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(54) **WALL ELEMENT, WALL ELEMENT AGGREGATE, BUILDING WALL CONSTRUCTION SYSTEM, BUILDING WALL AND METHODS FOR CONSTRUCTING SUCH A BUILDING WALL AND MANUFACTURING OF A WALL ELEMENT**

WANDELEMENT, WANDELEMENTAGGREGAT, GEBÄUDEWANDKONSTRUKTIONSSYSTEM, GEBÄUDEWAND UND VERFAHREN ZUR KONSTRUKTION SOLCH EINER GEBÄUDEWAND UND HERSTELLUNG EINES WANDELEMENTS

ÉLÉMENT DE PAROI, AGRÉGAT D'ÉLÉMENT DE PAROI, SYSTÈME DE CONSTRUCTION DE PAROI DE BÂTIMENT, MUR DE CONSTRUCTION ET PROCÉDÉS DE CONSTRUCTION D'UNE TELLE PAROI DE BÂTIMENT ET DE FABRICATION D'UN ÉLÉMENT DE PAROI

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Description

[0001] The present invention relates to a wall element, to a wall element aggregate as well as to a building wall construction system comprising such wall elements and/or such wall element aggregates. The system also relates to a building wall constructed using such building wall construction system. Furthermore, the invention relates to a method for constructing such a building wall, as well as to a method for manufacturing a wall element.

[0002] Requirements on building walls have increased continuously historically. Many years ago, building walls were constructed using one single layer of wooden planks, arranged one next to the other with their respective main extension planes in parallel to the extension of the building wall hence constructed. Such a wall could be covered with internal insulation and/or an external wall covering.

[0003] As demands for better insulation increased, house manufacturers instead started to provide building walls in which wooden beams were arranged with their respective main extension planes perpendicular to the wall, with insulation arranged between the beams. This provides better opportunities for insulating building walls.

[0004] However, as insulation requirements increased further, the desired wall depths increased so that it became difficult to meet these requirements with wooden beams of standard sizes, without using several layers of such beams as seen in the depth direction of the wall. Beams broader than about 170 mm are in general expensive to manufacture. Also, with deeper walls constructed this way, window and door through holes in the building wall become complicated to arrange, often requiring special solutions.

[0005] There is hence a need for a standardized, inexpensive construction system for a building wall, using which a desired well-insulated result can be achieved without special solutions.

[0006] Also, in order to simplify the work of an architect designing a building, it is desired that such a building wall system provides both high design flexibility and predictable results in terms of dimensions and detail positioning when using the system. This includes reliable tolerances.

[0007] Furthermore, additional requirements for a building wall system include sufficient vertical strength, wind load and draft resistance, moisture resistance and sufficient moisture transport from the interior of the building out.

[0008] Moreover, a building construction system should preferably also offer a simple solution for installing various types of functions such as pipe works, electrical systems and so forth.

[0009] In particular, the building wall system should be possible to produce in a central location in standardized way and to as large extent as possible, such as under a controlled environment, while still offering quick, simple and reliable installation at the building site. The building wall should also be easy and cheap to maintain once in

place. It should also have a minimal environmental footprint.

[0010] EP 0214088 A1 discloses a wooden construction element for use, together with other similar construction elements, in flat building constructions. In particular, it discloses a wall element according to the preamble of claim 1.

[0011] Prior art solutions comprise EP 2116657 A1, FR 2944815 A1, US 6122880 A, WO 03/102325 A2 and WO 2011/073524 A1, neither of which solves all the above described problems. To the contrary, the present invention solves all the above described problems.

[0012] Hence, the invention relates to a wall element for a building according to claim 1.

[0013] Furthermore, the invention relates to a method for constructing a building wall or a building wall element aggregate, which method is characterised in that the method comprises the steps of arranging and connecting together several wall elements of the said type so as to form said building wall or building wall element aggregate.

[0014] Also, the invention relates to a method of manufacturing a wall element of the said type, which method is characterised in that the wall element is produced from an endless structure comprising said outer and inner support parts, possibly without said outer and/or inner connecting parts, which endless structure is cut to suitable lengths and thereafter possibly provided with said connecting part(s).

[0015] In the following, the invention will be described in detail, with reference to exemplifying embodiments of the invention and to the enclosed drawings, wherein:

Figures 1a-1c are respective perspective views of three different wall elements according to a first preferred embodiment of the present invention;

Figures 2a-2d show respective auxiliary wall elements for use with the wall elements illustrated in Figures 1a-1c in a building wall construction system according to the first preferred embodiment of the invention;

Figures 3a show respective cross-sectional views, both from the side and from the top, of the wall elements shown in Figures 1a-1c;

Figures 3b-3e correspond to Figure 3a, but illustrate cross-sectional views, both from the side and from the top, of four different auxiliary wall elements according to the first preferred embodiment of the invention;

Figures 4a-4c are respective perspective views of three different wall elements according to a second preferred embodiment of the invention;

Figures 5a-5d show respective auxiliary wall elements for use with the wall elements illustrated in Figures 4a-4c in a building wall construction system according to the second preferred embodiment of the invention;

Figure 6a illustrates a wall element according to a

third preferred embodiment of the invention;
 Figure 6b is a top section view of a wall element;
 Figure 6c illustrates another wall element according to the said third preferred embodiment of the invention, but with a different dimension than the element shown in Figure 6a;
 Figure 6d illustrates another wall element according to the said third preferred embodiment of the invention, but with a yet another different dimension than the element shown in Figure 6a;
 Figure 7 is an overview side view of a building wall according to the present invention, including cross-sectional horizontal top views taken at to different heights;
 Figures 8a-8e illustrate respective side section views of connections between a wall element aggregate according to the invention and a roof; a wooden floor; a concrete foundation; a crawling space; and a concrete floor, respectively;
 Figures 9a-9c illustrate respective side section views of connections between a wall element aggregate according to the invention and a through opening such as a window;
 Figures 10a-10c are three different respective top section view each illustrating a different respective corner construction according to the invention;
 Figures 11a and 11b are two different respective top section view each illustrating the assembly of a different respective wall construction according to the invention;
 Figure 11c is a top section view illustrating the finally assembled wall construction shown in Figure 11b;
 Figure 12 is a simplified top view of a wall element according to the invention;
 Figure 13 illustrates a method according to the invention for constructing a building wall;
 Figure 14 illustrates a method according to the invention for manufacturing a building wall element;
 Figure 15 illustrates the principles for producing a floor plan using wall elements according to the present invention; and
 Figures 16 and 17 illustrate respective assembled wall element aggregates using two different types of wall elements according to the present invention.

[0016] All figures share reference numerals for same or corresponding parts. There are three main embodiments described regarding the wall element of the invention. In Figures 1a-3e, a first type of wall element 100', 100", 100''' is illustrated; in Figures 4a-5d, a second type of wall element 200', 200", 200''' is illustrated; and in Figure 6a, a third type of wall element 300" is illustrated. In all figures, the prefix 1, 2 or 3 relates to the general type of wall element in question, while postscripts', " and ''' denotes the centre-to-centre (C-C) width of the wall element in question.

[0017] Hence, 200''' denotes a wall element of the sec-

ond general type and of the third C-C width. In principle, wall elements of said first, second and third types can be combined in one and the same wall aggregate, wall or building.

[0018] Figure 1 illustrates a wall element 100' according to the invention. The wall element 100' is for a building wall of the below described type, in the sense that it is specifically arranged, in terms of its dimensions and structure, to form a part of such a building wall. The wall element is associated with a longitudinal direction L, a width direction W and a depth direction D. These directions in general apply also to the building wall aggregates and building walls described below.

[0019] The finished building wall, including any inner wall covering 604 and any outer wall covering 605, is preferably at least 20 cm thick, preferably at least 30 cm thick, and preferably at the most 50 cm thick.

[0020] The wall element 100' has a substantially elongated overall shape, preferably roughly a cuboid shape, and generally extending in said longitudinal direction L.

[0021] In particular, the wall element is arranged to be mounted between two other wall elements of the present type, in a mounted state (shown, for instance, in Figure 7), so as to form a connected, self-supporting building wall 600 extending in the width direction W with substantially no play between the wall elements 100', 100" in the width direction W.

[0022] Turning again to Figure 1, the wall element 100' comprises an elongated outer support part 110, extending in said longitudinal direction L and arranged to be mounted in an exterior part 601 of the building wall 600 of which the wall element 100' forms a part. In this context, "exterior" means being arranged in the part of the wall 600 facing to the exterior, such as outdoor.

[0023] The wall element 100' further comprises an elongated inner support part 120, also extending in said longitudinal direction L and being arranged to be mounted in an interior part 602 of the said building wall 600. Here, "interior" means being arranged in the part of the wall 600 facing to the interior, such as indoor.

[0024] Furthermore, the wall element 100' comprises a distance part 130, arranged between the outer 110 and inner 120 parts, preferably separating parts 110, 120 while keeping them fixed in relation to each other. The distance part 130 is hence arranged to provide a distance in said depth direction D. It is also arranged to define a hollow internal space 140, between the outer 110 and inner 120 parts. In this context, "internal" refers to the geometry of the wall element 100', in other words the hollow space 140 forms an element-internal, open or closed, space.

[0025] Figure 7 illustrates the mounted state of a wall element 100', together with other types of wall elements forming preferred parts of the building wall construction system according to the invention. This will be described in more detail further below.

[0026] According to the invention, the outer support part 110 of said wall element 100' comprises an outer

longitudinally extending connecting part 111, which is arranged to be fastened to the outer support part of an adjacent wall element in said mounted state so that at least one longitudinally extending hollow external space 150 is formed along the outer support part 110 between each pair of said connected wall elements. Here, "external" refers to the wall element geometry, the hollow space 150 is hence an open or closed space which is external in relation to the rest of the wall element 100'.

[0027] Further according to the invention, the inner support part 120 comprises an inner longitudinally extending connecting part 121, arranged to be fastened to the inner support part of an adjacent wall element in said mounted state.

[0028] Moreover, the total depth B of the wall element, including the depth of any inner wall covering material 604 (see, for instance, Figures 8a-9c) to be mounted on the inner support part, is a multiple of the C-C width A1 between two adjacently arranged connected wall elements 100' in said mounted state.

[0029] The inner wall covering may be any suitable wall covering, such as wood panels; a layer of wall-covering plaster; or sheet material. The wall element 100' is preferably specifically prepared for being provided with a wall covering of specified thickness, such as 13 mm plaster or 13 mm wood board plus 13 mm plaster.

[0030] It is realized that the said C-C distance A1 refers to a C-C distance between identical wall elements 100'.

[0031] However, Figures 1b and 1c illustrate, respectively, two additional variants 100" and 100'" of wall elements according to the present invention. The wall elements 100', 100", 100'" are identical, apart from their connecting parts 110, 120 being of different width, such that their respective C-C distances A2, A4 are different from the C-C distance A1 of wall element 100'. Specifically, in the illustrated example, the distance A4 is twice the distance A2, which in turn is twice the distance A1.

[0032] According to the invention, the total depth B of the wall element, comprising any inner wall covering 604 material, is 1, 2, 3 or 4 times the said C-C width A1, A2, A4. Preferably, a building wall construction system according to the invention comprises wall elements 100', 100", 100'" the total depth B of which, comprising any inner wall covering 604 material, are 1, 2 and 4 times, respectively, the said C-C width A4, A2, A1.

[0033] Preferably, all wall elements used to form one and the same building wall 600 have the same total depth B.

[0034] A wall element 100', 100", 100'" according to the above provides numerous advantages, as will be explained and described below, in connection to a number of detail examples. However, already at this point it is worth mentioning that the design with inner and outer support parts 110, 120, with respective connecting parts 111, 121 and having a distance part 130 between them in the specified manner, in combination with the said specific geometric dimensioning of the wall element in question, achieves a wall element which is both easy to man-

ufacture and mount, as well as provides a sturdy construction which is simple for an architect to use in the design process when drawing a building.

[0035] Namely, the said multiple measurements provide the advantage that walls being constructed from the wall elements 100', 100", 100'" will form a square horizontal "pixel" grid, with a square pixel size BxB, with the possibility of sub-pixels the size A1xA1, making the layout plan of the building very easy to plan and then to translate into a finished building, while making sure that any canalization for electricity and the like ends up in a predetermined connected layout. This is true both for individual building walls 600 but also to complex buildings comprising several wall element aggregates 500, 501, 502 running parallel and perpendicularly to each other. See, for instance, Figures 11a-11c. In this context, the term "pixel" is used to denote a smallest plannable two-dimensional horizontal geometric unit in terms of the floor plan of a building.

[0036] This is illustrated in Figure 15, in which one square is such a "pixel". In Figure 16, it is illustrated how the fact that individual wall elements each, when forming part of a floor plan, occupy a respective length and width that are an even pixel amount large. Figure 16 also illustrates how wall elements can be set at a non 90 degree angle α (see below), and still fit the same pixel grid. Note that in Figure 16, the dashed areas are wall elements, as seen from above. In Figure 16, measures A1, A2, A4 and B, which are preferably the same for the whole floor plan, are also illustrated. In Figure 16, no corner parts are shown, for simplicity.

[0037] In the wall element 100', it is the support parts 110, 120 that carry the vertical load of the finished building wall 600, while the connecting parts 111, 121 are primarily used to permanently join individual wall elements together. The distance part 130 is primarily used to provide the hollow space 140, which is arranged to be filled with insulation as described below.

[0038] According to a preferred embodiment, which is illustrated in the simplified (and not to scale) top view of the wall element 100' shown in Figure 12, the inner support part 120 comprises a vapour barrier 122 extending across the width W and length L of the wall element 100'. The vapour barrier 122 is arranged to abut the vapour barrier of an adjacent wall element in the mounted state, so as to form a connected vapour barrier across the interior part 602 of the building wall 600.

[0039] Similarly, it is preferred that the outer support part 110 comprises a wind barrier 112, extending across the width W and length L of the wall element 100' and arranged to abut the wind barrier of an adjacent wall element in said mounted state, so as to form a connected wind barrier across the exterior part 601 of the building wall 600.

[0040] In particular, it is preferred that at least one of said vapour barrier 122 and said wind barrier 112, preferably both, covers a respective side face of the wall element 100' facing in the width direction W, and preferably

also a side face facing in the length direction L, which width direction-facing W side face is arranged to be pressed against a corresponding opposite side face of an adjacent connected wall element in said mounted state. In Figure 12, this is exemplified by the vapour barrier 122 running across the whole interior width W of the support part 120, from a longitudinal fastening line near the distance part 130 to another longitudinal fastening line near the distance part 130 on the other width-direction W side of the support part 120, and passing around a vertically arranged resilient strip 123 on its way. The resilient strip 123, in turn, is arranged between the wall element 100' and the vapour barrier 122 in question, so that the respective vapour barriers of adjacent connected respective wall elements are pressed together against a spring force provided by said resilient strip 123 in said mounted state. Preferably, the resilient strip may 123 may be made of rubber, silicone or other suitable durable material. The vapour barrier 122 may be provided with a glue strip 124 at the location of the resilient strip 123, such as with a removable protective foil. Then, the glue strip 124 will provide proper adhesion to the vapour barrier of an adjacent wall element when the two wall elements are mounted together.

[0041] Alternatively, or such a resilient sealing strip may be arranged outside of the vapour barrier 122, so that the resilient strip is pressed against a corresponding resilient strip, or vapour barrier, of an adjacent connected wall element in the mounted state.

[0042] At any rate, it is preferred that the connection between vapour barriers 122 and/or resilient strips 123 of said two adjacent connected wall elements is arranged to be glued using a pre-installed glue strip 124 covered by a foil before mounting of the building wall 600. Similarly, the outer support part 110 may be provided with a wind barrier 112, such as with a resilient strip 113 and possible glue strip 114 in a way similar to the inner support part 120.

[0043] This way, the mounted wall 600 will be provided with a connected, proper vapour and/or wind barrier as a direct result of the mounting of the said wall elements one to the next.

[0044] Each of the wind barrier 112 and the vapour barrier 122 may be a per se conventional plastic foil.

[0045] The wind barrier 112 and/or the vapour barrier 122 may furthermore be attached in a similar manner, such as with a respective resilient strip, along an upper or lower end of the wall element in question, in addition to on its side. This provides for improved barrier functionality when using a combination of both vertically and horizontally oriented wall elements in one and the same wall 600 (see below), since longitudinal ends of certain wall elements will then abut width-direction W facing side edges of certain other wall elements.

[0046] As is illustrated in for instance Figures 1a-1c, the outer 111 and inner 121 connecting parts protrude in the width direction W from the remainder of the outer 110 and inner 120 support parts, respectively, so as to cover

part of the outer and inner support parts, respectively, of respective adjacent wall elements in said mounted state. Preferably, the outer 111 and inner 121 connecting parts protrude in opposite width directions W. Hence, when the wall element is viewed along the depth direction D, the connecting parts 111, 121 protrude from the distance part 130 in opposite width directions.

[0047] Specifically, in this case it is preferred that the outer 111 and/or inner 121 connecting parts, preferably both, are arranged to be connected to an adjacent wall element, to form said mounted state, using a fastening means which is driven through the connecting part 111, 121 in question and into the said adjacent wall element substantially in the depth direction D. The fastening means in question may preferably fasten to the corresponding support part 110, 120 of the adjacent wall element, however preferably not directly to a corresponding connecting part 111, 121 of said adjacent wall element.

[0048] This provides for a very simple mounting of the wall elements, since fastening means need only be applied from the interior and/or exterior side of the building wall 600 in the depth direction D, and not along the resulting wall 600 in the width direction W. In particular, it is preferred that the wall elements are not arranged to be fastened together using any other fastening mechanism than using the connecting parts 111, 121, apart from any inner 604 or outer 605 wall covering. Namely, it has turned out that the present invention, using connecting parts 111, 121, can form a building wall 600 sturdy enough to be self-supporting and meeting applicable load resistance requirements, even for multi-storage buildings.

[0049] The fastening means used may be any suitable fastening means, such as conventional screws driven into the wooden or metal materials of the supporting parts 110, 120 in question.

[0050] As mentioned above, it is preferred that the internal space 140 is prefilled with, or arranged to be filled with, insulating material 141, such as mineral wool sheet or loose material. In particular, it is preferred that the insulating material 141 is held in place, or arranged to be held in place, by said distance part 130.

[0051] This may be foreseen in different ways. In Figures 1a-1c, the distance part 130 comprises shallow walls 131 extending in the longitudinal direction L along the whole length of the element 100', 100", 100''' in question, as well as in the depth direction D between the support parts 110, 120. In this case, the walls 131 may define a box-shaped space 140 in which insulating sheets can be placed and contained. The walls 131 are preferably less than 5 mm thick, and may be made from pressed wood fibrous material, such as a Masonite® board.

[0052] In contrast thereto, in Figures 4a-4c, showing a second general type of wall element 200', 200", 200''' , the distance part 230 comprises a series of rods 231 instead of, or (less preferred) in addition to, the said walls 131. Such rods 231, that may be wooden or metal, round or square, bars, or any other suitable elongated and rel-

atively thin distance elements, are preferably arranged to run through sheets of insulating material, hence holding them in position in the space 240.

[0053] In a particular example, the outer 110, 210 and inner 120, 220 support parts are made from 34 mm x 195 mm wooden beams, while the outer 111, 211 and inner 121, 221 connecting parts are made from (22 or 34 or 45) mm x 95 mm wooden beams, and while the rods 231 are 25 mm diameter round wooden rods.

[0054] With respect to the said external space 150 formed by adjacent outer connecting parts 111, it is preferred that the external space 150 extends, along the length direction L, along substantially the whole length of the wall element 100', 100", 100"". Hence, the corresponding connecting parts 111 preferably also run along substantially the whole length of the wall element in question. This provides both a sturdy construction of the building wall 600, while at the same time providing adequate ventilation of the wall construction 600 since the external space 150 forms a vertical channel for air to flow through. This is in particular true in case an outer wall covering 605 is used, which is fastened to the outside of the outer connecting parts and covering the space 150 forming such a vertical channel, which may preferably be open in both a lower and an upper end.

[0055] Moreover, it is preferred that the inner support part 120 is arranged to be fastened to the corresponding inner support part of an adjacent wall element in said mounted state, so that at least one additional longitudinally extending hollow external space 160 is formed along the inner support part 120 between each pair of said connected wall elements. This additional hollow external space 160 is similar to the space 150, but is arranged on the inside of the mounted building wall 600. In particular, it is preferred that it is the inner connecting parts 121 of adjacent wall elements that between them form the additional space 160, preferably forming a vertical channel beneath an inner wall covering 604.

[0056] The additional, inner hollow space 160 ("inner" in terms of the side of the wall; "external" in relation to the wall structure itself) is useful for accommodating installations, such as electrical installations and/or pipe works. In particular, it is preferred that the additional external space 160 comprises a pre-installed electrical installation at predetermined longitudinal position from a longitudinal end of the wall element 100', 100", 100"". For instance, respective connection points for a switch and a socket may be arranged at different respective heights, with a wire tube drawn therebetween. When mounting the wall 600, through holes can then be made through an inner wall covering 604 after mounting, after which the switch and the socket may be installed.

[0057] As indicated above, in a building wall 600 according to the invention, adjacently connected wall elements are arranged to be connected only using said outer 111 and inner 121 connecting parts so as to form said building wall 600. In particular, the outer 111 and/or 121 inner connecting parts are preferably the only fastening

means arranged to connect one outer 110 and/or inner 120 support part to a corresponding outer and/or inner support part of an adjacent connected wall element in said mounted state. This provides a very efficient installation, while still guaranteeing a strong final wall construction.

[0058] As shown in the figures with respect to the exemplifying wall elements 100', 100", 100"" and 200', 200", 200"", the outer 110 and/or inner 120 support parts, preferably both support parts 110, 120, comprises a respective wooden support beam with rectangular cross-section, and in that the outer 111 and/or inner 121 connecting part, preferably both connecting parts 111, 121, comprises a respective wooden connecting beam with rectangular cross-section, fastened to the respective support beam and protruding out from the support beam in question in the width direction W. This provides a particularly simple yet light-weight and sturdy construction, which is also simple to manufacture and install, while also being associated with a low environmental footprint.

[0059] In particular in this case, it is preferred that the said wind barrier 112 and/or said vapour barrier 122, preferably both, is or are clamped between said support beam and said connecting beam. This way, the respective barrier 112, 122 may be fastened by the respective connecting beam in question in connection to its fastening to the support beam in question, which provides for simple manufacturing. In case the corresponding resilient strip 113, 123 is arranged on the opposite width-direction W side of the wall element 100' with respect to the connecting beam in question, the barrier 112, 122 in question may be fastened only at the resilient strip 113, 123 and the connecting beam. If, to the contrary, the resilient strip 113, 123 is arranged as shown in Figure 12, the barrier 112, 122 may be fastened using thumbtacks, using glue, or in any other suitable way on the side where it is not fastened to the connecting beam.

[0060] Alternatively, as illustrated in Figure 6a, the outer 310 and/or inner 320 support parts may comprise a respective folded metal sheet part 315, 325 providing said supporting function. Preferably, the outer 311 and inner 321 connecting parts are then also formed from the same respective metal sheet part 315, 325. In Figure 6a, the folded metal sheet parts 315, 325 are folded in a beam shape. However, the connecting parts 311, 321 may also be in the form of a simple respective flat metal sheet part extending from a beam-shaped main respective metal support part 310, 320.

[0061] Between the metal support parts 310, 320, the hollow space 340 is formed. Preferably, the support parts 310, 320 are separated without direct contact. Instead, it is preferred that the distance means 330 comprises a metal cross 331, preferably a pair of metal crosses 331, connecting the outer 110 and the inner 120 support parts while fixing their relative positions with respect to each other.

[0062] It is noted that, in the first, the second as well as the third main wall element embodiments, there are

no major cold bridges between the outer part and the inner part of the resulting wall.

[0063] Further particularly, the outer 311 and/or inner 321 connecting part, preferably both, comprises a metal sheet portion which is perpendicular to the width direction W and arranged to be fastened to a corresponding metal sheet portion of a connected adjacent wall element in said mounted state using a connecting part in the form of a fastening means 510, such as a screw, running through both metal sheet portions in the width direction W. This is illustrated in Figure 16. Figure 17 is a corresponding view but using wooden wall elements 200 as discussed above.

