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[57]	Abstract:	A height adjustable shipping container usable as a building structure. The container having vertical corner columns and at least three side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end. At least some of the vertical corner columns expand in length during expansion of the reduced height shipping container. The shipping container is able to transport therein structural components, such as wall panel, roof and even fittings to build a building structure that is the equivalent in floor area to that of at least two shipping containers.		

HEIGHT ADJUSTABLE SHIPPING CONTAINER

Description

FIELD OF THE INVENTION

The invention relates to a Height Adjustable Shipping Container for use as a building structure, typically for housing and/or mining accommodation.

BACKGROUND OF INVENTION

A problem with existing methods of shipping standard shipping containers lies in the height and transport costs of a product which does not take up the full space within the container particularly where the container is to be used as some form of accommodation or commercial use. In such cases the interior of the container is often almost empty but because the eventual residential height in the container is full height the transport costs are high.

Equally, where accommodation which is greater than the height of a shipping container must be provided the only real option is to provide it as two containers, one without floor, which must be mounted on top of each other.

PRIOR REFERENCES

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications may be referred to herein; this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

Object of the Invention

It is an object of the invention to provide a height adjustable shipping container that ameliorates some of the disadvantages and limitations of the known art or at least provide the public with a useful choice.

SUMMARY OF INVENTION

In a first aspect the invention resides in a height adjustable shipping container usable as a building and having vertical corner members and at least three side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container.

Preferably the vertical corner members are vertical rails or columns.

Preferably at least some part of a side wall is attached to an upper part of the height adjustable container during expansion.

Preferably at least some other part of a side wall is attached to the lower part of the height adjustable container during expansion.

Preferably the lower part of the side walls is substantially high enough to accommodate furniture below its height.

Preferably the lower part of the side walls is substantially 0.9 meters high.

Preferably the upper part of the side walls is substantially 0.3 meters high.

Preferably access points for utility services are at the junctures of the upper and lower walls.

Preferably at least part of a wall filling the gap between upper and lower shipping container parts is pulled into place on expansion of the container.

Preferably elements forming the shipping container walls during transport may be relocated elsewhere within the container after expansion.

Preferably the shipping container top surface is angled with respect to the plane of the floor.

Preferably two such expanded top surfaces may be placed side by side to form a peaked pitched roof.

Preferably the floor of the shipping container may act to receive a pourable settable material and may include elements acting as reinforcement for the settable material.

Preferably the reinforcement elements may extend through two adjacent expanded shipping container floors.

Preferably the shipping container corner members may include telescoping portions in which any engagement features in the corner rail top are substantially repeated in the top of each telescoping portion.

Preferably in the expanded form the corner members remain capable of supporting vertical loads.

Preferably, the expandable vertical members include a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members.

Preferably, the floor includes spaced apart openings adapted to receive the tines of a fork lift to allow the unerected shipping container to be easily transported and are adapted when the shipping container is erected to used as service ducts.

In another aspect as herein described the invention relates to a method of manufacturing an expandable shipping container by:

- (i) providing a container base and expandable vertical members, the members when not expanded extending to a packaged height, providing at least one first vertical wall portion attached to the base and extending less than the packaged height of the container, providing an upper surface secured at least at one position to an upper portion of an expandable vertical member, providing at least one second vertical wall portion extending towards the first vertical wall portion from the upper surface;
- (ii) extending the members to an expanded position further spacing the first vertical wall portion from the second vertical wall portion.

BRIEF DESCRIPTION

The invention will now be described, by way of example only, by reference to the accompanying drawings:

FIG. 1 is a height adjustable shipping container in accordance with a first preferred embodiment of the invention.

FIG. 2 is the container of FIG. 1 in an expanded position.

FIG. 3 is a variation of the container of FIG. 1.

FIG. 4 is an assemblage of two containers as shown in FIG. 3.

FIG. 5 is a prefabricated floor assembly suitable for a container.

FIG. 6 is detail of a joint between two prefabricated floor assemblies of FIG. 3.

FIG. 7 is a detail of a telescoping expanding vertical container rail.

FIG. 8 is a side view of a section of a compacted accommodation container.

FIG. 9 is a side view of the container of FIG. 8 in expanded form.

FIG. 10 is a perspective view of collapsed containers situated on a truck trailer ready for transport in accordance with a second preferred embodiment of the invention.

FIG. 11 is a perspective view of one of the collapsed containers shown in FIG. 10.

FIG. 12 is a perspective view of the container shown in FIG. 11 in expanded form.

FIG. 13 is an end view of the container shown in FIG. 12.

FIG. 14 is a further alternate end view of the container shown in FIG. 12.

FIG. 15 is a perspective cut-away view of the container shown in FIG. 12.

FIG. 16 is a top view of the container shown in FIG. 15.

FIG. 17 is a perspective view of the lower frame of the container shown in FIG. 12.

FIG. 18 is a perspective view of the lower frame shown in FIG. 17 without side panels and floor.

FIG. 19 is a top view of the lower frame shown in FIG. 18.

FIG. 20 is a perspective view of the upper frame of the container shown in FIG. 12.

FIG. 21 a side view detail of a telescoping expanding vertical container column.

FIG. 22 is a detail of the lower and upper portions of the column shown in FIG. 21.

FIG. 23 is a side cross-sectional view of part of the container as shown in FIG. 12.

FIG. 24 is a perspective view of a packaged unerected container in accordance with a third preferred embodiment of the invention.

FIG. 24A is a perspective exploded view of the container as shown in FIG. 24.

FIG. 24C is a perspective view of the container as shown in FIG. 24 in an erected state.

FIG. 24D is a perspective view of an assembled building.

FIG. 24E is a perspective view of a further partially assembled building created from two containers as shown in FIG. 24.

FIG. 24F is a perspective view of a fully assembled building as shown in FIG. 24E.

FIG. 24G is a perspective view of another assembled building.

FIG. 24H is a perspective view of another partially assembled building.

FIG. 24I is a perspective view of the building as shown in FIG. 24G in a completed state.

FIG. 24J is a perspective view of a container ready for transport.

FIG. 24K is an partial exploded view of the container shown in FIG. 24J

FIG. 25 is a perspective view of a packaged unerected container in accordance with a fourth preferred embodiment of the invention.

FIG. 25A is a perspective exploded view of the container as shown in FIG. 25.

FIG. 25B is a perspective view of the lower part of the packaged unerected container as shown in FIG. 25.

FIG. 25C is a perspective view of the container as shown in FIG. 25 in an erected state.

FIG. 25D is a perspective view of an assembled building.

FIG. 26 is a perspective view of a packaged unerected container in accordance with a fifth preferred embodiment of the invention.

FIG. 26A is a perspective exploded view of the container as shown in FIG. 26.

FIG. 26B is a perspective exploded view of the container as shown in FIG. 26 in an erected state.

FIG. 26C is a further perspective exploded view of the container as shown in FIG. 26 in an erected state.

FIG. 26D is a perspective view of the lower part of the packaged unerected container as shown in FIG. 26.

FIG. 26E is a perspective view of the container as shown in FIG. 26 in an erected state.

FIG. 26F is a perspective view of an assembled building.

FIG. 26G is a perspective exploded view of another partially assembled building.

FIG. 26H is a perspective view of a fully assembled building as shown in FIG. 26G.

FIG. 27 is a perspective view of a container in kit form.

FIG. 27A is an exploded view of the container as shown in FIG. 27.

FIG. 28 is a perspective view of a container in layered schematic form.

FIG. 28A is an exploded view of the container as shown in FIG. 28.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

The following description will describe the invention in relation to preferred embodiments of the invention, namely a height adjustable shipping container The invention is in no way limited to these preferred embodiments as they are purely to exemplify the invention only and that possible variations and modifications would be readily apparent without departing from the scope of the invention.

The inventive construction system is applicable for use as residential housing, domestic garages, machinery & farm sheds, emergency accommodation, etc.

The invention relates to a new system for the construction and transportation of accommodation that has many benefits compared to existing systems. The proposed system possesses a significant reduction in the net cost of production, and it addresses and resolves issues in the systems currently available.

Generally the invention pertains to an external building shell that is delivered and erected in minimum time, which may be as little as a few hours in some construction cases (eg: garages). As the building shell is fully enclosed, there are no weather limitations on the construction timeline. Local tradesmen may be engaged to do the internal installations thus promoting the local construction industry and stimulating the local economy, which is desired by councils and governments. The highly skilled local workers are likely to be more efficient than low-skilled, cheaper workers from foreign economies, and as weather conditions would not be a factor, these local workers would be more able to work with optimum efficiency and remain economically competitive compared to the global market. The inventive system is formatted around the ISO shipping container design, and is easily transported and positioned using equipment that is readily available. Due to the simplicity of the on-site setup of the building shell, for uncomplicated projects a low skill set is necessary to complete the required assembly. The finished erected building meets international bush fire building regulations.

In emergency accommodation situations, the ease of building erection and fully enclosed nature of the system mean that homeless people can have immediate shelter and security. In the collapsed container state, the inventive system can also be used to transport and store emergency relief materials, such as food and building resources, within the collapsed container.

Due to the versatility of the inventive system, including the potential to connect many individual containers together, it is possible to quickly create a large, sheltered and secure space that can be used for a variety of purposes, such as a hospital, a food storage facility, or for occupancy by many families. This latter use could also promote a sense of community living, helping to provide comfort to people affected by disasters.

The side panels that are used as bracing when the building unit is being transported can be relocated to the outer shell of the erected frame to create a combination of external walls, windows and door openings. The panels, windows and doors are interchangeable, and able to create a large number of different formats as desired.

Turning now to the drawings that exemplify the invention.

FIG. 1 shows a height adjustable shipping container **101** in which vertical corner rails extend to trucking and lifting points **102** at each end. Vertical walls on the exterior extend to cut line **105** forming partial end panel **103**, partial side panel **104** and top panel and top side partial panels **106**.

FIG. 2 shows the container of FIG. 1 in expanded form in which telescoping rails **107** have been expanded, a panel **110** formerly behind panel **103** has been pulled up into place and a window **108** formerly packed inside the container with windows **109** has been placed in the gap formed by expansion. Other panels or equipment which may have been packed within the container, such as doors, roller doors, ventilators, tables, etc can be fitted to the expanded container. Still others may be permanently fitted to the container before dispatch, such as lighting or plumbed fitments.

FIG. 3 shows a container **111** with a tilted top forming part of a peaked pitched roof **112** and an end panel **113**. Cut lines **105** are offset, providing for different panel fitments at each cut. Typically any services required in the container (plumbing, electrical) are located adjacent a joint line to allow easy servicing and testing on installation. FIG. 4 shows two containers such as that of FIG. 3 butted together before being expanded into a single larger accommodation structure. Various of the walls may be shifted in position when expanded, so that for instance the end panels **113** may be relocated to fill the other end leaving one end open for access.

In an alternative the two containers may be spaced apart and parts for bridging the gap between may be packed with the containers. This may include, for instance, flooring and a roof ventilation bridge.

FIG. 5 shows a view of a floor pan for a container which is intended to be static. It consists of an edge structure **501** and reinforcing bars **502** to allow the pouring of concrete or some other settable pourable material into the pan at the final site, producing a reinforced concrete pad within the container.

FIG. 6 displays a method of carrying the reinforcing **603** through containers abutted and secured together as in FIG. 4 so that edge rails **601, 602** are adjacent to render the concrete pad continuous.

FIG. 7 shows a view of a telescoping pole in expanded form. A lower portion **701** with engagement feature **703** for trucking or lifting has a cap **702** which slides down over portion **701**. When slid down the engagement features **704** align with those at **703** to allow lifting the compacted container.

FIG. 8 shows a side view of the interior of an accommodation container. External panels **801, 802** have a cut line between them allowing compacting of the container onto chair **803**, sink and faucet **804**, desk **805** and lights **806, 807**. Plumbing, electricity and any other utility services for the lights, wall power and sink may be located in areas **808** at the junctures of the cut line, providing access to services before the container is collapsed and after it is expanded. These services may be located within channels at the top of bottom of a wall attached to the container structure.

The cut line for such accommodation is preferably at 900 mm above the floor with panel **801** being 300 mm high to give a compacted height for the container of 1200 mm compared to the full standard height of 2500 mm or 2900 mm. This means that normal furniture can be accommodated within the compacted container.

FIG. 9 shows the same container in expanded form with the cut lines spaced apart by panels **810**. Before panels **810** are finally placed the services are connected, for instance by cables from lights **806, 807** being connected to a central connection board within areas **808** by sockets or by connector block. This has the advantage that access is relatively easy while the container is being expanded on site.

It is important that the compacted container still adheres to the measurements of a standard shipping container which means that in some cases a collapsed telescoping pole will still stand above part of the structure of a containerised building, as in FIG. 3.

FIG. 10 shows a truck transporting the shipping containers of the invention. Each container **1001** to **1006** is of a collapsed and reduced size or height relative to a standard shipping container. Each shipping container **1001** to **1006** includes all the components, including framing, walls, panels, etc., required to erect a building structure such as for mining, accommodation and/or commercial purposes.

FIG. 11 shows a shipping container **1000** in its storage and transportation state. The container has a chassis **1010** with side beam **1011** and end beam **1012**. Side beam **1011** has at least two spaced apart fork lifting pocket openings **1013**. The side and end beams **1011**, **1012** connect with lower standard ISO corner element **1054** at the base of column **1050**. The column **1050** includes a lower section interleave guide part **1051** and an upper section interleave guide part **1052** where the upper section interleave guide part **1052** telescopes within the lower section interleave guide part **1051** such that the height of the container **1000** can be adjusted in order to form a building structure when transported to the desired location. The container **1000** has side walls **1060**, end walls **1030** and roof **1040**. The column **1050** has an upper standard ISO corner element **1053**.

FIGS. 12 and 13 show the container **1000** in an erected state in which the columns **1050** are fully extended. The erected container is shown with end wall panels **1031**, **1032**, side wall panels **1062**, **1063**, **1064**, **1065**, **1067**, **1068** and door **1066**, **1082**. End wall panel **1031** and side wall panels **1063**, **1064** are fixed in place whereas end wall panel **1032** and side wall panels **1065**, **1065**, **1067** & **1068** are removable. Side panels **1061**, **1062** open out to form eaves, awning or shade panels and can be connected to another adjacent container to form a shelter walkway/porch area.

FIG. 14 shows a variation to the container **1000** shown in FIG. 13 in that FIG. 14 includes a plumbing drainage component **2300** beneath the floor of an assembled and erected container **1000**. Preferably the plumbing draining **2300** is transported within the container and connected in place once the container is sited and erected in the desired place.

FIGS. 15 and 16 show a cutaway view of an assembled and completed container **1000**. The container **1000** is shown to include a bedroom **2101**, lounge area **2102**, kitchen area **2103**, bathroom **2104** and toilet **2115**. Preferred fittings, appliances and amenities shown are microwave **1805**, fridge **1806**, hot water tank **1807**, locker **1808** and water closet **1809**. It is envisaged that

other fittings, appliances and amenities can be utilised to suit the purpose to which the erected and completed container is to be used for.

FIGS. 17 and 18 show the lower frame **1000A** of the container. FIG. 17 shows the lower frame in an assembled state with floor LA, side panels, and end panels in place. The end walls **1030, 1070** consist of end beams **1012, 1015** and structural service duct supports **1701, 1708** connected to and spaced apart by lower section interleave guide columns **1051**. The side walls **1060, 1080** include side beams **1011, 1014** connected to the lower part of lower section interleave guide columns **1051**. The structural service duct supports **1702, 1705, 1707, 1709, 1712, 1714** are spaced respectively above the side beams **1011, 1014** by the combination of the lower section interleave guide columns **1051** and vertically extending door posts **1703, 1704** and structural service duct supports **1706, 1710, 1711, 1713** to form sub frames to define walls for panels and windows and openings **1069A, 1085A** for doors. The upper structural service duct supports, **1701, 1702, 1705, 1707, 1708, 1709, 1712, 1714** can include slotted holes in which windows and wall panels can be inserted and held in place without the need to use fasteners or the like to hold windows and panels in place.

FIG. 19 shows the floor F of the container. The floor consists of a frame including side beams **1011, 1014** and end beams **1012, 1015** that are connected at the ends to the base of columns **1050**. At spaced intervals between side beams **1011, 1014** are connected floor joists **1016**. Situated equally spaced apart from the centre of the floor frame are fork lifting support compression plates **1017** that are hollow to accommodate the forks of a fork lift. The floor F as shown in FIG. 19 is included in the unerected container and is assembled and erected onto ground or piles or the like at the desired location upon which the container is then lowered and erected thereto. A pourable, settable medium such as cement is then poured (or this can be done prior to the container being put in place) to form a concrete floor.

To construct the floor, reinforcement steel is fixed inside the container and positioned so that concrete or another setting medium can be installed immediately and under cover. The skill requirement for floor construction is low as there is a relatively small distance between the form boards, which are of a uniform height. This allows for easy levelling of the concrete. The cement for the concrete can also be transported within the collapsed container shell. Concrete would also provide a floor capable of being easily decontaminated and cleaned, which is essential for use in hospitals.

