

(19)



(11)

EP 2 246 493 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

03.11.2010 Bulletin 2010/44

(51) Int Cl.:

E04B 1/348 (2006.01)

(21) Application number: **10161274.5**

(22) Date of filing: **28.04.2010**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR**

Designated Extension States:

AL BA ME RS

(30) Priority: **28.04.2009 FI 20090170**

(71) Applicant: **OY SHIPPAX LTD**
23500 Uusikaupunki (FI)

(72) Inventor: **Kordelin, Tapio**
FI-20700, Turku (FI)

(74) Representative: **Suominen, Kaisa Liisa**
Turun Patenttitoimisto Oy
P.O.Box 99
20521 Turku (FI)

(54) **Arrangement and method for attaching prefabricated load-bearing room units to each other**

(57) The invention relates to an arrangement and a method for attaching prefabricated load-bearing room units (1, 2, 3, 4, 55, 66) to each other with a pin connection

and a drawbar (12). The invention makes possible the construction of multi-storey rooms, for example a cabin compartment of a ship or an apartment building, without middle decks or intermediate floors.

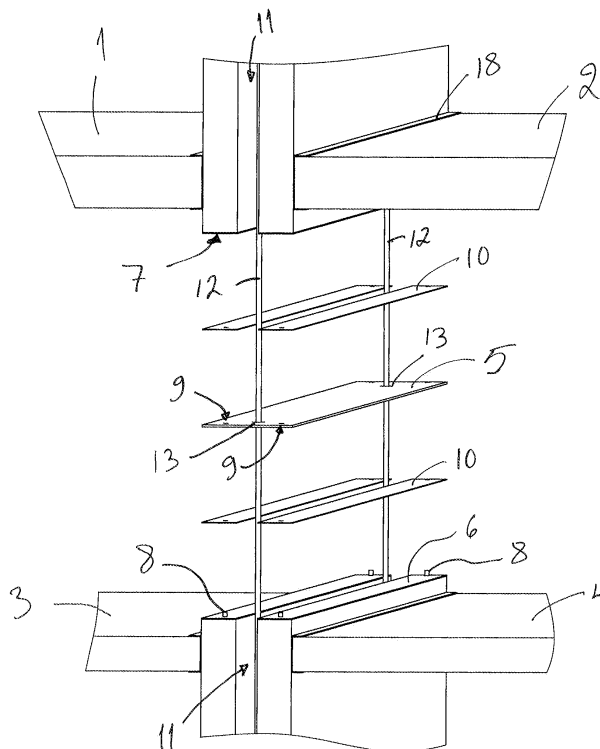


Fig. 2

EP 2 246 493 A2

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to an arrangement and a method for attaching prefabricated load-bearing room units to each other, a ship and a building according to the preambles of the independent claims presented below. The invention relates especially to a new manner of constructing multi-storey rooms, for example cabin compartments in ships or apartment buildings, which do not need middle decks or intermediate floors between the storeys.

PRIOR ART

[0002] It is known from patent publication WO 2006079682 A1 to construct multi-storey rooms, for example cabin compartments in ships or apartment buildings, from superposed load-bearing prefabricated room units, the ceiling, floor and at least two walls of which are mainly of cellular board. Even though there are no great defects in the solutions presented in the above-mentioned publication, new alternatives may in some cases be wanted for attaching room units. Simpler, more easily realized and if possible better functioning solutions are always welcome.

[0003] Patent publications WO 98/40573, JP 11081481 and US 3643390 present some manners of attaching room units to each other.

OBJECT AND BRIEF DESCRIPTION OF THE INVENTION

[0004] It is an object of the present invention to reduce or even to eliminate problems appearing in the above-mentioned and also other prior art.

[0005] It is especially an object of the present invention to provide a solution, with which the attaching of prefabricated load-bearing room units to each other is made simpler, quicker and more efficient.

[0006] It is an object of the present invention to efficiently provide safe multi-storey structures, such as apartment buildings or cabin compartments in ships.

[0007] It is an object of the present invention to provide multi-storey rooms, for example cabin compartments in ships or apartment buildings, which do not need middle decks or intermediate floors between the storeys.

[0008] In order to realize among others the objects mentioned above, the arrangement, method, ship, building and other objects of the invention are characterized by what is presented in the characterizing parts of the enclosed independent claims.

[0009] The embodiments and advantages mentioned in this text apply, when applicable, both to the arrangement, method, ship and building according to the invention, even though it is not always specifically mentioned.

[0010] The embodiments of the invention are suitable

for use in connection with various kinds of ships and buildings.

