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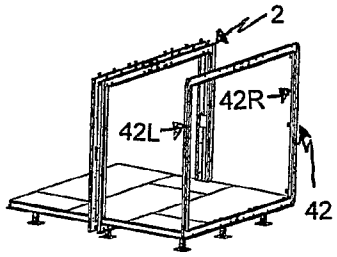

(57) Abstract: A building structure comprises an open upright rectangular main frame spanning the width of the building, one or more separate floor frames supported from the main frame, an open upright rectangular end frame extending parallel to the main frame and connected to the main frame via the floor frame, and wall and roof panels extending between the main frame and end frame. The building structure is demountable and individual components are of such a size that they can be lifted by just two adults without the need for special lifting equipment. To facilitate transportation and handling during construction, the main frame is assembled on-site as two frame halves, specifically a left hand and right hand frame half, each preferably formed from several components assembled together on-site.

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A BUILDING

The present invention relates to a building and more particularly to a building supplied in kit form to be assembled on site.

Conventional portable buildings of the type typically used to provide temporary accommodation such as for offices on construction sites, temporary living quarters, and temporary classrooms are supplied as pre-assembled units transported onto site by truck. In order to offload the unit from the truck and place it in the required position on site it is normally necessary to use a crane or other heavy duty lifting equipment. Although individual units are able to be coupled together in modular fashion to increase the size of the accommodation there is only restricted scope for significant variation. Moreover existing units of this type generally tend to be of a cuboid shape and are not aesthetically attractive.

According to the present invention, there is provided a building structure comprising an open upright rectangular main frame spanning the width of the building, one or more separate floor frames supported from the main frame, an open upright rectangular end frame extending parallel to the main frame and connected to the main frame via the floor frame, and wall and roof panels extending between the main frame and end frame.

Further according to the present invention there is provided a demountable building structure erected on-site from a kit of components including an upright rectangular main frame spanning the width of the building, an upright rectangular end frame extending parallel to the main frame and obtaining its principal structural support from the main frame, one or more separate floor frames extending between the main frame and end frame, and wall and roof panels extending between the main frame and end frame, the connections between the frames being bolted connections.

In a preferred embodiment of the invention the main frame includes ground-engaging components by which the main frame is supported from the ground, for example legs

carried by a lower beam of the main frame, and the adjacent end of the or each floor frame is supported from the ground by the lower beam of the main frame. Preferably the structure of the wall panels is such as to brace the end frame from the main frame.

In a particularly preferred form of the invention, the main frame consists of two rectangular sub-frames each consisting of upper and lower beams and outer vertical beams, the two sub-frames being joined back-to-back via brackets which maintain the two sub-frames spaced apart. Preferably the space defined between the sub-frames is in the form of a channel facing outwardly of the main frame, for example for housing guttering, one or more downpipes from the guttering, and conduits for electricity and/or water to be led into the building. The beams from which the sub-frames are constructed are preferably of lightweight channel construction as also are beams for forming the end frame.

The end frame extends to a greater height than the main frame so that the roof is able to drain into guttering installed within the channel of main frame.

To facilitate transportation and handling during construction, the main frame is assembled on-site from prefabricated components. In one particularly preferred form, the main frame consists of two frame halves, a left hand and right hand frame half which are assembled together on-site. Each frame half itself is preferably formed from several components assembled together on-site. These components include two sub-frame halves each consisting of upper and lower beams and a vertical side beam and brackets for assembling the two sub-frame halves together. The rectangular end frame is likewise formed from two frame halves assembled together on-site.

The connections between the brackets and the sub-frame halves to form the main frame half are bolted connections as are the connections between the two main frame halves. Likewise the connections between the end frame halves to form the end frame are bolted connections and the connections between the or each floor frame and the main frame and end frame are bolted connections.

Still further according to the invention, there is provided a frame for use in the construction of a prefabricated building, the frame being of open rectangular form and comprising two rectangular sub-frames each consisting of upper and lower beams and outer vertical beams, the two sub-frames being joined in back-to-back relation.

Advantageously the frame includes ground-engaging legs to support the frame raised from the ground.

Advantageously the two sub-frames are joined back-to-back via brackets which maintain the two sub-frames spaced apart, and the legs extend from brackets associated with the lower beams of the two sub-frames.

For ease of transportation, the frame is preferably fabricated from two frame halves which are assembled together on-site, each frame half including two sub-frame halves assembled together by the brackets. Advantageously the sub-frame halves and brackets are assembled by bolting together whereby the individual sub-frame halves and brackets may be separately transported.

The modularity of the building enables significant variation in building design. Although the main frame can lie at one end of the building with the end frame at the other, a more usual arrangement would be for the main frame to be central within the building with end frames at each end. Further modules can be added by incorporating a second main frame and possibly a further end frame together with associated floor frames.

Advantageously each of the components of the building is of such a size and weight that it can be lifted and manoeuvred by two adults and can lay flat on the tray of a flat bed truck or trailer.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the main frame of a building in accordance with a

preferred embodiment of the invention;

Figure 2 is a front view of the frame of Figure 1;

Figure 3 is a side view of the frame of Figure 1;

Figure 4 is a plan view of the frame of Figure 1;

Figure 5 is a section on line A-A of Figure 2;

Figure 6 is section on line B-B of Figure 2;

Figure 7 is a front view of a sub-assembly used in the construction of the main frame;

Figure 8 is a perspective view showing one form of bracket used in the construction of the main frame;

Figure 9 is a perspective view of another form of bracket used in the construction of the main frame;

Figure 10 is a front view of yet another form of bracket used in the construction of the main frame;

Figure 11 is a side view of the bracket of Figure 10;

Figure 12 is a plan view of the bracket of Figure 10;

Figure 13 is a perspective view of a floor module within the building;

Figures 14A to 14L and 15A to 15L are diagrammatic illustrations showing successive stages in the erection of the building;

Figure 16 is an exploded view of wall panel structure;

Figure 17 is an exploded view of roof panel structure; and

Figure 18 is an exploded view of the overall building structure.

The building in accordance with a preferred embodiment of the invention is assembled on-site from prefabricated components which can be "flat packed" for ease of transportation and delivery. The larger of the components are so designed that they are able to be lifted, manoeuvred, and erected by only two people without the need for lifting equipment. Moreover, the basic structure is designed for assembly by persons without specialist trade skills and without specialist tools. The building is demountable after erection and is capable of being erected/demounted many times.

The main structural component of the building is an open rectangular frame 2 (see Figures 1 to 6) which, depending on the detailed design of the building, will either be positioned within a central zone of the building or at an end of the building. In each case the frame extends vertically and spans the width of the building. The frame consists of two rectangular sub-frames in spaced back-to-back relation and this can readily be seen in Figure 1. The frame is assembled from left and right halves 2L, 2R substantially identical and joined together on-site at a central vertical plane. Each frame half comprises two sub-assemblies 4, 6 assembled in spaced back-to-back relation. The two sub-assemblies 4, 6 are substantially identical and each consists of an outer vertical beam 4a, 6a of channel section and upper 4b, 6b and lower 4c, 6c horizontal beams of channel section extending inwardly from the upper and lower ends of the vertical beam 4a, 6a. Accordingly each sub-assembly 4 or 6 constitutes one half of the rectangular sub-frame mentioned above. The sub-assembly 4 is shown in Figure 7.