[0064] As discussed above, the outer 111 and/or inner 121 connecting parts are arranged to, together with the corresponding outer 111 and/or inner 121 connecting parts of an adjacent wall element, define a respective external hollow space or vertical channel. In particular in this case, it is preferred that the outer 111 and/or inner 121 connecting part in question runs along substantially the whole longitudinal L length of the corresponding support part 110, 120, except for along a stretch near one or both longitudinal ends of the support part 110, 120 in question of between 5 and 30 cm from the end in question. For the inner connecting part 121, this is in particular useful for installations, such as installing electric cables in the mounted wall 600, without jeopardizing stability or strength. In particular, this is useful for horizontal cable paths, such as near the floor or above windows and doors.

[0065] In addition to the total wall element 100' depth B being a multiple of the C-C distance A, it is preferred that a total length, in the longitudinal direction L, of the wall element 100', 100", 100''' is an even multiple of said C-C width A, preferably also an even multiple of the total depth B. This way, the same wall elements 100', 100", 100''' that can be arranged one next to the other in a wall 600 with their longitudinal direction L vertically aligned can also be used, in the same or a different wall 600, one next to the other with their longitudinal direction L horizontally aligned, while still respecting and using the above described design grid of the building. Preferably, the length of the wall element in question refers to the effective length of the support parts 110, 120, or a C-C distance between two identical wall elements arranged, without play, one after the other in their longitudinal direction L.

[0066] Preferably, the C-C width A is, for each of the wall elements 100', 100", 100''' described herein, between 8 cm and 30 cm, more preferably between 10 and 20 cm. Similarly, preferred total depths B comprise multiples of such C-C widths A, specifically preferably at least 20 cm and at the most 100 cm.

[0067] The total length of at least one of the wall elements 100', 100", 100''' used in a building construction system according to the invention is preferably at least 220 cm.

[0068] In all configurations described herein, it is pos-

sible, and also preferred, to design each wall element so that the total weight of the wall element in question is at the most 25 kg.

[0069] According to a preferred embodiment, the said C-C width A comprises a tolerance distance, such that the wall elements are mounted with a certain play in the width direction W. In this case, the play is preferably absorbed by a resilient strip mounted along the length of the wall element in question, being pressed against an adjacent wall element and arranged to fully absorb a width-direction play of at least said tolerance distance. For instance, such resilient strip may be one or both or resilient strips 113, 123. Preferably, the tolerance distance is at the most 10 mm, preferably between 3 mm and 8 mm, preferably about 5 mm, and in the mounted state arranged to exist between adjacent support parts 110, 120 not counting the connecting parts 111, 121.

[0070] The present invention also relates to a wall element aggregate 500, comprising at least two wall elements 100', 100", 100''', 200', 200'', 300', 300'', 300''' of the above described types. Such wall element aggregates are, for instance, illustrated in Figure 7, together with two additional wall element aggregates 501, 502 to form a complete building wall 600 according to the invention.

[0071] In particular, such a wall element aggregate 500 is arranged to be mounted between two additional wall element aggregates 501, 502 of the same type, to form a mounted state. In this mounted state, which is similar to the above described mounted state in relation to the individual wall elements, a connected, self-supporting building wall 600 is formed, extending in the width direction W of vertically arranged wall elements and with substantially no play (not counting the above mentioned tolerance) between the first 500 and other 501, 502 wall element aggregates in the said width direction W. It is understood that the wall element aggregate 500, as well as the building wall 600, is associated with a width direction corresponding to the wall element width direction W for vertically arranged (longitudinal direction plumb) wall elements. Preferably, the individual wall element aggregates 500, 501, 502 are joined together by corresponding outermost wall elements of adjacent wall element aggregates being joined together in the way described above.

[0072] Such wall element aggregates 500, 501, 502 are suitable for preproduction, in addition to individual wall elements. For instance, in Figure 7, aggregate 501 is a plan wall section of predetermined width, height and depth; aggregate 500 is a corresponding window module; and aggregate 502 is a corresponding door module.

[0073] Furthermore, the invention relates to a building wall construction system, comprising at least two wall elements and/or wall element aggregates of the above described types. Such a building wall construction system may also comprise special wall elements such as start and end elements, as described below, and can be used to construct building walls as shown in, for instance, Figures 7-11c.

[0074] For instance, Figure 2a illustrates a special element "FA1", to be used to frame a window opening 607 (see Figure 7). The element FA1 is similar to wall element 100', but does not include the connecting parts 111, 121. The connection is then made using connecting parts 111, 121 of adjacent wall elements 100'.

[0075] Similarly, Figure 2b illustrates a start element ST2, which is used at the start of a wall 600, and is similar to wall element 100" apart from the fact that ST2 does not have the inner connecting part 121. Figure 2c shows a corresponding end element SL2, lacking the outer connecting part 121. Preferably, the building wall construction system according to the invention comprises at least one such start element ST2 and/or at least one such end element SL2, arranged without one of said outer 111 and inner 121 connecting parts.

[0076] Figures 5a-5c correspond to Figures 2a-2c, but show corresponding window frame FA1', start ST2' and end SL2' elements for the second wall element type 200'.

[0077] As illustrated in Figure 2d and 5d, the building wall construction system further comprises at least one corner element 400. The corner element 400 comprises a corner connecting part 411 (see further Figures 10a and 11b) arranged to connect the inner support part 120 of a first wall element to the inner support part 120 of a second wall element, said first and second wall elements being arranged at an angle α one in relation to the other, so that a width-direction W end of the first wall element is aligned with an inner surface of an inner wall covering material 604, such as wall-covering plaster, mounted on the second wall element. The corner connecting part 411 preferably has a cuboid shape, and is preferably a wooden beam.

[0078] As is illustrated in Figures 2d and 5d, the corner element 400 comprises a distance part 430, corresponding to the distance part 130 and preferably comprising a series, such as at least three, horizontal pieces of wooden sheet material. The corner element 400 further comprises a hollow internal space 440, corresponding to hollow space 140, and a stretch 470 near the longitudinal end of the corner element 400 along which the corner connecting part does not run, corresponding to stretch 170.

[0079] In Figure 6b, an alternative corner wall element 400' construction is shown, from the top as a part of a wall construction also comprising wall elements 200". As is illustrated in Figure 6b, the corner element 400' comprises an outer bent sheet metal part 442, arranged to be fastened to a respective outer support part of a first and second wall element 200", respectively, that are bound together using the corner element 400', at an angle. Furthermore, the bent sheet metal part 422 is arranged to run in the respective width direction W of the said respective bound together wall elements 200" up to the bend of the metal part 422. Also, the sheet metal part 422 defines, together with the above discussed corner connecting part and said first and second wall elements 200", the hollow corner space 440 which is preferably filled with insulation as described above. This provides

a light-weight, simple solution which is still sturdy enough. As seen in Figure 6b, the corner element 400 also preferably comprises a supporting outer corner protection, covering the said bend of the metal part 442. There may also be an inner bent metal part 443, arranged as a part of the corner connecting part.

[0080] Figures 3a-3c show more detailed versions of wall elements 100', 100", 100"', as well as corresponding views of wall elements ST1, ST2, ST4, SL1, SL2 and SL4 elements.

[0081] Figure 3d show corresponding views of three different inner corner elements 400a, 400b, 400d, while Figure 3e show corresponding views of three different outer corner elements 400d, 400e, 400f. In Figures 10a-10c, top views of wall constructions 600 are shown in which respective wall element aggregates constructed from wall elements 100" are bound together at a respective angle α using a respective one of corner elements 400d, 400e, 400f.

[0082] As is illustrated in Figures 3c, 3d, 10a, 10b and 10c, the angle α , at which wall elements bound together by the corner element in question are oriented in relation to each other, may be 90°. However, according to a preferred embodiment, the angle α is not 90°, and in preferred embodiments of the building wall construction system according to the present invention, at least one corner element having such an angle α which is not 90° is comprised in the system in question as a building block.

[0083] Exemplifying values for the angle α include 105° (corner elements 400f and 400c) and 75° (corner elements 400e and 400b).

[0084] A corner element as described above provides for a robust and strong construction, while at the same time providing plenty of space for insulation and without adding any cold bridges to the wall construction. In addition, angled corners with corner angles different from 90° are easy to arrange without resorting to complex solutions.

[0085] One of the advantages of the present invention is that the wall elements described herein can in general be mounted either vertically or horizontally to form a building wall 600. This has been explained above, and is illustrated in Figure 7. In Figure 7, 607 is an opening for a window, while 606 is an opening for a door. FB and FA may both be elements similar to FA1 (Figure 2a). Preferably, the building wall construction system according to the present invention comprises at least one wall element and/or wall element aggregate which is arranged to be mounted optionally either vertically or horizontally, in the sense that the dimensions (A, B and the length) of such a wall element or aggregate is adapted to fit with the horizontal dimensions A, B or vertically arranged elements and/or aggregates in both mounting orientations. Again, this has been described above.

[0086] Specifically, the system may preferably be adapted for constructing a building wall 600 comprising a through hole for a window 607 or a door 606. In particular, horizontally mounted wall elements SL2, ST2, 100',

100" may then be arranged, for instance as illustrated in Figure 7, for forming the part of the building wall 600 located above and/or below said window 607 or door 606, preferably immediately above and/or below said window 607 or door 606. Such combination of horizontally mounted wall elements and window/door holes, in addition to vertically mounted framing wall elements FA, FB, 100" may form or be comprised in a respective pre-fabricated wall element aggregate 500, 502 for direct mounting as a part of a finished building wall 600.

[0087] Figures 8a-9c illustrate various examples of how a building wall construction system according to the invention may be used to construct various wall construction details, and in particular connections between walls and a concrete foundation 710; a wooden floor part 720; a roof part 730; a crawling space 740 and a concrete floor part 750, as well as various connections to window openings 607.

[0088] Moreover, according to a preferred embodiment, the system according to the invention further comprises at least two floor parts 720, 740, 750, having respective length, width and depth dimensions and being elongated in a respective length direction, and further arranged to be mounted adjacent one another in said width direction W (of the wall elements forming the connecting wall 600) so as to form a connected floor construction connecting to the wall 600 in question, and in that the a C-C distance between two such floor parts, in their width direction, is an even multiple of said C-C distance A between adjacent connected wall elements in said mounted state. In other words, the floor connecting to the wall is in this case constructed from individual and joined, elongated construction elements having the same type of general geometric shape and dimensions as the wall elements described herein, in particular with respect to their respective width and length. This way, the floor can be laid out by an architect using the same pixel grid as relating to the floor plan, described above. In general, such floor elements may be designed in a way which corresponds to what has been described above for the said wall elements. This information is therefore not repeated here.

[0089] It is preferred that the building construction system according to the invention comprises several wall elements, each of one of the types described herein, but of at least two different types in total. In particular, a first such type has a different total respective C-C width A than a second such type. Specifically, the first type wall elements are preferably arranged to be mounted with a respective C-C width A which is twice as large as compared to wall elements of the second type wall elements. For instance, the first type may be wall elements 100" while the second type is wall elements 100".

[0090] The invention also pertains to a building wall 600, being constructed using a building wall construction system as described herein by connecting wall elements and/or wall element aggregates one adjacent to the next, in said mounted state, so as to form said wall 600.

[0091] Preferably, the building wall 600 further comprises the above discussed inner wall covering 604, such as wall covering plaster, which is attached to the respective inner support parts 120 of the wall elements comprised in the said system, while the building wall 600 further comprises an outer wall covering 605, such as wooden panel or plaster, which is attached to the respective outer support parts 110 of the wall elements comprised in the said system.

[0092] In particular, it is preferred that the outer wall covering 605 is attached to the respective outer connecting parts 110 of the said wall elements so that a ventilating channel is formed behind the said outer wall covering 605 by the said hollow external space 150.

[0093] Figure 13 illustrates a method according to the invention for constructing a building wall 600 or building wall element aggregate 500 according to the above.

[0094] The method starts in a first step. Thereafter, the method comprises several steps, in each of which at least one wall element or wall element aggregate, according to the above, is arranged and connected together with at least one other such wall element or wall element aggregate. The arrangement and connection is performed as has been described above.

[0095] In a particularly preferred such method, for constructing a building wall 600 or a building wall element aggregate 500, the method comprises the steps of arranging and connecting together several wall elements according to the above so as to form said building wall 600 or building wall aggregate 500.

[0096] In a preferred embodiment, at least some of the said used wall elements and/or wall element aggregates do not comprise insulating material 141 in said respective hollow internal respective spaces 140. In this case, the method further comprises a step in which loose insulating material is injected into the said respective hollow internal space 140 after attaching one wall element to another so as to achieve said mounted state of the wall element in question. Alternatively, sheet insulation material may be preinstalled in each wall element from factory.

[0097] The building wall 600 may be mounted in at least one of three different ways:

- By mounting each individual wall element one by one;
- by mounting blocks of 3-6 prejoined wall elements together with each other; or
- by mounting complete prejoined wall segments together, which wall segments may each be 4-6 meters of length.

[0098] Figures 11a-11c illustrate various exemplifying ways of performing such mounting. In particular, Figure 11c shows the final result after mounting the complete wall 600 in the way indicated in Figure 11b.

[0099] Once the building wall has been assembled, the method ends.

[0100] The construction of the wall element in its first

or second main embodiments, as described above, using wooden beams as outer 110, 210 and inner 120, 220 support parts, has the additional advantage that it provides a construction which is easy to manufacture.

[0101] In a preferred such manufacturing method, illustrated in Figure 14, the wall element in question is produced from an endless structure comprising said outer 110, 210 and inner 120, 220 support parts, possibly without said outer 111, 211 and/or inner 121, 221 connecting parts, which endless structure is cut to suitable lengths and thereafter possibly provided with said connecting part(s).

[0102] In particular in the case in which at least one of said outer 110, 210 and inner 120, 220 support parts comprises a wooden beam, said wooden beam is produced, before cutting, as an endless beam by lengthwise joining together consecutive beams. Such joining together may, for instance, use conventional finger joining. This preferably applies to at least the outer 110, 210 and/or the inner 120, 220 support beam.

[0103] The wall construction described above solves the initially stated problems, as has been explained herein. Furthermore, when constructing a wall using a building wall construction system according to the present invention, it is possible to repair damaged wall parts by simply replacing individual wall elements, by loosening said fastening means, removing the damaged wall element, replacing it with a new one and then again fastening the said fastening means. This way, both the load bearing functionality, the insulation, the wind and vapour barrier functionality, etc. will immediately have full effect, while keeping damages to the rest of the wall construction to a minimum.

[0104] It is also possible to use the same wall elements, preferably of the 100' or 200' type, for constructing inner walls, while maintaining the floor plan pixel grid discussed above.

[0105] Above, preferred embodiments have been described. However, it is apparent to the skilled person that many modifications can be made to the disclosed embodiments without departing from the basic idea of the invention.

[0106] For instance, numerous other types of wall members may be used in the building construction system, apart from the exemplifying ones described herein. One example is to make the inner 120 and outer 110 support parts of different widths for a "FA" type wall element, making it possible to build angled window embrasures.

[0107] In general, all which is said regarding one type of wall element is equally applicable to other types of wall elements, whenever this is possible. The same applies between what has been described in relation to wall elements; wall element aggregates; building walls; the building wall construction system; and the various methods described above.

[0108] Hence, the invention is not limited to the described embodiments, but can be varied within the scope

of the enclosed claims.

Claims

1. Wall element (100';100";100''';200';200";200''';300';300";300''') for a building wall (600), which wall element (100';100";100''';200';200";200''';300';300";300'''):

has a longitudinal direction (L), a width direction (W) and a depth direction (D);

has a substantially elongated overall shape, generally extending in said longitudinal direction (L);

is arranged to be mounted between two other wall elements

(100';100";100''';200';200";200''';300';300";300''') of the same type, in a mounted state, so as to form a connected, self-supporting building wall (600) extending in the width direction (W) with substantially no play between the wall elements

(100';100";100''';200';200";200''';300';300";300''') in the width direction (W);

comprises an elongated outer support part (110;210;310), extending in said longitudinal direction (L) and arranged to be mounted in an exterior part (601) of the building wall (600);

comprises an elongated inner support part (120;220;320), extending in said longitudinal direction (L) and arranged to be mounted in an interior part (602) of the building wall (600); and

comprises a distance part (130;230;330), arranged between said outer (110;210;310) and inner (120;220;320) support parts and arranged to provide a distance in said depth direction (D), as well as to define a hollow internal space (140;240;340), between the outer (110;210;310) and inner (120;220;320) support parts,

wherein the outer support part (110;210;310) comprises an outer longitudinally (L) extending connecting part (111;211;311), arranged to be fastened to the outer support part (110;210;310) of an adjacent wall element (100';100";100''';200';200";200''';300';300";300''') in said mounted state so that at least one longitudinally (L) extending hollow external space (150;250;350) is formed along the outer support part (110;210;310) between each pair of said connected wall elements (100';100";100''';200';200";200''';300';300";300'''), and

wherein the inner support part (120;220;320) further comprises an inner longitudinally (L) extending connecting part (121;221;321), arranged to be fastened to the inner support part

- (120;220;320) of an adjacent wall element (100';100";100''';200';200";200''';300';300";300''') in said mounted state, **characterised in that** said outer (111;211;311) and inner (121;221;321) connecting parts protrude in the width direction (W) from the remainder of the outer and inner support parts (120;220;320), respectively, so as to cover part of the outer (110;210;310) and inner support parts (120;220;320), respectively, of respective adjacent wall elements (100';100";100''';200';200";200''';300';300";300''') in said mounted state, and **in that** the total depth (B) of the wall element (100';100";100''';200';200";200''';300';300";300'''), including the depth of any inner wall covering material (604) to be mounted on the inner support part (120;220;320), such as a layer of wall-covering plaster, is 1, 2, 3 or 4 times the centre-to-centre width (A) between two identical, adjacently arranged connected wall elements (100';100";100''';200';200";200''';300';300";300''') in said mounted state.
2. Wall element (100';100";100''';200';200";200''';300';300";300''') according to claim 1, **characterised in that** the inner support part (120;220;320) comprises a vapour barrier (122;222;322) extending across the width and length of the wall element (100';100";100''';200';200";200''';300';300";300''') and arranged to abut the vapour barrier (122;222;322) of an adjacent wall element (100';100";100''';200';200";200''';300';300";300''') in said mounted state so as to form a connected vapour barrier across the building wall (600).
 3. Wall element (100';100";100''';200';200";200''';300';300";300''') according to claim 1 or 2, **characterised in that** the outer support part (110;210;310) comprises a wind barrier (112;212;312) extending across the width and length of the wall element (100';100";100''';200';200";200''';300';300";300''') and arranged to abut the wind barrier (112;212;312) of an adjacent wall element (100';100";100''';200';200";200''';300';300";300''') in said mounted state so as to form a connected wind barrier across the building wall (600).
 4. Wall element (100';100";100''';200';200";200''';300';300";300''') according to any one of the preceding claims, **characterised in that** the outer (111;211;311) and/or inner (121;221;321) connecting parts are arranged to be connected to said adjacent wall element (100';100";100''';200';200";200''';300';300";300''') using a fastening means (510) which is driven through the connecting part (111,121;211,221;311,321) in question and into the said adjacent wall element (100';100";100''';200';200";200''';300';300";300''') substantially in the depth direction (D).
 5. Wall element (100';100";100''';200';200";200''';300';300";300''') according to any one of the preceding claims, **characterised in that** the inner support part (120;220;320) is arranged to be fastened to the inner support part (120;220;320) of an adjacent wall element (100';100";100''';200';200";200''';300';300";300''') in said mounted state so that at least one additional longitudinally (L) extending hollow external space (160;260;360) is formed along the inner support part (120;220;320) between each pair of said connected wall elements (100';100";100''';200';200";200''';300';300";300''').
 6. Wall element (100';100";100''';200';200";200''';300';300";300''') according to any one of the preceding claims, **characterised in that** a total length of the wall element (100';100";100''';200';200";200''';300';300";300''') is an even multiple of said centre-to-centre width (A).
 7. Wall element aggregate (500), **characterised in that** the wall element aggregate (500) comprises at least two wall elements (100';100";100''';200';200";200''';300';300";300''') according to anyone of the preceding claims.
 8. Wall element aggregate (500) according to claim 7, **characterised in that** the wall element aggregate (500) is arranged to be mounted between two additional wall element aggregates (501,502) of the same type, in a mounted state, so as to form a connected, self-supporting building wall (600) extending in the width direction (W) with substantially no play between the first and other wall element aggregates (500) in the width direction (W).
 9. Building wall construction system, **characterised in that** the system comprises at least two wall elements (100';100";100''';200';200";200''';300';300";300''') and/or wall element aggregates (500) according to any one of the preceding claims.
 10. System according to claim 9, **characterised in that** the system further comprises at least two floor parts having respective length, width and depth dimensions and being elongated in their length direction, and further arranged to be mounted adjacent one another in said width direction (W) so as to form a connected floor construction, and **in that** the a centre-to-centre distance (A) between two such floor

parts, in their width direction (W), is an even multiple of said centre-to-centre distance (A) between adjacent connected wall elements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') in said mounted state.

11. Building wall (600), **characterised in that** the building wall (600) is constructed using a system according to claim 9 or 10, by connecting wall elements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') one adjacent to the next, in said mounted state, so as to form said building wall (600).
12. Method for constructing a building wall (600) or a building wall element aggregate (500), **characterised in that** the method comprises the steps of arranging and connecting together several wall elements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') according to any of the claims 1-6 so as to form said building wall (600) or building wall element aggregate (500).
13. Method of manufacturing a wall element (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') according to any one of claims 1-6, **characterised in that** the wall element (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') is produced from an endless structure comprising said outer and inner support parts (120; 220; 320), which endless structure has been produced by lengthwise joining together consecutive structure parts, which endless structure may or may not comprise said outer (111; 211; 311) and/or inner (121; 221; 321) connecting parts, which endless structure is cut to suitable lengths and thereafter provided with said connecting part(s) (111, 121; 211, 221; 311, 321) unless it does not already comprise said connecting part(s) (111, 121; 211, 221; 311, 321).

