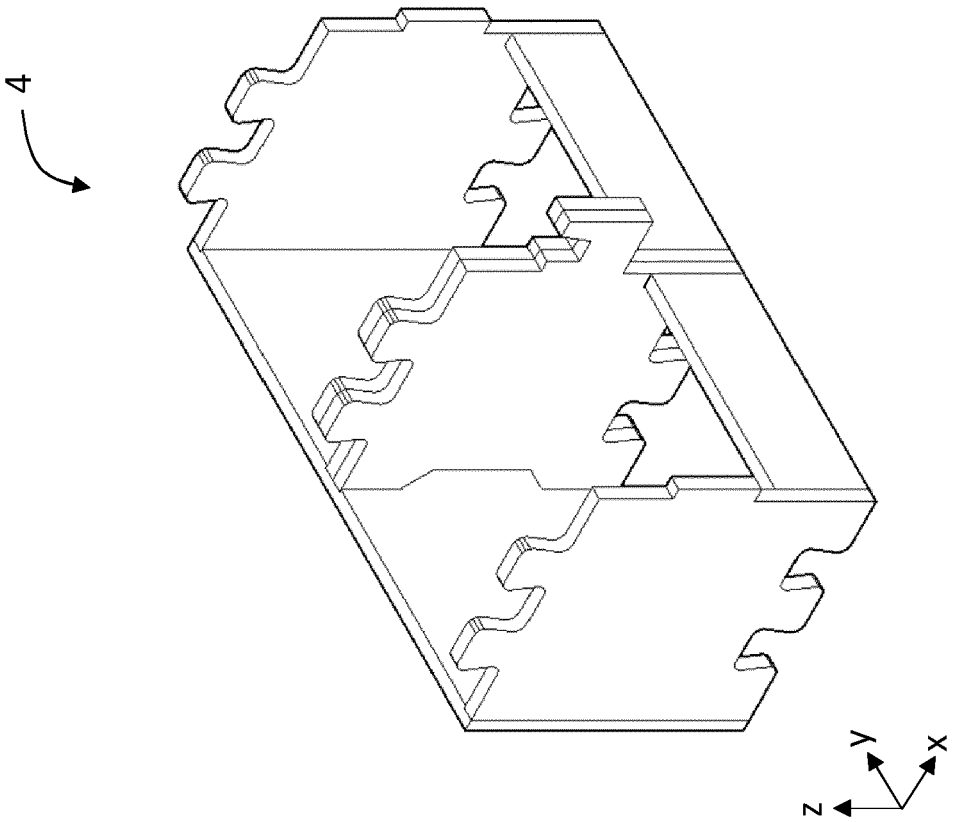

Fig. 21B

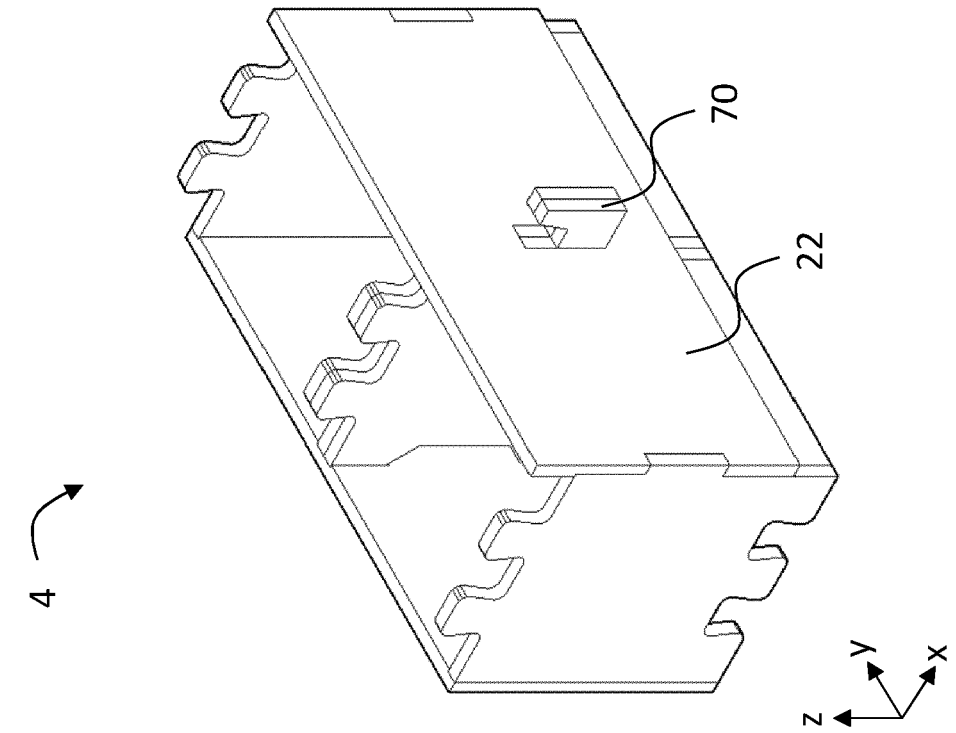

Fig. 21A

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 5433

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 April 2024	Giannakou, Evangelia

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