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(54) System and method for assembling an outer wall of a building

(57) System for assembling an outer wall for a building, comprising a number of vertical uprights with a length at least corresponding to the height of a floor of the building; fixing means for fixing the uprights on either side to a floor or wall of the building close to the end surfaces; a number of outer panels of weather-resistant material intended for fixing to the longitudinal sides of the uprights to be directed outward; a number of inner panels intended for fixing to the longitudinal sides of the uprights to be directed inward.

Method for assembling an outer wall for a building by means of a system according to the invention.

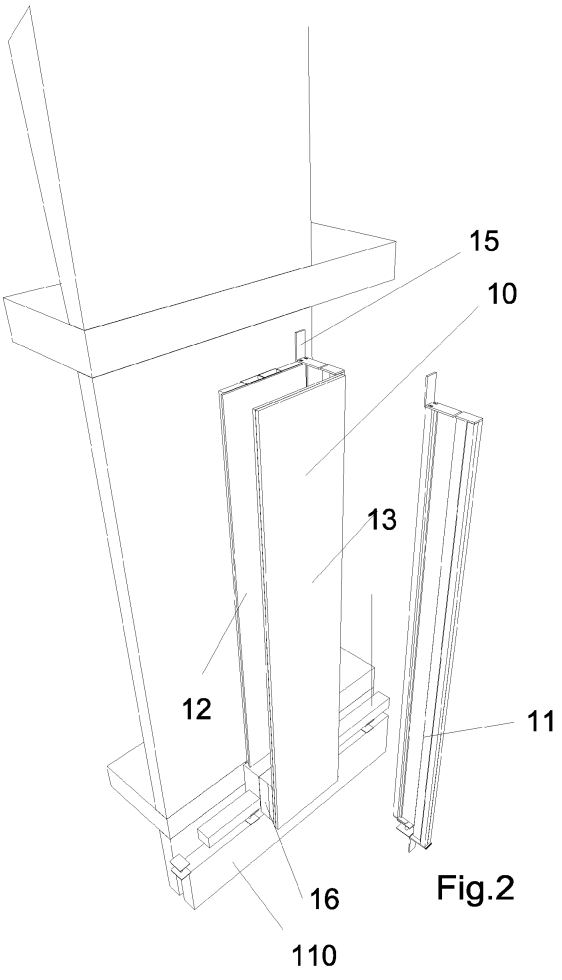

Fig.2

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Description

[0001] The present invention relates to a system and a method for assembling an outer wall of a building.

[0002] Assembled outer walls are known in the relevant field. An example of a known assembled outer wall has a frame of wood or steel provided with insulating material and a finish of choice, such as brick, tiles, plastic, aluminium, plasterwork etc.

[0003] From the viewpoint of durability assembled walls are preferred to brick-like walls. An assembled wall can have a higher insulating value at a smaller thickness and is more environmentally-friendly than a brick-like wall. In the designing of assembled walls a balance must be found between the required structural properties and a high insulating value in combination with low production costs.

[0004] The present invention has for its object to provide a system and a method for assembling an outer wall which result in an assembled outer wall with an improved construction and an improved insulating value, which can nevertheless be manufactured at lower production costs.

[0005] According to the invention the system for assembling an outer wall comprises:

- a number of vertical uprights with a length at least corresponding to the height of a floor of the building;
- a number of outer panels of weather-resistant material intended for fixing to the longitudinal sides of the uprights to be directed outward;
- a number of inner panels intended for fixing to the longitudinal sides of the uprights to be directed inward;
- insulating material intended for placing between the inner panels and the outer panels.

[0006] The method according to the invention for assembling an outer wall and fixing the outer wall to a building by means of a system according to the invention comprises the following steps of:

a) fixing the inner panels to the longitudinal sides of the uprights to be directed inward;
b) fixing the outer panels to the longitudinal sides of the uprights to be directed outward;
c) arranging insulating material between the inner panels and the outer panels. Such a system and method are known from US 5,136,822 and US 4,161,087.

[0007] The system according to the invention has the feature that the system comprises first fixing means for fixing the uprights on either side to a floor or wall of the building close to the end surfaces.

[0008] The method according to the invention is characterized by

d) fixing the uprights to a floor or wall of the building by means of the first fixing means.

[0009] The first fixing means now form the only connection between the outer wall and the building. The heat loss resulting from cold bridges at the transition between the outer wall and the building wall and building floor is consequently considerably smaller in the system according to the invention than in the known systems. In addition, the resulting assembled outer wall can be fixed removably to the building, this fitting in with the modular construction concept of applicant.

[0010] According to a first practical preferred embodiment of the system according to the invention, the first fixing means comprise anchors. The anchors themselves then form cold bridges with a relatively small surface area.

[0011] In an elegant embodiment the anchors are mounted rotatably on the end surfaces of the uprights and the anchors are intended to be at least partially received in a recess in the floor or wall of the building. In a further development the rotatable anchors take an eccentric form. According to yet another development, the rotatable anchors are provided with an engaging surface, for instance a tongue, with which the anchors can be moved between an unlocked and a locked position. The placing and fixing of the assembled outer wall according to the invention can take place quickly by means of the embodiment with rotatable anchors. If desired, the outer wall can also be removed quickly, without damage to the building.

[0012] According to a further preferred embodiment of the system according to the invention with a high insulating value, the uprights each comprise a plate-like body with second fixing means for fixing respectively the inner panel and the outer panel, which second fixing means comprise elongate supports extending on either side of the body. The vertical uprights contribute toward an improved construction of the assembled outer wall. The assembled outer wall according to the invention can accordingly be manufactured with a smaller thickness. Cold bridges resulting from the use of material with a low insulating value, such as wood, will then have a less adverse effect on the overall insulating value of the wall.

[0013] The body is preferably cut away in order to further increase the insulating value. The cut-away body is preferably formed by a number of generally plate-like elements situated at a predetermined mutual distance. According to an embodiment with optimal insulating value, the plate-like elements are manufactured from insulating material.

[0014] According to a first preferred embodiment of the method according to the invention, steps a) and b) are performed to form wall modules which each comprise one upright, an inner panel and an outer panel, the wall modules being manufactured in a predetermined width dimension or a multiple thereof. The system and the method according to the invention allow modular manufacture of the assembled outer wall. If desired, the wall

modules can be manufactured in prefab manner, this contributing toward a more efficient progression of the building process and a reduction in production costs. Owing to the modular method and the wall modules an assembled outer wall can be manufactured which has flexible dimensions. The system and the method according to the invention are hereby suitable for use in both new construction and the renovation of existing buildings.

[0015] According to a durable development, the particulate insulating material is poured between the inner panels and the outer panels. Pouring can take place as desired in a workshop or at the construction site.

[0016] In the case of prefab wall modules and/or assembled outer walls this means a guarantee of a good connection of the insulating material against the other structural parts, and thereby a guarantee of the overall insulating value of the structure. It is also possible to opt for recyclable bulk material which is produced in more environmentally-friendly manner than insulating plates.

[0017] An elegant preferred embodiment of the method according to the invention comprises the step of forming a daylight opening in the outer wall. Glass can be placed in inventive manner herein without making use of a frame by performing the following steps of: placing spacers along a part of the peripheral edge of the daylight opening; placing an inner frame and an outer frame on either side of the spacers; and clamping one or more glass panes between the inner frame and the outer frame. Avoiding the use of a frame also has a positive effect on the overall insulating value of the wall, since due to the choice of material the frame will always form a cold bridge.

[0018] The invention will now be further elucidated with reference to the accompanying figures, in which:

Figure 1A shows a schematic front view of an assembled outer wall according to the system and the method according to the invention;

Figure 1B shows a rear view of the outer wall of figure 1A;

Figure 2 shows schematically a wall module as part of the outer wall according to figures 1A and 1B;

Figure 3A shows schematically a preferred embodiment of an upright of the wall module of figure 2;

Figure 3B shows schematically a second preferred embodiment of the upright of figure 2;

Figures 4 and 5 illustrate the assembly of an outer wall according to the system and the method according to the invention in the context of renovating a building; and

Figures 6-9 illustrate the assembly of an outer wall according to the system and the method according to the invention in the context of new construction; and

Figures 10, 11A and 11B show schematically a preferred embodiment of an alternative upright as part of an outer wall according to the invention.