Patentansprüche

1. Wandelement (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') für eine Gebäudewand (600), wobei das Wandelement (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300''):

eine Längsrichtung (L), eine Breitenrichtung (W) und eine Tiefenrichtung (D) aufweist;
eine im Wesentlichen längliche Gesamtform aufweist, die sich allgemein in besagter Längsrichtung (L) erstreckt;
angeordnet ist, um zwischen zwei anderen Wandelementen (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') desselben Typs im montierten Zustand angebracht zu werden, um eine verbundene, selbsttragende Gebäudewand

(600) zu bilden, die sich in der Breitenrichtung (W) im Wesentlichen ohne Spiel zwischen den Wandelementen (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') in Breitenrichtung (W) erstreckt;

ein längliches äußeres Stützteil (110; 210; 310) umfasst, das sich in der besagten Längsrichtung (L) erstreckt und angeordnet ist, um an einem äußeren Teil (601) der Gebäudewand (600) angebracht zu werden;

ein längliches inneres Stützteil (120; 220; 320) umfasst, das sich in besagter Längsrichtung (L) erstreckt und angeordnet ist, um an einem inneren Teil (602) der Gebäudewand (600) angebracht zu werden; und

ein Abstandsteil (130; 230; 330) umfasst, welches zwischen den besagten äußeren (110; 210; 310) und inneren (120; 220; 320) Stützteilen angeordnet ist und so angeordnet ist, dass es einen Abstand in besagter Tiefenrichtung (D) bereitstellt, sowie einen hohlen Innenraum (140; 240; 340) zwischen den äußeren (110; 210; 310) und den inneren (120; 220; 320) Stützteilen definiert,

wobei das äußere Stützteil (110; 210; 310) ein äußeres, sich in Längsrichtung (L) erstreckendes Verbindungsteil (111; 211; 311) umfasst, das angeordnet ist, um an dem äußeren Stützteil (110; 210; 310) eines benachbarten Wandelements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') im besagten montierten Zustand befestigt zu werden, sodass ein sich mindestens in Längsrichtung (L) erstreckender hohler Außenraum (150; 250; 350) entlang des äußeren Stützteils (110; 210; 310) zwischen jedem Paar der besagten, verbundenen Wandelemente (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') gebildet wird, und

wobei das innere Stützteil (120; 220; 320) ferner ein inneres, sich in Längsrichtung (L) erstreckendes Verbindungsteil (121; 221; 321) umfasst, das angeordnet ist, um an dem inneren Stützteil (120; 220; 320) eines benachbarten Wandelements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') im besagten montierten Zustand befestigt zu werden,

dadurch gekennzeichnet, dass die besagten äußeren (111; 211; 311) und inneren (121; 221; 321) Verbindungsteile in Breitenrichtung (W) von dem Rest der äußeren bzw. inneren Stützteile (120; 220; 320) vorstehen, um einen Teil der äußeren (110; 210; 310) bzw. inneren Stützteile (120; 220; 320) der jeweiligen benachbarten Wandelemente (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'') im besagten montierten Zustand zu bedecken, und dass die Gesamttiefe (B) des Wandelements (100'; 100"; 100''; 200'; 200"; 200''; 300'; 300"; 300'');

- 300";300"), einschließlich der Tiefe eines beliebigen, auf dem inneren Stützteil (120;220;320) zu befestigendes, inneres Wandverkleidungsmaterial (604), wie beispielsweise eine Schicht aus Wandverkleidungsputz, im besagten montierten Zustand das 1-, 2-, 3- oder 4-fache der Mitte-zu-Mitte-Breite (A) zwischen zwei identischen, benachbart angeordneten, verbundenen Wandelementen (100';100";100'';200';200";200'';300';300";300''') beträgt.
2. Wandelement (100';100";100'';200';200";200'';300';300";300''') nach Anspruch 1, **dadurch gekennzeichnet, dass** das innere Stützteil (120;220;320) eine Dampfsperre (122;222;322) umfasst, die sich über die Breite und Länge des Wandelements (100';100";100'';200';200";200'';300';300";300''') erstreckt und so angeordnet ist, dass sie im besagten montierten Zustand an der Dampfsperre (122;222;322) eines benachbarten Wandelements (100';100";100'';200';200";200'';300';300";300''') anliegt, um eine verbundene Dampfsperre über die Gebäudewand (600) zu bilden.
3. Wandelement (100';100";100'';200';200";200'';300';300";300''') nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das äußere Stützteil (110;210;310) eine Windbarriere (112;212;312) umfasst, die sich über die Breite und Länge des Wandelements (100';100";100'';200';200";200'';300';300";300''') erstreckt und so angeordnet ist, dass sie an die Windbarriere (112;212;312) eines benachbarten Wandelements (100';100";100'';200';200";200'';300';300";300''') im besagten montierten Zustand anliegt, um eine verbundene Windbarriere über die Gebäudewand (600) zu bilden.
4. Wandelement (100';100";100'';200';200";200'';300';300";300''') nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die äußeren (111;211;311) und/oder inneren (121;221;321) Verbindungsteile angeordnet sind, um mit dem besagten Wandelement (100';100";100'';200';200";200'';300';300";300''') unter Verwendung eines Befestigungsmittels (510) verbunden zu werden, welches durch das betreffende Verbindungsteil (111, 121;211, 221;311, 321) und in das besagte benachbarte Wandelement (100';100";100'';200';200";200'';300';300";300''') im Wesentlichen in Tiefenrichtung (D) geführt wird.
5. Wandelement (100';100";100'';200';200";200'';300';300";300''') nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das innere Stützteil (120;220;320) angeordnet ist, um an dem inneren Stützteil (120;220;320) eines benachbarten Wandelements (100';100";100'';200';200";200'';300';300";300''') im besagten montierten Zustand befestigt zu werden, sodass mindestens ein zusätzlicher sich in Längsrichtung (L) erstreckender hohler Außenraum (160;260;360) entlang des inneren Stützteils (120;220;320) zwischen jedem Paar von besagten, verbundenen Wandelementen (100';100";100'';200';200";200'';300';300";300''') gebildet wird.
6. Wandelement (100';100";100'';200';200";200'';300';300";300''') nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Gesamtlänge des Wandelements (100';100";100'';200';200";200'';300';300";300''') ein geradzahliges Vielfaches der besagten Mitte-zu-Mitte-Breite (A) ist.
7. Wandelementaggregat (500), **dadurch gekennzeichnet, dass** das Wandelementaggregat (500) mindestens zwei Wandelemente (100';100";100'';200';200";200'';300';300";300''') nach einem der vorhergehenden Ansprüche umfasst.
8. Wandelementaggregat (500) nach Anspruch 7, **dadurch gekennzeichnet, dass** das Wandelementaggregat (500) angeordnet ist, um in montiertem Zustand zwischen zwei zusätzlichen Wandelementaggregaten (501, 502) desselben Typs angebracht zu werden, um eine verbundene, selbsttragende Gebäudewand (600) zu bilden, die sich in der Breitenrichtung (W) im Wesentlichen ohne Spiel zwischen dem ersten und weiteren Wandelementaggregaten (500) in der Breitenrichtung (W) erstreckt.
9. Bauwand-Konstruktionssystem, **dadurch gekennzeichnet, dass** das System mindestens zwei Wandelemente (100';100";100'';200';200";200'';300';300";300''') und/oder Wandelementaggregate (500) nach einem der vorhergehenden Ansprüche umfasst.
10. System nach Anspruch 9, **dadurch gekennzeichnet, dass** das System ferner mindestens zwei Bodenteile umfasst, die entsprechende Längen-, Breiten- und Tiefenabmessungen aufweisen und in ihrer Längsrichtung langgestreckt sind und ferner angeordnet sind, um in besagter Breitenrichtung (W) benachbart angebracht zu werden, um eine verbundene Bodenkonstruktion zu bilden, und dass der Mitte-zu-Mitte-Abstand (A) zwischen zwei solchen Bodenteilen in ihrer Breitenrichtung (W) ein gerades Vielfaches des besagten Mitte-zu-Mitte-Abstand (A) zwischen benachbarten verbundenen Wandelementen (100';100";100'';200';200";200'';300';300";300''') ist.

im besagten montierten Zustand ist.

11. Gebäudewand (600), **dadurch gekennzeichnet, dass** die Gebäudewand (600) unter Verwendung eines Systems nach Anspruch 9 oder 10 aufgebaut ist, indem benachbart liegende Wandelemente (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') im besagten montierten Zustand miteinander verbunden werden, um die besagte Gebäudewand (600) zu bilden. 5 10
12. Verfahren zum Errichten einer Gebäudewand (600) oder eines Gebäudewandelementaggregats (500), **dadurch gekennzeichnet, dass** das Verfahren die Schritte des Anordnens und Verbindens mehrerer Wandelemente (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') nach einem der Ansprüche 1-6 umfasst, um die besagte Gebäudewand (600) oder das Gebäudewandelementaggregat (500) zu bilden. 15 20
13. Verfahren zur Herstellung eines Wandelements (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das Wandelement (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') aus einer Endlosstruktur hergestellt wird, welche die besagten äußeren und inneren Stützteile (120; 220; 320) umfasst, wobei die Endlosstruktur durch Zusammenfügen aufeinanderfolgender Strukturteile in Längsrichtung hergestellt wurde, wobei die Endlosstruktur die besagten äußeren (111; 211; 311) und/oder inneren (121; 221; 321) Verbindungsteile umfassen kann oder nicht, wobei die Endlosstruktur auf geeignete Längen geschnitten und danach mit dem/den besagtem/n Verbindungsteil(en) (111, 121; 211, 221; 311, 321) versehen wird, sofern sie nicht bereits das/die besagte/n Verbindungsteil(e) (111, 121; 211, 221; 311, 321) umfasst. 25 30 35 40

Revendications

1. Élément de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') pour une paroi de bâtiment (600), lequel élément de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') : 45
 - a une direction longitudinale (L), une direction de largeur (W) et une direction de profondeur (D); 50
 - a une forme globale sensiblement allongée, s'étendant généralement dans ladite direction longitudinale (L);
 - est agencé pour être monté entre deux autres éléments de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') du même type, dans un état monté, afin de former une paroi de 55

bâtiment autoporteuse raccordée (600) s'étendant dans la direction de largeur (W) sensiblement sans jeu entre les éléments de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') dans la direction de largeur (W); comprend une partie de support externe allongée (110; 210; 310) s'étendant dans ladite direction longitudinale (L) et agencée pour être montée dans une partie extérieure (601) de la paroi de bâtiment (600); comprend une partie de support interne allongée (120; 220; 320) s'étendant dans ladite direction longitudinale (L) et agencée pour être montée dans une partie intérieure (602) de la paroi de bâtiment (600); et comprend une partie d'écartement (130; 230; 330) agencée entre lesdites parties de support externe (110; 210; 310) et interne (120; 220; 320) et agencée pour fournir une distance dans ladite direction de profondeur (D), ainsi que pour définir un espace interne creux (140; 240; 340) entre les parties de support externe (110; 210; 310) et interne (120; 220; 320), dans lequel la partie de support externe (110; 210; 310) comprend une partie de raccordement externe (111; 211; 311) s'étendant longitudinalement (L) agencée pour être fixée sur la partie de support externe (110; 210; 310) d'un élément de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') adjacent dans ledit état monté, de sorte qu'au moins un espace externe creux (150; 250; 350) s'étendant longitudinalement (L) est formé le long de la partie de support externe (110; 210; 310) entre chaque paire desdits éléments de paroi raccordés (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300'''), et dans lequel la partie de support interne (120; 220; 320) comprend en outre une partie de raccordement interne (121; 221; 321) s'étendant longitudinalement (L) agencée pour être fixée à la partie de support interne (120; 220; 320) d'un élément de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') adjacent dans ledit état monté, **caractérisé en ce que** lesdites parties de raccordement externe (111; 211; 311) et interne (121; 221; 321) font saillie dans la direction de largeur (W) à partir du reste des parties de support externe et interne (120; 220; 320) respectivement, afin de recouvrir une partie des parties de support externe (110; 210; 310) et interne (120; 220; 320) respectivement, des éléments de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''') adjacents dans ledit état monté, et **en ce que** la profondeur totale (B) de l'élément de paroi (100'; 100"; 100'''; 200'; 200"; 200'''; 300'; 300"; 300''')

- 300' ; 300" ; 300''') comprenant la profondeur de n'importe quel matériau de recouvrement de paroi interne (604) à monter sur la partie de support interne (120 ; 220 ; 320) telle qu'une couche de plâtre de recouvrement de paroi, représente 1, 2, 3 ou 4 fois la largeur centre à centre (A) entre deux éléments de parois raccordés (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') identiques agencés de manière adjacente dans ledit état monté.
2. Élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon la revendication 1, **caractérisé en ce que** la partie de support interne (120 ; 220 ; 320) comprend un pare-vapeur (122 ; 222 ; 322) s'étendant de part et d'autre de la largeur et de la longueur de l'élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') et agencée pour venir en butée contre le pare-vapeur (122 ; 222 ; 322) d'un élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') adjacent dans ledit état monté afin de former un pare-vapeur raccordé de part et d'autre de la paroi de bâtiment (600).
 3. Élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon la revendication 1 ou 2, **caractérisé en ce que** la partie de support externe (110 ; 210 ; 310) comprend un coupe-vent (112 ; 212 ; 312) s'étendant de part et d'autre de la largeur et de la longueur de l'élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') et agencé pour venir en butée contre le coupe-vent (112 ; 212 ; 312) d'un élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') adjacent dans ledit état monté afin de former un coupe-vent raccordé de part et d'autre de la paroi de bâtiment (600).
 4. Élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les parties de raccordement externe (111 ; 211 ; 311) et/ou interne (121 ; 221 ; 321) sont agencées pour être raccordées audit élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') adjacent en utilisant un moyen de fixation (510) qui est entraîné par la partie de raccordement (111, 121 ; 211, 221 ; 311, 321) en question et dans ledit élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') adjacent sensiblement dans la direction de profondeur (D).
 5. Élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la partie de support interne (120 ; 220 ; 320) est agencée pour être fixée à la partie de support interne (120 ; 220 ; 320) d'un élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 100'' ; 300' ; 300" ; 300'') adjacent dans ledit état monté de sorte qu'au moins un espace externe creux (160 ; 260 ; 360) supplémentaire s'étendant longitudinalement (L) est formé le long de la partie de support interne (120 ; 220 ; 320) entre chaque paire desdits éléments de paroi raccordés (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'').
 6. Élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'une** longueur totale de l'élément de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') est un multiple pair de ladite largeur centre à centre (A).
 7. Agrégat d'élément de paroi (500), **caractérisé en ce que** l'agrégat d'élément de paroi (500) comprend au moins deux éléments de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') selon l'une quelconque des revendications précédentes.
 8. Agrégat d'élément de paroi (500) selon la revendication 7, **caractérisé en ce que** l'agrégat d'élément de paroi (500) est agencé pour être monté entre deux agrégats d'éléments de paroi (501, 502) supplémentaires du même type, dans un état monté, afin de former une paroi de bâtiment autoporteuse raccordée (600) s'étendant dans la direction de largeur (W) sensiblement sans jeu entre le premier et les autres agrégats d'élément de paroi (500) dans la direction de largeur (W).
 9. Système de construction de paroi de bâtiment **caractérisé en ce que** le système comprend au moins deux éléments de paroi (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') et/ou des agrégats d'élément de paroi (500) selon l'une quelconque des revendications précédentes.
 10. Système selon la revendication 9, **caractérisé en ce que** le système comprend en outre au moins deux parties de plancher ayant des dimensions de longueur, largeur et profondeur respectives et étant allongées dans leur direction de longueur, et en outre agencées pour être montées de manière adjacente l'une par rapport à l'autre dans ladite direction de largeur (W) afin de former une construction de plancher raccordée, et **en ce qu'une** distance de centre à centre (A) entre deux de ces parties de plancher, dans leur direction de largeur (W) est un multiple pair de ladite distance centre à centre (A) entre des éléments de paroi raccordés (100' ; 100" ; 100'' ; 200' ; 200" ; 200'' ; 300' ; 300" ; 300'') adjacents dans ledit état monté.

11. Paroi de bâtiment (600), **caractérisée en ce que** la paroi de bâtiment (600) est construite en utilisant un système selon la revendication 9 ou 10, en raccordant des éléments de paroi (100' ; 100" ; 100''' ; 200' ; 200" ; 200''' ; 300' ; 300" ; 300''') l'un à côté de l'autre, dans ledit état monté, afin de former ladite paroi de bâtiment (600). 5
12. Procédé pour construire une paroi de bâtiment (600) ou un agrégat d'élément de paroi de bâtiment (500), **caractérisé en ce que** le procédé comprend les étapes pour agencer et raccorder ensemble plusieurs éléments de paroi (100' ; 100" ; 100''' ; 200' ; 200" ; 200''' ; 300' ; 300" ; 300''') selon l'une quelconque des revendications 1 à 6 afin de former ladite paroi de bâtiment (600) ou l'agrégat d'élément de paroi de bâtiment (500). 10 15
13. Procédé pour fabriquer un élément de paroi (100' ; 100" ; 100''' ; 200' ; 200" ; 200''' ; 300' ; 300" ; 300''') selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** l'élément de paroi (100' ; 100" ; 100''' ; 200' ; 200" ; 200''' ; 300' ; 300" ; 300''') est produit à partir d'une structure sans fin comprenant lesdites parties de support externe et interne (120 ; 220 ; 320), laquelle structure sans fin a été produite en assemblant dans le sens de la longueur des parties structurelles consécutives, laquelle structure sans fin peut ou peut ne pas comprendre lesdites parties de raccordement externe (111 ; 211 ; 311) et/ou interne (121 ; 221 ; 321), laquelle structure sans fin est coupée aux longueurs appropriées et ensuite prévue avec ladite (lesdites) partie(s) de raccordement (111, 121 ; 211, 221 ; 311, 321) sauf si elle ne comprend pas déjà ladite (lesdites) partie(s) de raccordement (111, 121 ; 211, 221 ; 311, 321). 20 25 30 35