FIG. 20 shows the upper frame **1000B** of the shipping container. The upper frame **1000B** consists of upper side section structural members **1091, 1094** connected to upper end section structural member **1092, 1093**, upper standard ISO corners **1053** of upper section interleave guide columns **1052**. Structural service duct supports **1095** are situated spaced apart between the upper side section structural members **1091, 1094** in order to provide structural support. Lower upper side section structural members **1097, 1098** extend spaced below the upper section structural members **1091, 1092, 1093, 1094**. Structural service duct supports **1099** extend between the upper side section structural members **1091, 1094** in order to provide further structural integrity to the upper frame **1000B**. Depending down from the Lower upper side section structural members **1097, 1098** are door post spigots **1096** situated in position where a door is to be situated and supported there under. The upper frame **1000B** can include fork lifting support compression plates (not shown) similar to the compressions plates **1017** in FIG. 19. These compression plates that are hollow accommodate the forks of a fork lift to allow the upper frame to be raised and situated in place when erecting a building structure.

FIGS. 21 and 22 show aspects of the expandable column **1050**. The column is attached at its base to the side beam **1011** by standard ISO corner **1054**. The column **1050** consists of three telescoping hollow interleave guide columns **1051, 1055** and **1062**. Lower section interleave guide column **1051** is connected at its lower end to standard ISO corner. Centre section interleave guide column **1055** is of a smaller diameter to that of both interleave guide columns **1051** and **1052** such that centre section interleave guide column **1055** is able to telescope within interleave guide columns **1051, 1052** such that when the container is in a storage and transport state centre section interleave guide column **1055** is fully enclosed within interleave guide columns **1051, 1052**. Upper interleave guide column **1052** is attached to the upper standard ISO corner **1053** and also can be of a smaller diameter to that of lower section interleave guide column **1051** such that in the unerected state part of upper section interleave guide column **1052** fits within lower section interleave guide column **1051**.

The standard ISO corners **1053, 1054** include holes **1056, 1057** that are able to act as lifting points so that the interleave guide columns **1052, 1055** can be raised and lowered relative to lower section interleave guide column **1051**.

FIG. 23 shows a cross-sectional view of part of an erected container. There is shown a floor F supported on floor joists **1016** fixed to side beam **1010** that supports a lower wall panel **1063**,

service duct support **1705**, upper wall panel/window **1067** that all form part of side wall **1060**. Side panel **1061** fastened to side wall **1060** during transport made by fasteners **1716** is used as an awning or extended eave or shutter when and once the container is erected and assembled. Side panel **1061** also acts during transport as a shock absorber and as a brace. A ceiling panel **1720** extends transversely from and connected to, via corner internal coving **1715**, the top of wall panel/window **1067** and is situated below roof **1040**. An air gap exists between the ceiling panel **1720** and roof **1040** which can be used as part and connected to an air conditioning system.

FIGS. 24 and 24A show a packaged container **2400** ready for transport (minus the side panels), the container **2400** consists of a floor base **2401**, roof sections **2402**A, further wall/roof sections **2403, 2404** and columns **2405**. FIG. 24C shows the container in a fully erected state ready to be fit out and completed. FIG. 24D shows a building structure of an area equally to area of two containers **2400, 2410** joined side by side to the form a building structure. FIGS. 24E & 24F show two assembled containers **2400, 2410** joined together by a covered roof/walkway **2420**. Whilst in the lower un raised position such as that shown in FIG. 24E roofing, eaves and other roof and ceiling related components and fittings for ease of assembly and occupational health and safety requirements. FIGS. 24G & 24I shows a building structure **2430** having two levels and equal in area to that of that of eight shipping containers. FIG. 24H shows a building structure **2440** equal in area to that of that of three shipping containers. FIGS. 24J & 24K shows a container **2400** in ready condition and configuration for transportation showing floor base **2401**A, **2401**B, roof sections **2402**A, **2402**B, columns **2405** and wall panel sections **2406, 2407, 2408, 2409**. It is envisaged that one container includes enough components to build a building structure the equivalent in floor area to that of at least two shipping containers.

FIGS. 25 and 25A show a packaged container **2500** ready for transport (minus the side panels), The container **2500** consists of a floor base **2501**A, **2501**B, roof sections **2502**A, **2502**B, further wall/roof sections **2503, 2504** and columns **2505**. FIG. 25B shows a partial assembled container **2500** in which the roof section has yet to be raised relative to the base by adjusting the columns **2405**. FIG. 25C shows the container **2500** in a fully erected state ready to be fit out and completed. FIG. 25D shows a building structure **2520** formed and equal in area to that of that of eight shipping containers.

FIGS. 26 and 26A show a packaged container **2600** ready for transport (minus the side panels), The container **2600** consists of a floor base **2601**, roof sections **2602**A, **2602**B, further

wall/roof sections **2603**, **2604** and columns **2605**. FIGS. 26B & 26C shows exploded views of the container **2600** in an erected state. FIG. 26D shows a partial assembled container **2600** in which the roof section has yet to be raised relative to the base by adjusting the columns. FIG. 26E shows the container in a fully erected state ready to be fit out and completed. FIG. 26F shows a building structure **2620** formed and equal in area to that of that of four shipping containers. FIGS. 26G & 26H shows a building structure **2630** formed and equal in area to that of that of four shipping containers and has a covered walkway/roof.

FIGS. 27 & 27A show the container **2700** in kit form identifying the key components required to build a building structure of at least equal in area to the floor area of two shipping containers combined. The kit includes floor base **2701**A, **2701**B, **2701**C, **2701**D, roof sections **2702**A, **2702**B, columns **2705**, centre roof panels **2706**, **2707**, extra columns **2708**, and eave panels **2709**, **2710**.

FIGS. 28 & 28A show the container **2800** in a layered schematic form identifying the key components required to build a building structure of at least equal in area to the floor area of two shipping containers combined. The kit includes floor base **2801**A, **2801**B, **2801**C, **2801**D, **2801**E, **2801**F, **2801**G, roof sections **2802**A, **2802**B, **2802**C, **2802**D, columns **2805**, centre roof panels **2806**, **2807**, extra columns **2808**, and eave panels **2809**.

The columns may include a horizontal steel channel to support a beam between the columns.

The beam could be of concrete, steel, wood or similar suitable material adapted to bear and support a load such that of an upper floor.

The fork lift pockets can be used for the carriage of services once the floor is concreted

The upper and lower frame parts can be delivered together to eliminate sequence confusion that currently exists with known methods.

The unassembled parts can be transported on a frame so that they can be assembled at the point of destination and thus allowing the transportation of a greater floor and roof area

High quality external finishes, such as cladding or brickwork, can be installed to create a more traditional appearance. Paint and/or texture patterns, such as roof tiles or bricks, could also be printed into the steel panels. Internal walls can also be easily constructed including insulation, plaster board and paint.

If a wider building is desired, additional infill sections may be installed on the roof and floor, connecting two housing module units on either side.

The building units may be used to rapidly and cheaply construct a double garage.

Multi-storey buildings are envisaged whereby building shells can be erected on top of another. Floor pans can be installed to the concrete sections for the construction of a second-storey concrete (or other medium) floor, which can also be fire rated.

Any existing building format can be replicated. Eaves, valleys, hips and other traditional building features are designed into the system.

Builders can program projects without the weather constraints that currently exist. This would maximise efficiency of labour and capital, and as progress is not limited by adverse weather conditions, it would create more stable cash flows and a more stable and predictable building industry.

In 2011, the prefabricated housing market in America alone produced 185,000 units and was worth US$8-6 billion. This is a big market, and this method will significantly reduce the cost of the building shell, and could potentially revolutionise the industry by supplying more efficient, affordable housing.

The versatility of the construction design enables the inventive system to be used to create a vast variety of buildings for different applications including, but not limited to, residential housing, storage units, sheds, garages, and buildings for emergency relief, public or commercial use.

The new inventive building system has many applications for portable/modular buildings, and a major use for such buildings is in mining camp accommodation.

The modular building industry is less than five years old and has undergone many developments that have led to greater efficiencies over this time. However there is a need for even more efficient and serviceable products. The new and inventive system for the construction and transportation of portable housing accommodation has many benefits and improvements compared to existing systems. The proposed inventive system possesses a significant reduction in the net cost of production, and it resolves issues in the systems currently available.

The product requires minimal on-site setup, with fully complete interior fittings and services.

The collapsed building shell simply needs to be placed, erected and centre panels inserted, which takes minimal time

The inventive system allows for the access of all services with ease, and allows for upgrading, testing and repair if required at any time.

The inventive system addresses occupational health and safety issues and reduces the risk of personnel injury during construction. As it has been fully designed considering safety.

The inventive system is formatted around the ISO shipping container and is easily transported and positioned using readily available equipment.

The storage space required is reduced by 50%, so transportation costs are also reduced by up to 50% or more, which is a considerable cost advantage. Furthermore, twice as many units can then be delivered in the same amount of time.

The manufacturing process has been designed so that different components may be constructed at different sites, and services can be installed depending on the local government standards, e.g. wiring colours, plumbing, etc. Installation of services and amenities would occur at the final assembly stage.

Covered walkways and balconies can be included in the design.

The inventive system can be used for mining and military accommodation, and emergency relief, and it is light enough that it could be air dropped from a cargo plane

As the fuel and transport costs are greatly reduced, the inventive system is 'greener' than current systems and would be eligible for carbon credits

The inventive system has been designed to be mass produced using a similar method as is used in the automobile industry.

It is estimated that over the next 5 years, accommodation will be needed for millions of mine workers.

The location of service ducts horizontally are at the level that services are required i.e. at bench height 900 mm approx and then a 1150 mm approx spacing panel and then another service duct for lighting and then a top panel above to the ceiling junction. The roof section is situated in place last and thus capturing the panels in position and then fastening the roof section to the columns for transport.

As the inventive system allows for more than one building shell to be transported multiple and individual building sections can be coupled together to create a wider building structure.

The finished building structure can have a sloping roof that would be more aesthetically pleasing and allow water or snow to run off the roof and also create a void between the ceiling and roof for ventilation and a more efficient insulation roof area.

The inventive system can utilise spreader pieces to the roof and floor and thus increase the overall width of a completed building where two or more building shells are to be joined together to form a single building structure.

By enclosing the external faces of the transported container sections with protection panels that can be relocated to complete the external walls, the protection panels serve the purpose as a bracing component and a shock absorber to absorb destructive energy during transport caused by pot holes or bumps in road surfaces and other unknown factors during transport. These panels could be installed in such a way to allow window and door openings. This provides an exterior shell of a building that could then be completed in a conventional manner. A concrete floor slab as the base gives the building mass to hold the building down. A concrete slab can be added to the top of the container when used in a high rise situation.

The columns can also be filled with concrete or other suitable material from the top. Reinforcement material such as steel rods can also be installed inside the columns. Thus the finished building will have the sufficient structural integrity and fire rating capacity.

The inventive system generally comes with a horizontal roof which is easier to store, transport and install and can be stacked to many levels if required

The inventive system can be transported 2, 3 or more high on a truck or carriage in a near complete state (see FIG. 10)

The inventive system can be pre certified and easily adapted to suit all regions world wide The inventive system requires minimal on-site setup, with fully completed interior fittings and services. The inventive system simply needs to be placed, erected and centre panels inserted reducing commissioning times and reducing costs.

The inventive system allows for easy access of all services, and allows for upgrading, testing and repair if required at any time.

The manufacturing process has been designed so that different components may be constructed at different sites, and services can be installed depending on the local government standards, eg: wiring colours, plumbing, etc. installation of services and amenities would occur at the final assembly stage.

Covered walkways and balconies can be included in the design by utilizing the side panels.

The product can be used for mining and military accommodation, and emergency relief, and it is light enough that it could be air dropped from a cargo plane

The inventive system has been designed to be mass produced using a similar method as is used in the automobile industry. There is nothing of this kind on the market.

Eave overhangs, valley panels and other sections that may be required can be installed to the building.

DRAWINGS NUMBER DESCRIPTION LIST

- **1000** Container
- **1000A** Lower Section
- **1000B** Upper Section
- **1001** Collapsed Container—Transport Arrangement
- **1002** Collapsed Container—Transport Arrangement
- **1003** Collapsed Container—Transport Arrangement
- **1004** Collapsed Container—Transport Arrangement
- **1005** Collapsed Container—Transport Arrangement
- **1006** Collapsed Container—Transport Arrangement
- **1010** Chassis
- **1011** Lower Section—Side Beam
- **1012** Lower Section—End Beam
- **1013** Fork Lift Pocket Opening
- **1014** Lower Section—Side Beam
- **1015** Lower Section—End Beam
- **1016** Floor Joist
- **1017** Fork Lift Pockets*Compensation Plate
- **1030** End Wall
- **1031** End Wall Panel—Lower Fixed
- **1032** End Wall Panel—Removable
- **1033** Side Wall Panel—Upper (Fixed)

- **1040** Roof
- **1040** Roof Skin
- **1042** Roof Skin
- **1050** Rail/Column
- **1051** Interleave Guide Rail/Column—Lower Section
- **1052** Interleave Guide Rail/Column—Upper Section
- **1053** Standard ISO Corner
- **1054** Standard ISO Corner
- **1055** Interleave Guide Rail—Centre Section
- **1056** Standard ISO Corner Top Opening
- **1057** Standard ISO Corner Side Opening
- **1060** Side Wall
- **1061** Side Panel/Awning
- **1062** Side Panel/Awning
- **1063** Side Wall Panel Fixed—Insulated (Sandwich Panel)
- **1064** Side Wall Panel Fixed—Insulated (Sandwich Panel)
- **1065** Side Wall Panel Removable—Insulated (Sandwich Panel)
- **1066** Door
- **1067** Side Window—Removable
- **1068** Side Wall Panel Removable—Insulated (Sandwich Panel)
- **1069** Doorway
- **1069A** Doorway
- **1070** End Wall
- **1080** Side Wall
- **1081** Side Wall Panel Removable—Insulated (Sandwich Panel)
- **1082** Door
- **1083** Side Wall Panel Removable—Insulated (Sandwich Panel)
- **1084** Side Wall Panel Removable—Insulated (Sandwich Panel)
- **1085** Doorway
- **1085A** Doorway
- **1091** Upper Side Section Structural Corner Member

- **1092** Upper End Section Structural Corner Member
- **1093** Upper End Section Structural Corner Member
- **1094** Upper Side Section Structural Corner Member
- **1095** Structural Service Duct Support
- **1096** Door Post Spigot
- **1097** Structural Service Duct
- **1098** Structural Service Duct
- **1099** Structural Service Duct
- **1600** Interleave Guide Rail—Collapsed—Section
- **1660** Interleave Guide Rail—Collapsed—Section
- **1701** Structural Service Duct
- **1702** Structural Service Duct
- **1703** Door Post
- **1704** Door Post
- **1705** Structural Service Duct Support
- **1706** Structural Service Duct Support
- **1707** Structural Service Duct Support
- **1708** Structural Service Duct Support
- **1709** Structural Service Duct Support
- **1710** Door Post
- **1711** Door Post
- **1712** Structural Service Duct Support
- **1713** Structural Service Duct Support
- **1714** Structural Service Duct Support
- **1715** Internal Coving
- **1716** Fastener
- **1720** Ceiling Panel
- **1801** Internal Wall Panel—Removable
- **1802** Internal Wall Panel—Removable
- **1803** Internal Wall Panel—Removable
- **1804** Internal Wall Panel—Removable

- **1805** Microwave
- **1806** Fridge
- **1807** Hot Water Tank
- **1808** Locker
- **1809** Water Closet
- **1810** Flexible Doors
- **2101** Bedroom
- **2102** Lounge
- **2103** Kitchen
- **2104** Bathroom
- **2115** Toilet
- **2300** Plumbing/Drainage
- **2400** Container
- **2401** Floor base
- **2402A** Roof section
- **2402B** Roof section
- **2403** Wall/roof sections
- **2404** Wall/roof sections
- **2405** Column
- **2406** Wall panel
- **2407** Wall Panel
- **2408** Wall Panel
- **2409** Wall Panel
- **2410** Container
- **2411** Floor base
- **2420** Walkway/roof
- **2430** Two storey building structure
- **2440** Container building structure
- **2500** Container
- **2501A** Floor base
- **2501B** Floor base

- **2502**A Roof section
- **2502**B Roof section
- **2503** Wall/roof sections
- **2504** Wall/roof sections
- **2505** Column
- **2520** Building structure
- **2600** Container
- **2601** Floor base
- **2602**A Roof section
- **2602**B Roof section
- **2603** Wall/roof sections
- **2604** Wall/roof sections
- **2605** Column
- **2620** Container building structure
- **2630** Container building structure with covered walkway
- **2701**A Floor base
- **2701**B Floor base
- **2701**D Floor base
- **2701**G Floor base
- **2702**A Roof section
- **2702**B Roof section
- **2705** Columns
- **2706** Centre roof panel
- **2707** Centre roof panel
- **2708** Extra columns
- **2709** Eave panel
- **2710** Eave panel
- **2801**A Floor base
- **2801**B Floor base
- **2801**C Floor base
- **2801**D Floor base

- **2801E** Floor base
- **2801F** Floor base
- **2801G** Floor base
- **2802A** Roof section
- **2802B** Roof section
- **2802C** Roof section
- **2802D** Roof section
- **2805** Columns
- **2806** Centre roof panel
- **2807** Centre roof panel
- **2808** Extra columns
- **2809** Eave panels

ADVANTAGES

a) A height adjustable shipping container is provided which allows a compacted building to be easily transported and expanded at the destination.

b) Multiple containers can be located together to provide rooms which are larger than a single container.

c) Exterior panels of the container may either be packed within the container or moved from one position when compacted to another when expanded.

d) Significant reduction in the net cost of providing accommodation.

e) Formatted around ISO shipping container design.

f) Able to create high rise by stacking multiple containers on one another.

g) Able to be used for different applications including, but not limited to, residential housing, storage units, sheds, garages, and buildings for emergency relief, public or commercial use.

h) The storage space required is reduced by at least 50%, so transportation costs are also reduced by up to 50%.

i) Twice as many containers can then be delivered in the same amount of time.