Each of the sub-assemblies 4, 6 is prefabricated and is of a weight such that it can easily be carried by two people. For this purpose it is particularly preferred that each beam of the sub-assembly is fabricated from a channel section beam formed by cold rolling metal sheet into channel form to form double thickness, hollow, side walls which are resistance welded to complete the structure. Such a product is available from Smorgon Steel Group Limited and is marketed under the trademark "LiteSteel" and provides a product approximately 40% lighter in weight than equivalent hot rolled beams. It is however to be understood that the invention in its broader concepts is not confined to the use of such a beam, and other products which provide the necessary strength while of a weight which permits the required manoeuvrability could also be used.

The two sub-assemblies 4, 6 forming each half of the rectangular frame 2 are assembled in back-to-back relation on-site using brackets which extend between the base walls of the beams of the two sub-assemblies so that the base walls are spaced apart, the brackets being secured to the two sub-assemblies by bolts extending through preformed holes in the base walls of the channel section. While it is preferred to assemble together on-site the two sub-assemblies 4, 6 using brackets and bolts to form the frame half as just described, it may be

feasible to pre-assemble the two sub-assemblies together for transportation to the site as an assembled frame half and in that case the brackets could be secured to the two sub-assemblies by welding; when constructed of relatively lightweight steel beam such as that discussed above, the pre-assembled frame half could still be lifted and carried by two people. The brackets used to connect the lower beams of the two sub-assemblies carry downwardly projecting legs designed to engage foot pads on the ground.

Figure 8 shows one of the brackets 10 used to connect the sub-assemblies 4, 6 at their upper beams and vertical beams. The bracket 10 is of channel section and preferably is fabricated from the same type of material as that used for the beams themselves, for strength and lightness in weight. The brackets 10 lie between the base walls of the adjacent beams with the side walls of the brackets being bolted to the base walls of the beams. The brackets are orientated such that the channel defined by the structure of the bracket extends in the longitudinal direction of the beams to which they are secured, with the base lying innermost so that the channel faces outwardly. In this way there is formed a channel-like space between the upper and vertical beams of the two connected sub-assemblies and which opens to the outside of the structure. This is clearly visible in Figure 1 and Figures 3 to 6. These channel-like spaces have significance in the overall construction of the building as will be described later.

Figure 9 shows one of the brackets 12 used for connecting the two sub-assemblies 4, 6 at their lower beams 4c, 6c. These are also of channel form of the same structure as that used for the brackets 10. They are however fastened to the base walls of the two beams 4c, 6c with the channel of the brackets directed at right angles to the axis of the beam as shown in Figures 1 and 3, for example. The bracket 12 is of a length such that it projects upwardly beyond the lower beams to engage with a floor module subsequently to be described. The projecting part of the bracket 12 has a slot 12a in its base wall to receive a flat bar at the end of the floor module. The particular bracket shown in Figure 9 includes a downwardly projecting leg 14 and that bracket is positioned towards the outer end of the two beams 4c, 6c. Further brackets of this type within this part of the structure are absent the leg.

Figures 10 to 12 show a bracket 20 used at the inner end of the two lower beams 4c, 6c. This bracket also includes a leg 14. This bracket principally serves to connect the two frame halves 2L, 2R together at the inner end of their lower beams and for this purpose the sides 20a of the bracket are of a length to span the joint between the two frame halves when the two are assembled together as will be described.

Preferably the legs 14 incorporated in the bracket 12 and bracket 20 are of telescopic construction with an inner section (not shown) which can be slid vertically within the outer section and locked at a selected extension by a removable pin to permit adjustment in effective leg length to compensate for variations in the level of the site on which the building is to be erected.

Figure 13 shows a floor module 24. The width dimension of the floor module corresponds to the width dimension of a frame half whereby two such floor modules will be placed side-by-side to form a floor structure projecting to one side of the main frame. The floor module is in the form of a frame comprising longitudinal beams 26 of channel section preferably of the same type of material as that used for the main frame, so as to achieve strength with lightness in weight. A transverse beam 28 of angle section is provided at the outer end of the module and a transverse bar 30 of flat cross-section is provided at the inner end of the module. It is this bar which engages into the slots 12a in the brackets 12 of the main frame. Legs (not shown in Figure 13 but equivalent to the legs 14) are bolted to two of the longitudinal beams 26 towards the outer ends thereof via brackets welded to the legs.

It will be noted from Figure 13 that the floor module has a corner portion 24a which is inset. This is the outer corner portion of that module and the inset 24a is needed to enable that corner portion to fit around the adjacent part of the vertical beam of the main frame whereas the remainder of the inner end of the floor module is supported by the adjacent lower beam of the main frame and extends into the central zone of the frame where it inter-fits with the slots 12a in the bracket 12. The second floor module is identical to that shown except that the inset corner of that will be its left hand corner.

The assembly of the basic building structure will now be described with reference to Figures 14A to 14L. A first frame half (as shown the right hand half 2R) is assembled while lying flat on the ground by bolting the two sub-assemblies 4, 6 together using the brackets 10, 12, 20 previously described (Figure 14A); it is to be noted in this respect that while the lower beam bracket 20 is common to both frame halves in the completed frame, it is applied initially to the first frame half. When assembled, the first frame half will thereby include two legs 14, one adjacent its outer side and the other adjacent its inner side. The floor modules 13 are supplied in assembled form save for the legs 14 which are bolted onto the longitudinal beams 26 on-site. With the assembled frame half lying flat on the ground, a first floor module 24 is lifted vertically and engaged with the frame half by insertion of the flat end bar 30 of the floor module into the slots 12a of the brackets 12 (Figure 14B). The floor module is secured to the frame half by bolting the inner ends of its longitudinal beams 26 to the adjacent brackets 12 by bolts extending through the base walls of the beams and brackets. With the first floor module thus secured, the frame half can then be tilted upwardly from the ground so that it extends vertically to be supported from the ground on its two legs 14, with the floor module 24 then extending horizontally to be supported on the ground by its two legs 14 (Figure 14C). There is thereby formed at this stage a freestanding stable structure. Assuming, as will usually be the case, that the main frame 2 is to be within the central part of the completed building a second floor module 24 is installed to extend to the other side of the frame half (Figure 14D). The inner end bar 30 of the second floor module is engaged within the slots 12a in the brackets 12 to lie in face-to-face relation with the bar of the first floor module. The second floor module is bolted to the brackets 12 and, if required, the end bars 30 of the two floor modules may also be bolted together.

The second half of the building is erected by assembling the second half 2L of the main frame on the ground substantially in the manner described earlier, lifting it and then coupling it to the first frame half 2R by bolting to the bracket 20 which already exists at the inner end of the lower beams of the first frame half and by connector plates bolted across the junction between the upper beams of the two frame halves (Figure 14E);

alternatively the first frame half could include at the inner end of its upper beams a junction bracket of generally similar form to the bracket 20 for providing the connection to the other frame half. With the two frame halves 2R, 2L firmly secured together to form the main rectangular frame 2, floor modules 24 for the second half of the building are then applied to the second half of the frame in the same manner as previously described, and are bolted to the brackets 12 (Figures 14F, G).

At this stage, and as shown, floor panels 40 are applied to the floor modules 24 (Figure 14H) although alternatively the floor panels could be applied after end frames (now to be described) have been erected.

The described structure of the main frame has high strength and rigidity and forms the main structural component of the building. Its strength is such that the erected building is capable of achieving a rating for use in cyclonic conditions.