[0011] A typical arrangement according to the invention for attaching prefabricated load-bearing room units to each other comprises an upper and a lower prefabricated room unit, and attaching means between them for attaching the room units to each other. Typical attaching means according to the invention comprise a pin connection. Additionally typical attaching means according to the invention comprise at least one drawbar, which is arranged to hold superposed room units together in the direction of the drawbar.

[0012] In a typical method according to the invention for attaching prefabricated load-bearing room units to each other, the upper and lower prefabricated room units are attached to each other with a pin connection between them. Superposed room units are further held together with one or more drawbars.

[0013] In this text room unit means a self-bearing unit which is used in construction and which comprises a ceiling, a floor and walls. The room unit can typically be moved in one piece and installed to its location in one piece. The room unit can for example be a prefabricated cabin of a ship or an apartment in an apartment building or a part of an apartment.

[0014] In this text room arrangement means a structure that is formed of several room units, which have been attached together, for example superposed apartments of an apartment building or a cabin compartment in a ship or a part of them.

[0015] In this text prefabricated means that the ceiling, floor and walls of a room unit have been connected together already prior to its installation to its location in a ship or a building. Interior design of the rooms, such as furniture, carpets, wall papers, bathroom design, and heating, plumbing, ventilation and electrical installations, has typically also been made as ready as possible in the prefabricated room unit before the room unit is brought to its installation location. All walls, typically two side walls and two end walls, are preferably ready in the prefabricated room unit. The walls are typically provided with necessary doors and possibly windows. Typically the walls, floor and ceiling also have a necessary number of openings for cords, pipes etc.

[0016] In this text load-bearing structure means a structure, which carries its own weight as well as the weight above it. A typical load-bearing structure forms a support frame for the entire structure, which support frame carries forces directed to the structure, and provides a sufficient functional rigidity.

[0017] In an embodiment of the invention the room units have a ceiling, a floor and at least two walls, which are made at least mainly of cellular board. By using cellular board known as such as a main structure for the floor, ceiling and walls of the room units, an extremely rigid, self-bearing and light structure is easy to achieve. By using cellular boards, the room unit can be made into a self-bearing structure without any specific beam struc-

tures or the like. Room arrangements formed of superposed and/or adjacent room units according to the invention can form a self-bearing structure. The room arrangements can also be manufactured of something else than cellular board.

[0018] In this text cellular board means a structure known as such, formed of two substantially parallel surface plates and of a core arranged between them. Typically also the core is of a plate-like material, but its shape has been arranged to differ from the direction of the surface plates, for example by forming folds and grooves between the folds in the plate material. Typically, the core comprises several adjacent and parallel straight shapes having usually mainly the length of the whole cellular board. In this text such longitudinal direction of the shapes of the cellular board core is called a core direction. The cellular board resists bending in a transversal direction in relation to the direction of the cores especially well. Typically the core of the cellular board according to the invention has been firmly attached to the surface plates. For example the surface plates and the core can be welded together, for example by laser welding. Typically the surface plates and the core of the cellular board according to the invention are made of metal, such as steel, for example stainless steel, or aluminium, but also other materials can be used. The thickness of the surface plates and the core of the cellular board, the material, and the shape of the core can be dimensioned to be appropriate for each situation. By means of a cellular board structure, a structure can be achieved, which is considerably lighter, more rigid and has better bending resistance than a continuous plate structure. The shape of the core has a great impact on the rigidity and strength of the cellular board. For example, a core made of steel can have the shape of a wavelike bent plate, where wave crests are typically welded to the surface plates. The cores can also be arranged for example in the shape of a letter V, or formed of plates substantially perpendicular to the surface plates, i.e. of plates arranged in the shape of a letter I. The core can consist of a plate bent in the form of a honeycomb. It is also possible to use beams that have the shape of a pipe, the cross-section of which is circular or another shape, as a core. In an embodiment of the invention the surface plates and the core of the cellular board are of the same material.

[0019] According to an embodiment of the invention the cellular board is manufactured from individual profiles, by joining several profiles adjacently. The profiles are manufactured from a plate-like material, which can be for example steel or aluminium. The plate-like material can on its one or both sides be coated, for example with a PVC sheet. The thickness of the plate-like material can for example be 0.5-5 mm or 0.5-3 mm.

[0020] According to an embodiment of the invention each individual profile is meant to form in the completed cellular board a planar first surface protrusion, a planar second surface protrusion or a core, which is arranged to join the first and the second surface protrusion together.