VARIATIONS

It will of course be realised that while the foregoing has been given by way of illustrative example of this invention, all such and other modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of this invention as is hereinbefore described.

Claims

1. A method of manufacturing a transportable expandable shipping container for use as a building structure, wherein the transportable expandable shipping container during transportation houses within a minimum of two roofs and two floors such that when the transportable expandable shipping container is expanded for use as a building structure, the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the method includes:

providing a container base and vertical members, providing at least one first vertical wall portion adapted to be attachable to the base and adapted to extend less than the packaged height of the container, providing an upper surface secured at least in one position to an upper portion of a vertical member, providing at least one second vertical wall portion adapted to extend towards the first vertical wall portion from the upper surface, the vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members;

extending the members to an expanded position;

attaching at least some part of an interchangeable and relocatable side walls to an upper part of the height adjustable container during expansion; and

attaching at least some other part of the interchangeable and relocatable side walls to the lower part of the height adjustable container during expansion whereby the lower part of the side walls is substantially high enough to accommodate building components, fittings, furniture and fixtures below its height;

wherein when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface along the entire surface area of the outer wall.

2. A height adjustable transportable shipping container usable as a building structure, wherein the transportable expandable shipping container houses during transportation within a minimum of

two roofs and two floors such that when the transportable expandable shipping container is expanded for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the height adjustable shipping container having:

vertical corner members and at least three interchangeable and relocatable side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container and the shipping container is capable to house and to transport therein structural components, such as wall panels, floor, roof and even fittings to erect a building structure that is the equivalent in floor area to that of at least two shipping containers;

at least some part of the interchangeable and relocatable side walls is attached to an upper part of the height adjustable container during expansion and at least some other part of an interchangeable and relocatable side walls is attached to the lower part of the height adjustable container during expansion, the lower part of the side walls is substantially high enough to accommodate building components, fittings, furniture and fixtures below its height: and

the vertical members including a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart vertical members,

wherein further when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and such that when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface along the entire surface area of the outer wall.

3. The height adjustable shipping container as claimed in claim 2, wherein the vertical members are vertical rails or columns.

4. The height adjustable shipping container as claimed in claim 2 includes access points for utility services, the access points are situated at the junctures of the upper and lower walls.

5. The height adjustable shipping container as claimed in claim 2, wherein at least part of a wall filling the gap between upper and lower shipping container parts is pulled into place on expansion of the container.

6. The height adjustable shipping container as claimed in claim 2, wherein the floor of the shipping container may act to receive a pourable settable material and may include elements acting as reinforcement for the settable material.

7. The height adjustable shipping container as claimed in claim 6, wherein the reinforcement elements may extend through two adjacent expanded shipping container floors.

8. The height adjustable shipping container as claimed in claim 2, wherein the shipping container corner members may include telescoping portions in which any engagement features in the corner rail top are substantially repeated in the top of each telescoping portion.

9. The height adjustable shipping container as claimed in claim 2, wherein when in the expanded form the corner members remain capable of supporting vertical loads.

10. The height adjustable shipping container as claimed in claim 2, wherein the side panels can be relocated to an outer shell of the erected container to create a combination of external walls, windows and door openings, whereby the panels, windows and doors are interchangeable, and able to create a number of different formats as desired.

11. The height adjustable shipping container as claimed in claim 6, wherein the floor includes spaced apart openings adapted to receive the tines of a fork lift to allow the unerected shipping container to be easily transported and are adapted when the shipping container is erected to used as service ducts.

12. The height adjustable shipping container as claimed in claim 2, wherein the vertical corner members have an open cross section.

13. The height adjustable shipping container as claimed in claim 2, wherein the lower part of the side walls is substantially 0.9 meters high and the upper part of the side walls is substantially 0.3 meters high.

14. The height adjustable shipping container as claimed in claim 12, wherein the vertical corner members have a substantially 'L'-shaped cross section.

15. A transportation system for the transportation, packaging and erection of a transportable height adjustable shipping container usable as a building, the transportable expandable shipping container during a transportation mode houses within a minimum of two roofs and two floors such that when the transportable expandable shipping container in a building mode for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the transportation system including an external building shell transformable from the transportation mode to the building mode, when in the transportation mode the external building shell falls within same floor dimensions and floor area of a shipping container format, the external building shell being height adjustable such that the external shell is adapted to be transformed from the transport mode to the building mode by adjusting the height of the external building shell to a desired height, when in the transportation mode the internal space within the external building shell includes structural components, such as building components, wall panels, floor, roof fittings, furniture and fixtures required to erect and fit out a building structure that is the equivalent in floor area to that of at least two shipping container formats; the external building shell includes:

vertical corner members and at least three interchangeable and relocatable side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container;

at least some part of the interchangeable and relocatable side walls is attached to an upper part of the height adjustable container during expansion and at least some other part of an interchangeable and relocatable side walls is attached to the lower part of the height adjustable container during expansion, the lower part of the side walls is substantially high enough to

accommodate the structural components, such as building components, wall panels, floor, roof fittings, furniture and fixtures, below its height when in the transportation mode; and

the expandable vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members,

wherein the transportation system when in the transportation mode the external building shell is at a reduced height of at least 50% to that of a standard shipping container and such that when in the building mode the external building shell is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface along the entire surface area of the outer wall.

16. The transportation system as claimed in claim 15, wherein the lower part of the side walls is substantially 0.9 meters high and the upper part of the side walls is substantially 0.3 meters high.

17. The height adjustable shipping container as claimed in claim 15, wherein the vertical corner members have an open cross section.

18. The transportation system as claimed in claim 17, wherein the vertical corner members have a substantially 'L'-shaped cross section.

19. The method of manufacturing a transportable expandable shipping container for use as a building structure as claimed in claim 1, wherein the method includes a further step of relocating the elements forming the shipping container walls during transport elsewhere to and/or within the container after expansion.

20. The height adjustable transportable shipping container usable as a building structure as claimed in claim 2, wherein the elements forming the shipping container walls during transport adapted to be relocated elsewhere within the container after expansion.

FIG. 1

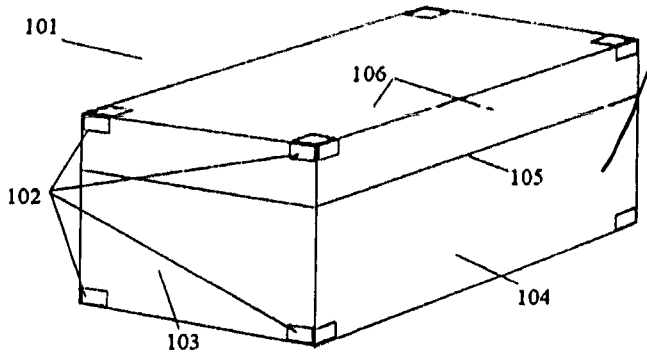


FIG. 2

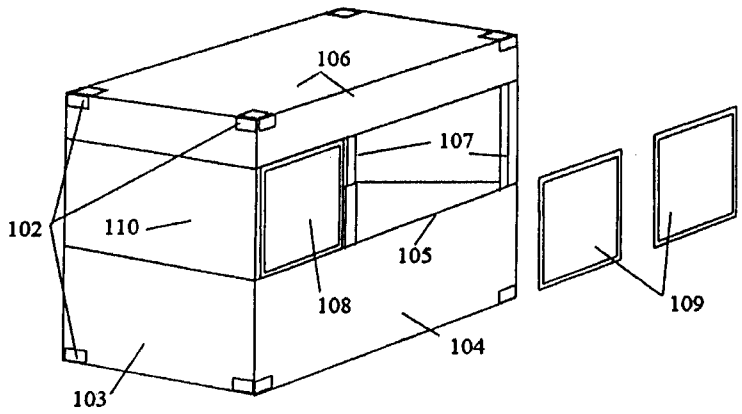
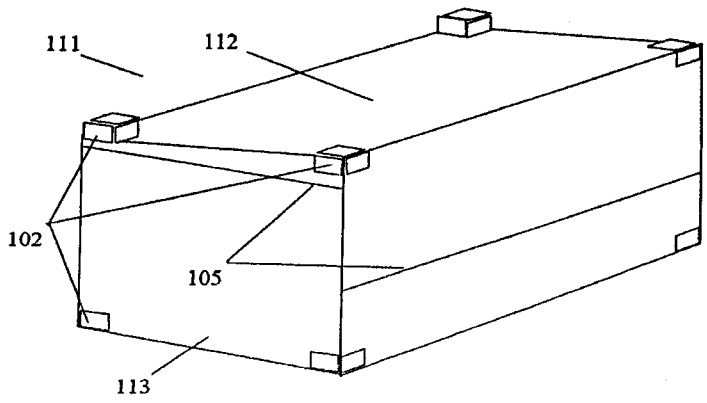


FIG. 3



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FIG. 4

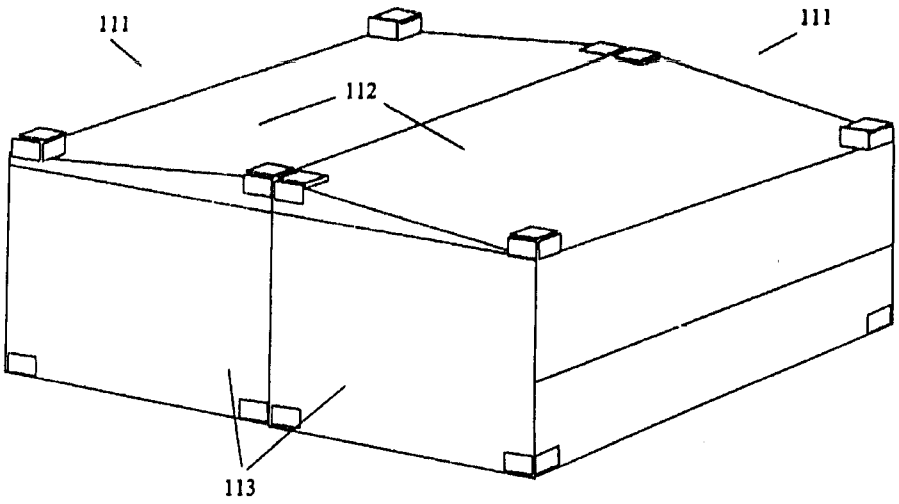
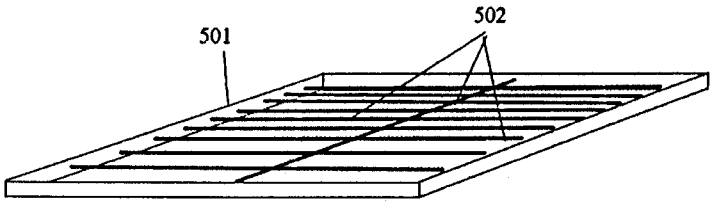


FIG. 5



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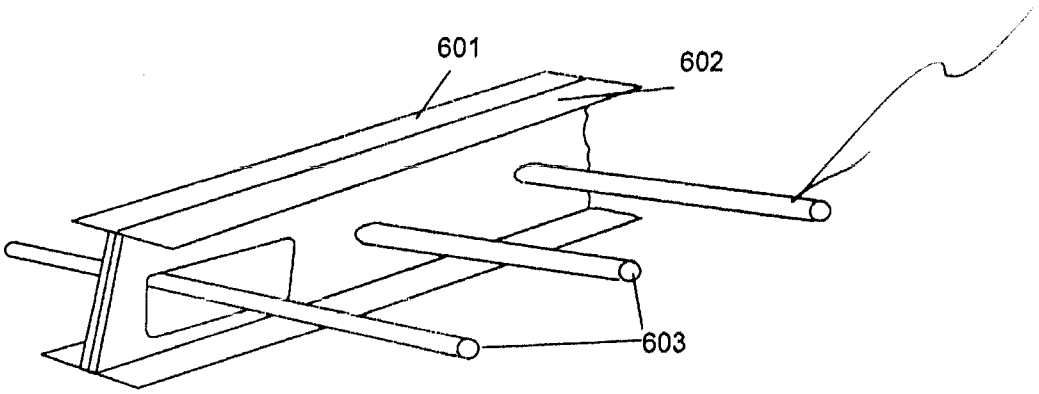


FIG. 6

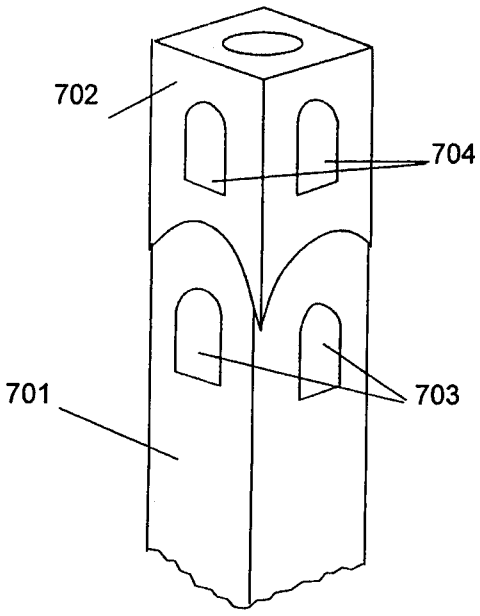


FIG. 7

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FIG. 8

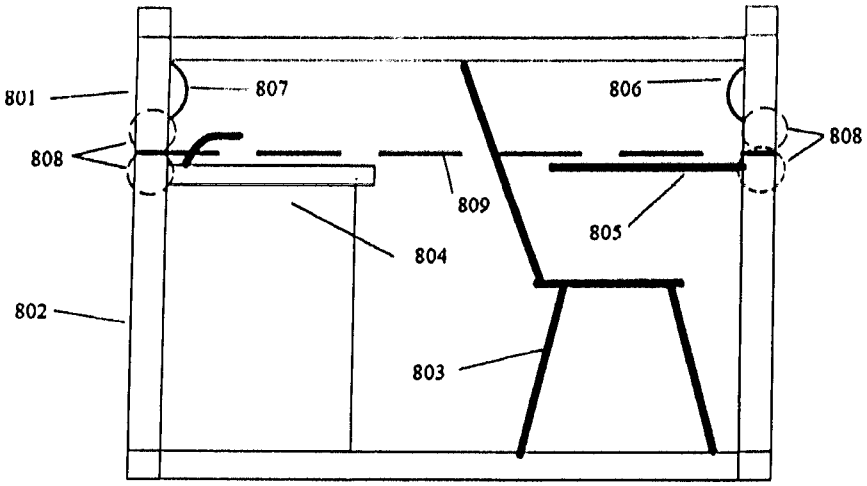
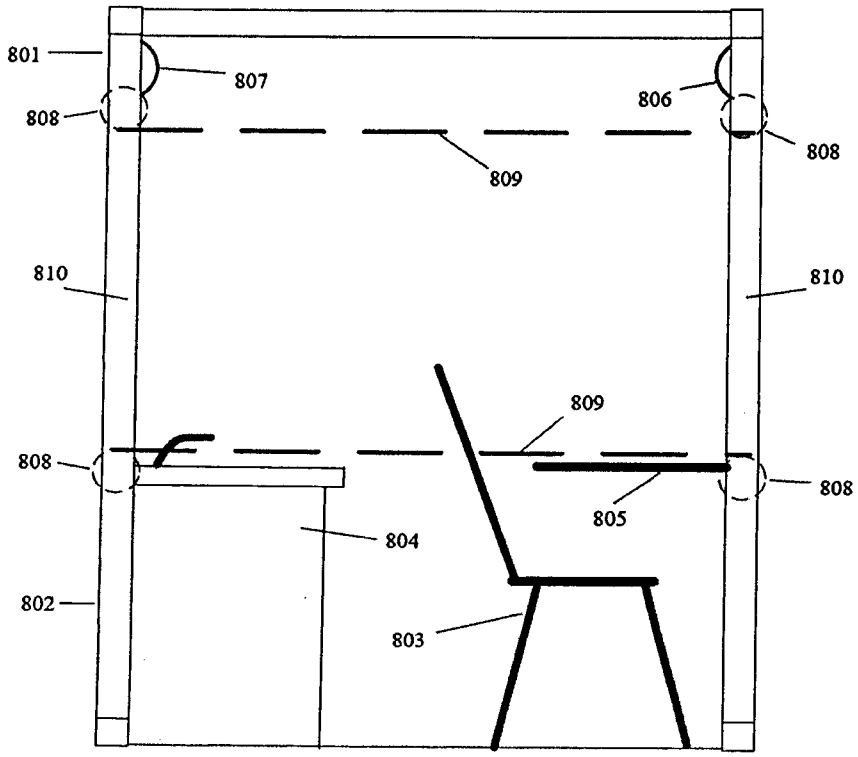