A rectangular end frame 42 is assembled to the outer end of each floor module. Each end frame 42 is in two halves 42L, 42R coupled at a central vertical connection plane, and each is formed from beams of channel section preferably of the type previously described for strength and lightness of weight. However unlike the main frame halves, each end frame half is constructed using only a single set of beams to form upper and lower horizontal beams and an outer vertical beam and is thereby equivalent to a single sub-assembly 4 or 6 of the main frame. That structure is adequate for the end frame which does not require to be of the more complex structure needed for the main frame as, in the completed building, the end frames will be braced from the main frame and will take a significant part of their structural support from that frame. The end frame 42 is assembled by erecting one frame half, the right frame half 42R as shown in Figure 14I, on the flange of the angled end beam 28 of the adjacent floor module 24 so that the frame half is supported by that flange, and the frame half is bolted to the vertical face of the end beam 28. The second frame half 42L is applied in the same way (Figure 14J). The upper beams of the two frame halves 42L, 42R are connected by a connection plate which spans the joint between them. It is to be noted that while the end frame 42 is of the same width as the main frame 2, it extends to a

greater height so that when roof structure is applied the roof will pitch downwardly towards the main frame.

The end frame 42 at the other end of the structure is then assembled in the same way (Figures 14 K, L).

With the basic frame structure of the building now erected, side wall, end wall and roof panels are applied to the frame to complete the structure. See Figures 15A to 15L.

Firstly, side wall panels 50 are applied between each end frame and the main frame (Figures 15A to 15D). Although various constructions of wall panel are suitable for this purpose, it is important that the wall panel has sufficient strength to brace the end frame from the main frame and also in practice it needs to be of a size and weight such that it can be carried by two people. One preferred construction of wall panel consists of a core of polyurethane foam sandwiched between two metal outer skins. Such a construction provides the strength needed to securely brace the end frame but is also relatively light and the foam core provides good thermal insulation. Each wall panel 50 extends between the face of the adjacent vertical beam of the main frame 2 and the vertical beam of the end frame 42. Although the method used to fasten the wall panel to the frames will depend on the structure of the wall panel, it is preferred to secure the wall panel by bolting or screwing into an end edge of the panel by passage through the base walls of the beams forming these frames so that the fastenings are not visible from the exterior of the building. In the case of a sandwich panel of a construction as just described, each end edge of the panel includes a strong metal section to receive fastening bolts or screws extending through the main and end frames.

Although a wall panel of sandwich construction as described above will be of relatively lightweight, nevertheless for ease of packing and transportation to site it is preferred that the panel is fabricated in two or possibly more sections which are assembled on-site to form the complete panel. The exploded view of Figure 16 shows the panel 50 as comprising two panel sections 52a, 52b which are coupled on-site along adjacent inner

vertical edges. One of these edges is provided with a tongue which engages into a groove in the other edge to provide a secure weather tight connection between the two sections. Each panel is prefabricated with capping strips 54 along its upper and lower edges and with a strong metal section 56 along its outer vertical edge to receive fastening bolts or screws extending through the main and end frames to fasten the panel thereto as previously described.

The wall panel 50 as assembled on-site by mating the two sections 52a, 52b in side-by-side relation and then applying a connection channel 58 across the upper and lower capping strips 54 of the two sections and screwing the connection channel 58 to the capping strips 54 to ensure that the two panels are firmly connected and are braced. For additional integrity of the structure thus formed, an end part of the connecting channel 58 may project a short distance along the outer vertical edge of each of the connected panel sections.

Roof panels 60 are then applied to extend from the upper beam of the end frame 42 to the upper beam of the adjacent section of the main frame 2 (Figures 15E to 15H). Each roof panel is of a construction having sufficient rigidity to enable it to span the required distance without the need to apply a separate underlying supporting frame. The preferred construction of roof panel is of sandwich construction equivalent to that used for the wall panels. To facilitate packing and transportation, the roof panel is supplied in two or more separate sections (as shown three sections 62a, b, c) which are applied individually to the structure as shown in Figures 15E to 15H. Adjacent panel sections mate with a tongue and groove connection as described in relation to the sections of the wall panels. Each panel section is prefabricated with a metal capping channel 64 along its upper and lower edges. This is shown in the exploded view of Figure 17.

The roof panel sections are anchored to the upper beam of the end frame 42 by screwing through the upper wall of the beam into the capping channels 64 at that end. The upper beam of the main frame includes upwardly projecting brackets 66 (see Figures 1 and 2) which are installed during the prefabrication of the sub-assemblies 4, 6 by welding to the inside faces of their upper beams. The lower ends of the panel sections rest on the upper

edges of the beams and are secured by screwing through the brackets 66 into the capping channels 64 at that end. These brackets serve to locate the roof panel sections prior to fastening and also facilitate the installation prior to application of the panels of flashing associated with guttering to be subsequently described.

To achieve a weather tight seal, a sealing strip is applied between the upper edge of the side wall panel 50 and the adjacent section of the roof panel 60. Although a variety of different sealing systems could be used for this purpose, a simple but effective sealing system is obtained by fitting to the upper edge of the wall panel a sealing strip of a compressible closed cell foam material prior to application of the roof panel.

End wall panels 70, 72 are then applied to the end frames 42 of the structure (Figures 15I, J). As these end wall panels do not provide structural rigidity for the end frames it is feasible for one of the end frames to provide a large window panel and the other of the end panels to provide a door opening and possibly a further window opening. Due to their size, the end panels may also be formed in two or more sections which are coupled together during installation into the end frame. In the case of the end panel including the door opening, this may be of sandwich construction similar to that of the side wall and roof panels, and with inter-fitting sections. It is to be noted that while the side wall panels may also contain door and window openings, care needs to be taken to ensure that the positioning of such openings does not compromise the strength of the panel in a manner which adversely effects its capability to brace the end frame from the main frame.

As mentioned previously, the main frame 2 in its assembled state has an open channel between its two upper and vertical beams. The open channel defined between the upper beams is able to receive a box gutter and that is mounted into the frame prior to application of the roof panels. Flashing is also applied at that time. Gutter and flashing sections are shown in Figure 18 and are designated 80, 82 respectively. The gutter can be configured to provide a fall just to one side of the frame 2, or to both sides of the frame from the central part, to lead into a downpipe which is mounted within the open channel formed between the vertical beams of the main frame. That channel can also conveniently house

conduits for leading electricity and water into the interior of the building. After installation of the downpipe and conduits for electricity and water, the channel can be closed by a lightweight capping sections 84 to conceal the downpipe and conduits for aesthetic reasons. Likewise the part of the channel visible from the interior of the building can be closed by a capping section for aesthetic reasons.

In a variation, the gutter mounted into the channel may be composed of a translucent plastics material. The capping section applied to the upper side of the main frame at the inside of the building may also be translucent. Accordingly a "light well" can be formed to admit natural light into the central part of the building which may be particularly desirable if the wall panels do not themselves include any window openings.

Capping sections 86, 88 can also be applied at the junctions between the wall panels 50 and roof panels 60 and between the wall panels 50 and floor modules 24, for additional weather-proofing and to provide a cleaner aesthetic appearance.

Overhanging eave structures 90 (Figures 15K, 15L) may be fastened to the upper beams of the end frames as shown.

As previously mentioned all of the components of the building are designed so they can be lifted and carried by two people without the need for lifting equipment. The components are sized so that they can all be packed within a standard container or on the bed of a flat bed truck or trailer.

The components are designed to be assembled on-site predominantly by screwed or bolted connections through preformed holes formed in the components during fabrication. Not only does this mean that the building can be erected without special skills and without special tools, it also means that the building is easily demountable so that the disassembled building can be disassembled and packed for shipment to a different site.