[0019] Figures 1A and 1B show respectively a schematic front view and rear view of an assembled outer wall according to the system and the method according to the invention. Outer wall 1 is constructed from different wall modules 10.

[0020] Figure 2 shows a wall module 10 schematically. Each wall module 10 comprises at least one vertical upright 11, an inner panel 12 and an outer panel 13. Fixing means 15 are also provided for fixing the wall module to the building. Each wall module 10 is also provided on the underside with closing means 16.

[0021] Each wall module 10 takes a hollow form. Inner panel 12 is fixed to a longitudinal side of upright 11. Outer panel 13 is fixed to the other longitudinal side of upright 11. Upright 11 imparts strength to the module and also serves as spacer between the inner panel and the outer panel. The hollow space is closed on the underside by means of closing means 16.

[0022] Examples of suitable materials for inner panel 12 are: plywood, chipboard, chipwood, steel, aluminium, cement-bonded panel and all other structurally strong plate materials.

[0023] An example of suitable material for outer panel 13 is a panel manufactured from cellulose. The material for outer panel 13 must in any case be weather-resistant. Examples of suitable materials for closing means 16 are insulating materials, preferably with closed cell, sufficiently pressure-resistant and moistureproof.

[0024] Figures 3A and 3B show schematically two preferred embodiments of vertical upright 11. Vertical upright 11 is constructed from a body 11-1. Fixing means 11-2, 11-3 and respectively 11-4 are arranged on either side of body 11-1 for fixing of respectively the inner panel and the outer panel. Fixing means 11-2 and 11-3 in figure 3A are separate and are situated on either side of body 11-1. Fixing means 11-4 in figure 3B are integrated and comprise part of the peripheral edge of body 11-1. In the shown preferred embodiment the fixing means are formed by rails. Suitable materials for body 11-1 and fixing means 11-2, 11-3, 11-4 of uprights 11 are plastic and wood, or combinations thereof.

[0025] The method according to the invention will now be elucidated with reference to figures 4-9. Figures 4 and 5 illustrate a system and method for assembling an outer wall of a building in the context of renovation. Figures 6-9 illustrate the system and the method according to the invention for assembling an outer wall of a building in the context of new construction. The same reference numerals designate the same components in all the figures.

[0026] Figure 4 shows the front side of an existing building 100, the outer leaf of which has been removed. An assembled outer wall according to the system and the method according to the invention is fixed against the exposed outside wall 101. Outer wall 1 can be constructed against the outside wall. If desired, modular construction can take place through placing of wall modules 10. These can be prefabricated. Before outer wall 1 or wall modules 10 are arranged, a layer of insulating material

2 can be arranged against the rear side of the wall. Figure 4 shows a number of cut-away wall modules 10, i.e. without outer panel 13, which are arranged adjacently. Figure 5 shows a number of closed wall modules 10 provided with outer panel 13, which are arranged adjacently.

[0027] Building 100 comprises a ground floor B and a first floor V. Already present in the outer wall on the ground floor is a daylight opening 102, which must be retained. A daylight opening 103 is also present on the first floor. This must be concealed behind the assembled outer wall 1. Outer wall 1 is assembled from two different types of wall modules 10A, 10B respectively. Wall modules 10A extend over the whole length of the ground floor. Wall modules 10B extend over a part of the ground floor. Wall modules 10C extend over more than the length of the first floor.

[0028] Wall modules 10A and 10B are placed directly on the exposed foundation 110 of building 100. A spanning construction 10D is arranged above daylight opening 102 opposite wall modules 10B. Spanning construction 10D has a structure similar to that of the wall modules, but is of smaller height. Each upright is preferably secured substantially every 600 mm to the outside wall lying behind so that no special provisions need be made for fixing the light spanning construction.

[0029] Wall modules 10C are arranged respectively on wall modules 10A and spanning construction 10D.

[0030] Wall modules 10A and 10C are fixed to the outer wall of building 100 using fixing means 15. Suitable fixing means are anchors 15. In the shown preferred embodiment anchor 15 is a mounting anchor intended for use with a plastic upright 11. Suitable material for anchor 15 in new construction is steel plate. Anchor 15 can for instance be pushed round rail 11-3 so that the wall can be received between the floor of the ground floor and the floor of the party floor and the anchor can be fixed to the floor. In the case of a wooden upright alternative fixing means 15 can be formed by giving the rear part of the upright a longer form than the front part.

[0031] Wall modules 10A, 10B and 10C are fixed to each other by fixing inner panels 12 and outer panels 13 to uprights 11 of each adjacent wall module.

[0032] The hollow space present in each wall module between inner panels 12 and outer panels 13 has to be filled with suitable insulating material. An example of suitable insulating material is particulate insulating material such as cellulose, straw, flax etcetera. This material can be poured as bulk material at the construction site. If desired, use can also be made of per se known insulating plates.

[0033] The wall modules are manufactured with predetermined width dimension. It is possible to envisage a width or module size of 15 centimetres or a multiple thereof. In the case of new construction this modular size can be taken into account in the design of the outside wall so that an assembled outer wall can always be manufactured to size on the basis of prefab wall modules, a supply of which can be manufactured if necessary. In the case of renovation it is sometimes necessary to use a fitting piece when the existing size of the outside wall is not a multiple of 15, or is another selected modular size.

[0034] Figures 6-9 illustrate the assembly of an outer wall using the system and the method according to the invention in new construction of a building 200. In figures 6-9 outer wall 1 is shown in each case in front and rear view. In the case of new construction the assembled outer wall 1 can be arranged partially from the outside and/or be placed during assembly of the carcass. In wall modules 10A and 10C the dimensions of inner panel 12 are smaller than the dimensions of outer panel 13. The dimensions of inner panel 12 correspond to the distance between the floor and the ceiling of each floor level (B, V). The dimensions of outer panel 13 are longer. The length difference amounts to approximately the thickness of the floor or the ceiling plus the insulation thickness at this position. Inner panels 12 are provided on the visible side with service conduits 21, for instance for electricity, and can be finished by means of a finishing panel 22.

[0035] Figures 6 and 7 illustrate the placing of glass in daylight opening 202 of an assembled outer wall according to the invention. Spacers 17 in the form of wooden blocks are attached to the vertical uprights 11 on either side of daylight opening 202. Wooden blocks 17 have a predetermined mutual distance so as to prevent cold losses. A stop 18 is mounted on the outer side of blocks 17. The glass 20 can be placed thereagainst. Stop 18 takes the form of for instance a frame provided with rubber glass seals. A finish 19 is arranged on the inner side of blocks 17 to clamp the glass between stop 18 and finish 19. Finish 19 preferably takes the form of an inner frame. This inner frame is also provided with rubber glass seals. Suitable glass panes of double or triple glass are available commercially. Alternatively, it is also possible to arrange sliding window profiles, these likewise being available commercially.

[0036] Figure 10 shows schematically an alternative preferred embodiment of the vertical upright of the system according to the invention. Vertical upright 111 has a cut-away body. In the shown preferred embodiment the body is formed by generally plate-like elements 111-1 situated at a predetermined mutual distance. Vertical upright 111 further comprises at least two elongate supports 111-5 and 111-6 which extend on either side of body 111-1 and form the longitudinal sides of the upright. Plate-like elements 111-1 are attached to supports 111-5 and 111-6. The supports also serve as fixing means for fixing respectively the inner panel and the outer panel and are alternatives to supports 11-2 and 11-3 in figure 3A and supports 11-4 in figure 3B. In the shown preferred embodiment the supports are formed by rails. Suitable materials for body 111-1 and fixing means 111-5 and 111-6 of uprights 111 are plastic and wood, or combinations thereof. Plate-like elements 111-1 can alternatively be manufactured from insulating material. An example of suitable insulating material is plastic material with air chambers or air ducts. The sides are preferably sealed

at the position of the saw cuts, for instance by means of end members.

[0037] The length of supports 111-5 and 111-6 can differ. In the shown preferred embodiment the length of support 111-5 corresponds substantially to the distance between the party floors, and support 111-6 is longer.

[0038] It is noted that other embodiments of the upright can be formed by combining the different supports 11-2, 11-3, 11-4 with body 111-1 or by combining supports 111-5 and 111-6 with body 11-1.

[0039] Figures 11A and 11B show schematically the lower side of uprights 111-1 of figure 10. Shown here are alternative fixing means for fixing the uprights on either side to a floor or wall of the building close to the end surfaces. Anchors 115 are attached rotatably to the end surface of upright 111-1. Anchors 115 are intended for co-action with the floor or the wall of the building, which is provided for this purpose with a slotted recess 125 for partially receiving anchor 115. Figure 11A shows the unlocked position of the anchors and figure 11B shows the locked position of the anchors. Anchors 115 preferably take an eccentric form. In the shown preferred embodiment anchors 115 take a semicircular form. Anchors 115 are more preferably provided with an engaging surface 116, for instance an edge, with which the anchors can be moved between the unlocked and the locked position.

[0040] The invention is of course not limited to the described and shown embodiments. The invention relates generally to any embodiment falling within the scope of protection as defined in the claims and as seen in the light of the foregoing description and accompanying drawings.

Claims

1. System for assembling an outer wall for a building, comprising

- a number of vertical uprights with a length at least corresponding to the height of a floor of the building;
- a number of outer panels of weather-resistant material intended for fixing to the longitudinal sides of the uprights to be directed outward;
- a number of inner panels intended for fixing to the longitudinal sides of the uprights to be directed inward;
- insulating material intended for placing between the inner panels and the outer panels, **characterized in that** the system comprises first fixing means for fixing the uprights on either side to a floor or wall of the building close to the end surfaces.

2. System as claimed in claim 1, wherein the first fixing means comprise anchors.

3. System as claimed in claim 2, wherein the anchors are mounted rotatably on the end surfaces of the uprights and are intended to be at least partially received in a recess in the floor or wall of the building.

4. System as claimed in claim 3, wherein the anchors take an eccentric form.

5. System as claimed in claim 3 or 4, wherein the anchors are provided with an engaging surface, for instance a tongue, with which the anchors can be moved between an unlocked and a locked position.

6. System as claimed in any of the foregoing claims, wherein the uprights each comprise a plate-like body with second fixing means for fixing respectively the inner panel and the outer panel, which second fixing means comprise elongate supports extending on either side of the body.

7. System as claimed in claim 6, wherein the body is cut away.

8. System as claimed in claim 7, wherein the body is formed by a number of generally plate-like elements situated at a predetermined mutual distance.

9. System as claimed in claim 8, wherein the plate-like elements are manufactured from insulating material.

10. Method for assembling an outer wall and fixing the outer wall to a building by means of a system as claimed in any of the foregoing claims, comprising the following steps of:

a) fixing the inner panels to the longitudinal sides of the uprights to be directed inward;
b) fixing the outer panels to the longitudinal sides of the uprights to be directed outward;
c) arranging insulating material between the inner panels and the outer panels, wherein the method is **characterized by**
d) fixing the uprights to a floor or wall of the building by means of the first fixing means.

11. Method as claimed in claim 10, wherein steps a) and b) and c) are performed to form wall modules which each comprise one upright, an inner panel and an outer panel, the wall modules being manufactured in a predetermined width dimension or a multiple thereof, wherein adjacent wall modules are mutually connected by fixing the outer panel and the inner panel of each wall module to the upright of the adjacent wall module for the purpose of assembling the outer wall.

12. Method as claimed in claim 10 or 11, wherein step c) comprises of pouring particulate insulating mate-

rial.

13. Method as claimed in any of the foregoing claims 10-12, wherein the method further comprises the following step of:

e) forming a daylight opening in the outer wall.

14. Method as claimed in claim 13, wherein step e) comprises of placing adjacently a number of uprights, inner panels and outer panels of shorter length.

15. Method as claimed in claim 13 or 14, further comprising the following steps of:

f) placing spacers along a part of the peripheral edge of the daylight opening;
g) placing an inner frame and an outer frame on either side of the spacers; and
h) clamping glass panes between the inner frame and the outer frame.

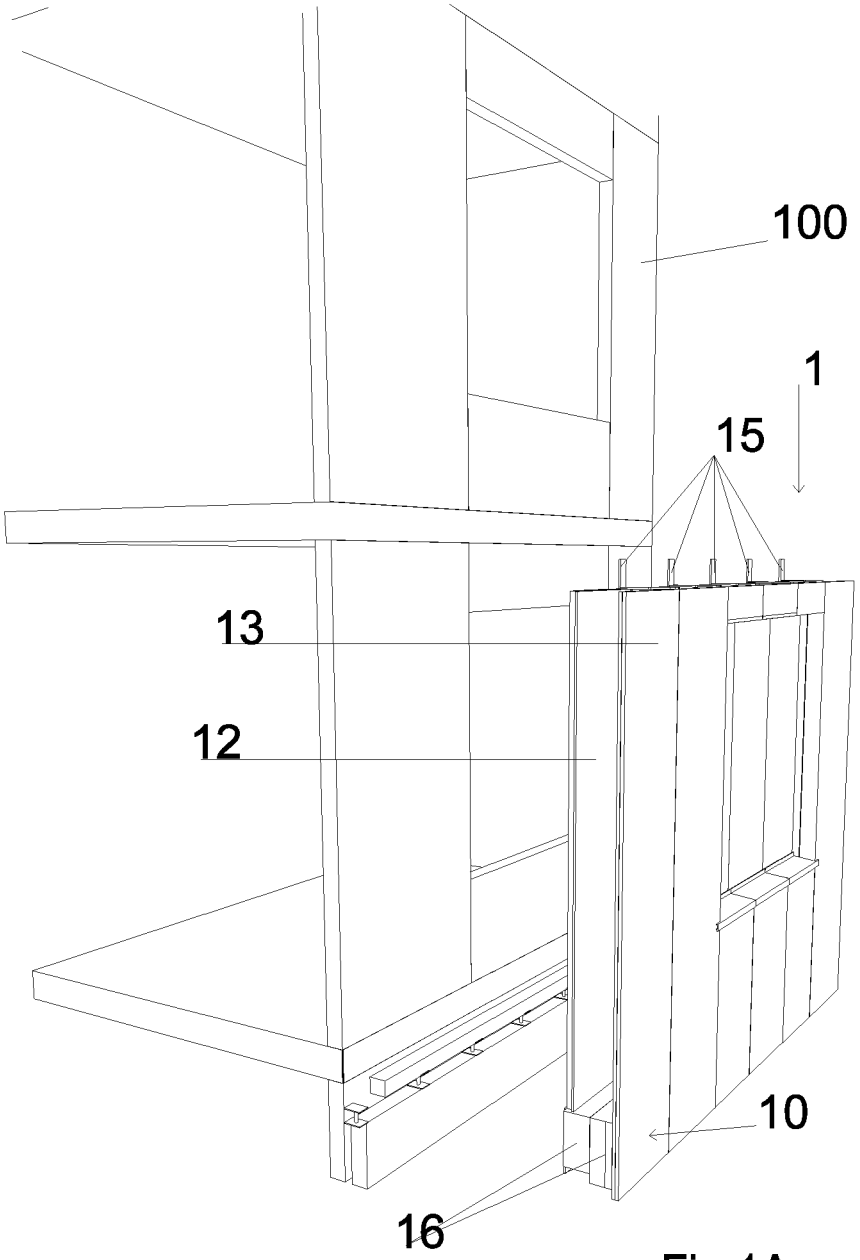

Fig.1A

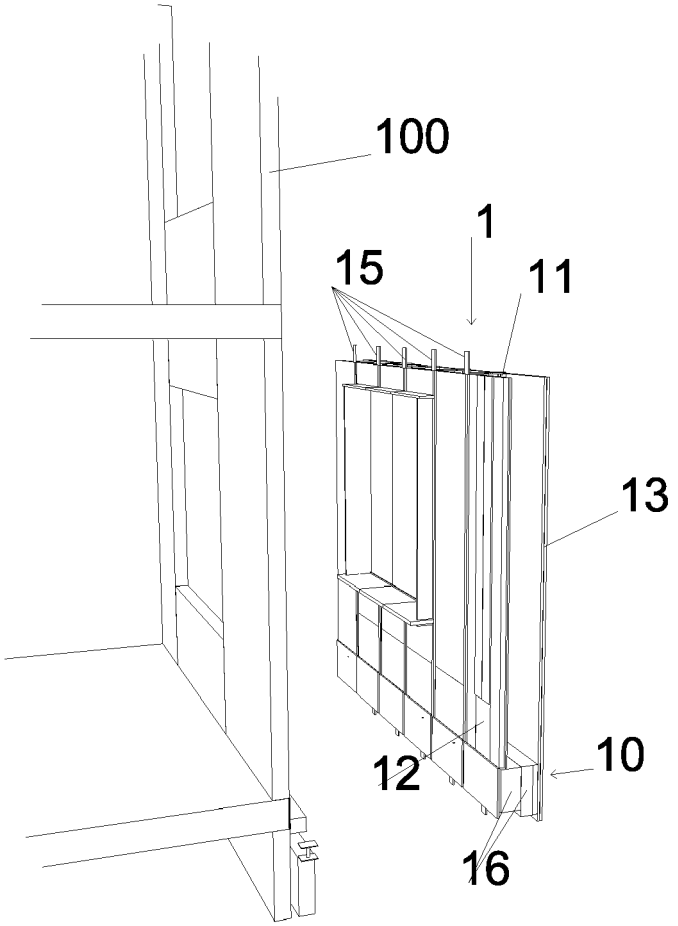

Fig.1B

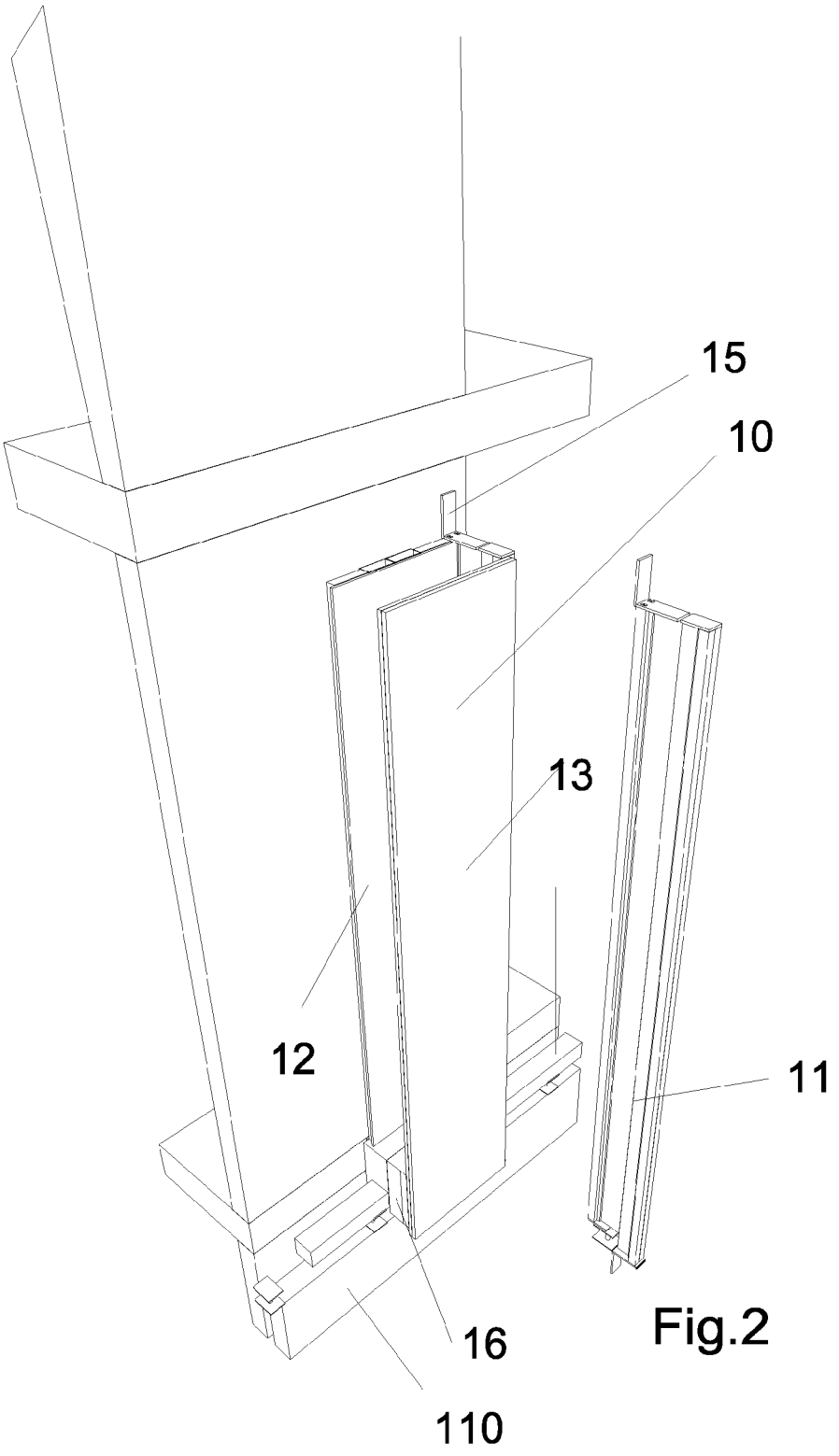

Fig.2

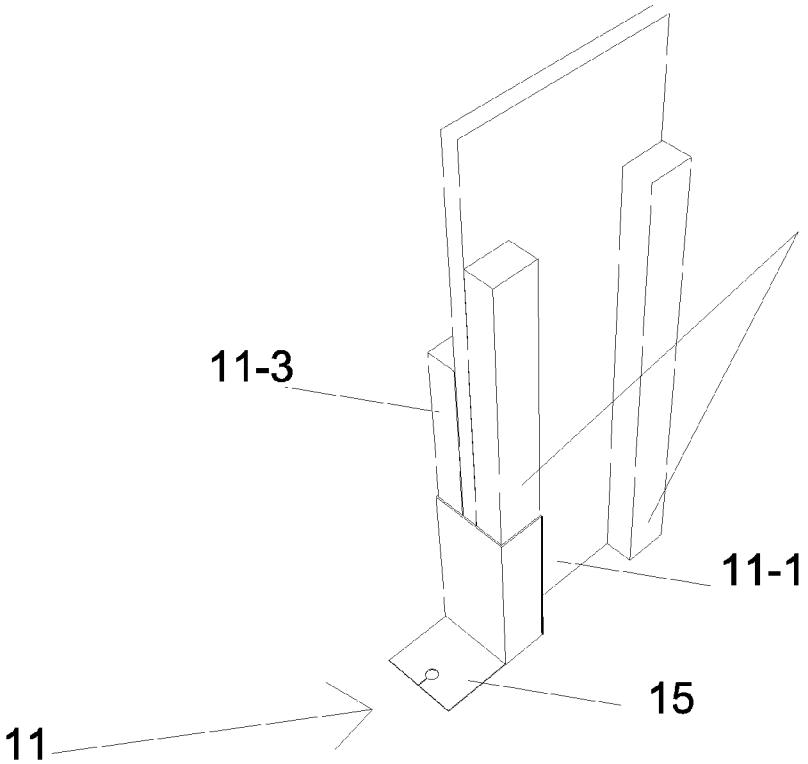

Fig.3A

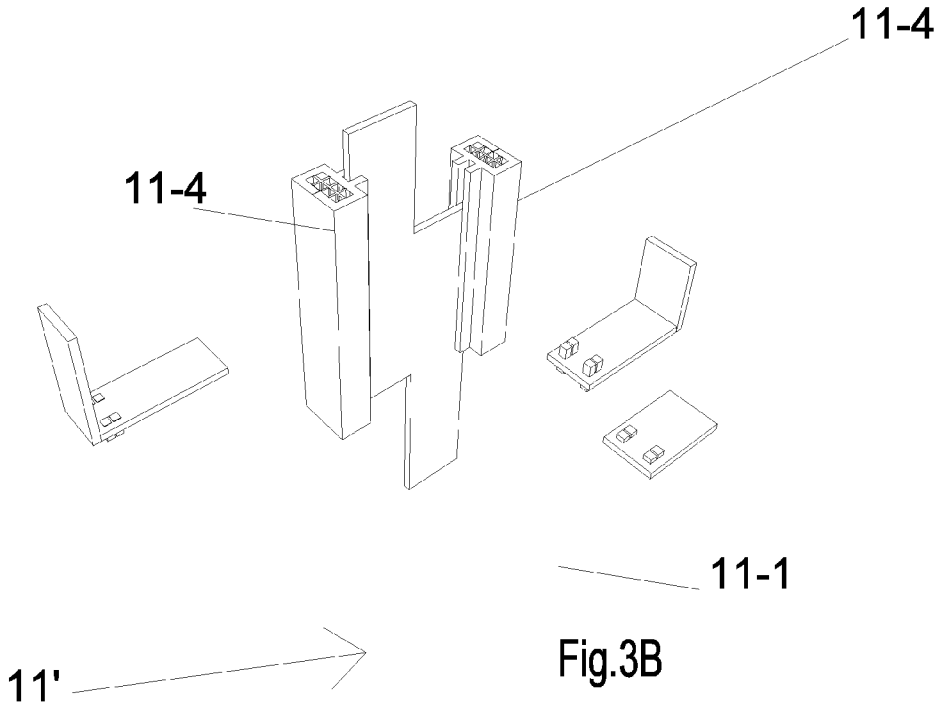

Fig.3B

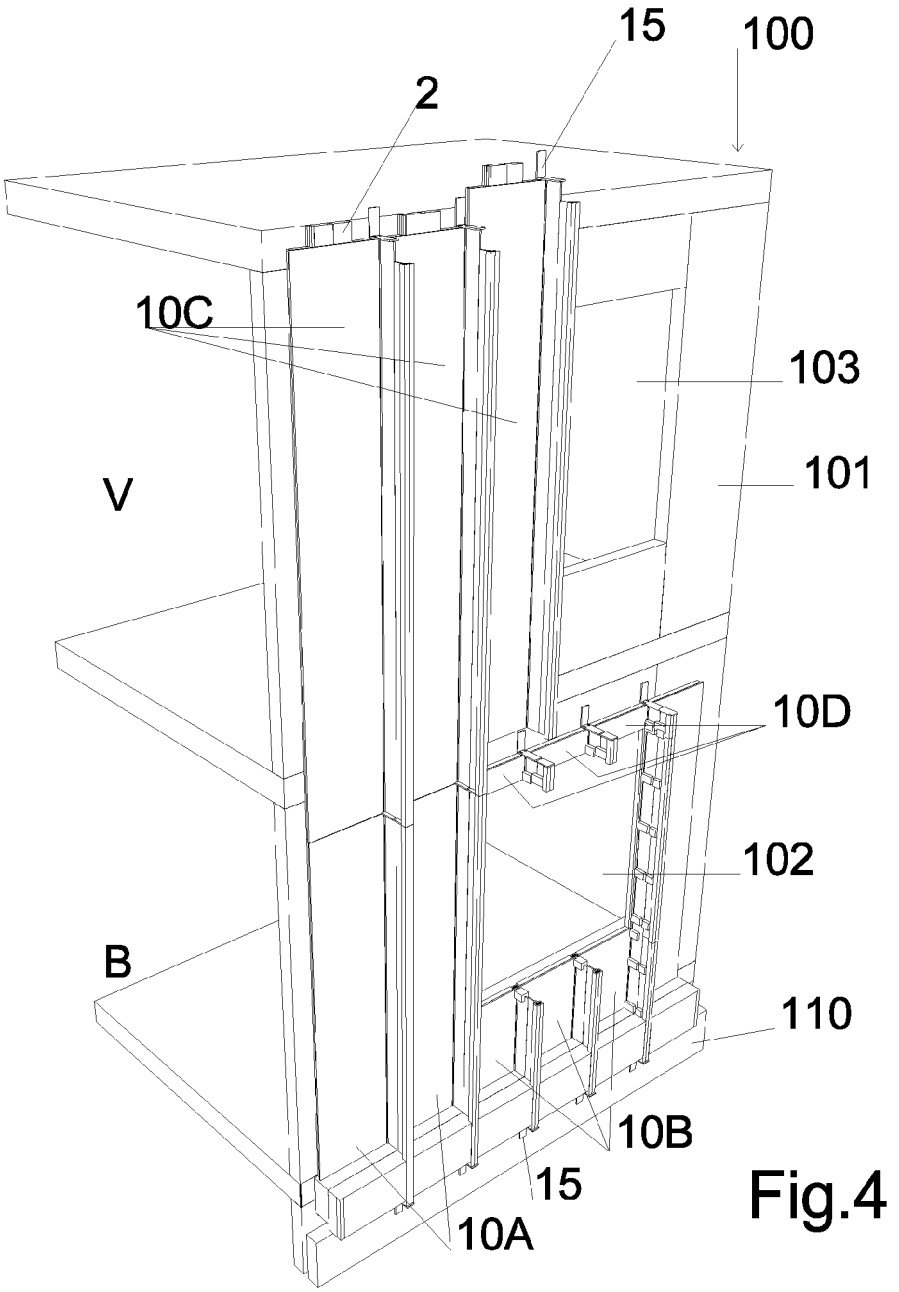

Fig.4

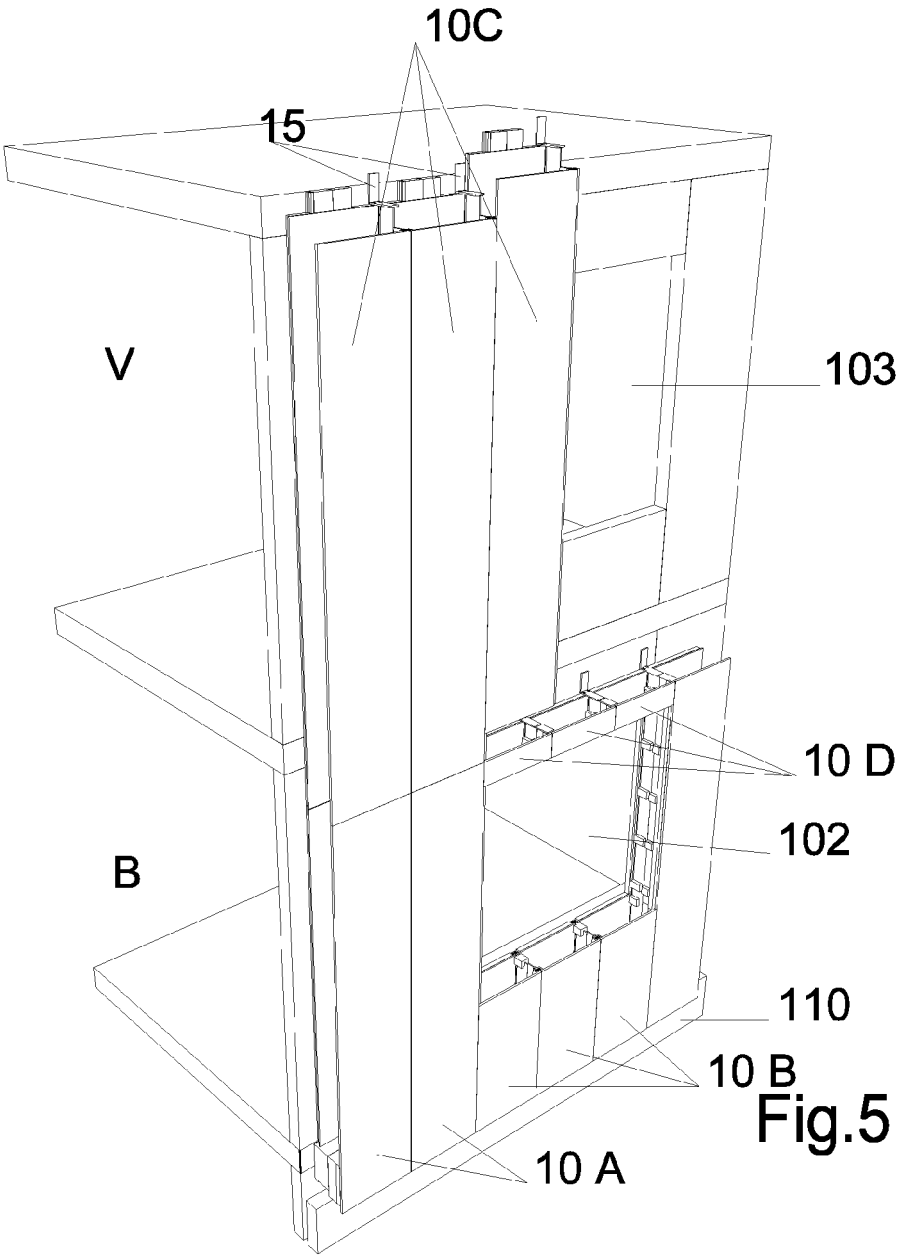

Fig.5

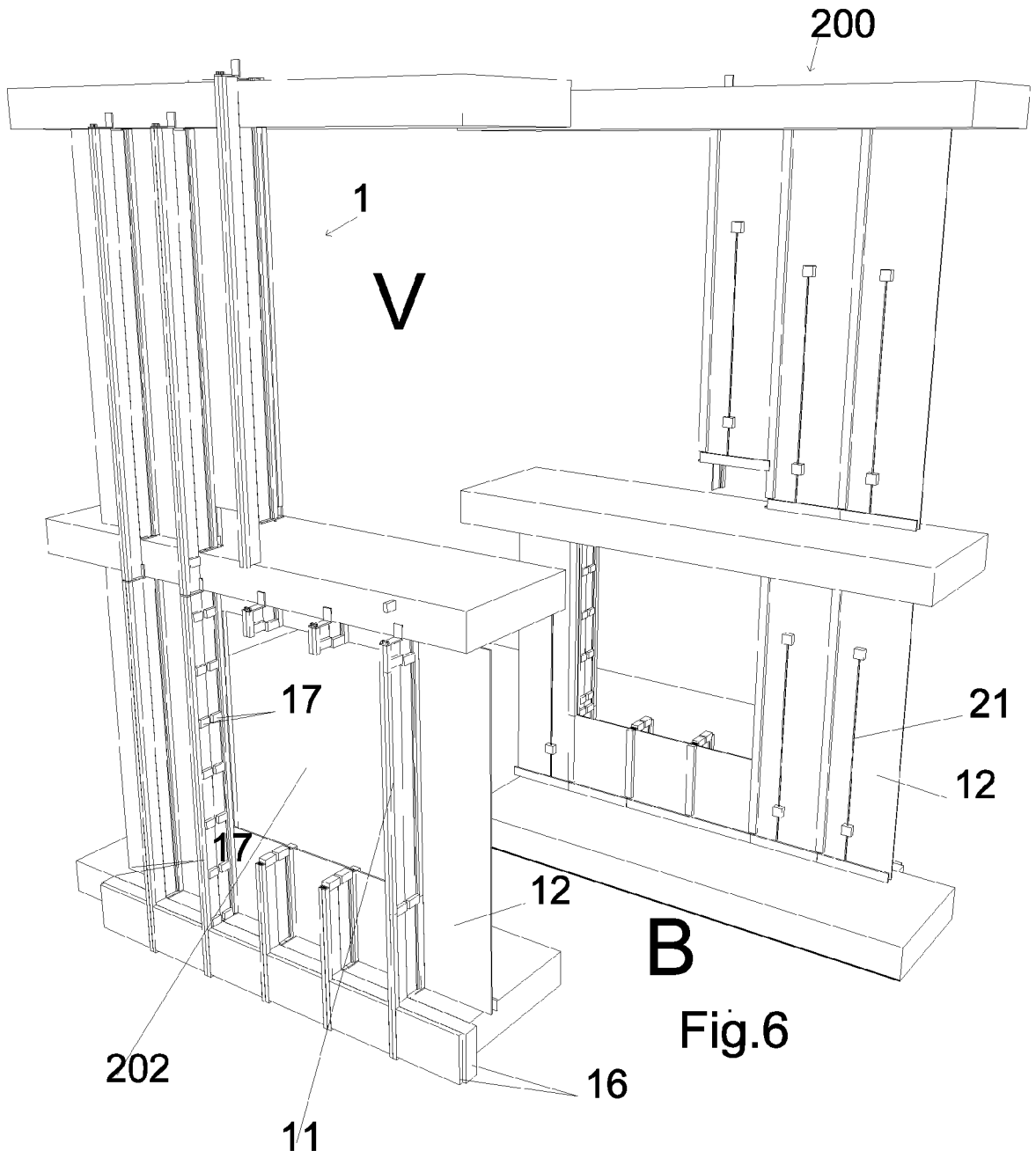

Fig.6

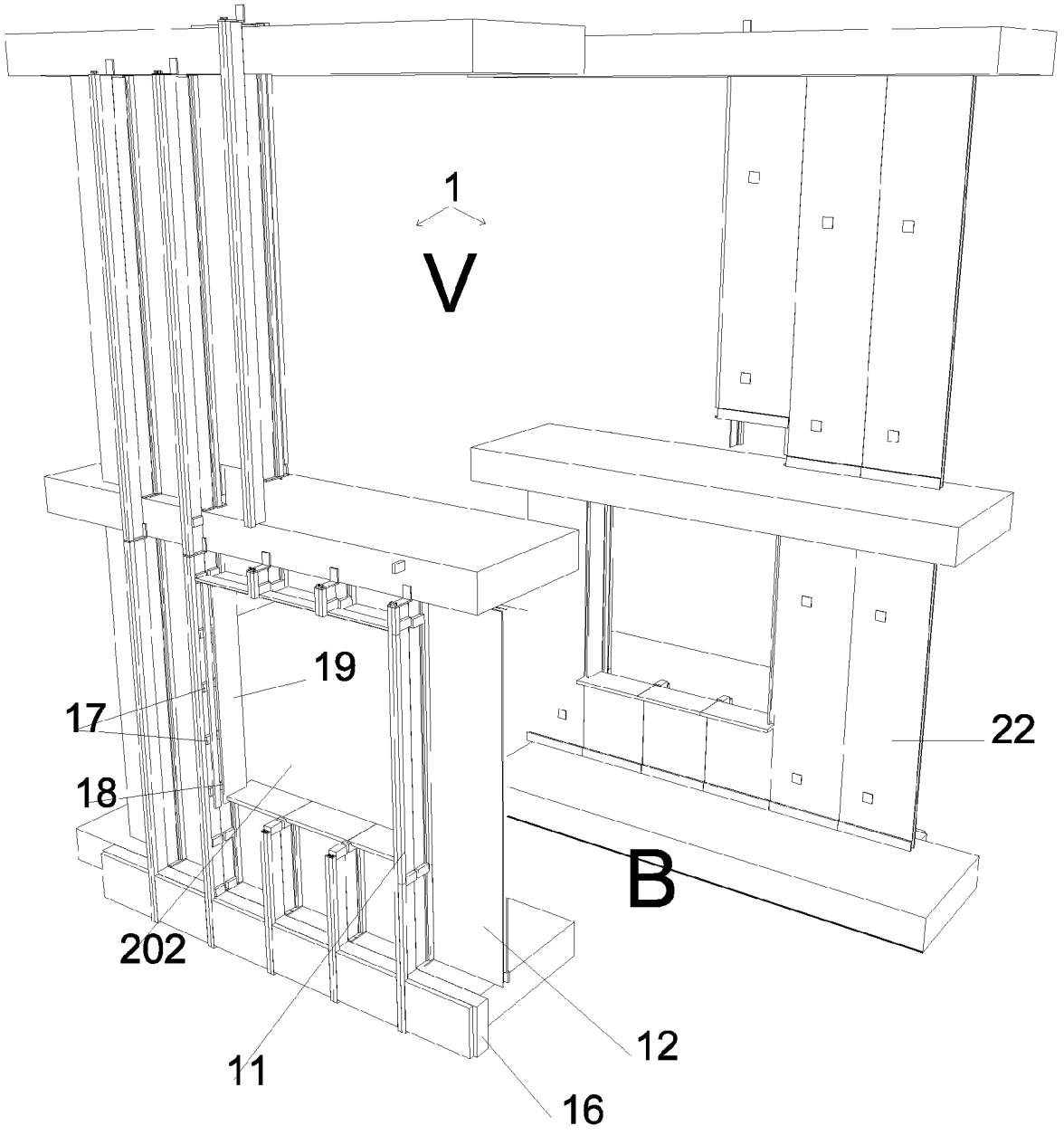

Fig.7

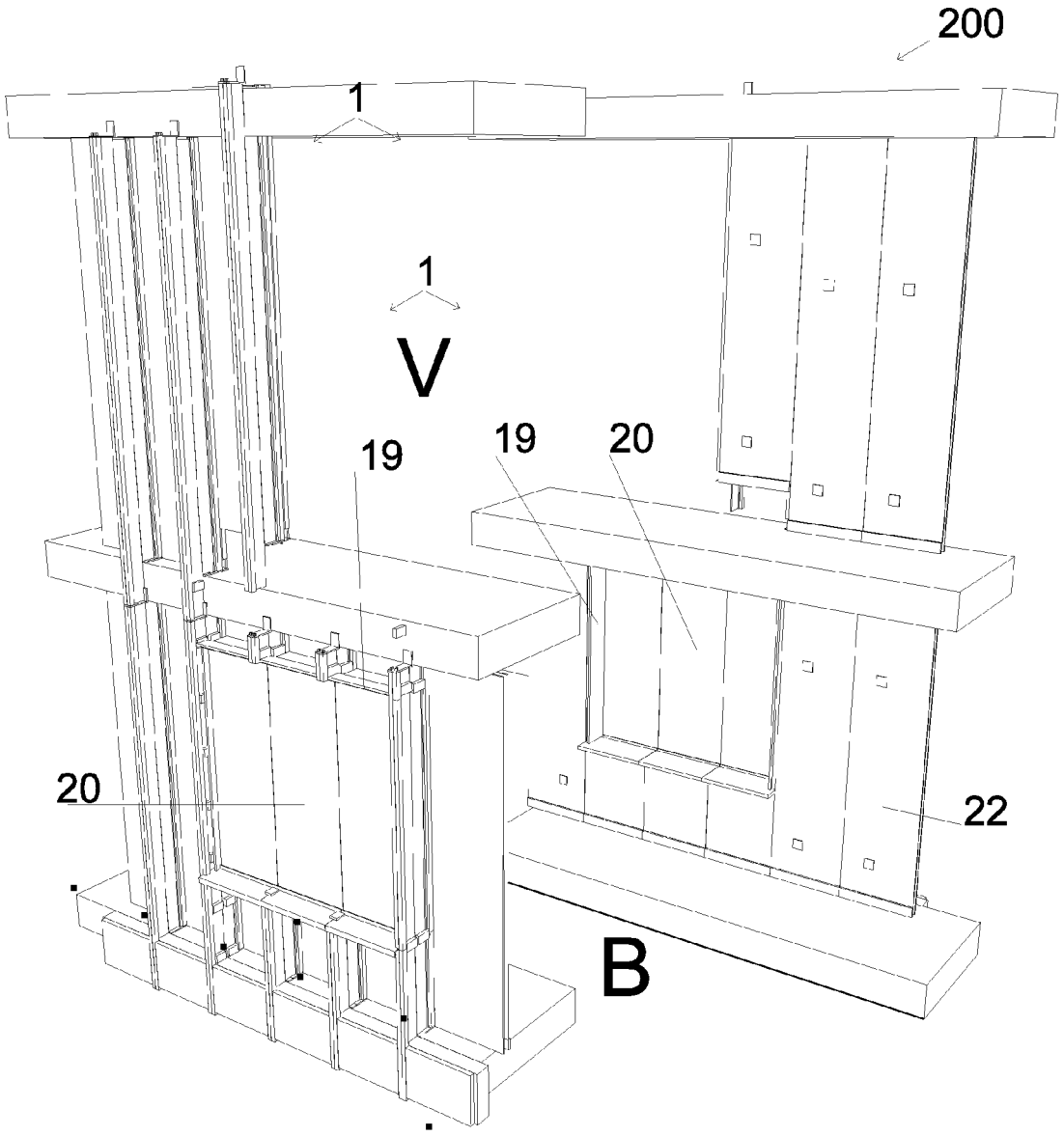