FIG. 9



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FIG. 10

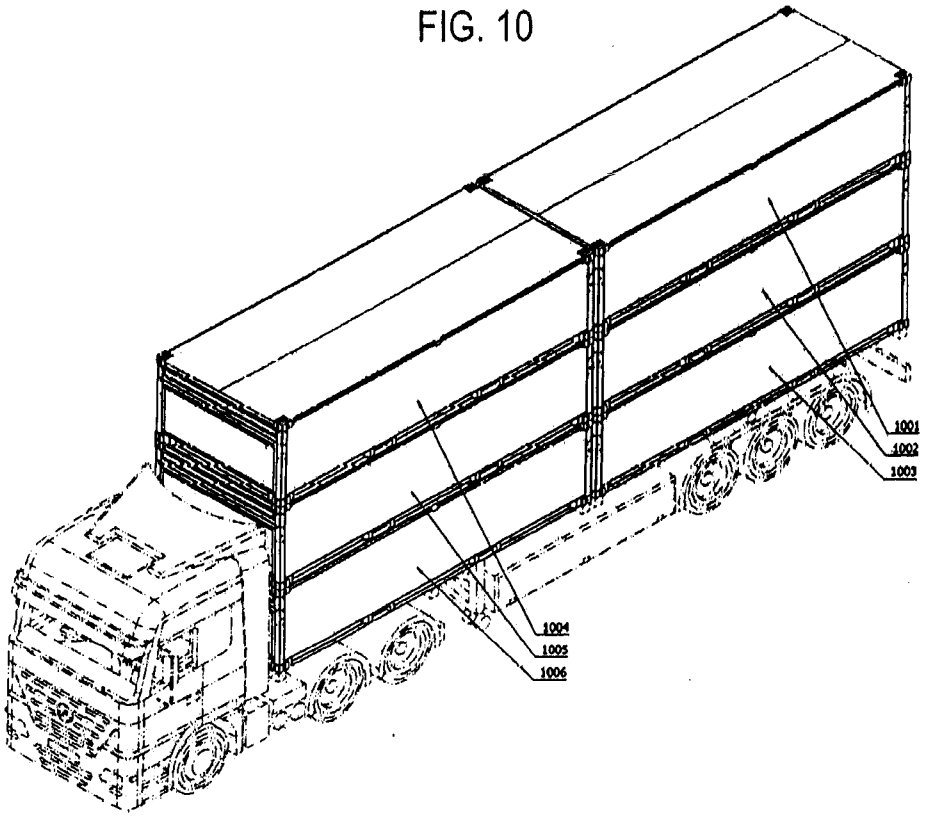
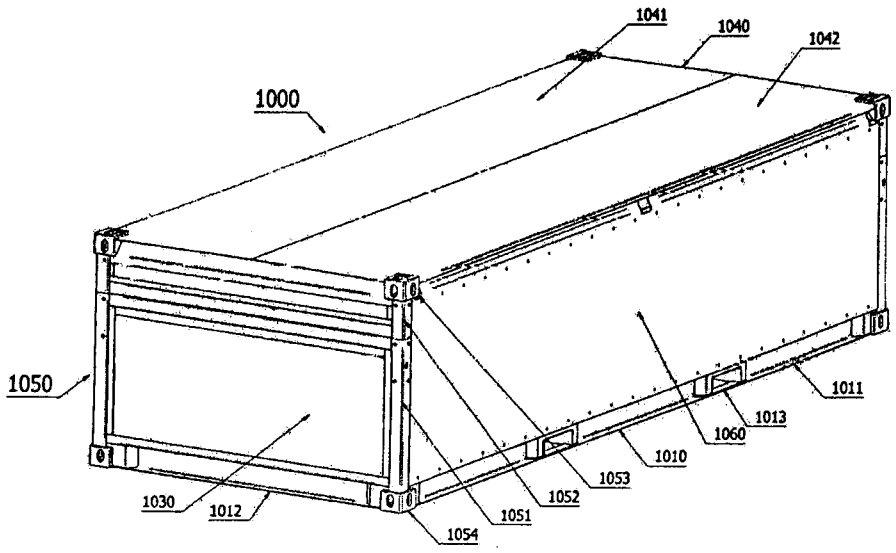


FIG. 11



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FIG. 12

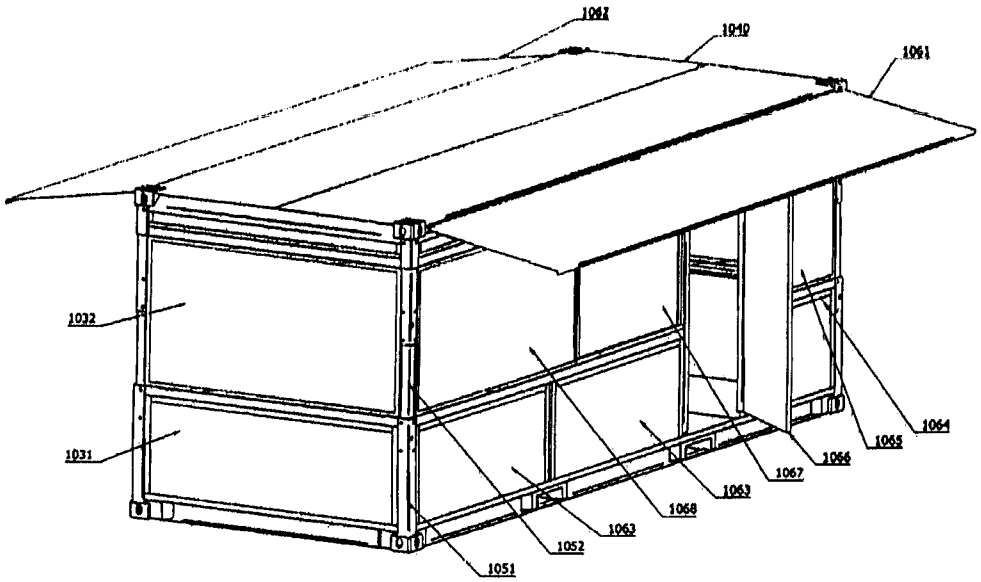
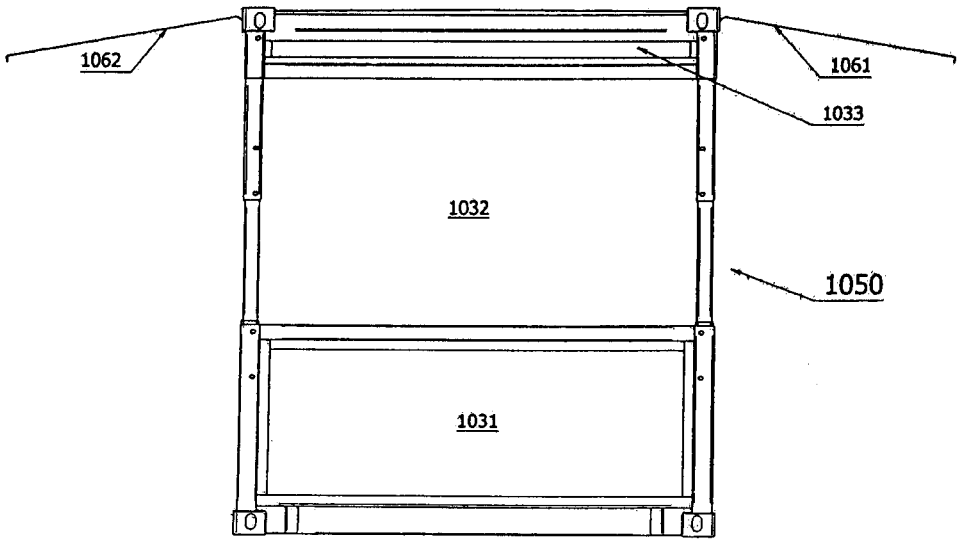


FIG. 13



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FIG. 14

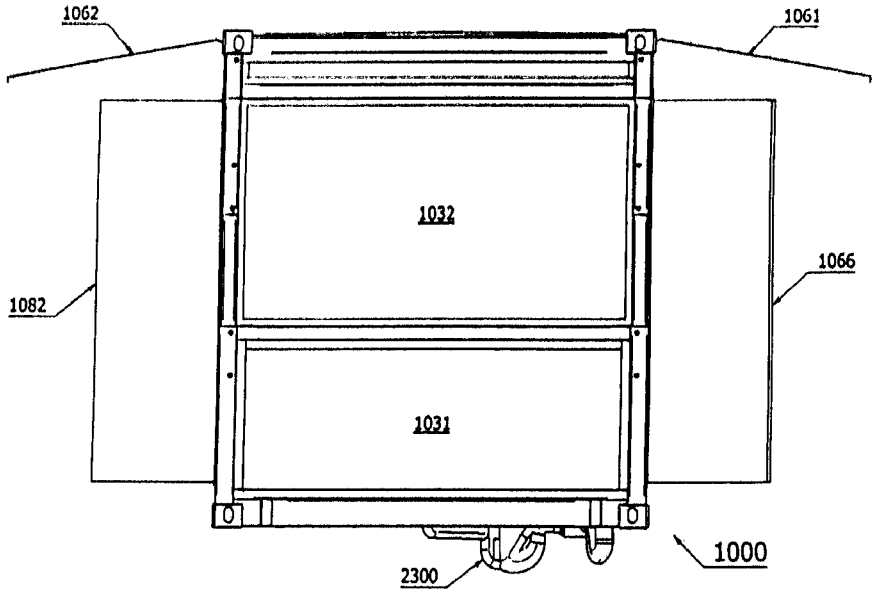
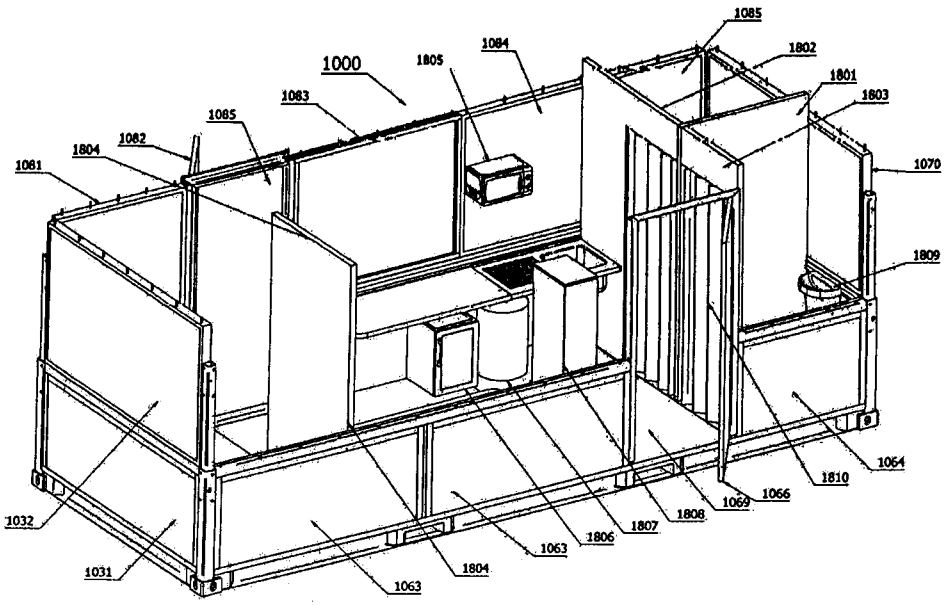


FIG. 15



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FIG. 16

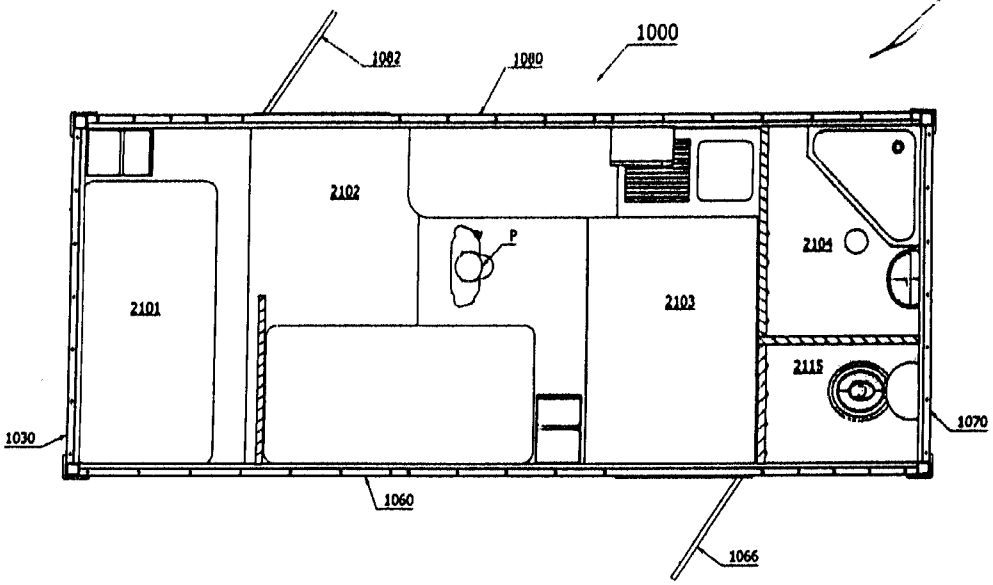
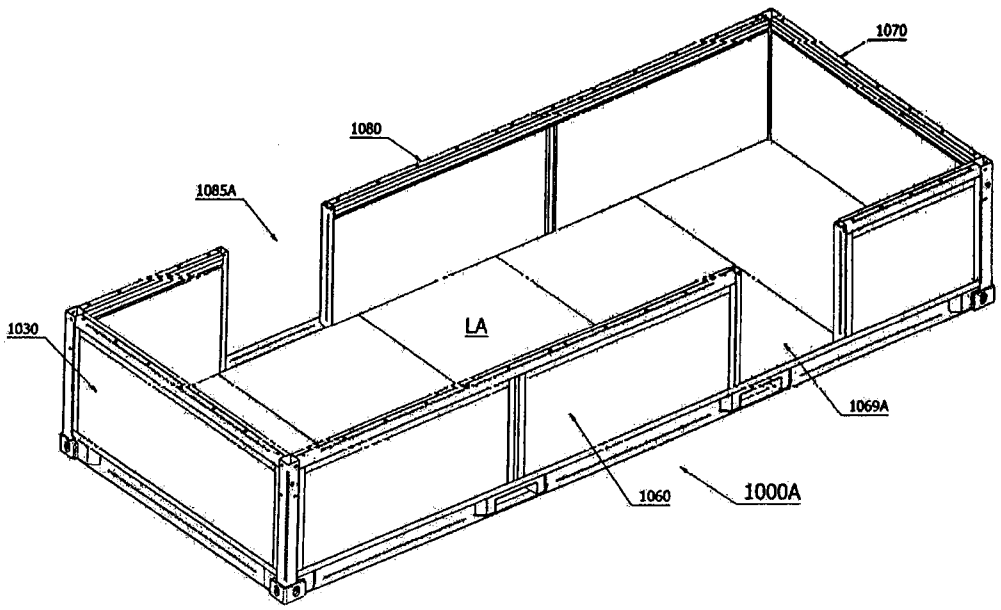