The modularity of the design enables significant versatility in configuration, for example

by providing shorter or longer floor modules or by rigidly connecting floor modules of standard size in end-to-end relation to provide a greater span between the end frame and main frame. It will also be understood that a building of the form particularly described with a central main frame and two end frames could be extended by coupling a further main frame and floor module combination to one or other of the end frames with a further end frame beyond that, if necessary.

The embodiment has been described by way of example only and modifications are possible within the scope of the invention.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers or steps but not the exclusion of any other integer or group of integers.

CLAIMS

1. A building structure comprising an open upright rectangular main frame spanning the width of the building, one or more separate floor frames supported from the main frame, an open upright rectangular end frame extending parallel to the main frame and connected to the main frame via the floor frame, and wall and roof panels extending between the main frame and end frame.

2. A demountable building structure erected on-site from a kit of components including an upright rectangular main frame spanning the width of the building, an upright rectangular end frame extending parallel to the main frame and obtaining its principal structural support from the main frame, one or more separate floor frames extending between the main frame and end frame, and wall and roof panels extending between the main frame and end frame, the connections between the or each floor frame and the main frame and end frame being bolted connections.

3. A structure according to claim 1 or claim 2, wherein the main frame includes ground-engaging components by which the main frame is supported from the ground.

4. A structure according to claim 3, wherein the ground-engaging components comprise legs carried by a lower beam of the main frame, and the adjacent end of the or each floor frame is supported from the ground by the lower beam of the main frame.

5. A structure according to any one of claims 1 to 4, wherein the structure of the wall panels is such as to brace the end frame from the main frame.

6. A structure according to any one of claims 1 to 5, wherein the main frame is formed by two rectangular sub-frames each comprising upper and lower beams and outer vertical beams, the two sub-frames being joined back-to-back via brackets which maintain the two sub-frames spaced apart.

7. A structure according to claim 6, wherein the space defined between the sub-frames is in the form of a channel facing outwardly of the main frame, for example for housing guttering, one or more downpipes from the guttering, and conduits for electricity and/or water to be led into the building.

8. A structure according to claim 7, wherein the end frame extends to a greater height than the main frame so that the roof is able to drain into guttering installed within the channel of main frame.

9. A structure according to any one of claims 1 to 5, wherein the main frame is formed by a left hand frame half and a right hand frame half which are assembled together.

10. A structure according to claim 9, wherein each main frame half is formed from several components assembled together and including two sub-frame halves each comprising of upper and lower beams and a vertical side beam, and brackets for assembling the two sub-frame halves together back-to-back.

11. A structure according to claim 10, wherein the connections between the brackets and the sub-frame halves to form the main frame half are bolted connections, the connections between the two main frame halves are bolted connections.

12. A structure according to any one of claims 1 to 11, wherein the rectangular end frame is formed from two end frame halves connected together by bolted connections.

13. A frame for use in the construction of a prefabricated building, the frame being of open rectangular form and comprising two rectangular sub-frames each formed by upper and lower beams and outer vertical beams, the two sub-frames being joined in back-to-back relation.

14. A frame according to claim 13, wherein the frame includes ground-engaging legs to support the frame raised from the ground.

15. A frame according to claim 14, wherein the two sub-frames are joined back-to-back via brackets which maintain the two sub-frames spaced apart, and the legs extend from brackets associated with the lower beams of the two sub-frames.

16. A frame according to claim 15, wherein the frame is fabricated from two frame halves which are assembled together, each frame half including two sub-frame halves assembled together by the brackets, the sub-frame halves and brackets being assembled by bolting together.

17. A method of assembling a building structure according to claim 9, wherein the main frame is assembled on-site from the two frame halves and the two frame halves are formed from several components assembled together on-site.

18. A method according to claim 17, wherein the rectangular end frame is formed from two separate frame halves assembled together on-site.

19. A method according to any one of claims 17 or 18, wherein the or each floor frame is transported to site substantially in assembled form.

20. A method according to any one of claims 17 to 19, wherein the floor frame is attached to a first frame half of the main frame while the frame half is lying on the ground, and the sub-assembly formed thereby is pivoted to move the first frame half to an upright configuration and the floor frame to a horizontal configuration to form a free standing structure.

21. A method according to claim 20, wherein the second frame half of the main frame is attached to the first frame half after pivoting of the sub-assembly to move the first frame half to the upright configuration.

22. A method according to claim 20 or claim 21, wherein the end frame is connected to

the floor frame after the sub-assembly has been pivoted to move the floor frame to the horizontal configuration.

23. A method according to claim 22, wherein a second floor frame is mounted to a side of the first floor frame when the latter is in the horizontal configuration after pivoting of the sub-assembly and the end frame is connected to the adjacent ends of the two floor frames.

24. A method according to any one of claims 17 to 23, wherein each of the components transported to the site for erection of the building is of such a size and weight that no more than two adults are required to lift and manoeuvre the individual components prior to assembly.