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Fig. 1a

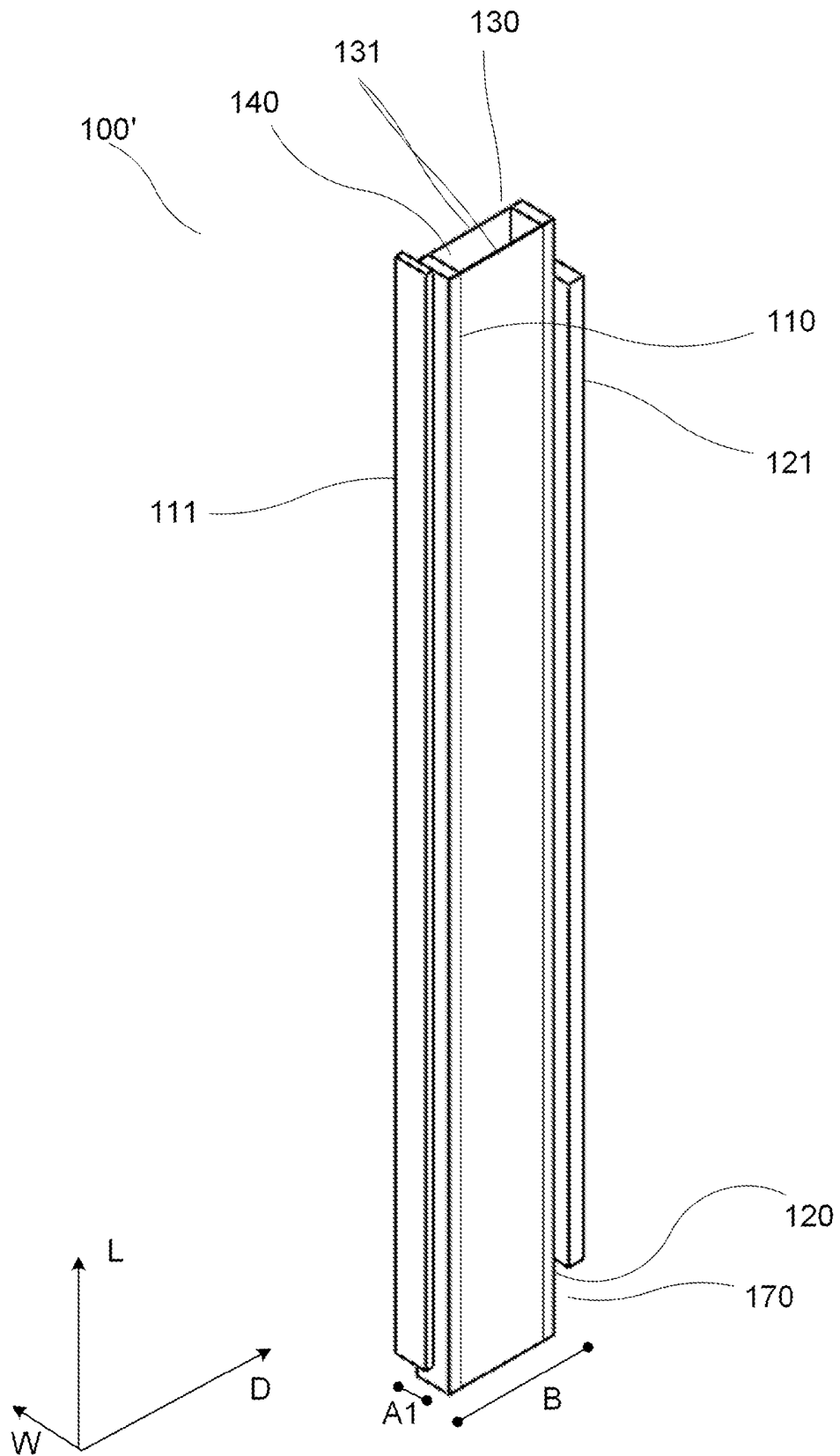


Fig. 1b

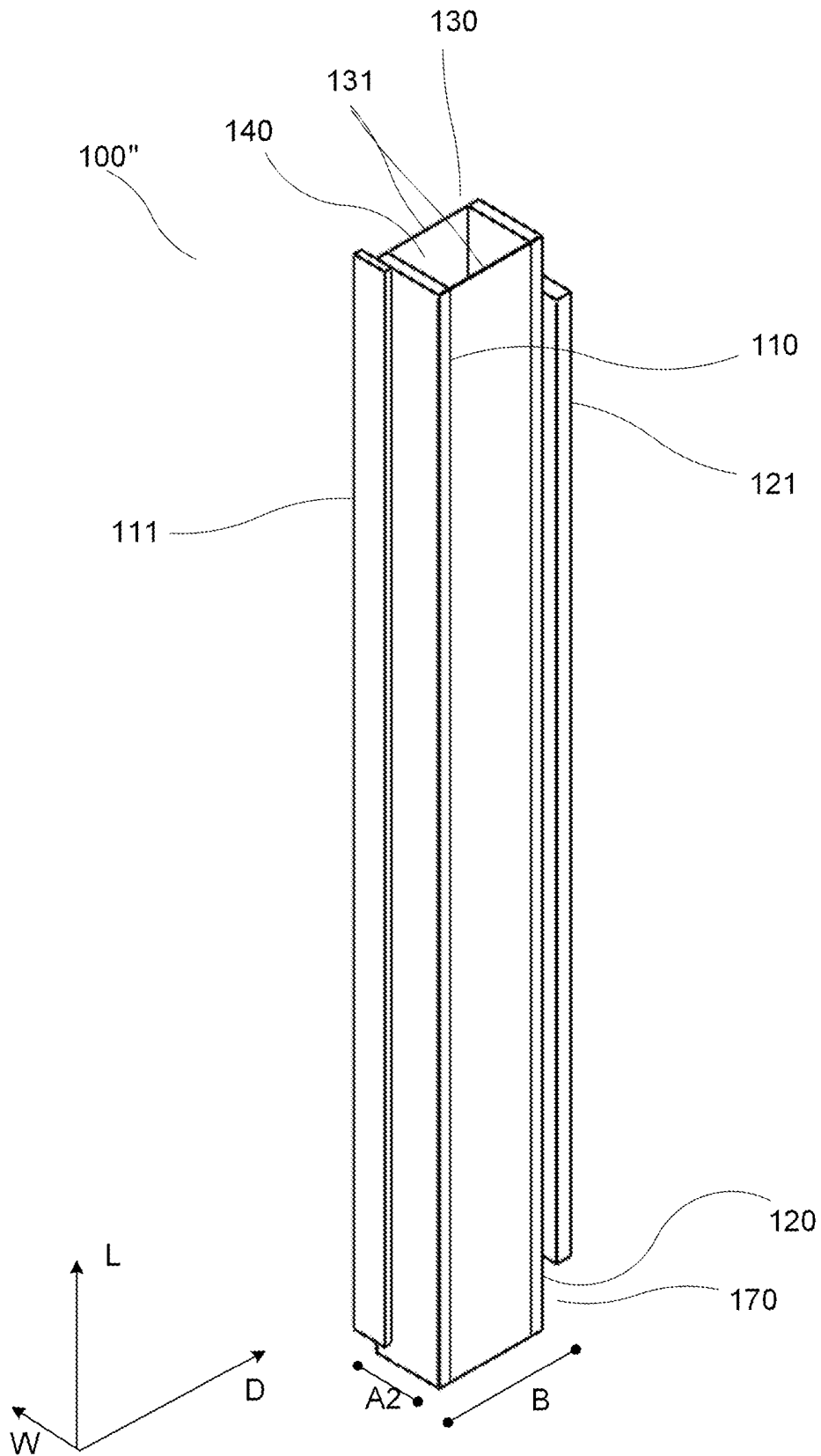


Fig. 1c

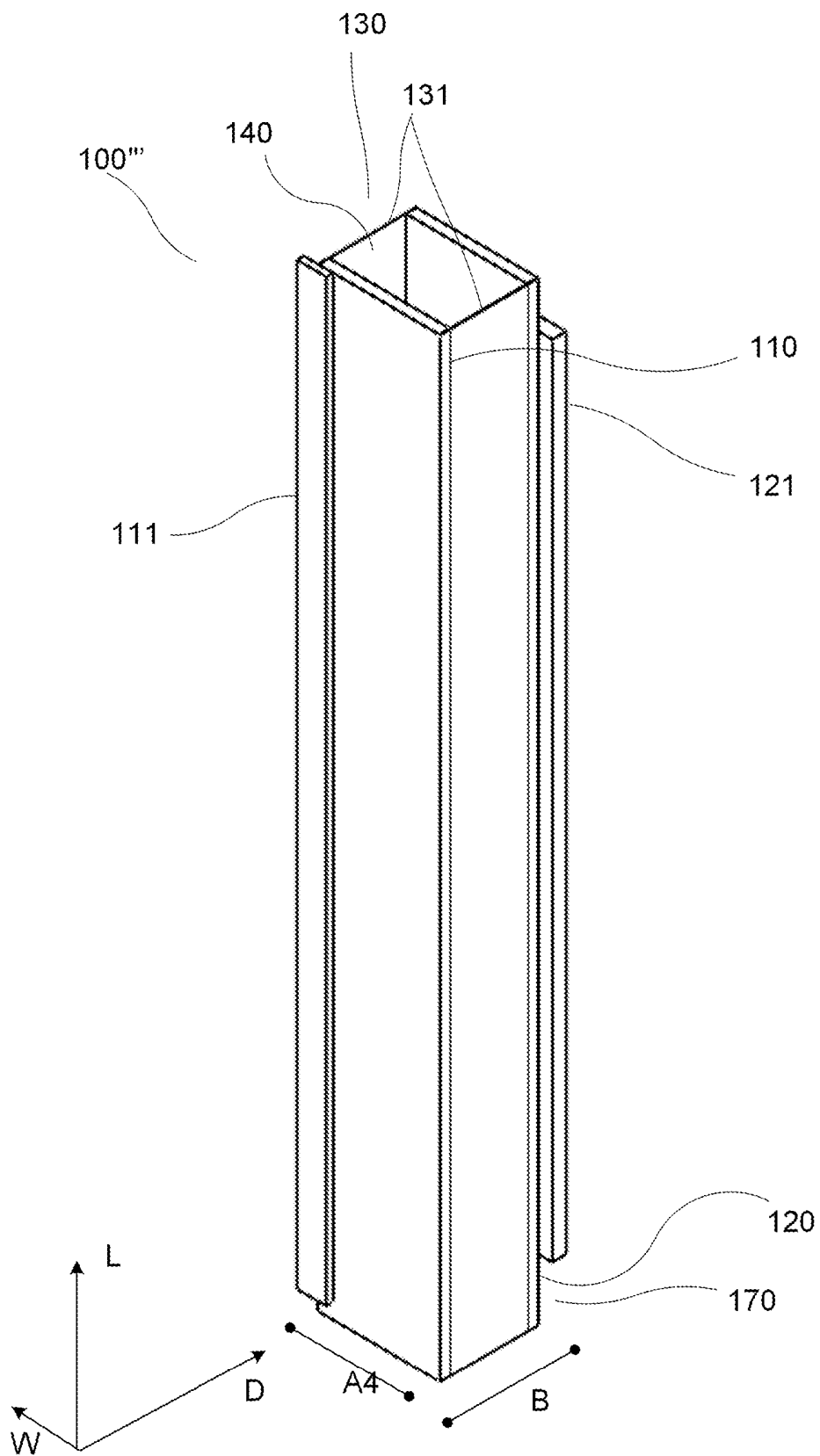


Fig. 2a

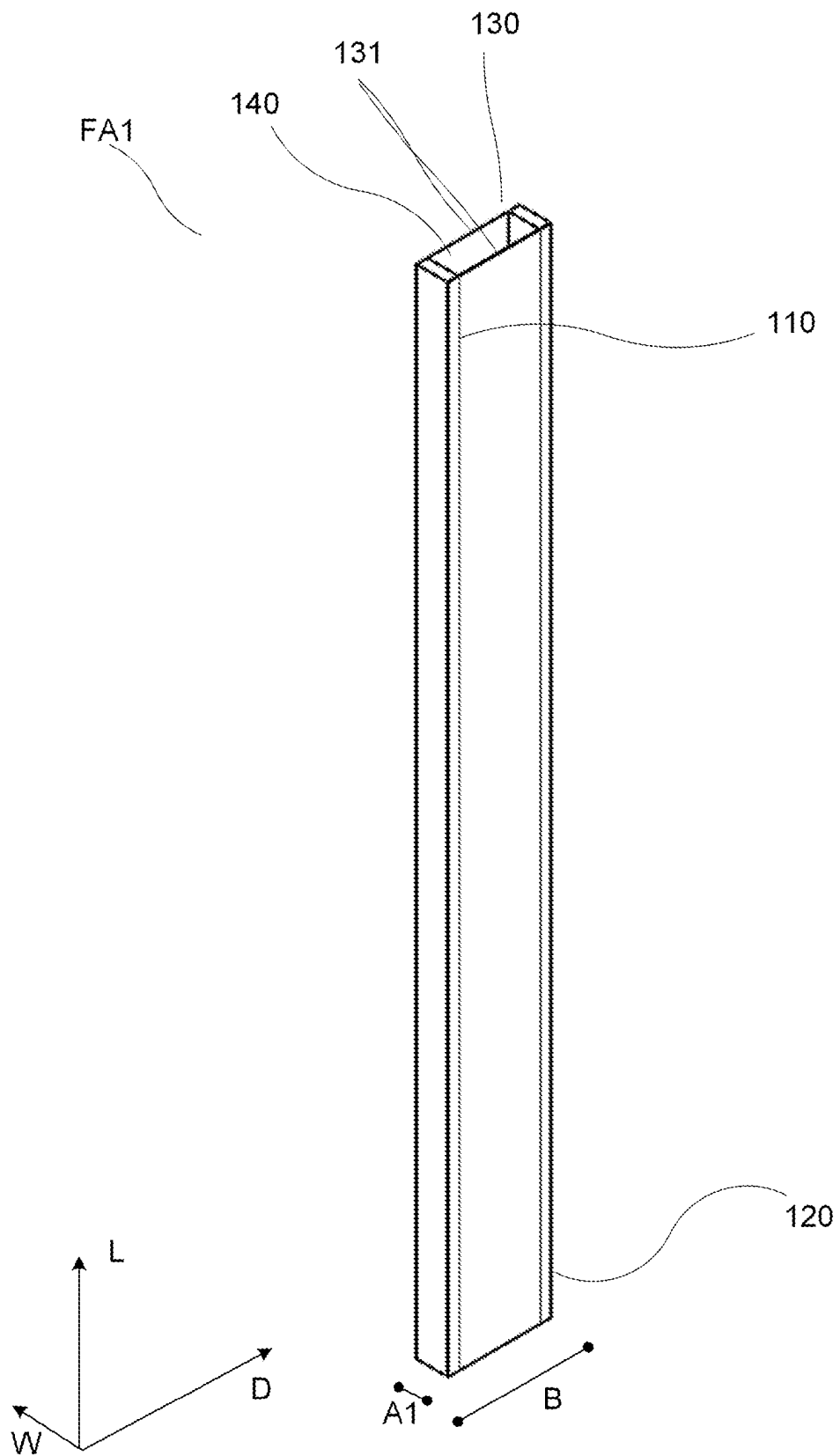


Fig. 2b

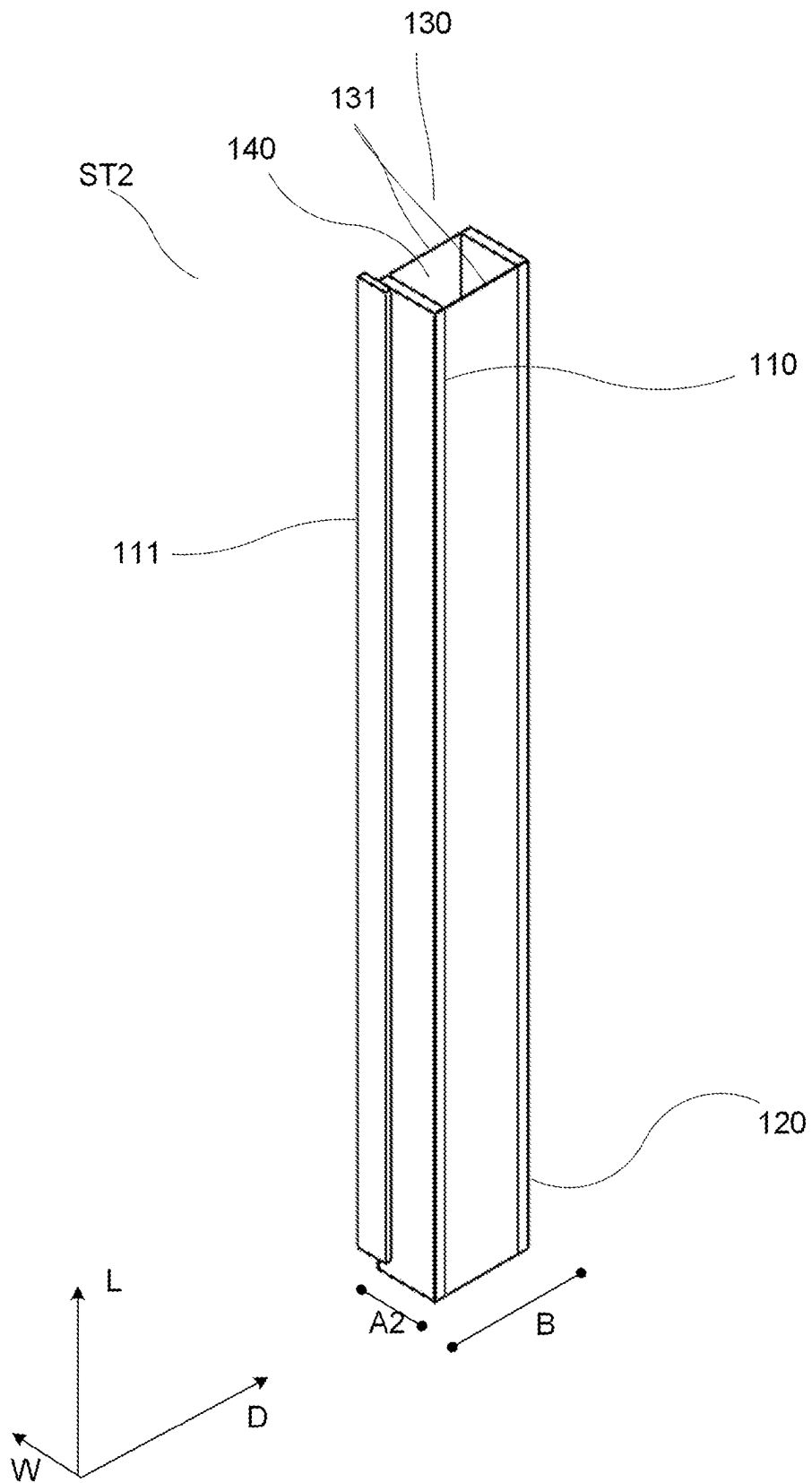


Fig. 2c

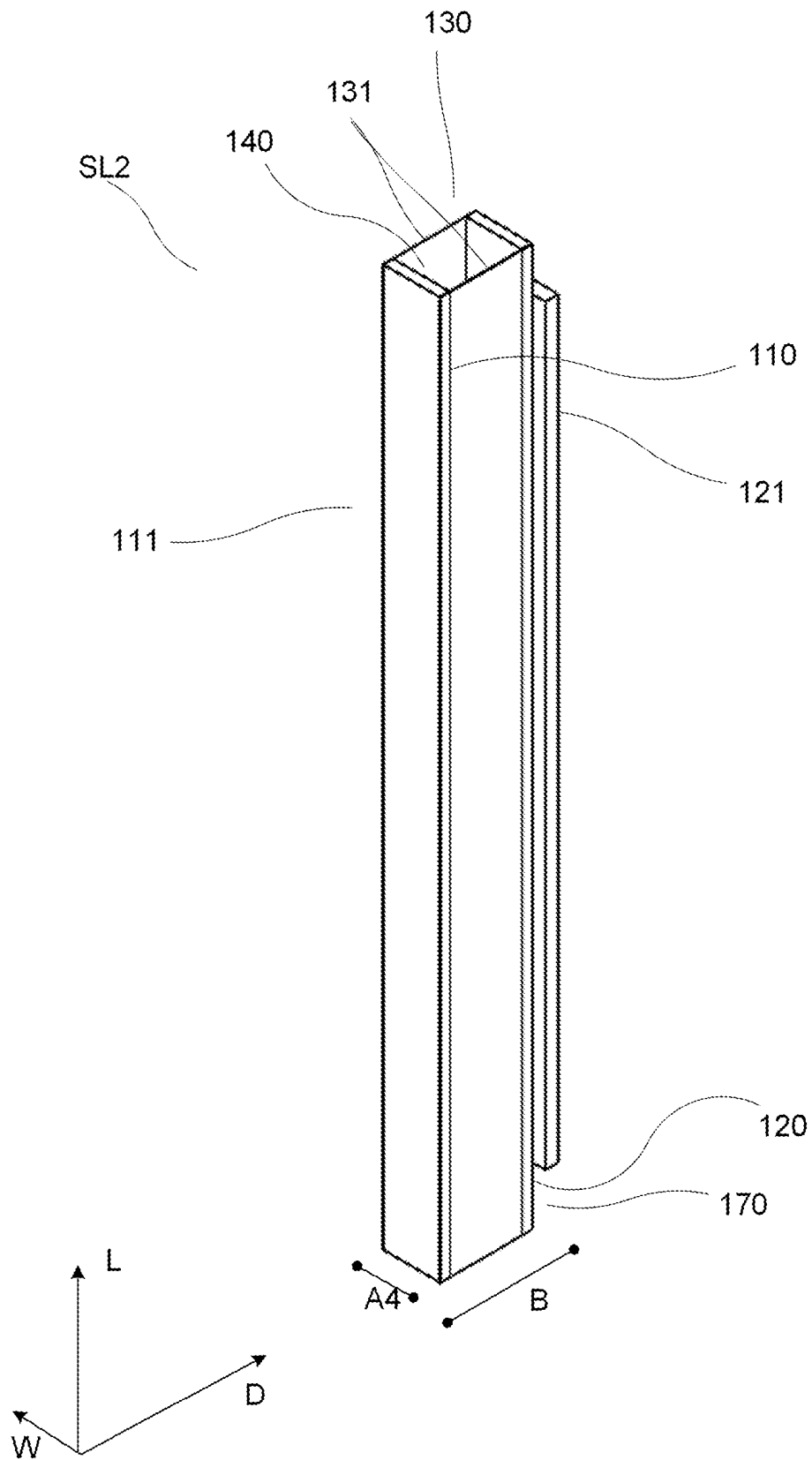


Fig. 2d

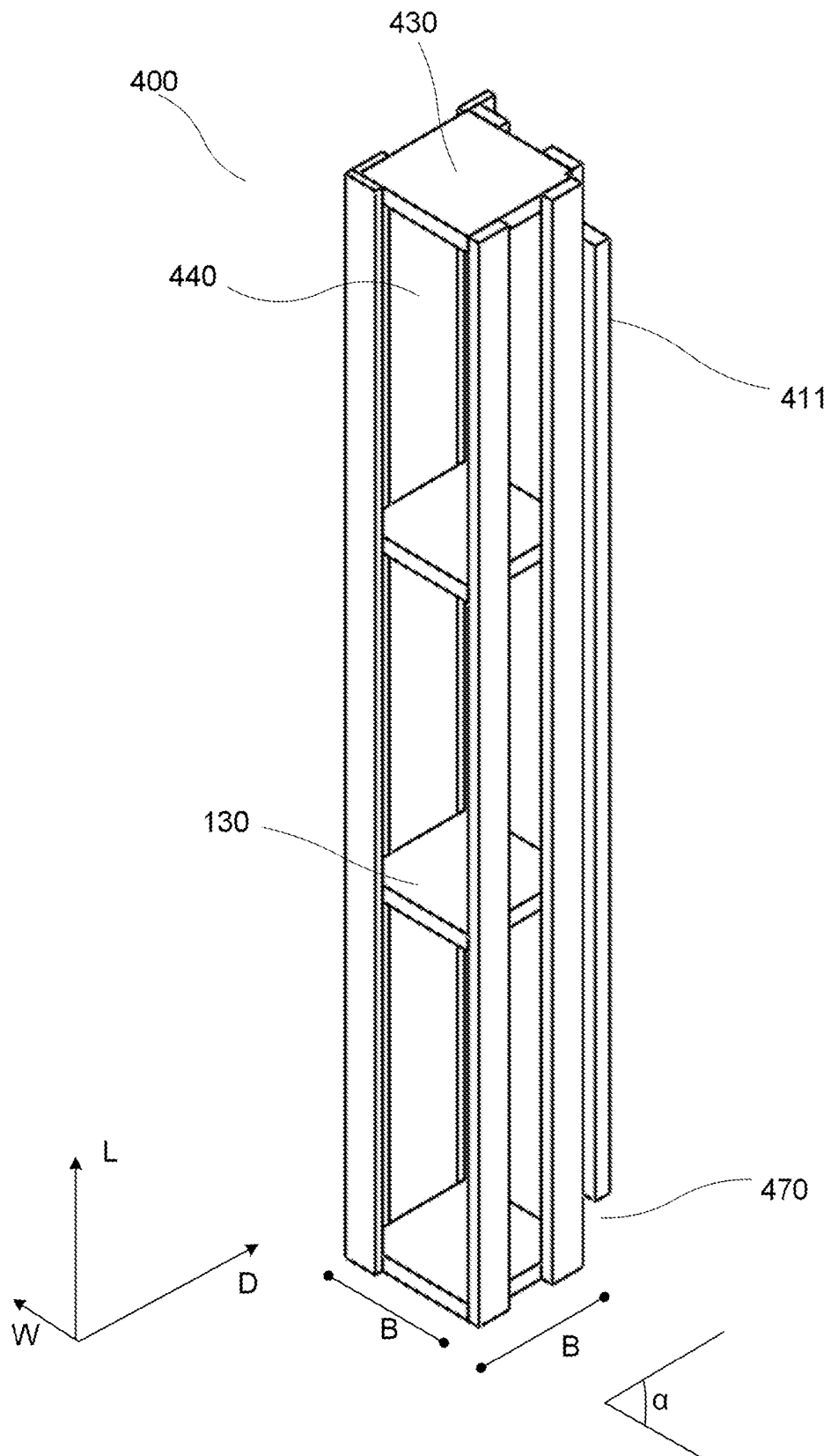


Fig. 3a

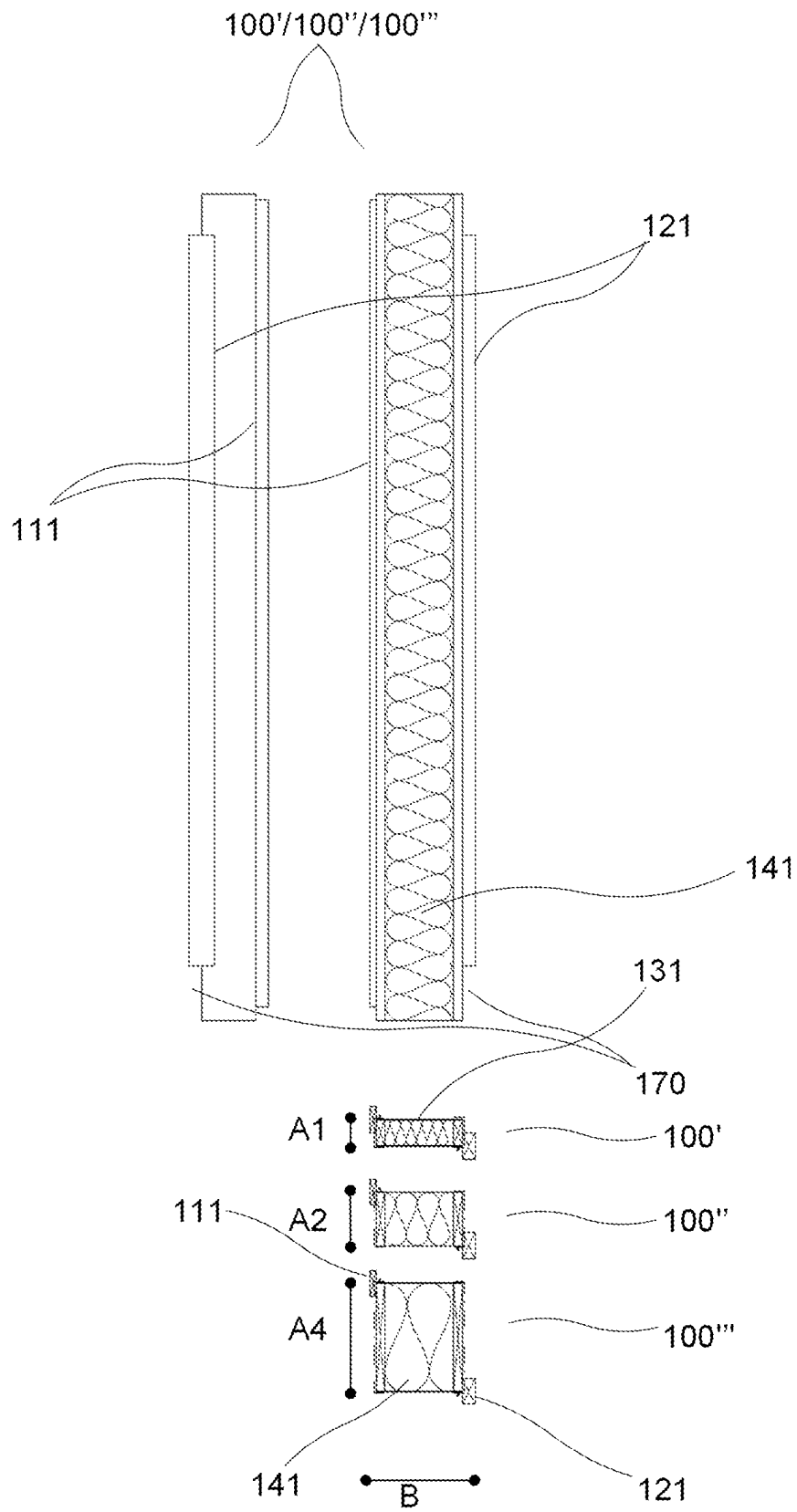


Fig. 3b