FIG. 17



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FIG. 18

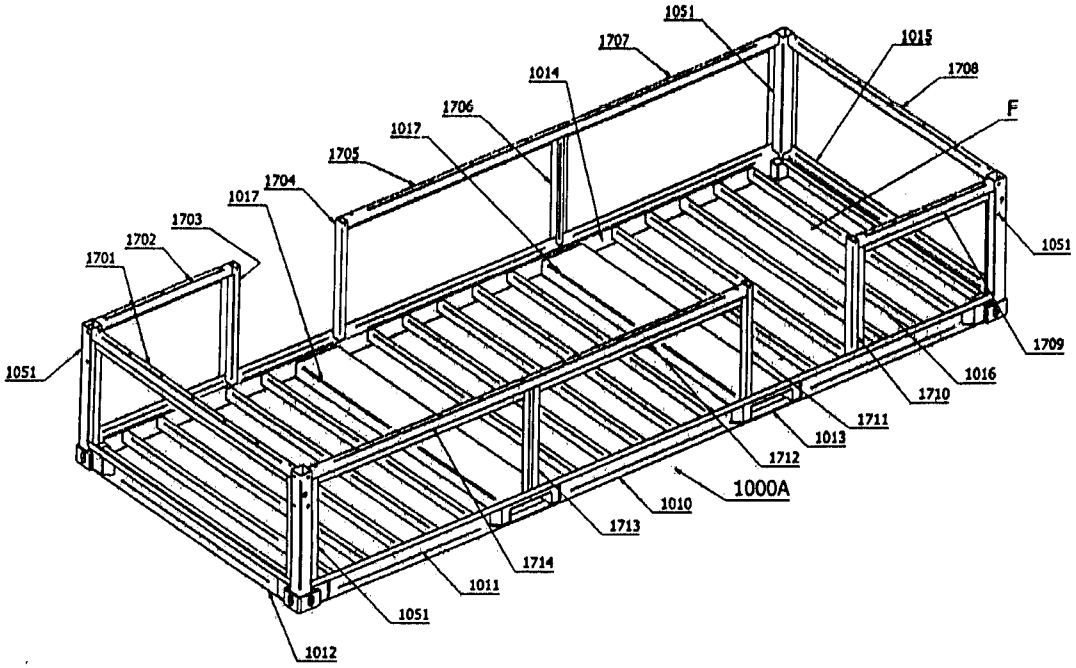
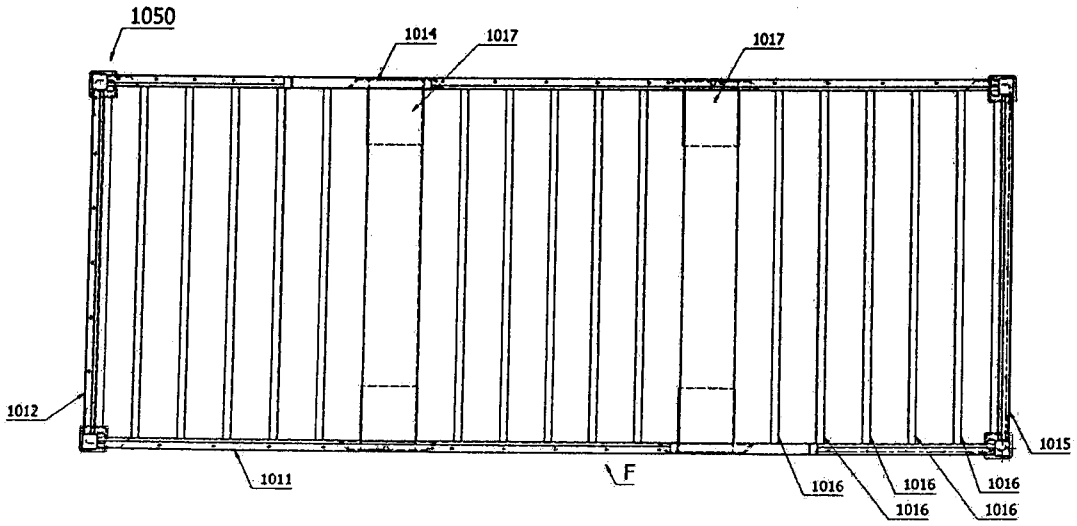


FIG. 19



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FIG. 20

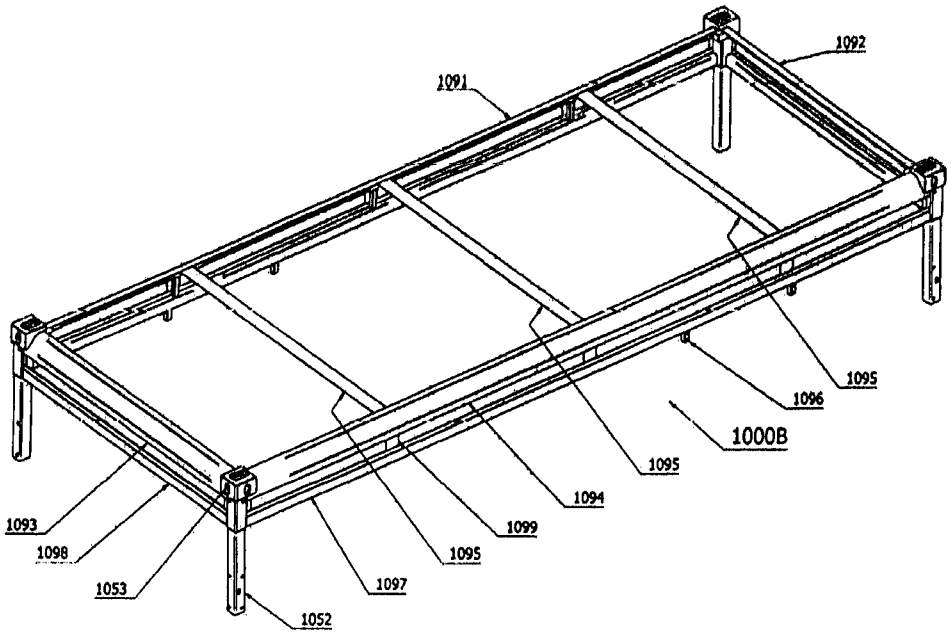
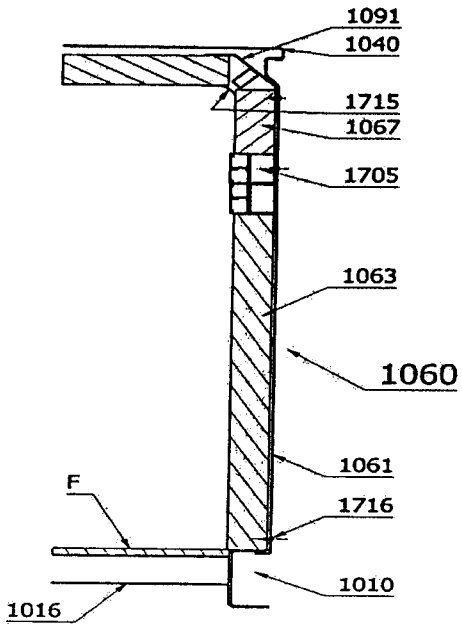


FIG. 23

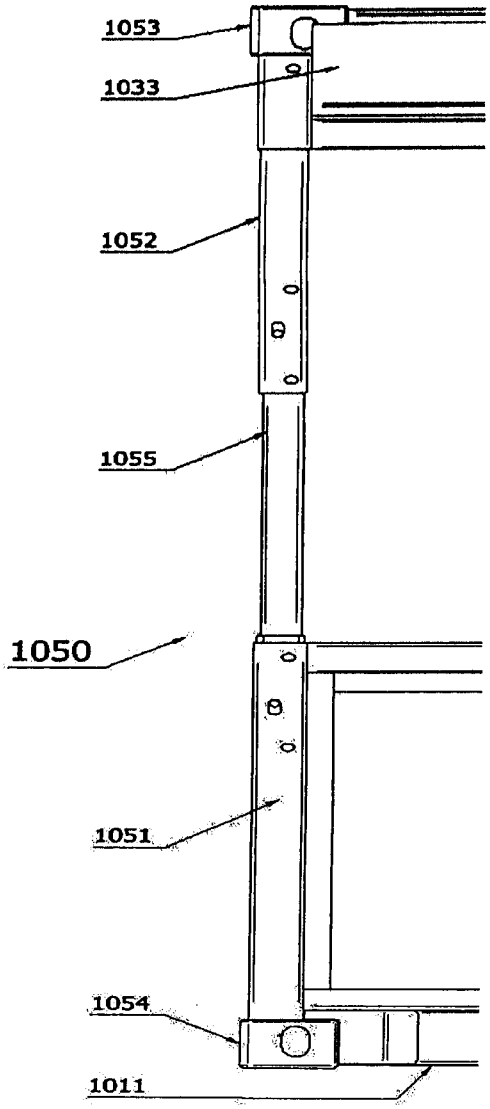


LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:

ASTERIA I. MERCADO

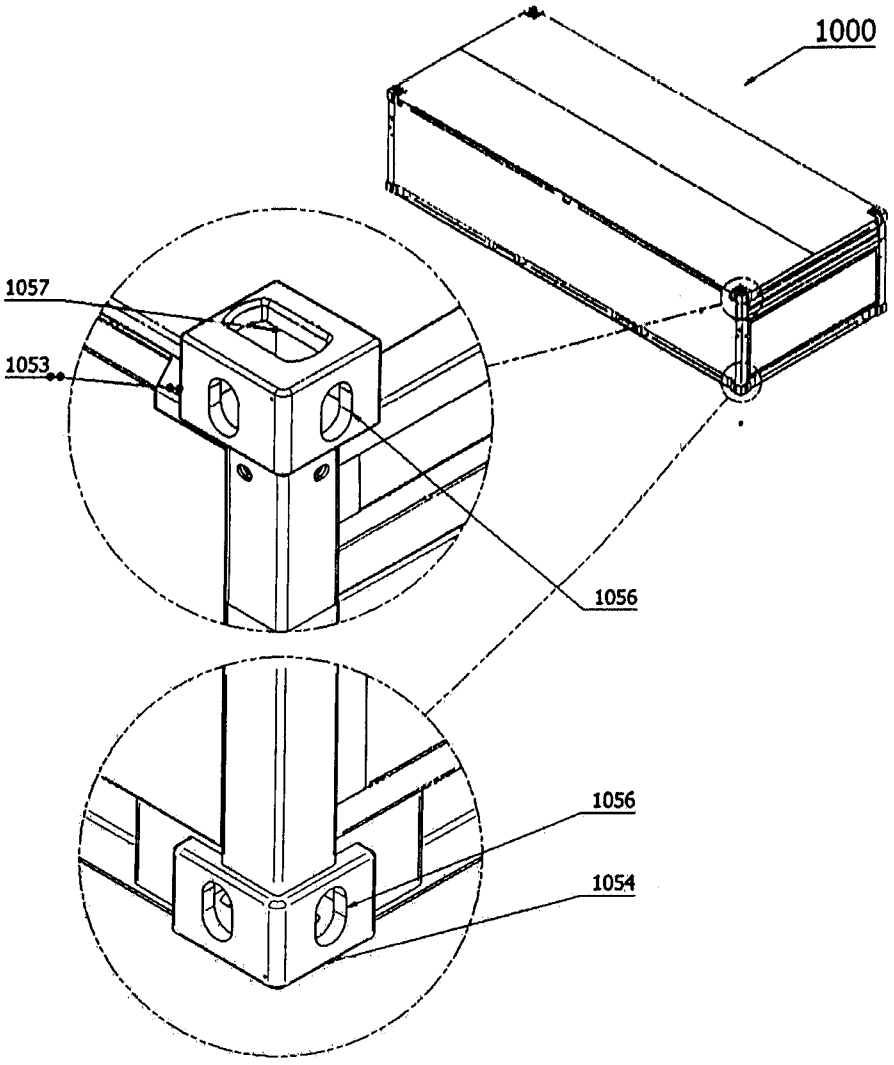
FIG. 21



LIFTING POINT PTY LTD
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FIG. 22



LIFTING POINT PTY LTD
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ASTERIA I. MERCADO

FIG. 24

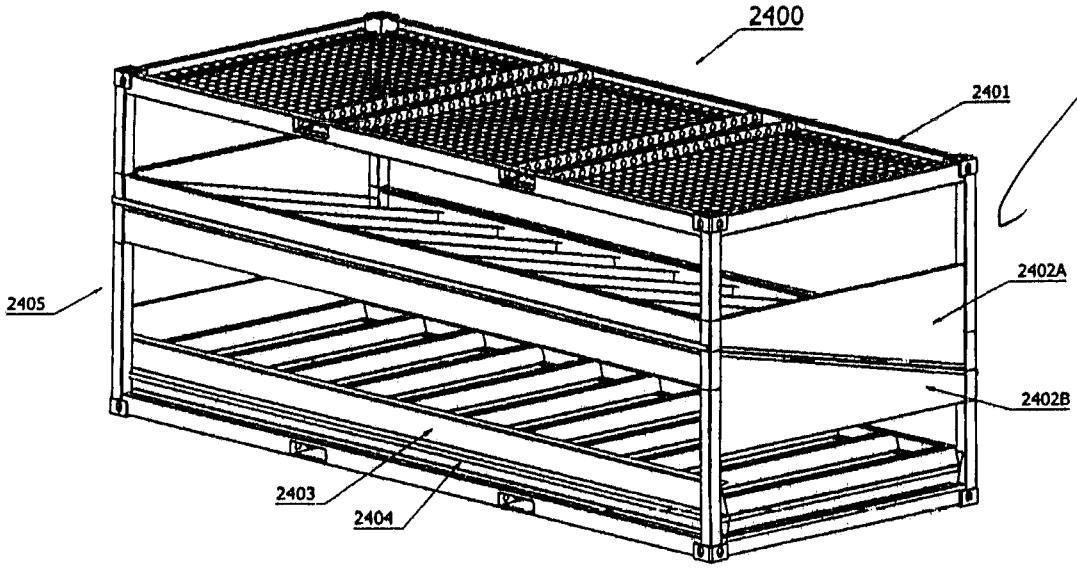
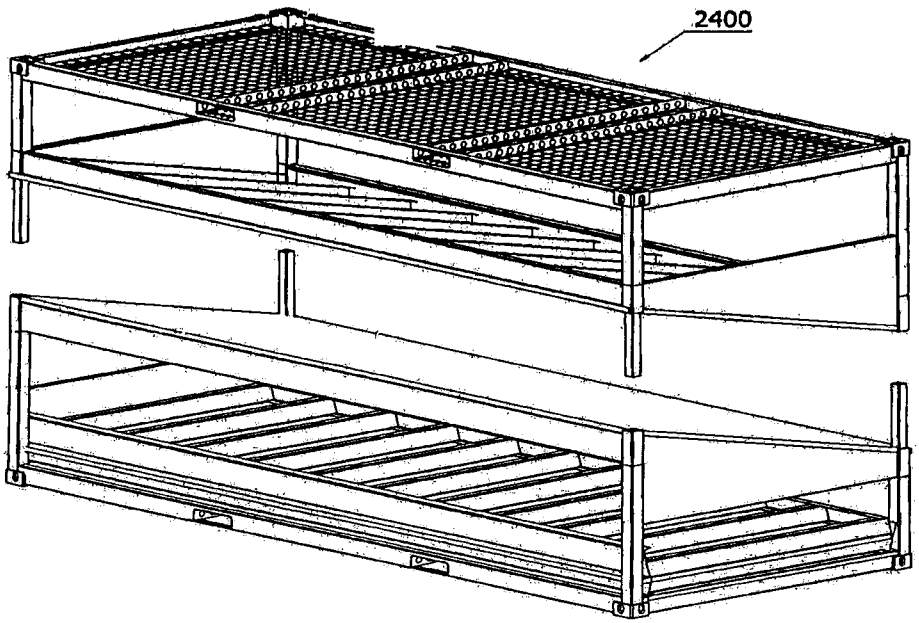


FIG. 24A



LIFTING POINT PTY LTD
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FIG. 24B

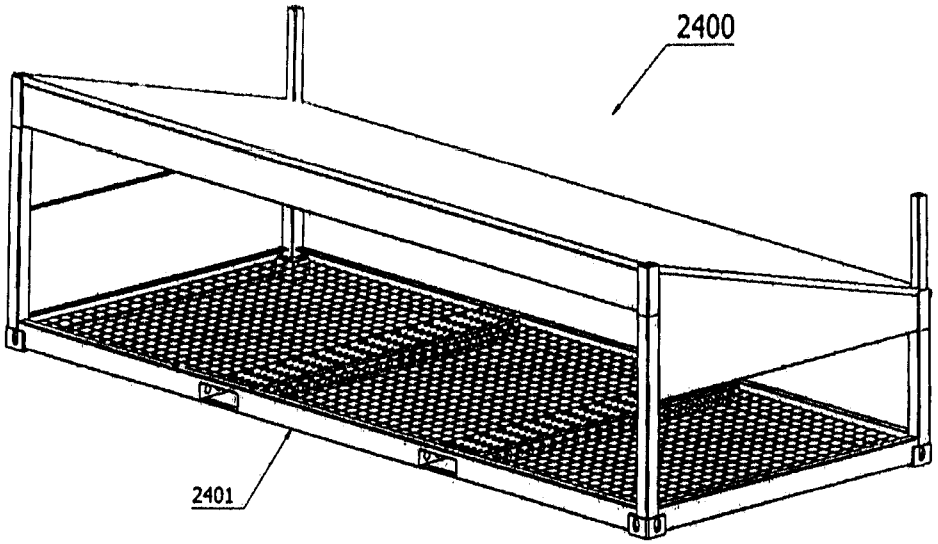
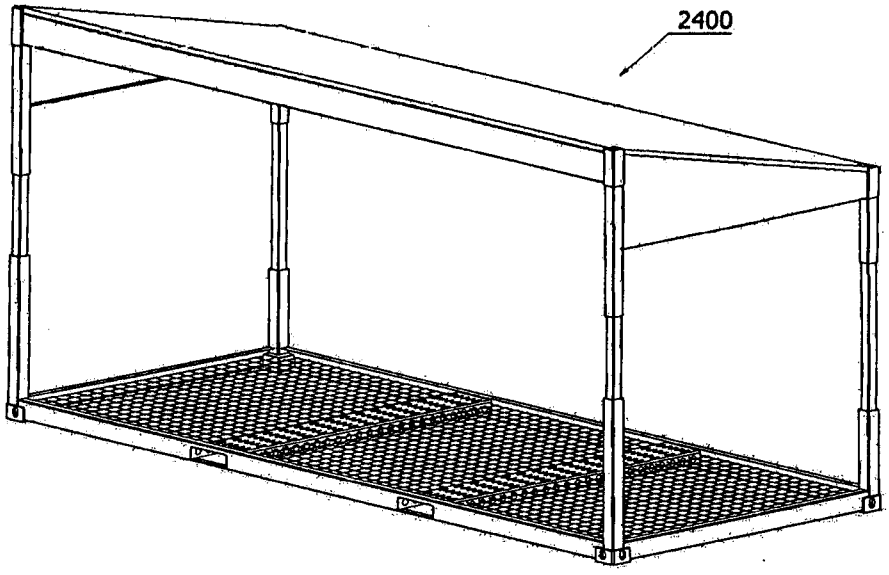


