



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.06.2024 Bulletin 2024/26

(21) Application number: **23217499.5**

(22) Date of filing: **18.12.2023**

(51) International Patent Classification (IPC):
E04B 1/02 (2006.01) E04B 1/14 (2006.01)
E04B 1/61 (2006.01) E04B 1/70 (2006.01)
E04B 5/02 (2006.01) E04B 5/04 (2006.01)
E04B 5/08 (2006.01) E04B 5/10 (2006.01)
E04B 5/12 (2006.01)

(52) Cooperative Patent Classification (CPC):
E04B 1/14; E04B 1/6187; E04B 1/7069;
E04B 5/023; E04B 5/04; E04B 5/08; E04B 5/10;
E04B 5/12; E04B 1/04; E04B 1/08; E04B 1/10;
E04B 2001/6195

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **19.12.2022 IT 202200025908**

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(54) **PREFABRICATED STRUCTURAL PANEL, MANUFACTURING METHOD AND STRUCTURAL SYSTEM**

(57) A prefabricated structural panel (1) for making an industrialized structural construction system (2), in particular panels for civilian buildings, wherein said prefabricated panel (1) defines a vertical or horizontal panel plane (3) with a peripheral edge (4) for the connections (16), comprises

a load-bearing frame (5) made either of concrete or steel or wood extending substantially coplanar to the panel plane (3), wherein the load-bearing frame (5) defines at least one through opening (6) in a direction transverse to the panel plane (3), wherein the prefabricated panel (1) comprises at least one blind (7) or glass (12) filling layer housed in the load-bearing frame (5) so as to close at least one through opening (6), wherein the prefabricated panel (1) is completed in the fashion of an assembly line with a plurality of layers made of different materials assembled on both sides of the load-bearing frame (5) and the filling layer (7), in particular

on the inner side of the filling element (7), a covering layer (9) fixed to metal profiles (8) defines the gap (10) for the circulation of air between the filling layer (7) and the covering layers (9), while

on the outer side of the load-bearing frame (5) and the filling element (7), opposite to the covering layer (9), one or more layers (13) of isolating materials create the thermal and acoustic insulation of the prefabricated panel (1), everything thus being manufactured in a factory or on site; the prefabricated panels (1) are transported to the

construction site to be assembled by means of a geometric interlocking coupling (16) and form housing units such as apartments, detached houses, and/or building projects with no limitations or restrictions.

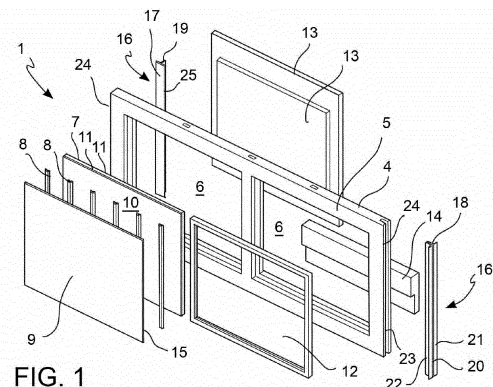


FIG. 1

Description

Field of the invention

[0001] The present invention relates to the standardization of a construction system mainly based on a "*pre-fabricated structural panel*" for building which can be used as a wall and as a slab when assembled with a series a different materials, thus performing seismic, thermal, hygrometric, and acoustic functions.

[0002] In particular, the invention relates to a prefabricated structural frame to be used in civilian, commercial or industrial buildings, which forms outer and inner walls and slabs when assembled with an accurate manufacturing method in the fashion of an assembly line.

[0003] Specifically, the present invention relates to a completely industrialized construction system which can be used to build any housing type and/or building project without limitations or restrictions when preassembled in a factory or on site.

Backaround art

[0004] Multilayer wall panels are known, for example, from CH699149B1, EP0921243A2, EP1273729A2, US6625948 B2, EP1892350A2 and PCT/IB2018/058161 to the same inventor.

Solution

[0005] It is the object of the present invention to provide a standard structural system comprising a single prefabricated panel made either of concrete or steel or wood which can generate different types of panels, walls or slabs according to the position it takes in the project and according to the application of layers of different materials such as to meet the following assumptions:

- increasing the industrialization level of the manufactured items;
- increasing the industrialization level of the materials;
- scheduling labor through production programs;
- creating a warehouse of materials and semi-finished products;
- facilitating the creation of certified housings in compliance with seismic, phonic, and acoustic safety legislation;
- providing an anti-seismic structure;
- creating an air flow in the gaps of the structures to eliminate moisture, impure air, and gas such as radon, for example, which are among the main causes of the lack of living comfort and deterioration of the structures;
- reducing construction times and costs;
- keeping the intervention and sales prices of housings constant;
- building certified housings;
- increasing the benefits for the operator.

[0006] These and other objects are achieved by the standard prefabricated structural panel with its layers and assembly methods according to independent claim 1.

[0007] The dependent claims relate to preferred and advantageous embodiments of the present invention.

Drawings

[0008] In order to better understand the invention and appreciate the advantages thereof, some non-limiting exemplary embodiments thereof will be described below with reference to the accompanying drawings, in which:

- Figure 1 is an exploded perspective view of a prefabricated panel, according to an embodiment of the invention;
- Figure 2 is an exploded perspective view of a prefabricated panel, according to an embodiment of the invention;
- Figure 3 is a front view of a component of a prefabricated panel, according to an embodiment of the invention;
- Figure 3A is a cross-section view of the component in Figure 3;
- Figure 3B is a longitudinal section view of the component in Figure 3;
- Figure 4 is a front view of a component of a prefabricated panel, according to an embodiment of the invention;
- Figure 4A is a cross-section view of the component in Figure 4;
- Figure 4B is a longitudinal section view of the component in Figure 4;
- Figure 5 is a front view of a component of a prefabricated panel, according to an embodiment of the invention;
- Figure 5A is a cross-section view of the component in Figure 5;
- Figure 5B is a longitudinal section view of the component in Figure 5;
- Figure 6 is a cross-section view of a component of a prefabricated panel, according to an embodiment of the invention;
- Figure 6 is a cross-section view of a component of a prefabricated panel, according to a further embodiment of the invention;
- Figure 6B is a cross-section view of a component of a prefabricated panel, according to a further embodiment of the invention;
- Figure 7 is a cross-section view of a prefabricated panel, according to an embodiment of the invention;
- Figure 7A is a cross-section view of a prefabricated panel, according to a further embodiment of the invention;
- Figure 7B is a cross-section view of a prefabricated panel, according to a further embodiment of the invention;
- Figure 8 is an upper view of a structural system, ac-

- cording to an embodiment of the invention;
- Figure 9 is a view of a structural system, according to a further embodiment of the invention;
- Figure 9A is a cross-section view of the structural system in Figure 9;
- Figure 9B is a longitudinal section view of the structural system in Figure 9;
- Figure 10 is a detail view of a structural system, according to an embodiment;
- Figure 10 is a detail view of a structural system, according to a further embodiment;
- Figure 10B is a detail view of a structural system, according to a further embodiment;
- Figure 11 is a detail view of a structural system, according to an embodiment;
- Figure 11A is a detail view of a structural system, according to a further embodiment;
- Figure 11B is a detail view of a structural system, according to a further embodiment;
- Figure 12 is a detail view of a structural system, according to an embodiment;
- Figure 12A is a detail view of a structural system, according to an embodiment;
- Figure 12B is a detail view of a structural system, according to an embodiment;
- Figure 13 is a detail view of a structural system, according to an embodiment;
- Figure 13A is a detail view of a structural system, according to an embodiment;
- Figure 13B is a detail view of a structural system, according to an embodiment;
- Figure 14 is a detail view of a structural system, according to an embodiment;
- Figure 14A is a detail view of a structural system, according to an embodiment;
- Figure 14B is a detail view of a structural system, according to an embodiment;
- Figure 15 is a detail view of a structural system, according to an embodiment;
- Figure 16 is a further detail view, according to an embodiment;
- Figure 17 is a view of a component of a structural system, according to an embodiment;
- Figure 17A is a view of a component of a structural system, according to an embodiment;
- Figure 17B is a view of a component of a structural system, according to an embodiment;
- Figure 17C is a view of a component of a structural system, according to an embodiment;
- Figure 17D is a front view of the component in Figure 17;
- Figure 17E is a front view of the component in Figure 17A;
- Figure 17F is a front view of the component in Figure 17B;
- Figure 17G is a front view of the component in Figure 17C;
- Figure 18 is a view of a component of a prefabricated

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- panel, according to an embodiment;
- Figure 18A is a cross-section view of the component in Figure 18;
- Figure 18B is a longitudinal section view of the component in Figure 18;
- Figure 18C is a detail view of a cross section of the component in Figure 18;
- Figure 19 is an upper view of a structural system, according to an embodiment;
- Figure 19A is a detail view of a structural system, according to a further embodiment;
- Figure 20 is a perspective view of a component of a structural system, according to an embodiment;
- Figure 21 is an exploded view of the component in Figure 20;
- Figure 22 is a perspective view of a component of a structural system, according to an embodiment;
- Figure 23 is an exploded view of the component in Figure 22.

Description of some preferred embodiments

Prefabricated panel 1

[0009] With reference to the drawings, a prefabricated panel is generally indicated by reference numeral 1 and can be made of concrete, steel, or wood.

[0010] The prefabricated panel 1 is adapted to make a structural construction system (2), in particular a building.

[0011] The prefabricated panel 1 defines a vertical or horizontal panel plane 3 with a peripheral edge 4.

[0012] The prefabricated panel 1 comprises a load-bearing frame 5 defining at least one through opening 6 extending through the load-bearing frame 5 in a direction transverse to the panel plane 3.

[0013] Moreover, the prefabricated panel 1 comprises at least one filling layer 7 housed in the load-bearing frame 5 so as to close at least one through opening 6.

[0014] The prefabricated panel 1 comprises a covering layer 9 positioned opposite to the filling layer 7.

[0015] The filling layer 7 and the covering layer 9 are spaced apart from each other in a direction transverse to the panel plane 3 so as to mutually define a gap 10 which is substantially parallel to the panel plane 3.

[0016] The prefabricated panel 1 comprises a plurality of metal profiles 8 positioned in gap 10 and interposed between the filling layer 7 and the covering layer 9.