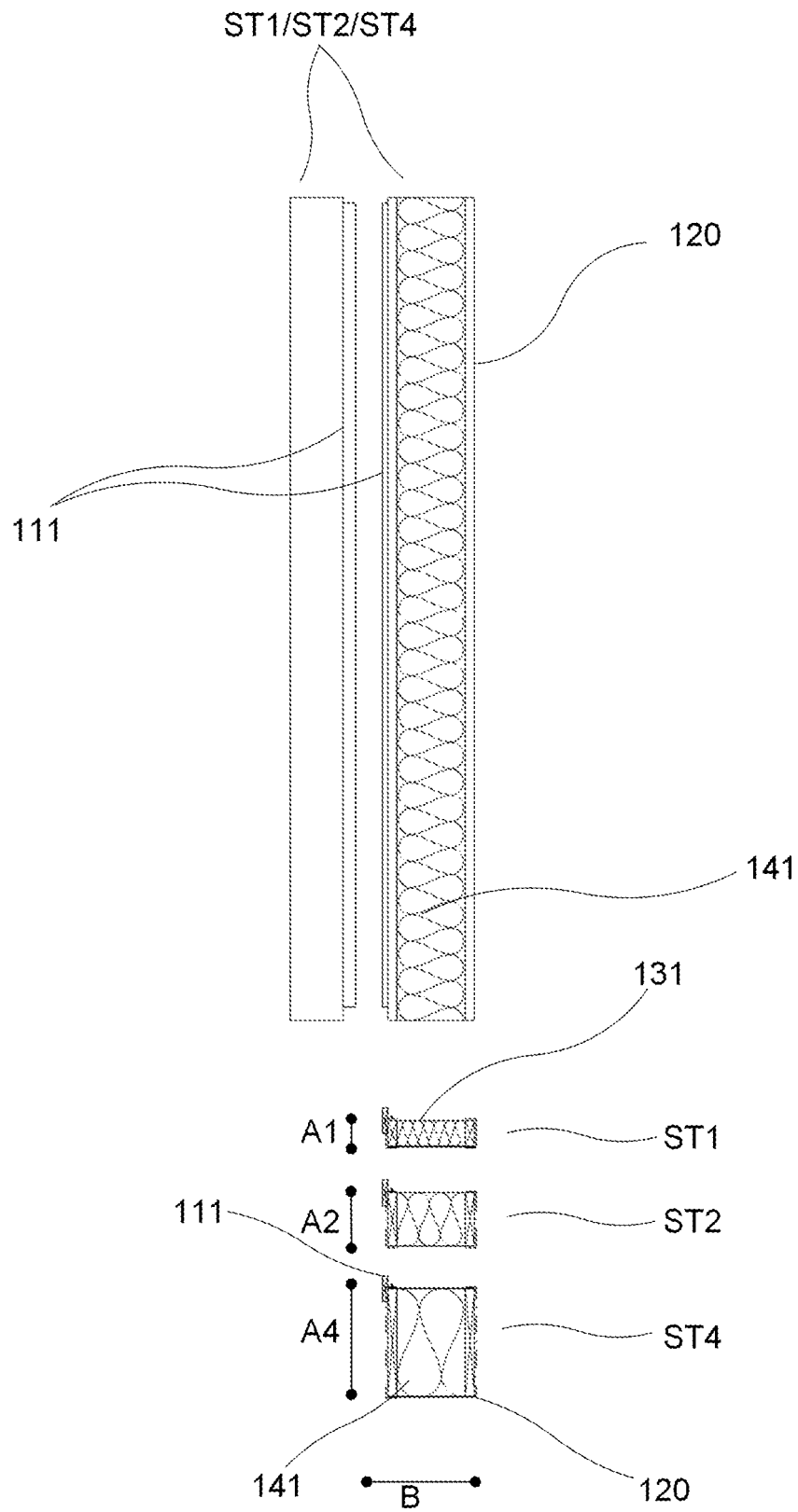


Fig. 3c

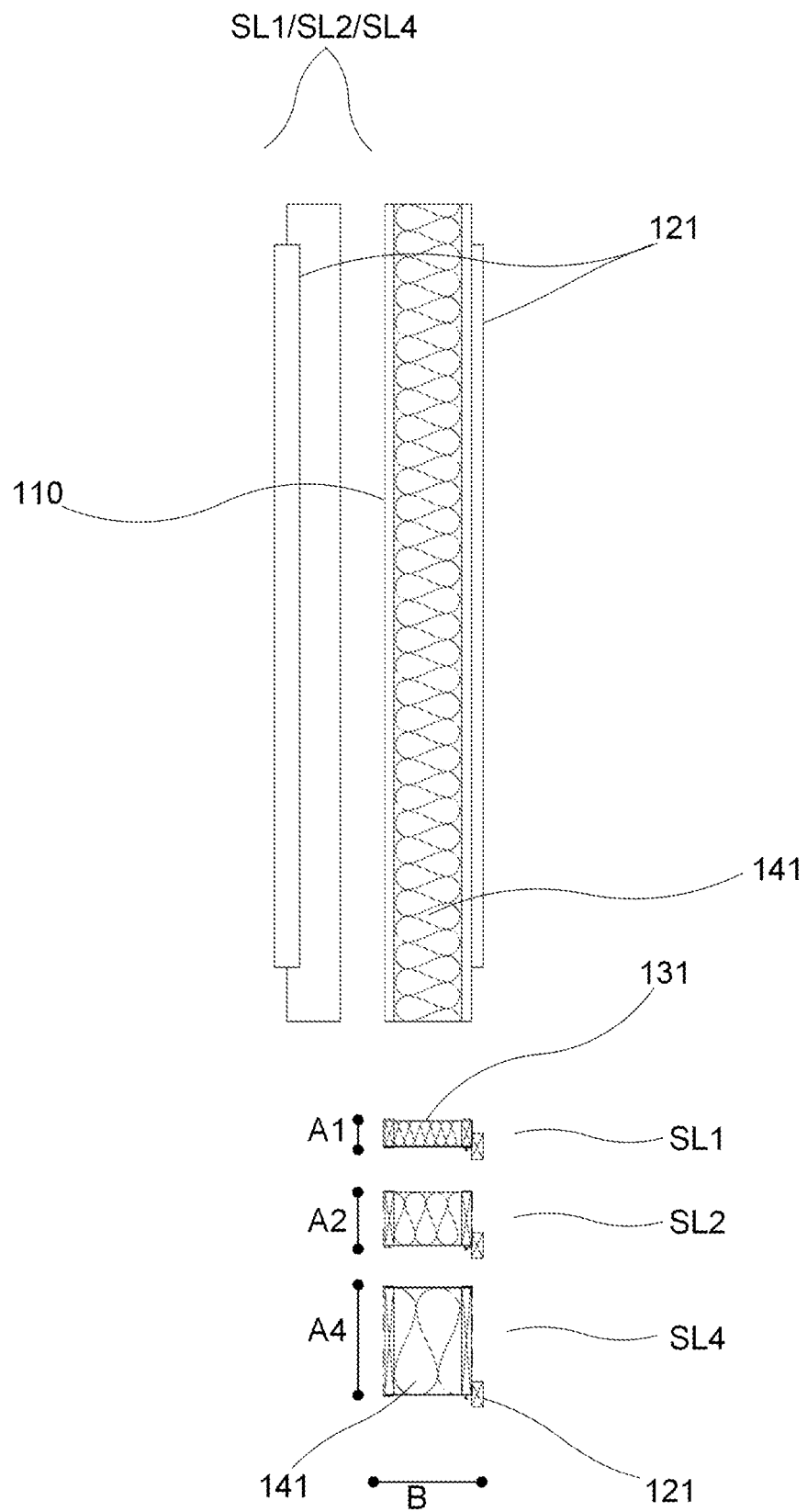


Fig. 3d

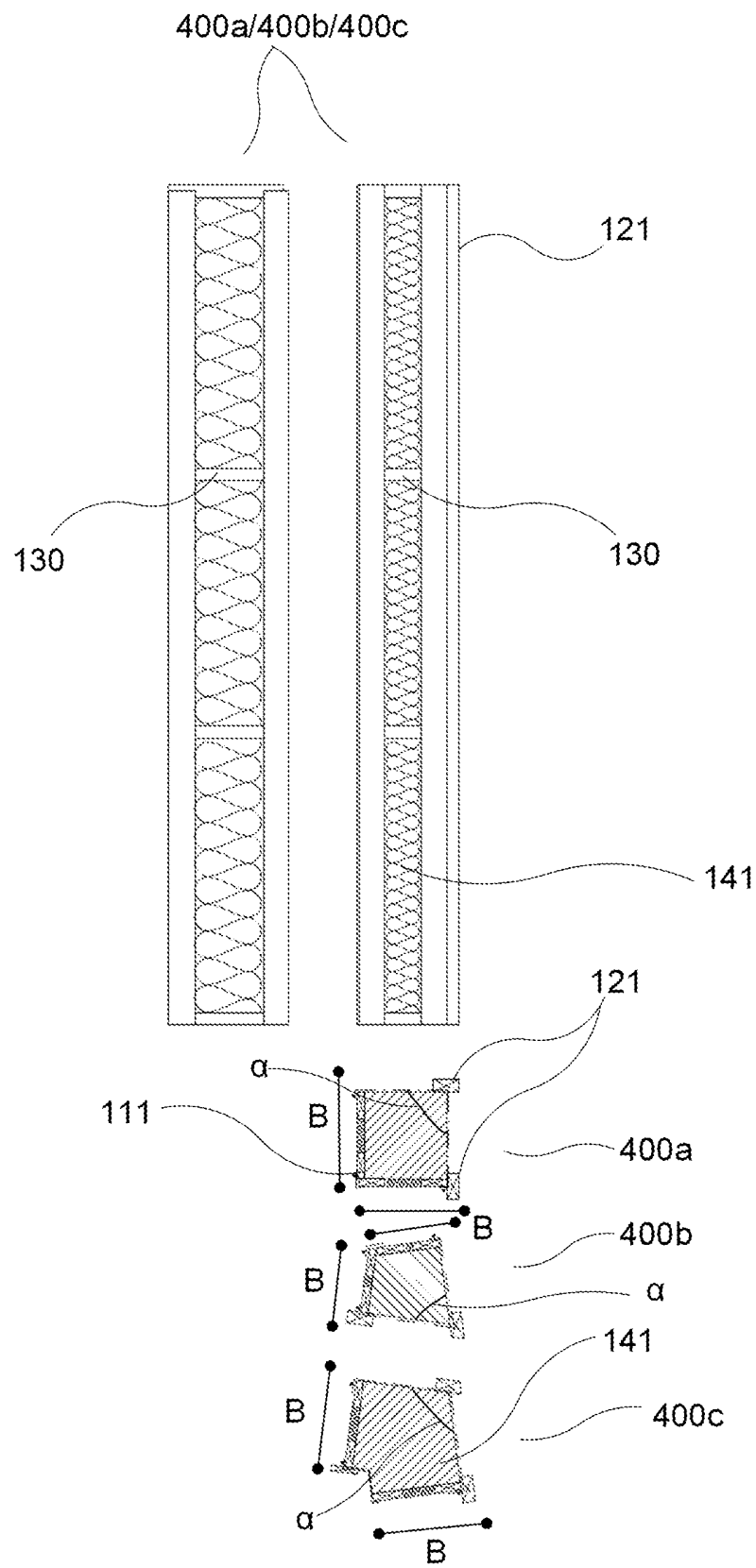


Fig. 3e

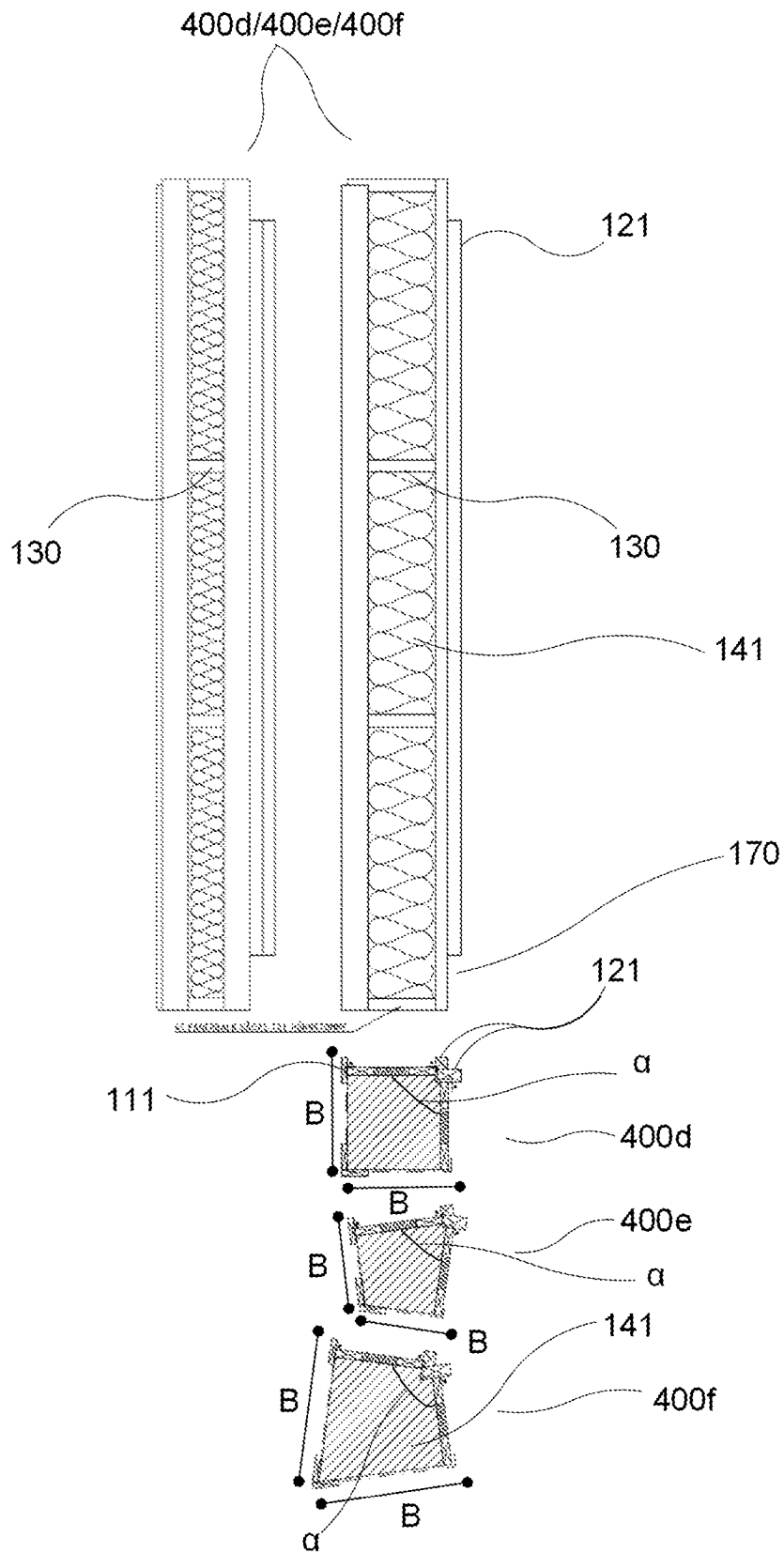


Fig. 4a

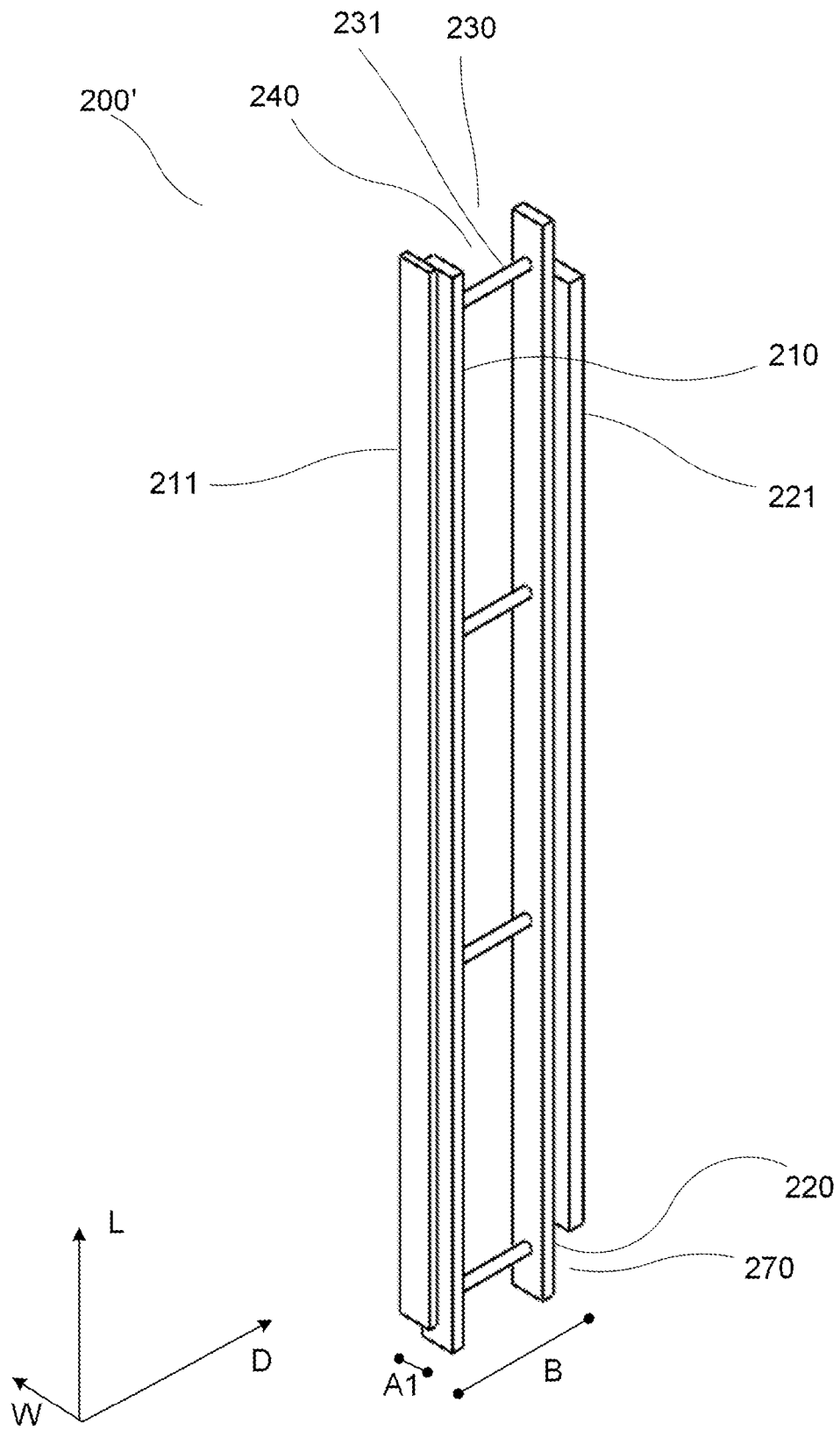


Fig. 4b

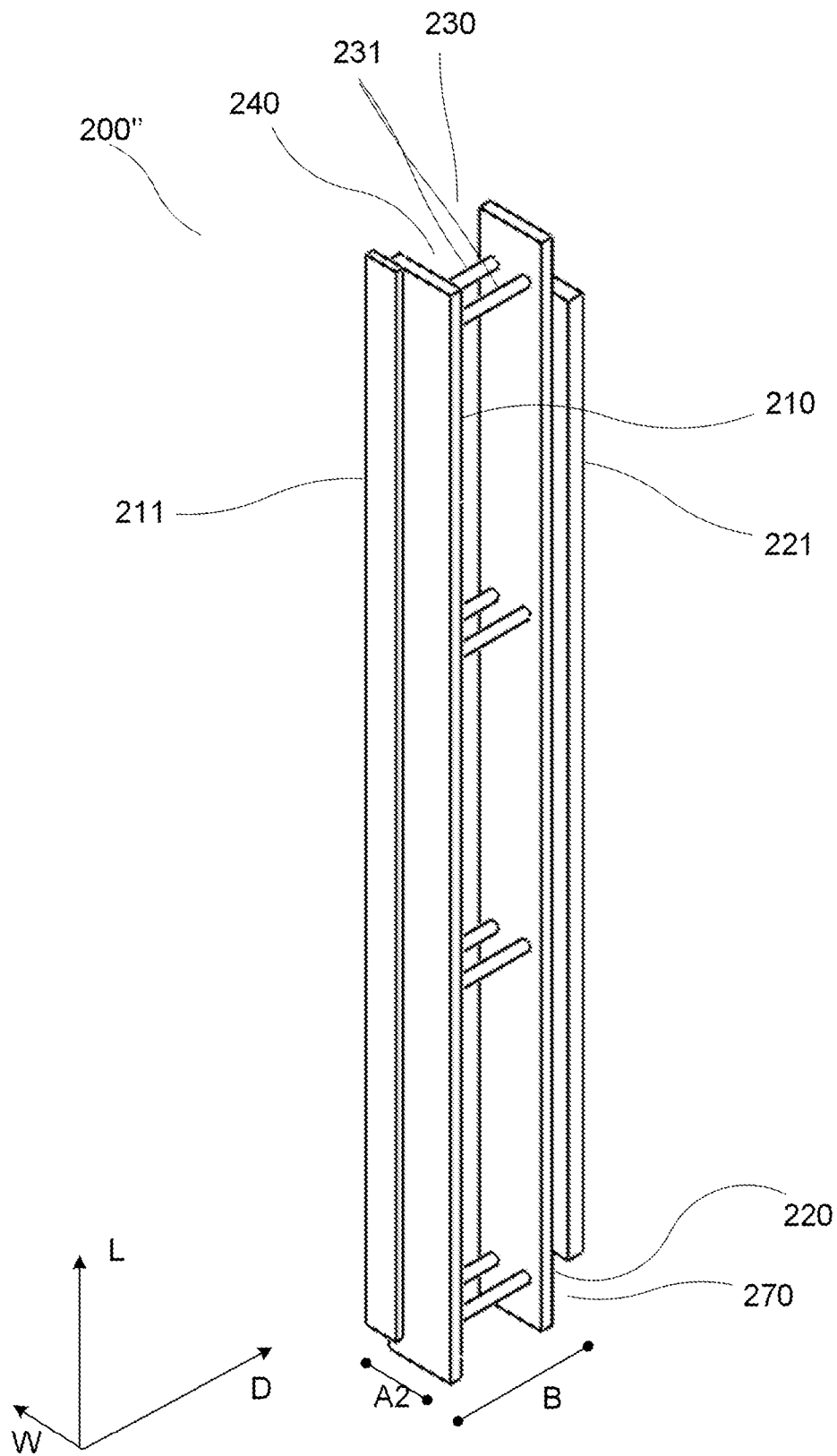


Fig. 4c

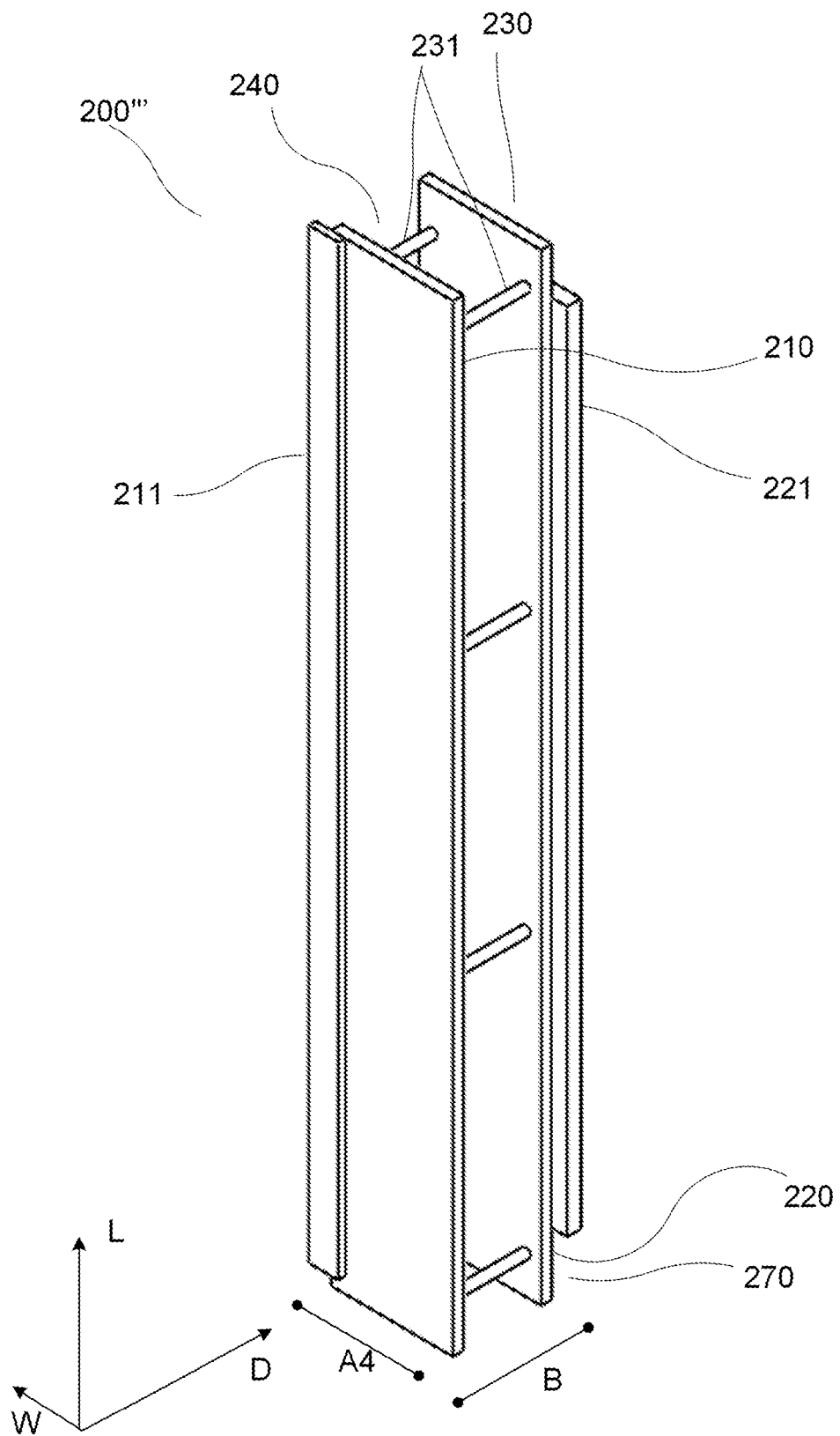


Fig. 5a

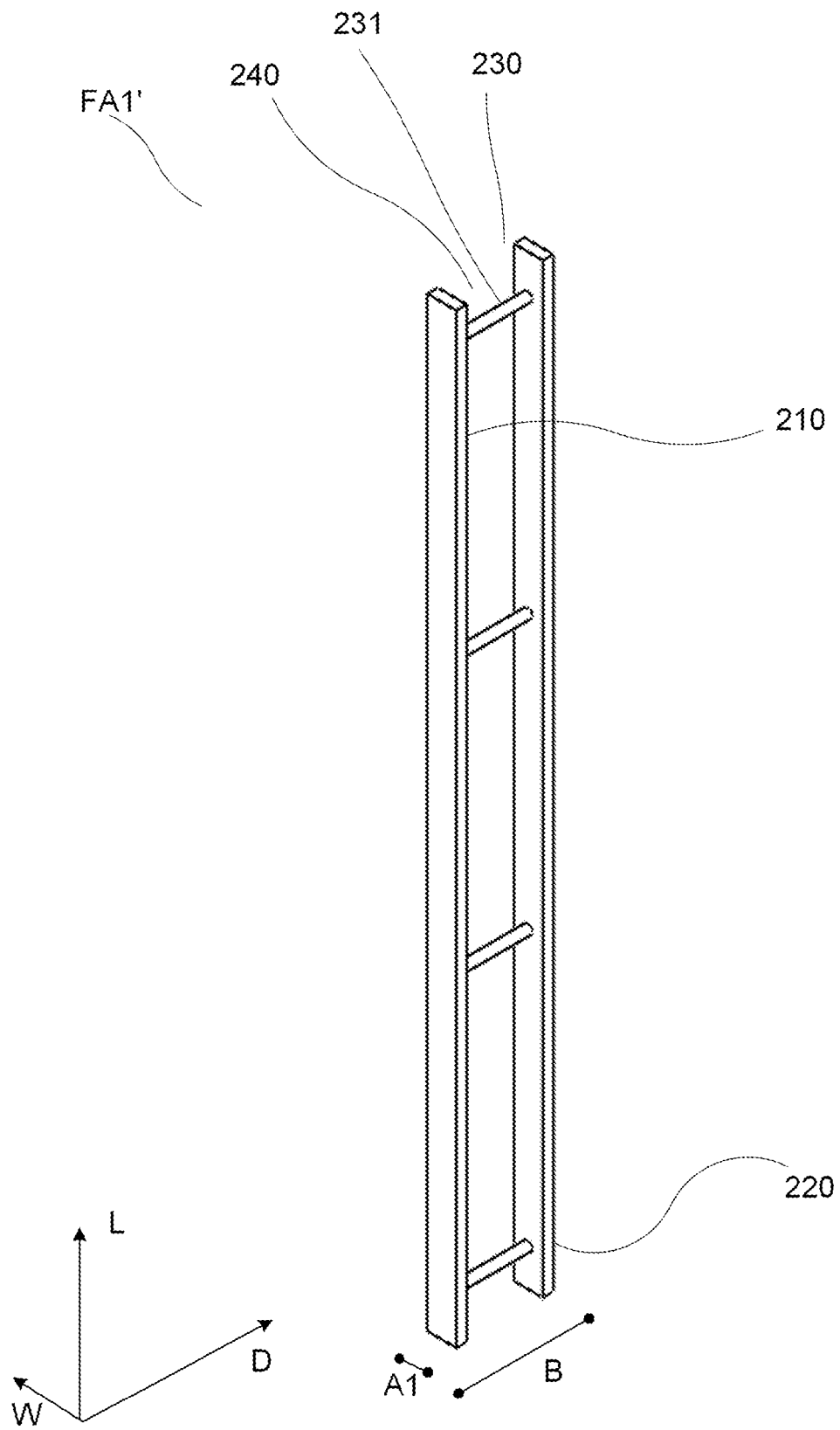


Fig. 5b

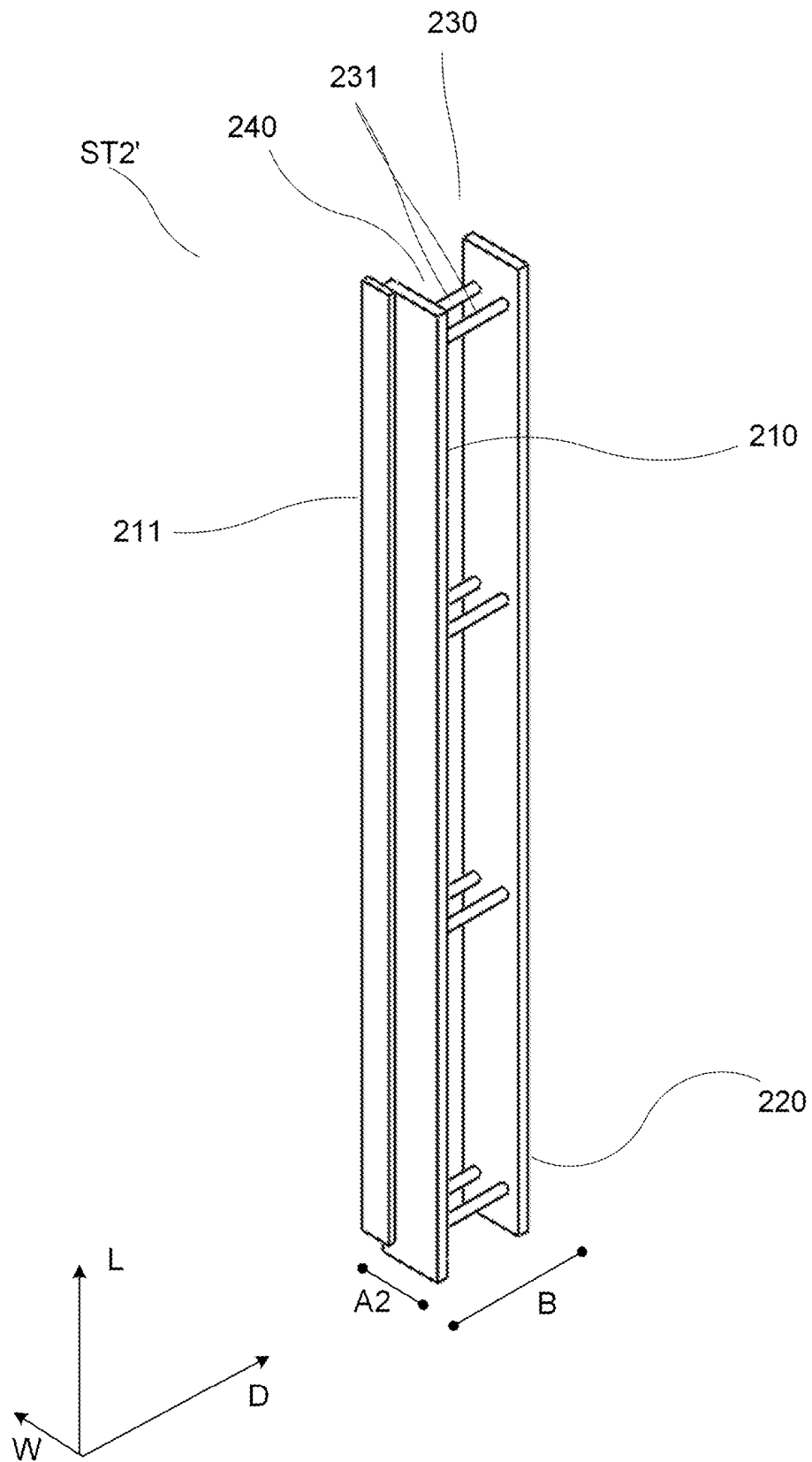


Fig. 5c

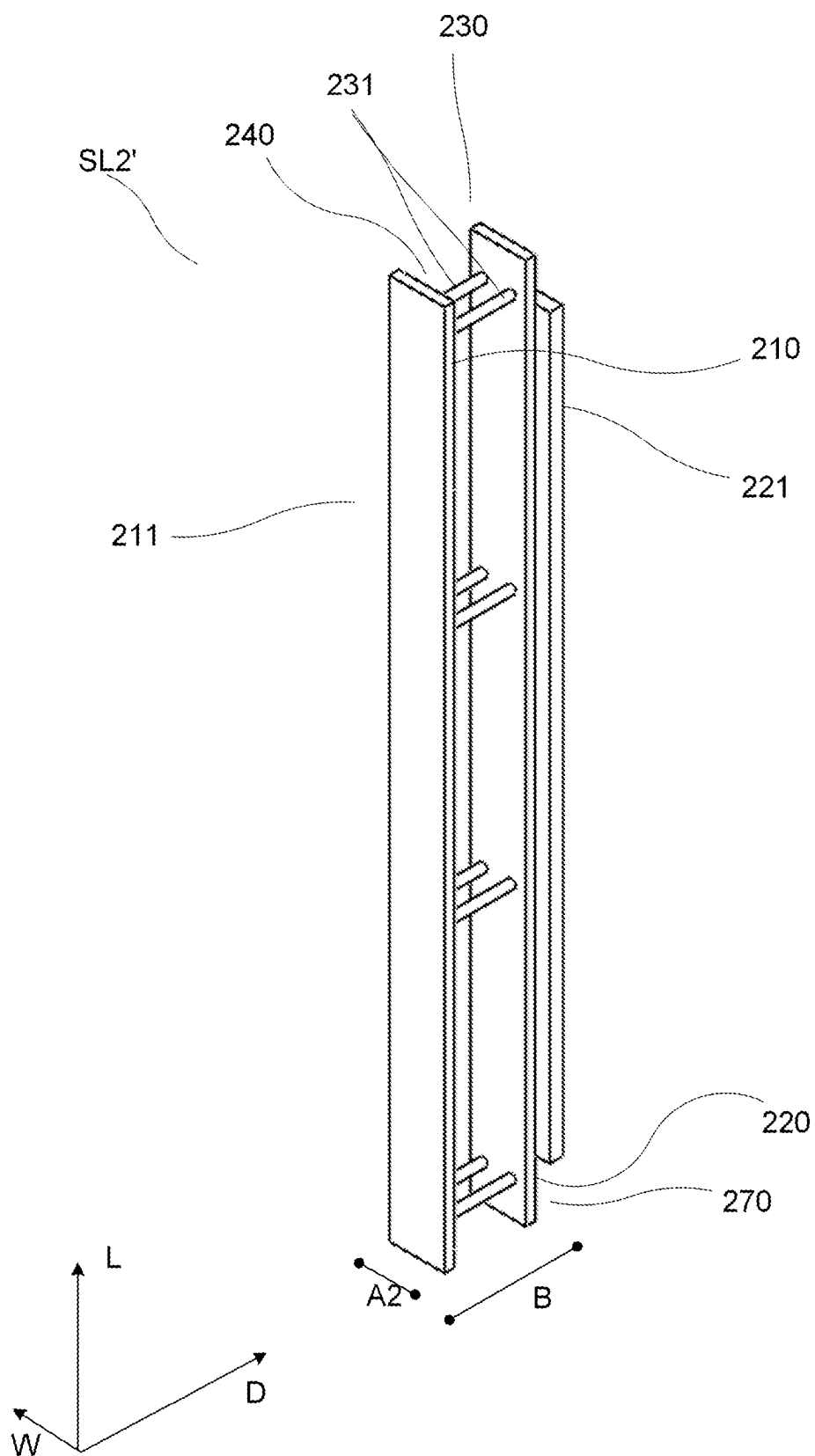