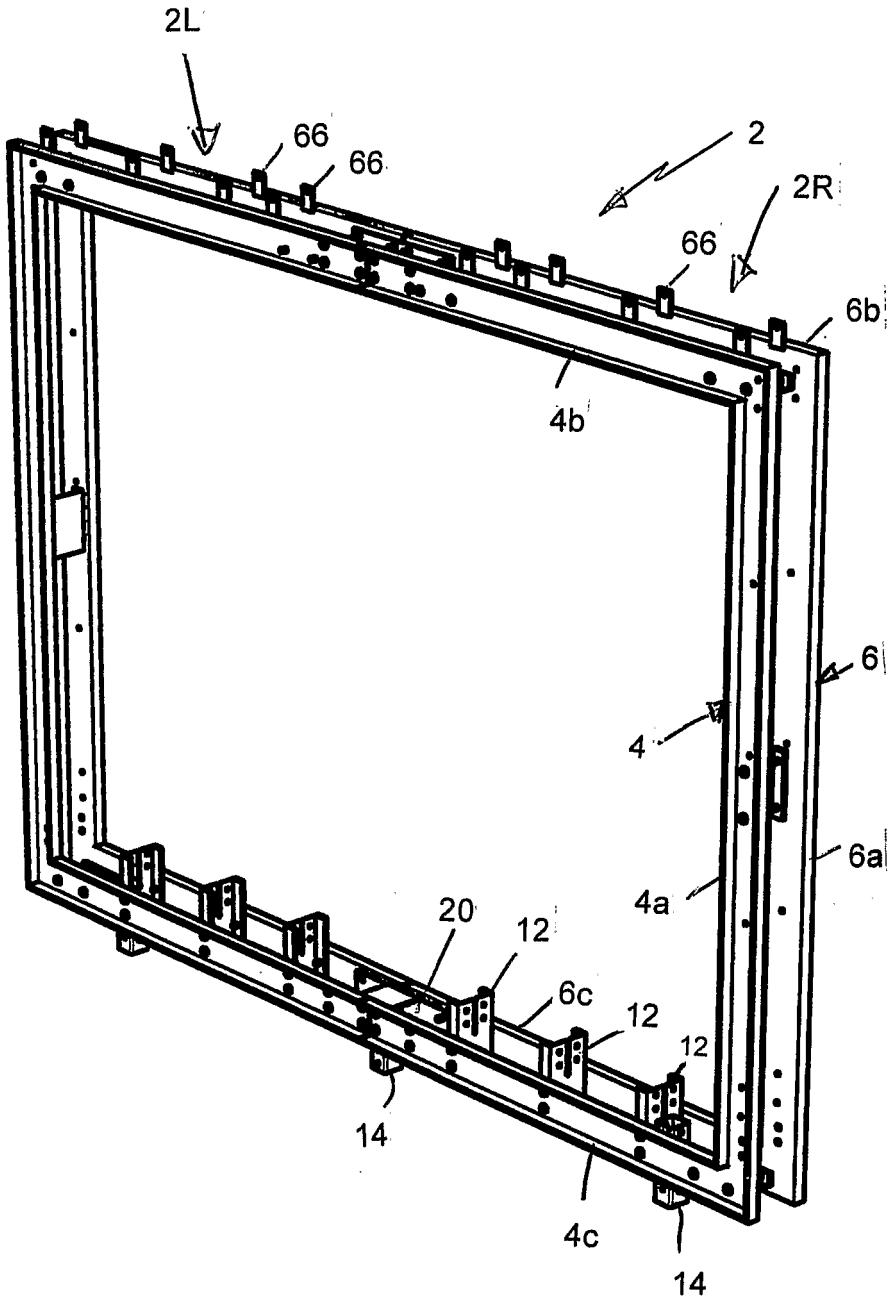

FIG. 1

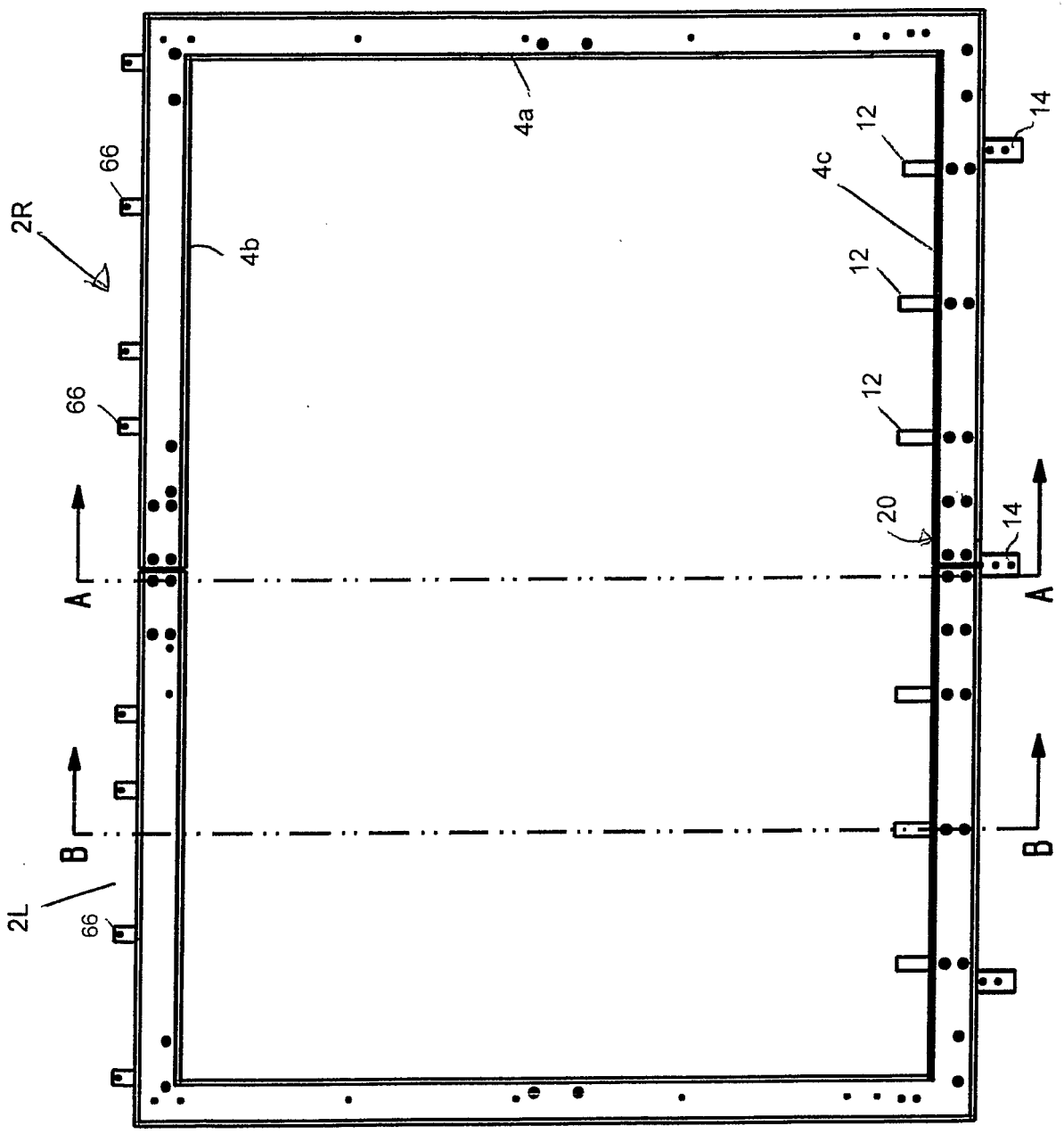

FIG. 2

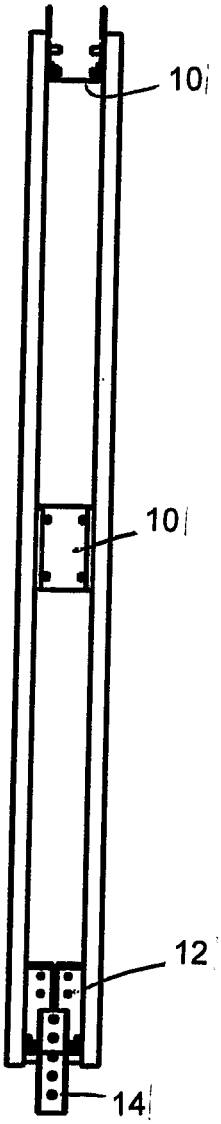

FIG. 3

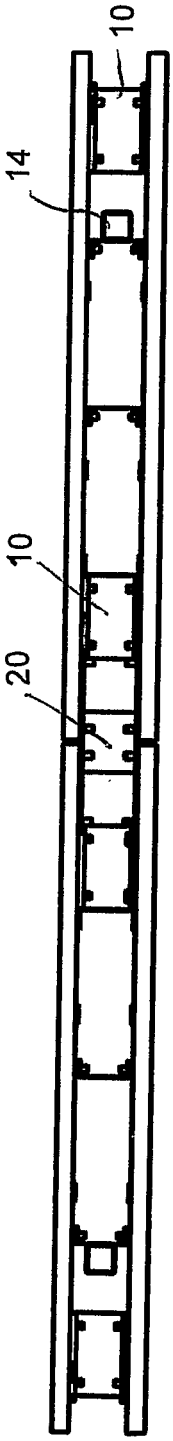

FIG. 4

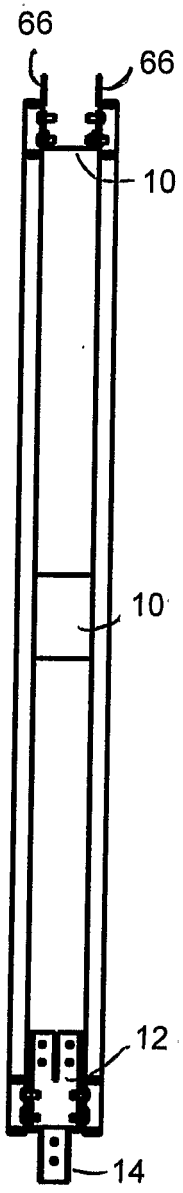

FIG. 6

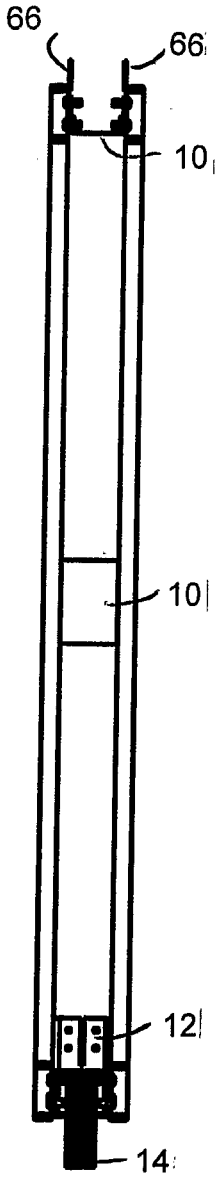