[0017] Advantageously, gap 10 allows a circulation of air over the whole prefabricated panel 1 and over the whole structural system 2 formed by prefabricated panels 1. Such an air circulation is particularly advantageous for eliminating moisture, impure air and gas, e.g., radon, which are among the main causes of the lack of living comfort and deterioration of the structures.

[0018] Further advantageously, the thus-configured prefabricated panel 1 is usable both as a vertical wall of a structural system 2 and as a slab of a structural system

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[0019] Further advantageously, the thus-configured prefabricated panel 1 is easily standardizable and industrializable for the production of structures 2 in series and allows reducing the construction times and costs, as well as increasing the thermal-hygrometric protection performance of the panel and the structural system, and increasing the versatility of construction of structural systems, in particular housings, with reference to the dimensions, number of floors, and distribution of the indoor spaces. Indeed, the standardization of the components of the prefabricated panel 1 and the structural system 2 allows forming a warehouse stock to be used at any time and thus reducing the purchase costs of the materials.

[0020] Further advantageously, the prefabricated panel 1 allows, in the filling element 7, the passage of ducts and electric cables to form the housing system network without driving holes or making channels in the coverings and/or structural frames.

[0021] Preferably, the through opening 6 is rectangular in shape.

[0022] According to an embodiment of the walls, the metal profiles 8 are preferably Omega-shaped and are positioned parallel and spaced apart from one another (Fig. 1).

[0023] According to an embodiment of the possible false ceilings of the slabs, the metal profiles 8 are positioned according to a grid configuration comprising metal profiles 8 intersected with one another (Fig. 2).

[0024] According to an embodiment, the metal profiles 8 are profiles made of perforated sheet having a thickness of 1.5 mm.

[0025] According to an embodiment, the filling layer 7 is formed by at least three filling sheets 11 stacked in a direction transverse to the panel plane 3, including at least one inner filling sheet 11 and two opposite outer sheets 11.

[0026] Moreover, at least two of the three filling sheets 11 are formed by panels made of high strength compacted phenolic or marine wood.

[0027] According to an embodiment, the filling layer 7 formed by/on the three layers 11 has a thickness between 80 mm and 120 mm.

[0028] According to an embodiment, the filling layer 7 is fixed to the load-bearing frame 5 by means of threaded connections by means of screws, bolts or dowels, for example, or by gluing, for example by means of bicomponent glues, or by means of a combination thereof.

[0029] Advantageously, the thus-configured filling layer 7 increases the solidity and stability of the load-bearing frame 5 to which it is connected, and therefore of the whole prefabricated panel 1, especially when used as a slab.

[0030] Further advantageously, the filling layer 7 is the element on which to make the systems for the sanitary apparatuses such as sinks, toilets, bidets, showers, sink drains, and/or electrical panels or furnishing components such as wardrobes, bookcases.

[0031] According to an embodiment, the load-bearing frame 5 preferably has two through openings 6 extending through the load-bearing frame 5 in a direction transverse to the panel plane 3.

5 **[0032]** The two through openings 6 are separate from each other.

[0033] Moreover, the prefabricated panel 1, used as a wall, with the two openings 6 thereof, can comprise a blind filling layer 7 and a glass filling element 12, or two blind filling layers 7, housed in the load-bearing frame 5 so that the blind 7 and glass 12 filling layers, or the two blind ones, close the two through openings 6.

10 **[0034]** Alternatively, the prefabricated panel 1, used as a slab, comprises two blind filling layers 7 housed in the load-bearing frame 5 so that each filling layer 7 closes a respective through opening 6.

15 **[0035]** According to an embodiment, the covering layer 9 comprises at least two covering sheets 15 fixed to each other in a direction transverse to the panel plane 3.

20 **[0036]** According to an embodiment of the walls, the two covering sheets 15 are formed from two different materials, respectively, preferably fiber cement panels and plasterboard sheets.

[0037] According to an embodiment, the plasterboard covering sheet 15 optionally forms the false ceiling of a prefabricated panel 1 used as a slab.

25 **[0038]** According to an embodiment, the visible surface of the covering layer 9 opposite to the load-bearing frame 5 is trimmed and painted, or can be covered as desired with wallpaper or decorative wood panels, for example.

30 **[0039]** According to an embodiment, the load-bearing frame 5 is formed from concrete (Fig. 3) or steel (Fig. 4) or laminated wood (Fig. 5), or a combination thereof.

35 **[0040]** According to an embodiment, the load-bearing frame 5 is made as a one-piece body.

[0041] Advantageously, the load-bearing frame 5 performs the load-bearing, support, and stability function of the prefabricated panel 1.

40 **[0042]** According to an embodiment, the prefabricated panel 1 comprises one or more layers 13 of isolating material.

[0043] The isolating layers 13 are connected to the load-bearing frame 5, opposite to the covering layer 9.

45 **[0044]** The isolating layers 13 are configured to provide the thermal and acoustic insulation of the prefabricated panel 1.

[0045] Therefore, the layers 13 act as a thermal cladding for the structural system 2 comprising the prefabricated panel 1.

50 **[0046]** According to an embodiment, the isolating layers 13 are formed from self-extinguishing expanded polystyrene ("EPS") or rock wool or wood fiber or cork or polystyrene, for example, or a combination thereof.

55 **[0047]** According to an embodiment, the isolating layer 13 has a thickness between 100 mm and 200 mm.

[0048] According to an embodiment, the isolating layer 13 is reinforced with a plasticized mesh, trimmed and

painted with quartz paint.

[0049] According to an embodiment, the isolating layer 13 can be reinforced or supported with marine wood panels or plumed wood panels 14.

[0050] According to an embodiment, the isolating layer support 14 has a thickness between 16 mm and 20 mm; a commercially-made vapor barrier sheet optionally can be applied to support 14.

[0051] According to an embodiment, the isolating layer support 14 is fixed to the load-bearing frame 5 by means of a threaded connection by means of screws, bolts or dowels, for example, or by gluing, for example by means of bicomponent glues, or by means of a combination thereof.

[0052] According to an embodiment, when used as a slab, a waterproofing cladding sheet preferably made of polymeric material is applied to the prefabricated panel 1.

[0053] Advantageously, the waterproofing cladding sheet is configured to prevent the passage of any water from an upper floor to a lower floor.

[0054] According to an embodiment, when used as a slab, the prefabricated panel 1 comprises a raised technical floor or a floating parquet. According to a further embodiment, the prefabricated panel 1 comprises a layer of screed or mortar suitable for gluing tiles.

Structural system 2

[0055] According to a further aspect of the invention, a structural system 2 comprises at least two prefabricated panels 1 connected to each other by means of a connection system 16.

[0056] According to an embodiment, the connection system 16 is positioned interposed between two prefabricated panels 1.

[0057] According to an embodiment, the connection system 16 comprises a first connection element 17 and a second connection element 18.

[0058] The first connection element 17 is connected to one of the two prefabricated panels 1, while the second connection element 18 is connected to the other one of the two prefabricated panels 1.

[0059] The first connection element 17 and the second connection element 18 are connected to each other by means of geometric coupling.

[0060] According to an embodiment, the first connection element 17 is preferably T-shaped, varying in thickness, size, and length.

[0061] The second connection element 18 is preferably Omega-shaped with recess 20 varying in thickness, size, and length to promote interlocking 21.

[0062] The housing cavity 21 is open towards the insertion portion 19 of the connection element 17.

[0063] In connected configuration, the insertion portion 19 is inserted into the housing cavity 21.

[0064] According to an embodiment, the first connection element 17 and the second connection element 18 have a height substantially equal to the height of the load-

bearing frame 5.

[0065] According to an embodiment, the peripheral edge 4 of each prefabricated panel 1 of the structural system 2 comprises at least one edge side 24 facing another prefabricated panel 1.

[0066] According to an embodiment, the first connection element 17 and the second connection element 18 are positioned at the respective edge sides 24 of two respective connected prefabricated panels 1.

[0067] According to an embodiment, the longitudinal groove 23 extends along the whole length of the edge side 24.

[0068] Preferably, the second connection element 18 is fixed in the longitudinal groove 23 by embedding when the prefabricated panel 1 is made of concrete, welded when made of steel and screwed when made of wood.

[0069] Specifically, the two guide walls 22 are inserted into the longitudinal groove 23.

[0070] According to an embodiment, the insertion portion 19 and the housing portion 20 both define at least one fixing through hole 26.

[0071] Specifically, the insertion portion 19 and the housing portion 20 are configured so that when the insertion portion 19 is completely inserted into the housing portion 20, the fixing hole 26 of the insertion portion 19 is aligned with the housing holes 20.

[0072] According to this embodiment, the connection system 16 comprises a fixing member 27.

[0073] The fixing member 27 is configured to be inserted into the fixing holes 26 of the insertion portion 19 and the housing portion 20 so as to fix the first connection element 17 to the second connection element 18.

[0074] According to an embodiment, the first connection element 17, the second connection element 18 and the load-bearing frame 5 define a plurality of fixing holes 26 and through holes 28 at the side edge 24 of the load-bearing frame 5.

[0075] Advantageously, the thus-configured connection system 16 allows connecting at least two prefabricated panels 1 with a straight angle or in parallel so that the two prefabricated panels 1 extend substantially along a same panel plane 3 (**Figures 11, 15, 16**).

[0076] According to an embodiment, the connection system 16 comprises a spacer element 29 configured to be interposed between two prefabricated panels 1 connected to each other along the same panel plane 3 so as to define a seat for the housing of the third prefabricated panel 1.

[0077] According to this embodiment, the structural system 2 comprises at least three prefabricated panels 1, two prefabricated panels 1 of which connected to each other along a same panel plane 3 and a third prefabricated panel 1 interlocked between the two prefabricated panels 1, thus forming a three-dimensional node substantially representing a lower wall, a floor slab and an upper wall (**Figures 12-14 and 20-23**).

[0078] According to an embodiment, the spacer element 29 is a section bar preferably having a rectangular

or square section.

[0079] According to an embodiment, the third prefabricated panel 1 is positioned to abut against the spacer element 29.

[0080] According to an embodiment, the spacer element 29 is fixed to the third prefabricated panel 1 by means of a threaded connection.

[0081] Specifically, the spacer element 29 is positioned to abut against the base walls 25 of the two connection elements 17, opposite to the two second connection elements 18.