The profiles of the cellular board are attached together so that the first surface protrusions are arranged adjacently and form the first surface plate of the cellular board, the second surface protrusions are arranged adjacently and form the second surface plate of the cellular board, and the cores of the profiles are attached to the first and second surface protrusions, whereby they make up the core structure of the cellular board. The length of the profiles can in the so-called core direction be for example 0.5-20.0 m or 1.0-10.0 m. The width of an individual profile can be for example 0.1-1.0 m, 0.1-0.5 m or 0.1-0.2 m. The thickness of a completed cellular board can be for example 0.1-1.0 m, 0.1-0.5 m or 0.1-0.2 m. A completed cellular board can have for example 5-1000, 10-200 or 20-100 profiles joined adjacently. Generally the length i.e. size of the completed cellular board is approximately the same in the direction which bears more load as the length of the profiles in the so-called core direction. The width of the cellular board in the direction, which is perpendicular to the core direction, can be for example 0.5-50 m, 1-25 m or 5-20 m. In an advantageous embodiment the direction of the cores of the cellular boards, which make up the walls of the completed room module and building, is arranged to be vertical.

[0021] In an embodiment of the invention attaching folds, which fit into each other, have been formed in the edges of the profiles which are to be joined with other profiles. Typically an attaching fold of a profile, which forms the core of a cellular board, has also been arranged to fit in connection with the attaching folds of two adjacent surface protrusions. The attaching folds can be formed so that the attaching folds formed in the ends of three separate profiles in one contact point can be attached to each other. The attaching is easy to perform for example by pressure seaming in a way known as such. Before the pressure seaming or after it, a seam insulating substance, such as a mineral wool sheet or glue, for example urethane glue, can be arranged between the profiles of the cellular board.

[0022] Now it has thus surprisingly been noted that the room units are easy to arrange firmly on top of each other with the aid of a simple pin connection, if the superposed room units are at the same time held together with one or more drawbars. Pin connections are known as such, and several different models of pin connections are suitable for this invention. The pin connection efficiently prevents movement of the superposed room units other than in the direction of the pin. For example if the pins are in the vertical direction, the pin connection efficiently prevents horizontal movement of the room units. By planning the locations of the pins of the pin connections in detail beforehand, the superposed and adjacent room units are easy to install just in the desired position and place in relation to each other. In an embodiment of the invention the attaching means comprise centering pins and centering openings which fit them. The pins can be for example of steel, some other metal or plastic. The edges of the centering openings can be of metal, and a sleeve for

example of plastic can be installed on them. The necessary amount and size of the pins and the openings fitting them can be planned separately for each situation.

[0023] With the aid of the drawbars, superposed room units can be held firmly together in the direction of the drawbar. The amount and size of the drawbars can be solved separately for each situation. For example only two, three or four superposed room units can be attached to each other in the vertical direction with one drawbar. On the other hand even an entire multi-storey building can be attached in the vertical direction with one bar. Drawbars are known prior art as such, and they will not be described in this text in further detail.

[0024] In an embodiment of the invention the attaching means comprise an attaching element, which can be fitted between the lower edge of a wall of the upper room unit and the upper edge of a wall of the lower room unit. The centering pins and/or centering openings can be situated in this attaching element. Centering pins and/or centering openings which fit these pins and/or openings can thus be situated in the lower edge of the wall of the upper room unit and in the upper edge of the wall of the lower room unit. Thus the wall of the upper room unit, the wall of the lower room unit and the attaching element are attachable to each other with the aid of a pin connection.

[0025] In an embodiment of the invention the attaching element is a mainly planar steel plate, which is for example 3-100 mm, 5-50 mm or 7-30 mm thick. The centering pins can for example be welded to such a plate, for example perpendicularly in relation to the level of the plate, up or down from the level of the plate.

[0026] In an embodiment of the invention the pins are in the attaching element and openings, which fit the pins, are in the upper edge and/or lower edge of the walls of the room units.

[0027] In an embodiment of the invention the pins are in the upper edge and/or lower edge of the walls of the room units and openings, which fit the pins, are in the attaching element.

[0028] In an embodiment of the invention the attaching element is arranged to cover the space between the walls of superposed room units at least mainly completely. The attaching element is thus at least as long and as wide as the entire upper or lower edge of the wall. It can also be conceived that one space between superposed walls is covered with several smaller attaching elements. In an embodiment of the invention one attaching element is arranged to be as long as the entire building or cabin compartment of a ship.

[0029] In an embodiment of the invention a sound-insulating mat or band or a corresponding insulating material is placed in a manner known as such between the attaching element and the walls of the room unit. The openings needed for the pin connection can be arranged into this insulating material.