FIG. 5

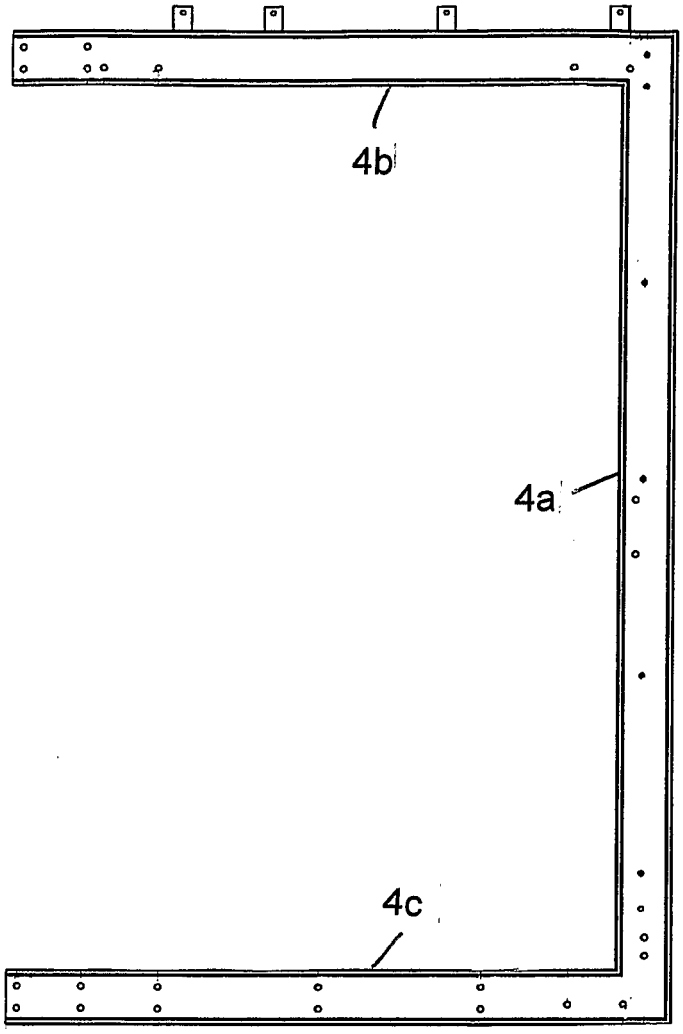

FIG. 7

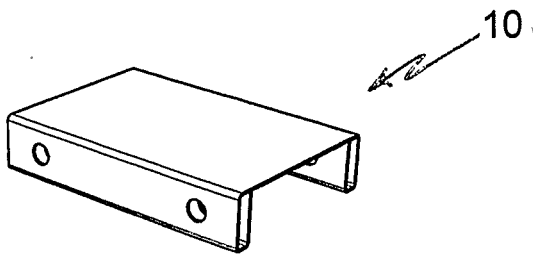

FIG. 8

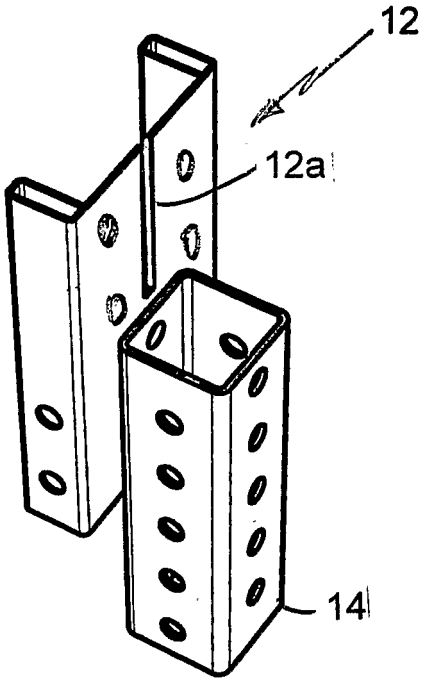

FIG. 9

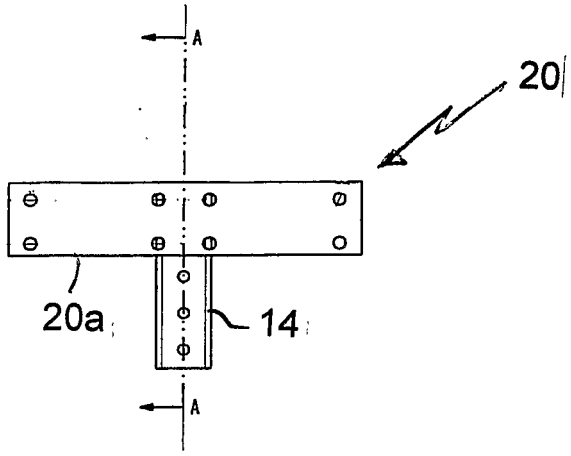

FIG. 10

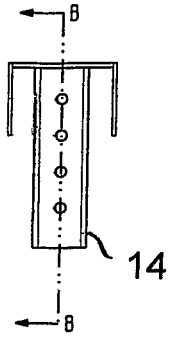

FIG. 11

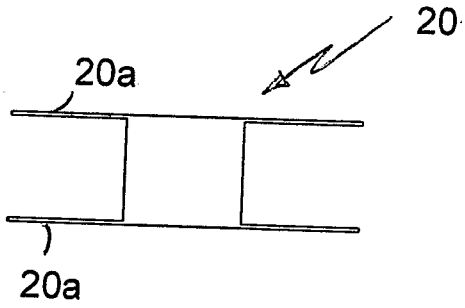