FIG. 24C



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 24D

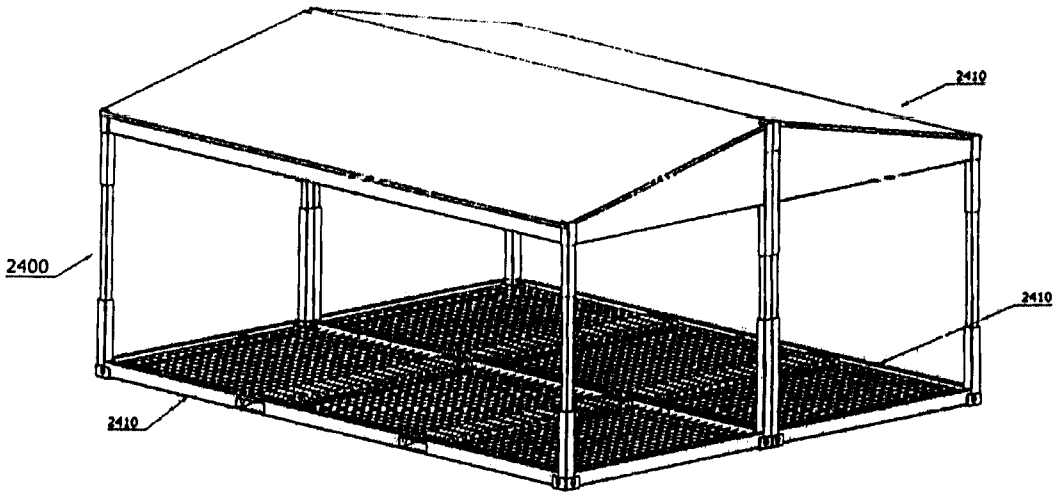
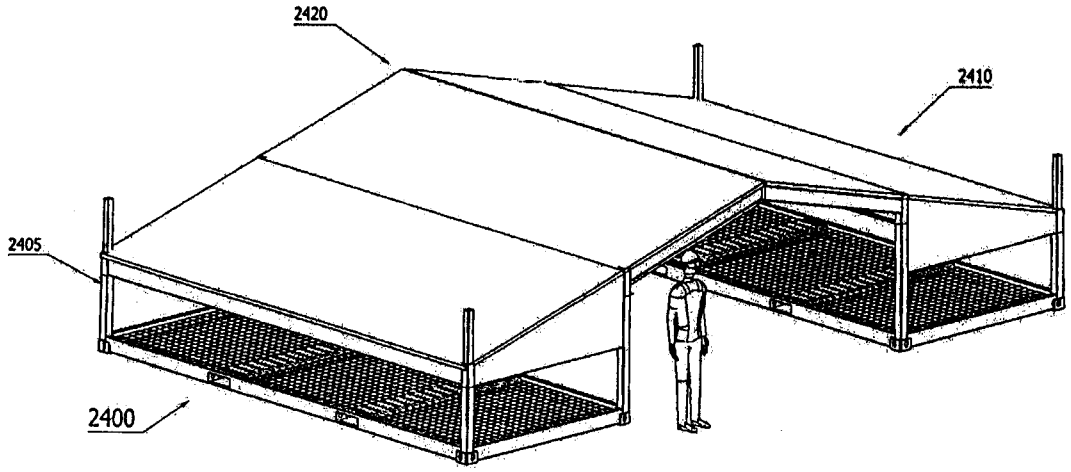


FIG. 24E



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 24F

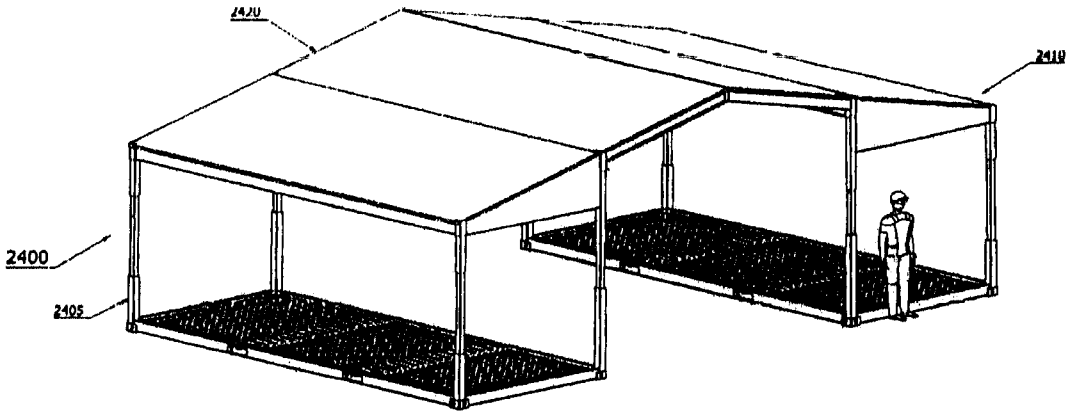
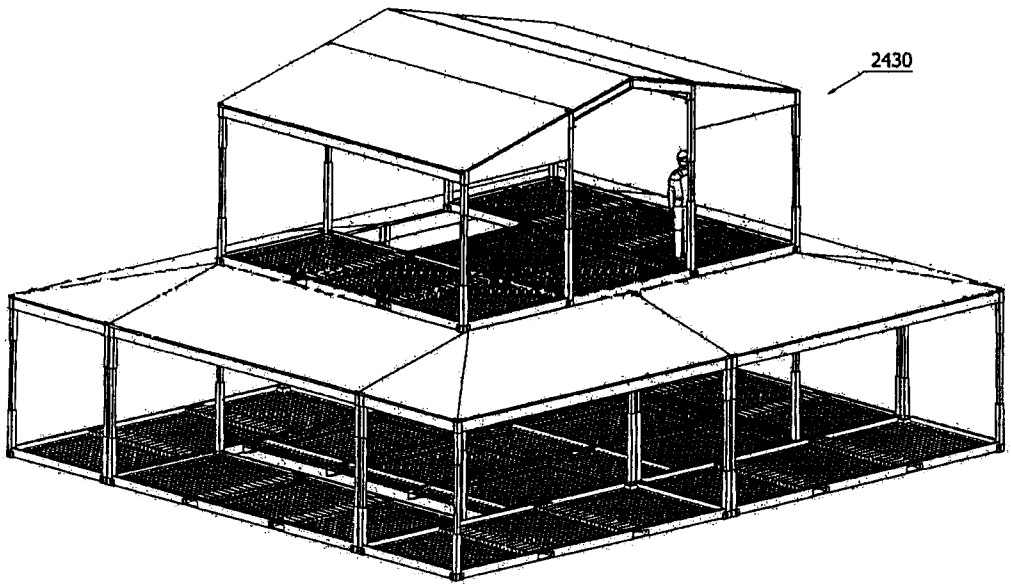


FIG. 24G



LIFTING POINT PTY LTD
Applicant

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By:
ASTERIA I. MERCADO

FIG. 24H

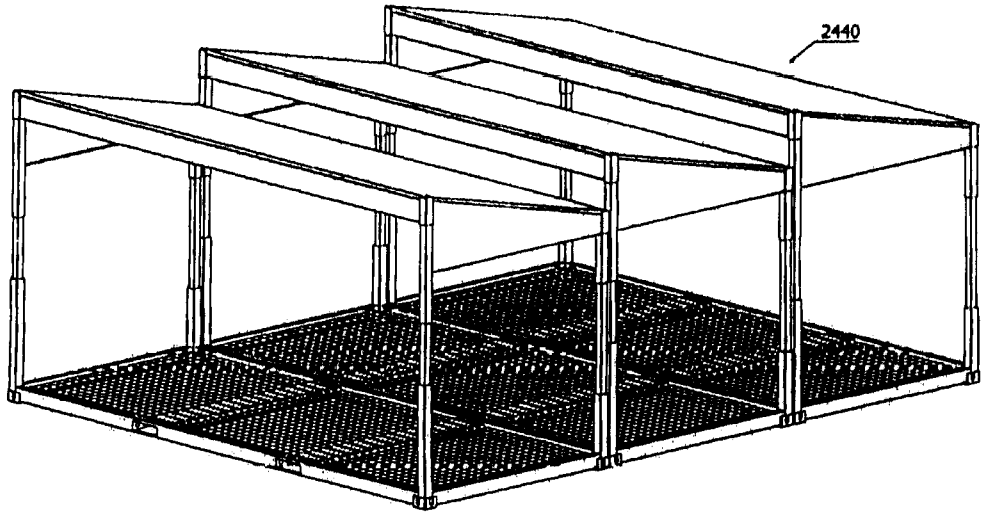
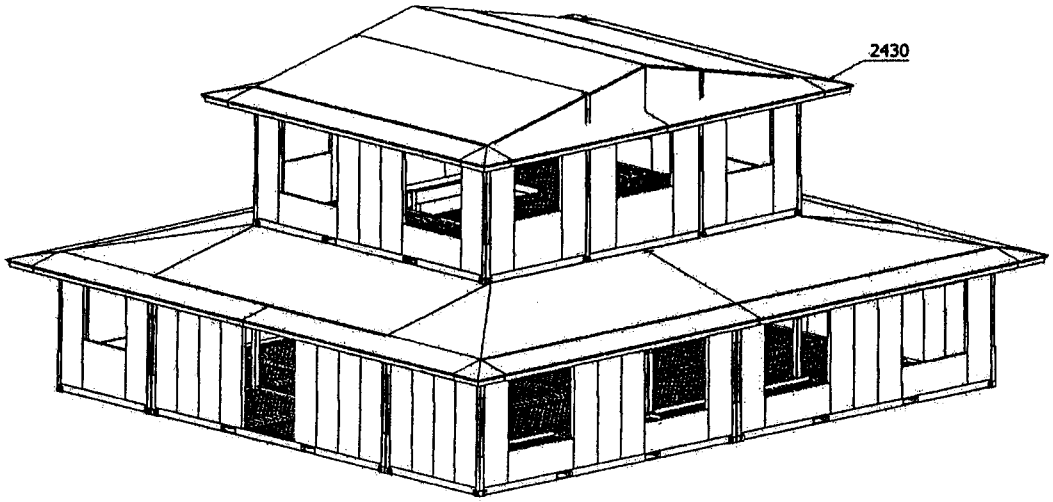


FIG. 24I



LIFTING POINT PTY LTD
Applicant

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FIG. 24J

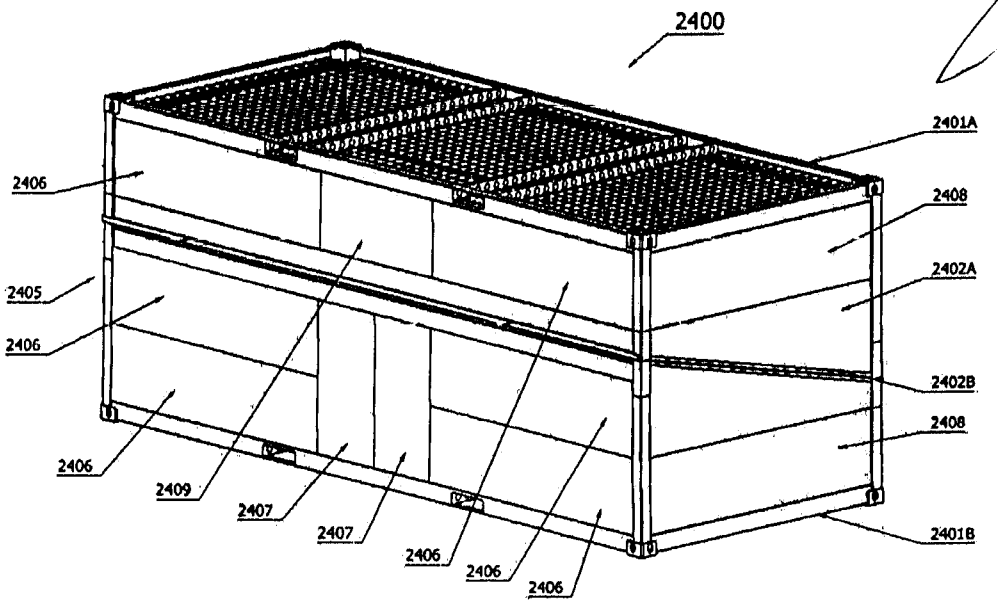
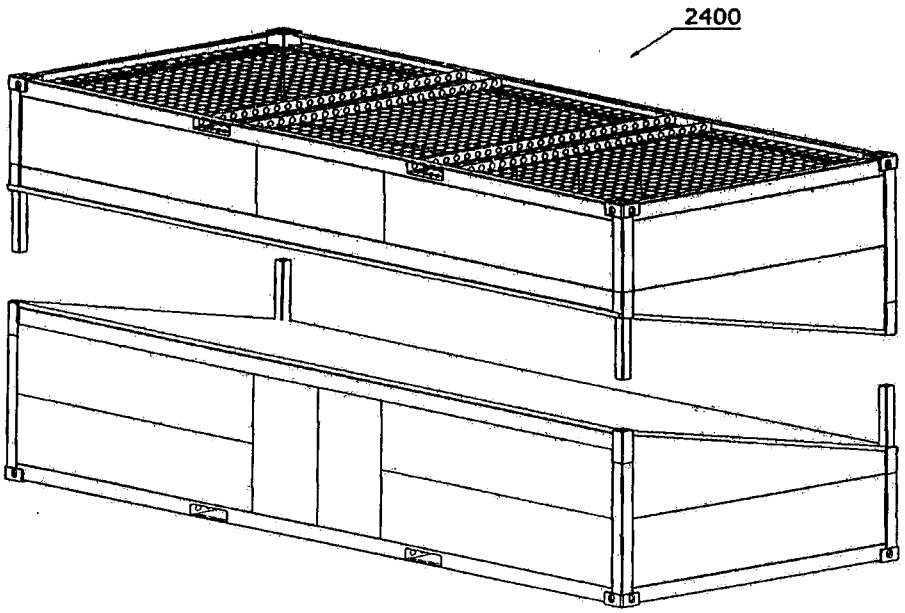


FIG. 24K



LIFTING POINT PTY LTD
Applicant

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By:

ASTERIA I. MERCADO

FIG. 25

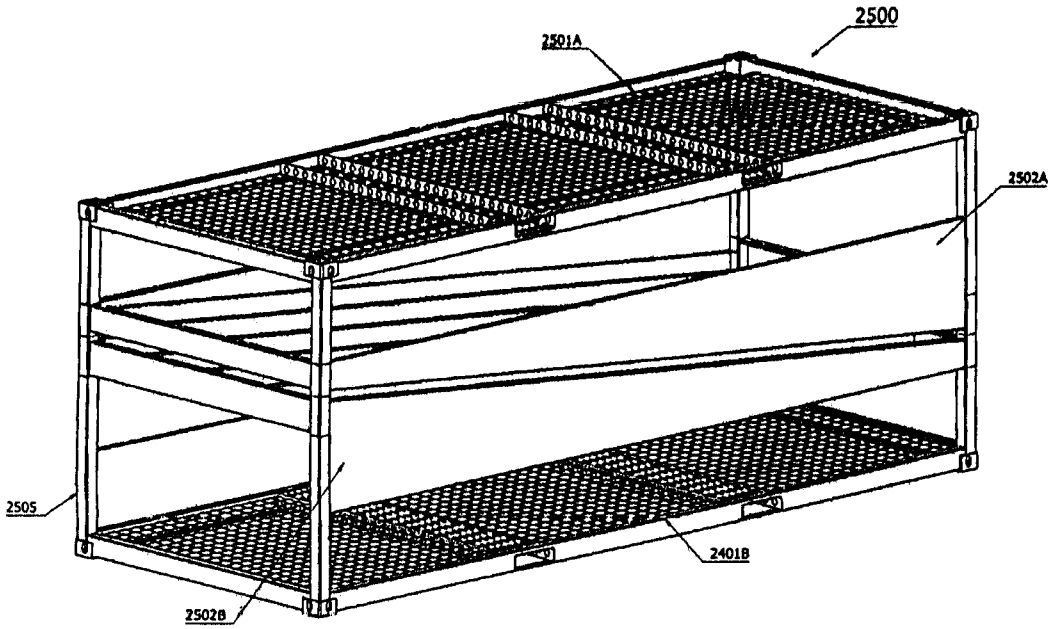
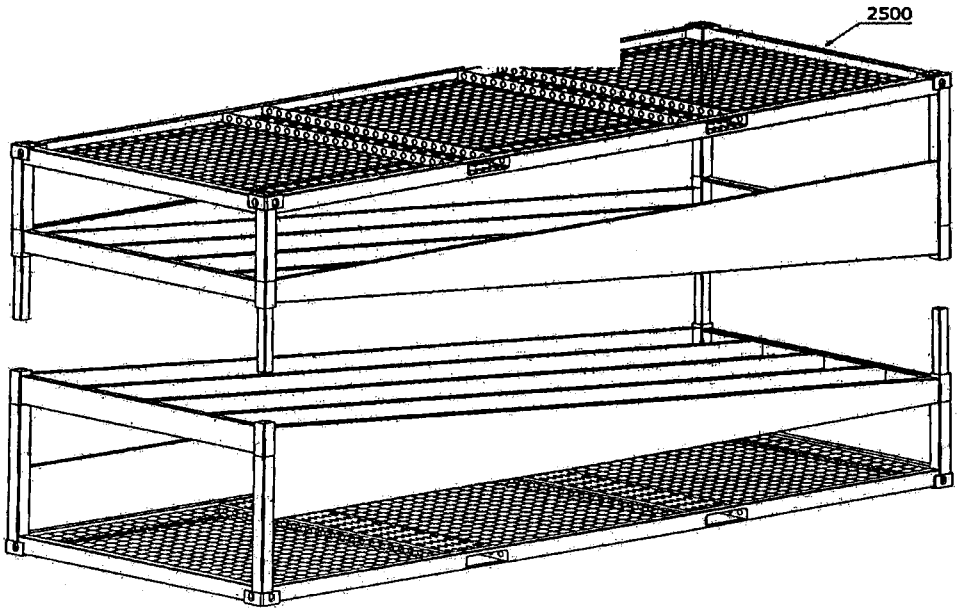