Fig. 5d

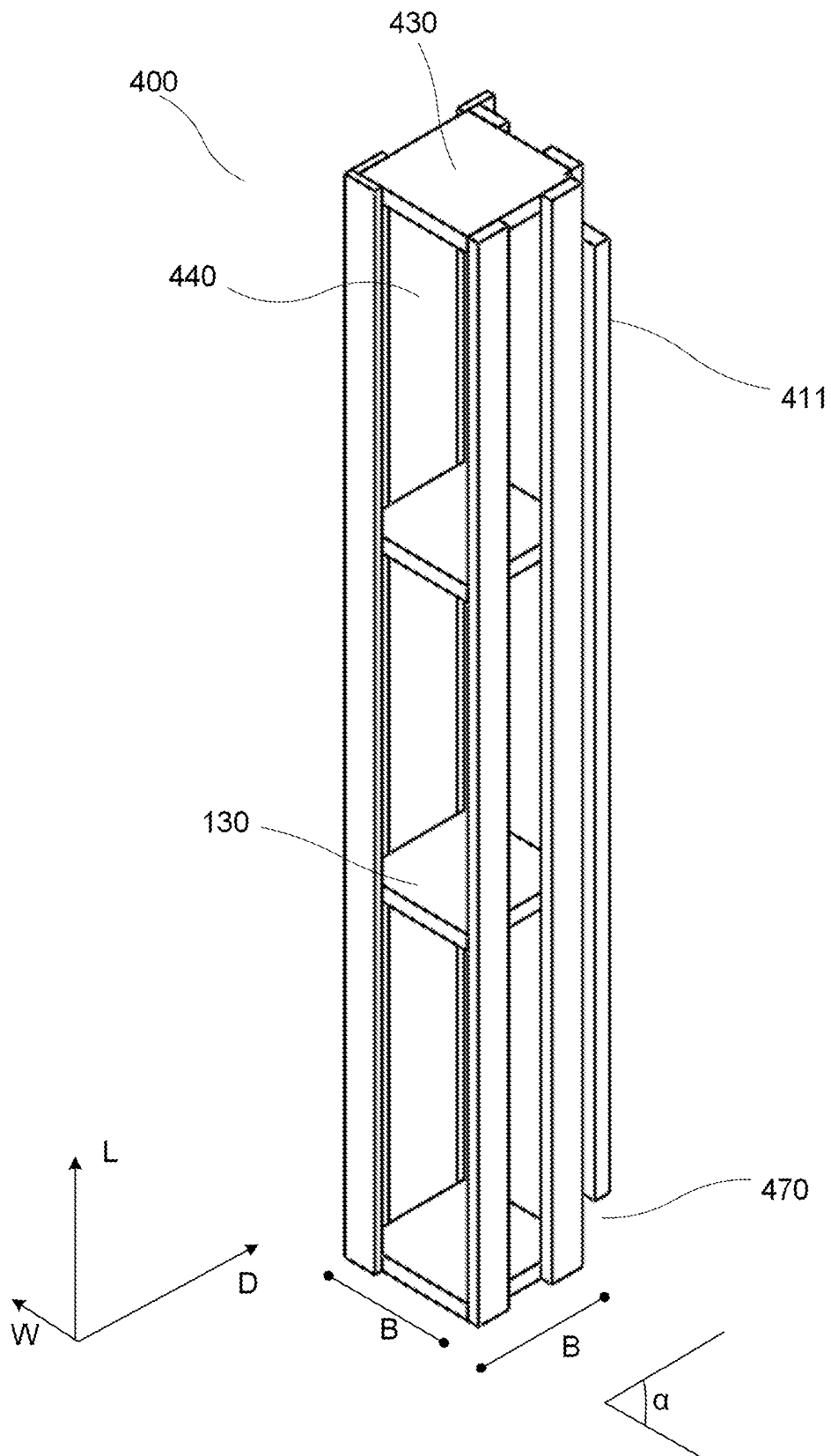


Fig. 6a

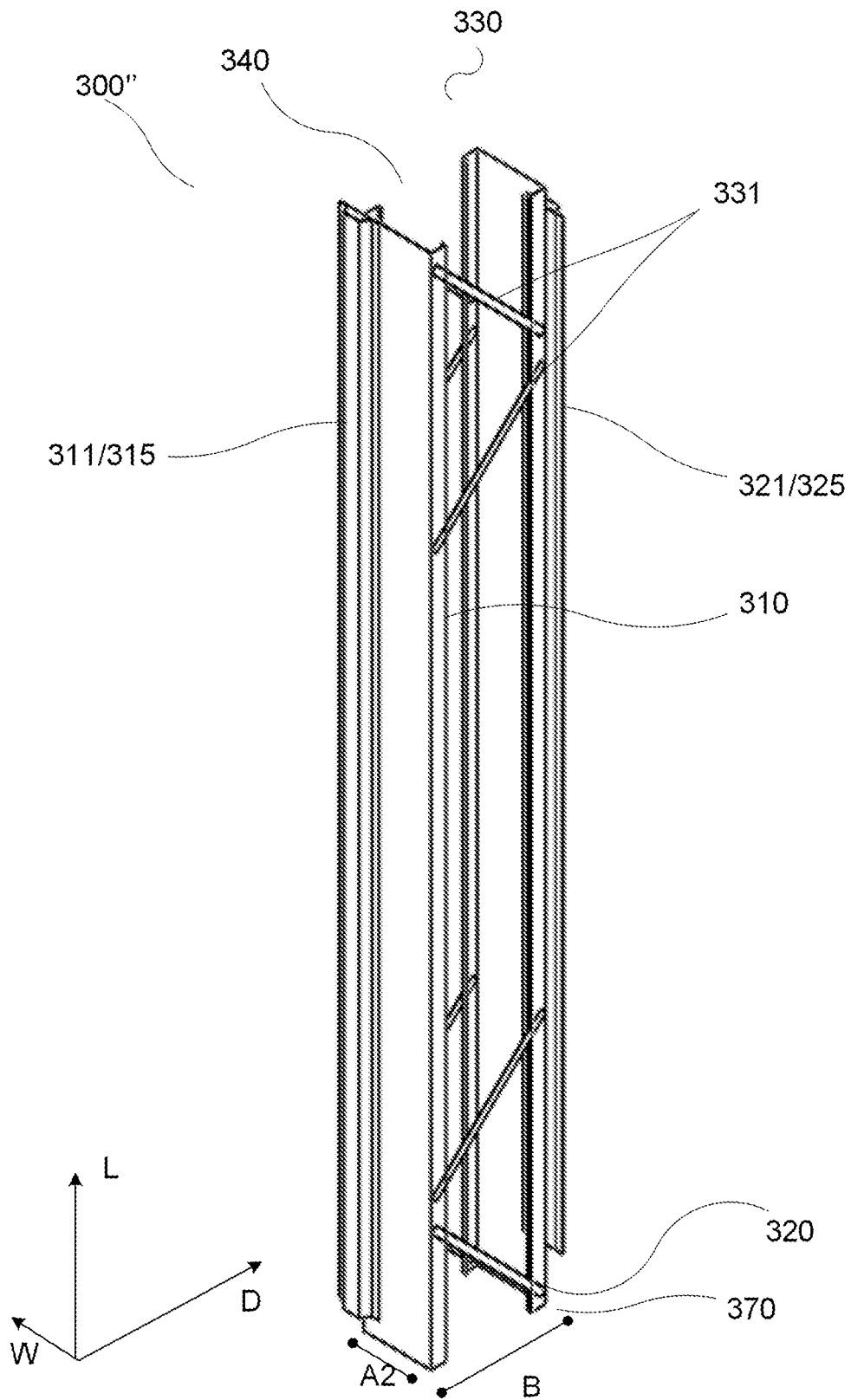


Fig. 6b

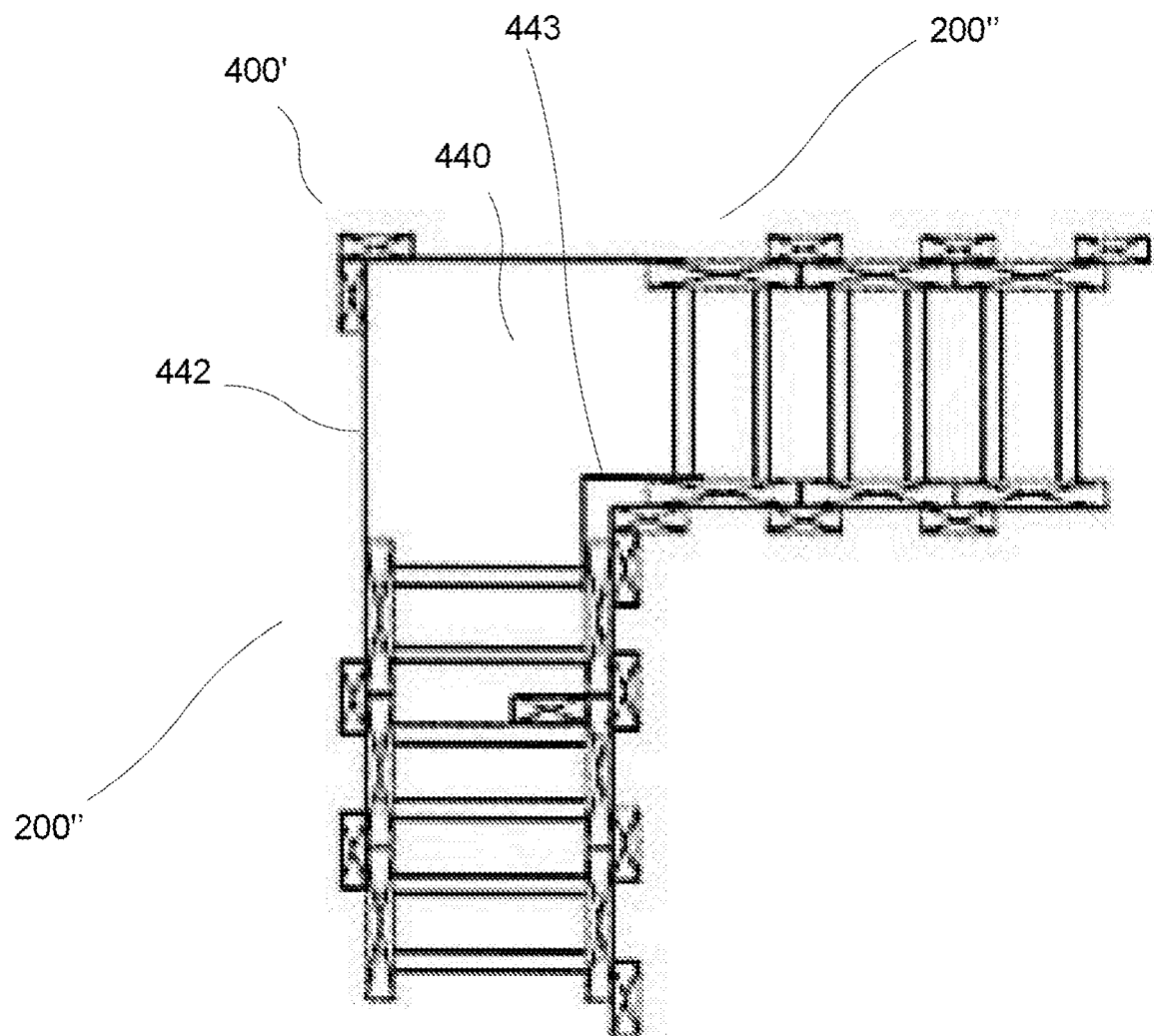


Fig. 6c

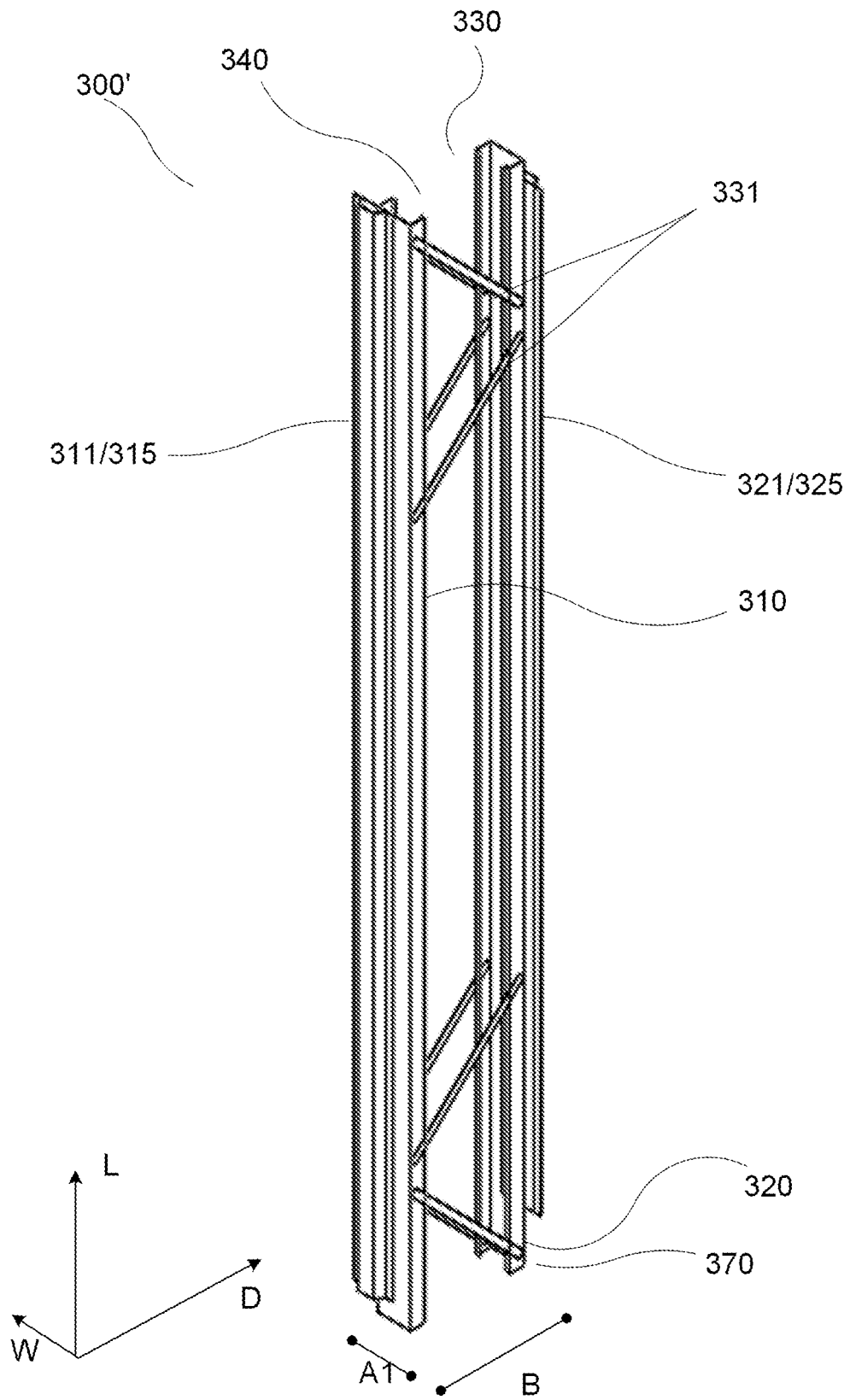


Fig. 6d

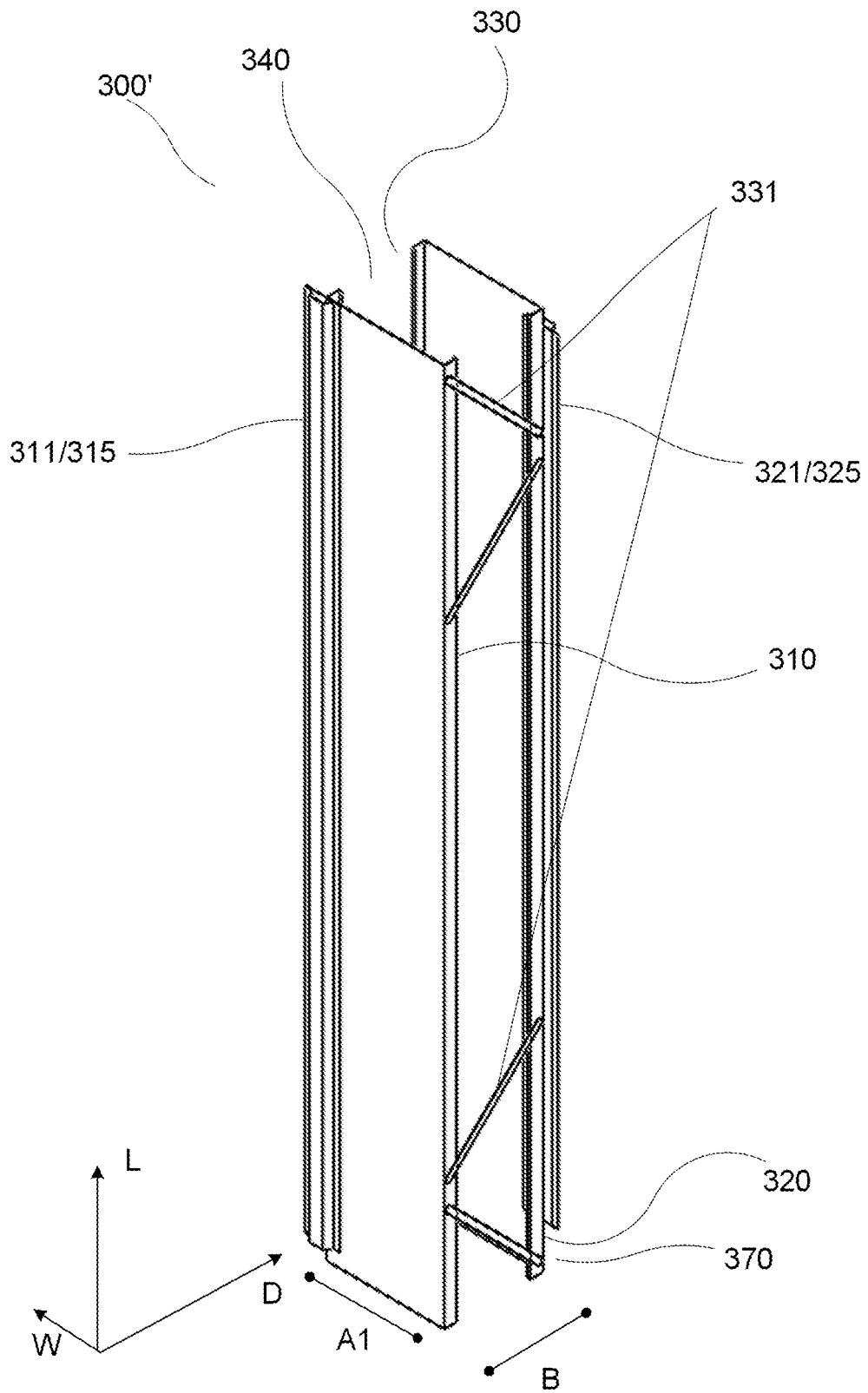


Fig. 7

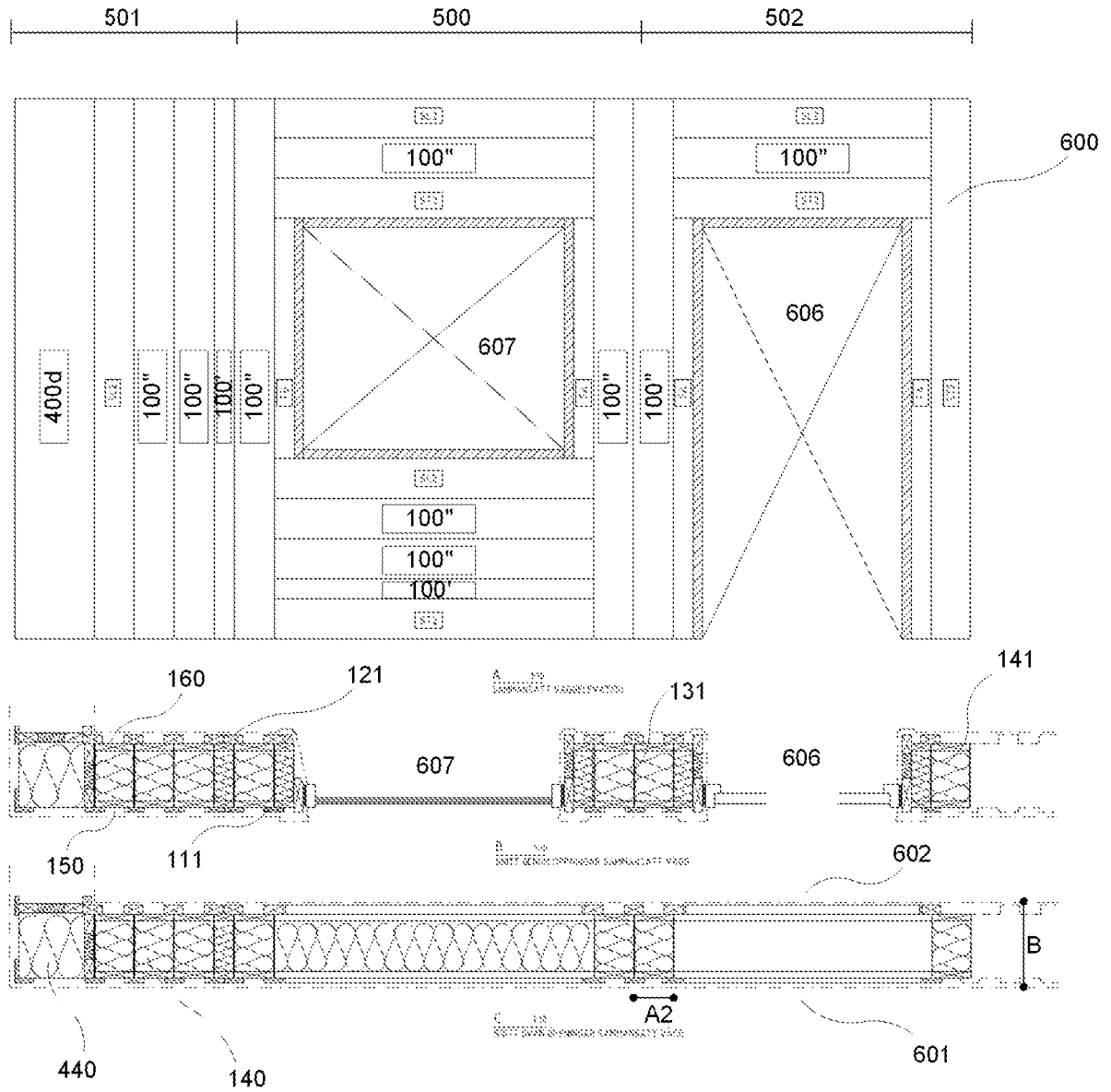


Fig. 8a

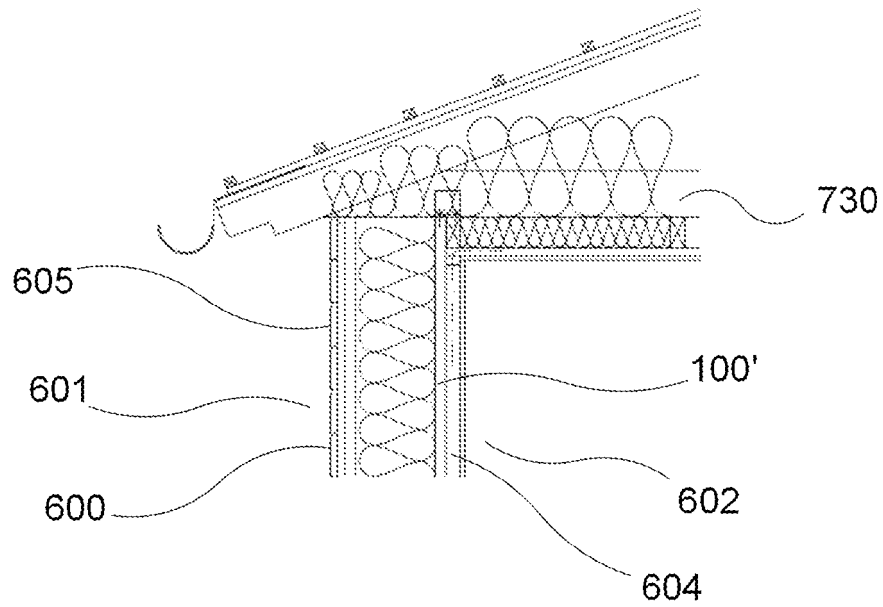


Fig. 8b

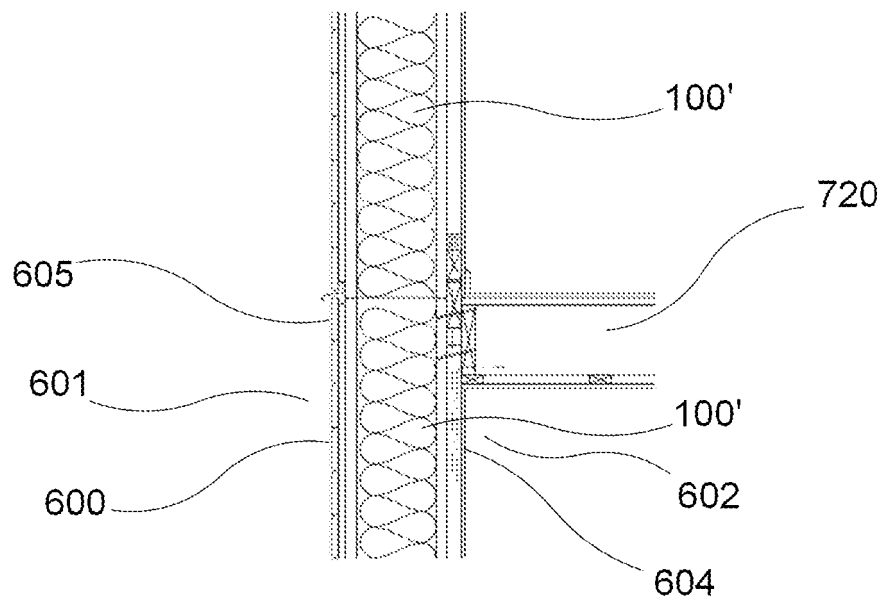


Fig. 8c

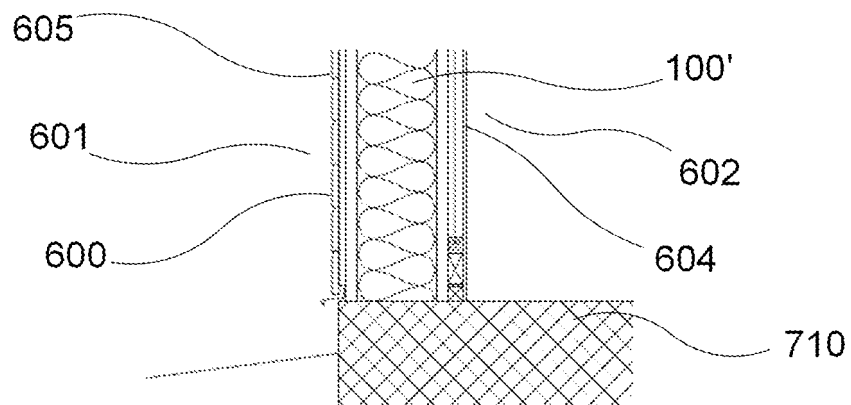


Fig. 8d

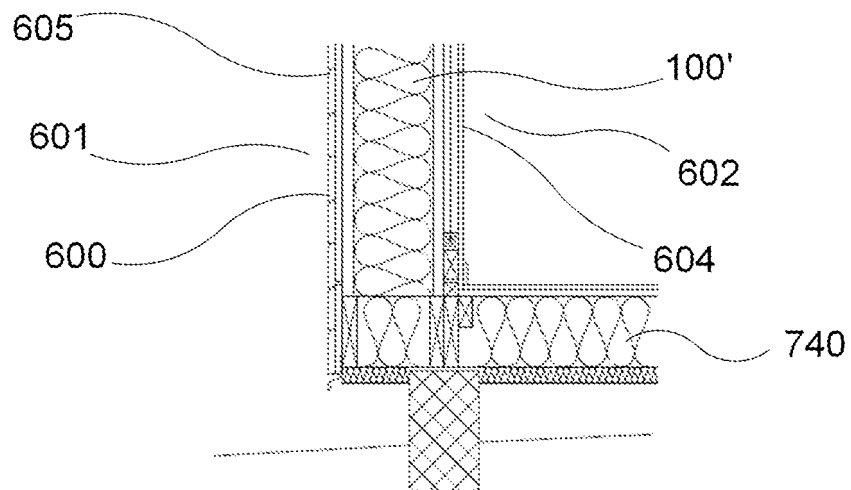


Fig. 8e

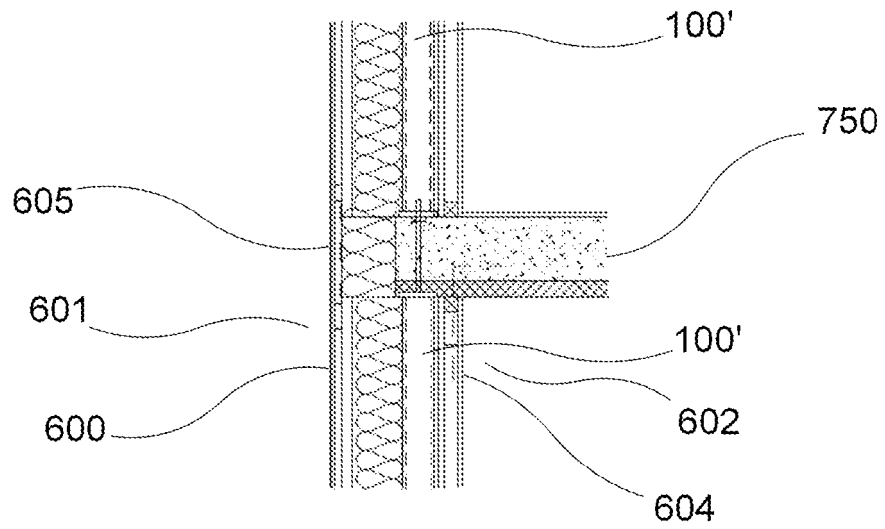


Fig. 9a

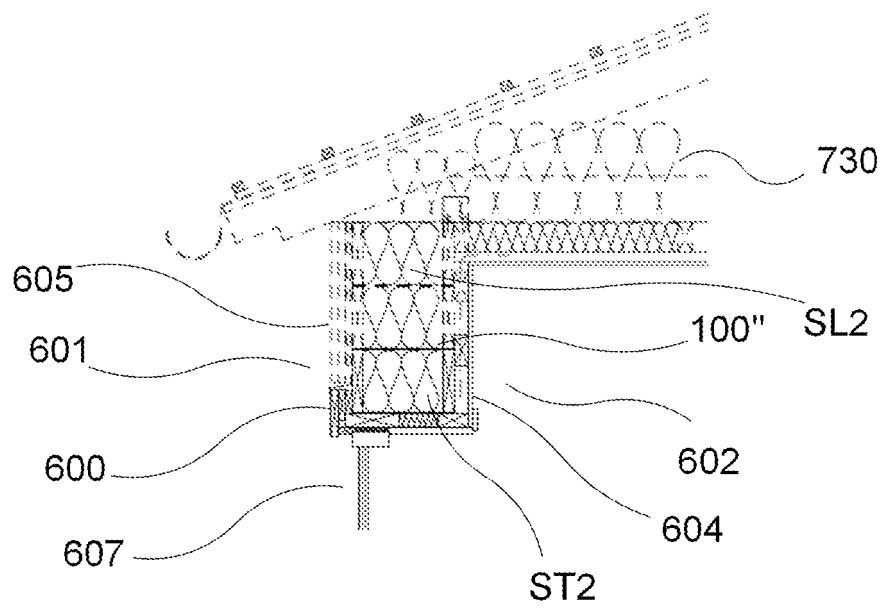


Fig. 9b

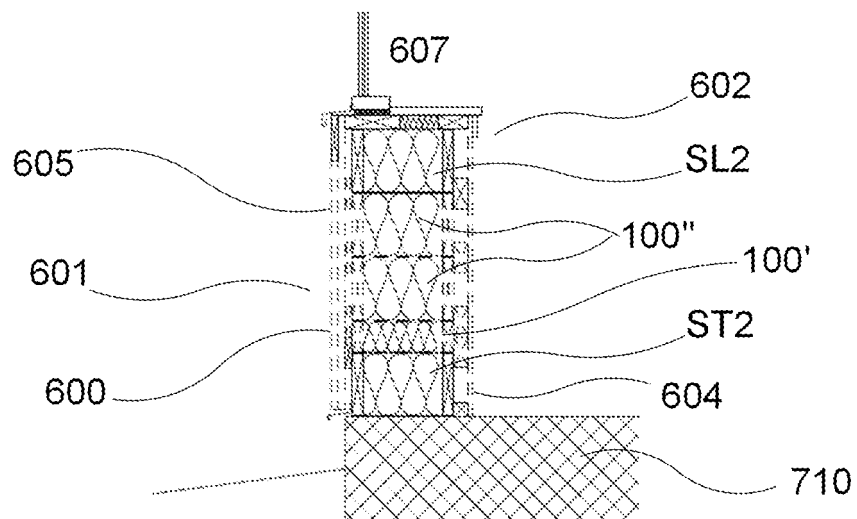


Fig. 9c

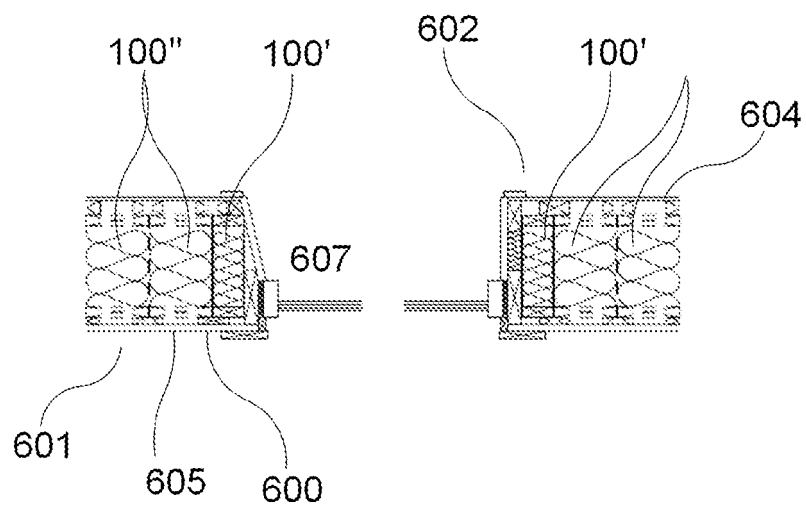


Fig. 10a

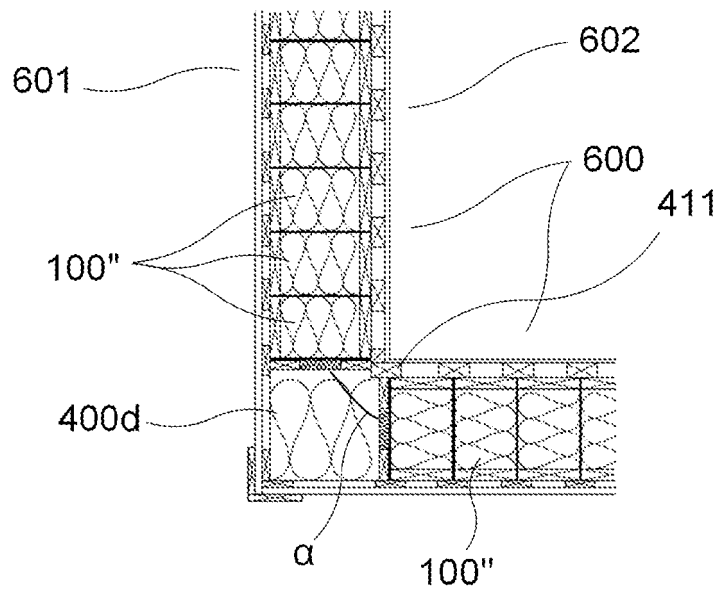


Fig. 10b

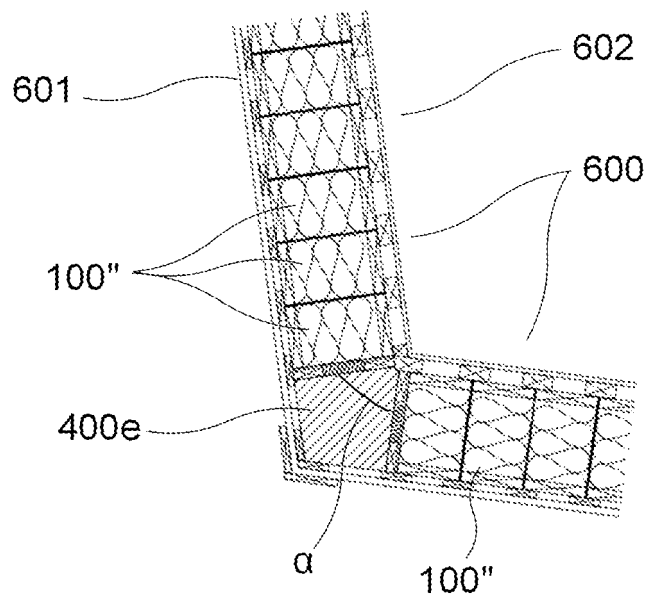


Fig. 10c

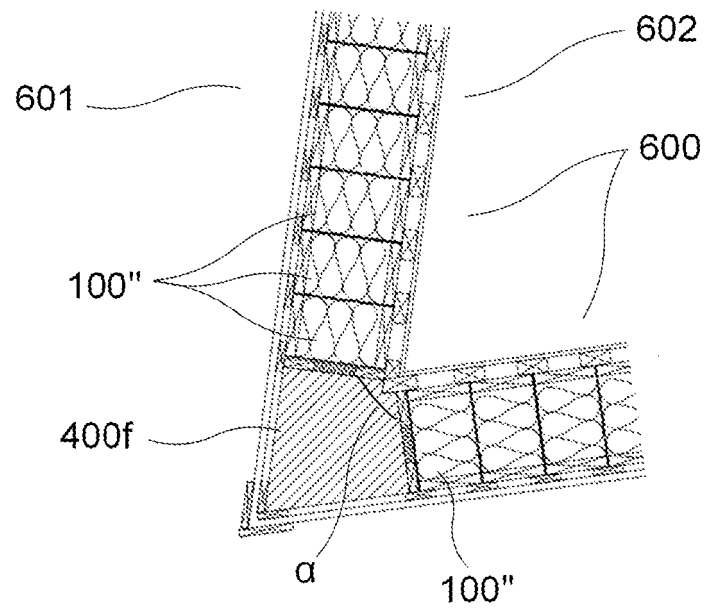


Fig. 11a

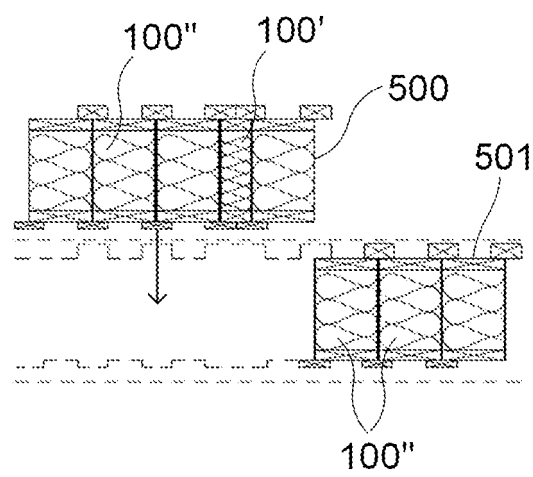


Fig. 11b