FIG. 12

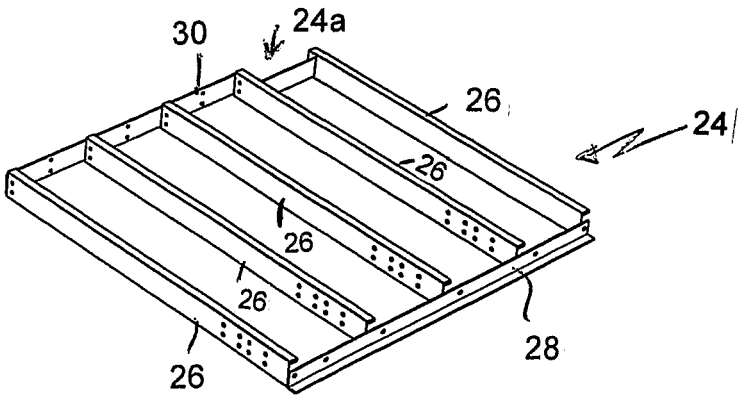

FIG. 13

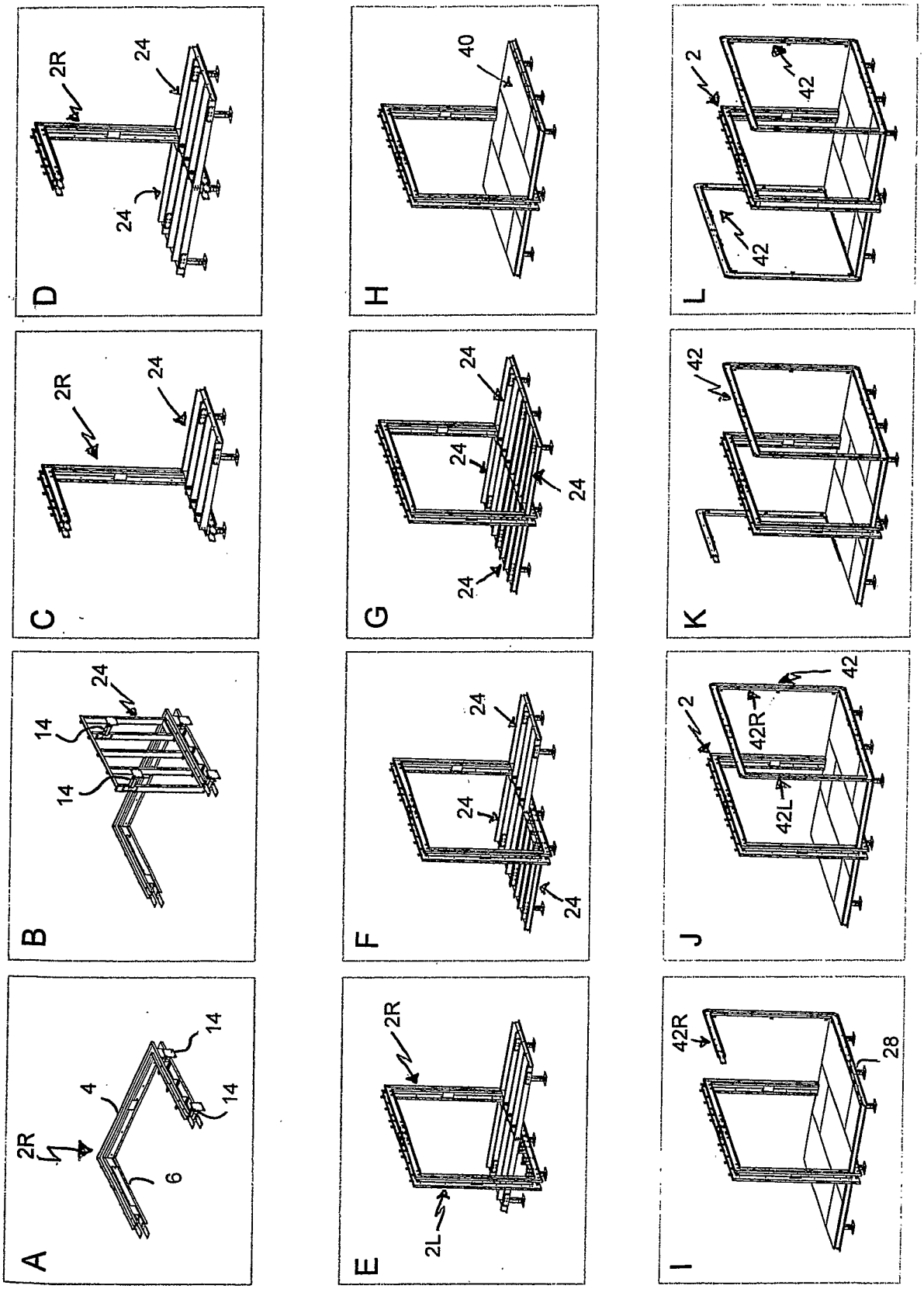
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FIG. 14

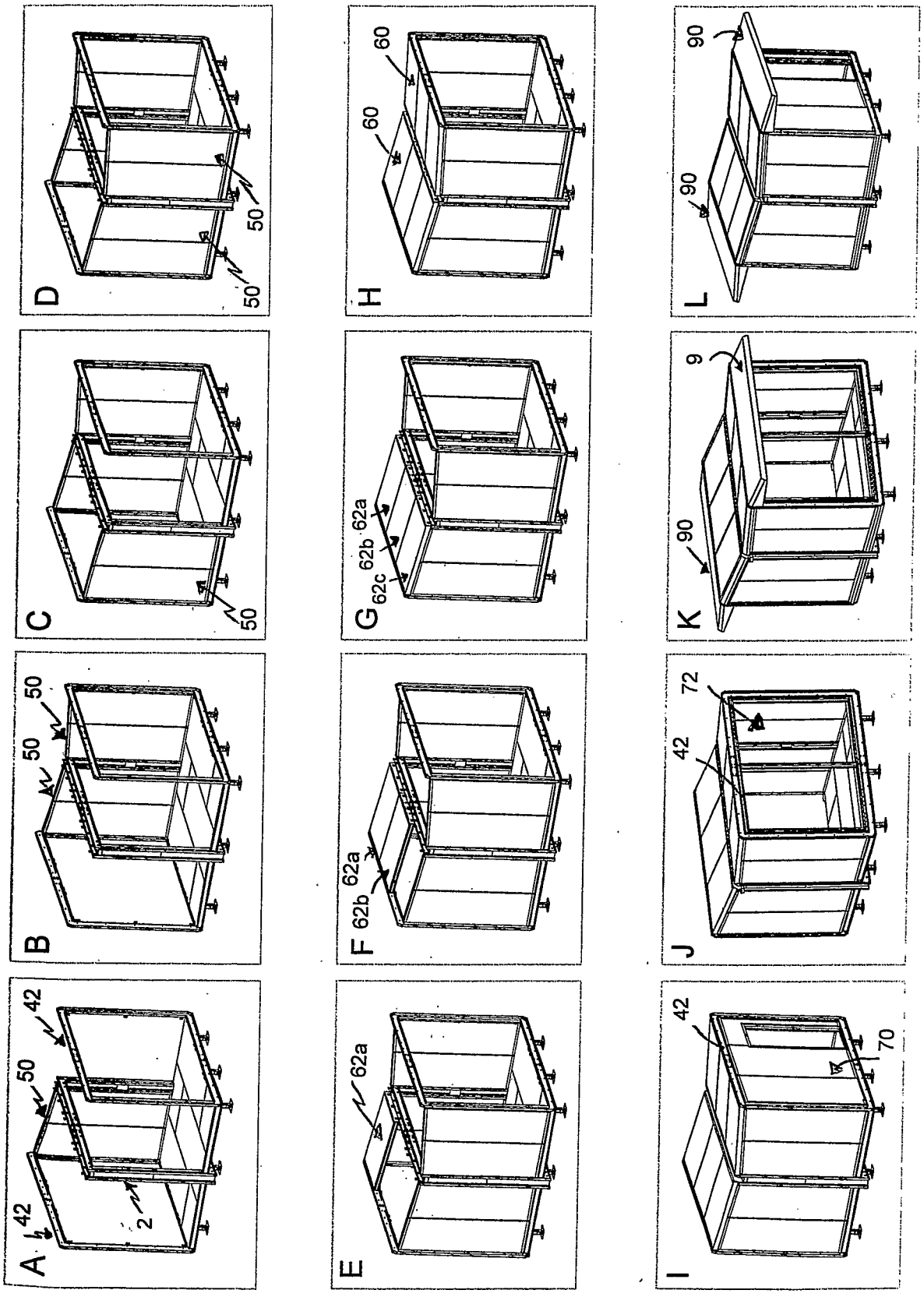
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FIG. 15