FIG. 25A



LIFTING POINT PTY LTD
Applicant

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By:
ASTERIA I. MERCADO

FIG. 25B

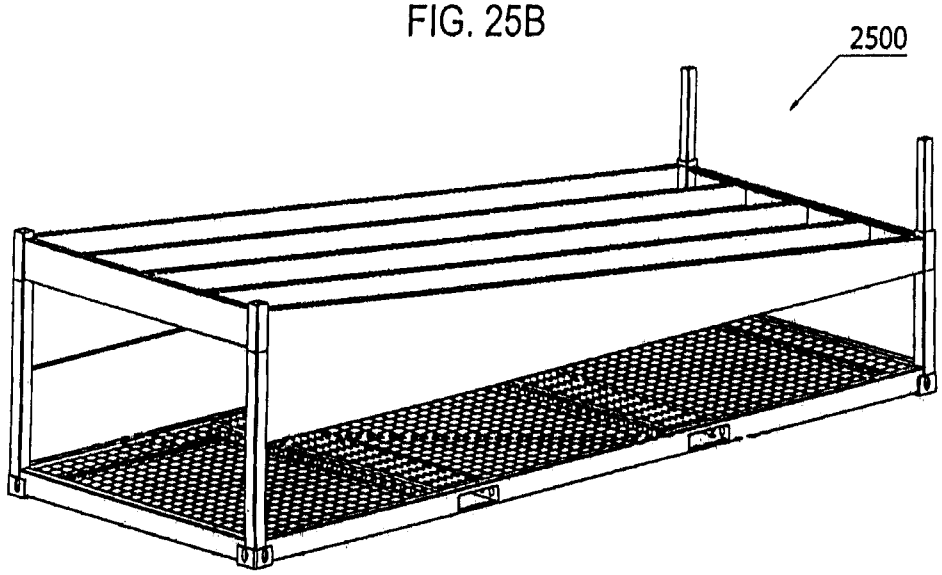
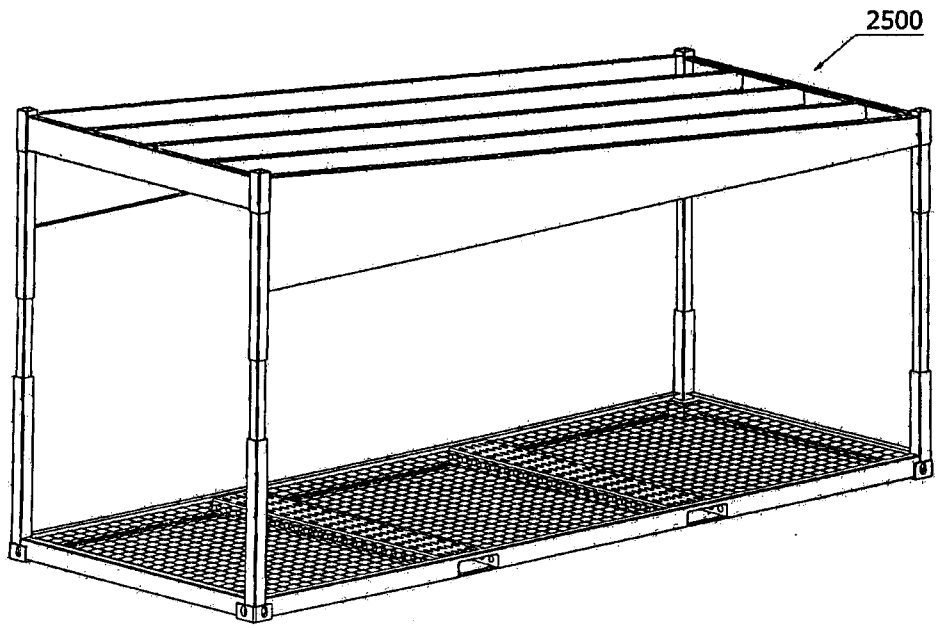


FIG. 25C



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:

ASTERIA I. MERCADO

FIG. 25D

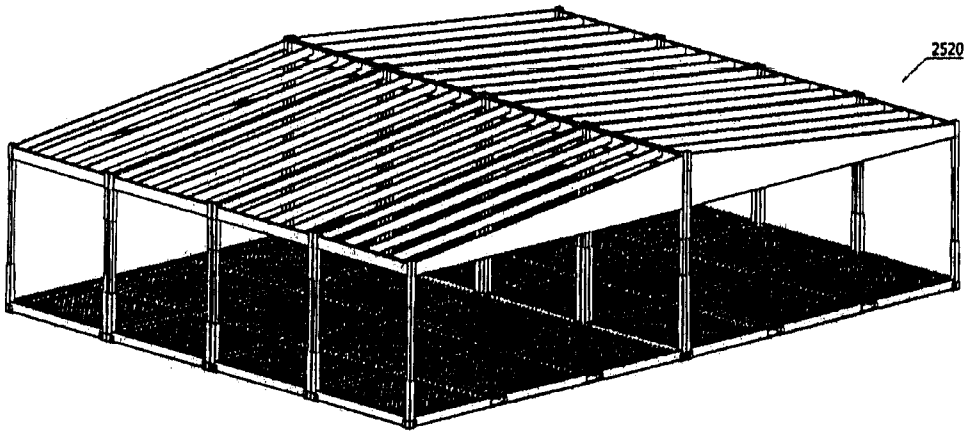
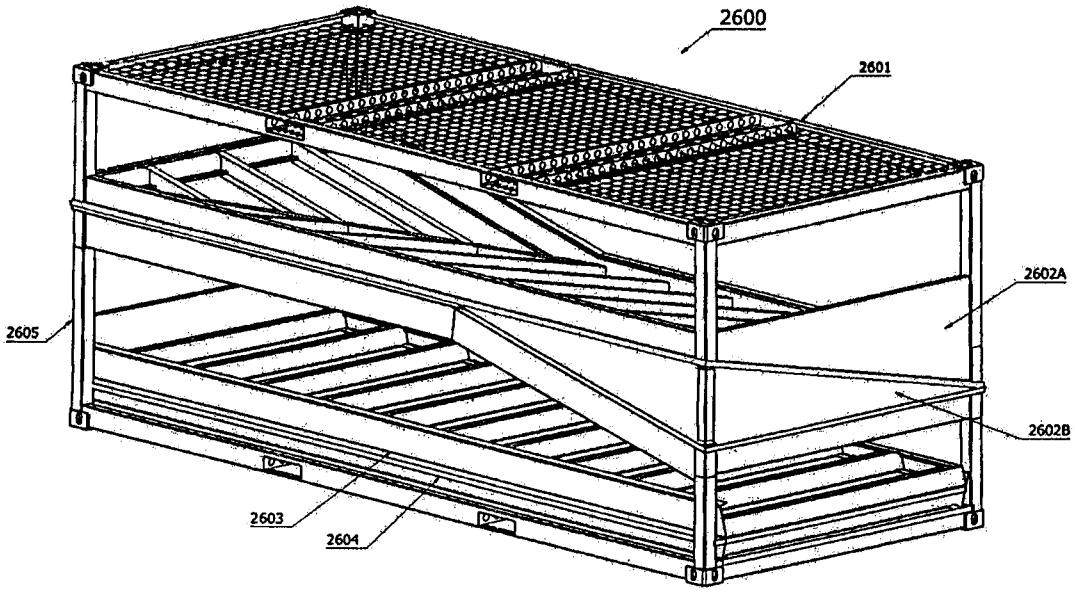


FIG. 26



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:

ASTERIA I. MERCADO

FIG. 26A

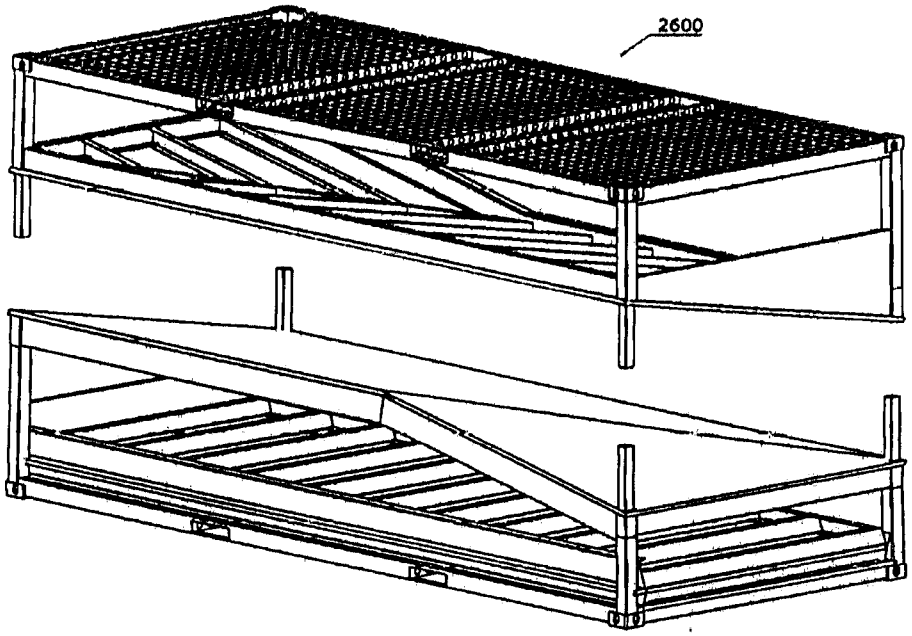
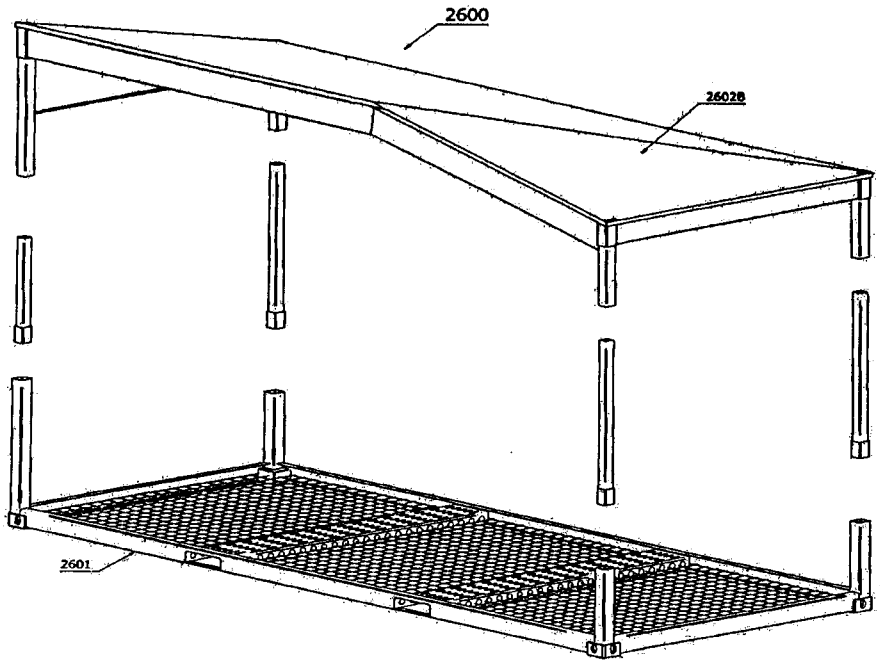


FIG. 26B



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:

ASTERIA I. MERCADO

FIG. 26C

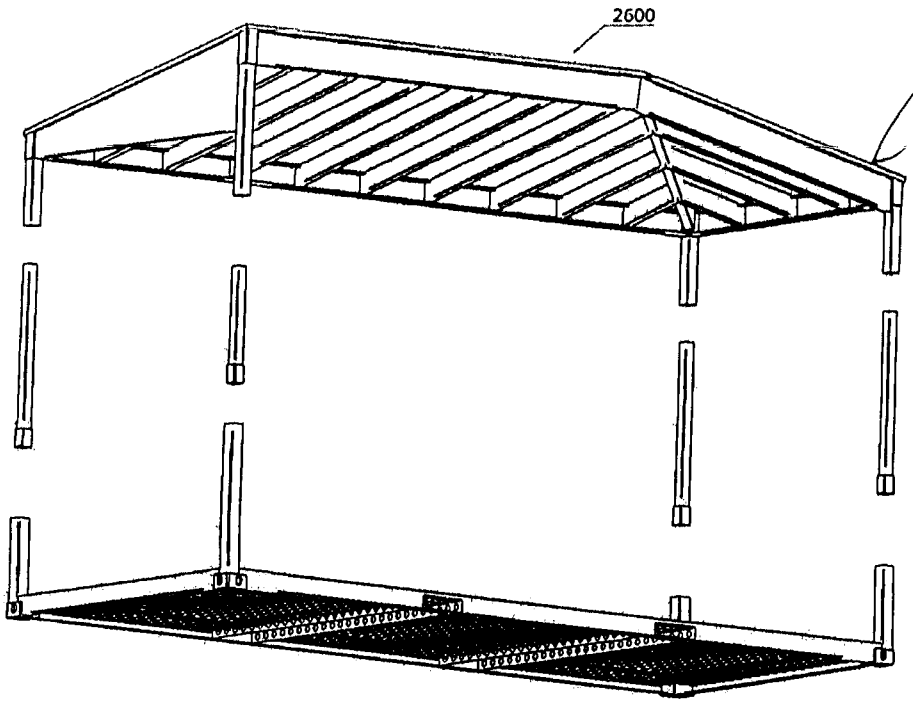
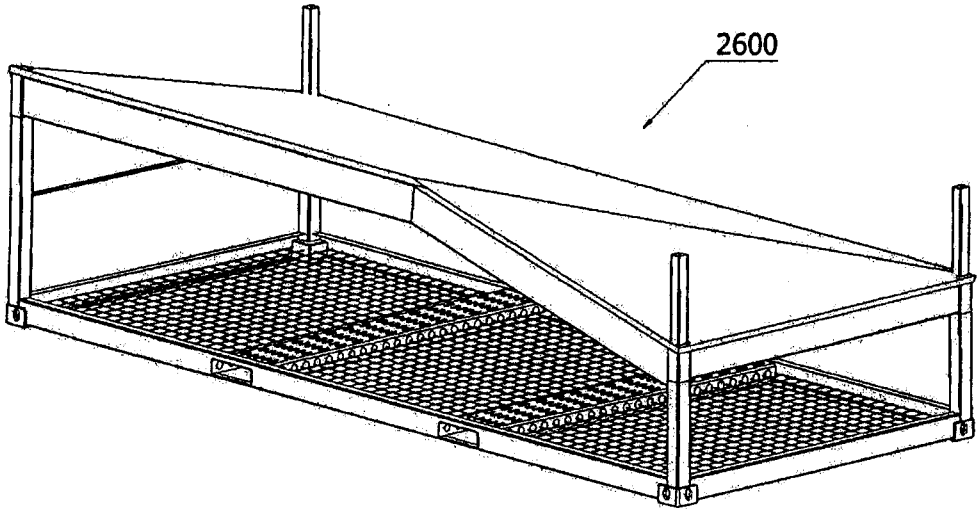


FIG. 26D



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 26E

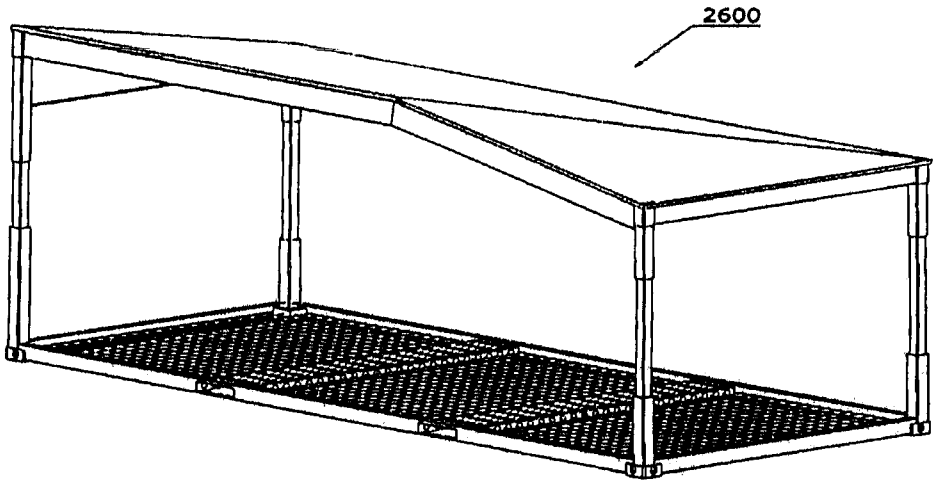
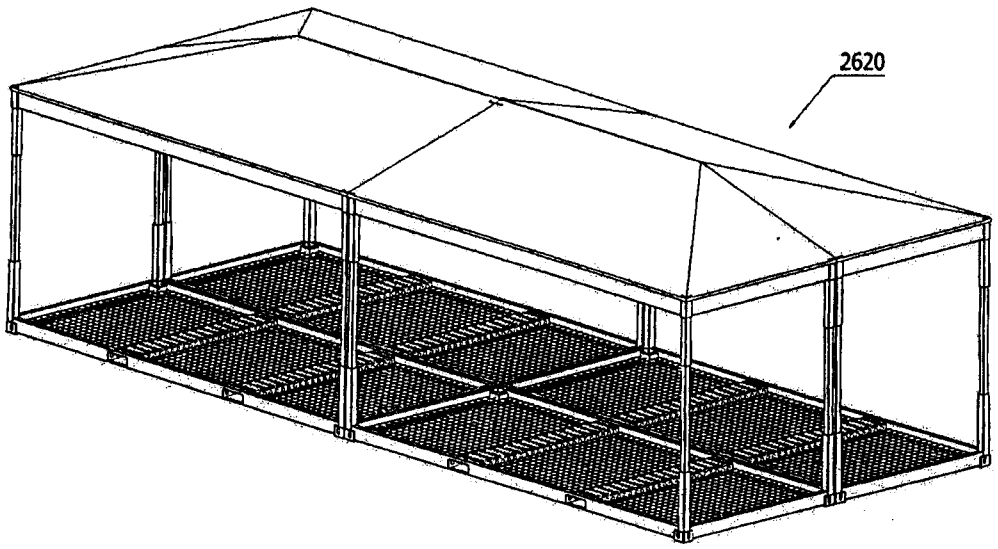


FIG. 26F



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 26G

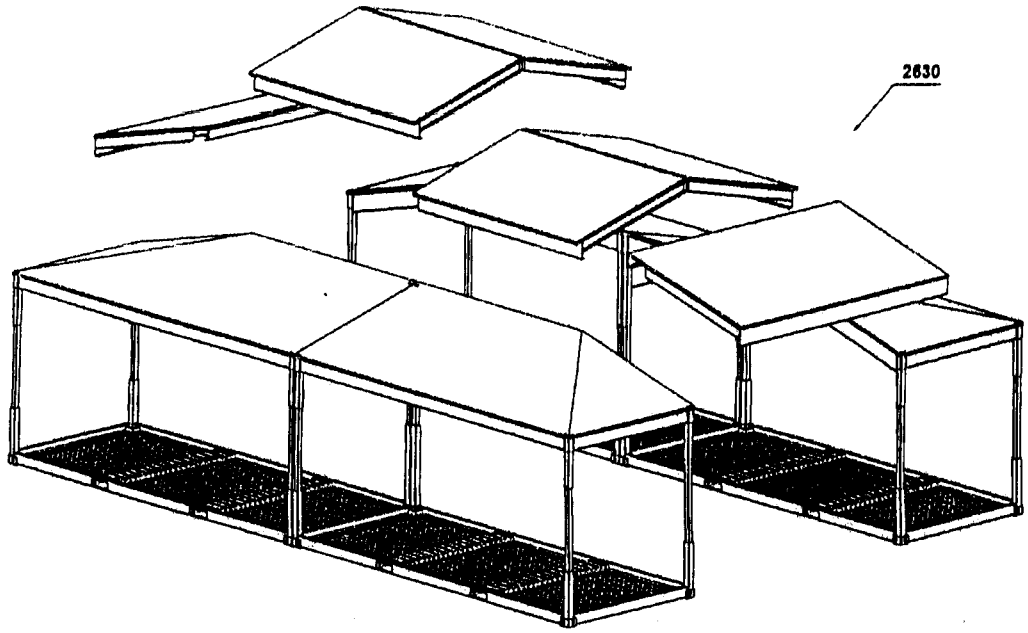
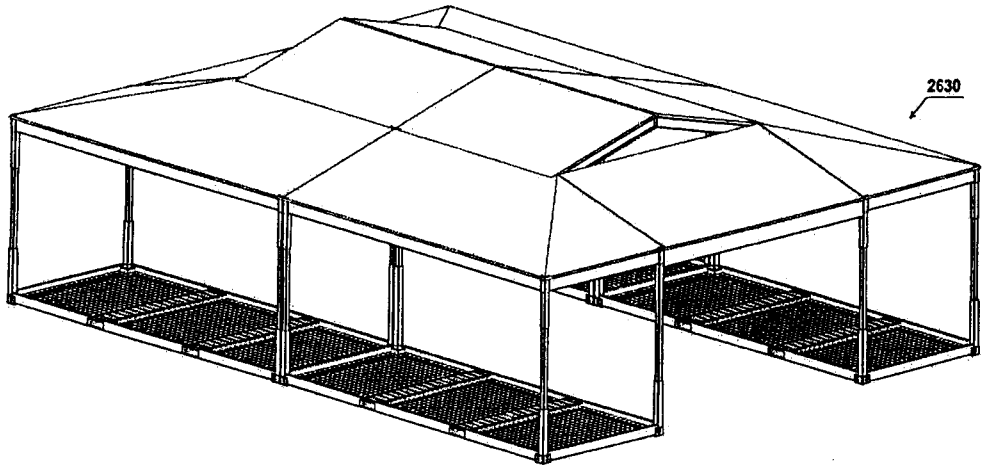


FIG. 26H



LIFTING POINT PTY LTD
Applicant

E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 27

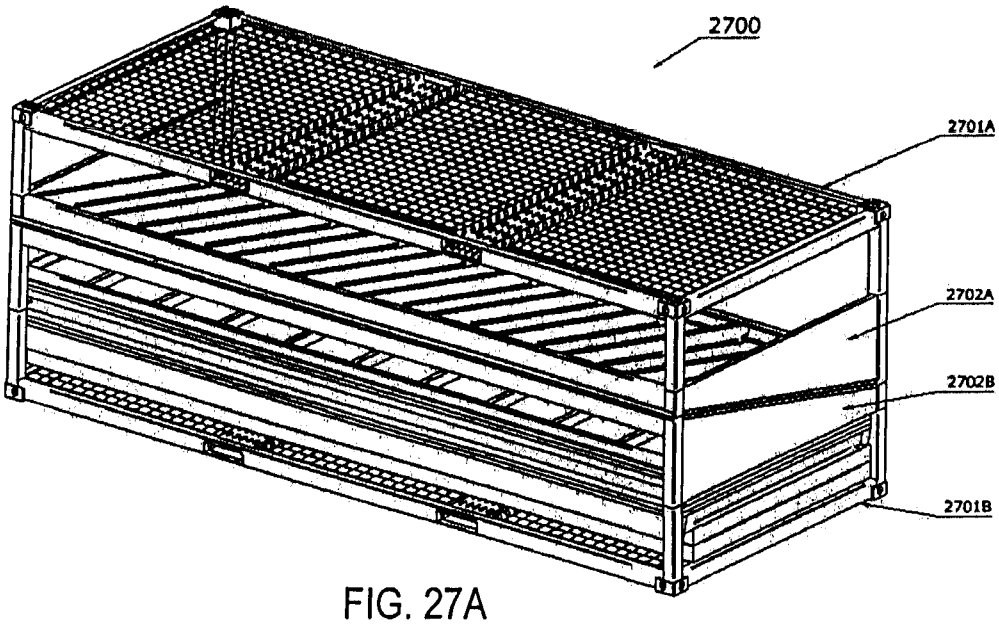
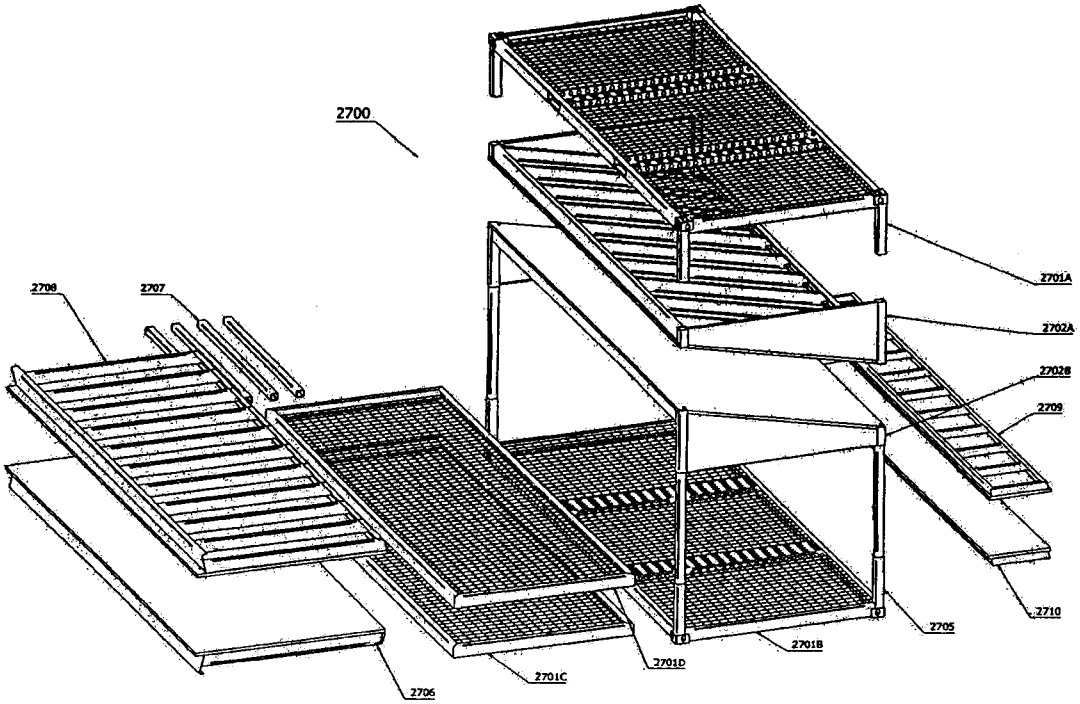


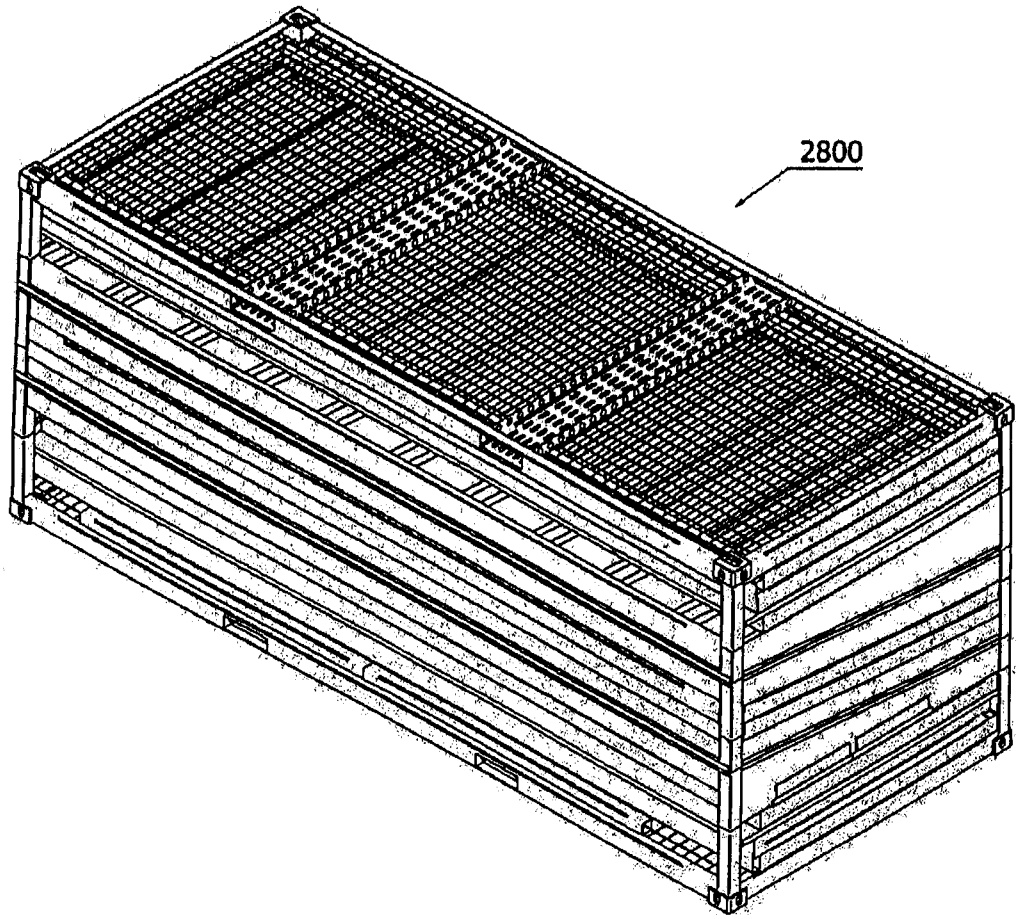
FIG. 27A



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ASTERIA I. MERCADO

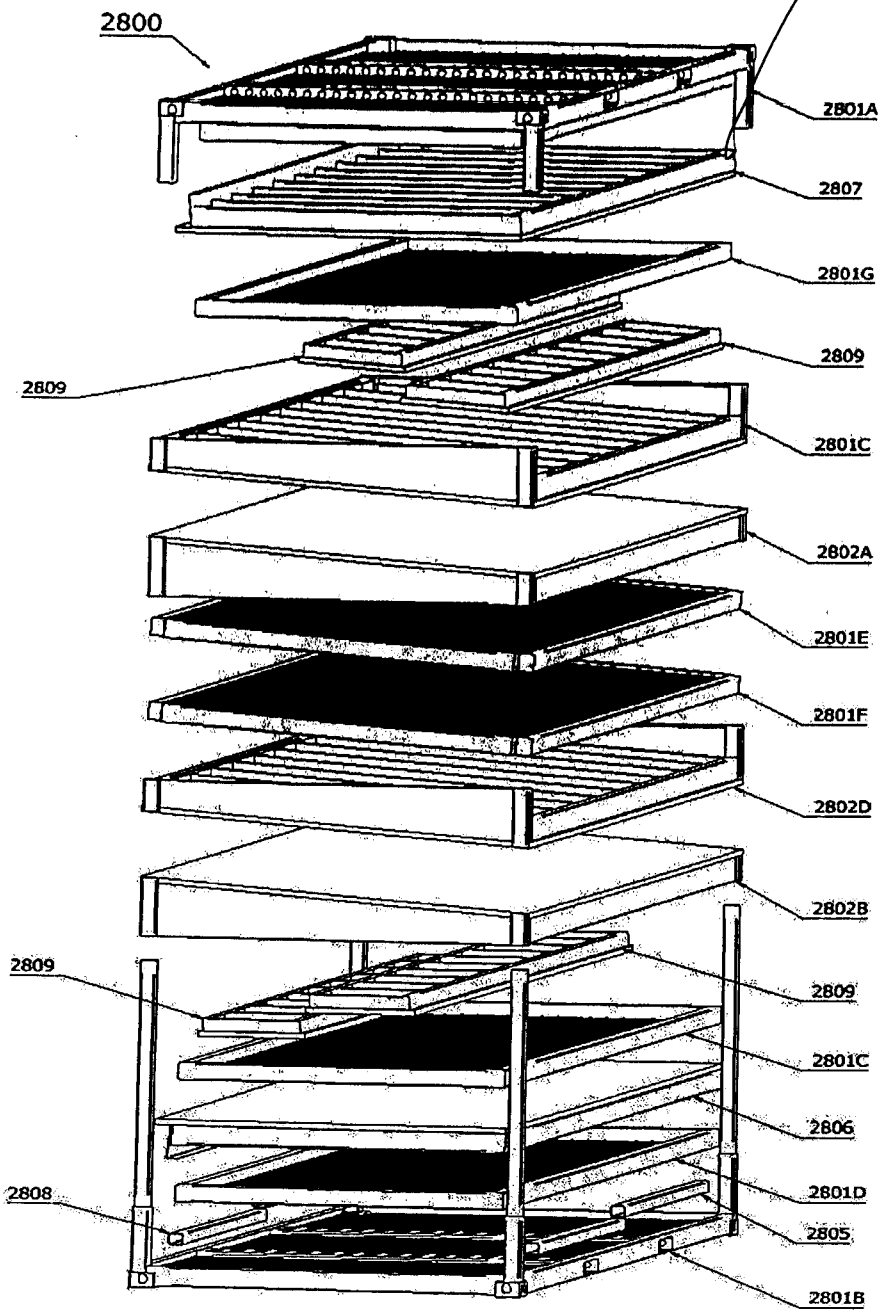
FIG. 28



LIFTING POINT PTY LTD
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E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO

FIG. 28A



LIFTING POINT PTY LTD
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E. B. ASTUDILLO & ASSOCIATES
By:
ASTERIA I. MERCADO