[0030] In an embodiment of the invention the arrangement comprises adjacent room units. Thereby one at-

taching element can have centering pins and/or centering openings for the lower edges of the walls of two adjacent upper room units and the upper edges of the walls of two adjacent lower room units meant to be underneath them. Thus the adjacent and superposed room units are attached to the same attaching element.

[0031] In an embodiment of the invention one attaching element is arranged to extend from the outer edge of the entire building or cabin compartment of a ship to the opposite outer edge. In an embodiment of the invention an edge of the attaching element extends outside the outer walls of the building or cabin compartment of a ship by for example 5-50 cm or 10-30 cm. Other structures, for example a balcony, can be supported on this protruding edge.

[0032] In an embodiment of the invention the centering pins and/or centering openings in the attaching element are arranged so that the walls of two adjacent room units are situated at a distance, for example 50-500 mm, from each other. For example insulations or various kinds of cords, pipes and possible support structures can be placed in these spaces. The attaching element can thus be as wide as two adjacent walls and the space between them.

[0033] In an embodiment of the invention one or more drawbar openings have been arranged in at least two superposed attaching elements. One or more drawbars can thereby be arranged through the drawbar openings in the superposed attaching elements. With the aid of the drawbars, superposed attaching elements and thus superposed room units can be held together in the direction of the drawbar. In an embodiment of the invention the drawbar openings and the drawbar are between adjacent room units. It is possible to attach the drawbars also in other ways than in the attaching elements according to the invention. In an embodiment of the invention the drawbar does not penetrate the wall structures of the room unit. In an embodiment of the invention the drawbar is mainly vertical.

[0034] The lower end of the drawbar can be attached for example to the deck of the ship or the bottom of the building, whereon the arrangement according to the invention has been erected. In an embodiment of the invention only the uppermost storeys of the arrangement are attached to each other with the aid of drawbars. For example the uppermost 2, 3, 4 or 5 storeys in an arrangement according to the invention, which has more than 6, more than 8 or more than 10 storeys, can be attached with drawbars. In an embodiment of the invention the attaching element is arranged on top of the upper edge of the wall of the uppermost room unit and/or below the lower edge of the wall of the lowest room unit. The attaching element is thus not necessarily always between the walls of two superposed room units. Also in such attaching elements, there can be drawbar openings. If the drawbar is attached to such attaching elements, one drawbar can be used to hold together the uppermost or bottom storeys or even all the storeys of the arrangement.

[0035] In an embodiment of the invention balconies mainly outside the room units have been supported on one or more attaching elements.

BRIEF DESCRIPTION OF THE FIGURES

[0036] The invention is described in more detail below with reference to the enclosed schematic drawing, in which

- Figure 1 shows a connection between four room units according to the invention,
- Figure 2 shows the connection of Figure 1 as an exploded view,
- Figure 3 shows the uppermost connection of an arrangement according to the invention,
- Figure 4 shows an arrangement according to the invention, and
- Figure 5 shows a magnified view of a detail A of Figure 4.

DETAILED DESCRIPTION OF THE EXAMPLES OF THE FIGURES

[0037] For the sake of clarity, the same reference numbers are used for corresponding parts in different embodiments.

[0038] Figures 1 and 2 show a connection between four room units according to the invention. The upper room units 1 and 2 are attached to the lower room units 3 and 4 with an attaching element 5. There are pins 8 in the upper edges 6 of the walls of the room units. There are openings 9, which fit the pins, in the lower edges 7 of the walls of the room units and in the attaching element 5. There are sound-insulation bands 10 in the spaces between the walls and the attaching element. Two drawbars 12 run in the space 11 between the walls, for which drawbars the attaching element 5 has openings 13.

[0039] Figure 3 shows the uppermost connection of the arrangement according to the invention. The attaching element 5 has openings 9 and 13 for the pins 8 and the drawbars 12. The upper end of the drawbar is tightened with a bolt 14. There can also be a corresponding bolt tightening in the bottom end of the drawbar.

[0040] Figure 4 shows an arrangement 20 according to the invention, which has six room units 1, 2, 3, 4, 55 and 66. Balconies 15 are arranged in the two uppermost storeys, i.e. in room units 1, 2, 3 and 4, which balconies are supported on the attaching elements 5. Figure 5 shows a magnified view of a detail A of Figure 4, where the attaching of the balcony can be seen in more detail. A support plate 16 has been attached, for example by welding, to the attaching element 5. The edge of the floor of the balcony, which is against the arrangement 20, is bolted directly to the support plate. The edge, which is further from the arrangement, is supported via bars 17 to a support plate attached to an upper attaching element.

[0041] Edge steels 18 arranged in the edges of the

walls, floors and ceilings manufactured from cellular board, which steels make the structure of the cellular board more sturdy, can also be seen in the figures.