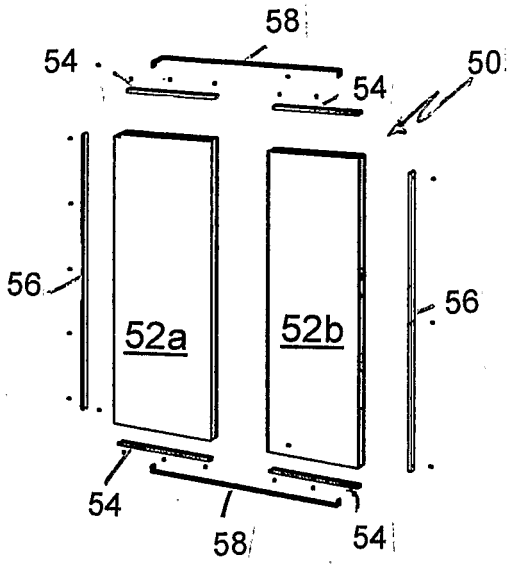


FIG. 16

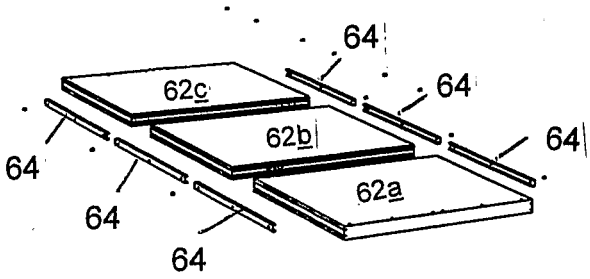
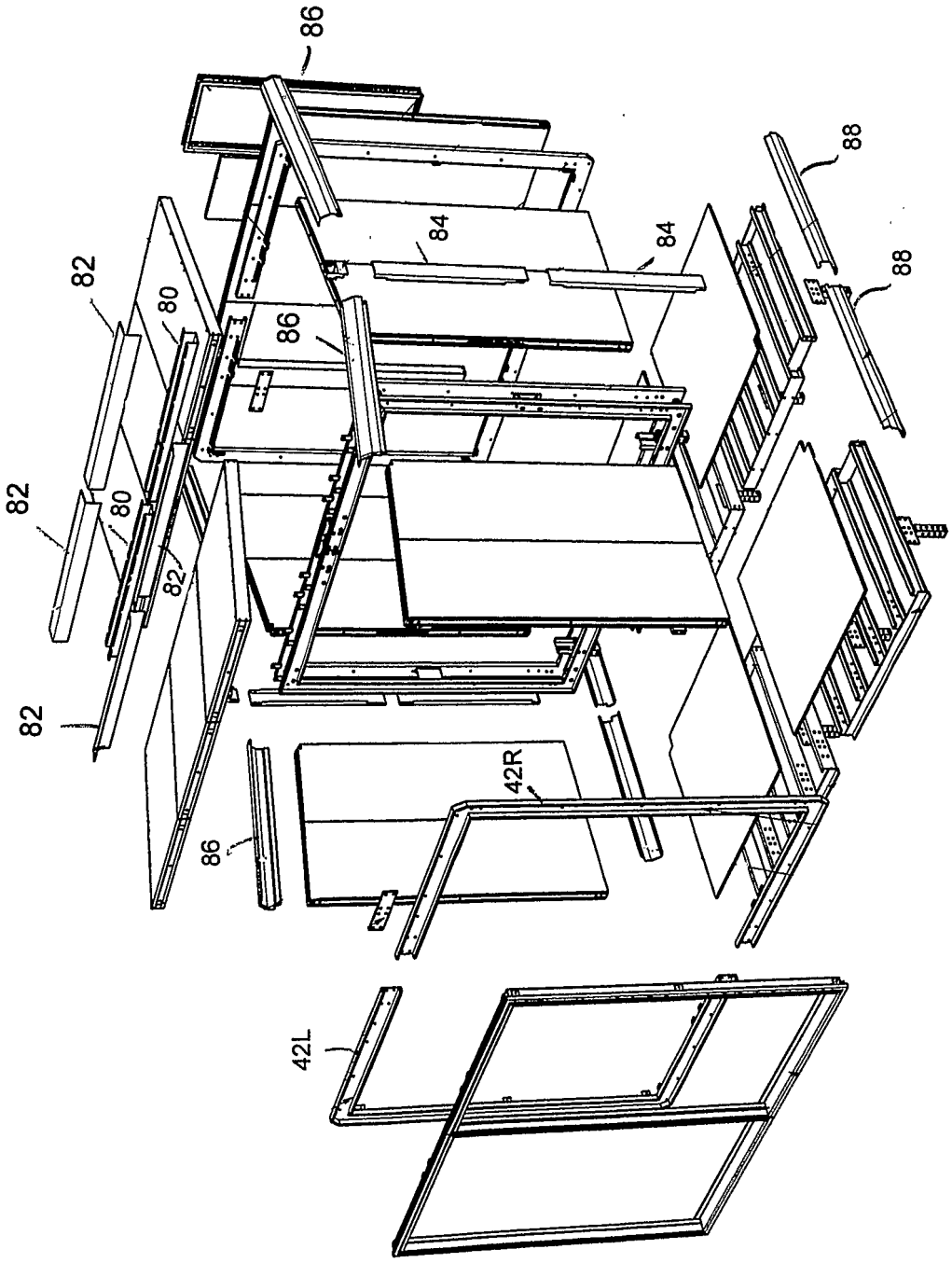


FIG. 17

FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/000900

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

E04B 1/00 (2006.01) ***E04H 3/00*** (2006.01)
E04H 1/00 (2006.01) ***E04H 5/00*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI: E04B, E04H Keywords: Frame, Prefabricated, Panel, Rectangle and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6463705 B1 (DAVIS D. *et al.*) 15 October 2002. See Figure 2, 6 and Column 2 line 8 to line 27.	1,2 and 5
X	US 2007/0074465 A (KUAN C.) 5 APRIL 2007. See Figures 1,4 and 6.	1,2
X	US 2006/0185296 A1 (SASAKI M. *et al.*) 24 AUGUST 2006. See Figures 1-6.	1-4
X	DERWENT ABSTRACT ACCESSION NO. A3475W/02, FR 2221598 A (BERCE J) 15 NOVEMBER 1974. See whole document.	1-4

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 July 2007	13 SEP 2007
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **SUHITH ILLESINGHE** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : (02) 6283 6105

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/000900

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See supplemental box.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:1-12, 17-24

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Supplemental Box
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

- Claims 1-12, 17-24 are directed to a building structure comprising a main frame, end frame a floor frame, a roof and walls. The building structure having the floor frame extending between the main and end frames is considered to be the first distinguishing feature.

- Claims 13-16 are directed to a frame comprising of two sub frames being interconnected together. This frame is considered to be the second distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

The only feature common to all of the claims is a frame. However this common feature is generic in the art. This means that the common feature can not constitute a special technical feature within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art.

Because the common feature does not satisfy the requirement for being a special technical feature it follows that it cannot provide the necessary technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention a posteriori.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/000900

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	6463705	AU	17376/00	BR	9915522	CA	2351559
		CN	1357073	EP	1141502	NZ	511637
		WO	0031362				
US	2007074465						
US	2006185296	EP	1614819	JP	2004316076	KR	2006000298
		WO	2004092501				
FR	2221598						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX