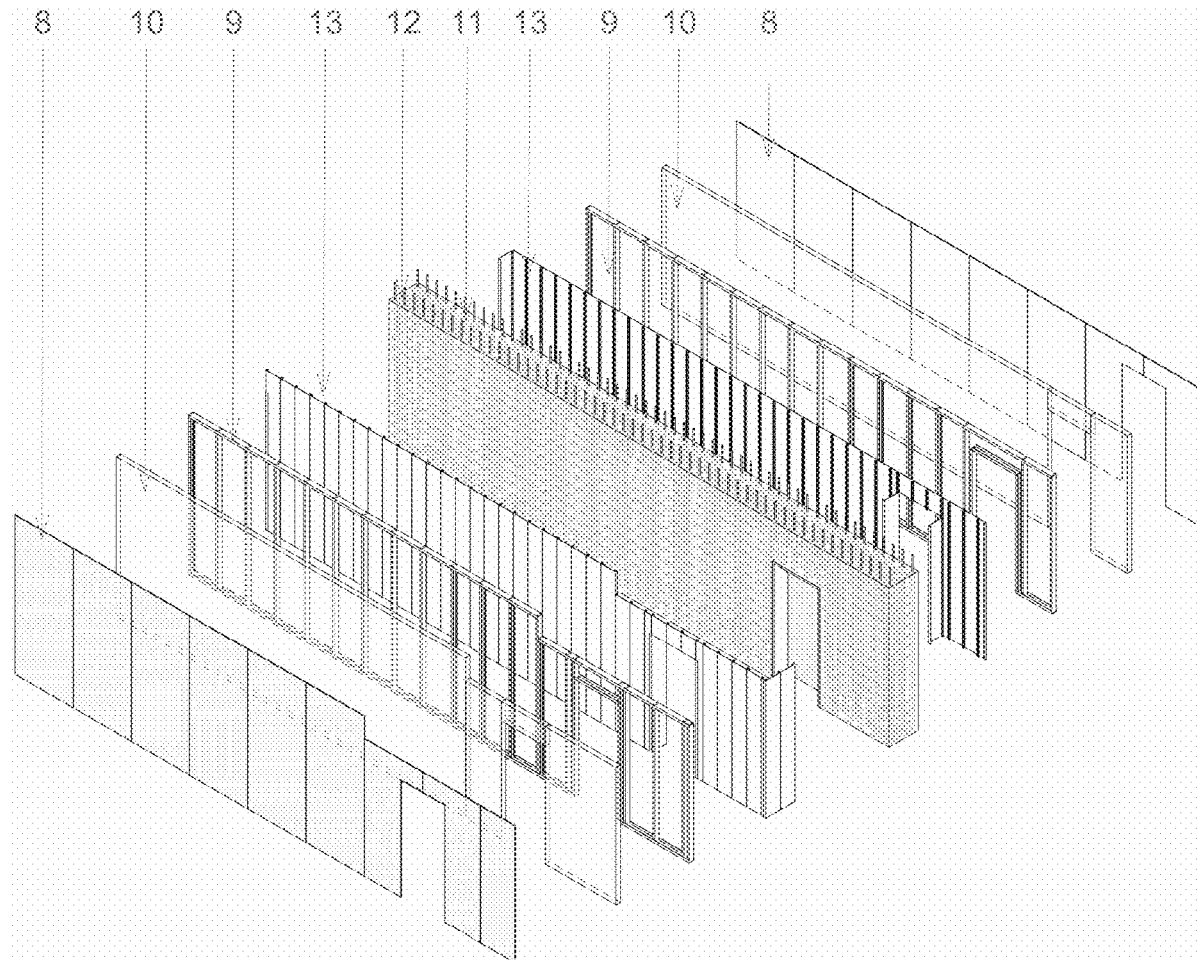




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(19) **United States**(12) **Patent Application Publication****GARCIA-ABRIL RUIZ et al.**(10) **Pub. No.: US 2020/0123760 A1**(43) **Pub. Date: Apr. 23, 2020**(54) **VERTICAL SELF-SUPPORTING
FORMWORK BUILDING SYSTEM**(71) Applicants: **ANTON GARCIA-ABRIL RUIZ,**
LAS ROZAS (ES); **DEBORA MESA**
MOLINA, LAS ROZAS (ES)(72) Inventors: **ANTON GARCIA-ABRIL RUIZ,**
LAS ROZAS (ES); **DEBORA MESA**
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E04B 2/86 (2006.01)
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CPC **E04B 1/167** (2013.01); **E04B 1/35**
(2013.01); **E04B 2103/02** (2013.01); **E04B**
5/38 (2013.01); **E04B 2/86** (2013.01)(57) **ABSTRACT**

The present disclosure relates to components and methods for a modular building system, used for high-rise residential and office building, to pre-fabricate and assemble the system quickly, easily and simply. More particularly, it relates to a building temporary self-supporting panel system invention that includes formwork, structural rebars and insulated panels for the purpose of wall, floor and roof, also for the structure and enclosure. The building system is composed of a number of layers and a temporary-structural frame, integrating all constructive elements needed: temporary structural capacity, thermal and acoustical insulation, impermeability and pre-installations; designed considering operation, function, fabrication and assembling.



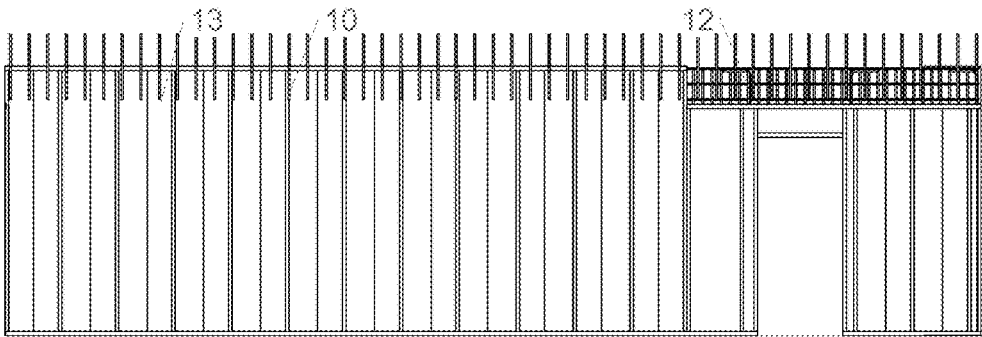


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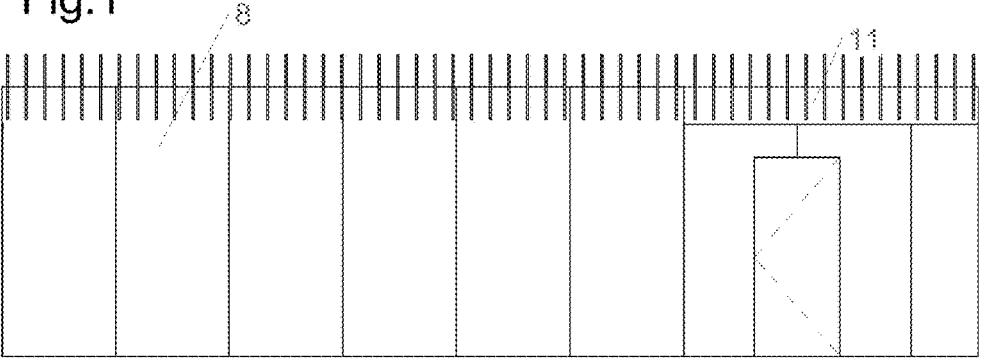


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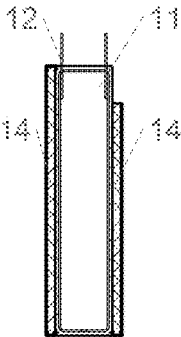


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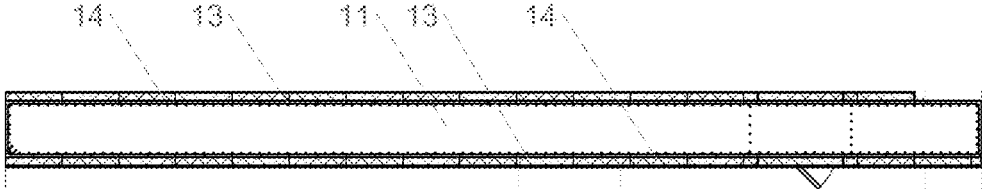


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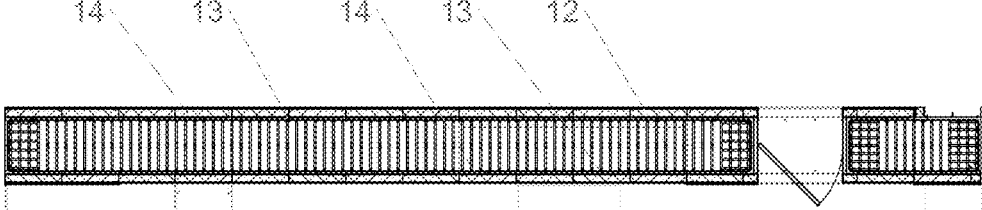


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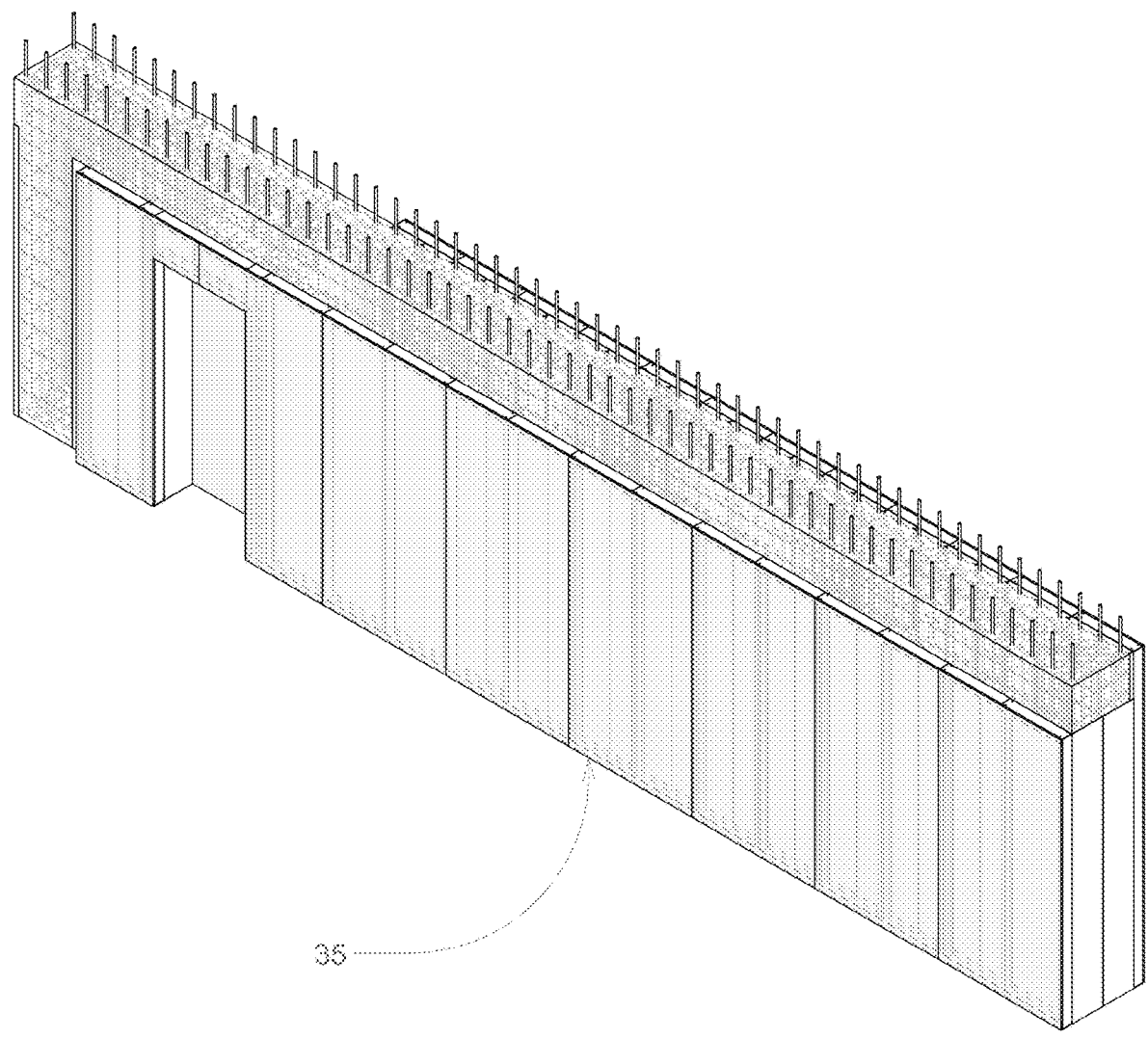


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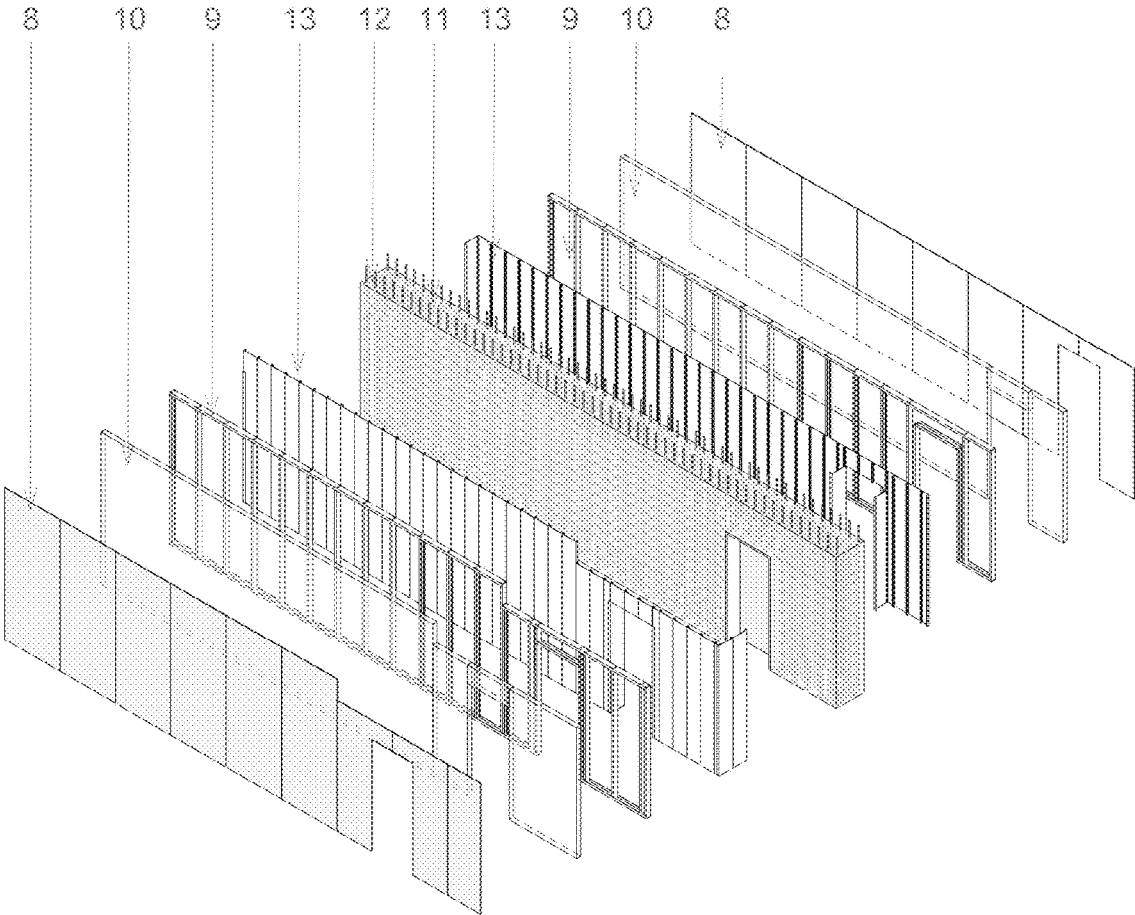


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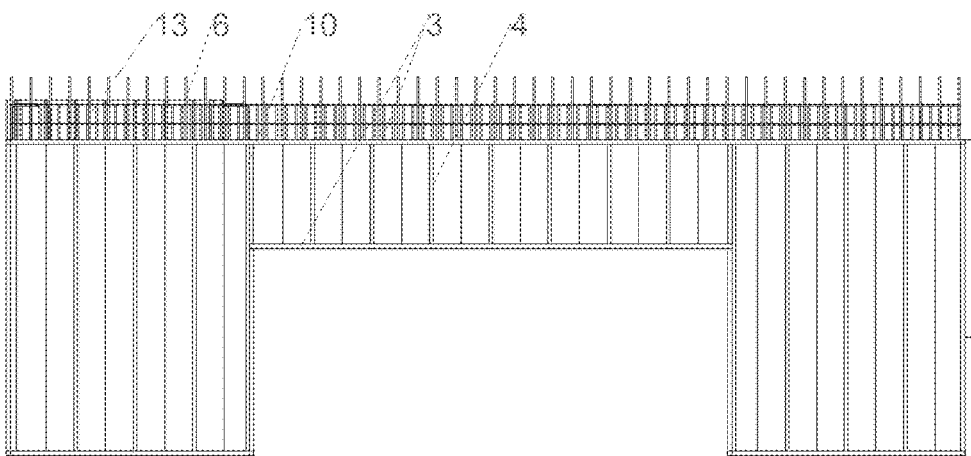


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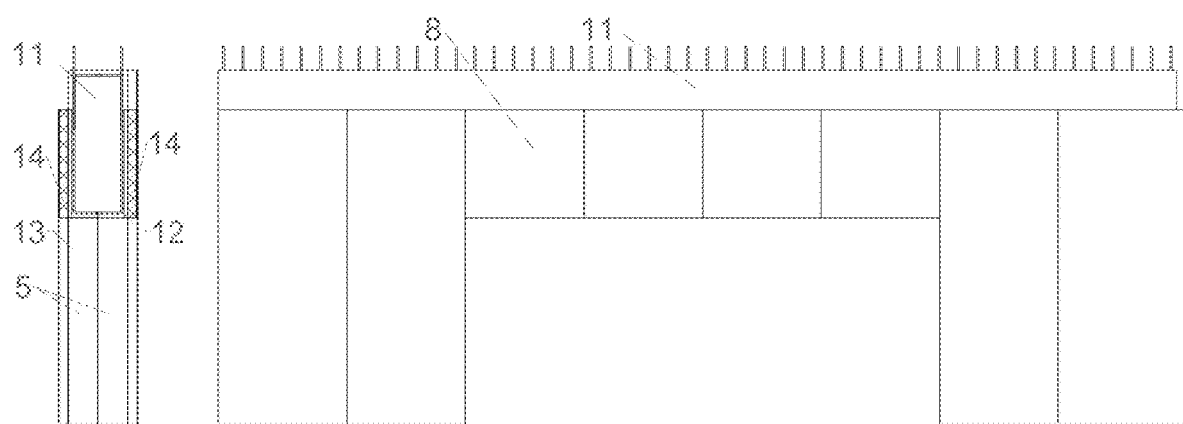


Fig. 9 Fig. 10

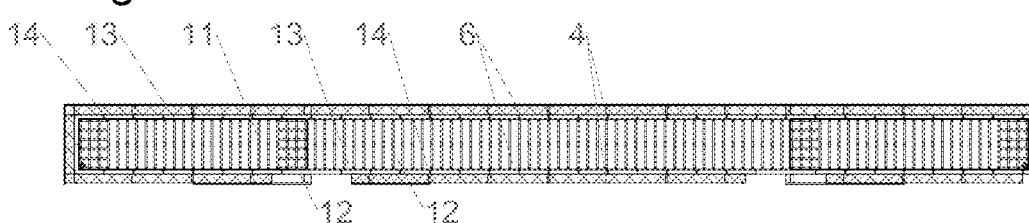


Fig. 11



Fig. 12

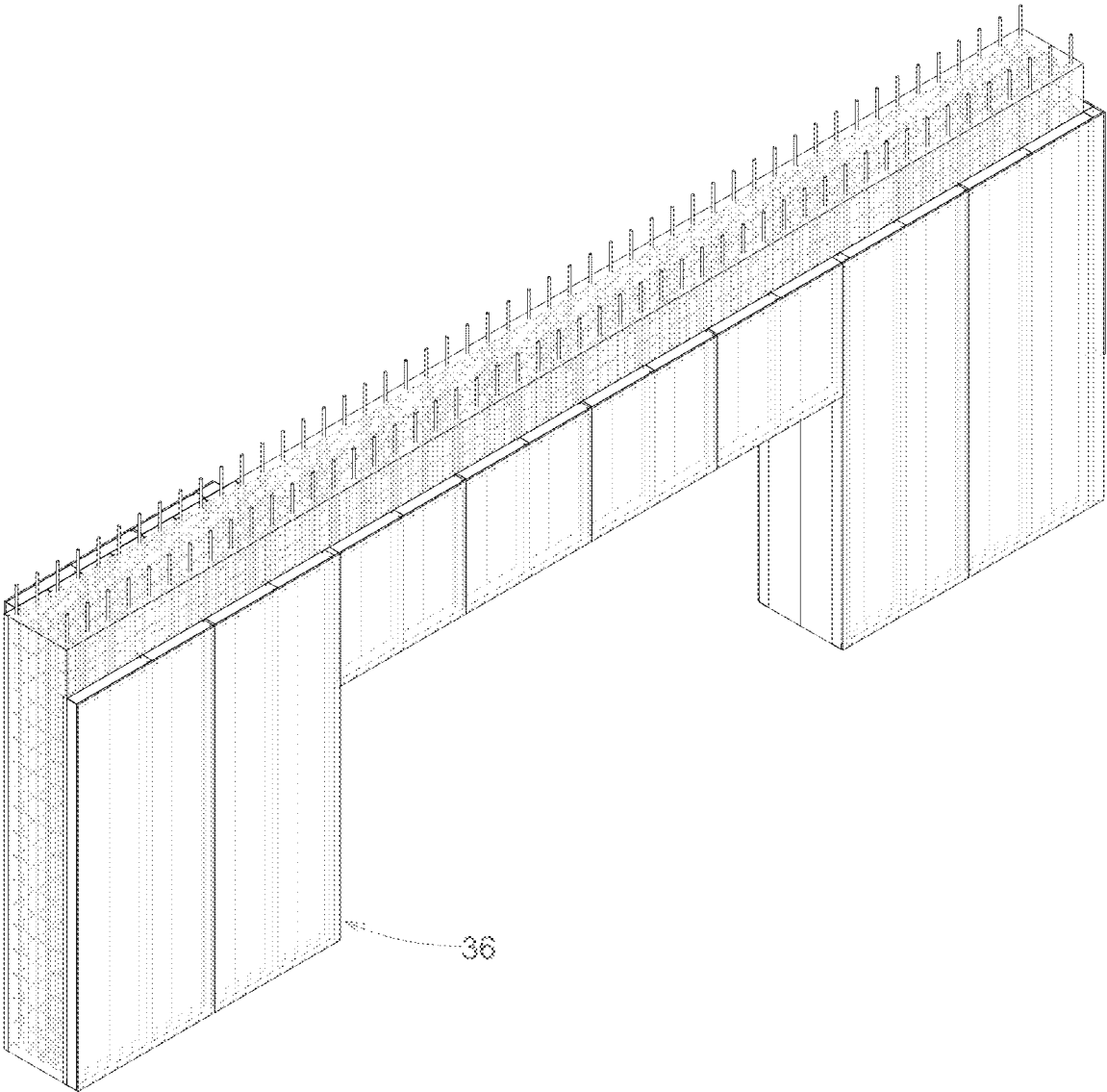


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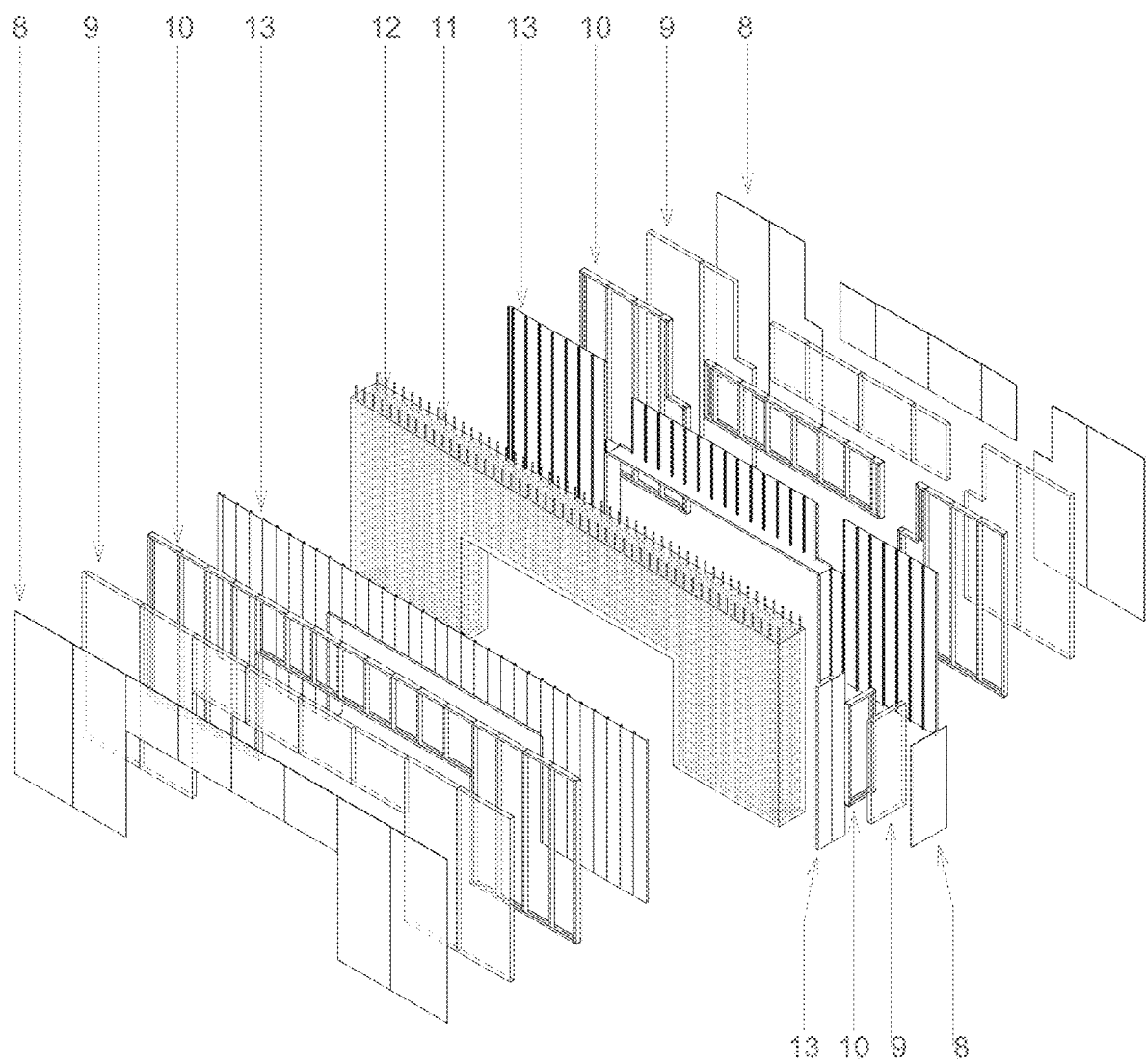


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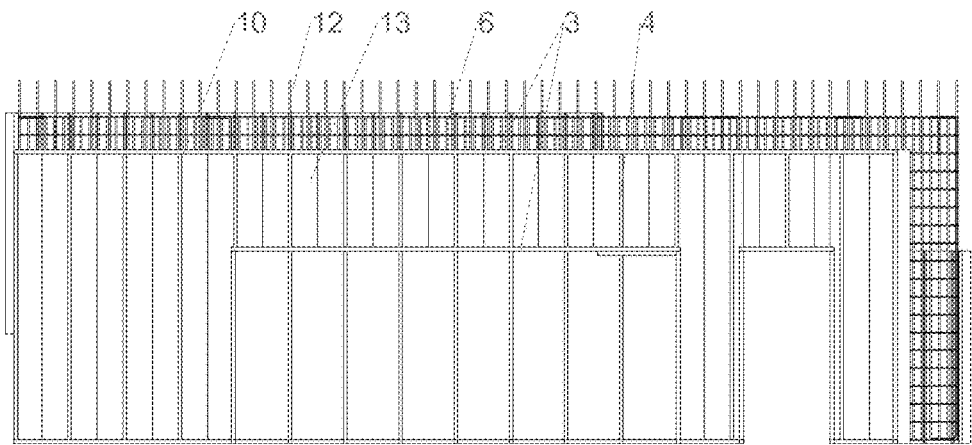


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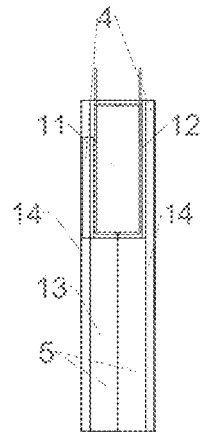


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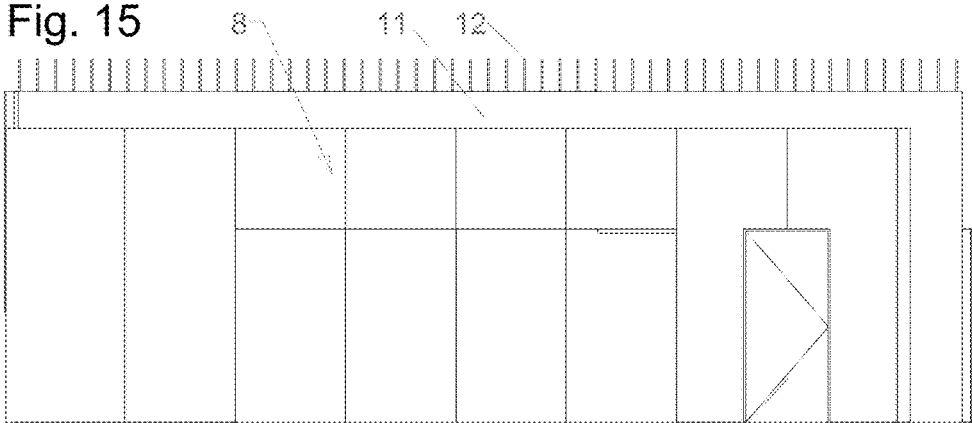


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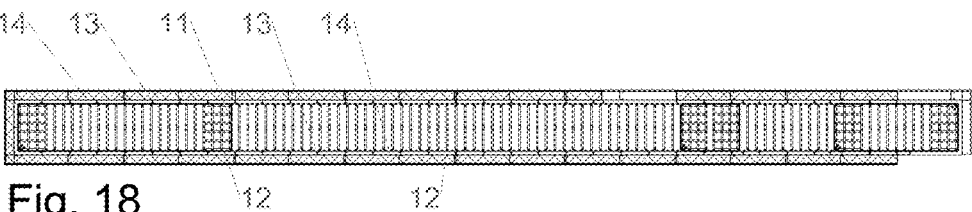


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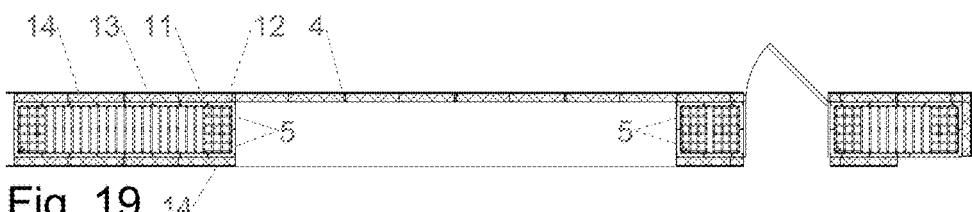


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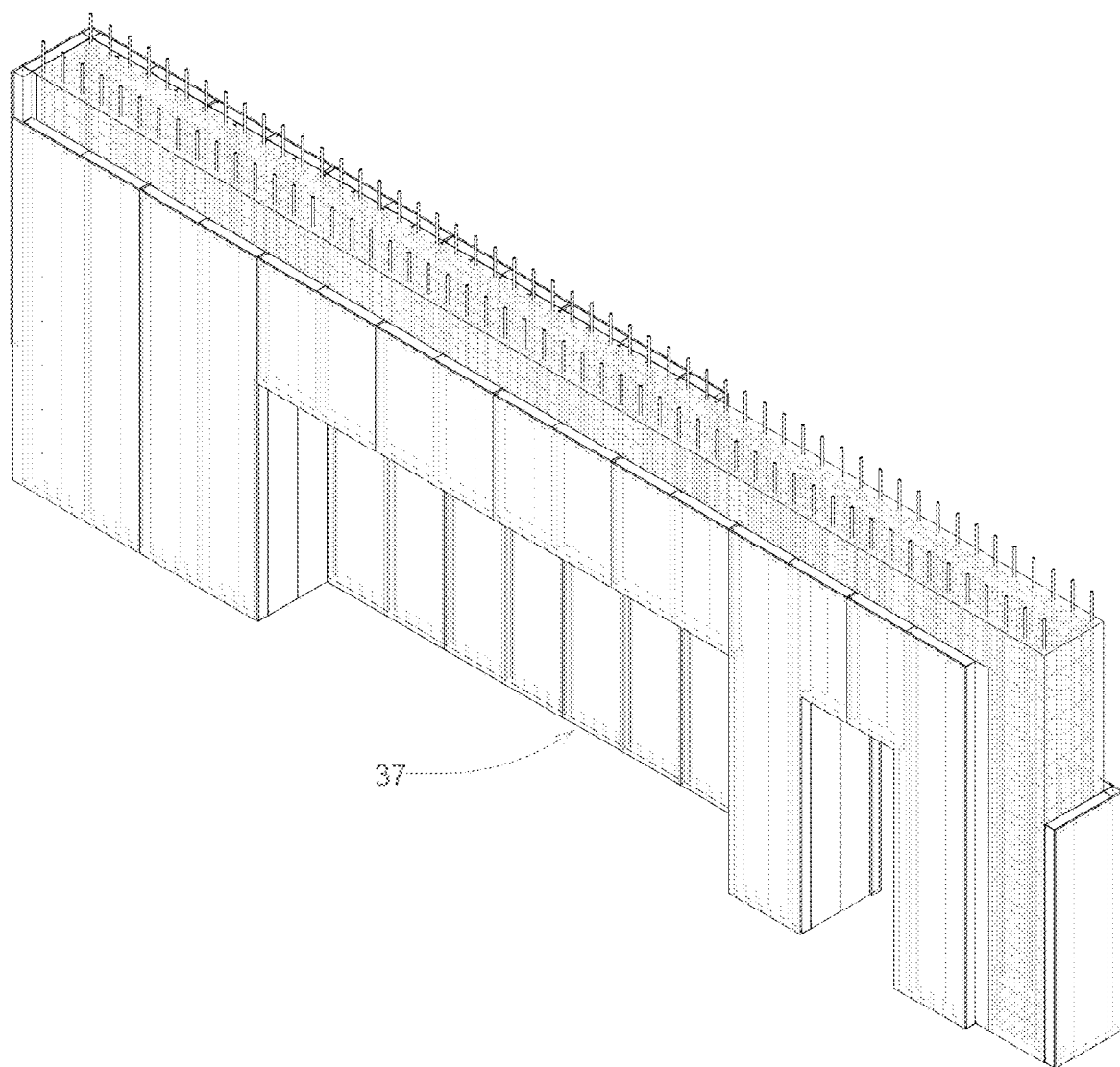


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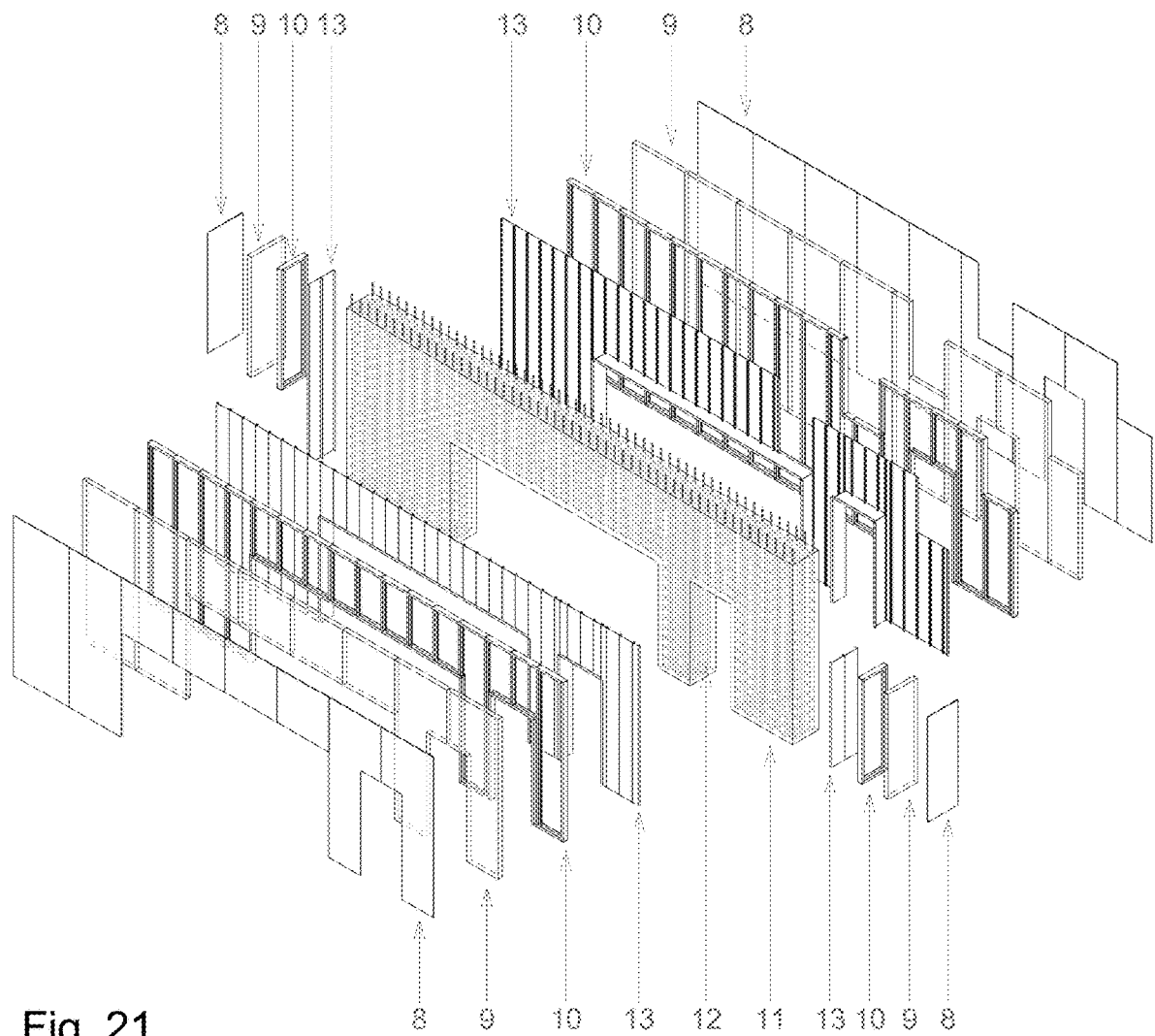


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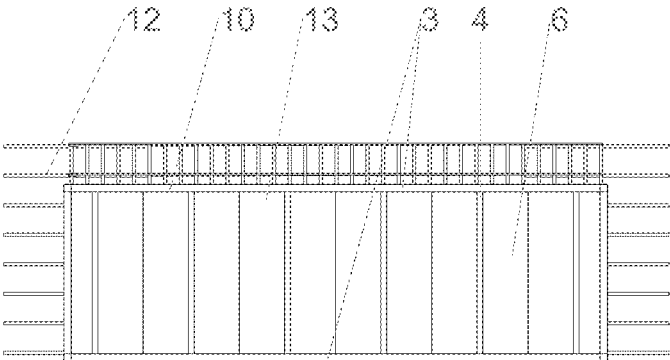


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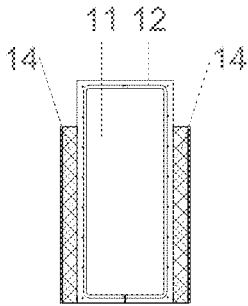


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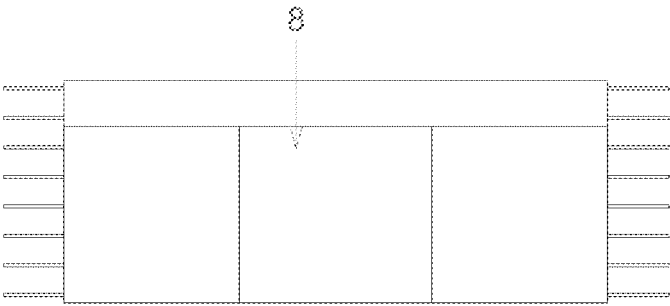


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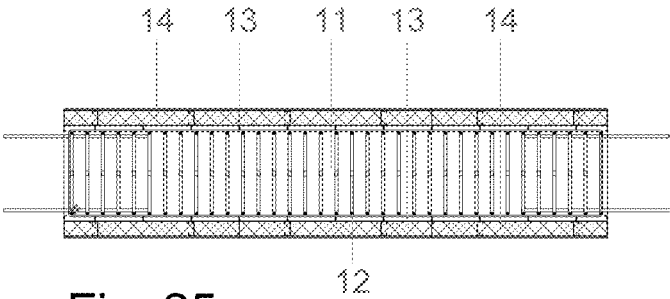


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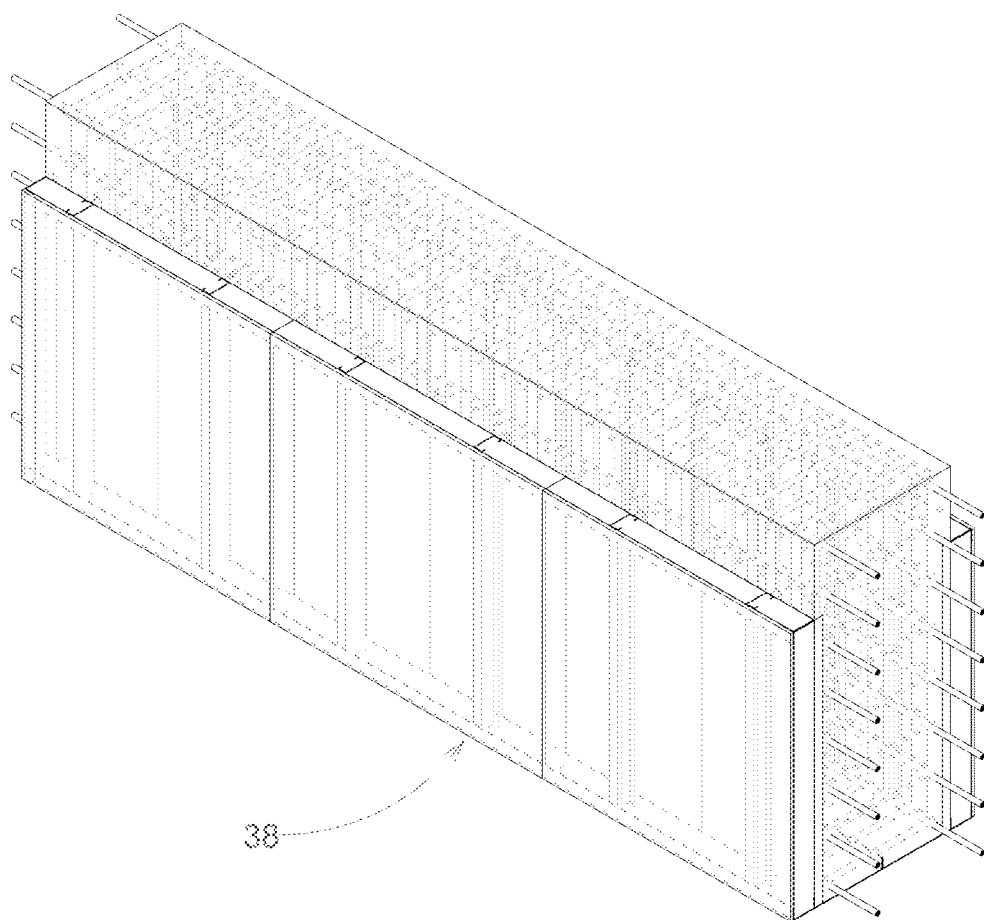


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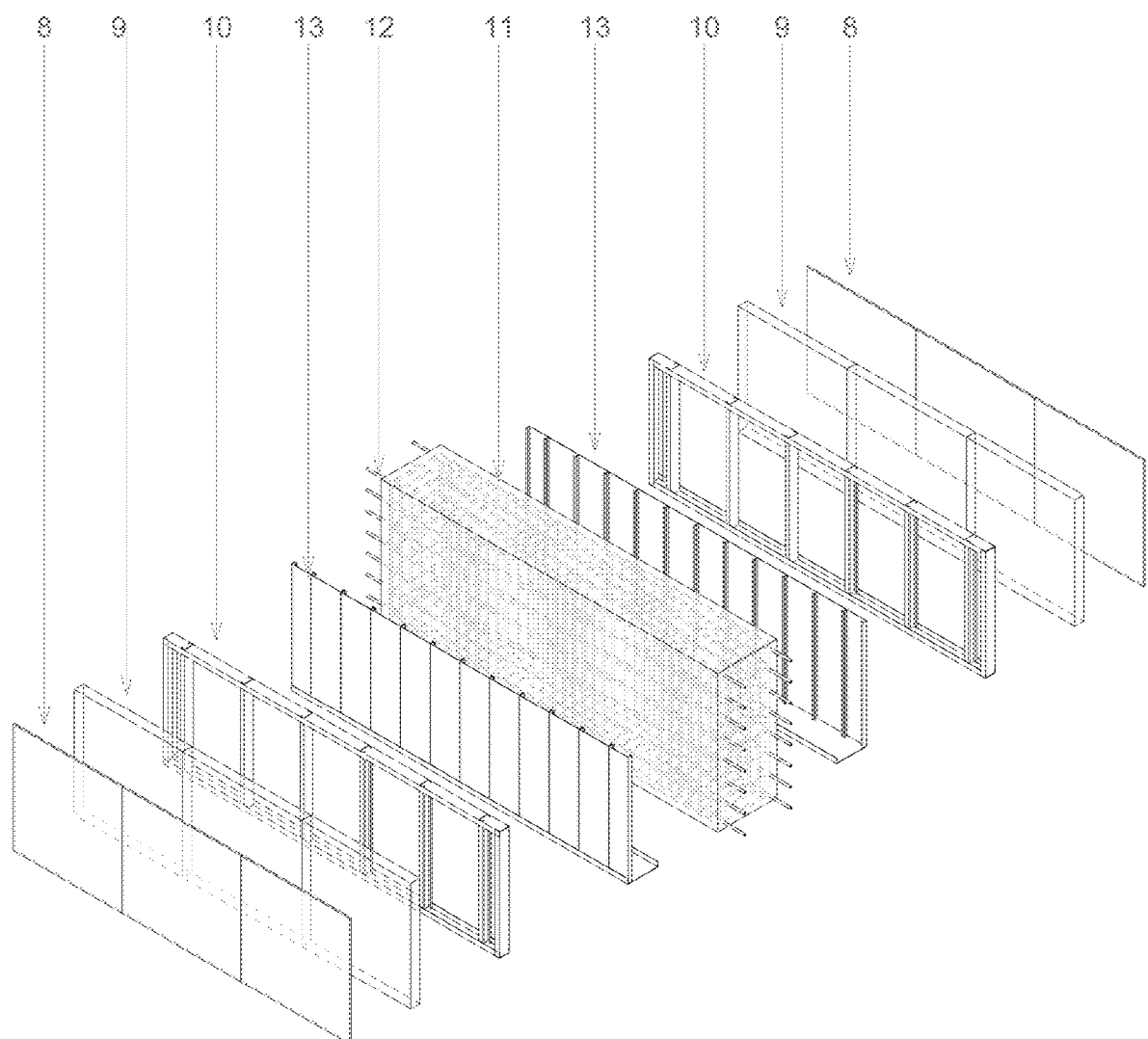
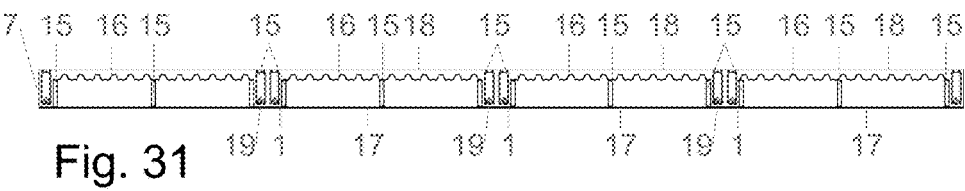
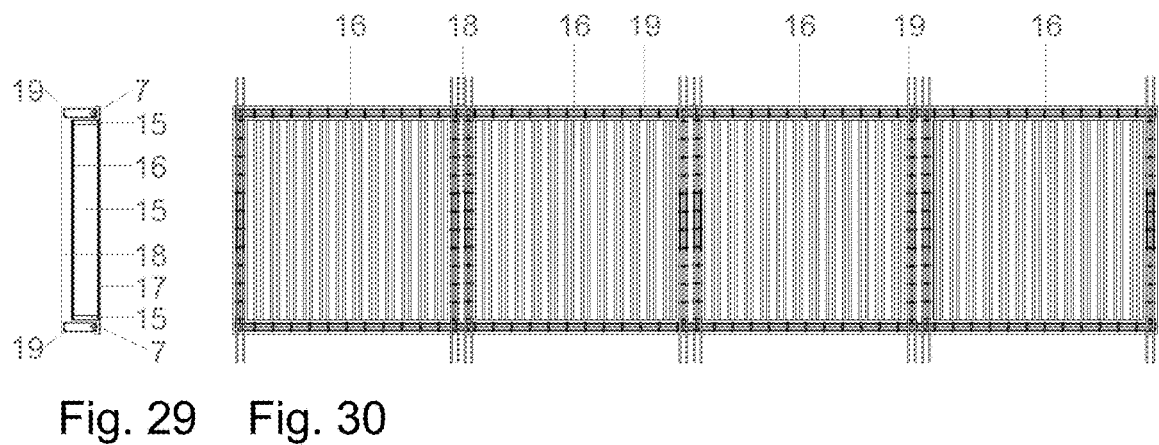
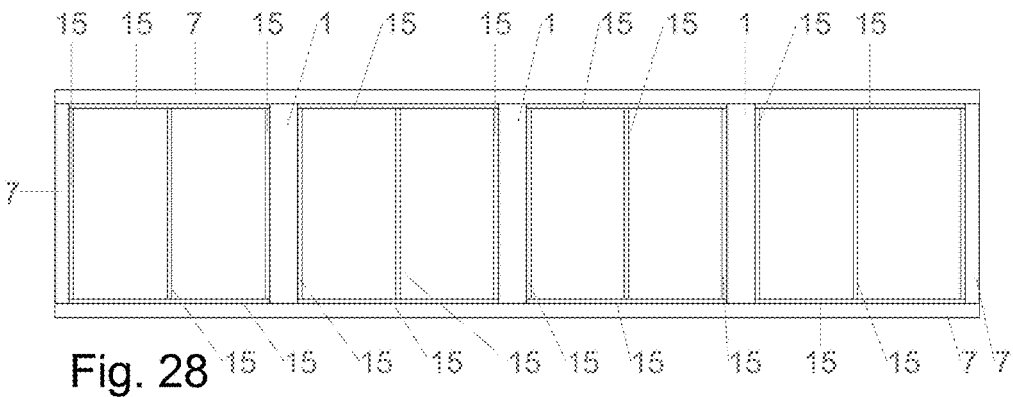
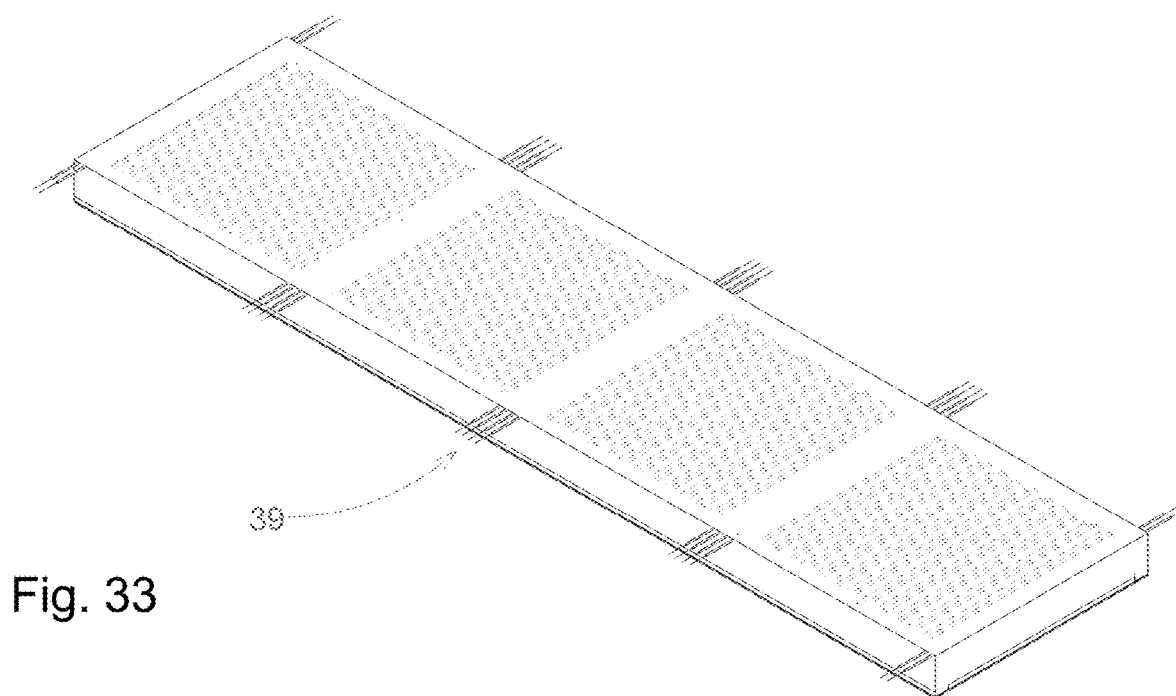
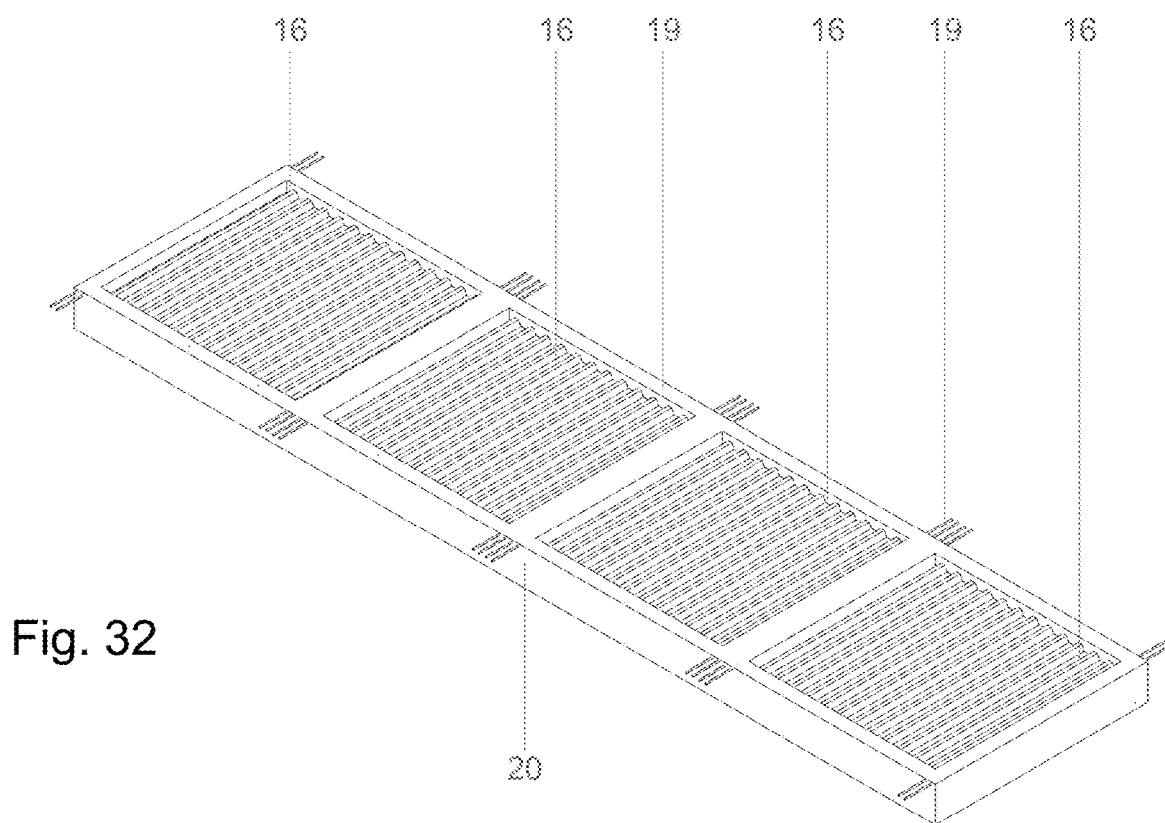


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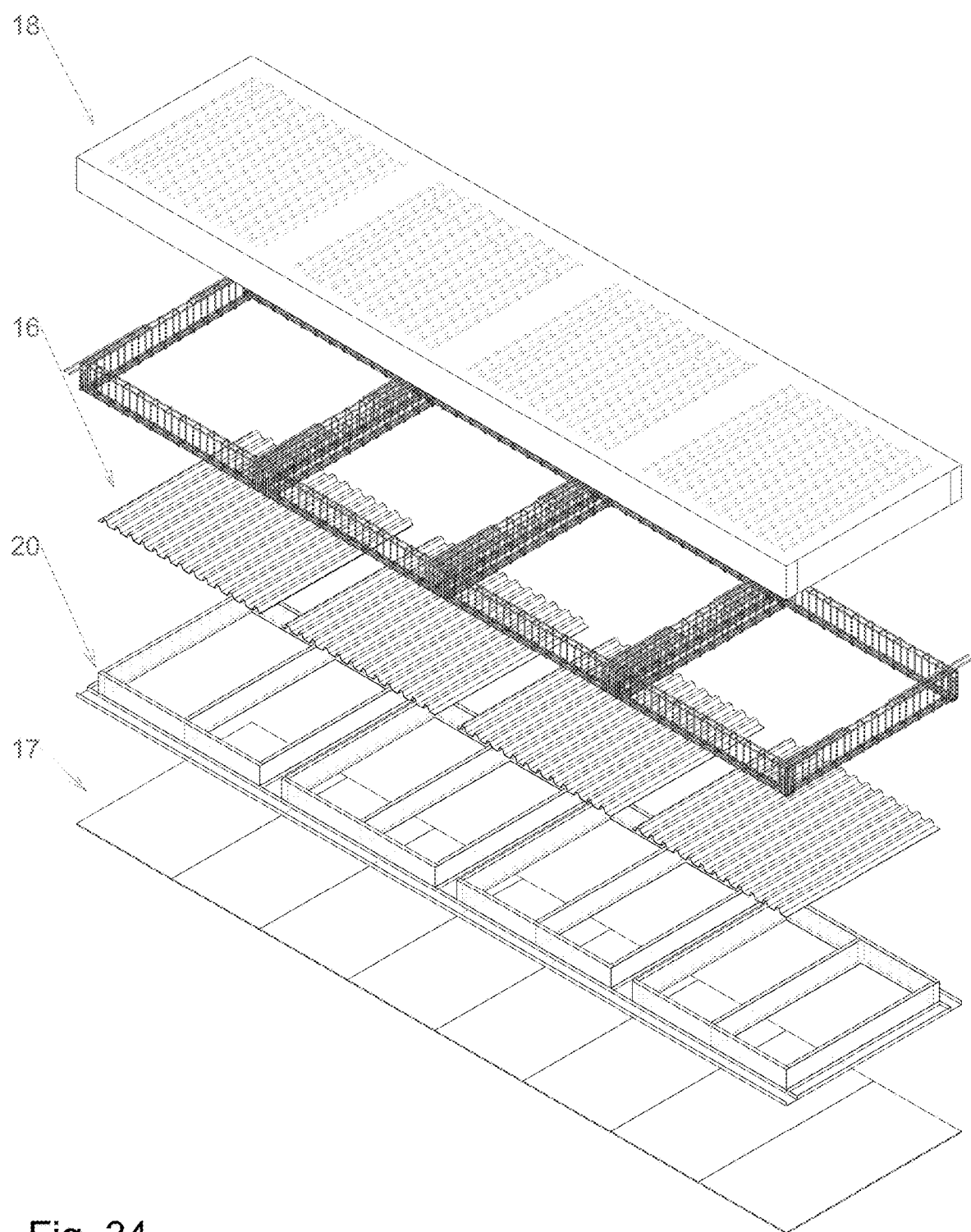


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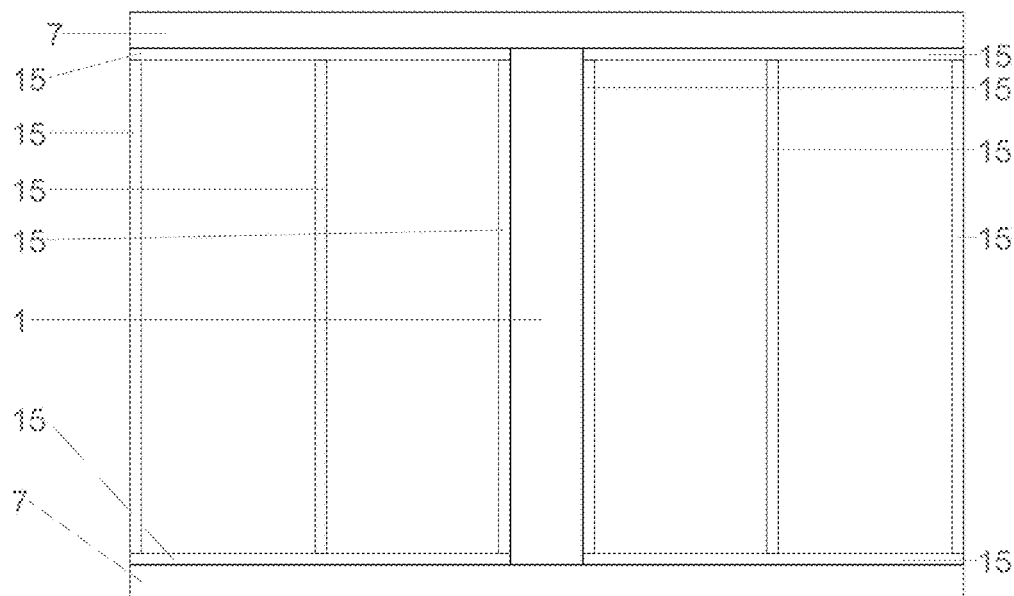


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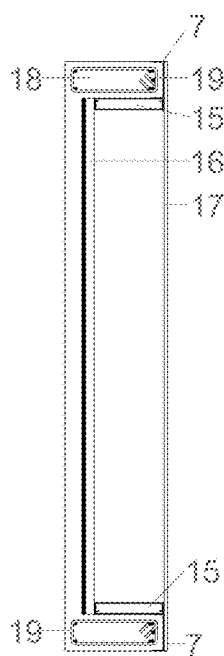


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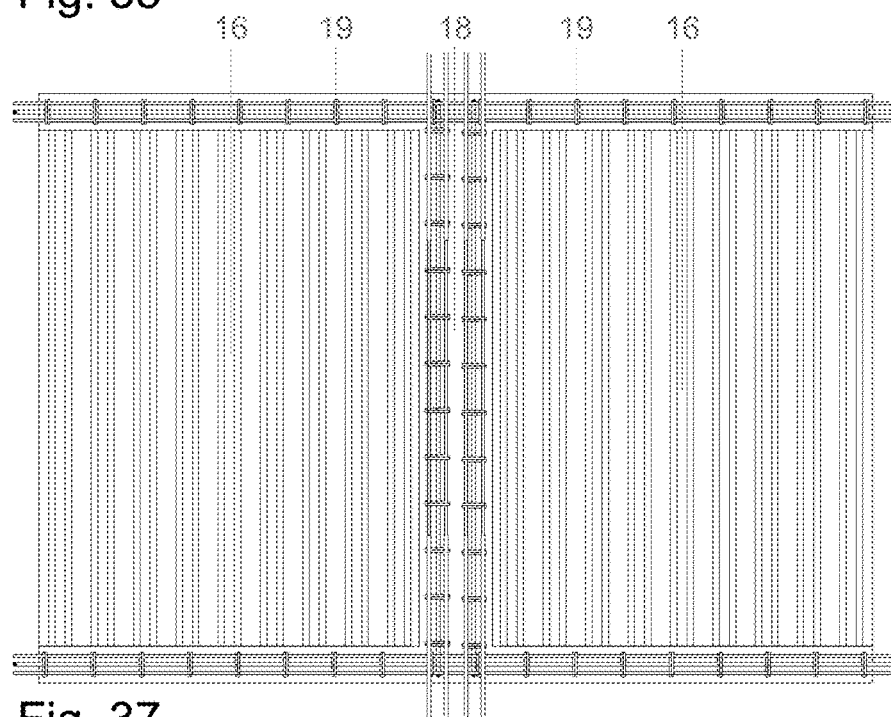


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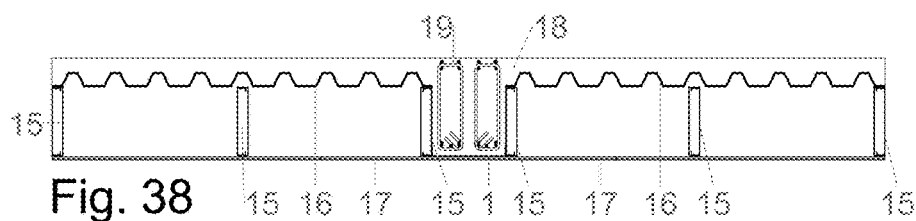
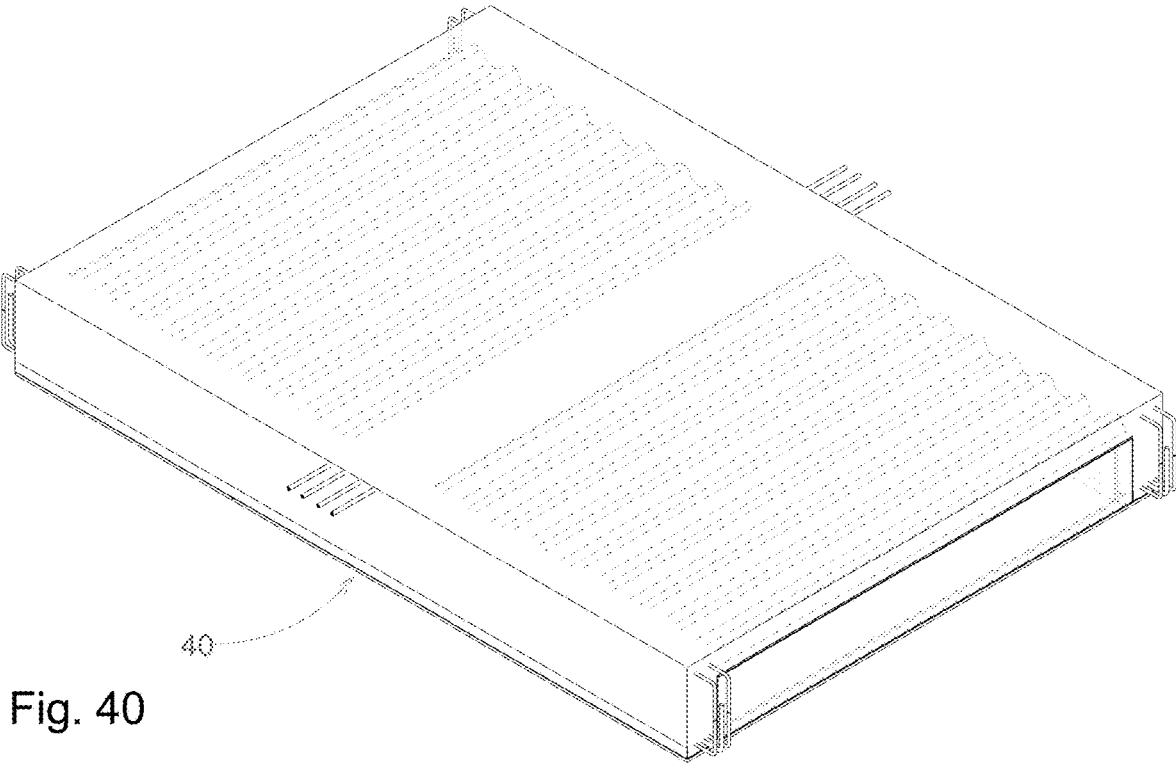
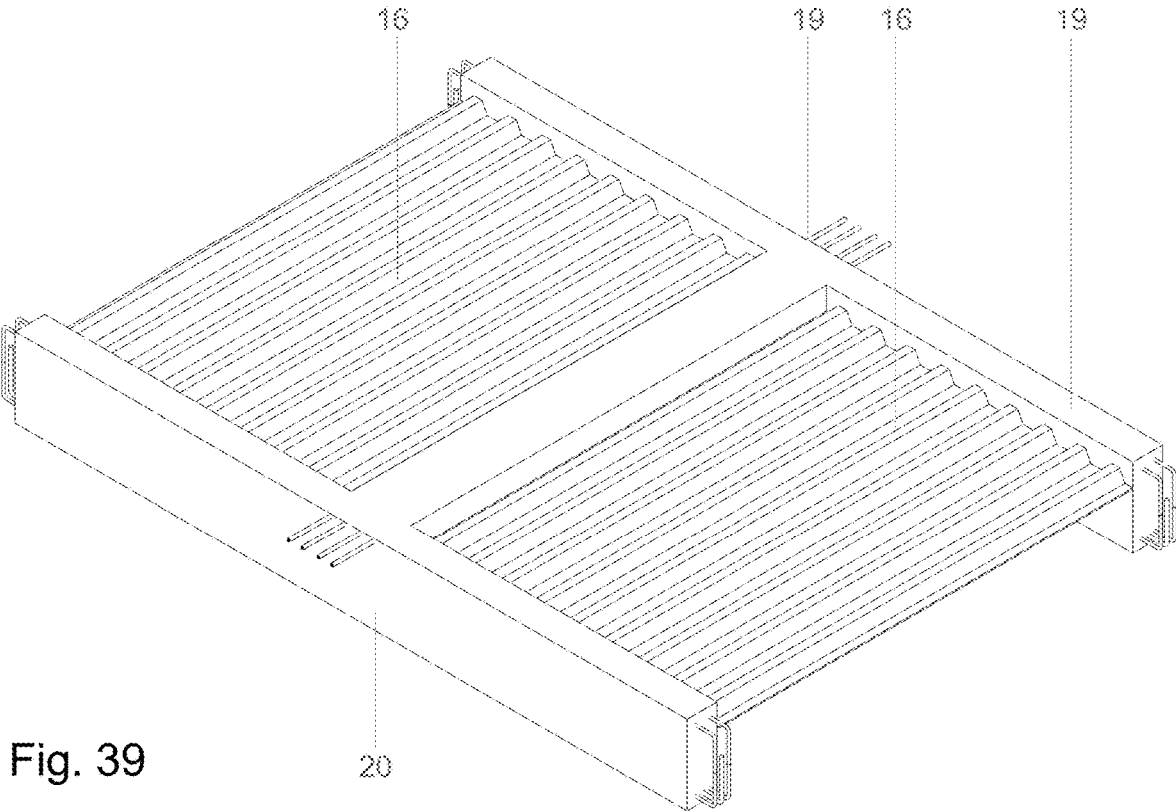


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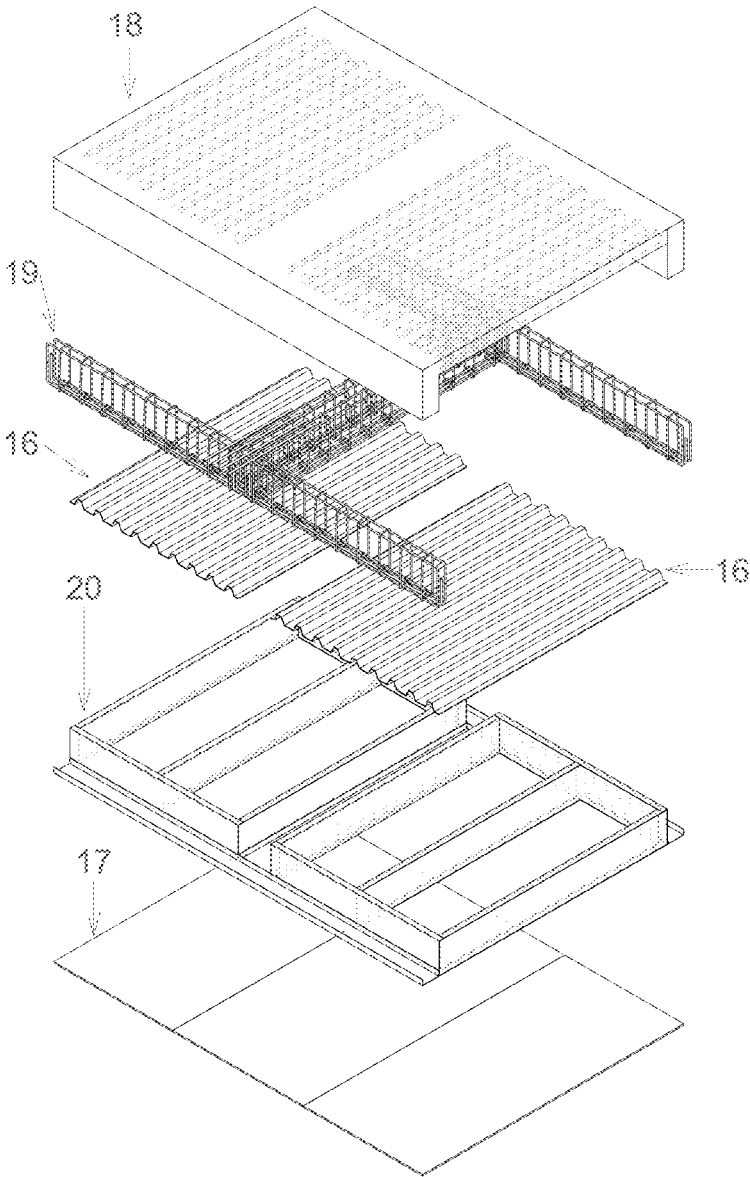


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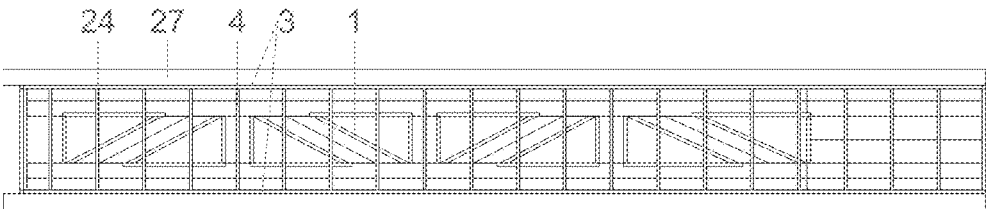


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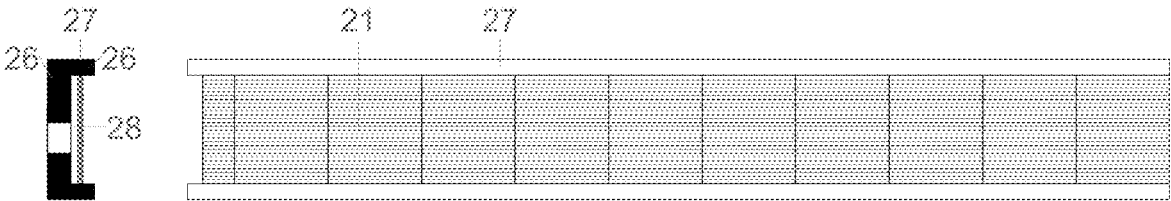


Fig. 43 Fig. 44

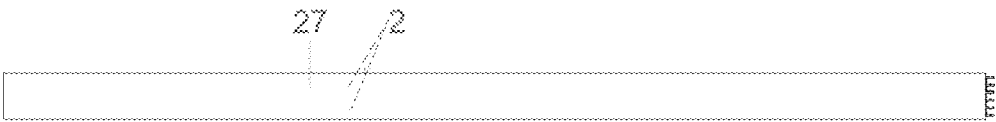


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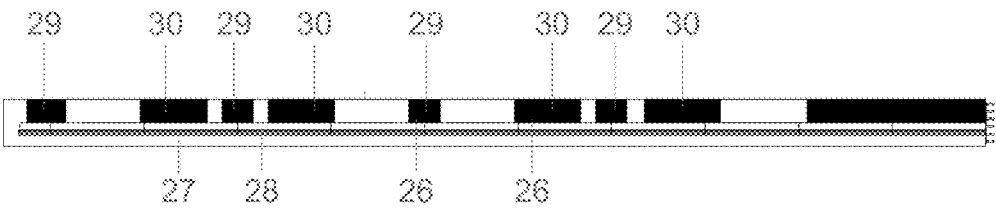


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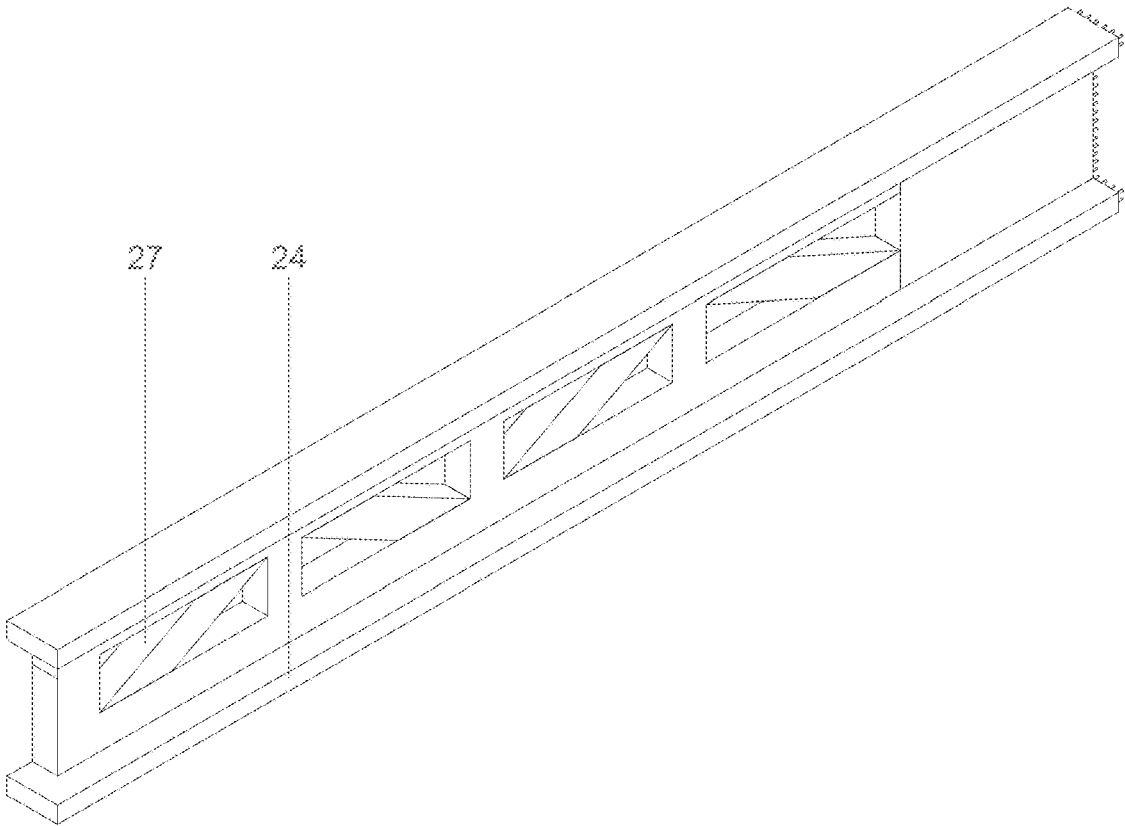


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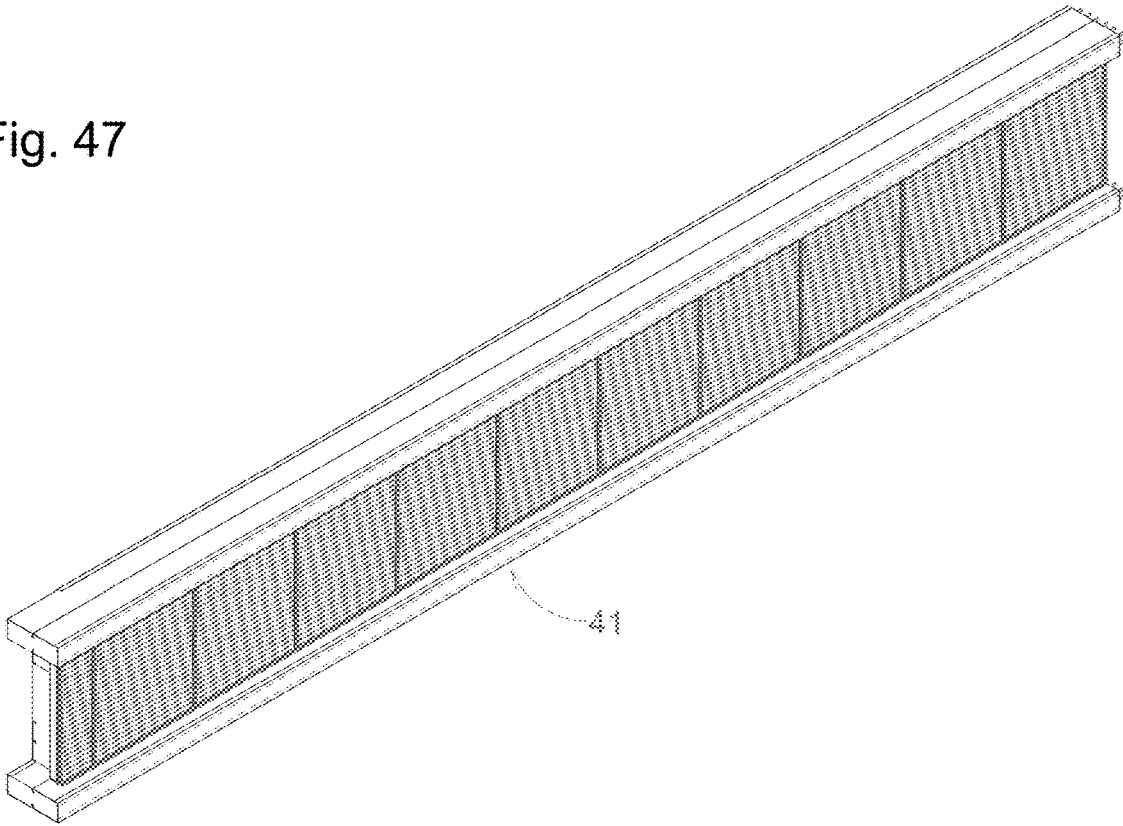


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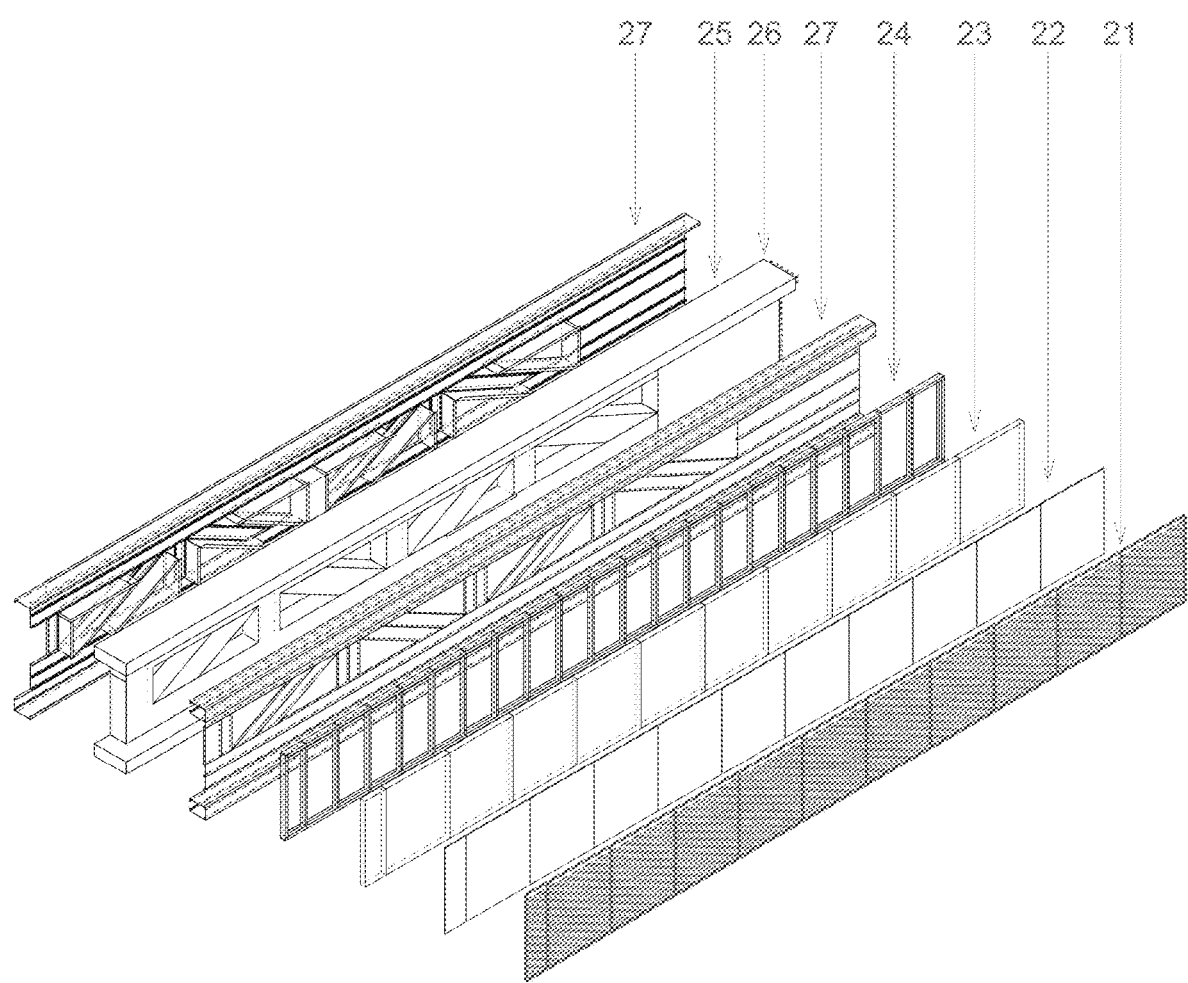


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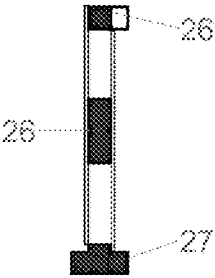


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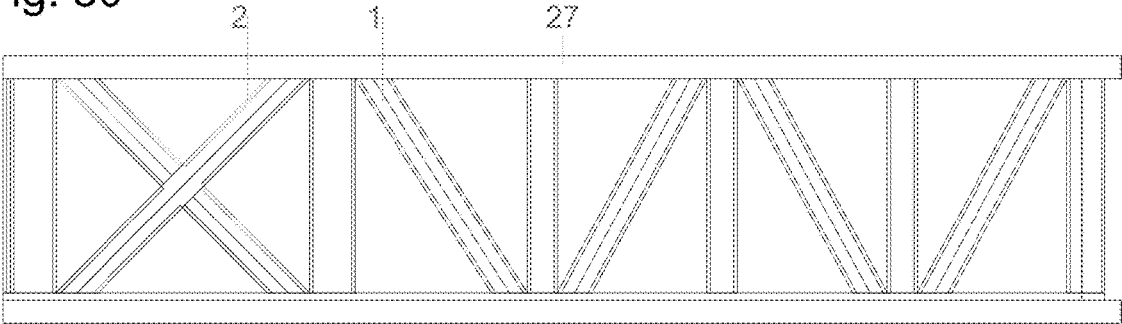


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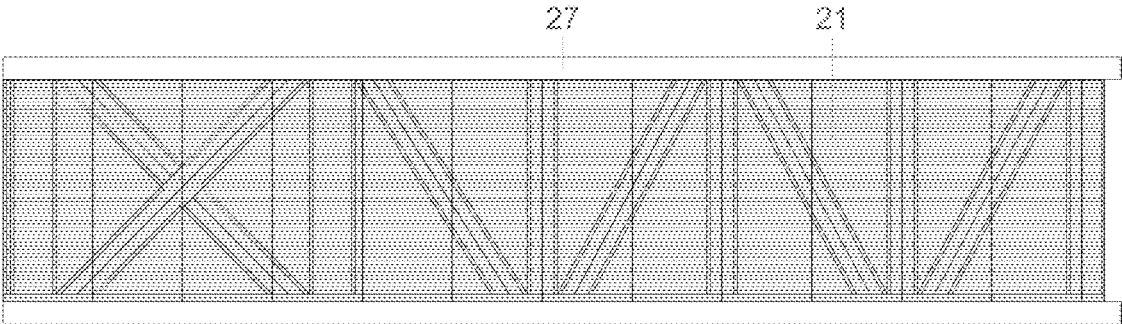


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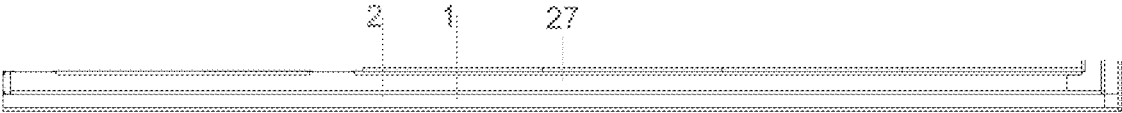


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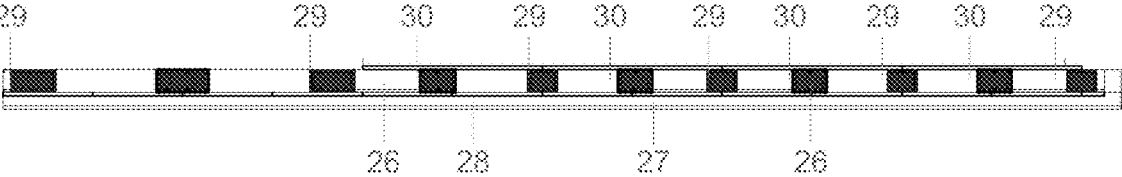


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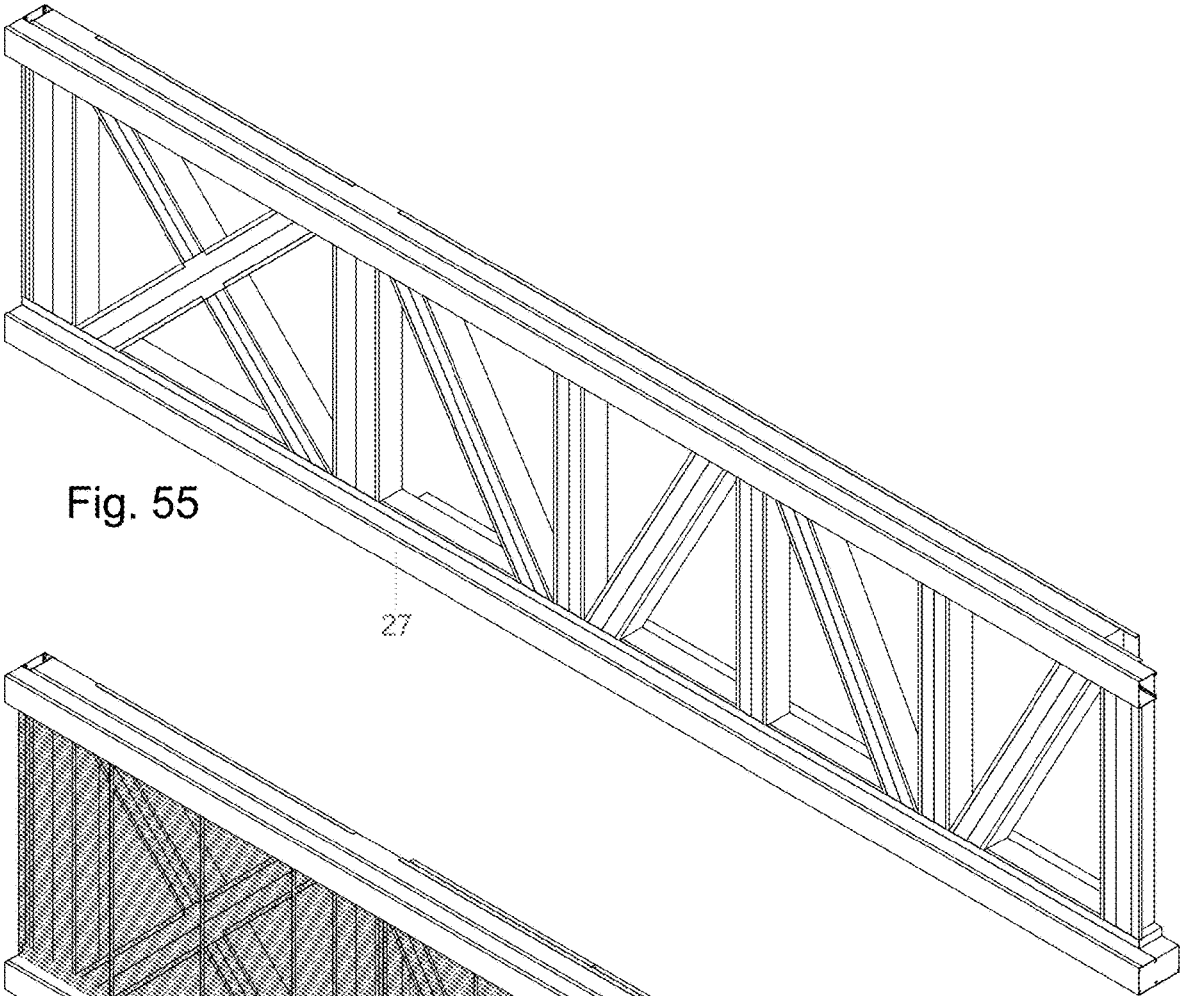


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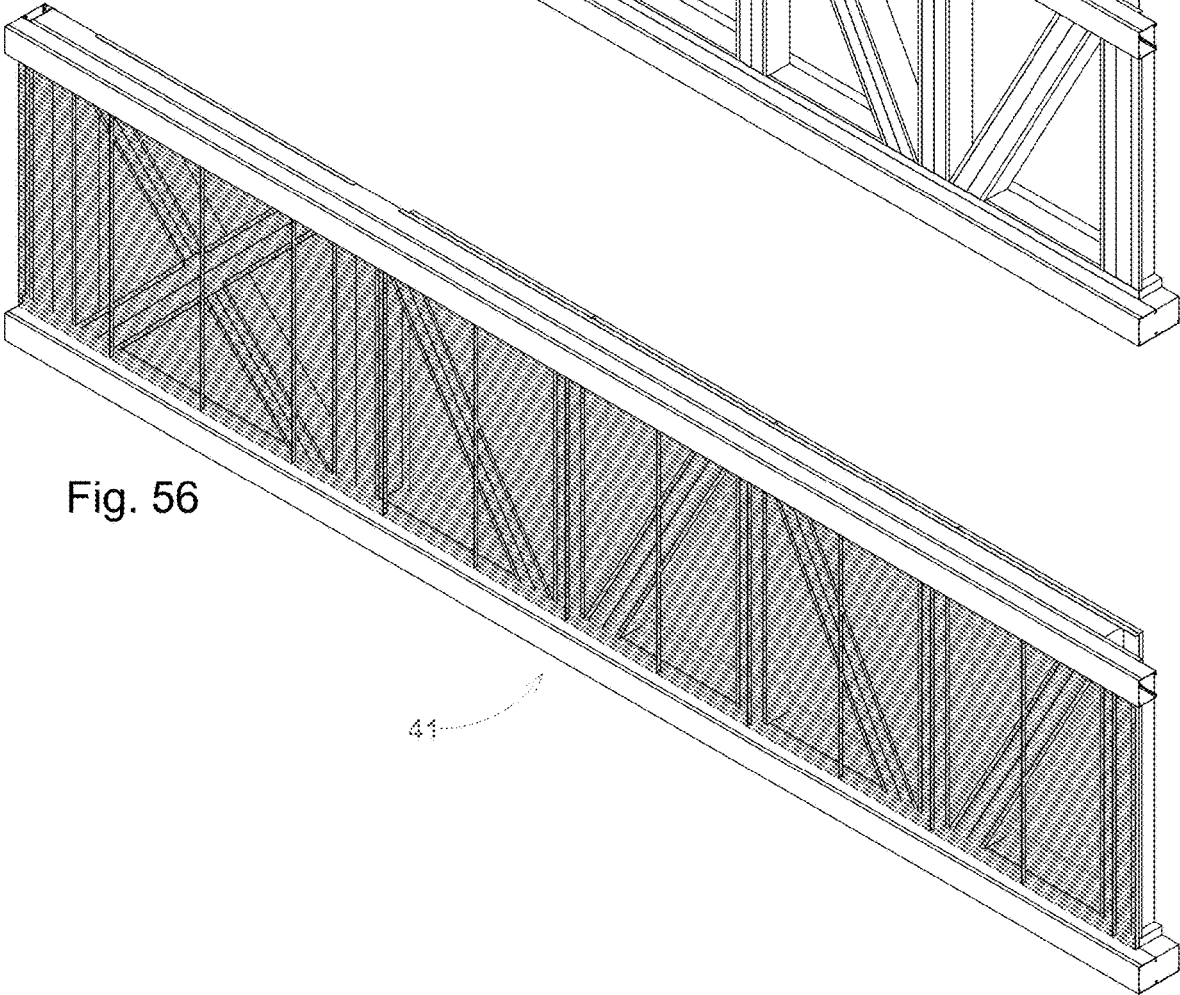


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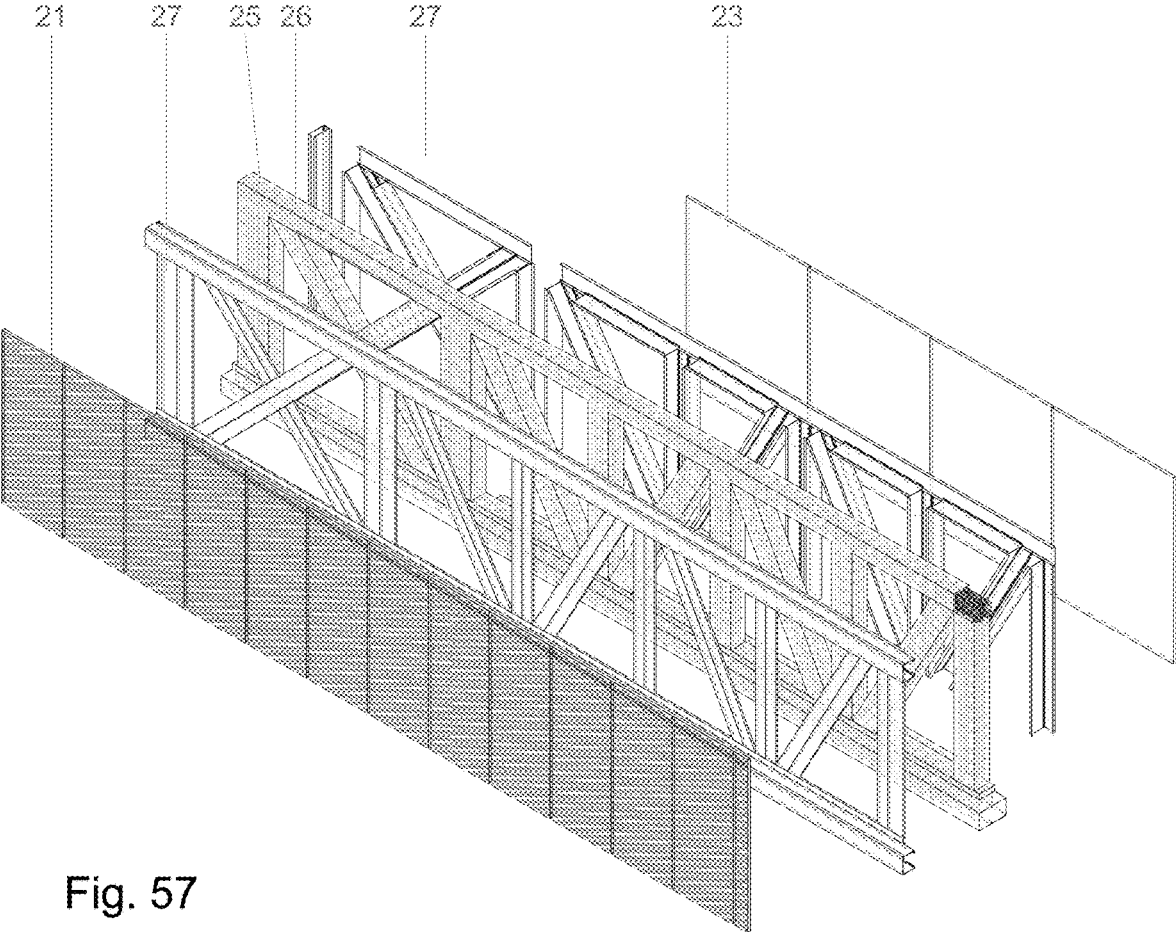


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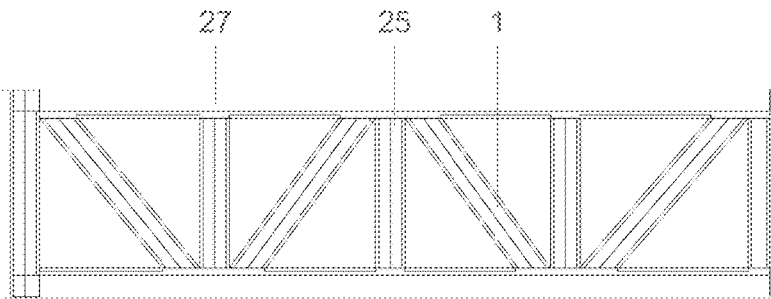


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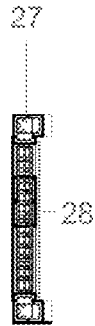


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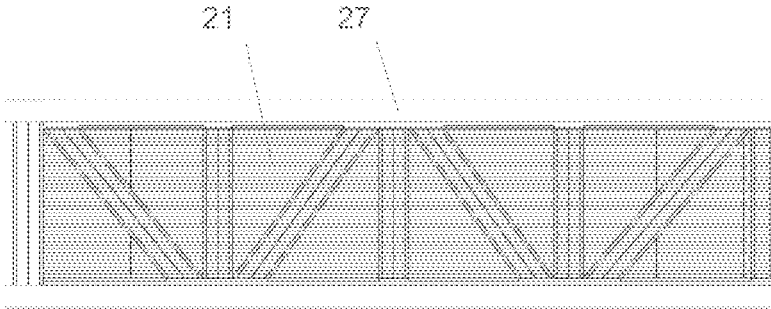


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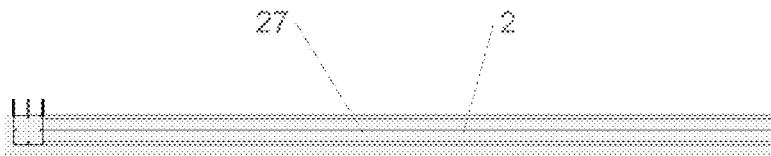


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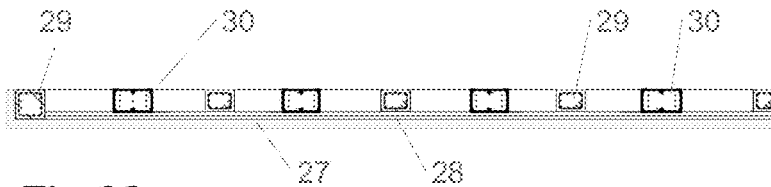


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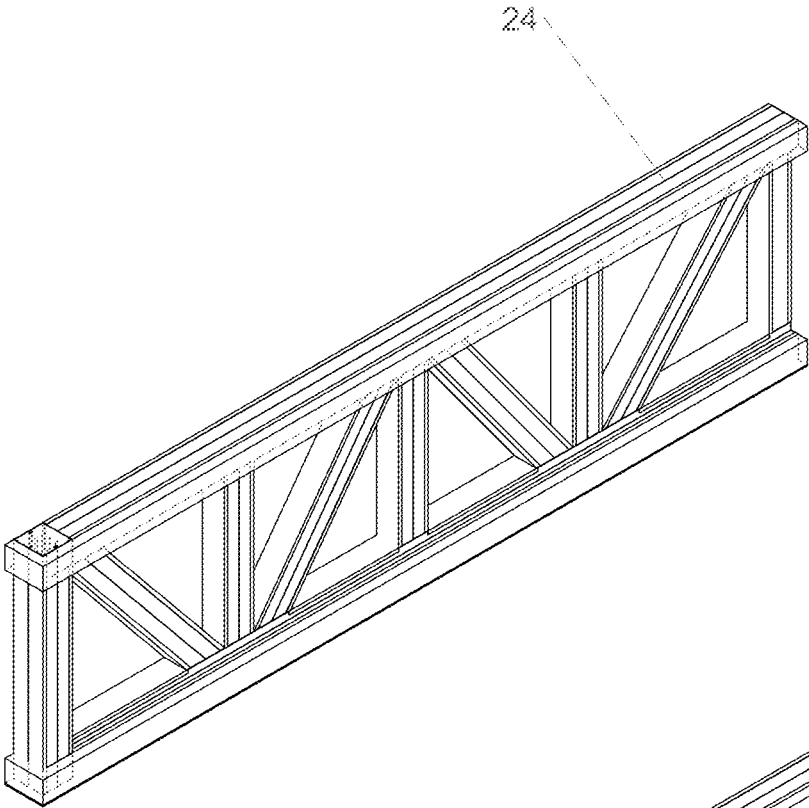


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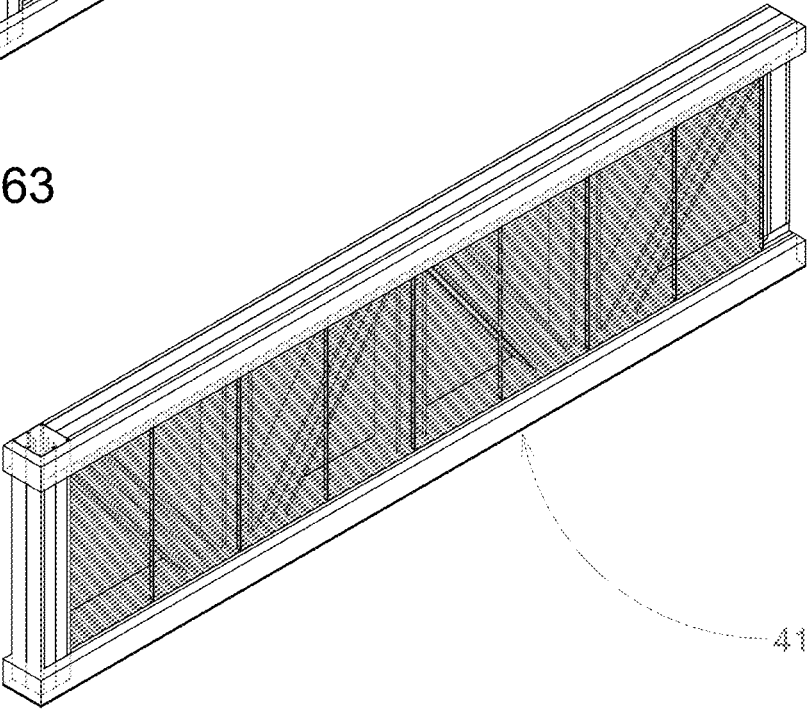


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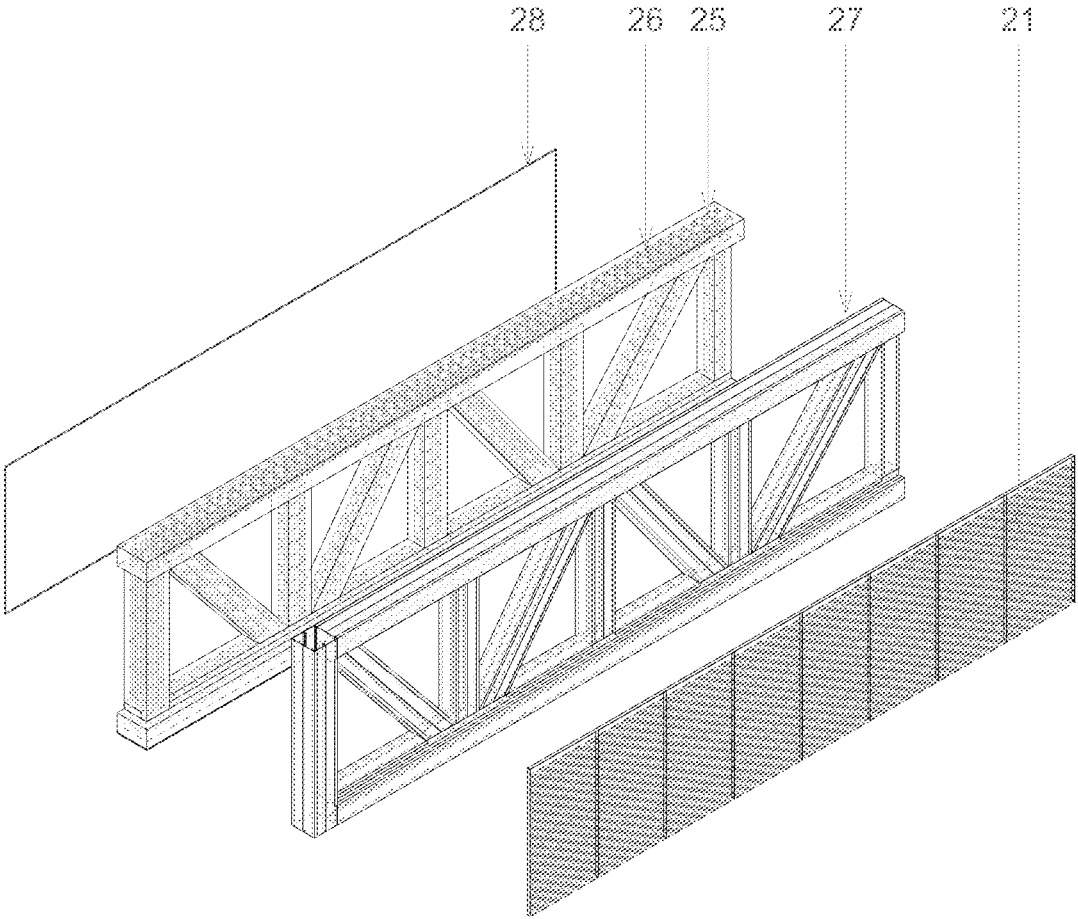
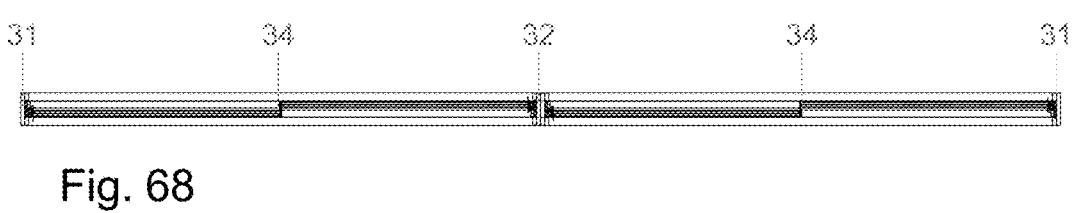
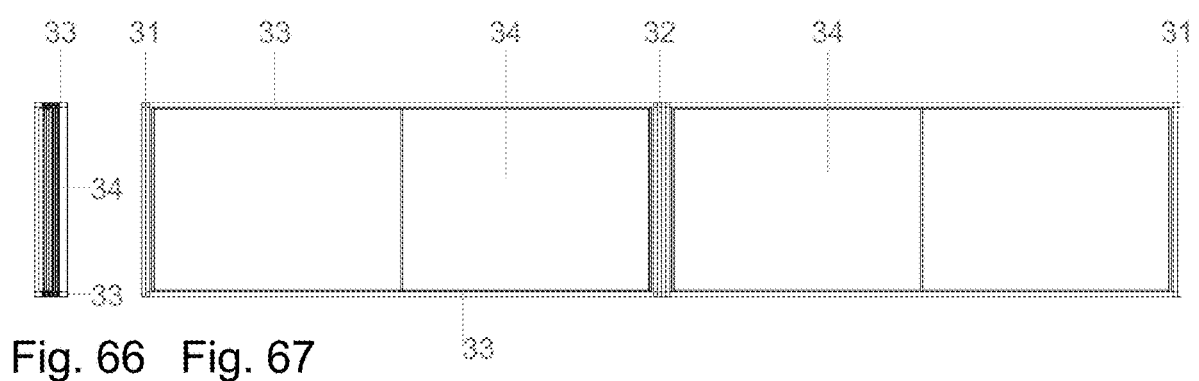


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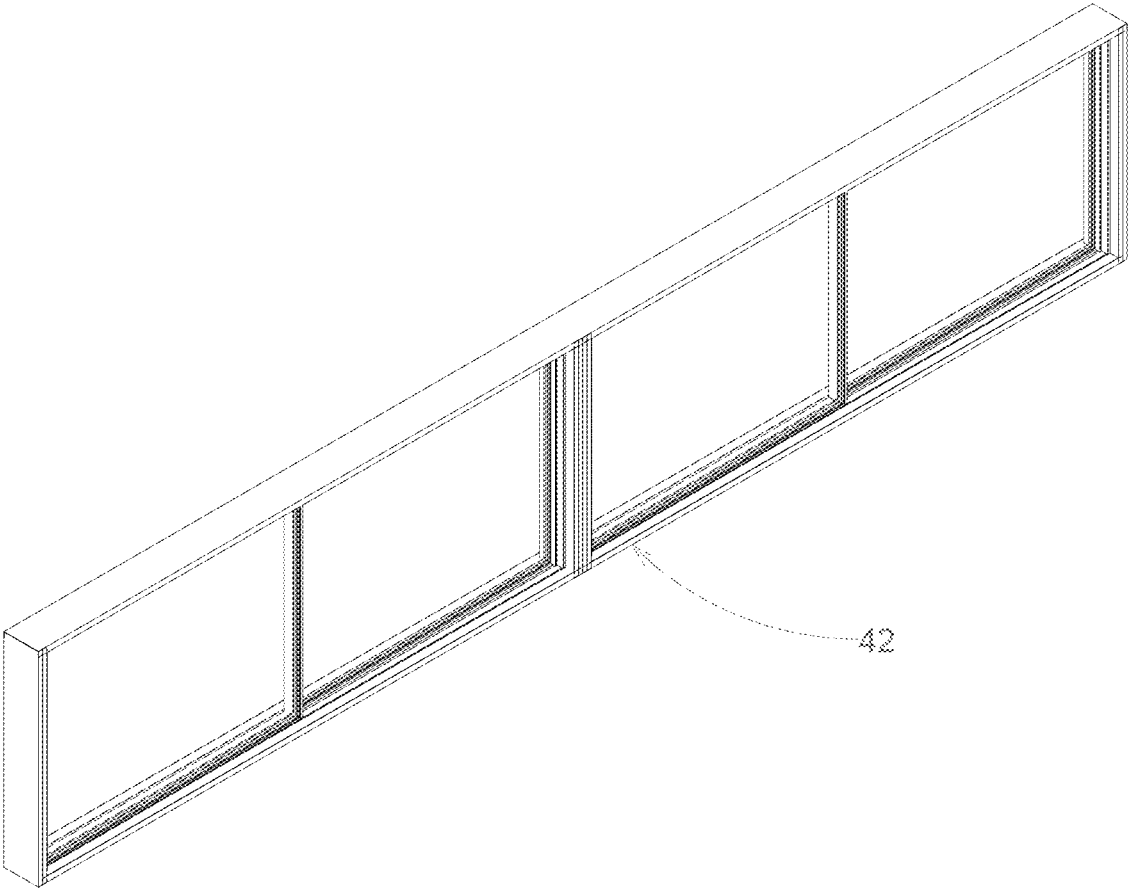


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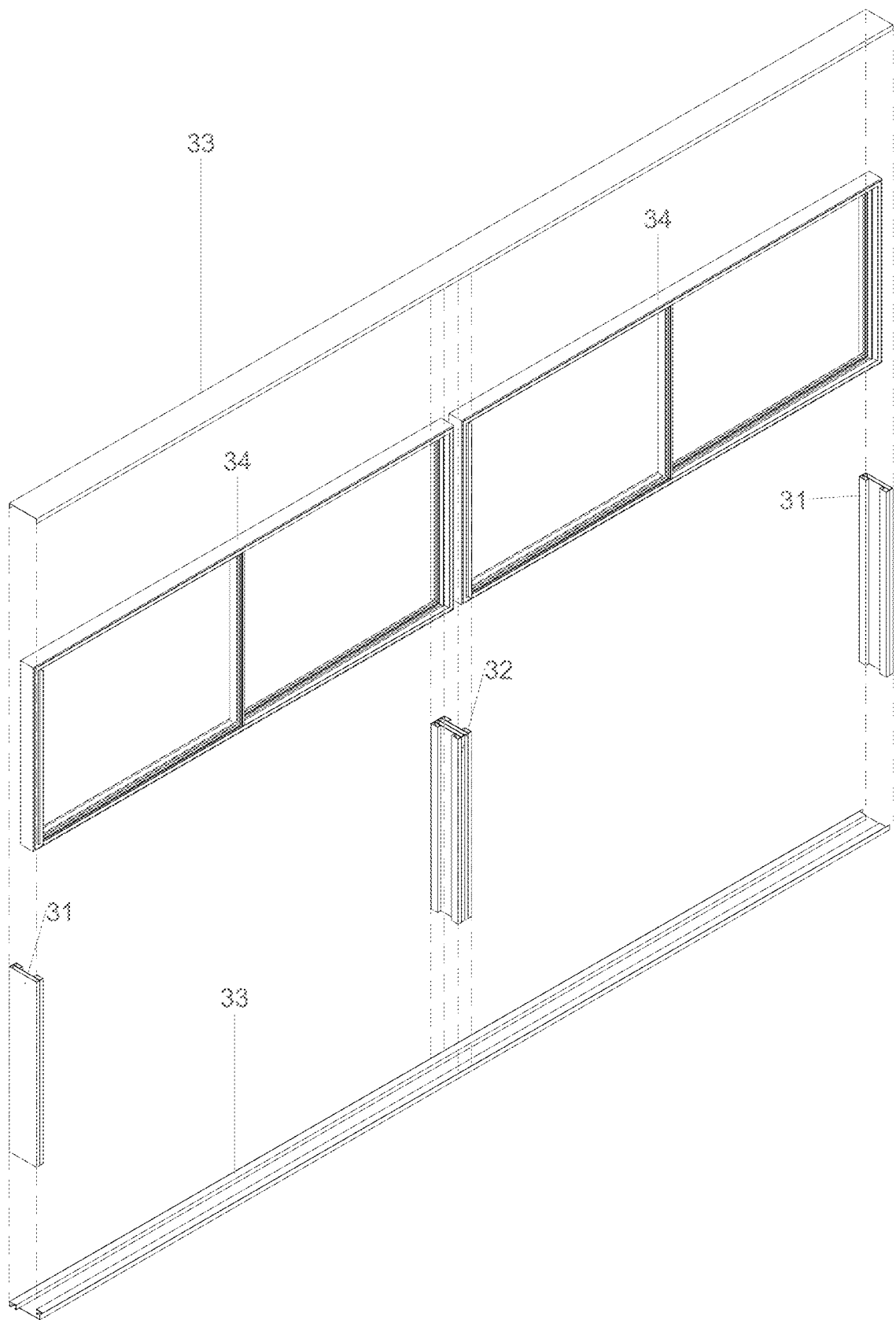


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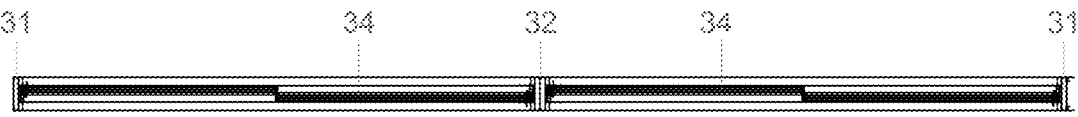
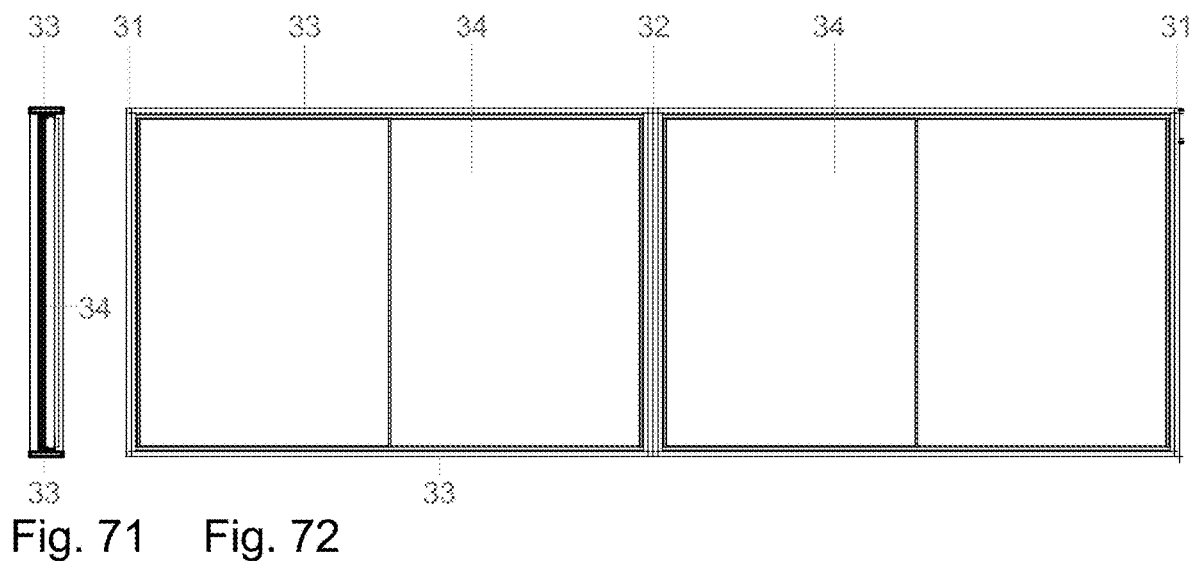


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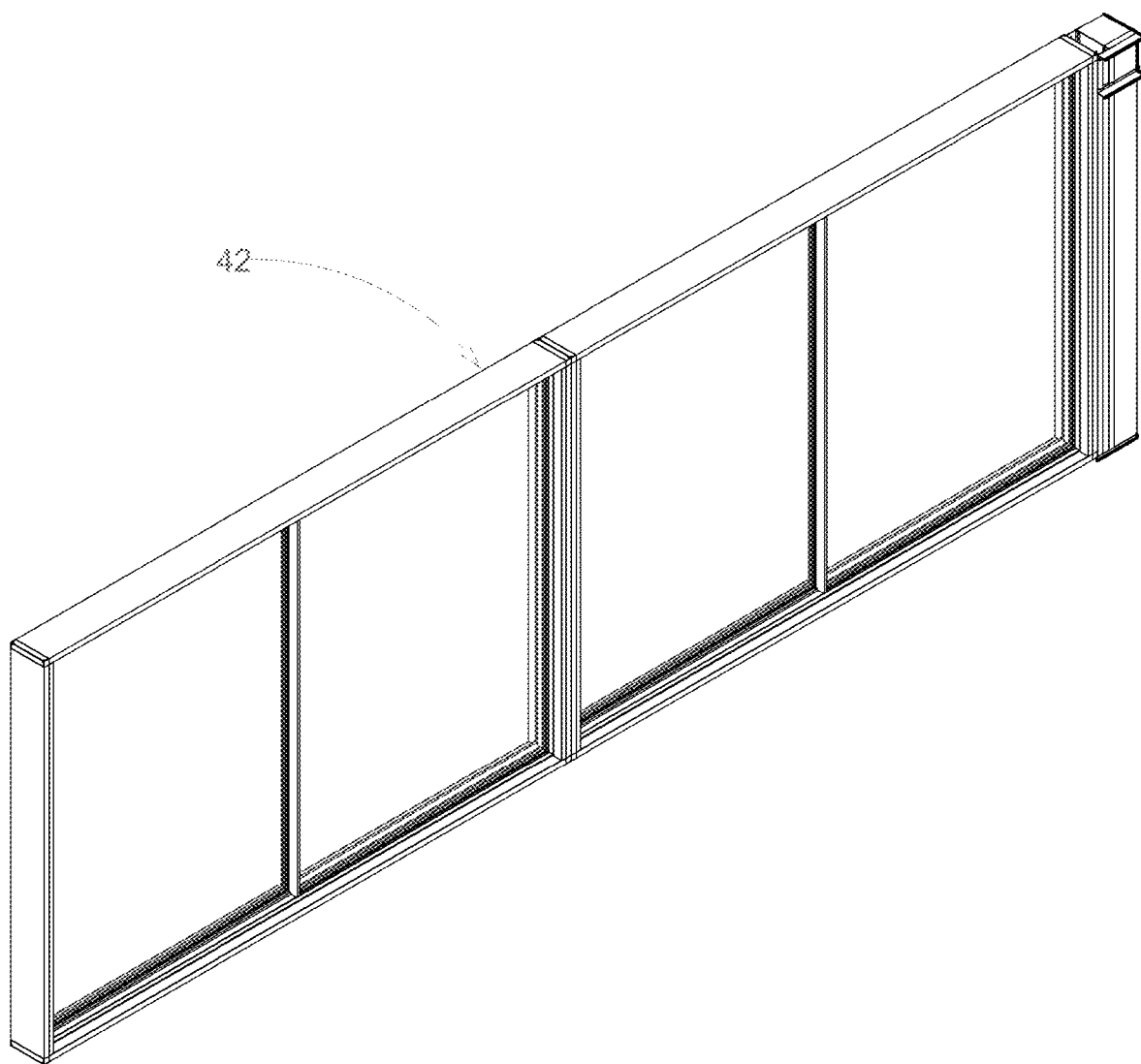


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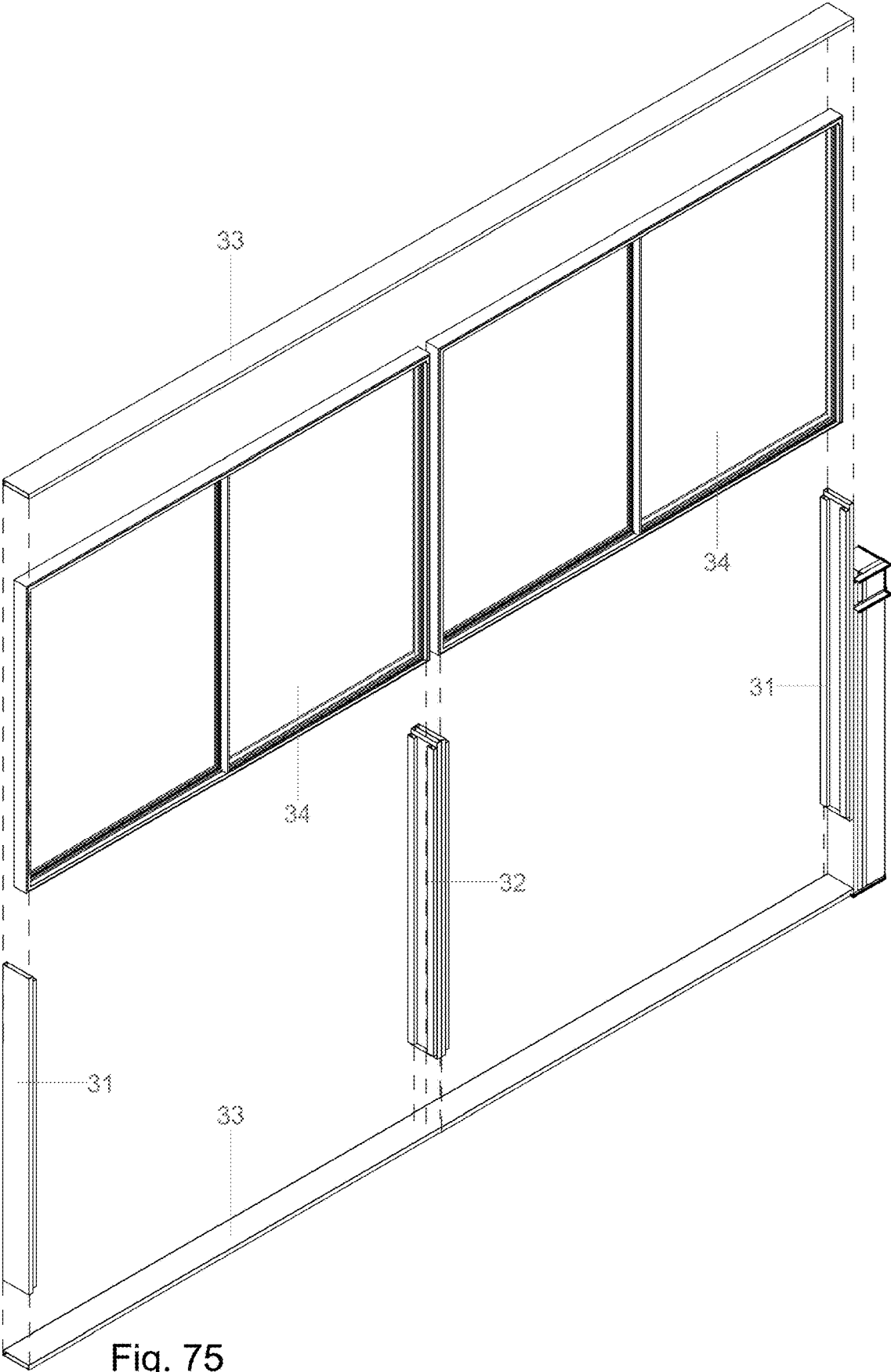


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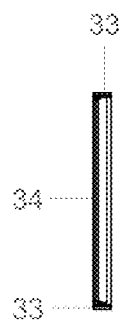


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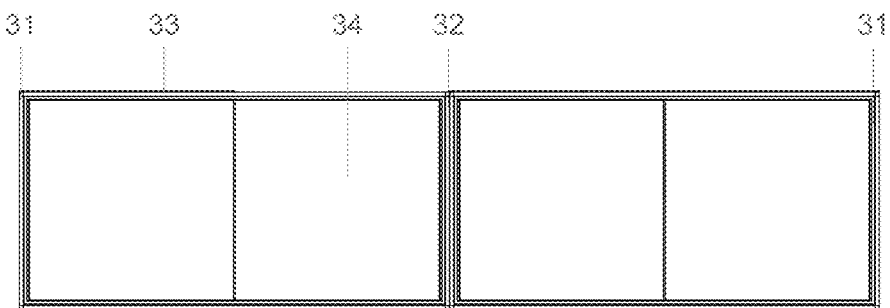


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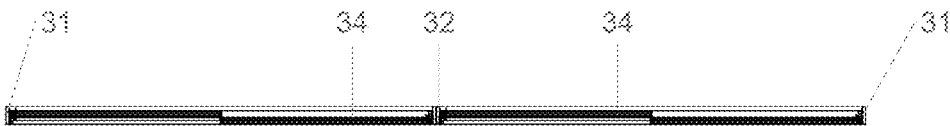


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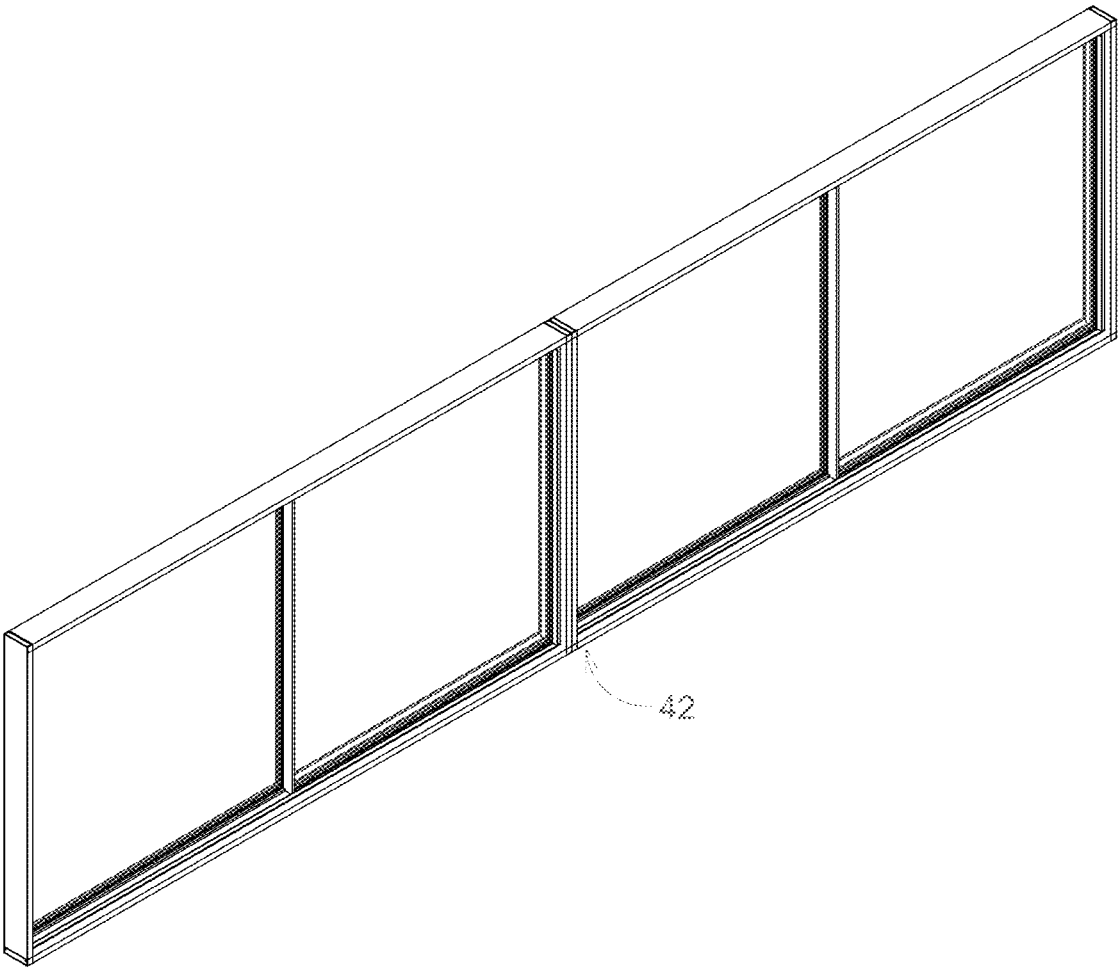


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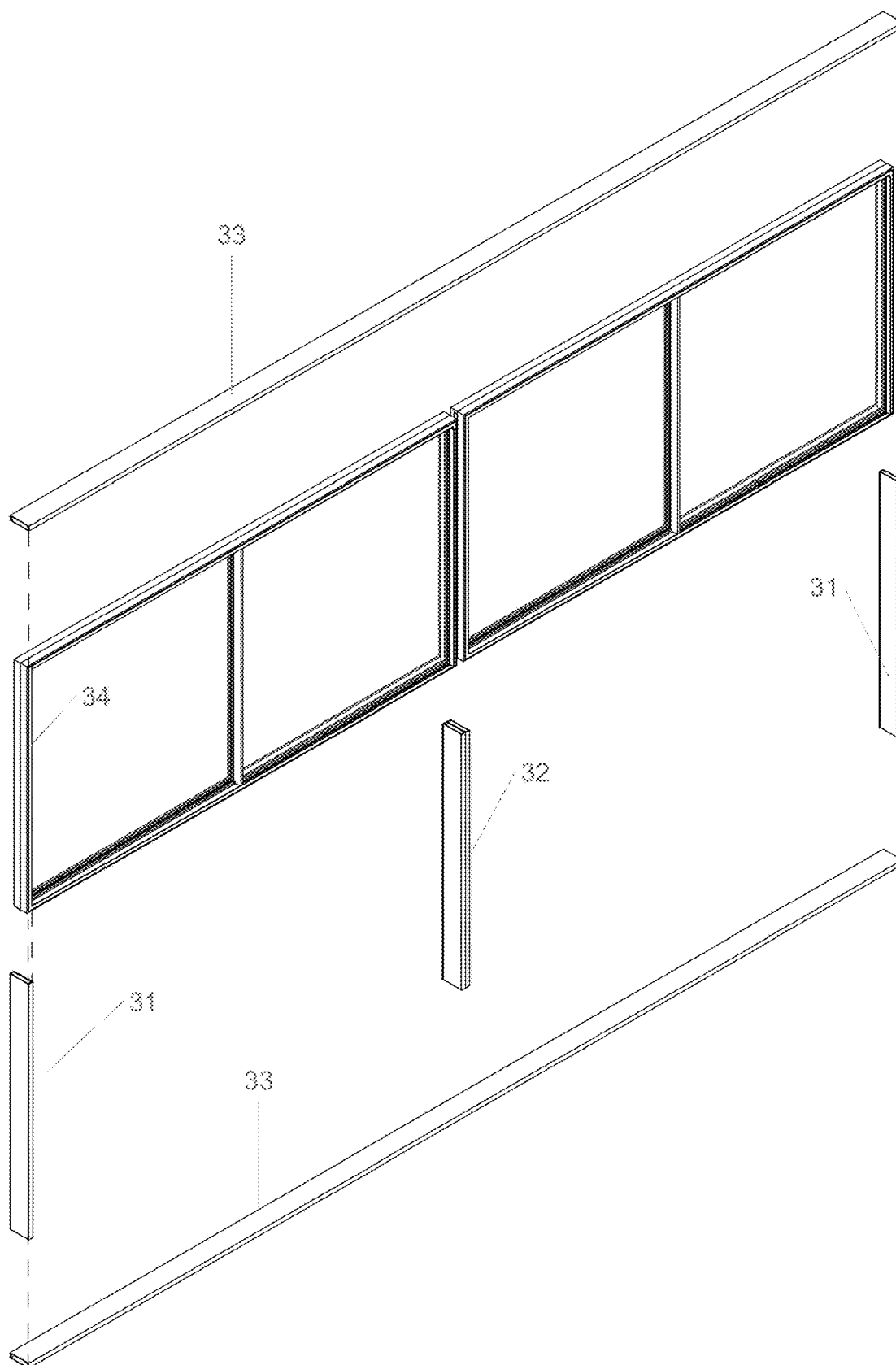


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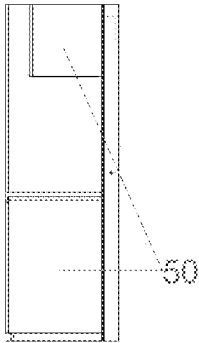


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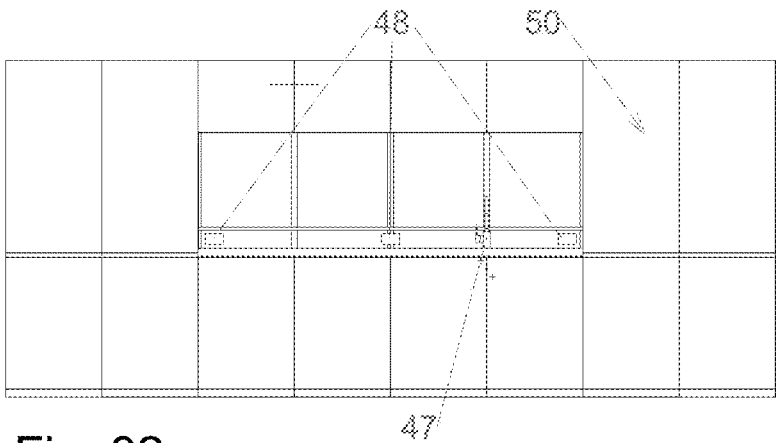


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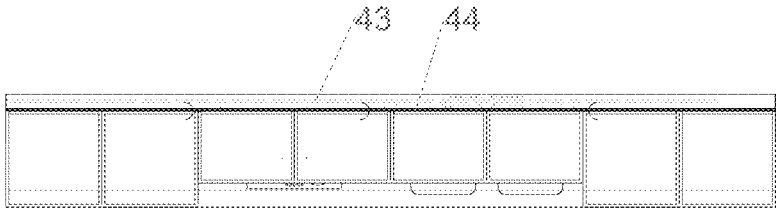


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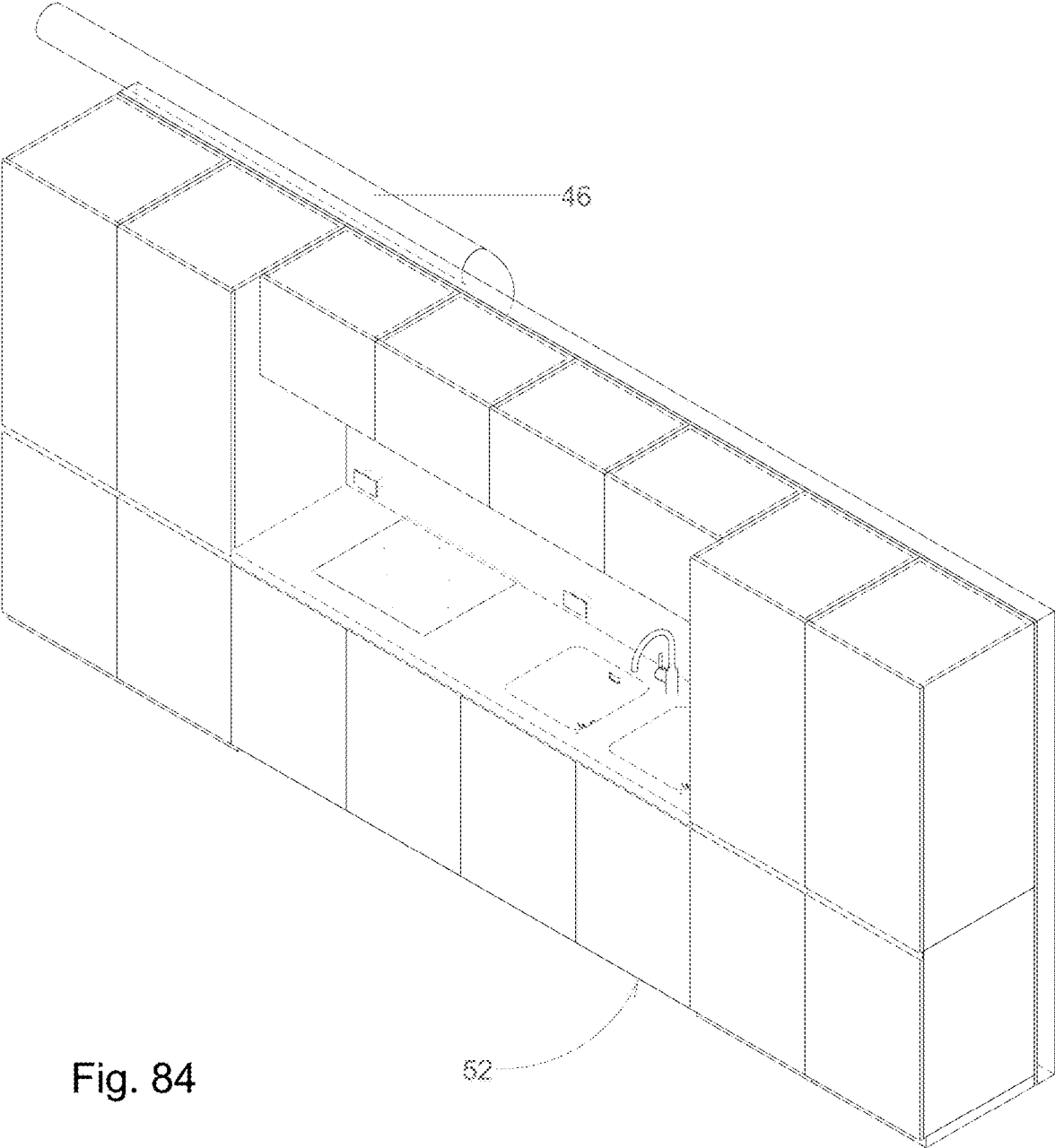


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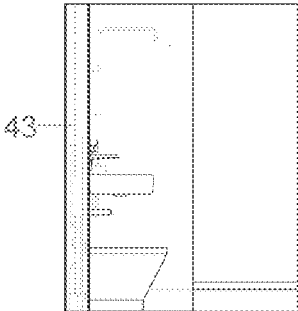


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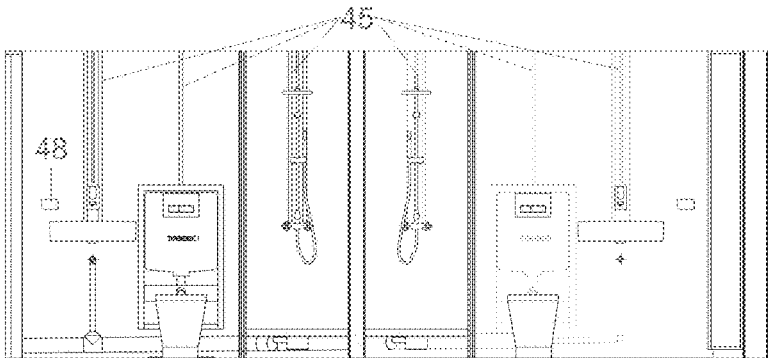


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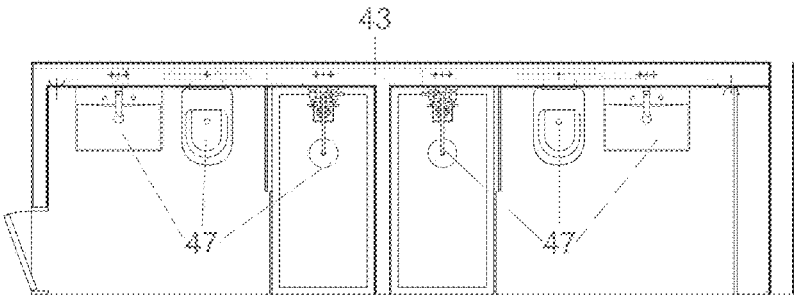


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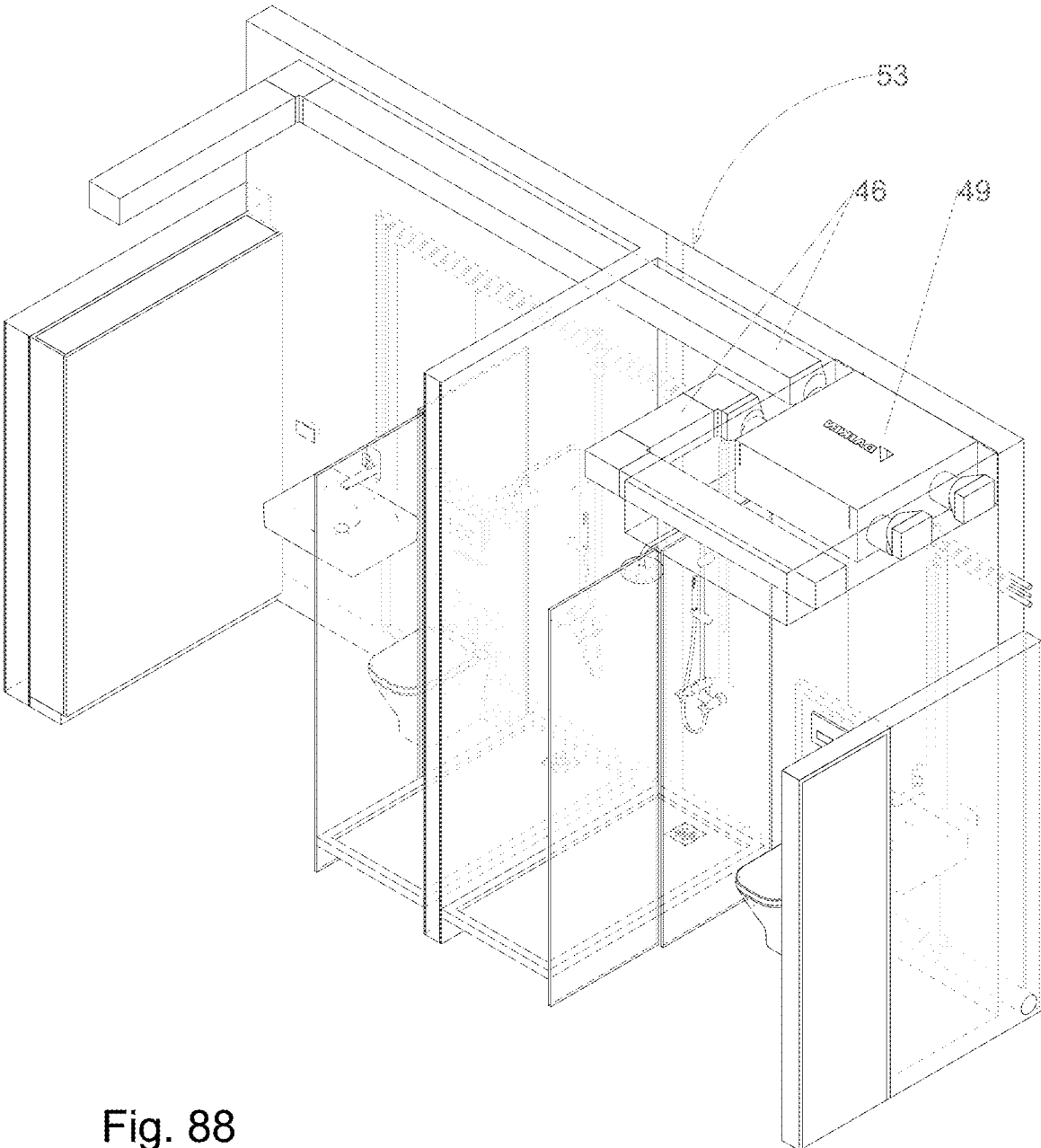


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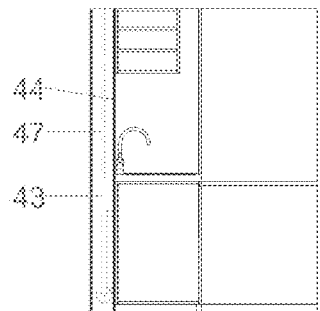


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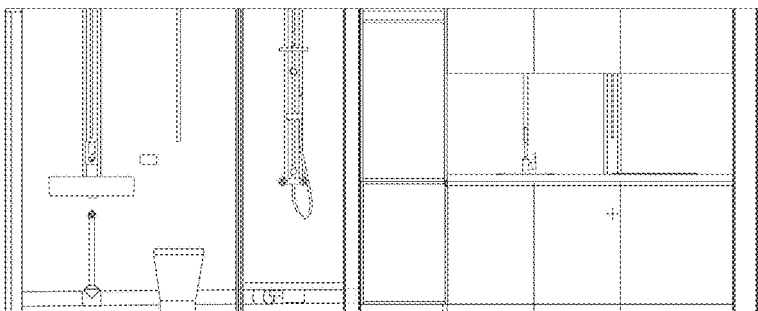


Fig. 90

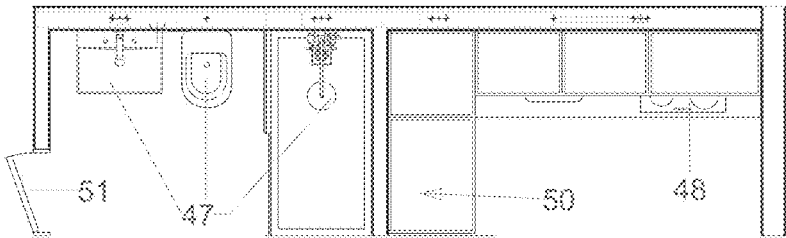


Fig. 91

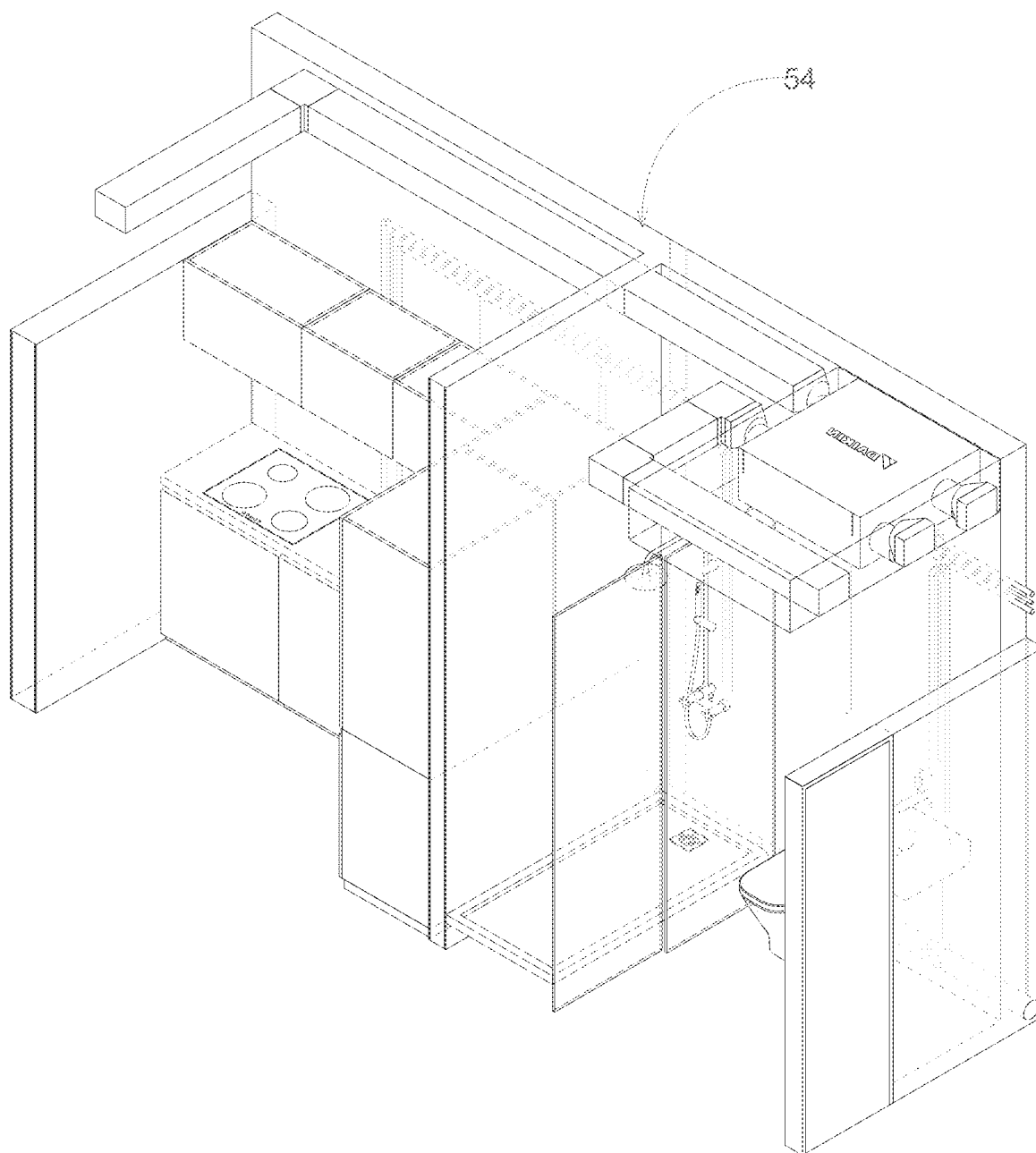


Fig. 92

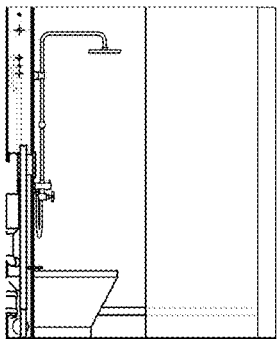


Fig. 93

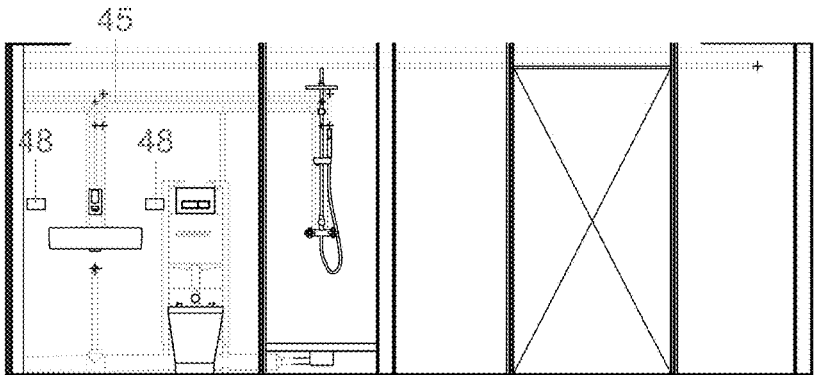


Fig. 94

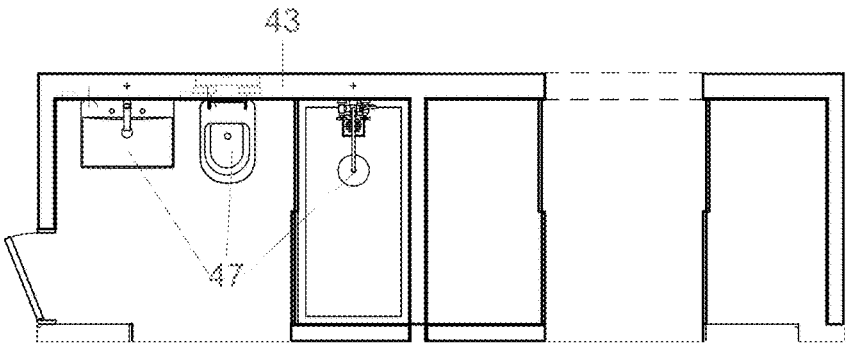


Fig. 95

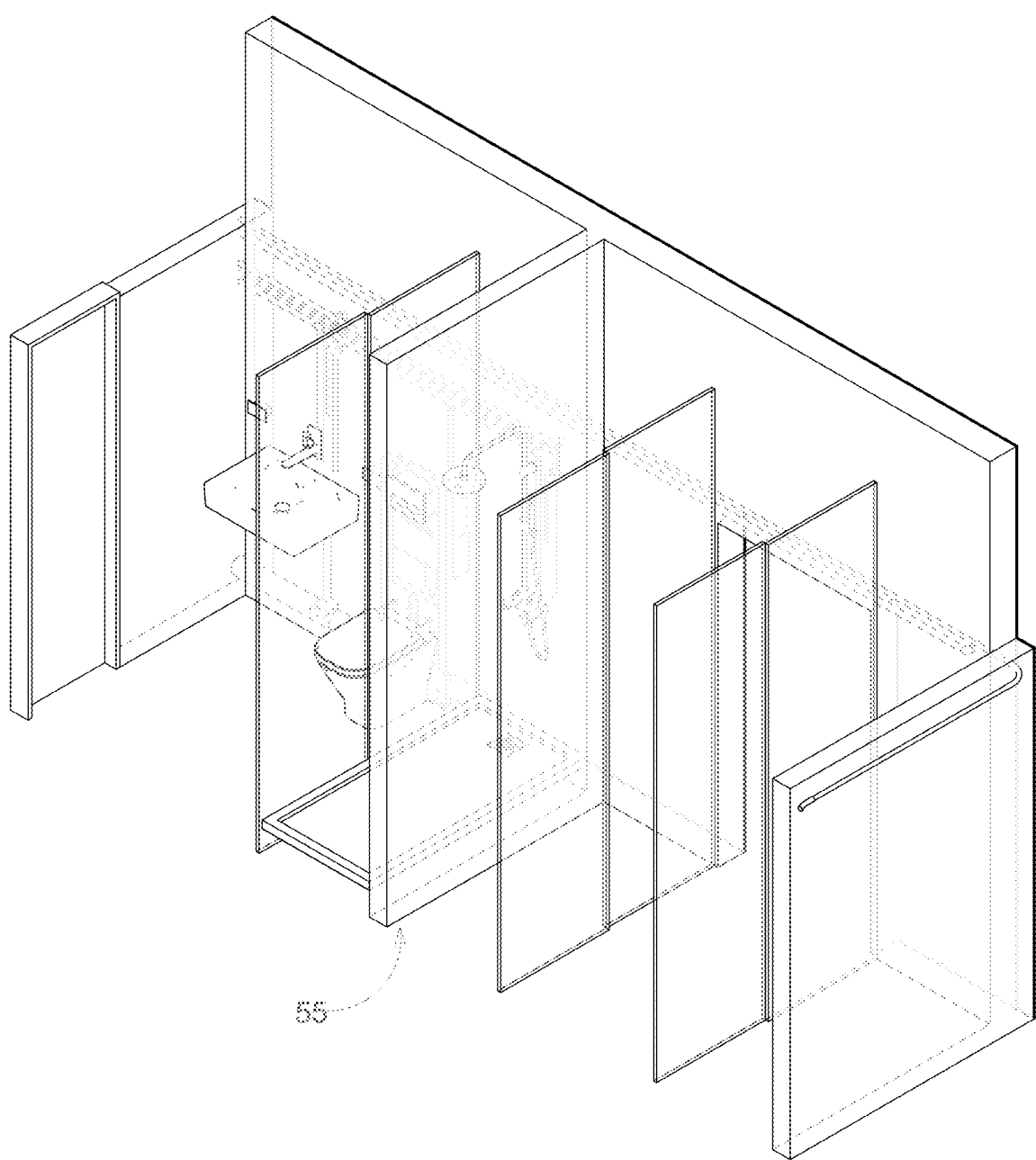


Fig. 96

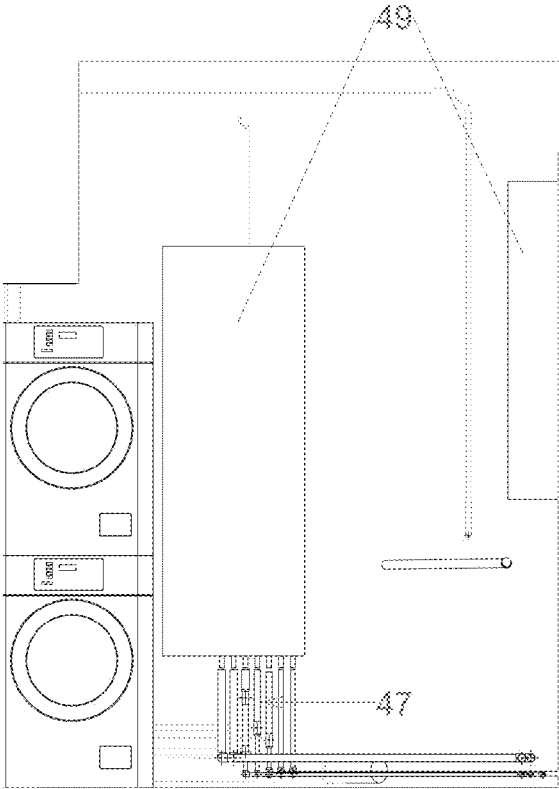


Fig. 97

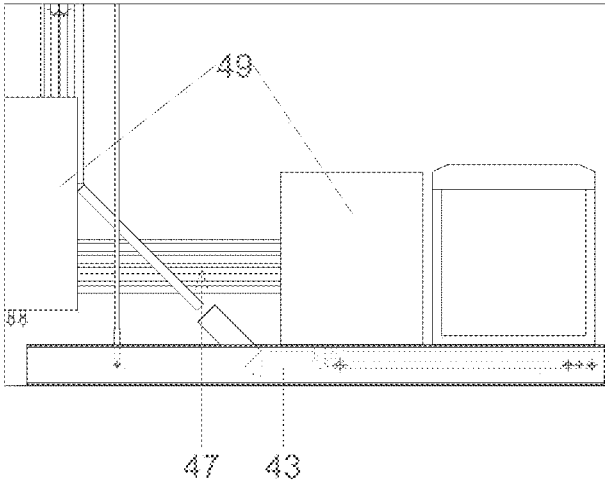


Fig. 98

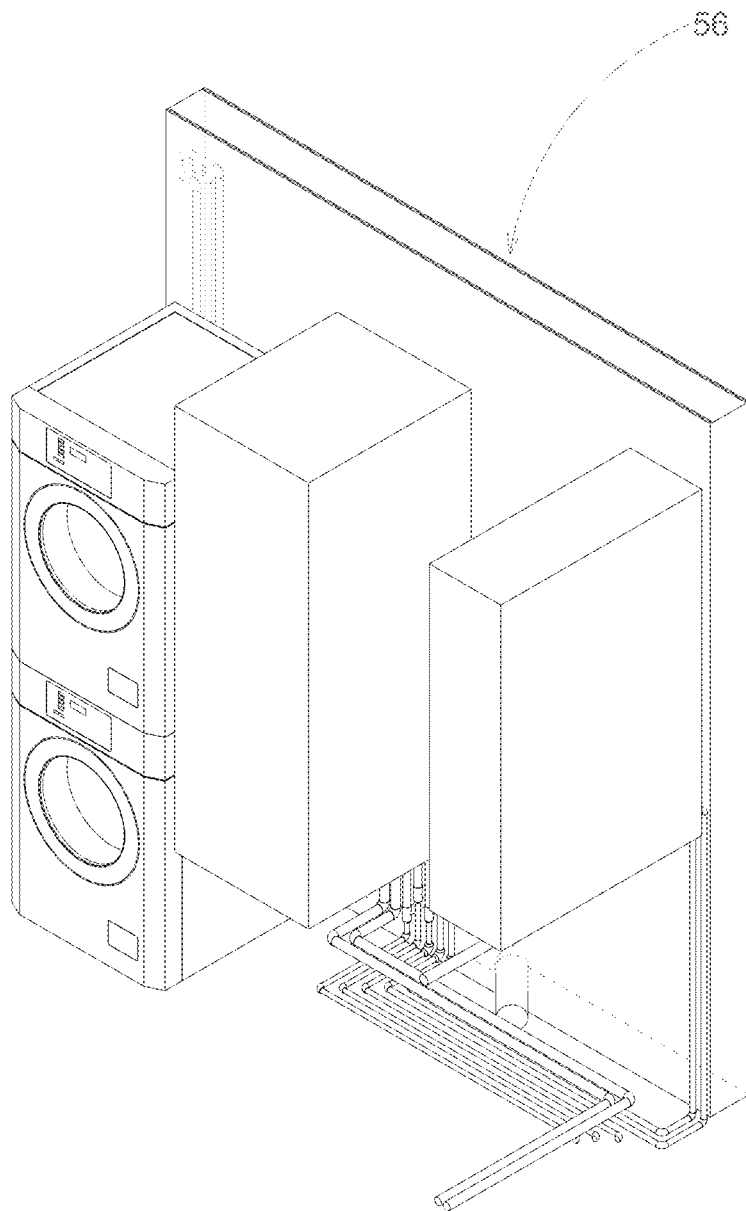


Fig. 99

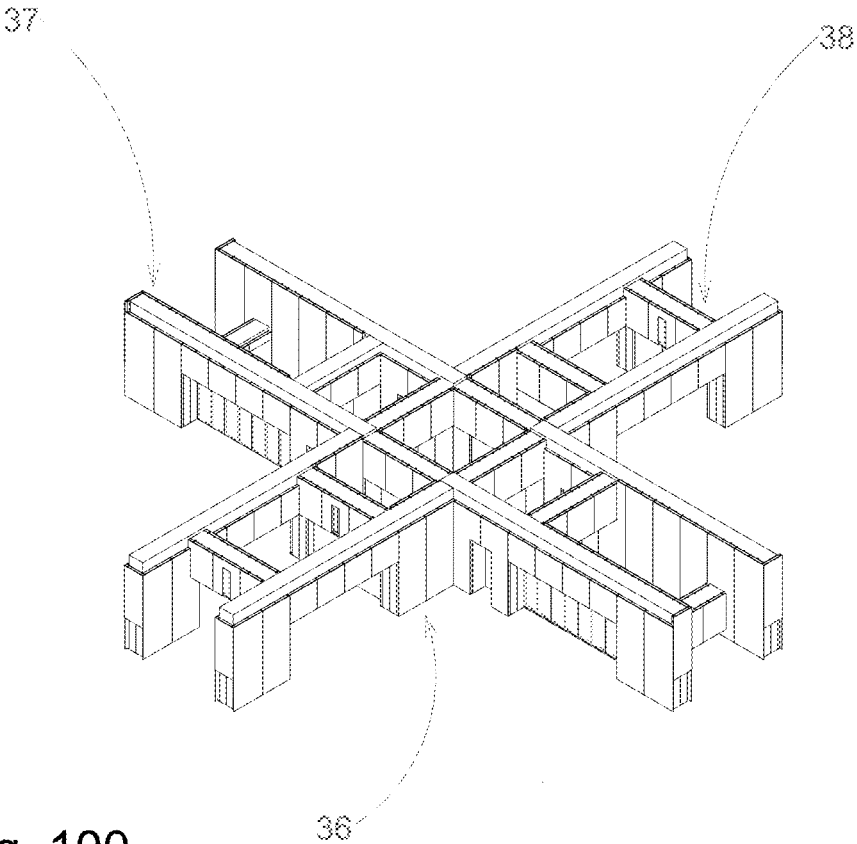


Fig. 100

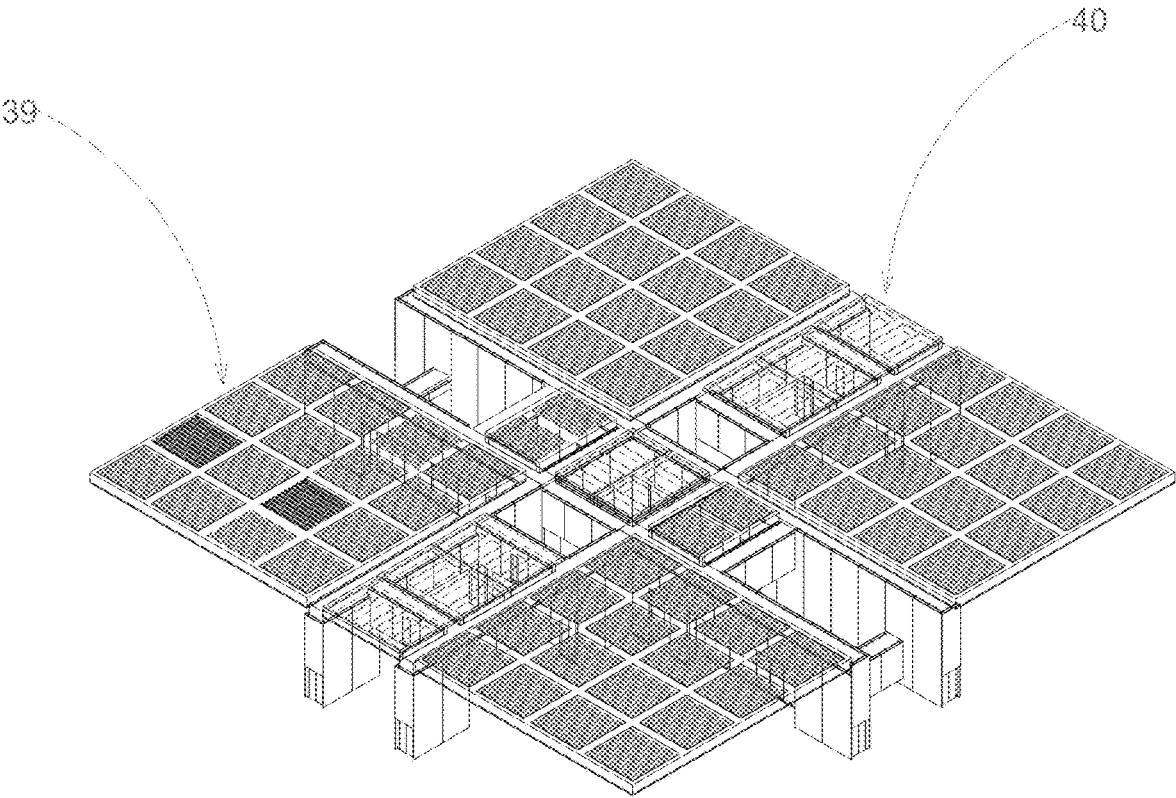


Fig. 101

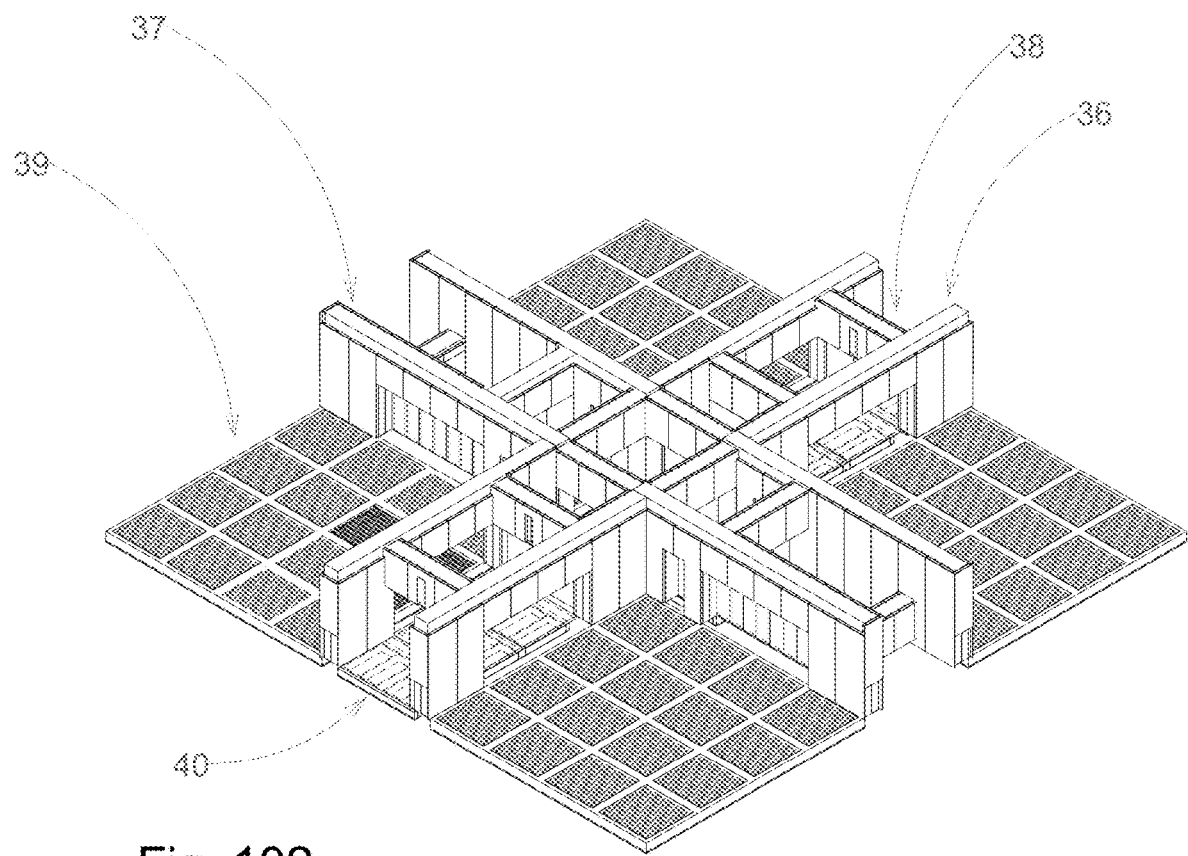


Fig. 102

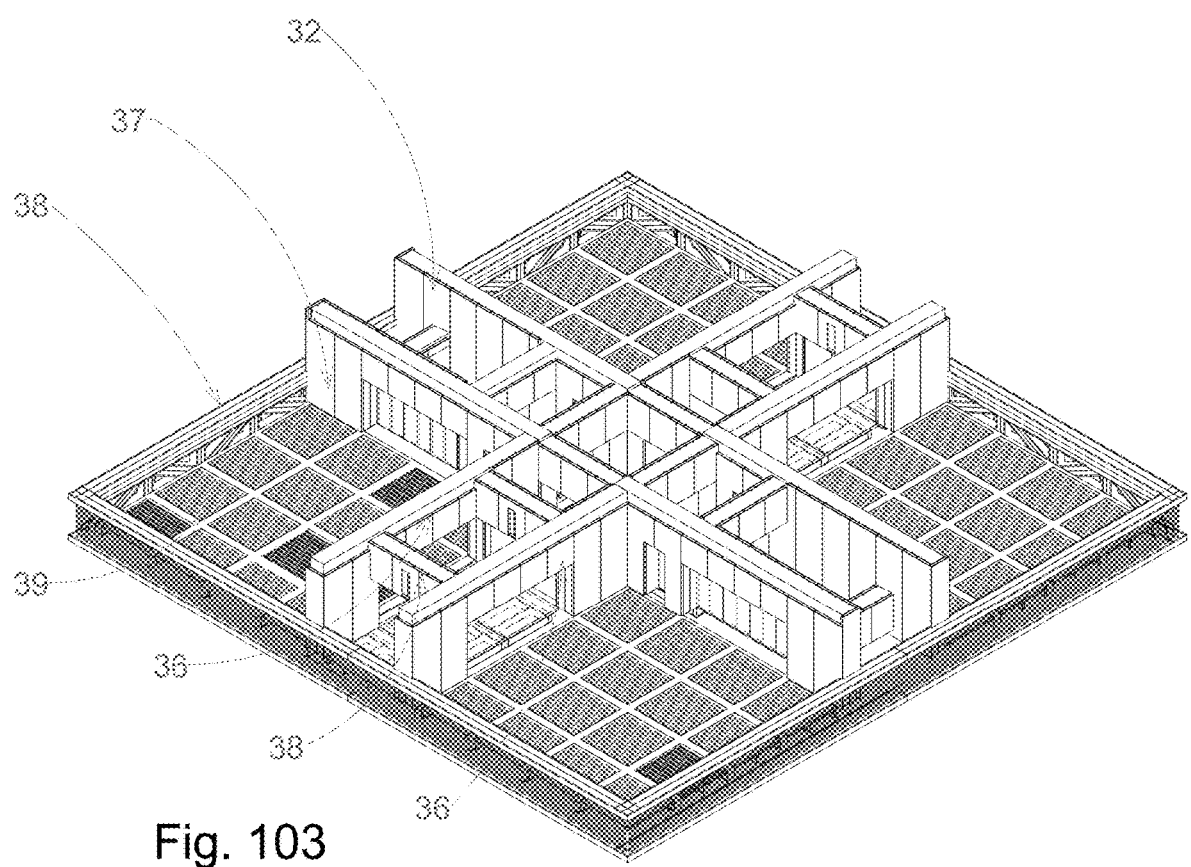


Fig. 103

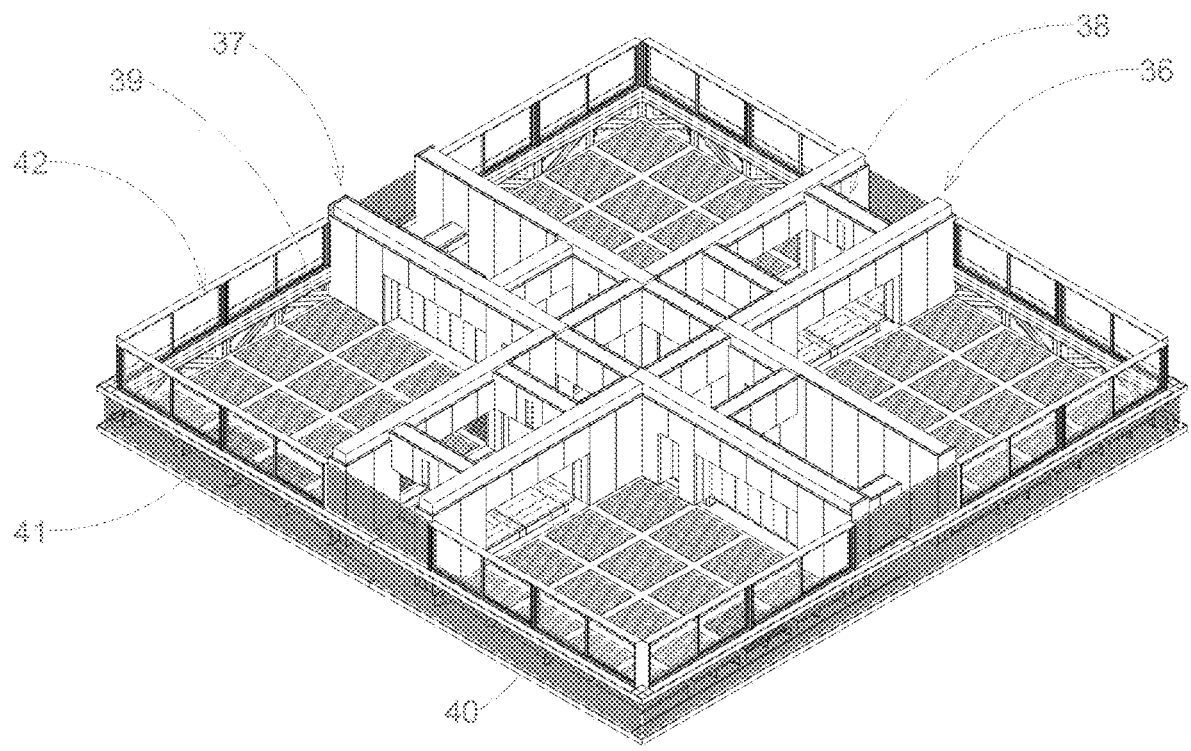


Fig. 104

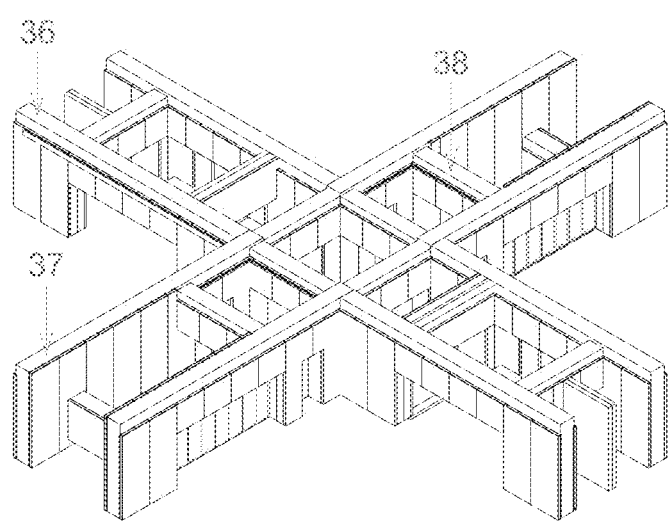


Fig. 105

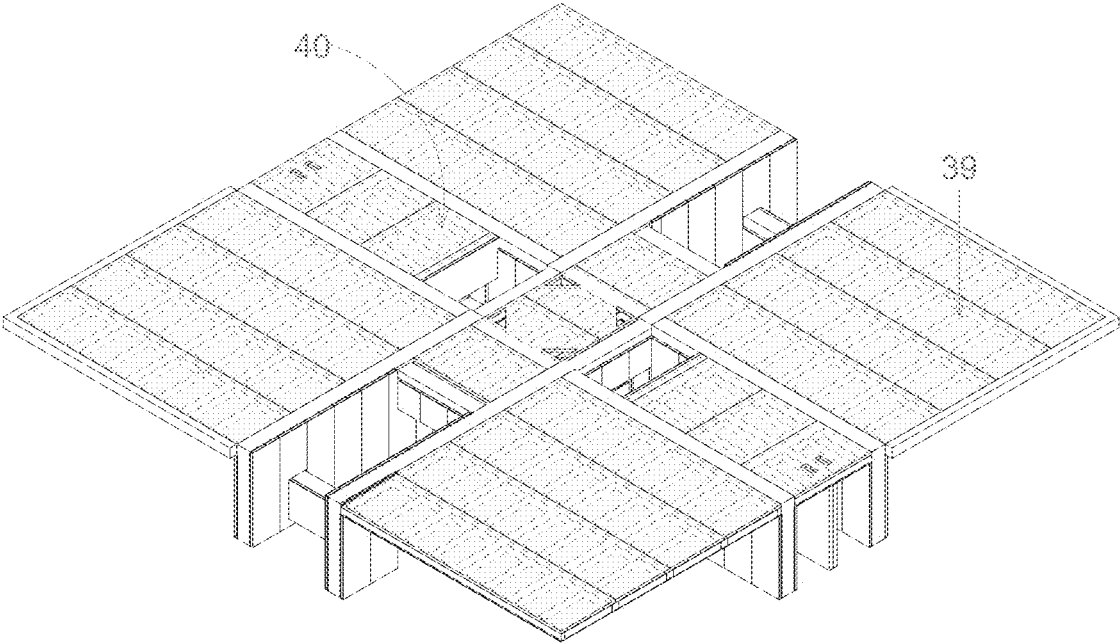


Fig. 106

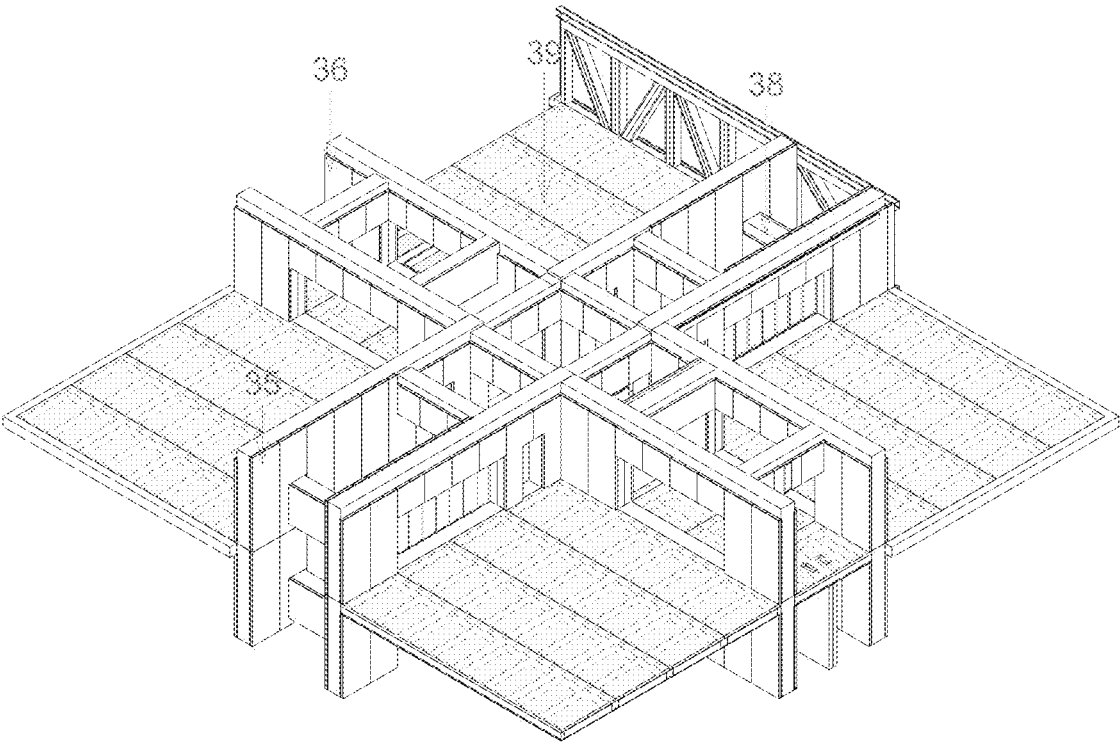


Fig. 107

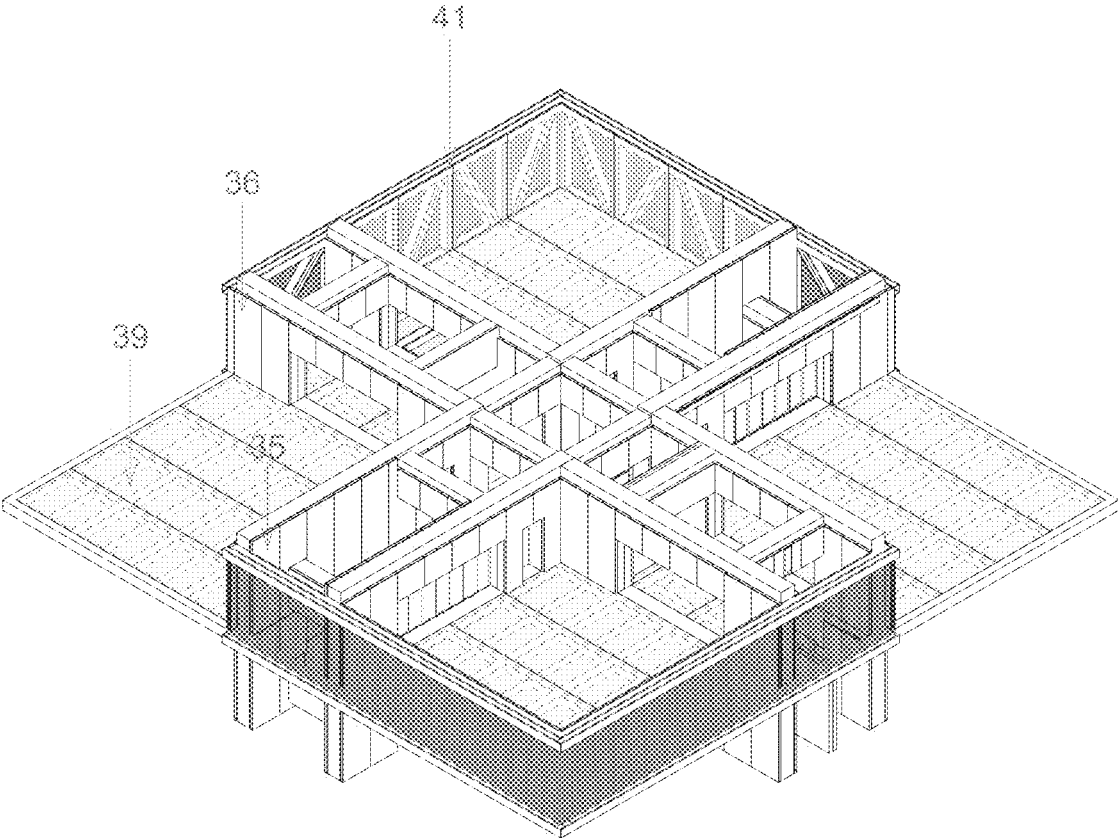


Fig. 108

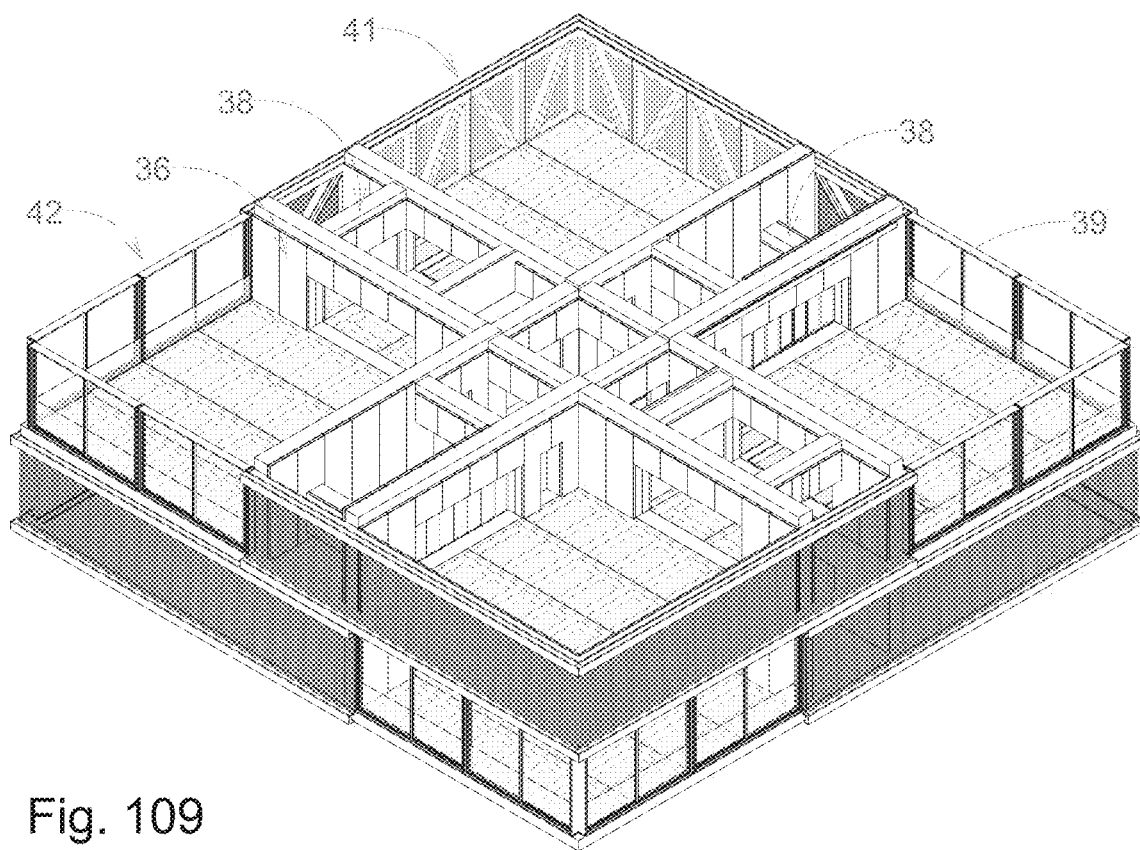


Fig. 109

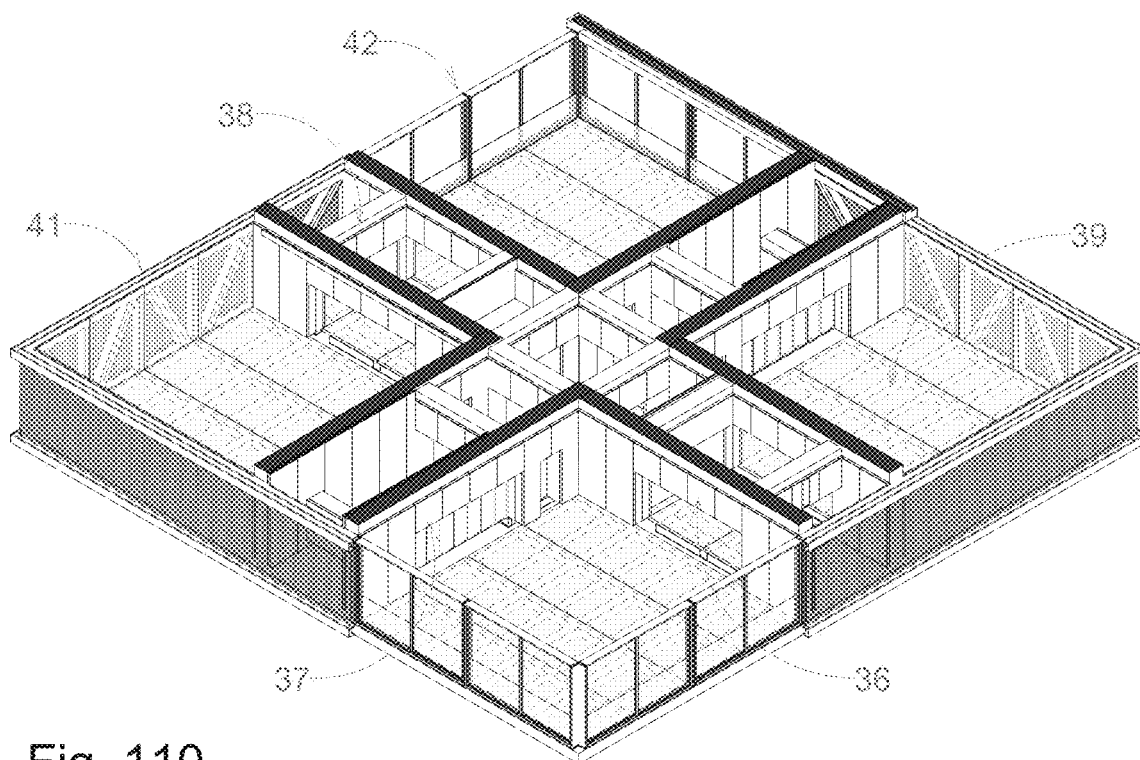


Fig. 110

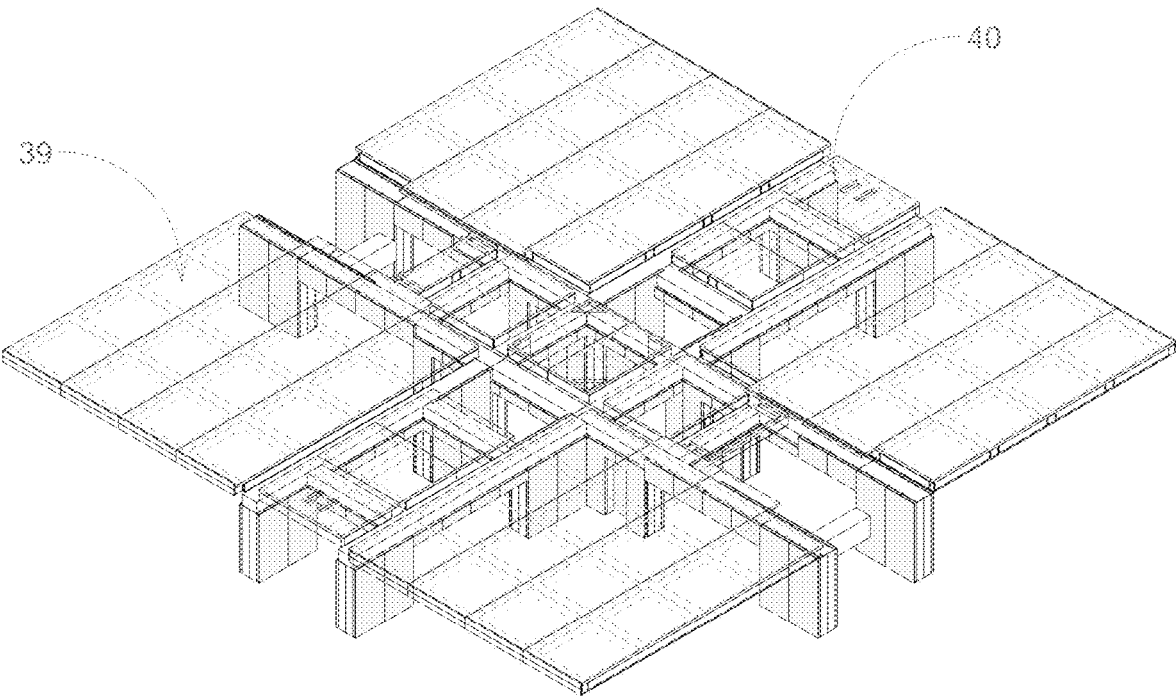


Fig.111

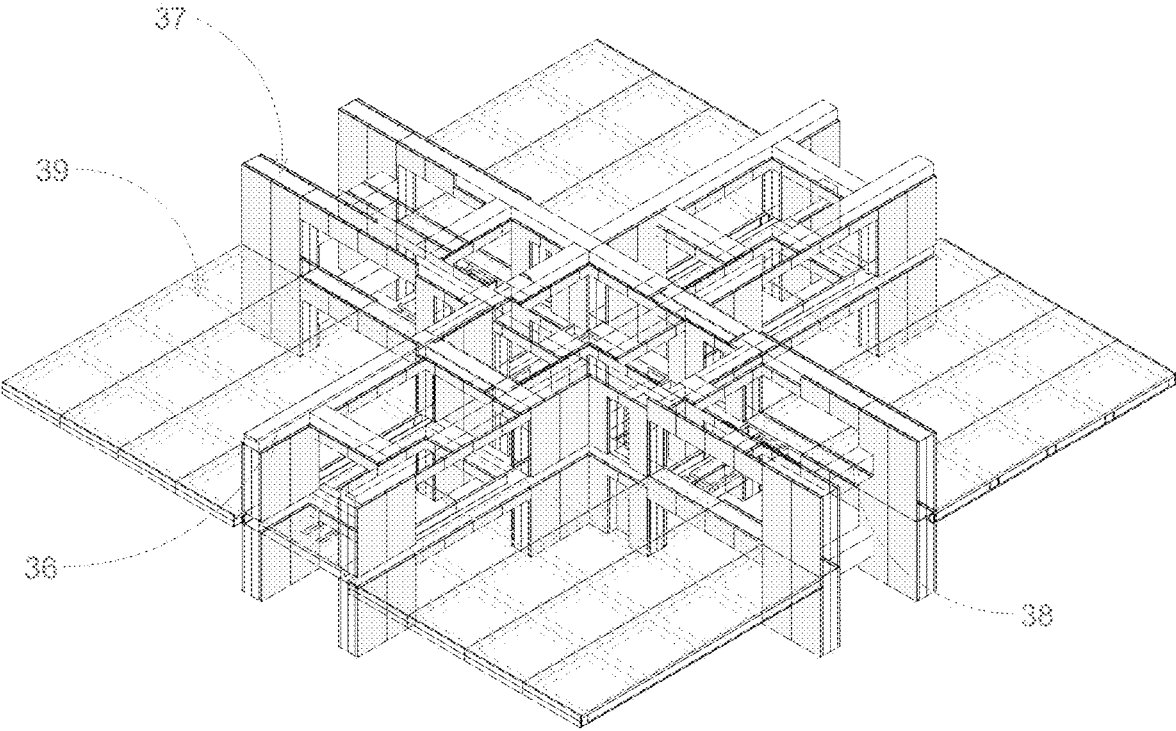


Fig.112

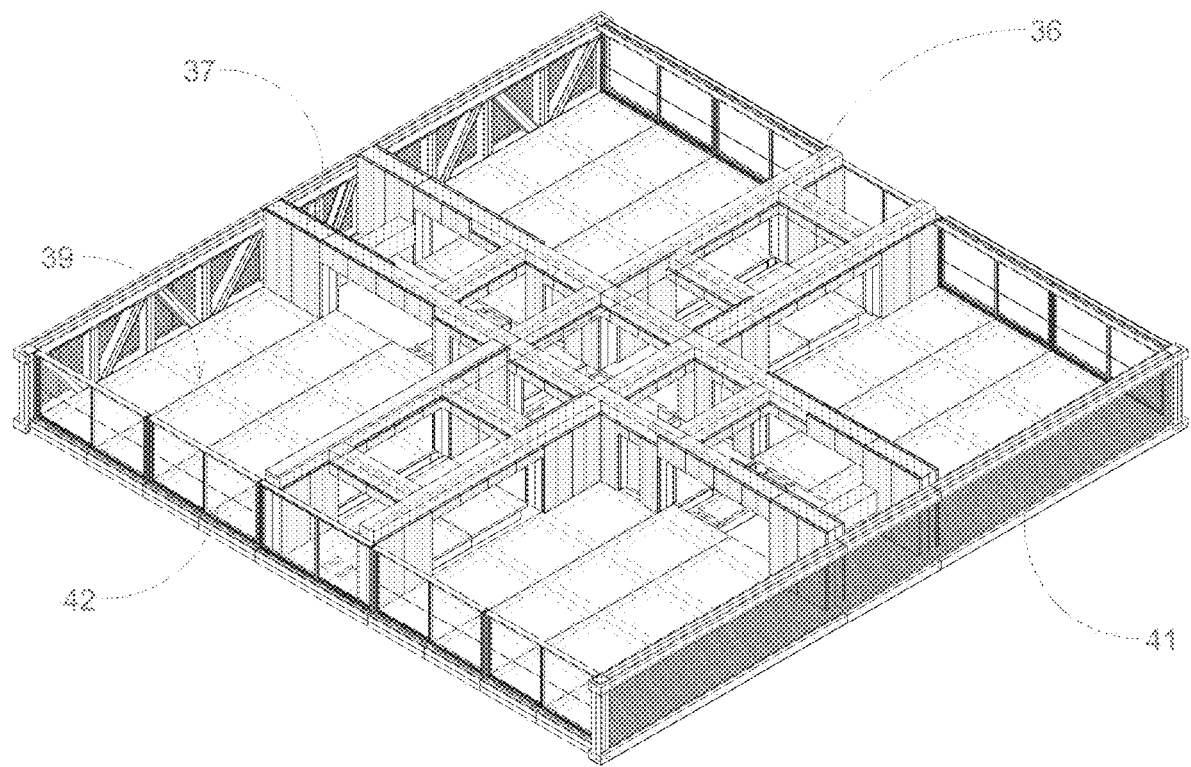


Fig.113

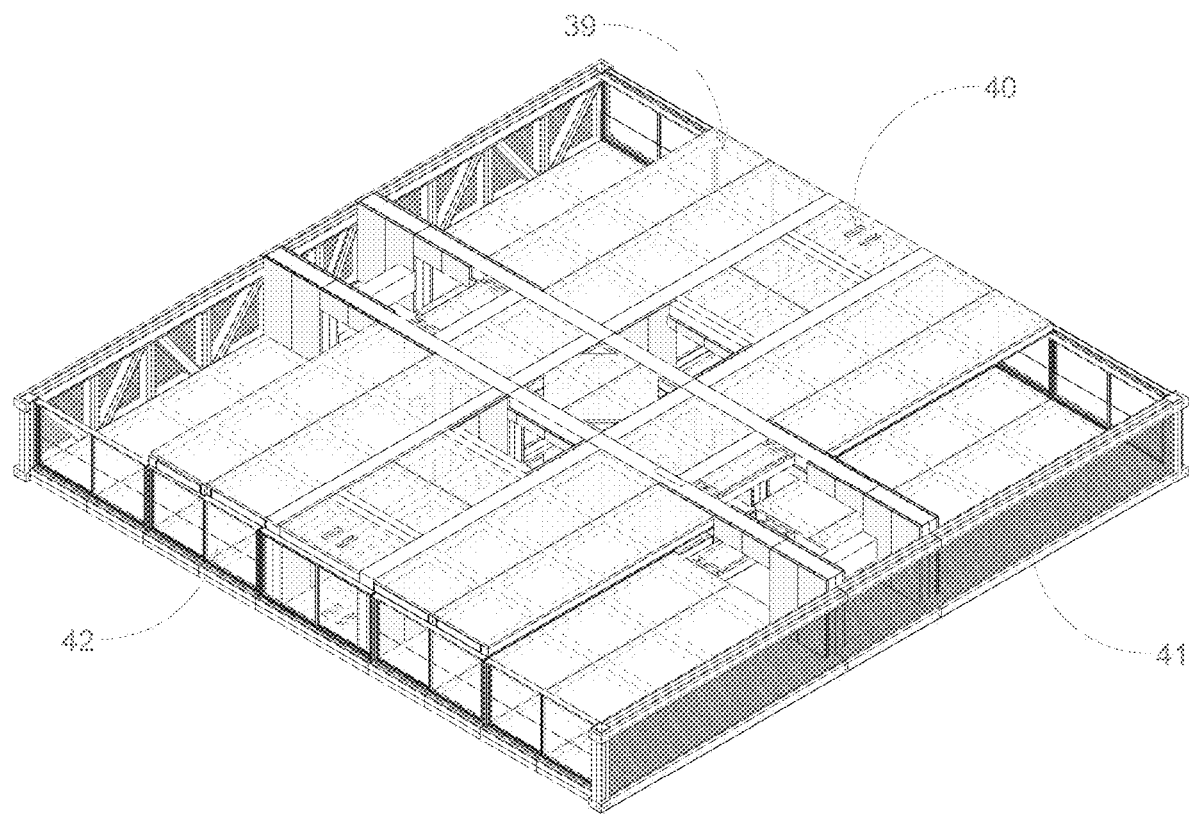


Fig.114

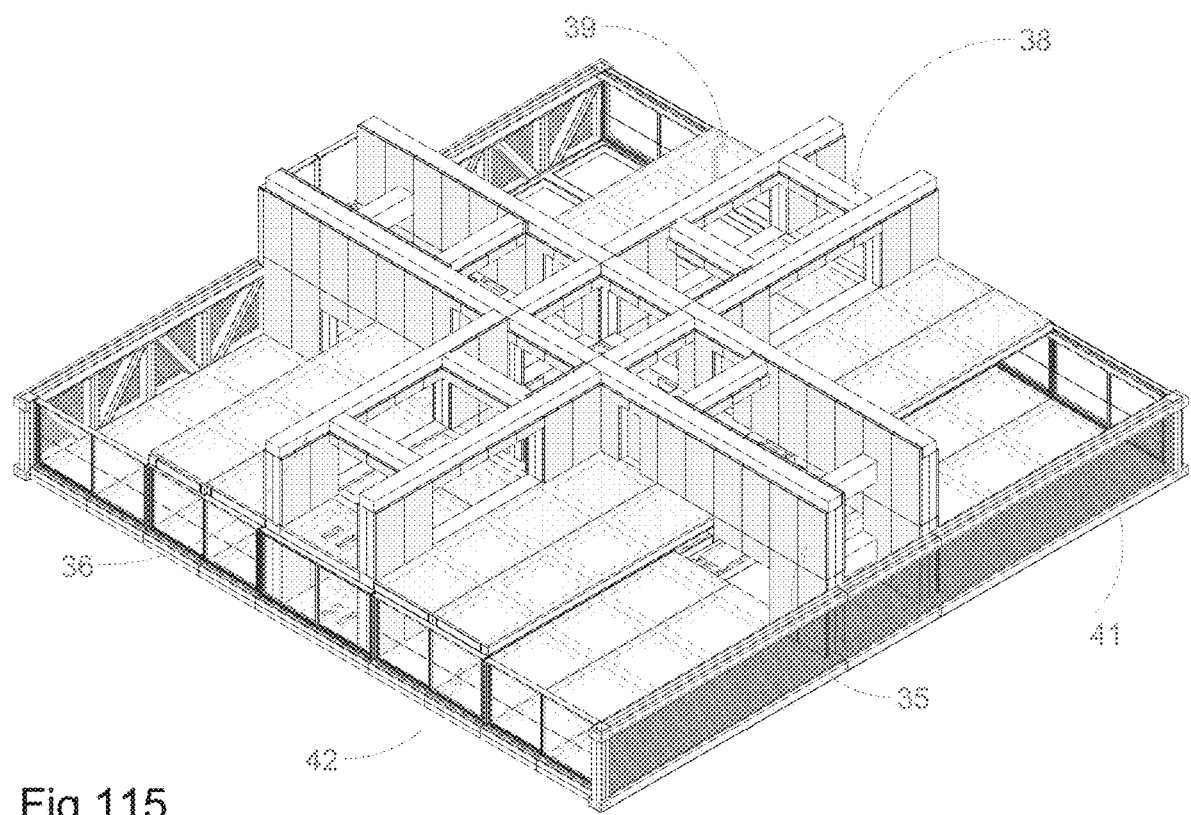


Fig.115

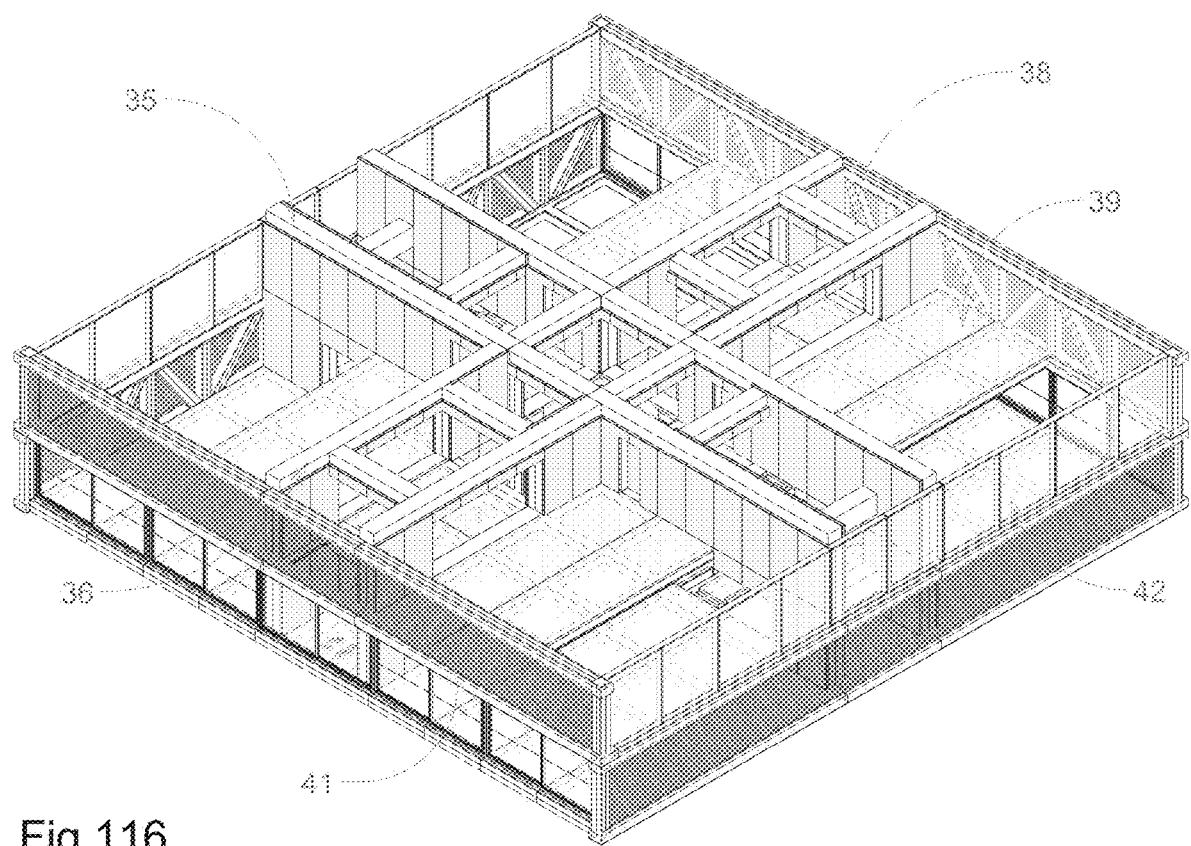


Fig.116

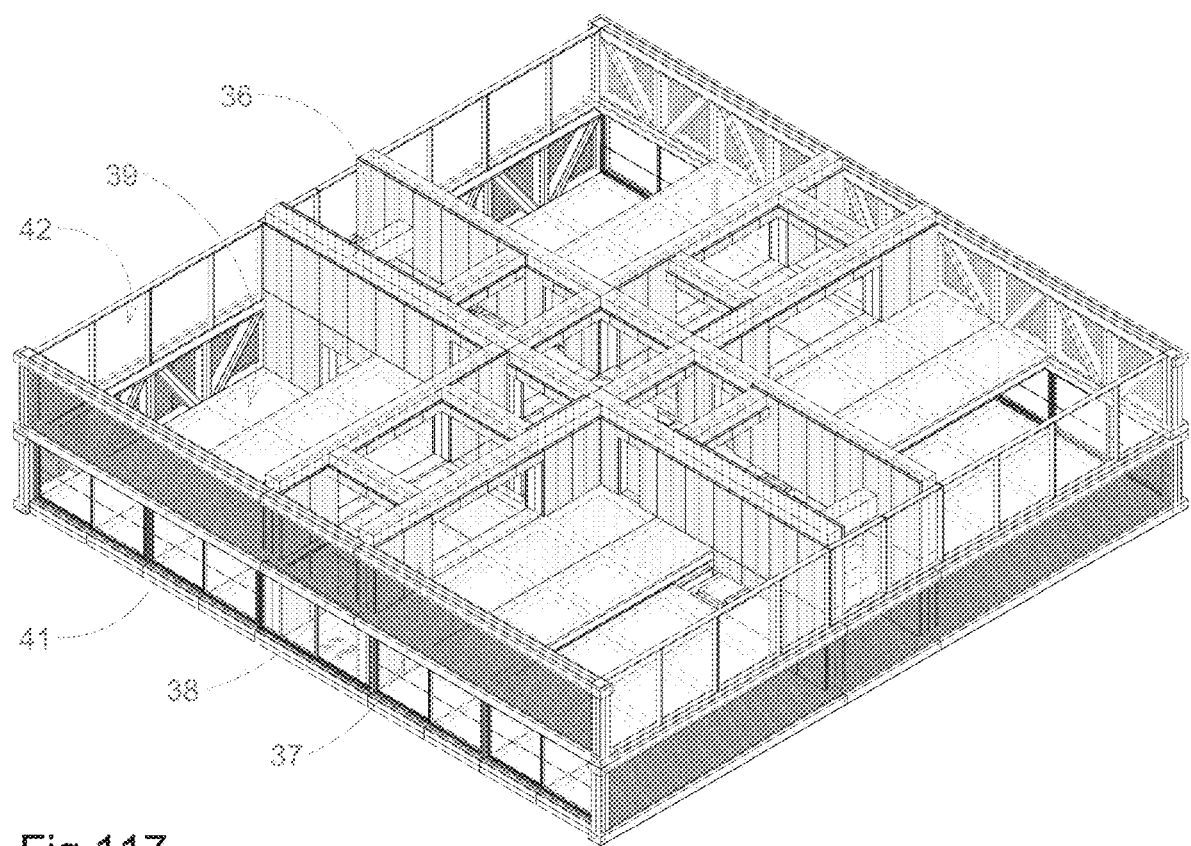


Fig.117

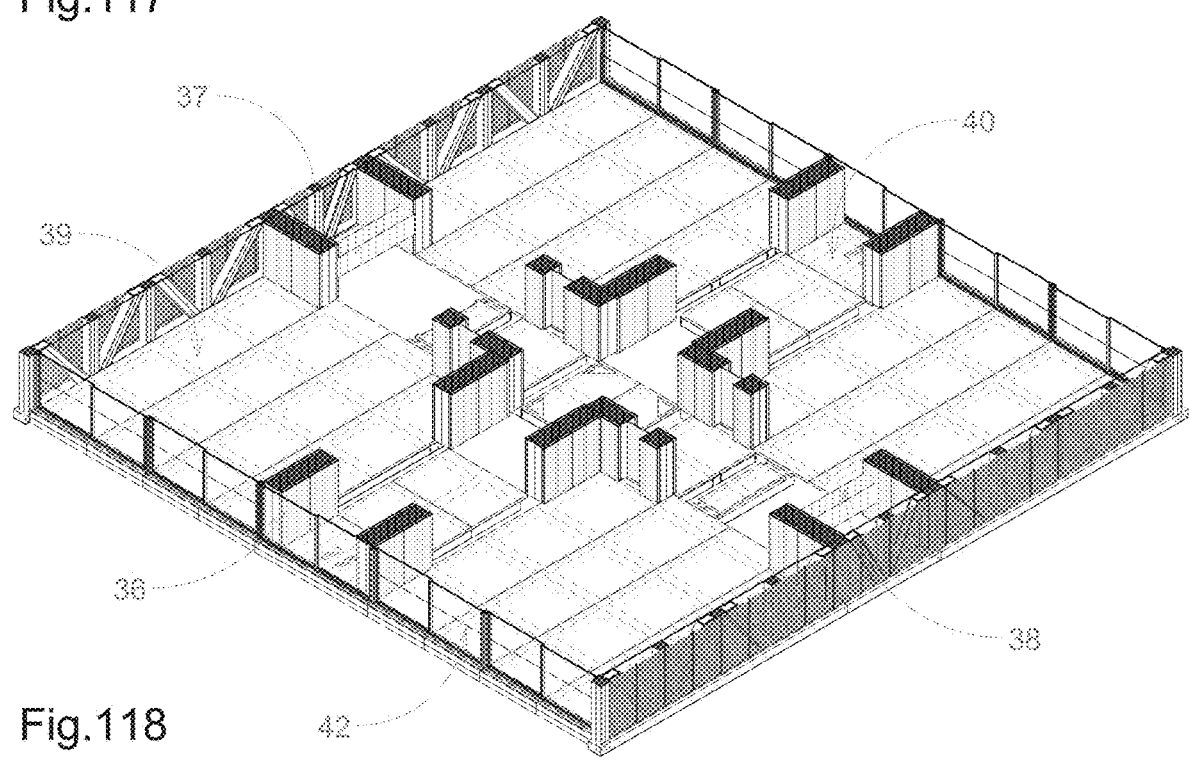


Fig.118

VERTICAL SELF-SUPPORTING FORMWORK BUILDING SYSTEM

BACKGROUND

[0001] There are various types of building systems. In general, the most common building systems cannot satisfy the demands of industrialization and the need of intelligent and smart construction.

[0002] One possible solution to the overall complexity and resource inefficiency issues of traditional construction is the use of prefabricated construction technologies. Generally, a prefabricated system includes a primary framing structure and a secondary closure of panels, assembled on-site. Although there have been certain improvements in prefabrication building construction systems, including panels, walls, buildings, methods of making building panels, methods of constructing walls, wall systems and buildings systems, there are still unmet needs and a wide field of developments of more efficient and ambitious systems. Prefabricated construction systems are increasingly common in single-family home building, but are virtually absent at a large scale in high-rise building. This is primarily due to the difficulty and complexity of structure and equipment, the cost of investing in building facilities, the risk of trying a new construction method, and the startup cost of research and development.

[0003] There is a need in the construction industry for the necessary improvements in lightweight building panels and systems to reach a high-rise building with a clear and simple system that attends the different needs of this typology. The present disclosure provides the art with a construction system that overcomes all the disadvantages of the previous systems and can fulfil the requirement of high-rise building.

SUMMARY

[0004] Some embodiments include a single, self-supporting and formwork panel, which behaves like temporary structure. The said formwork is to be concreted on-site and division of space at the same time. Thus, a standard building system contains various construction elements assembled on-site. Aspects of the disclosed subject matter include wall panel, slab panel, truss and window frame, that integrate all constructive elements needed: structural capacity (once the steel-frame formwork are poured with concrete), thermal and acoustic insulation, impermeability, and pre-installations in a very efficient and flexible manner.

[0005] Some embodiments include a system having modular panels for simplifying the constructions of buildings and/or interior spaces, as well as methods for using those panels to construct those buildings and/or interior spaces. In some embodiments, the panels include a number of functional layers to endow the panels with desired properties. In some embodiments, the panels provide for buildings and interior spaces with walls, floors, and ceilings. In some embodiments, the panels are configured to be lightweight for easier construction, assembly and concreting.

[0006] In some embodiments, the panels have an internal structure. In some embodiments, the panels are self-supporting during construction works. In some embodiments, the internal structure includes both horizontal and vertical components. In some embodiments, the internal structure include the structural corrugated steel bars attached to the formwork as a reinforcement for the in-site concrete. In

some embodiments, the internal structure profiles constitute the formwork for the concrete. In some embodiments, panels include the structural corrugated steel bars attached to the formwork. In some embodiments, panels are connectable to adjacent panels via the internal structure. In some embodiments, the internal structure includes extension areas configured to interface with adjacent panels. In some embodiments, panels include recessed areas for accepting the extensions of adjacent panels. In some embodiments, the internal structure includes longitudinal components. In some embodiments, the internal structure is comprised of C and U shaped profiles as temporary beams and joists. In some embodiments, internal structure components are combined with fasteners such as screws. In some embodiments, adjacent panels are combined with such fasteners.

[0007] In some embodiments, the components of the internal structure define interior space within each panel. In some embodiments, the functional layers are provided in the interior space. In some embodiments, the functional layers are a modular block sized to fit the interior spaces defined by the modular internal structure and an outer layer. In some embodiments, opposing profiles flanking functional layers are a modular block.

[0008] In some embodiments, wall panels include at least one outer layer forming a side of the panel. In some embodiments, the internal structure, comprised of C and U shaped profiles constituting the formwork for the concrete wall. In some embodiments, wall panels include the structural corrugated steel bars attached to the formwork. In some embodiments, wall panels include the structural corrugated steel bars attached to the formwork as a reinforcement for the in-site concrete. In some embodiments, wall panels include at least one acoustic insulation layer. In some embodiments, wall panels include at least one filler layer. In some embodiments, the filler layer is a thermal insulating layer. In some embodiments, the filler layer comprises expanded polystyrene (EPS). The thickness of the wall panels is of any desired size, and configured to connect to adjacent panels on at least one of a horizontal axis and a vertical axis. In some embodiments, the outer layer is connected directly to the internal structure. In some embodiments, an additional outer layer is provided on the side opposite the first outer layer of the wall panel. In some embodiments, wall panel includes openings.

[0009] In some embodiments, wall lintels include at least one outer layer forming a side of the panel. In some embodiments, the internal structure, comprised of C and U shaped profiles, constitute the formwork for the concrete wall. In some embodiments, wall lintels include the structural corrugated steel bars attached to the formwork. In some embodiments, wall lintels include at least one acoustic insulation layer. In some embodiments, wall lintels include at least one filler layer. In some embodiments, the filler layer is a thermal insulating layer. In some embodiments, the filler layer comprises expanded polystyrene (EPS). The thickness of the wall lintels is of any desired size, and configured to connect to adjacent panels. In some embodiments, the outer layer is connected directly to the internal structure. In some embodiments, an additional outer layer is provided on the side opposite the first outer layer of the wall lintel.

[0010] In some embodiments, floor and/or ceiling panels, referred to herein as "slab" panels, also include at least one outer layer, forming the side of the slab panel. In some embodiments, the internal structure, comprised of C/U

shaped profiles and the metal layer form the formwork for the concrete beams and joists. In some embodiments, the metal layer is a corrugated metal sheet. In some embodiments, wall slab include the structural corrugated steel bars attached to the formwork. In some embodiments, slab panels include at least one filler layer. In some embodiments, the filler layer is a thermal insulating layer. In some embodiments, slab panels include at least one acoustic insulation layer. In some embodiments, an additional outer layer is provided on the side opposite the first outer layer of the slab panel.

[0011] In some embodiments, truss panels, referred to herein as “truss”, include at least one outer layer forming a side of the truss. In some embodiments, the internal structure, comprised of C and U shaped profiles constituting the formwork for the concrete framing. In some embodiments, trusses include the structural corrugated steel bars attached to the formwork. In some embodiments, trusses include at least one acoustic insulation layer. In some embodiments, trusses include at least one filler layer. In some embodiments, the filler layer is a thermal insulating layer. The thickness of the truss is of any desired size, and configured to connect to adjacent panels. In some embodiments, the outer layer is connected directly to the internal structure. In some embodiments, an additional outer layer is provided on the side opposite the first outer layer of the truss panel. In some embodiments, the outer layer is a curtain wall system. In some embodiments, the curtain wall panel is an aluminum grid.

[0012] In some embodiments, window frame panel includes at least one functional layer. In some embodiments, the functional layer in the aforementioned window frame is a sliding window. In some embodiments, the functional layer is a fixed window. In some embodiments, the functional layer is a combination of sliding and fixed windows. In some embodiments, the sliding/fixed window has the function as acoustic and thermal insulation. In some embodiments, the internal structure of the aforementioned window frame is comprised of C and U shaped profiles filled with thermal and acoustic insulation. In some embodiments, the window frame is the enclosure element which satisfies the demand of natural illumination and ventilation. In some embodiments, the window frame is connected with adjacent wall panel, slab panel and truss panel.

[0013] The panels of the present disclosure can be manufactured on an assembly line and easily transported. The modular nature of the panels also enables advantageous quality control, cost reduction, waste reduction, improvement of working conditions for workers, use of specialized equipment, and reduction of construction times, complexity, and injury risk. Further, the panels provide for advantageous ductility and tolerances. The panels are assembled and concreted in phases. The assembling phases correspond to the logic of construction, being assembled by element and level.

[0014] The disclosure includes a plurality of elements which is capable to be prefabricated and hoisted on-site. The elements in current disclosure include but is not limited to the kitchen element, the double bathroom element, the bathroom and kitchen element, the bathroom and corridor element and the shaft closet element. All the elements in the disclosure have internal structure and are self-supporting. In some embodiment, the element is prefabricated with plumbing, electrical, mechanical fixture and furniture kit. In some

embodiment, the installation fixture and furniture kit are prefabricated in a modular manner.

[0015] In some embodiments, elements include different types of interior functional features of the building. In some embodiments, elements can be combined and arranged to generate different interior spaces. In some embodiments, elements are prefabricated with the necessary features to be connected between each other. In some embodiments, elements are prefabricated with the necessary features to be connected with the main building mechanical, piping and electrical features. In some embodiments, elements satisfy the comfort, ventilation and usability needs of the building.

[0016] The elements of the present disclosure can be manufactured on an assembly line and easily transported. The modular nature of the panels also enables advantageous quality control, cost reduction, waste reduction, improvement of working conditions for workers, use of specialized equipment, and reduction of construction times, complexity, and injury risk. Further, the panels provide for advantageous ductility and tolerances. The elements are assembled in phases. The assembling phases correspond to the logic of construction, being assembled by level and element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

[0018] FIG. 1 is a front elevation of the wall panel “Type 1”, showing the internal lightweight structure, the attached corrugated steel bars and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0019] FIG. 2 is a transversal section of the wall panel “Type 1”, consistent with some embodiments of the present disclosure;

[0020] FIG. 3 is a front elevation of the wall panel “Type 1”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0021] FIG. 4 is a top-view of the wall panel “Type 1”, showing the completed panel (internal lightweight structure, substructure and finishing), consistent with some embodiments of the present disclosure;

[0022] FIG. 5 is a plan-view cross-section of the wall panel “Type 1”, showing the completed panel (internal lightweight structure, corrugated steel rebars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0023] FIG. 6 illustrates an axonometric view of the wall panel “Type 1”, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0024] FIG. 7 illustrates an axonometric view of the wall panel “Type 1”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0025] FIG. 8 is a front elevation of the wall panel “Type 2”, showing the internal lightweight structure, the attached corrugated steel bars and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0026] FIG. 9 is a transversal section of the wall panel “Type 2”, consistent with some embodiments of the present disclosure;

[0027] FIG. 10 is a front elevation of the wall panel “Type 2”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0028] FIG. 11 is a top-view of the wall panel “Type 2”, showing the completed panel (internal lightweight structure, substructure and finishing), consistent with some embodiments of the present disclosure;

[0029] FIG. 12 is a plan-view cross-section of the wall panel “Type 2”, showing the completed panel (internal lightweight structure, corrugated steel rebars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0030] FIG. 13 illustrates an axonometric view of the wall panel “Type 2”, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0031] FIG. 14 illustrates an axonometric view of the wall panel “Type 2”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0032] FIG. 15 is a front elevation of the wall panel “Type 3”, showing the internal lightweight structure, the attached corrugated steel bars and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0033] FIG. 16 is a transversal section of the wall panel “Type 3”, consistent with some embodiments of the present disclosure;

[0034] FIG. 17 is a front elevation of the wall panel “Type 3”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0035] FIG. 18 is a top-view of the wall panel “Type 3”, showing the completed panel (internal lightweight structure, substructure and finishing), consistent with some embodiments of the present disclosure;

[0036] FIG. 19 is a plan-view cross-section of the wall panel “Type 3”, showing the completed panel (internal lightweight structure, corrugated steel rebars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0037] FIG. 20 illustrates an axonometric view of the wall panel “Type 3”, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0038] FIG. 21 illustrates an axonometric view of the wall panel “Type 3”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0039] FIG. 22 is a front elevation of the wall lintel, showing the internal lightweight structure, the attached corrugated steel bars and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0040] FIG. 23 is a transversal section of the wall lintel, consistent with some embodiments of the present disclosure;

[0041] FIG. 24 is a front elevation of the wall lintel, showing the finish panels, consistent with some embodiments of the present disclosure;

[0042] FIG. 25 is a top-view of the wall lintel, showing the completed panel (internal lightweight structure, substructure and finishing), consistent with some embodiments of the present disclosure;

[0043] FIG. 26 illustrates an axonometric view of the wall lintel, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0044] FIG. 27 illustrates an axonometric view of the wall lintel, showing the different exploded layers of the panel; consistent with some embodiments of the present disclosure;

[0045] FIG. 28 is a top view of the slab panel “Unit”, showing the internal lightweight structure and formwork constituted by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0046] FIG. 29 is an elevation view cross-section of the slab panel “Unit”, showing the completed panel with the different layers, consistent with some embodiments of the present disclosure;

[0047] FIG. 30 is a top view of the slab panel “Unit”, showing the completed slab including a corrugated steel sheet and the attached corrugated steel rebars, consistent with some embodiments of the present disclosure;

[0048] FIG. 31 is an elevation-view longitudinal-section of the slab panel “Unit”, showing the material layers and the internal structure, consistent with some embodiments of the present disclosure;

[0049] FIG. 32 illustrates an axonometric view of the slab panel “Unit”, showing the material layers and the internal prefabricated structure of steel profiles and corrugated steel bars, consistent with some embodiments of the present disclosure;

[0050] FIG. 33 illustrates an axonometric view of the slab panel “Unit”, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0051] FIG. 34 illustrates an axonometric view of the slab panel “Unit”, showing the exploded different layers of the panels; consistent with some embodiments of the present disclosure;

[0052] FIG. 35 is a top view of the slab panel “Core”, showing the internal lightweight structure and formwork constituted by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0053] FIG. 36 is an elevation view cross-section of the slab panel “Core”, showing the completed panel with the different layers, consistent with some embodiments of the present disclosure;

[0054] FIG. 37 is a top view of the slab panel “Core”, showing the completed slab including a corrugated steel sheet and the steel bars, consistent with some embodiments of the present disclosure;

[0055] FIG. 38 is an elevation-view longitudinal-section of the slab panel “Core”, showing the material layers and the internal structure, consistent with some embodiments of the present disclosure;

[0056] FIG. 39 illustrates an axonometric view of the slab panel “Core”, showing the material layers and the internal prefabricated structure of steel profiles and corrugated steel bars, consistent with some embodiments of the present disclosure;

[0057] FIG. 40 illustrates an axonometric view of the slab panel “Core”, showing the total volume of the panel, consistent with some embodiments of the present disclosure;

[0058] FIG. 41 illustrates an axonometric view of the slab panel “Core”, showing the exploded different layers of the panels; consistent with some embodiments of the present disclosure;

[0059] FIG. 42 is a front elevation of the truss “Type 1”, showing the internal lightweight structure and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0060] FIG. 43 is a transversal section of the truss “Type 1”, consistent with some embodiments of the present disclosure;

[0061] FIG. 44 is a front elevation of the truss “Type 1”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0062] FIG. 45 is a top-view of the truss “Type 1”, showing the completed element, consistent with some embodiments of the present disclosure;

[0063] FIG. 46 is a plan-view cross-section of the truss “Type 1”, showing the completed element (internal lightweight structure, corrugated steel bars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0064] FIG. 47 illustrates an axonometric view of the truss “Type 1”, showing the internal lightweight structure, corrugated steel bars and substructure, consistent with some embodiments of the present disclosure;

[0065] FIG. 48 illustrates an axonometric view of the truss “Type 1”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0066] FIG. 49 illustrates an axonometric view of the truss “Type 1”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0067] FIG. 50 is a front elevation of the truss “Type 2”, showing the internal lightweight structure and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0068] FIG. 51 is a transversal section of the truss “Type 2”, consistent with some embodiments of the present disclosure;

[0069] FIG. 52 is a front elevation of the truss “Type 2”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0070] FIG. 53 is a top-view of the truss “Type 2”, showing the completed element, consistent with some embodiments of the present disclosure;

[0071] FIG. 54 is a plan-view cross-section of the truss “Type 2”, showing the completed element (internal lightweight structure, steel bars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0072] FIG. 55 illustrates an axonometric view of the truss “Type 2”, showing the internal lightweight structure, steel bars and substructure, consistent with some embodiments of the present disclosure;

[0073] FIG. 56 illustrates an axonometric view of the truss “Type 2”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0074] FIG. 57 illustrates an axonometric view of the truss “Type 2”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0075] FIG. 58 is a front elevation of the truss “Type 3”, showing the internal lightweight structure and the internal substructure formed by cold-formed steel profiles, consistent with some embodiments of the present disclosure;

[0076] FIG. 59 is a transversal section of the truss “Type 3”, consistent with some embodiments of the present disclosure;

[0077] FIG. 60 is a front elevation of the truss “Type 3”, showing the finish panels, consistent with some embodiments of the present disclosure;

[0078] FIG. 61 is a top-view of the truss “Type 3”, showing the completed element, consistent with some embodiments of the present disclosure;

[0079] FIG. 62 is a plan-view cross-section of the truss “Type 3”, showing the completed element (internal lightweight structure, corrugated steel bars, substructure and finishing), consistent with some embodiments of the present disclosure;

[0080] FIG. 63 illustrates an axonometric view of the truss “Type 3”, showing the internal lightweight structure, steel bars and substructure, consistent with some embodiments of the present disclosure;

[0081] FIG. 64 illustrates an axonometric view of the truss “Type 3”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0082] FIG. 65 illustrates an axonometric view of the truss “Type 3”, showing the different exploded layers of the panels; consistent with some embodiments of the present disclosure;

[0083] FIG. 66 is a transversal section of the window frame “Type 1”, consistent with some embodiments of the present disclosure;

[0084] FIG. 67 is a front elevation of the window frame “Type 1”, showing the finish element, consistent with some embodiments of the present disclosure;

[0085] FIG. 68 is a plan-view cross-section of the window frame “Type 1”, showing the completed element, consistent with some embodiments of the present disclosure;

[0086] FIG. 69 illustrates an axonometric view of the window frame “Type 1”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0087] FIG. 70 illustrates an axonometric view of the window frame “Type 1”, showing the different exploded components of the element; consistent with some embodiments of the present disclosure;

[0088] FIG. 71 is a transversal section of the window frame “Type 2”, consistent with some embodiments of the present disclosure;

[0089] FIG. 72 is a front elevation of the window frame “Type 2”, showing the finish element, consistent with some embodiments of the present disclosure;

[0090] FIG. 73 is a plan-view cross-section of the window frame “Type 2”, showing the completed element, consistent with some embodiments of the present disclosure;

[0091] FIG. 74 illustrates an axonometric view of the window frame “Type 2”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0092] FIG. 75 illustrates an axonometric view of the window frame “Type 2”, showing the different exploded components of the element; consistent with some embodiments of the present disclosure;

[0093] FIG. 76 is a transversal section of the window frame “Type 3”, consistent with some embodiments of the present disclosure;

[0094] FIG. 77 is a front elevation of the window frame “Type 3”, showing the finish element, consistent with some embodiments of the present disclosure;

[0095] FIG. 78 is a plan-view cross-section of the window frame “Type 3”, showing the completed element, consistent with some embodiments of the present disclosure;

[0096] FIG. 79 illustrates an axonometric view of the window frame “Type 3”, showing the total volume of the element, consistent with some embodiments of the present disclosure;

[0097] FIG. 80 illustrates an axonometric view of the window frame “Type 3”, showing the different exploded components of the element; consistent with some embodiments of the present disclosure;

[0098] FIG. 81 is a transversal cross-section of the kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0099] FIG. 82 is a front elevation of kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0100] FIG. 83 is a plan-view cross-section of the kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0101] FIG. 84 illustrates an axonometric view of the completed kitchen element; consistent with some embodiments of the present disclosure;

[0102] FIG. 85 is a transversal cross-section of the double bathroom element, showing the completed element, consistent with some embodiments of the present disclosure;

[0103] FIG. 86 is a front elevation of the double bathroom element, showing the completed element, consistent with some embodiments of the present disclosure;

[0104] FIG. 87 is a plan-view cross-section of the double bathroom element, showing the completed element, consistent with some embodiments of the present disclosure;

[0105] FIG. 88 illustrates an axonometric view of the completed double bathroom element; consistent with some embodiments of the present disclosure;

[0106] FIG. 89 is a transversal cross-section of the bathroom and kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0107] FIG. 90 is a front elevation of the bathroom and kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0108] FIG. 91 is a plan-view cross-section of the bathroom and kitchen element, showing the completed element, consistent with some embodiments of the present disclosure;

[0109] FIG. 92 illustrates an axonometric view of the completed bathroom and kitchen element; consistent with some embodiments of the present disclosure;

[0110] FIG. 93 is a transversal cross-section of the bathroom and corridor element, showing the completed element, consistent with some embodiments of the present disclosure;

[0111] FIG. 94 is a front elevation of the bathroom and corridor element, showing the completed element, consistent with some embodiments of the present disclosure;

[0112] FIG. 95 is a plan-view cross-section of the bathroom and corridor element, showing the completed element, consistent with some embodiments of the present disclosure;

[0113] FIG. 96 illustrates an axonometric view of the completed bathroom and corridor element; consistent with some embodiments of the present disclosure;

[0114] FIG. 97 is a front elevation of shaft closet, showing the completed element, consistent with some embodiments of the present disclosure;

[0115] FIG. 98 is a plan-view cross-section of the shaft closet, showing the completed element, consistent with some embodiments of the present disclosure;

[0116] FIG. 99 illustrates an axonometric view of the completed shaft closet; consistent with some embodiments of the present disclosure;

[0117] FIG. 100 illustrates an axonometric view of the whole wall panels and wall lintels of a typical level of construction module “Type 1”, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0118] FIG. 101 illustrates an axonometric view of the whole wall panels and wall lintels of a typical level of construction module “Type 1”, with the addition of the slab panels of the level above, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0119] FIG. 102 illustrates an axonometric view of the whole slab panels of a typical level of construction module “Type 1”, with the addition of the wall panels and lintels of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0120] FIG. 103 illustrates an axonometric view of the whole slab panels and wall panels and lintels of a typical level of construction module “Type 1”, with the addition of the trusses of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0121] FIG. 104 illustrates an axonometric view of the whole level of the construction module “Type 1”, with all the different construction elements, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0122] FIG. 105 illustrates an axonometric view of the whole wall panels and wall lintels of a typical level of construction module “Type 2”, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0123] FIG. 106 illustrates an axonometric view of the whole wall panels and wall lintels of a typical level of construction module “Type 2”, with the addition of the slab panels of the level above, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0124] FIG. 107 illustrates an axonometric view of the whole slab panels of a typical level of construction module “Type 2”, with the addition of the wall panels and lintels of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0125] FIG. 108 illustrates an axonometric view of the whole slab panels and wall panels and lintels of a typical level of construction module “Type 2”, with the addition of the trusses of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0126] FIG. 109 illustrates an axonometric view of the whole double level of the construction module “Type 2”, with all the different construction elements, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0127] FIG. 110 illustrates an axonometric view of the whole single level of the construction module “Type 2”, with all the different construction elements, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0128] FIG. 111 illustrates an axonometric view of the whole wall panels and wall lintels of a typical level of construction module “Type 3”, with the addition of the slab panels of the level above, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0129] FIG. 112 illustrates an axonometric view of the whole slab panels of a typical level of construction module “Type 3”, with the addition of the wall panels and lintels of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0130] FIG. 113 illustrates an axonometric view of the whole slab panels and wall panels and lintels of a typical main level of construction module “Type 3”, with the addition of the trusses and the window frames of the same level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0131] FIG. 114 illustrates an axonometric view of the whole typical level of the construction module “Type 3”, with the addition of the slab panels of the mezzanine, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0132] FIG. 115 illustrates an axonometric view of the whole typical level of the construction module “Type 3”, with the addition of the wall panels of the second level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0133] FIG. 116 illustrates an axonometric view of the whole typical level of the construction module “Type 3”, with the addition of the trusses and the windows frames of the mezzanine level, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0134] FIG. 117 illustrates an axonometric view of the whole double level of the construction module “Type 3”, with all the different construction elements, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

[0135] FIG. 118 illustrates an axonometric view of the whole single level of the construction module “Type 3”, with all the different construction elements, showing the optimal application of the building system; consistent with some embodiments of the present disclosure;

DESCRIPTION

[0136] The standard building system of the present disclosure contains various construction elements assembled on-site, aspects of the disclosed subject matter include different categories of panels: three categories of wall panels, one category of wall lintel, two categories of slab panel, three categories of trusses and three categories of window frames.

[0137] The standard building system of the present disclosure contains various elements assembled on-site, aspects of the disclosed subject matter include different categories of elements: one category of kitchen element, one category of bathroom element, one category of shaft closet.

[0138] In some embodiments, a plurality of wall panels is provided as a kit wherein the plurality of the wall panels is of the same type. In some embodiments, a plurality of wall panels is provided as a kit, wherein wall panels come in a plurality of different types. In some embodiments, these

different types are complementary in denomination, i.e., the wall panels could come in three types: a type with a door opening, a type with a structural opening, and a type with a structural opening and a door opening. The size of each type of the wall panel is ultimately the decision of the user and depends upon the following non-limiting list of factors: human-scale, space quality, industrial sizes, and transportation margins.

[0139] Referring to FIG. 1, in some embodiments, the wall panels for use with the system of the present disclosure have internal structure configured to operate as a support skeleton. Referring to FIG. 1, in some embodiments, the main internal structure is comprised of columns 5 and 6 which is configured as the formwork of concrete. In some embodiments the secondary structure 10 referring to FIGS. 1 and the functional panels referring to FIGS. 2 integrate constructive elements needed such as steel frame, EPS/Rockwool 9 as thermal and acoustic insulation and cement board 8. In some embodiments, the panels are self-supporting during construction work. In some embodiments, the panels have a vertical crush resistance of at least 2000 pounds per linear foot; length of said wall panel when tested according to ASTM E72, and using a safety factor of 3. In some embodiments, the panels have a bending resistance when subjected to uniform loading in accord with ASTM E72 of up to 2000 pounds per square foot surface area.

[0140] As shown in FIGS. 3, 4, and 5, the internal structure component of the panels provides ample interior space between these components for the application of functional layers to endow each panel with not only structural stability, but desired properties derived from the composition of materials filling that space. In some embodiments, the panels can have different interior spaces based on the purpose of the panel and the needs of the system user. Some embodiments of interior spaces and functional layers 14 are discussed below in FIG. 7.

[0141] In some embodiments, panels are configured to be connected to other panels and/or a building foundation. In some embodiments, the connections are made via the internal structures of adjacent panels and via rebars. In some embodiments, the connection between the various panels and/or the connection between the panels and the foundation is reversible. In some embodiments, panels are connected directly to a foundation using any suitable means. In some embodiments, an interface is provided to stabilize the connection between a panel and the foundation. Referring to FIGS. 5 and 6, in some embodiments, U-profile 5 and C-profile 6 constitute the steel frame and act as the formwork for on-site concrete 13. In some embodiments the steel frame comprises rebars 12 that allow for connection with panels installed above them, as will be discussed in the construction process below. In some embodiments wall panels are connected with possible wall lintel 38. In some embodiments wall panels are connected with possible slab panel unit 39 or slab panel core 40. In some embodiments panels are connected with possible facade element such as the truss 41 or the window frame 42.

[0142] Referring again to FIGS. 4-5, the wall panel includes at least two side boards. In some embodiments, side boards are disposed on opposing sides of the interior space of wall panel. In some embodiments, side boards are comprised of at least one of wood, cement, fiber cement, drywall, suitable metal sheets, and the like. In some embodiments, the thickness of side boards is approximately 0.5-1 inches.

[0143] In some embodiments, wall panels includes fireproof board. In some embodiments, the thickness of fireproof board is designed to comply with the relevant fire codes applicable to the building. Increasing the thickness of fireproof board can increase the fire resistance of the layer. By way of example, a 30 mm fireproof board may be fire resistant for about 90 minutes, while a 40 mm fireproof board may be fire resistant for about 120 minutes. In some embodiments, fireproof board is comprised of any suitable fireproof or fire resistant material. In some embodiments, fireproof board is comprised of calcium silicate. In some embodiments, the secondary structure 10, the EPS/Rockwool 9 and the cement board 8 cover fireproof board. In some embodiments, opposing fireproof boards enclose the main structural formwork 13 of the panel. In some embodiments, the internal structure is connected to the fireproof board. In some embodiments a U-shaped profile 3 is framing on the top of cement board 8 and fireproof board and another U-shaped profile 3 is fastened on the bottom of above-mentioned cement board 8 and fireproof board as baseboard.

[0144] In some embodiments, wall panel further includes at least one acoustic insulation layer (such as Rockwool). In some embodiments, the thickness and composition of Rockwool are configured to provide the desired level of sound insulation to wall panel. In some embodiments, the thickness of Rockwool is approximately 45-50 mm (2 inch) in each side. In some embodiments, the Rockwool is filled in the inner space of substructure 10.

[0145] In some embodiments, wall panel further includes EPS layer 9. In some embodiments, the density of EPS layer 9 is approximately 25-35 kg/m³. In some embodiments, the EPS layer is filled in the inner space of the substructure 10.

[0146] The overall thickness of wall panel is the summation of at least the layers described in the above paragraphs. In some embodiments, the overall thickness of wall panel is adapted according to local needs, such as climate conditions, building codes, constructions budget, and the like. In some embodiments, the total thickness of wall panel is approximately 31¼ inches. In some embodiments, this thickness includes the internal structure. In some embodiments, the main internal structure is disposed between fireproof dry panels and the substructure is disposed between fireproof dry panel and the cement board 8.

[0147] In some embodiments, the wall panels have internal structure. In some embodiments, the internal structure includes a main structure and a substructure. In some embodiments, the main structure comprises some profiles such as U profile 1. In some embodiments, the main structure serves as formwork of on-site concrete 11. In some embodiments, a plurality of prefabricated rebars 12 is contained in the formwork for the possible connection to the upper panels. In some embodiments, the distance between two sides of the formwork 13 is 24 inches. In some embodiments, the wall panels have a structural door opening of 3 feet in width and 7 feet in height. In some embodiments, the wall panels have a structural opening of 16 feet in width and 7 feet in height.

[0148] In some embodiments, the formwork 13 is held and fastened by two substructures on both side. In some embodiments, EPS/Rockwool 9, fireproof dry panels and any other functional layer disposed between are held between profiles such as U-profiles 3 and C-profiles 4 from FIG. 7. In some embodiments, these profiles form substructure of panel. In

some embodiments, the horizontal distance between two profiles in the substructure is 2 feet. In some embodiments, the profiles in substructure along with the functional layers held there between define a functional layer block that can be stacked with other functional layer blocks to fill the interior space of a panel. In some embodiments, two functional layer blocks are attached on both side of the structural formwork 13.

[0149] Referring to FIGS. 8-14, the wall panels “Type 2” have similarities in internal structure, layers and differences in the structural opening and in the finished dimensions. In some embodiments, the internal structure of wall comprises profiles which form the main structural formwork 13. In some embodiments, substructures with functional layers are installed on both side of formwork 13 like the wall panel “Type 1”. In some embodiments, the components and order of functional layers in the wall panels “Type 2” are the same as those in wall panels “Type 1”.

[0150] Referring to FIGS. 15-21, the wall panels “Type 3” have similarities in internal structure, layers and differences in the structural opening and in the finished dimensions. In some embodiments, the internal structure of wall comprises profiles which form the main structural formwork 13. In some embodiments, substructures with functional layers are installed on both side of formwork 13 like the wall panel “Type 1”. In some embodiments, the components and order of functional layers in the wall panels “Type 2” are the same as those in wall panels “Type 1”.

[0151] Referring to FIGS. 22-27, the wall lintel has similarities in internal structure, layers and differences in the structural dimensions. In some embodiments, the internal structure of wall comprises profiles which form the main structural formwork 13. In some embodiments, substructures with functional layers are installed on both side of formwork 13 like the wall panel “Type 1”. In some embodiments, the components and order of functional layers in the wall lintel are the same as those in wall panels “Type 1”.

[0152] In some embodiments, a plurality of slab panels is provided as a kit wherein each of slab panels has different size. In some embodiments, these different shapes are complementary in position, i.e., one slab panel could be used in the core while others in living unit. Each type provides openings for installation tubes, piping and space for equipment. In some embodiments, the slab panel used in the building system in this disclose consist of 2 types: Slab panel Unit and Slab panel Core.

[0153] In some embodiments, slab panels Unit are approximately 8 feet in width and approximately 32 feet in length. The size of slab panel is ultimately the decision of the user and depends upon the following non-limiting list of factors: structure feasibility, building code, human-scale, space possibility, industrial sizes, and transportation margins. In some embodiments, slab panel Unit includes at least one side board and two 6 mm cement boards. In some embodiments, the slab panels have steel frame as seen in FIG. 28. In some embodiments, the steel frame includes an internal structure which are formed by steel profiles groups 15 which have a C profile 2 jammed in a U-profile 1. In some embodiment, the internal structure is divided into four modules part. In some embodiment a U-profile 7 are connected on the periphery of the internal structure as the bottom of formwork for on-site concrete beam 18. In some embodiment a transversal U-profile 1 are connected between two parts as bottom of formwork for on-site concreting

beam 18. Referring to FIG. 29-31, in some embodiment, a plurality of metal corrugated sheet 15 are fixed upon the internal structure served as the formwork of on-site concrete floor. In some embodiments, metal corrugated sheet 16 has a thickness of approximately 2-3 inches (54 mm). In some embodiment at least two cement board 17 are attached in the bottom of the internal structure as compound ceiling. In some embodiments, the two cement board layer 17 has a thickness of approximately ½ inch. Further functional layer is allowable to add in the compound ceiling. Referring to FIG. 32-34, in some embodiment, the steel rebars could be attached on the slab panel and concreted with the internal structure and profiles in-between. In some embodiment, the steel rebars in the slab panel could fasten with the rebars on wall panel. In some embodiments, the rebars could be concreted on either side. In some embodiments, concrete could cover the metal corrugated sheet 16, the side rebars of slab panel and the top rebars of wall panel as a whole.

[0154] Referring to FIG. 35-41, in some embodiments, slab panel Core have a similar steel frame and functional layers as slab panel Unit. In some embodiments, the slab panel Core are approximately 8' in width and approximately 12' 4" in length. In some embodiment, the internal structure of slab panel Core is formed with the same steel profiles group 15, whereas the slab panel core only has two modules. In some embodiment, on the both lateral side, a U profile 7 are connected with the internal structure frame serving as the bottom of on-site concreting beam, whereas on the transversal side there is no profiles serving as bottom as formwork. In some embodiment, the slab panel Core are assembled between two wall panel, where the frame on transversal side is fixed with the adjacent wall panel and serve part of formwork of concreting the wall.

[0155] Referring to FIGS. 42-49, in some embodiments, the truss "Type 1" for use with the system of the present disclosure have internal structure configured to operate as a support skeleton. Referring to FIG. 42, in some embodiments, the main internal structure is comprised of U-profiles 1 and C-profiles 2 which is configured as the formwork of concrete 27. In some embodiments the secondary structure 24 referring to FIG. 42 and the functional panels referring to FIG. 44 integrate constructive elements needed such as steel frame, exterior curtain wall system 21 with aluminum grid panel. In some embodiments, the trusses are self-supporting during construction work. In some embodiments, the panels have a vertical crush resistance of at least 2000 pounds per linear foot; length of said wall panel when tested according to ASTM E72, and using a safety factor of 3. In some embodiments, the trusses have a bending resistance when subjected to uniform loading in accord with ASTM E72 of up to 2000 pounds per square foot surface area.

[0156] As shown in FIGS. 42-46, the internal structure component of the trusses provides ample interior space between these components for the application of functional layers to endow each panel with not only structural stability, but desired properties derived from the composition of materials filling that space. In some embodiments, the panels can have different interior spaces based on the purpose of the panel and the needs of the system user. Some embodiments of interior spaces and functional layers 28 are discussed below in FIG. 47.

[0157] In some embodiments, trusses are configured to be connected to other panels. In some embodiments, the connections are made via the internal structures of adjacent

panels and via rebars. In some embodiments, the connection is configured to be between the various trusses and slab panels. Referring to FIGS. 47 and 48, in some embodiments, U-profile 1 and C-profile 2 constitute the steel frame and act as the formwork 27 for on-site concrete 25. In some embodiments the steel frame comprises rebars that allow for connection with slab panels installed above them, as will be discussed in the construction process below. In some embodiments truss panels are connected with possible wall panel 35, 36. In some embodiments truss panels are connected with possible slab panel unit 39 or slab panel core 40. In some embodiments panels are connected with possible facade element such as window frame 42.

[0158] Referring again to FIGS. 47-49, the truss panel includes at least a sandwich layer. In some embodiments, sandwich layer is disposed on exterior sides of the interior space of truss panel. In some embodiments, sandwich layer comprised of at least one of wood, cement, fiber cement, drywall, suitable metal sheets.

[0159] In some embodiments, wall panel further includes EPS layer 23. In some embodiments, the thickness of EPS is approximately 90 mm (3½ inch). In some embodiments, the density of EPS layer 23 is approximately 25-35 kg/m³. In some embodiments, the EPS layer is filled in the inner space of the substructure 24.

[0160] In some embodiments, truss panel further includes an exterior curtain wall system disposed on exterior sides. In some embodiments, curtain wall system comprised of at least one suitable metal sheets and aluminum metal grid panel.

[0161] The overall thickness of truss panel is the summation of at least the layers described in the above paragraphs. In some embodiments, the overall thickness of wall panel is adapted according to local needs, such as climate conditions, building codes, constructions budget, and the like.

[0162] In some embodiments, the wall panels have internal structure. In some embodiments, the internal structure includes a main structure and a substructure. In some embodiments, the main structure comprises columns, beams and diagonals. In some embodiments, columns, beams and diagonals serve as block separation formwork of on-site concrete 25. In some embodiments, a plurality of prefabricated rebars 26 is contained in the formwork for the possible connection to the other elements.

[0163] In some embodiments, the formwork is composed by columns, beams and diagonals. In some embodiments, columns, beams and diagonals are composed by U-profile 1 and C-profile 2.

[0164] Referring to FIGS. 50-57, the truss "Type 2" has similarities in internal structure, layers and differences in the structural dimensions and in the dimension of the structural elements. In some embodiments, the internal structure of truss comprises columns and profile which forms the main structural formwork 27. In some embodiments, substructures with functional layers are installed on both side of formwork 27 like the truss "Type 1". In some embodiments, the components and order of functional layers in the truss "Type 2" are the same as those in trusses "Type 1".

[0165] Referring to FIGS. 58-65, the truss "Type 3" has similarities in internal structure, layers and differences in the structural dimensions and in the dimension of the structural elements. In some embodiments, the internal structure of truss comprises columns and profile which forms the main structural formwork 27. In some embodiments, substructure

tures with functional layers are installed on both side of formwork 27 like the truss “Type 1”. In some embodiments, the components and order of functional layers in the truss “Type 3” are the same as those in truss “Type 1”.

[0166] Referring to FIG. 66-70, the window frame panels “Type 1” for use with the system of the present disclosure have internal structure configured to operate as a support skeleton. In some embodiments, the main internal structure is comprised of prefabricated U-profiles and C-profiles group 32 as column in both side, U-profiles and C-profiles group 33 as column in the middle and U-profiles and C-profiles group 31 as beams in the top and bottom. In some embodiments, sliding windows can be fixed in the structural frame.

[0167] Referring to FIG. 71-75, the window frame panels “Type 2” for use with the system of the present disclosure have similarities with the window frame panel “Type 1”. In some embodiments, window frame panel “Type 2” has differences in dimensions with the window frame panel “Type 1”. In some embodiments, the window frame panels “Type 2” have internal structure configured to operate as a support skeleton. In some embodiments, the main internal structure is comprised of prefabricated U-profiles and C-profiles group 32 as column in both side, U-profiles and C-profiles group 33 as column in the middle and U-profiles and C-profiles group 31 as beams in the top and bottom. In some embodiments, sliding windows can be fixed in the structural frame.

[0168] Referring to FIG. 76-80, the window frame panels “Type 3” for use with the system of the present disclosure have similarities with the window frame panel “Type 1”. In some embodiments, window frame panel “Type 3” has differences in dimensions with the window frame panel “Type 1”. In some embodiments, the window frame panels “Type 3” have internal structure configured to operate as a support skeleton. In some embodiments, the main internal structure is comprised of prefabricated U-profiles and C-profiles group 32 as column in both side, U-profiles and C-profiles group 33 as column in the middle and U-profiles and C-profiles group 31 as beams in the top and bottom. In some embodiments, sliding windows can be fixed in the structural frame.

[0169] In some embodiments, the window frame is fixed to the structural truss. In some embodiments, the window frame is fixed to the unit slab. In some embodiments, the window frame is fixed to the wall panels.

[0170] Referring to FIGS. 81-83, kitchen elements should be installed inside the structural opening of walls panels. In some embodiments, kitchen elements are prefabricated with all the various modular furniture elements 50. In some embodiments, kitchen elements are prefabricated with all the needed piping 45 and plumbing fixtures 47. In some embodiments, kitchen elements are prefabricated with all the needed electrical fixtures 48 and connection. In some embodiments, kitchen elements are prefabricated with all the needed mechanical equipments 49 and connecting duct 46. In some embodiments, all the needed piping 45 and electrical equipment and fixtures 48 are integrated inside the functional layer 43.

[0171] Referring to FIGS. 85-88, double bathroom elements should be installed between the structural opening of walls panels. In some embodiments, double bathroom elements are prefabricated with all the needed piping 45 and plumbing fixtures 47. In some embodiments, double bath-

room elements are prefabricated with all the needed electrical fixtures 48 and connection. In some embodiments, double bathroom elements are prefabricated with all the needed mechanical equipments 49 and connecting duct 46. In some embodiments, all the needed piping 45 and electrical equipment and fixtures 48 are integrated inside the functional layer 43.

[0172] Referring to FIGS. 89-92, bathroom and kitchen elements should be installed between the structural opening of walls panels. In some embodiments, bathroom and kitchen elements are integrated with a plurality of functions such as bathroom and kitchen. In some embodiments, bathroom and kitchen elements are prefabricated with all the various modular furniture elements 50. In some embodiments, bathroom and kitchen elements are prefabricated with all the needed piping 45 and plumbing fixtures 47. In some embodiments, bathroom and kitchen elements are prefabricated with all the needed mechanical equipments 49 and connecting duct 46. In some embodiments, all the needed piping 45 and electrical equipment and fixtures 48 are integrated inside the functional layer 43.

[0173] Referring to FIGS. 93-96, bathroom and corridor elements should be installed between the structural opening of walls panels. In some embodiments, bathroom and corridor elements are integrated with a plurality of functions such as bathroom and corridor. In some embodiments, bathroom and kitchen elements are prefabricated with all the various modular furniture elements 50. In some embodiments, bathroom and corridor elements are prefabricated with all the needed piping 45 and plumbing fixtures 47. In some embodiments, bathroom and corridor elements are prefabricated with all the needed electrical fixtures 48 and connection. In some embodiments, bathroom and corridor elements are prefabricated with all the needed mechanical equipments 49 and connecting duct 46. In some embodiments, all the needed piping 45 and electrical equipment and fixtures 48 are integrated inside the functional layer 43.

[0174] Referring to FIGS. 97-99, shaft closet elements should be installed between the structural opening of walls panels. In some embodiments, shaft closet elements are prefabricated with all the various furniture elements. In some embodiments, shaft closet elements are prefabricated with all the needed piping fixtures and connections. In some embodiments, shaft closet elements are prefabricated with all the needed electrical fixtures and connection. In some embodiments, shaft closet elements are prefabricated with all the needed mechanical fixtures and connections.

[0175] In some embodiments, internal elements are prefabricated to be connected with each other. In some embodiments, elements are prefabricated to be connected with the building vertical piping.

[0176] Referring now to FIGS. 100-104, in the construction module “Type 1”, wall panels, wall lintel, slab panel and truss panels are connected via rebars and other connections. In some embodiments, vertical rebars in the all the element panels are connected to horizontal rebars from other element panels. In some embodiments, on-site concrete unifies the rebars on different panels and the entirety. In some embodiments, on-site concrete acts as the finishing layer of the floor.

[0177] In some embodiments, the present disclosure is directed to a method of assembling modular panels to produce a building or interior space. In some embodiments,

the modular panels are self-supporting, so individual panels can be installed one at a time and remain in place while adjacent panels are installed until a desired size and shape of the building or interior space is completed. FIG. 104 portray exemplary processes for connecting panels in the construction module “Type 1” consistent with some embodiments of the present disclosure and as discussed above.

[0178] Once wall panels, lintel panels, slab panels, truss panels and window frames arrive at a building site, wall panels are first installed on a foundation. Referring to FIG. 101, wall lintels for the wall connections would then be installed in many positions generating a continuity between wall panels. Referring to FIG. 102, slab panels for the ground floor would then be installed at the top of the installed wall panels. Referring to FIG. 103, truss panels for the facade would then be installed at the end of the installed wall panels. Slab panels for the floors would then be installed at the top of the installed wall, lintel and truss panels. In some embodiments, prefabricated groups of rebars connect wall, lintel, truss and slab panels. In some embodiments, concrete on site connects the panels into a whole. In some embodiments, any gaps at the joints between wall, lintel, truss and slab panels are filled with polyurethane foam spray, which is fast-solidifying and has thermal insulation properties. Windows frame for the facade would be installed at the top of the concrete slab panels. In some embodiments, window frames does not have structural connection with other panels. In some embodiments, gaps between adjoining panels and/or window frames are stuck with adhesive. In some embodiments, construction of subsequent floors of a building begins after the underlying floor has settled. In some embodiments, the second floor is formed by installing panels on the internal structures of the previous floor. Upper floors are subsequently constructed in a similar manner.

[0179] Referring now to FIGS. 105-110, in the construction module “Type 2”, wall panels, wall lintel, slab panel and truss panels are connected via rebars and other connections. In some embodiments, vertical rebars in the all the element panels are connected to horizontal rebars from other element panels. In some embodiments, on-site concrete unifies the rebars on different panels and the entirety. In some embodiments, on-site concrete acts as the finishing layer of the floor.

[0180] In some embodiments, the present disclosure is directed to a method of assembling modular panels to produce a building or interior space. In some embodiments, the modular panels are self-supporting, so individual panels can be installed one at a time and remain in place while adjacent panels are installed until a desired size and shape of the building or interior space is completed. FIGS. 109-110 portray exemplary processes for connecting panels in the construction module “Type 2” consistent with some embodiments of the present disclosure and as discussed above.

[0181] Once wall panels, lintel panels, slab panels, truss panels and window frames arrive at a building site, wall panels are first installed on a foundation. Referring to FIG. 105, wall lintels for the wall connections would then be installed in many positions generating a continuity between wall panels. Referring to FIG. 106, slab panels for the ground floor would then be installed at the top of the installed wall panels. Referring to FIG. 107, wall panels would then be installed at the top of the installed slab panels. Referring to FIG. 108, truss panels for the facade would then be installed at the end of the installed wall panels. Slab

panels for the floors would then be installed at the top of the installed wall, lintel and truss panels. In some embodiments, prefabricated groups of rebars connect wall, lintel, truss and slab panels. In some embodiments, concrete on site connects the panels into a whole. In some embodiments, any gaps at the joints between wall, lintel, truss and slab panels are filled with polyurethane foam spray, which is fast-solidifying and has thermal insulation properties. Windows frame for the facade would be installed at the top of the concrete slab panels. In some embodiments, window frames does not have structural connection with other panels. In some embodiments, gaps between adjoining panels and/or window frames are stuck with adhesive. In some embodiments, construction of subsequent floors of a building begins after the underlying floor has settled. In some embodiments, the second floor is formed by installing panels on the internal structures of the previous floor. Upper floors are subsequently constructed in a similar manner.

[0182] Referring now to FIGS. 111-118, in the construction module “Type 3”, wall panels, wall lintel, slab panel and truss panels are connected via rebars and other connections. In some embodiments, vertical rebars in the all the element panels are connected to horizontal rebars from other element panels. In some embodiments, on-site concrete unifies the rebars on different panels and the entirety. In some embodiments, on-site concrete acts as the finishing layer of the floor.

[0183] In some embodiments, the present disclosure is directed to a method of assembling modular panels to produce a building or interior space. In some embodiments, the modular panels are self-supporting, so individual panels can be installed one at a time and remain in place while adjacent panels are installed until a desired size and shape of the building or interior space is completed. FIGS. 117-118 portray exemplary processes for connecting panels in the construction module “Type 3” consistent with some embodiments of the present disclosure and as discussed above.

[0184] Once wall panels, lintel panels, slab panels, truss panels and window frames arrive at a building site, wall panels are first installed on a foundation. Referring to FIG. 111, wall lintels for the wall connections would then be installed in many positions generating a continuity between wall panels. Referring to FIG. 112, slab panels for the ground floor would then be installed at the top of the installed wall panels. Referring to FIG. 113, wall panels would then be installed at the top of the installed slab panels. Referring to FIG. 114, truss panels for the facade would then be installed at the end of the installed wall panels. Slab panels for the floors would then be installed at the top of the installed wall, lintel and truss panels. In some embodiments, prefabricated groups of rebars connect wall, lintel, truss and slab panels. In some embodiments, concrete on site connects the panels into a whole. In some embodiments, any gaps at the joints between wall, lintel, truss and slab panels are filled with polyurethane foam spray, which is fast-solidifying and has thermal insulation properties. Windows frame for the facade would be installed at the top of the concrete slab panels. In some embodiments, window frames does not have structural connection with other panels. In some embodiments, gaps between adjoining panels and/or window frames are stuck with adhesive. In some embodiments, construction of subsequent floors of a building begins after the underlying floor has settled. In some embodiments, the second floor is formed by installing panels on the internal

structures of the previous floor. Upper floors are subsequently constructed in a similar manner.

[0185] In some embodiments, a plurality of elements are provided as a kit wherein the plurality of the elements are of the same type. In some embodiments, a plurality of elements are provided as a kit, wherein wall panels come in a plurality of different types. In some embodiments, these different types are complementary in denomination, i.e., the elements could come in three types: a kitchen type, a bathroom type and a shaft closet type. The size of each type of the elements is ultimately the decision of the user and depends upon the following non-limiting list of factors: human-scale, space quality, industrial sizes, and transportation margins.

1. A system for constructing buildings and interior spaces comprising:

- at least one wall panel including a wall internal structure, at least one side layer, and at least one functional wall layer;
- at least one wall lintel including a lintel internal structure, at least one side layer, and at least one functional wall layer;
- at least one slab panel including a slab internal structure, at least one side layer, and at least one functional slab layer;
- at least one truss panel including a truss internal structure, at least one side layer, and at least one functional wall layer;
- at least one window frame including a frame structure and at least one sliding window;
- at least one interior element including a prefabricated structure and at least a bathroom;
- at least one interior element including a prefabricated structure and at least a kitchen;
- at least one interior element including a prefabricated structure and at least a corridor;
- at least one interior element including a prefabricated structure and at least a shaft closet;
- wherein said internal wall, lintel, slab and truss structures are configured to connect adjacent panels, and at least wall and slab panel are temporarily self-supporting during assembly; wherein said interior elements are configured to connect to adjacent structure and to each other.

2. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one functional wall layer positioned in an interior space, defined by said internal wall structure.

3. The system for constructing buildings and interior spaces according to claim 2, wherein at least one wall panel further includes a formwork and interior structural rebars to be concreted.

4. The system for constructing buildings and interior spaces according to claim 2, wherein at least one functional wall layer includes at least one of either a fireproof layer, an acoustic insulation layer, a waterproof layer, or combinations thereof.

5. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one functional wall layer positioned in an interior space, defined by said internal lintel structure.

6. The system for constructing buildings and interior spaces according to claim 5, wherein at least one wall lintel further includes a formwork and interior structural rebars to be concreted.

7. The system for constructing buildings and interior spaces according to claim 5, wherein at least one functional wall layer includes at least one of either a fireproof layer, an acoustic insulation layer, a filler layer, a rockwool layer, a waterproof layer, or combinations thereof.

8. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one functional slab layer, positioned in an interior space and defined by said slab's internal structure.

9. The system for constructing buildings and interior spaces according to claim 8, wherein at least one slab panel further includes a formwork and interior structural rebars to be concreted.

10. The system for constructing buildings and interior spaces according to claim 8, wherein at least one functional slab layer includes at least one of either a fireproof layer, an acoustic insulation layer, a filler layer, a metal layer, a rockwool layer, a waterproof layer, or combinations thereof.

11. The system for constructing buildings and interior spaces according to claim 8, further including opposing profiles, wherein at least one functional wall and slab layer is disposed between said opposing profiles, to provide a modular functional layer block.

12. The system for constructing buildings and interior spaces according to claim 11, wherein said opposing profiles are components of said internal structure.

13. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one functional layer positioned in an interior space, defined by said internal truss structure.

14. The system for constructing buildings and interior spaces according to claim 13, wherein at least one truss further includes a formwork and interior structural rebars to be concreted.

15. The system for constructing buildings and interior spaces according to claim 13, wherein at least one functional wall layer includes at least one of either a fireproof layer, an acoustic insulation layer, a filler layer, a rockwool layer, a waterproof layer, or combinations thereof.

16. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one window frame, includes an internal structure formed by cold-formed steel profiles.

17. The system for constructing buildings and interior spaces according to claim 16, wherein at least one sliding window.

18. The system for constructing buildings and interior spaces according to claim 1, further comprising at least one interior element, positioned in an interior space and defined by said interior element structure.

19. The system for constructing buildings and interior spaces according to claim 18, wherein at least one interior element includes at least one of either a kitchen, a bathroom, a corridor, a shaft closet, or combinations thereof.

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