[0042] The figures show only a few preferred embodiments according to the invention. Facts of secondary importance regarding the main idea of the invention, facts known as such or apparent for a person skilled in the art, such as support structures possibly required by the invention, are not separately shown in the figures. It is apparent to a person skilled in the art that the invention is not limited exclusively to the examples presented above, but that the invention may vary within the scope of the claims presented below. The dependent claims present some possible embodiments of the invention, and they are not to be considered to restrict the scope of protection of the invention as such.

Claims

1. An arrangement for attaching prefabricated load-bearing room units (1, 2, 3, 4, 55, 66) to each other, which arrangement comprises an upper and a lower prefabricated room unit and attaching means between them for attaching the room units to each other, which attaching means comprise centering pins (8) and centering openings (9) which fit them, i.e. a pin connection, **characterized in that** the attaching means further comprise at least one drawbar (12), which is arranged to hold superposed room units together in the direction of the drawbar.
2. The arrangement according to claim 1, **characterized in that** the attaching means comprise
 - an attaching element (5), which can be fitted between a lower edge (7) of a wall of the upper room unit and an upper edge (6) of a wall of the lower room unit, which attaching element has centering pins and/or centering openings (9).
3. The arrangement according to claim 2, **characterized in that** the attaching means comprise
 - centering pins (8) and/or centering openings in the lower edge (7) of the wall of the upper room unit and in the upper edge (6) of the wall of the lower room unit,
 whereby said centering pins (8) and/or centering openings of the attaching element (5) and of the walls of the upper and lower room unit fit into each other, so that the wall of the upper room unit, the wall of the lower room unit and the attaching element are attachable to each other.
4. The arrangement according to claim 2 or 3, **characterized in that** the attaching element (5) is arranged

to cover the space between the walls of the superposed room units at least mainly completely.

5. The arrangement according to any of the preceding claims 2-4, **characterized in that** the arrangement comprises adjacent room units, whereby the attaching element has centering pins and/or centering openings for the lower edges of the walls of two adjacent upper room units and for the upper edges of the walls of two adjacent lower room units meant to be underneath the walls of the upper room units, whereby the adjacent room units are attached to the same attaching element.
6. The arrangement according to claim 5, **characterized in that** the centering pins and/or centering openings in the attaching element are arranged so that the walls of two adjacent room units are situated at a distance, for example 50-500 mm, from each other.
7. The arrangement according to any of the preceding claims 2-6, **characterized in that** at least two superposed attaching elements (5) have been provided with one or more drawbar openings (13), and at least one drawbar (12) has been arranged through the drawbar openings in the superposed attaching elements, which drawbar is arranged to hold superposed attaching elements and thus superposed room units together in the direction of the drawbar.
8. The arrangement according to claim 7, **characterized in that** the drawbar openings and the drawbar are between (11) adjacent room units.
9. The arrangement according to any of the preceding claims 2-8, **characterized in that** it comprises balconies (15), which are mainly outside the room units, which balconies are supported on one or more attaching elements (5).
10. The arrangement according to any of the preceding claims, **characterized in that** the prefabricated room units are at least mainly of cellular board structure.
11. A ship, **characterised in that** it comprises an arrangement according to any of the claims 1-10.
12. A building, **characterised in that** it comprises an arrangement according to any of the claims 1-10.
13. A method for attaching prefabricated load-bearing room units (1, 2, 3, 4, 55, 66) to each other, which comprises:
 - attaching an upper and a lower prefabricated room unit to each other with a pin connection

between them,

characterized in

- 5 - holding the superposed room units together with one or more drawbars (12).
14. The method according to claim 13, **characterized in**
 - 10 - fitting an attaching element (5) between a lower edge (7) of a wall of the upper room unit and an upper edge (6) of a wall of the lower room unit, which attaching element has centering pins and/or centering openings (9), and
 - 15 - fitting the centering pins and/or centering openings (9) of the attaching element (5) into the centering pins (8) and/or centering openings in the lower edge (7) of the wall of the upper room unit and the upper edge (6) of the wall of the lower room unit.
15. The method according to any of the preceding claims 13-14, **characterized in**
 - 25 - attaching the lower edges of the walls of two adjacent upper room units and the upper edges of the walls of two adjacent lower room units meant to be underneath the walls of the upper room units in the centering pins and/or centering openings (9) of one and the same attaching element (5).
16. The method according to claim 15, **characterized in**
 - 35 - attaching the walls of two adjacent room units at a distance, for example 50-500 mm, from each other.
17. The method according to any of the preceding claims 13-16, **characterized in**
 - 40 - holding superposed attaching elements (5) and thus superposed room units together with one or more drawbars (12) arranged through at least two superposed attaching elements (5).
18. The method according to any of the preceding claims 13-17, **characterized in**
 - 50 - supporting a balcony (15), which is mainly outside the room units, on one or more attaching elements.
19. The method according to any of the preceding claims 13-18, **characterized in that** the prefabricated room units are at least mainly of cellular board structure.