Fig.8

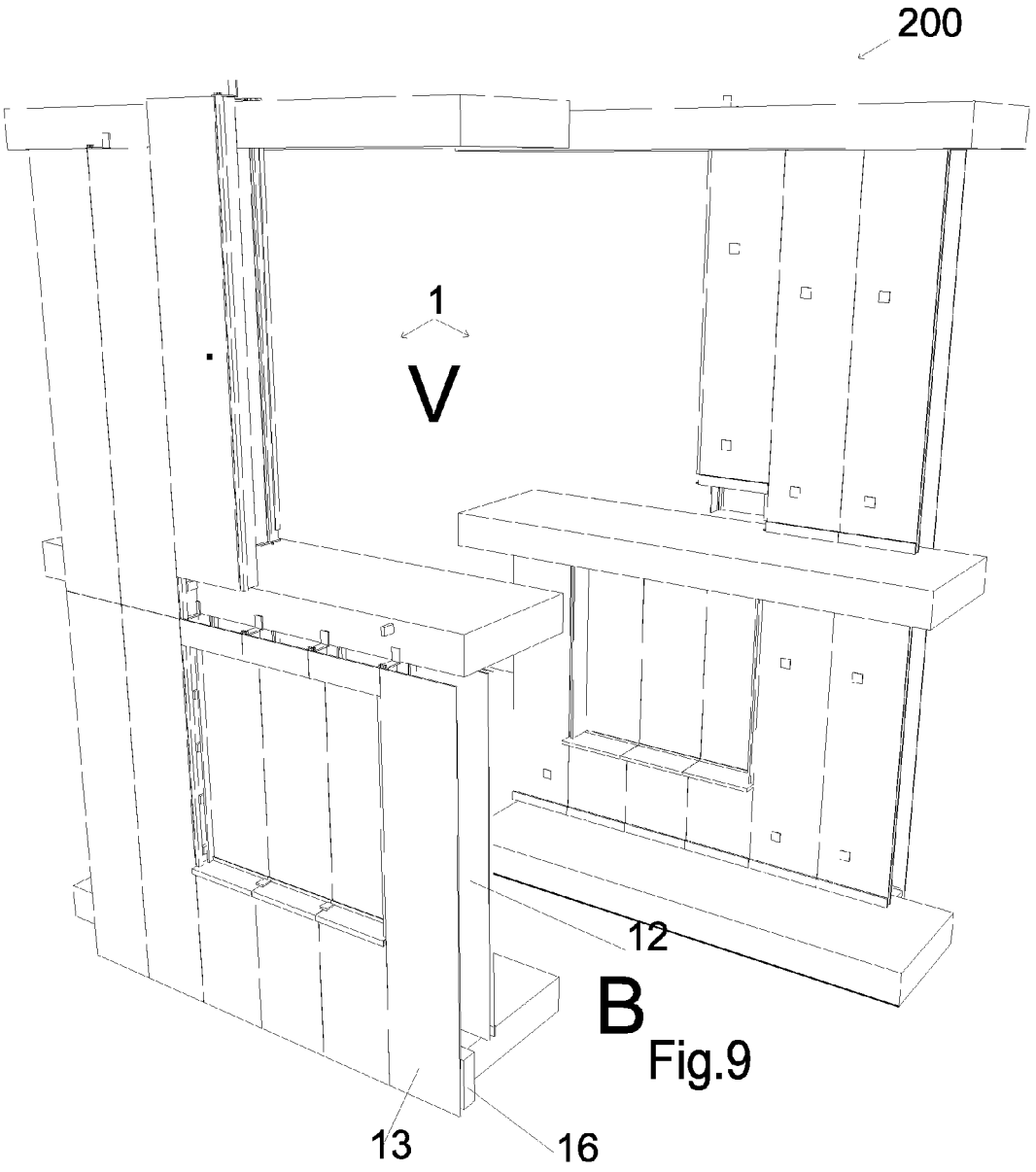

Fig.9

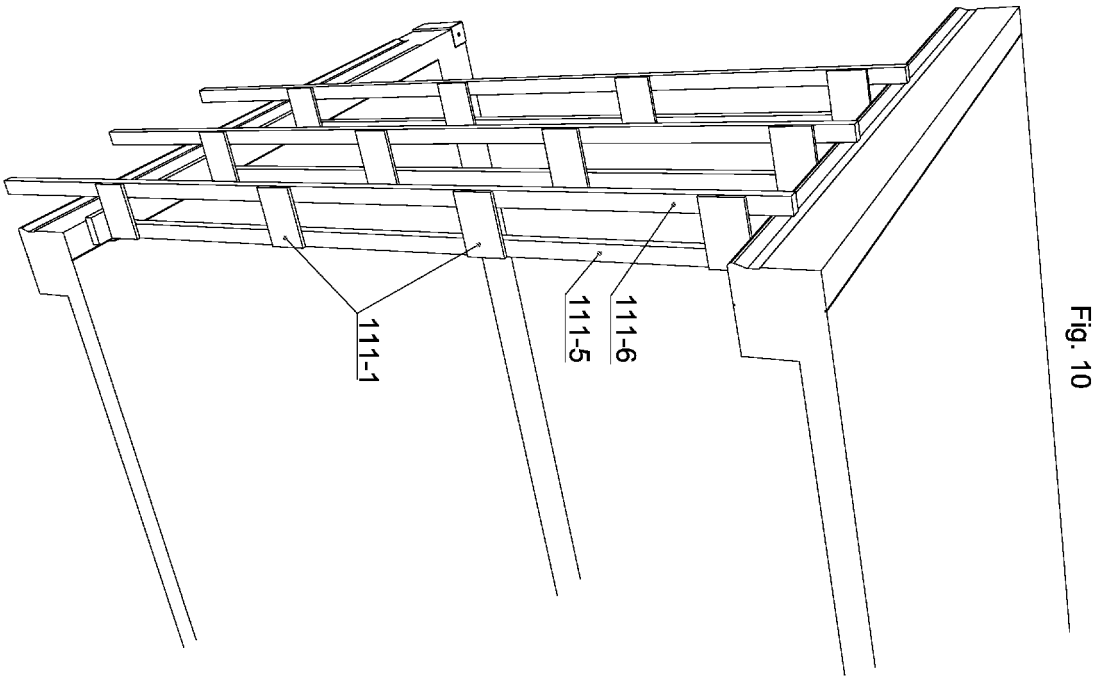

Fig. 10

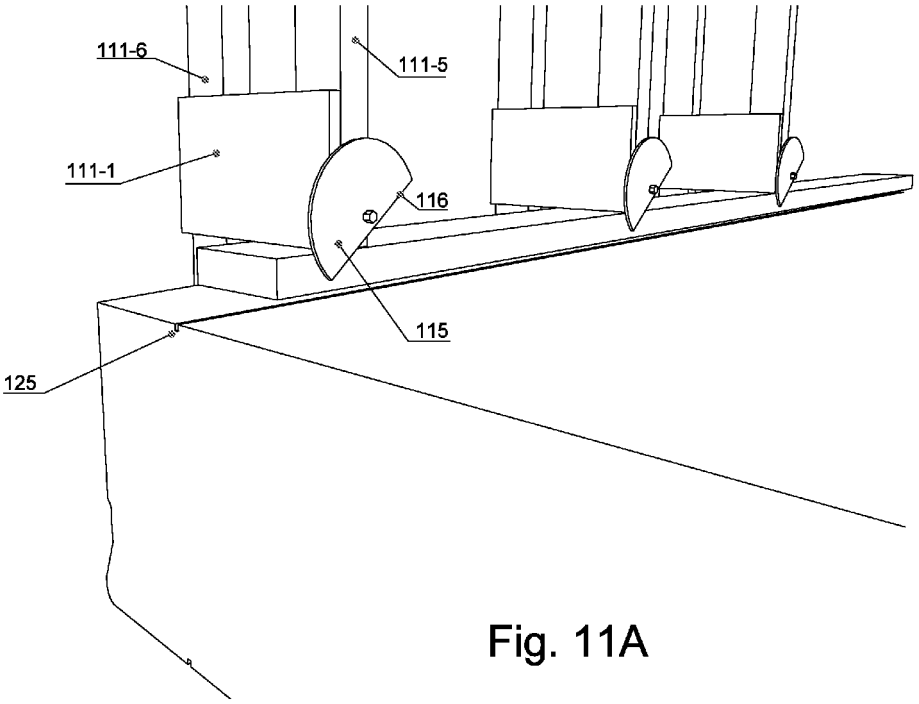