[0082] According to an embodiment, the spacer element 29 is connected to the two first connection elements 17 by means of a threaded connection.

[0083] According to an embodiment, the structural system 2 is formed by at least six prefabricated panels 1 connected to one another, four prefabricated panels 1 of which connected to one another at an angle and forming the vertical walls of the structural system 2, and two further prefabricated panels 1 connected to each other in parallel and forming the treading slab of the structural system 2 (**Figures 8, 9**).

[0084] According to an embodiment, the structural system 2 has at least one structural compensating element placed in the center of the two prefabricated panels 1, which acts as a bracing and structural reinforcement for higher structural stability needs than standard ones (**Figures 10, 10A and 10B**).

[0085] According to an embodiment, the structural system 2 comprises a plurality of prefabricated panels 1 so as to form housing units or accommodations starting from two rooms (**Figures 19 and 19A**).

Standardized and industrialized manufacturing method

[0086] According to a further aspect of the invention, a method of manufacturing a prefabricated panel 1 provides for a warehouse stock of all the components of the system, in particular:

- load-bearing frames 5 made of concrete, steel or wood;
- blind filling elements 7;
- glass elements 12 or single elements such as windows to be inserted into the filling elements 7;
- connections 16 obtained from metal profiles or press-formed sheet which are perforated and welded at a height equal to the prefabricated panel 1;
- arrangement of the covering elements 9, preferably fiber cement sheets and plasterboard sheets 15;
- arrangement of the insulation 13;
- arrangement of the fixing accessories, materials for the indoor covering finishes 9 and/or outer isolating panels 13.

[0087] According to an embodiment, the method includes positioning each load-bearing frame 5 in vertical position on a movable device equipped with wheels.

[0088] The movable device equipped with wheels is configured to move, preferably translate, each load-bearing frame 5 through different working stations so as to apply the various layers or components to the load-bearing frame 5, thus starting the assembly steps, in particular:

- arranging the load-bearing frames 5 on the special movable trolleys placed on tracks;
- connecting the filling layer 7 to the load-bearing frame 5;
- fixing the connection devices 16;
- connecting the plurality of metal profiles 8 to the filling layer 7;
- connecting a covering layer 9 to the plurality of metal profiles 8 so as to define a gap 10 between the filling layer 7 and the covering layer 9;
- then applying one or more isolating layers 13, optionally resting on a wood support 14 fixed to the load-bearing frame 5;
- applying a surface finish to the covering layer 9;
- applying the various plaster layers with mesh on the isolating material 13 to finish the outer surface of the prefabricated panel 1 (exterior cladding);

[0089] Obviously, those skilled in the art will be able to make changes or adaptations to the present invention, without however departing from the scope of the following claims.

Reference numerals

[0090]

1. Prefabricated panel
2. Structural system
3. Panel plane
4. Peripheral edge
5. Load-bearing frame
6. Through opening
7. Filling layer
8. Tubular profiles
9. Covering layer
10. Gap
11. Filling sheets
12. Glass filling element
13. Isolating layer
14. Isolating layer support
15. Covering sheets
16. Connection system
17. First connection element
18. Second connection element
19. Insertion portion
20. Housing portion
21. Housing cavity
22. Guide walls
23. Longitudinal groove
24. Edge side

- 25. Base wall
- 26. Fixing hole
- 27. Fixing member
- 28. Through hole
- 29. Spacer element

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Claims

1. A standard prefabricated panel (1), made of concrete or steel or wood, provided with a structural system (2) for constructing civilian buildings, wherein said prefabricated panel (1) defines a vertical or horizontal panel plane (3) with a peripheral edge (4) arranged for the structural connections (16), and with at least one through opening (6) in a direction transverse to the panel plane (3), and comprises

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at least one filling layer (7) housed in the load-bearing frame (5) so as to close the at least one through opening (6), where on one side a plurality of metal profiles (8) forming a gap (10) substantially parallel to the panel plane (3) and a covering (9) opposite to the filling layer (7) are positioned, which are fastened to the metal profiles (8), while on the other side of the prefabricated panel (1) a considerable isolating mass (13) finished with colored plaster completes the structure of the prefabricated panel (1).

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2. A prefabricated panel (1) according to claim 1, wherein the filling layer (7) comprises at least three mutually compacted and stacked wood panels (11) placed in a direction transverse to the panel plane (3), wherein at least two of the panels are made of phenolic or marine wood forming a thickness between 80 mm and 120 mm. The thus-composed filling element 7 is fixed to the load-bearing frame (5) by means of a threaded connection or by gluing with bicomponent glues, or by means of a combination thereof.

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3. A prefabricated panel (1) according to any one of the preceding claims, wherein the load-bearing frame (5) defines two mutually distinct through openings (6) extending through the load-bearing frame (5) in a direction transverse to the panel plane (3),

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wherein, when used as an outer wall, the prefabricated panel (1) can comprise two blind filling layers (7), or one blind filling element (7) and one glass filling element (12), or two glass filling elements (12) housed in the load-bearing frame (5) so that the filling layers (7) and (12) close the through openings (6), or

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when the prefabricated panel (1) is used as a slab, it comprises two blind filling layers (7) housed in the load-bearing frame (5) so that each filling layer (7) closes a respective through opening (6).

4. A prefabricated panel (1) according to any one of the preceding claims, wherein the covering layer (9) is formed by at least two covering sheets (15) fixed to each other and with the profiles (8), in a direction transverse to the panel plane (3), wherein the two covering sheets (15) are formed from two different materials, optionally a sheet of fiber cement panels, while the other is formed from plasterboard, respectively. The covering sheet (9) facing away from the visible load-bearing frame (5) is trimmed and optionally painted.

5. A prefabricated panel (1) according to any one of the preceding claims, wherein the load-bearing frame (5) is formed from concrete or steel or lamellar wood, and is made as a one-piece body.

6. A prefabricated panel (1) according to any one of the preceding claims, comprising an isolating layer (13) connected to the load-bearing frame (5), opposite to the covering layer (9),

wherein the isolating layer (13) is configured to provide an outer thermal and acoustic insulation of the prefabricated panel (1), and wherein, optionally, the isolating layer (13) is formed from expanded polystyrene or rock wool or wood fiber or cork or polystyrene, or a combination thereof, and/or wherein the isolating layer (13) has a thickness between 100 mm and 200 mm, and/or wherein the isolating layer (13) is reinforced with a plasticized, trimmed and painted mesh.

7. A prefabricated panel (1) according to claim 6, optionally comprising an isolating layer support (14) interposed between the load-bearing frame (5) and the isolating layer (13), wherein the isolating layer support (14) is configured to connect the isolating layer (13) to the load-bearing frame (5),

wherein, optionally, the isolating layer support (14) is formed by panels made of compacted marine or plumbed wood.

8. A prefabricated panel (1) according to any one of the preceding claims, used as a slab, has a waterproofing cladding sheet hot glued onto the filling element (7) as a base support, and comprises a raised technical floor or a floating parquet or a cement mortar screed to accommodate the gluing of tiles.

9. A structural system (2), consisting of at least two prefabricated panels (1) connected to each other by means of a connection system (16), wherein the connection system (16) is interposed between two prefabricated panels (1).

10. A structural system (2) according to claim 9, comprising a first connection element (17) and a second connection element (18),

wherein the first connection element (17) is connected to one of the two prefabricated panels (1), while the second connection element (18) is connected to the other of the two prefabricated panels (1),

wherein the first connection element (17) and the second connection element (18) are connected to each other by means of a geometric interlocking coupling.

11. A structural system (2) according to claim 10, wherein the insertion portion (19) and the housing portion (20) both define at least one fixing hole (26), wherein the connection system (16) comprises a fixing member (27) configured to be inserted into the fixing holes (26) of the insertion portion (19) and the housing portion (20), so as to fix the first connection element (17) to the second connection element (18), and, preferably, the fixing holes (26) are threaded and the fixing member (27) is a threaded member configured to be screwed into the threaded fixing holes (26), such as a screw or a bolt, for example.

12. A structural system (2) according to claim 11, wherein the connection system (16) comprises a support and/or spacer element (29), wherein the structural system (2) consists of an intersection of at least three prefabricated panels (1), two prefabricated panels (1) of which connected to each other along the same panel plane (3), vertical for example, and a third prefabricated panel (1) connected opposite or horizontal to the two prefabricated panels (1), wherein the spacer element (29) defines the seat, support, interlocking and fixing of the three panels by means of a threaded connection, the spacer element (29) being a section bar, preferably having a rectangular or square section.

13. A structural system (2) according to any one of the preceding claims, formed by at least six prefabricated panels (1) connected to one another, four prefabricated panels (1) of which connected to one another at an angle and forming the vertical walls of the structural system (2), and two further prefabricated panels (1) connected to each other in parallel and forming the treading slab of the structural system (2).

14. A standard prefabricated panel (1), made of concrete

or steel or wood, provided with a structural system (2) for constructing civilian buildings, wherein said prefabricated panel (1) is industrially obtained by:

- producing in series a plurality of load-bearing frames (5) to be stored in a warehouse;
- producing in series a plurality of connections (16) to be stored in a warehouse;
- producing in series a plurality of blind (12) or glass (7) filling layers to be stored in a warehouse;
- arranging in a warehouse a plurality of layers (8, 9, 13, 14) made of different materials to complete the prefabricated panel (1)

so as to:

- position each load-bearing frame (5) in vertical position;
- connect each filling layer (7 and 12) to each load-bearing frame (5);
- then connect the plurality of tubular profiles (8) to each filling layer (7), respectively;
- then fix the covering layers (9) to the metal profiles (8);
- fix the various isolating layers (13) to the respective load-bearing frame (5) and filler layer (7), reinforce the isolating layer (13) with a plasticized, trimmed and painted mesh;
- optionally, apply a surface finish to the covering layer (9).

The prefabricated panel (1) is ready for transport and construction site assembly.

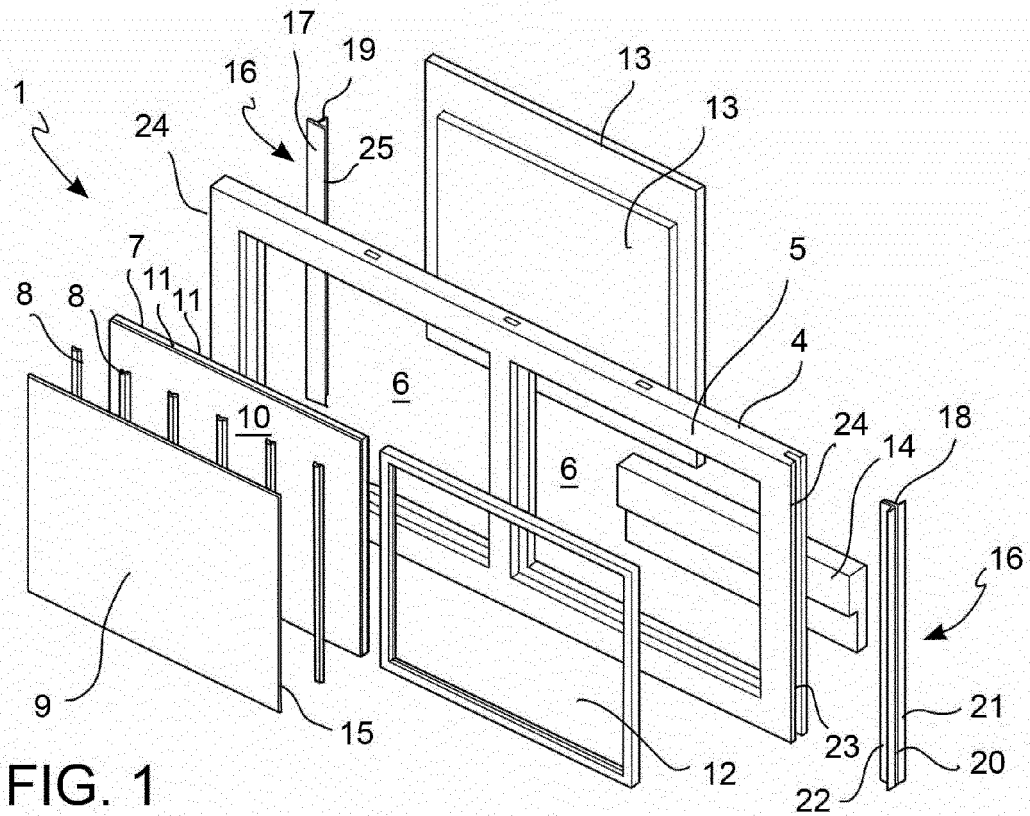


FIG. 1

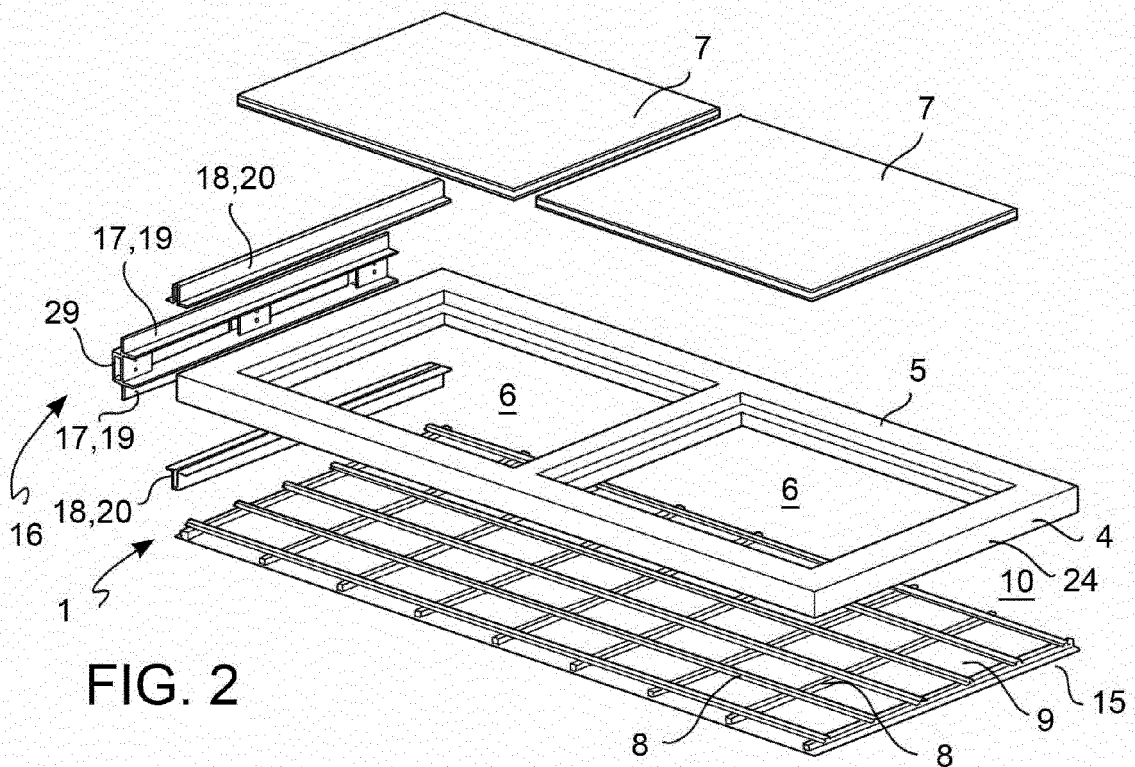


FIG. 2

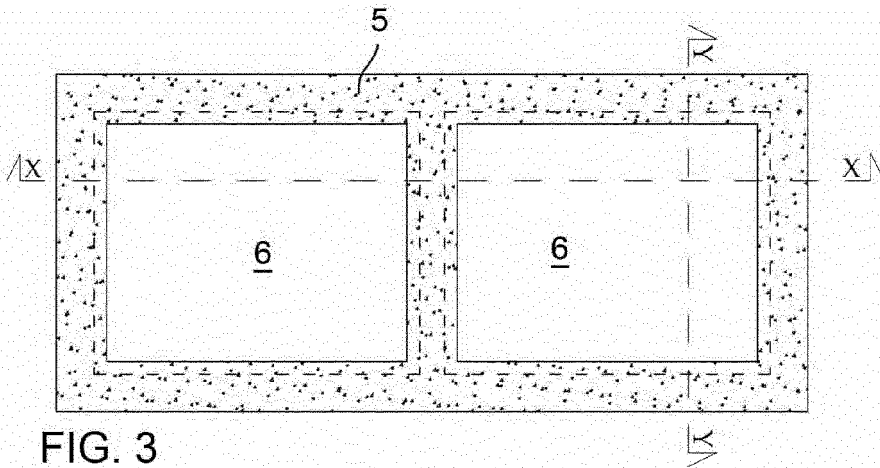


FIG. 3

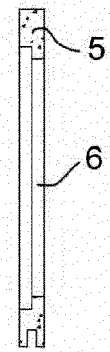


FIG. 3A

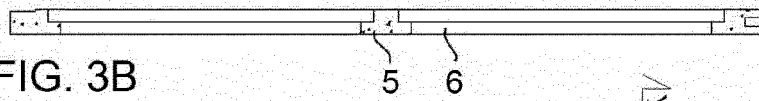


FIG. 3B

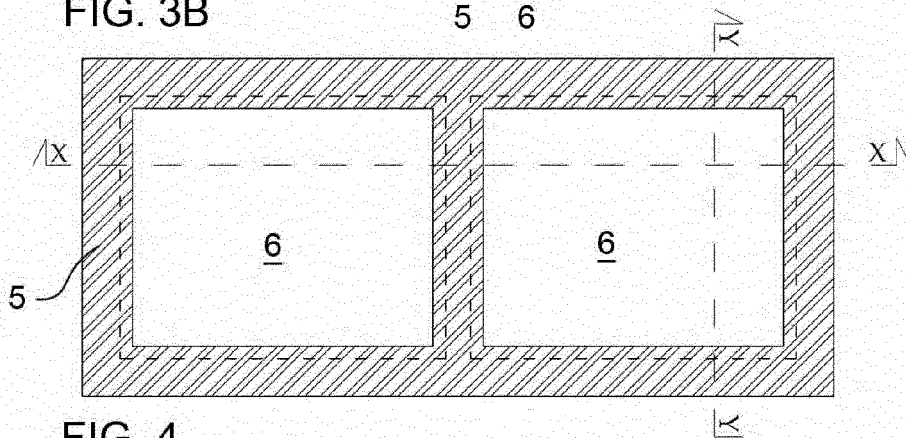


FIG. 4

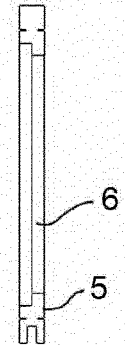


FIG. 4A

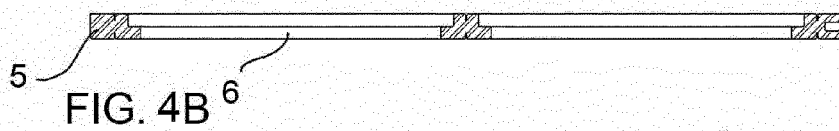


FIG. 4B

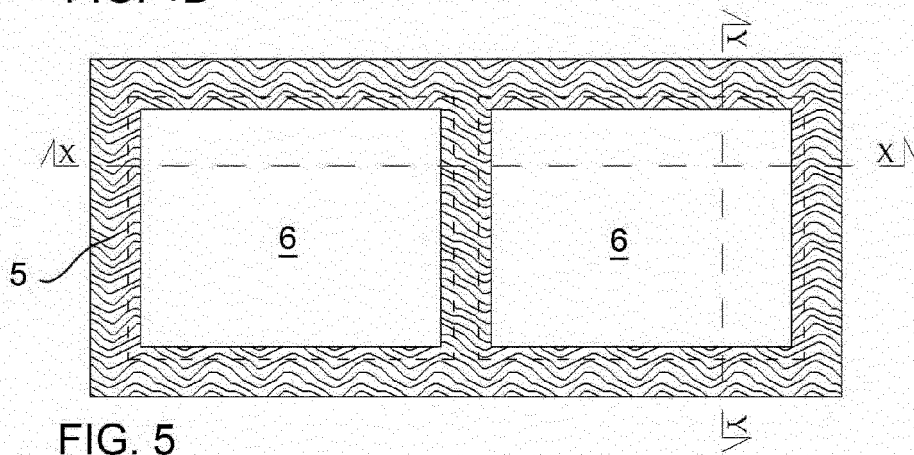


FIG. 5

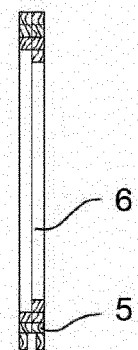


FIG. 5A

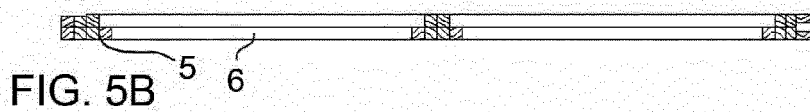


FIG. 5B



FIG. 6



FIG. 6A

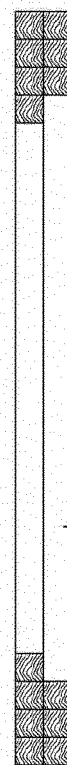


FIG. 6B

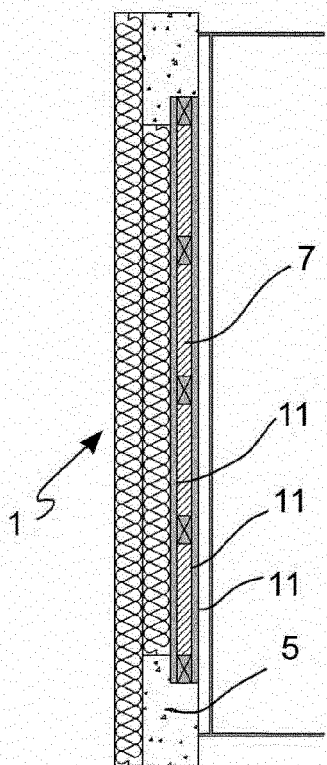


FIG. 7

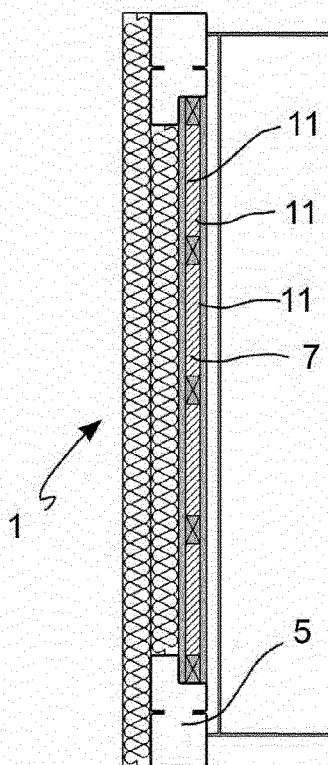


FIG. 7A

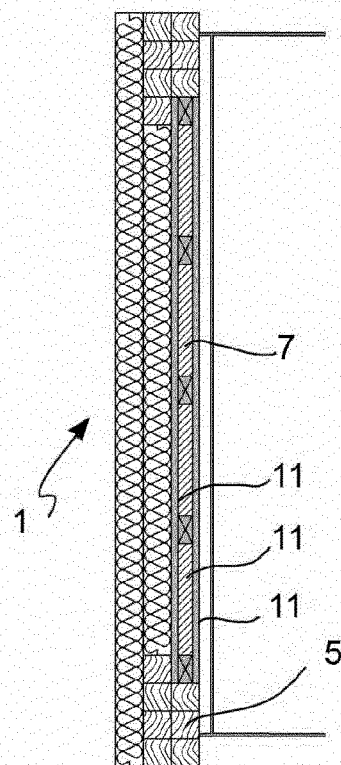


FIG. 7B

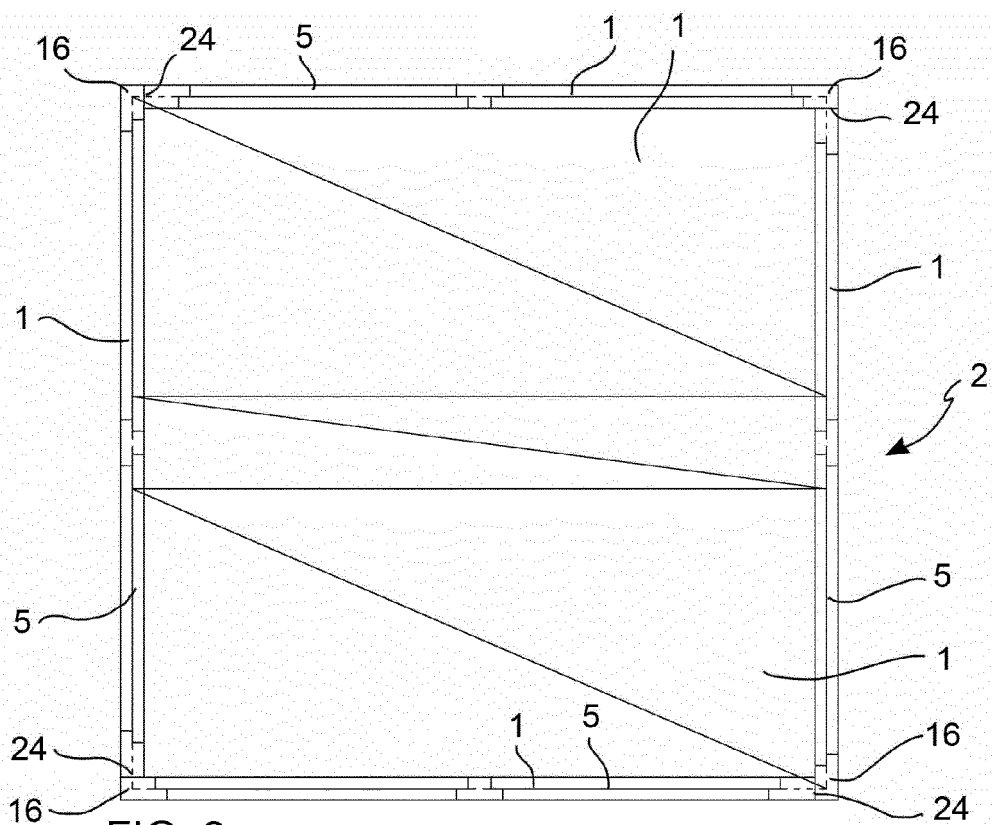


FIG. 8

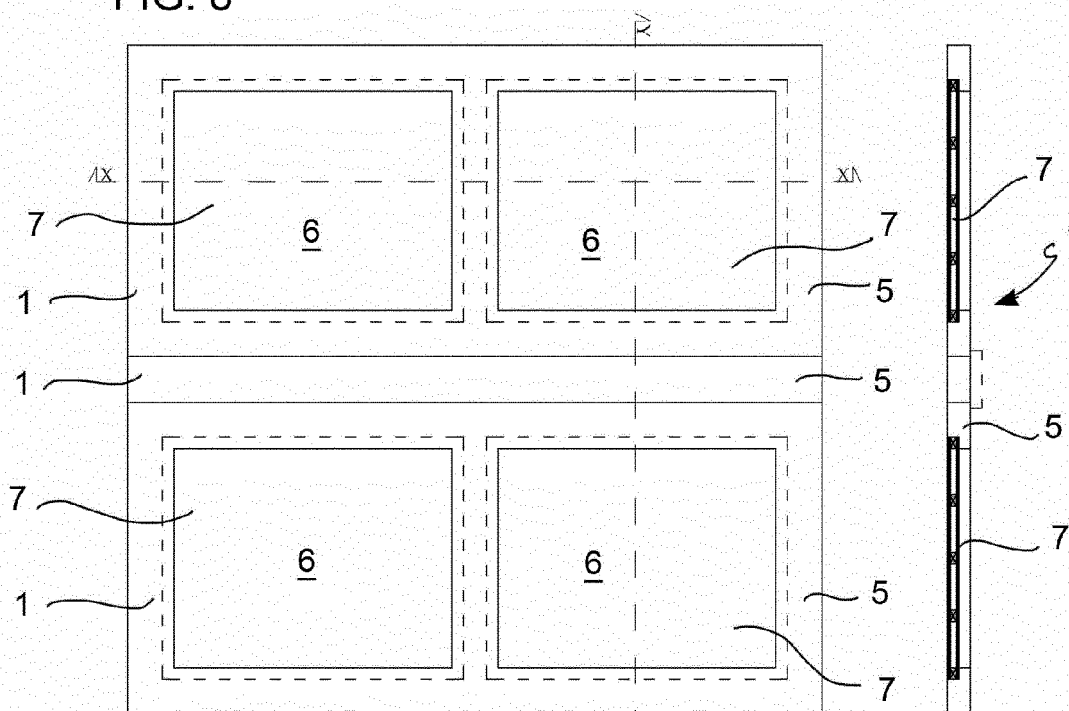


FIG. 9

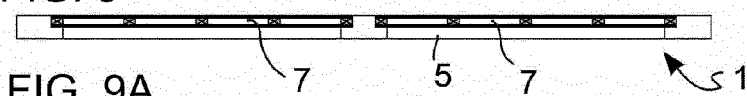


FIG. 9A

FIG. 9B

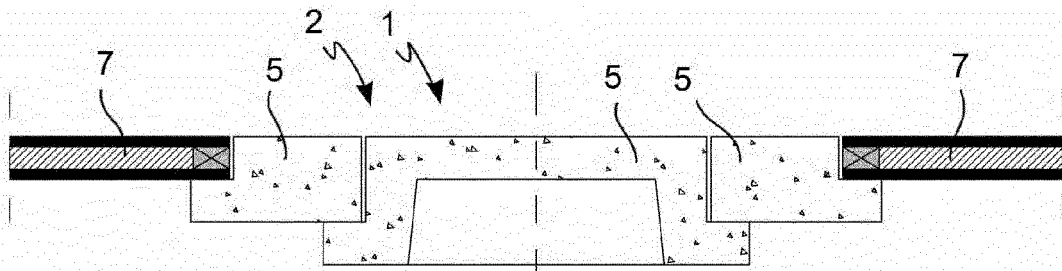


FIG. 10

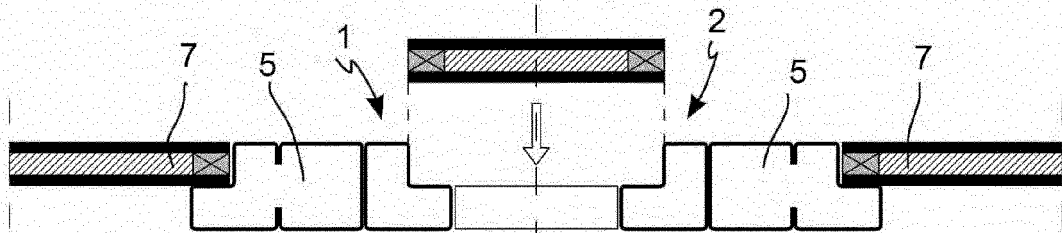


FIG. 10A

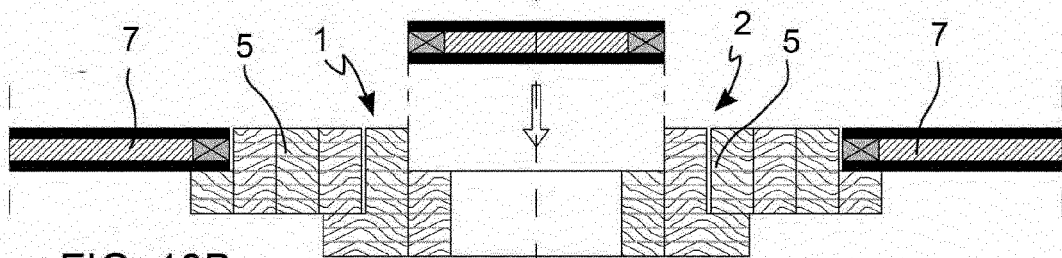


FIG. 10B

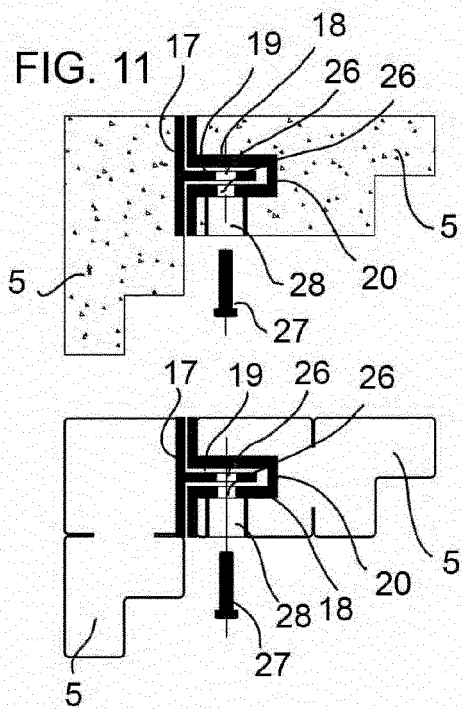


FIG. 11

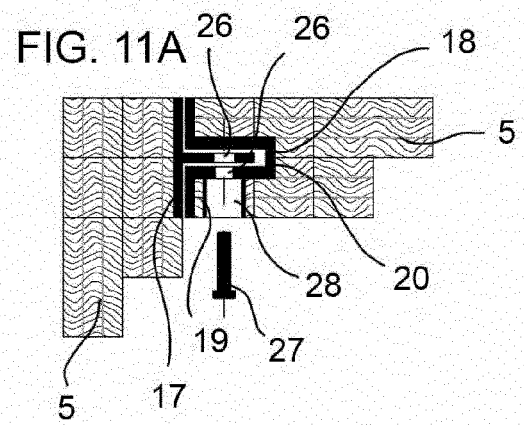


FIG. 11A

FIG. 11B

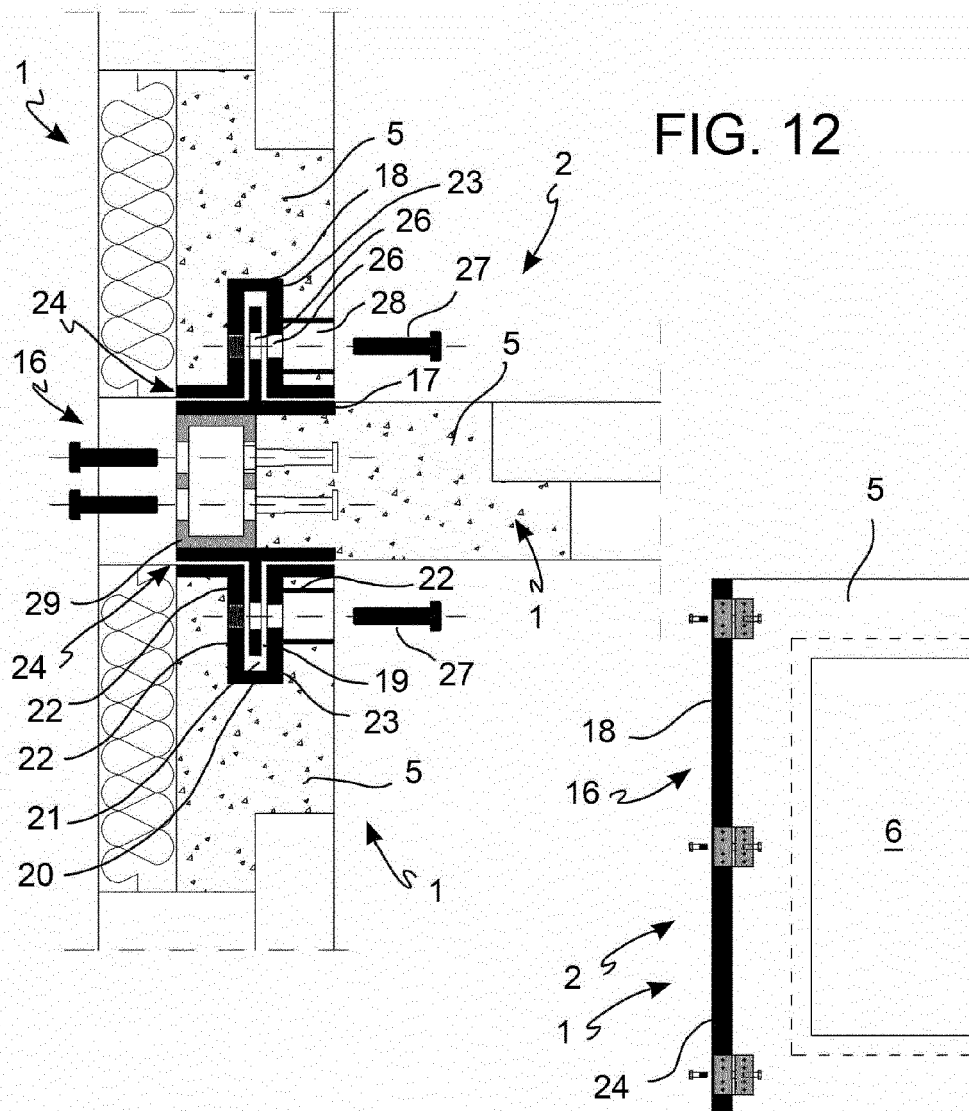
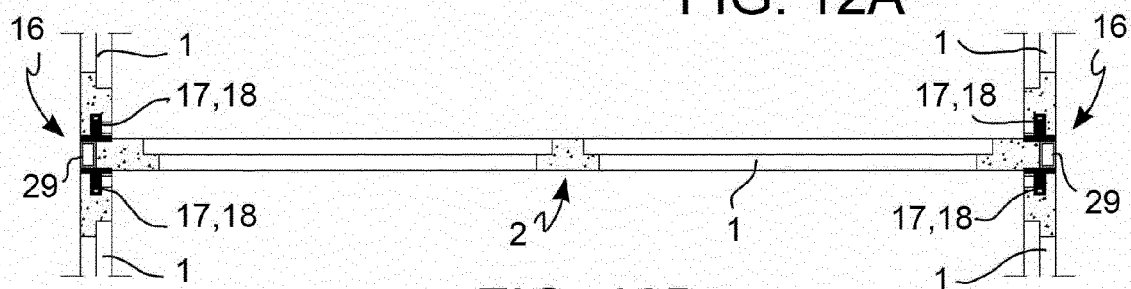
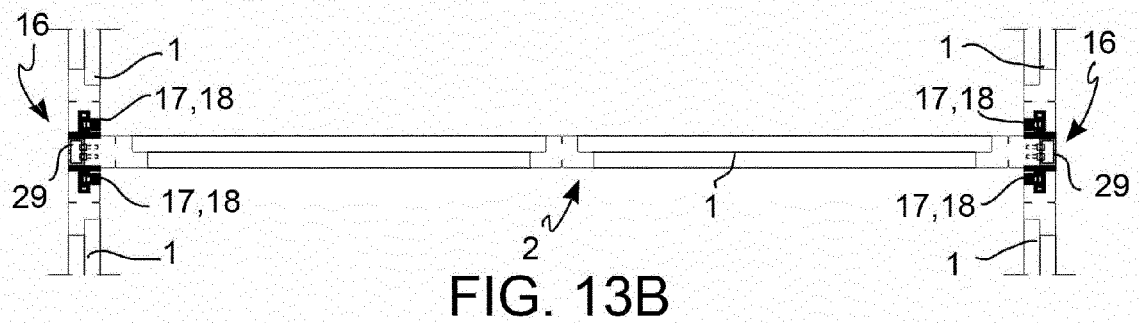
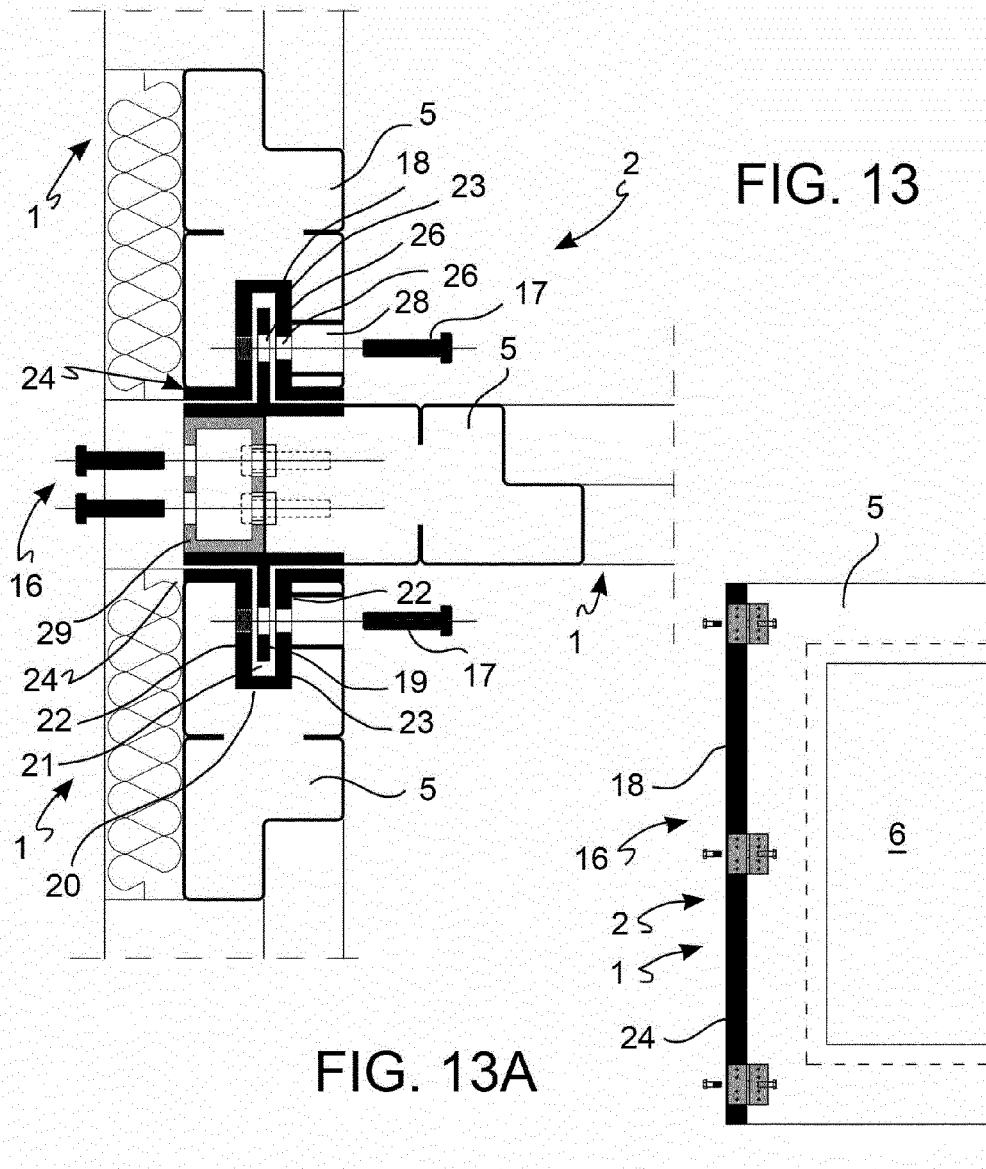


FIG. 12A





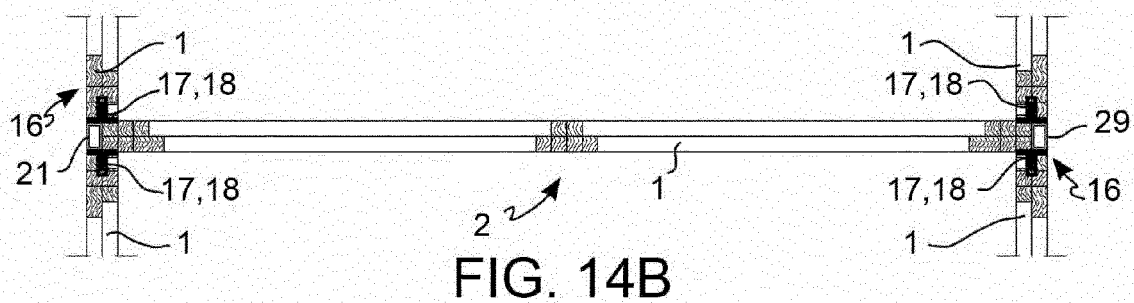
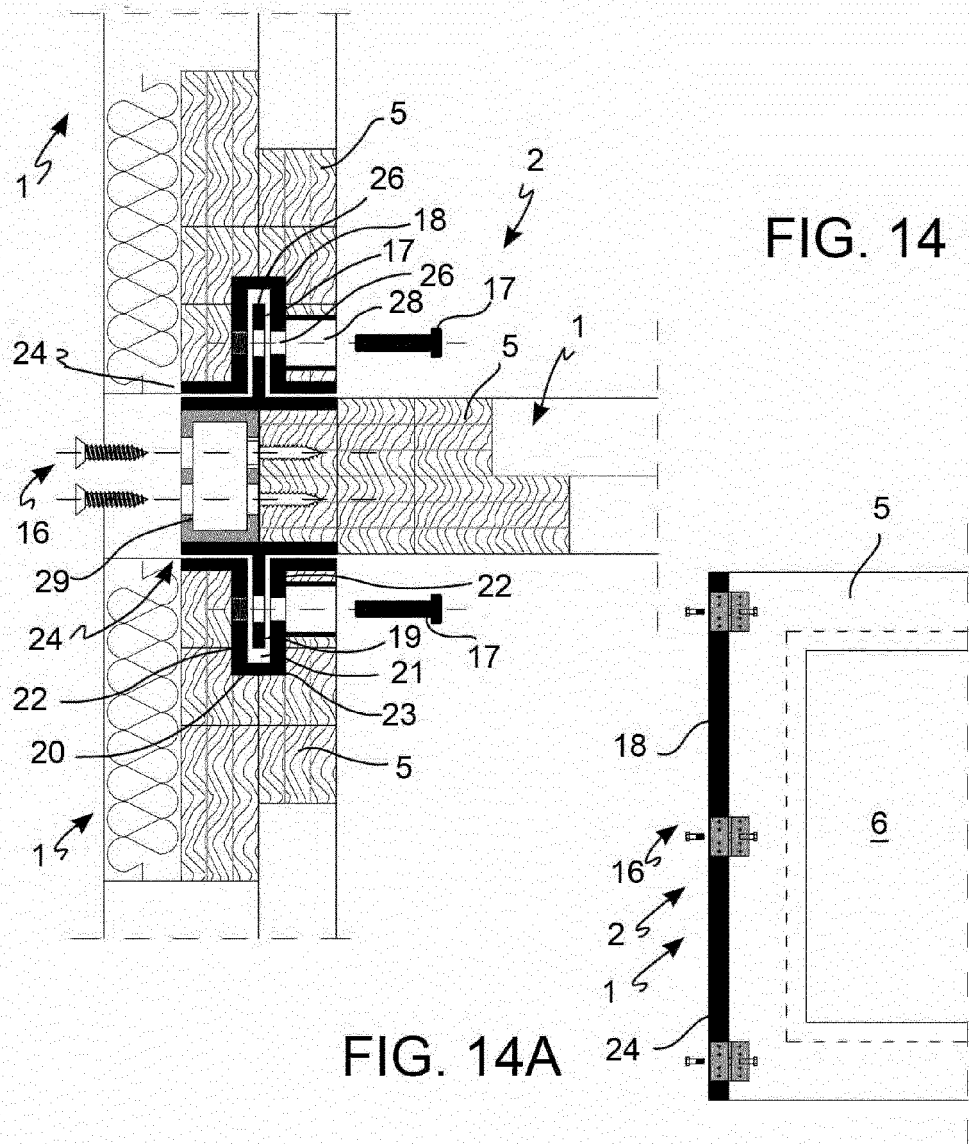


FIG. 15

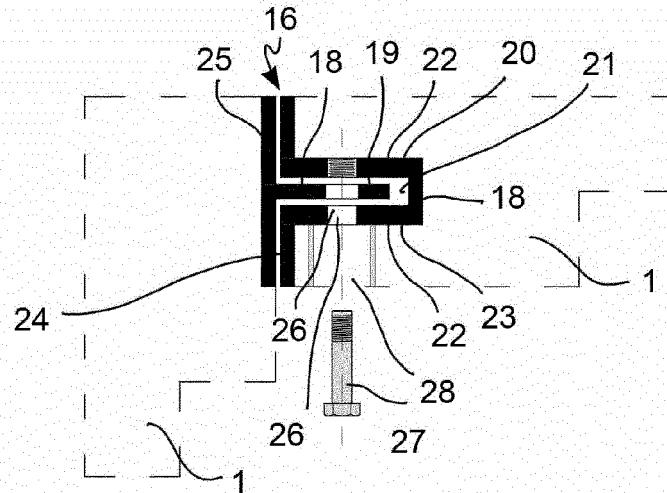


FIG. 16

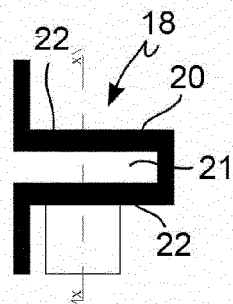
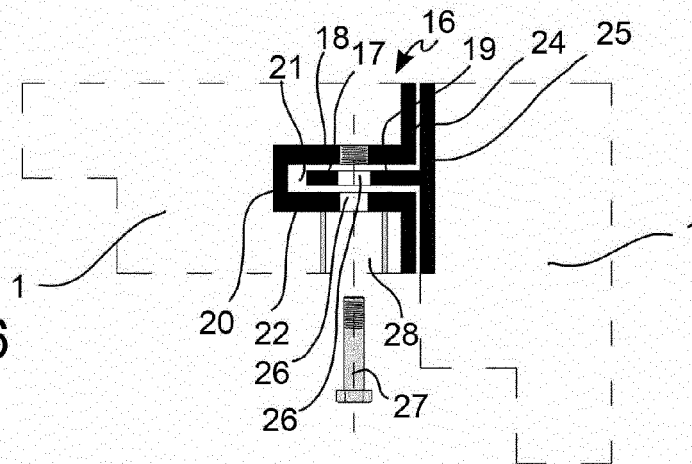