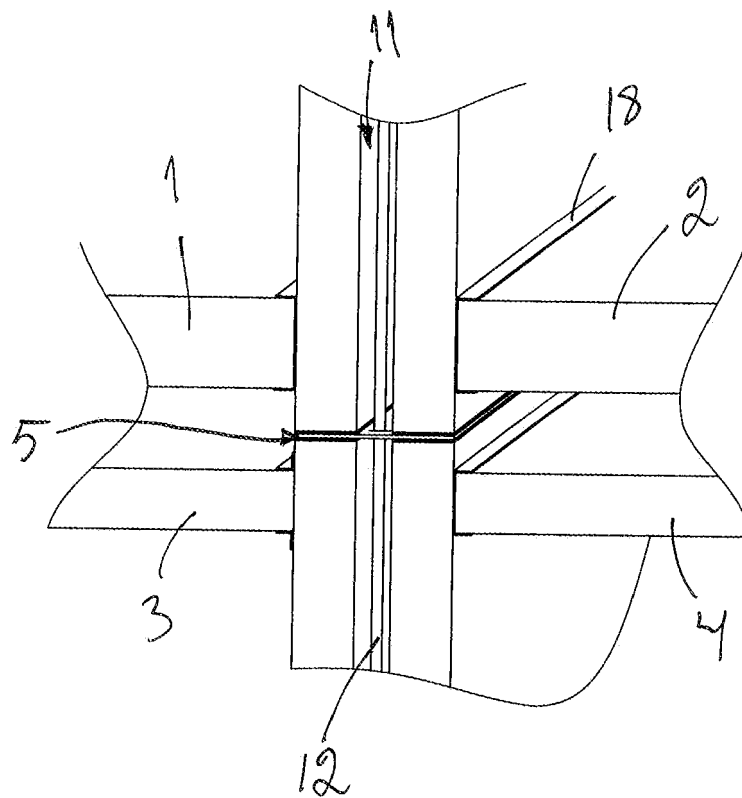


Fig. 1

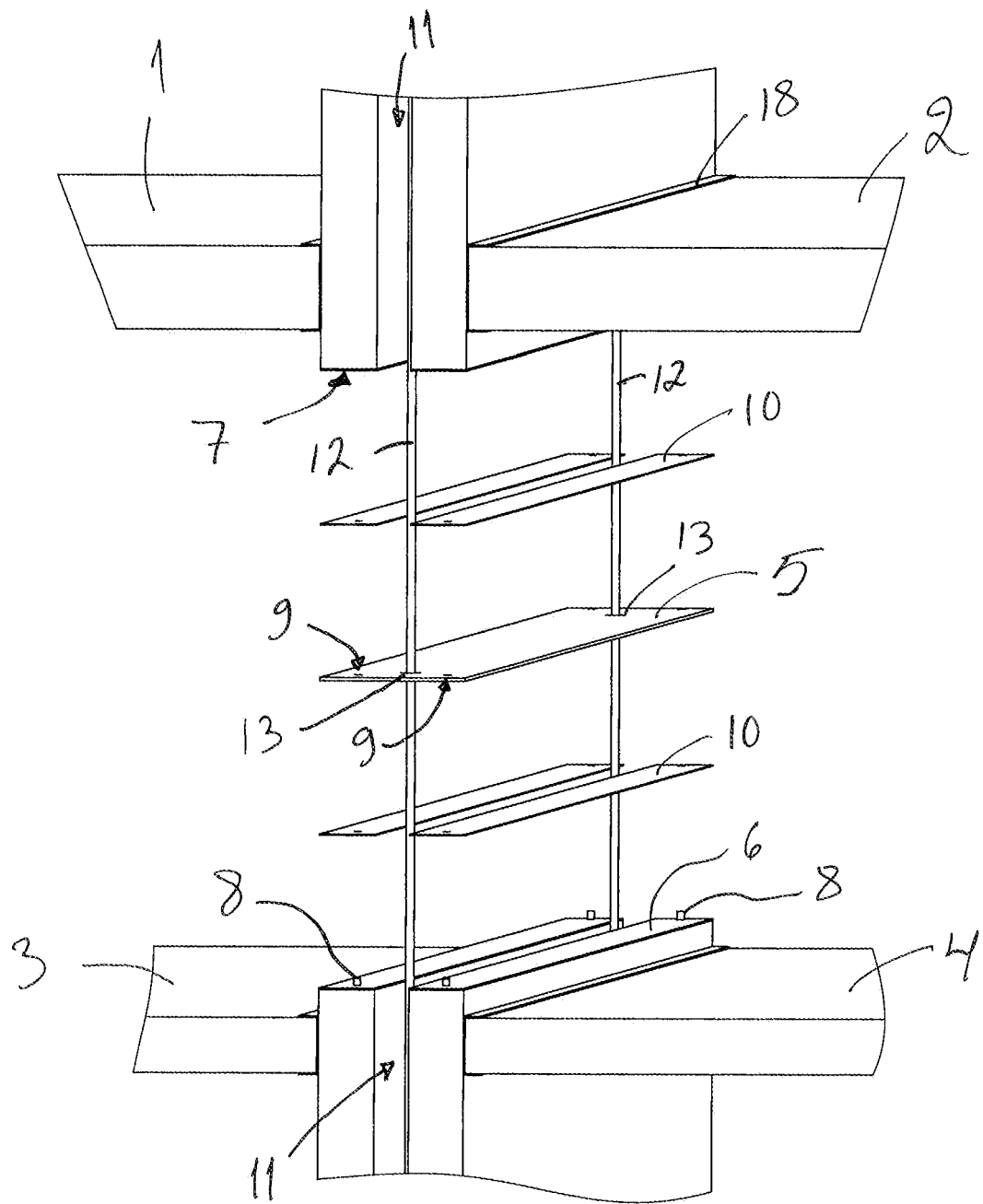


Fig. 2

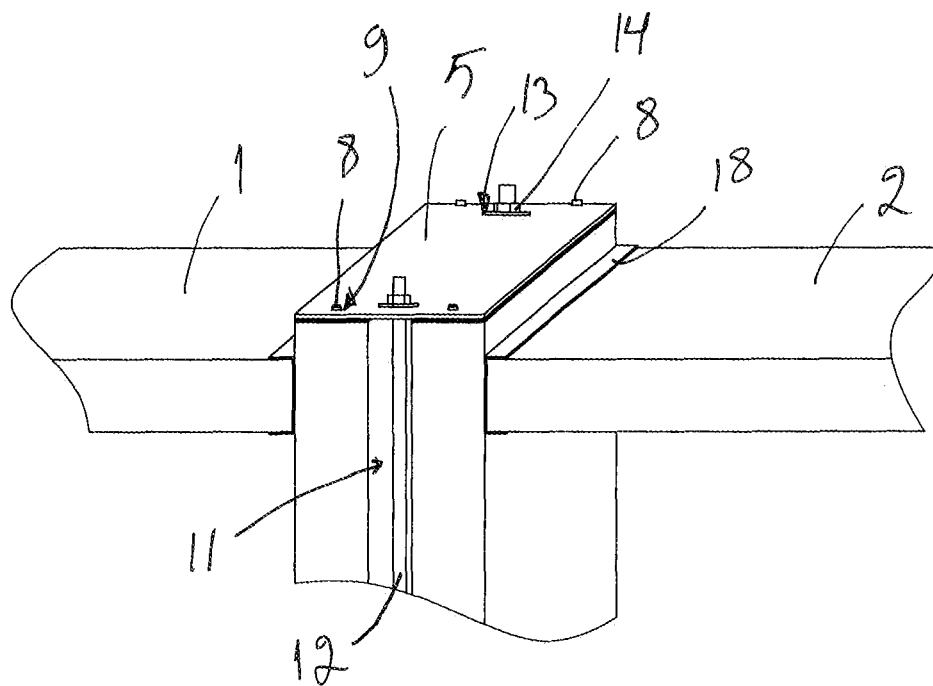