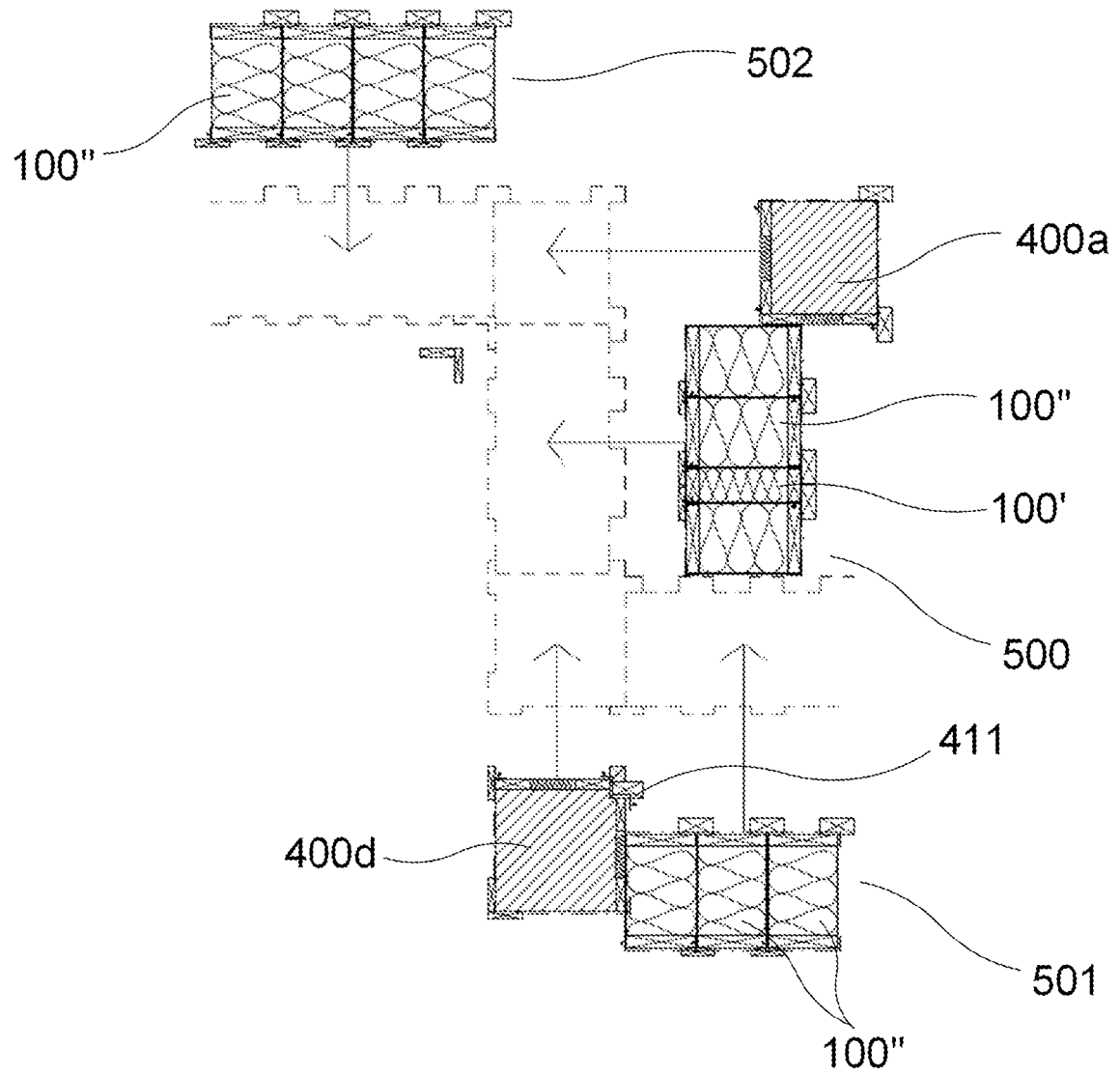


Fig. 11c

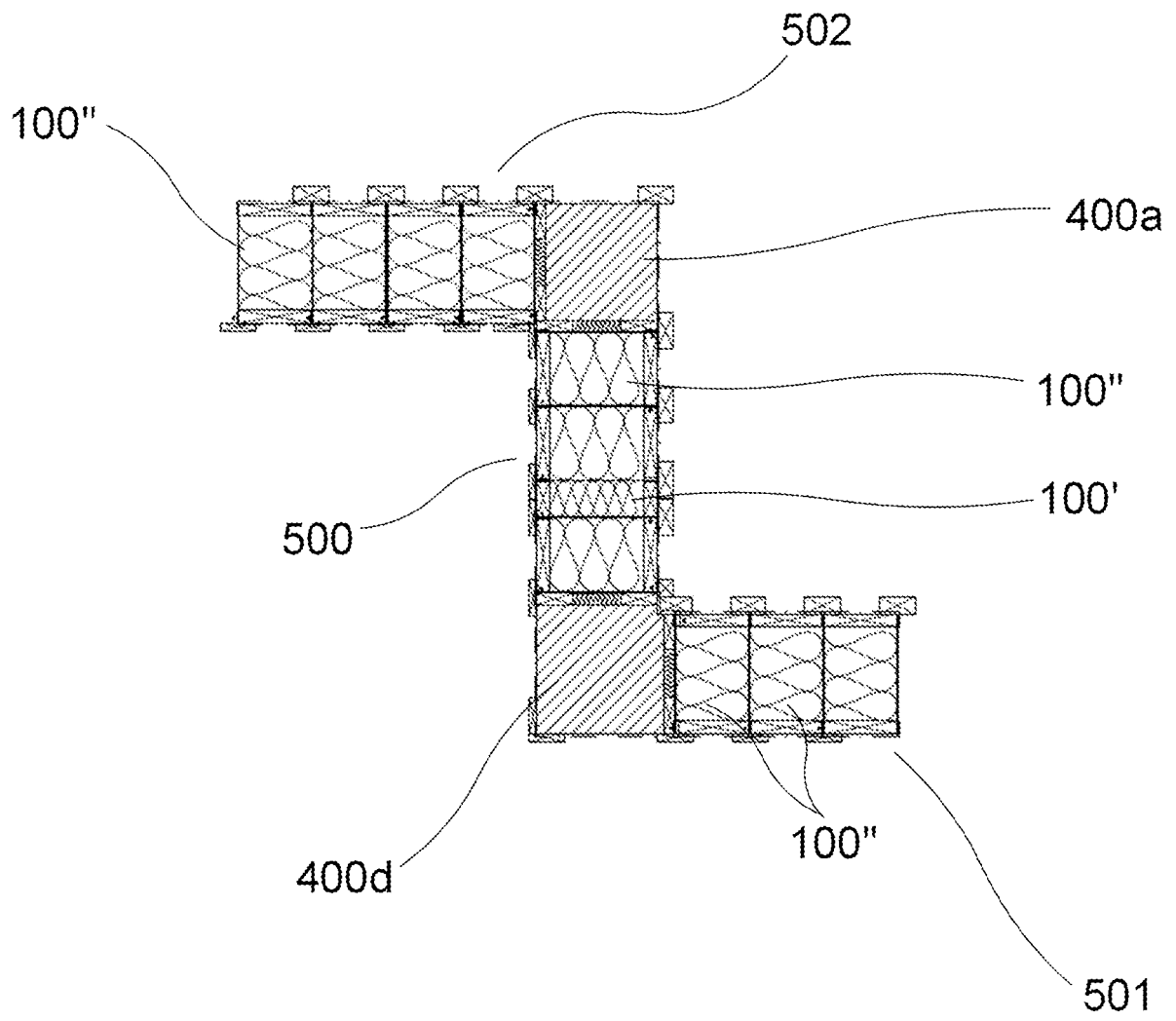


Fig. 12

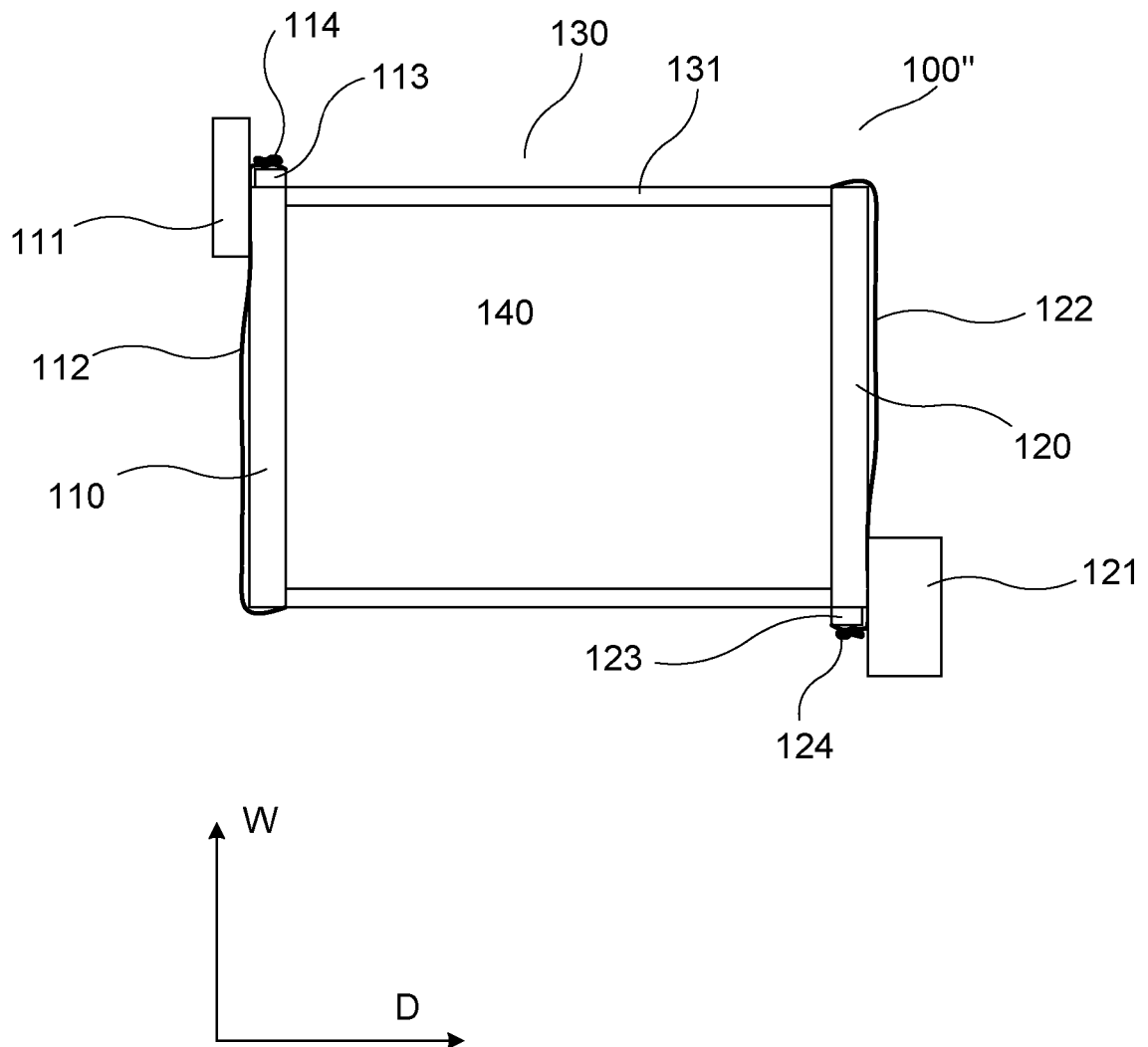


Fig. 13

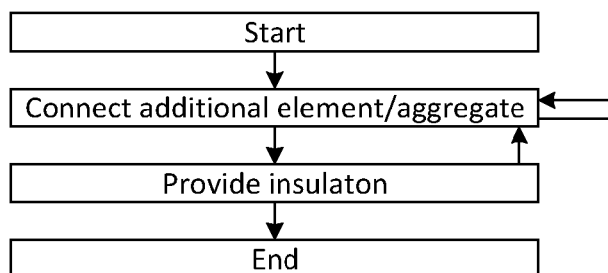


Fig. 14

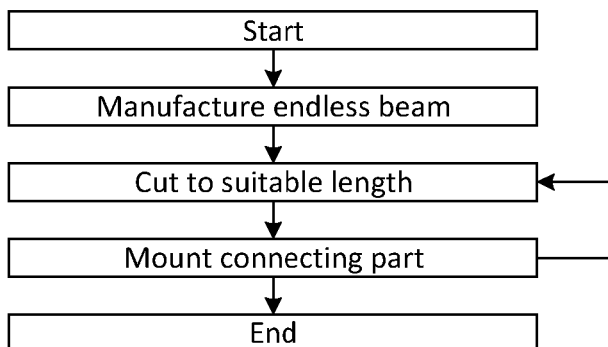


Fig. 15

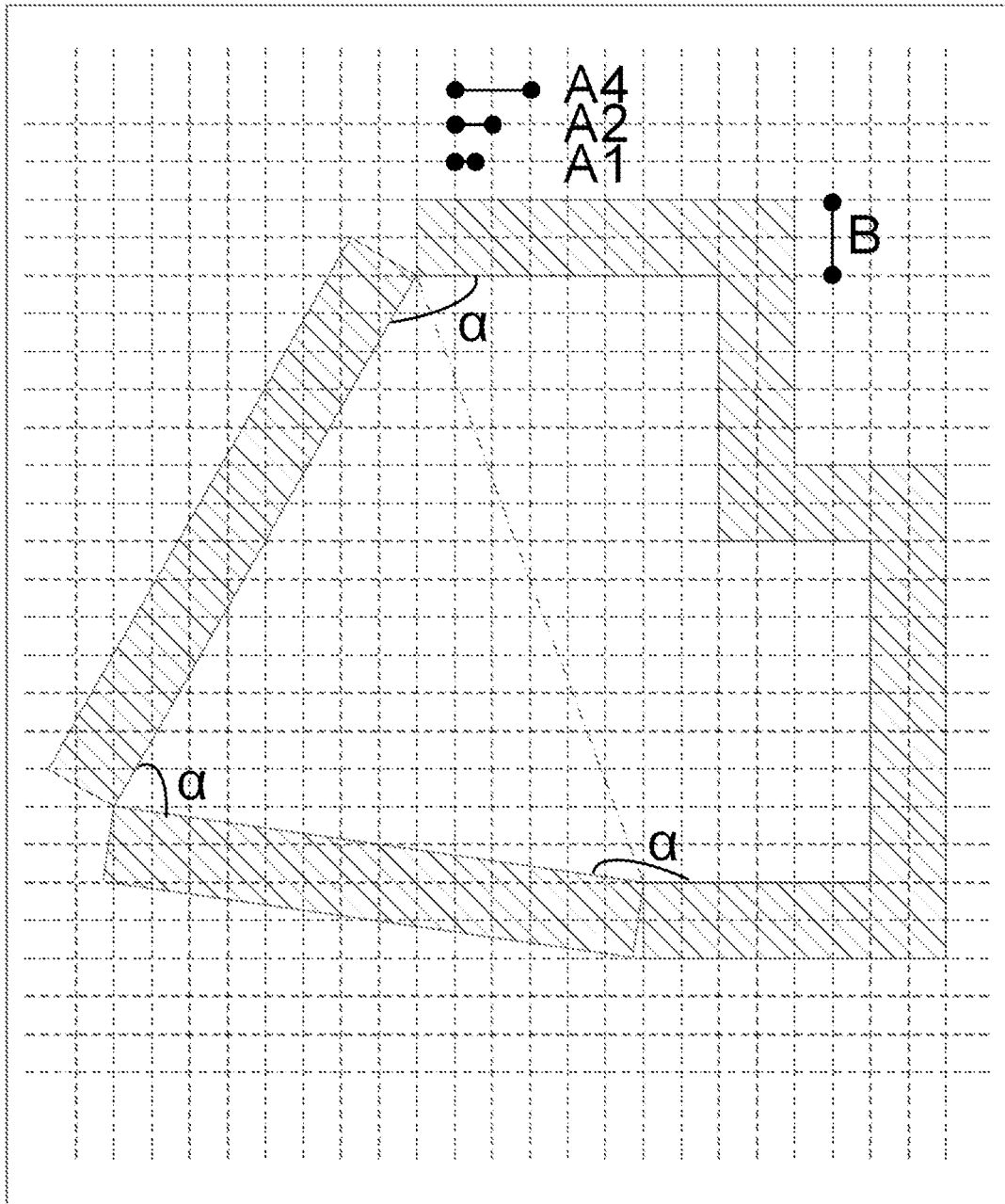


Fig. 16

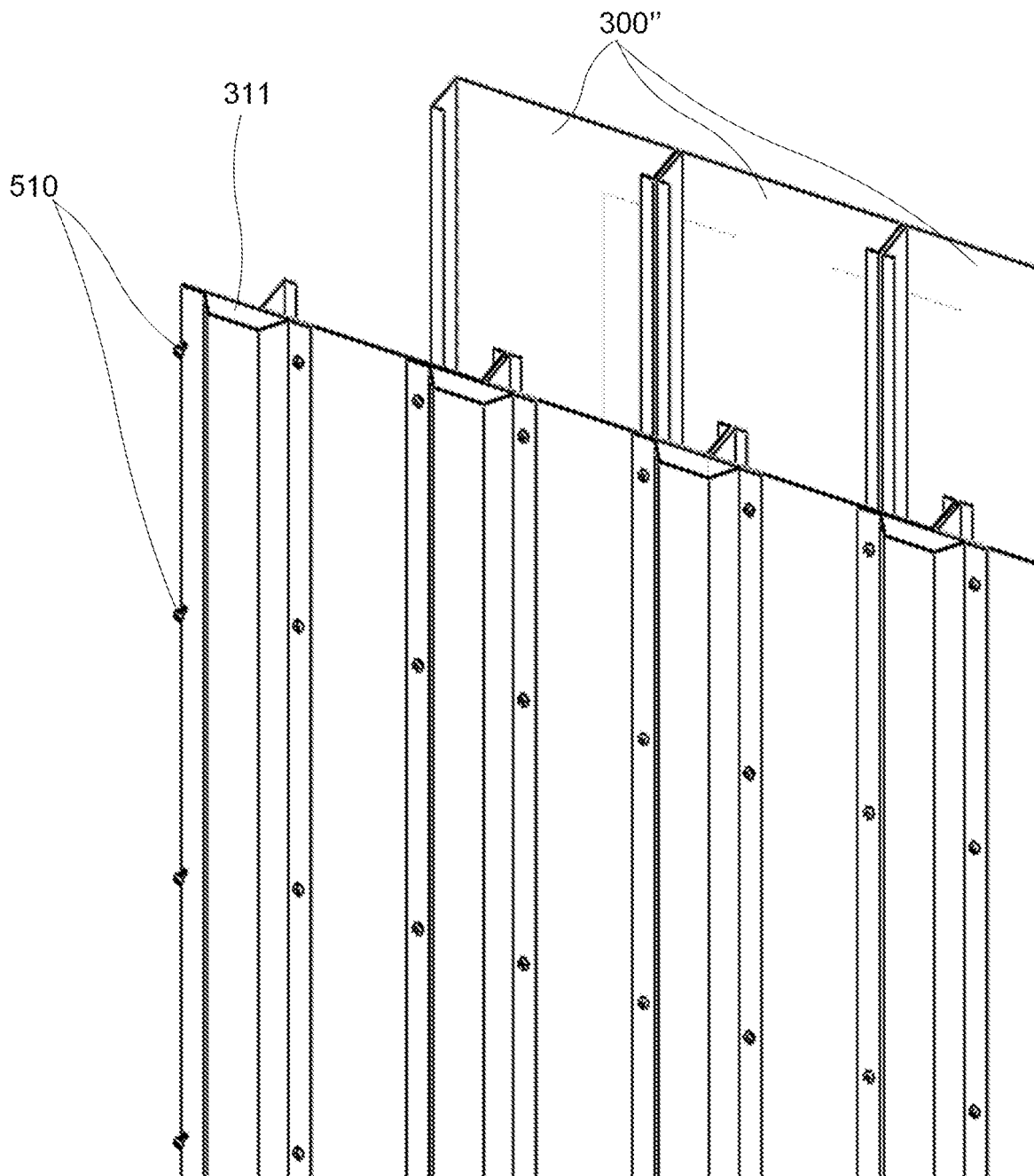
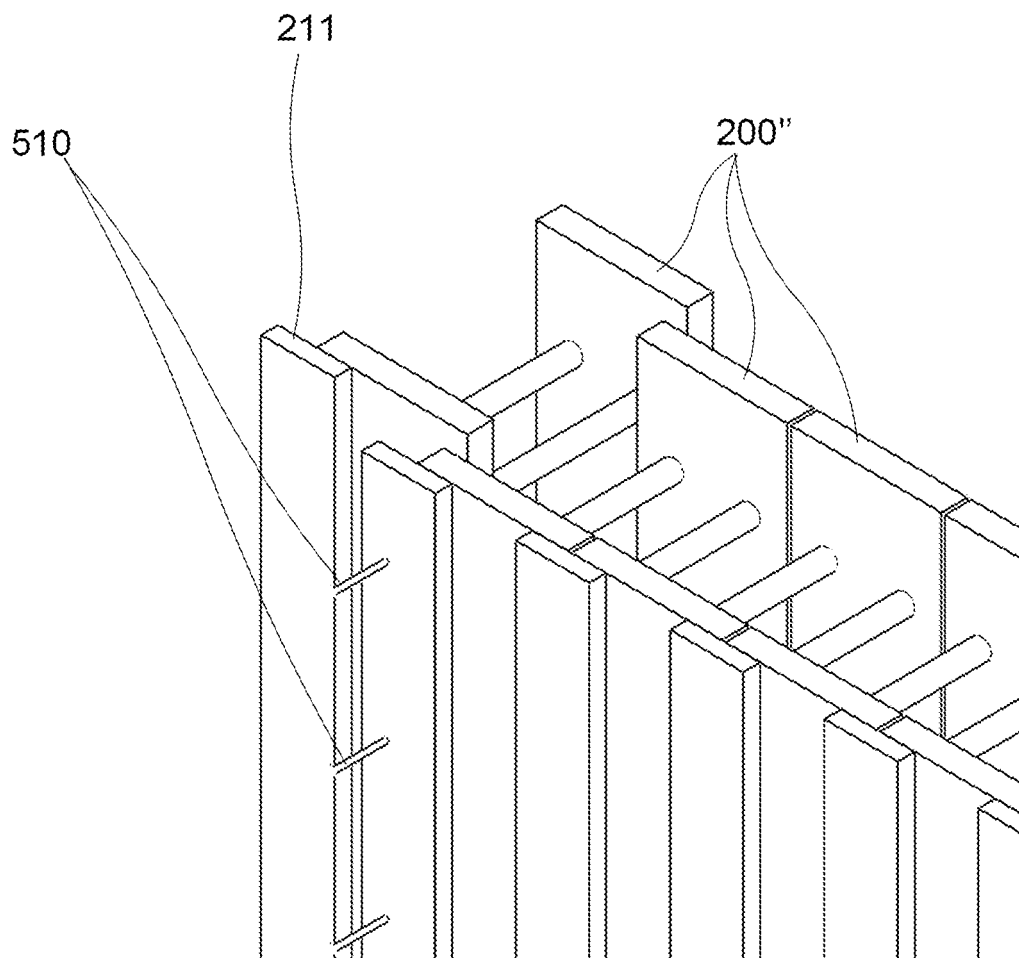


Fig. 17



REFERENCES CITED IN THE DESCRIPTION

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