Fig. 11A

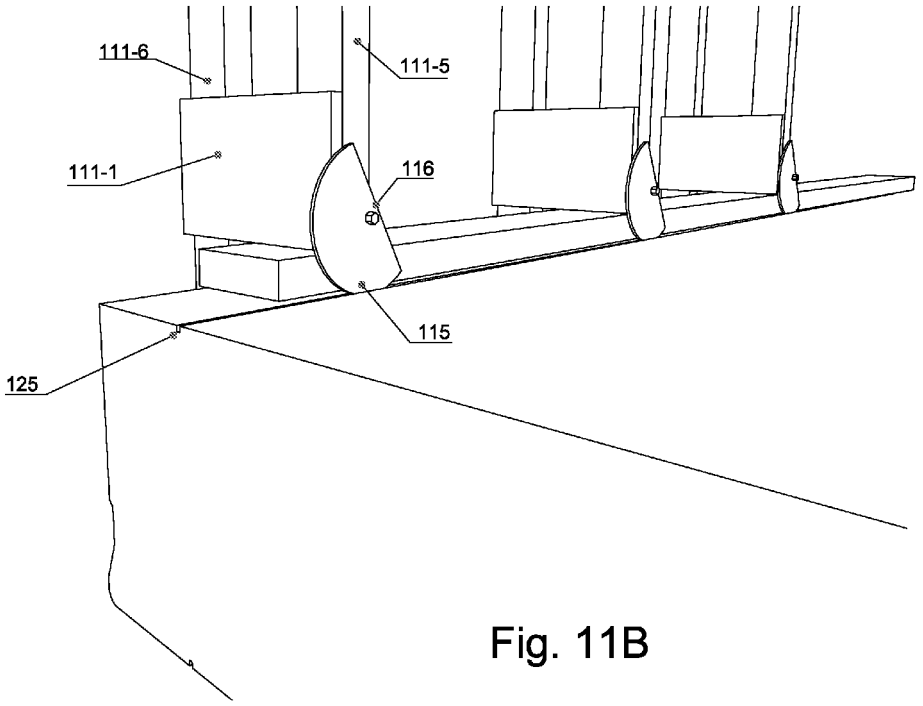

Fig. 11B

REFERENCES CITED IN THE DESCRIPTION

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