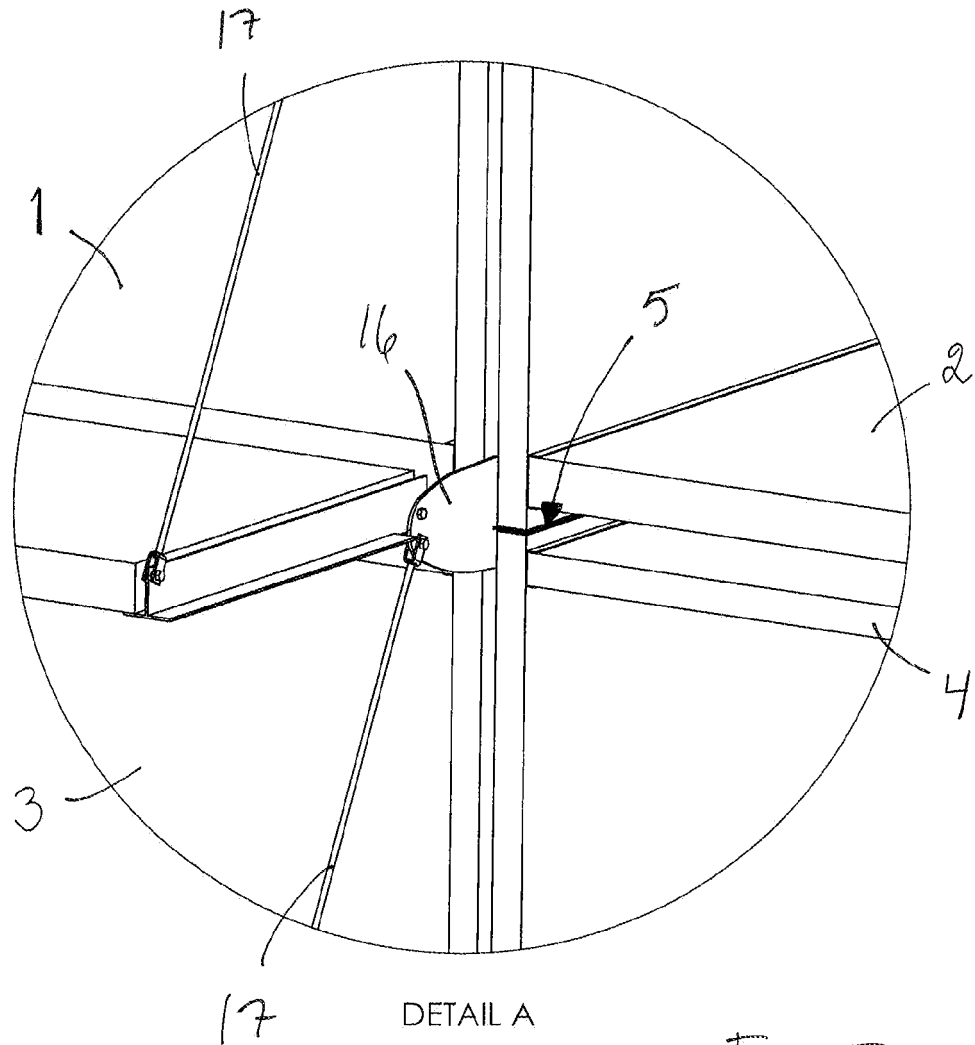
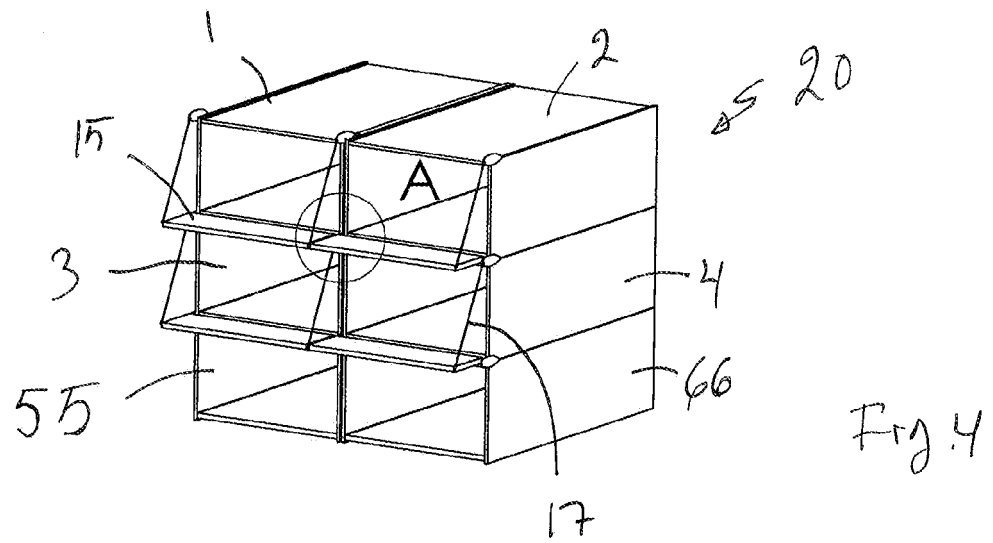


Fig 3



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2006079682 A1 [0002]
- WO 9840573 A [0003]
- JP 11081481 B [0003]
- US 3643390 A [0003]