FIG. 17

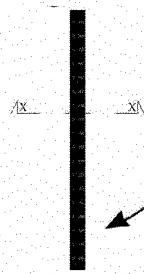


FIG. 17A

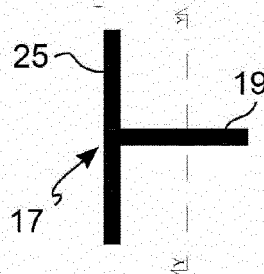


FIG. 17B

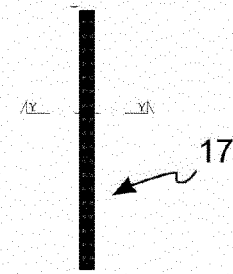


FIG. 17C

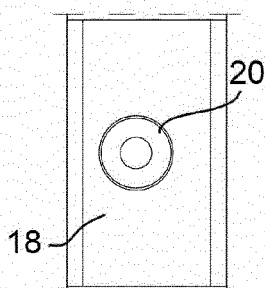


FIG. 17D

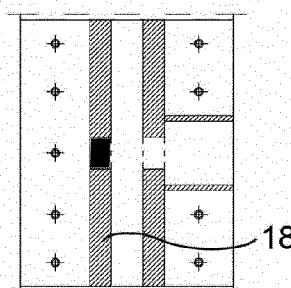


FIG. 17E

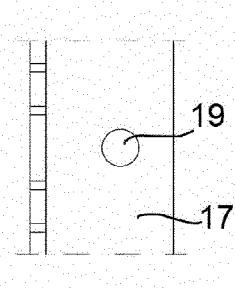


FIG. 17F

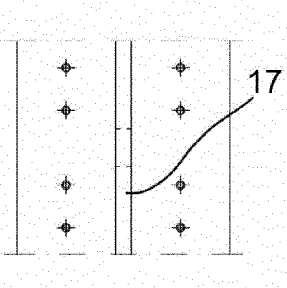


FIG. 17G

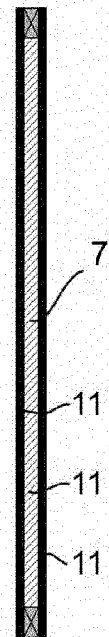
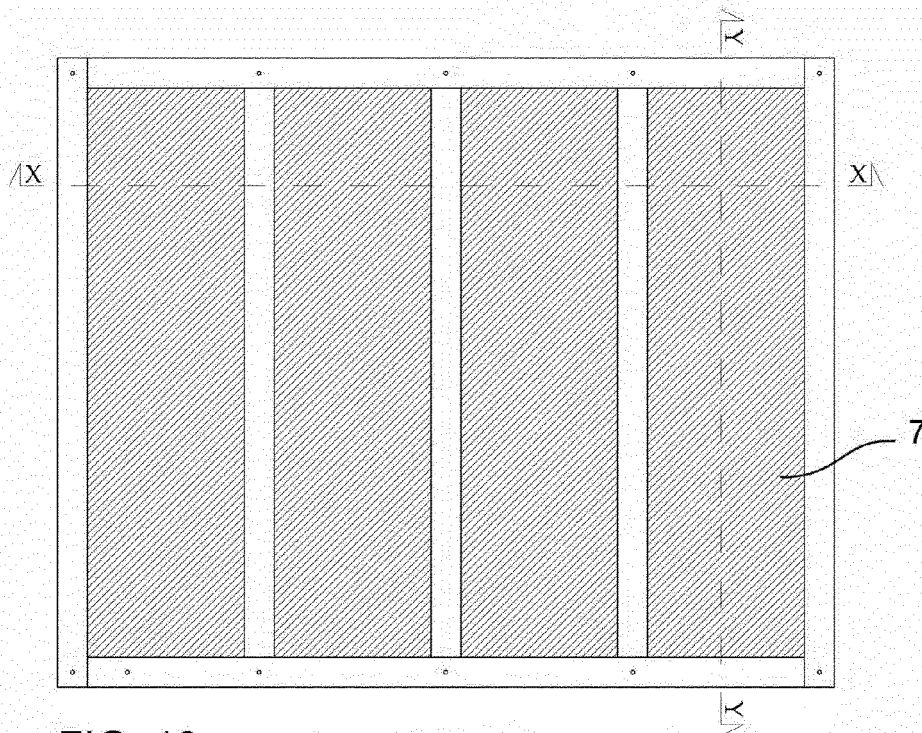


FIG. 18

FIG. 18A

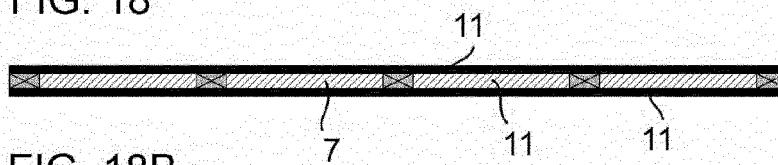


FIG. 18B

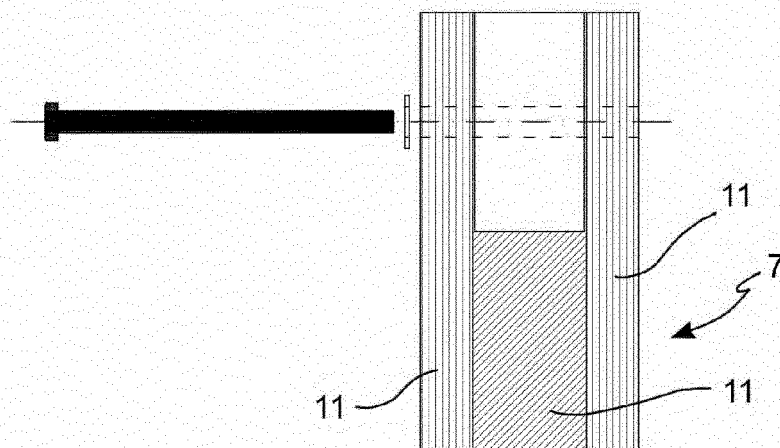
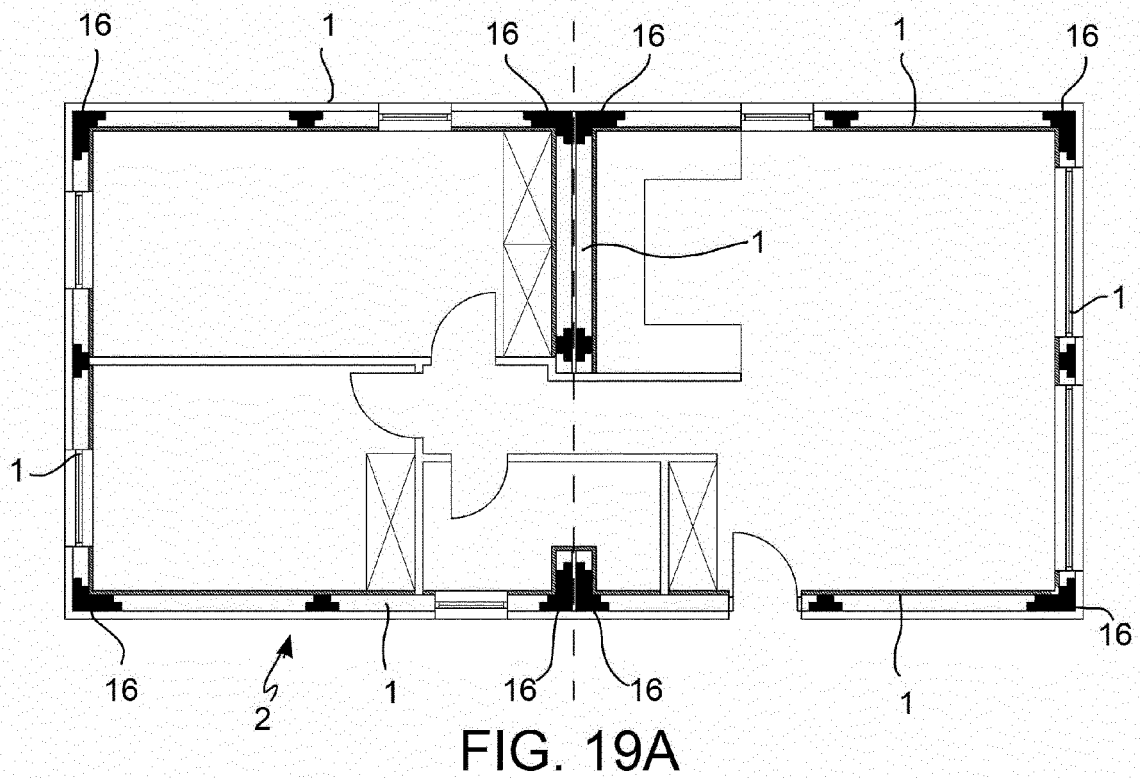
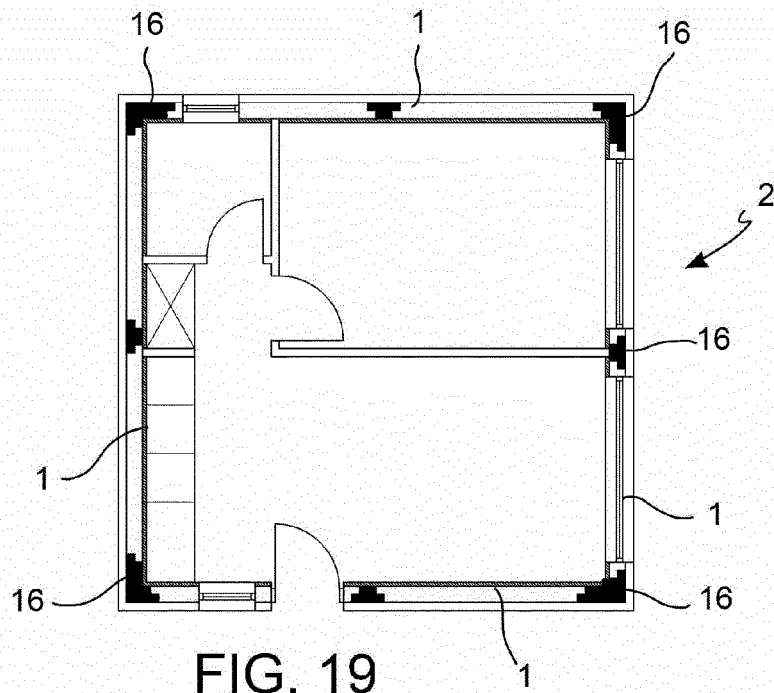


FIG. 18C



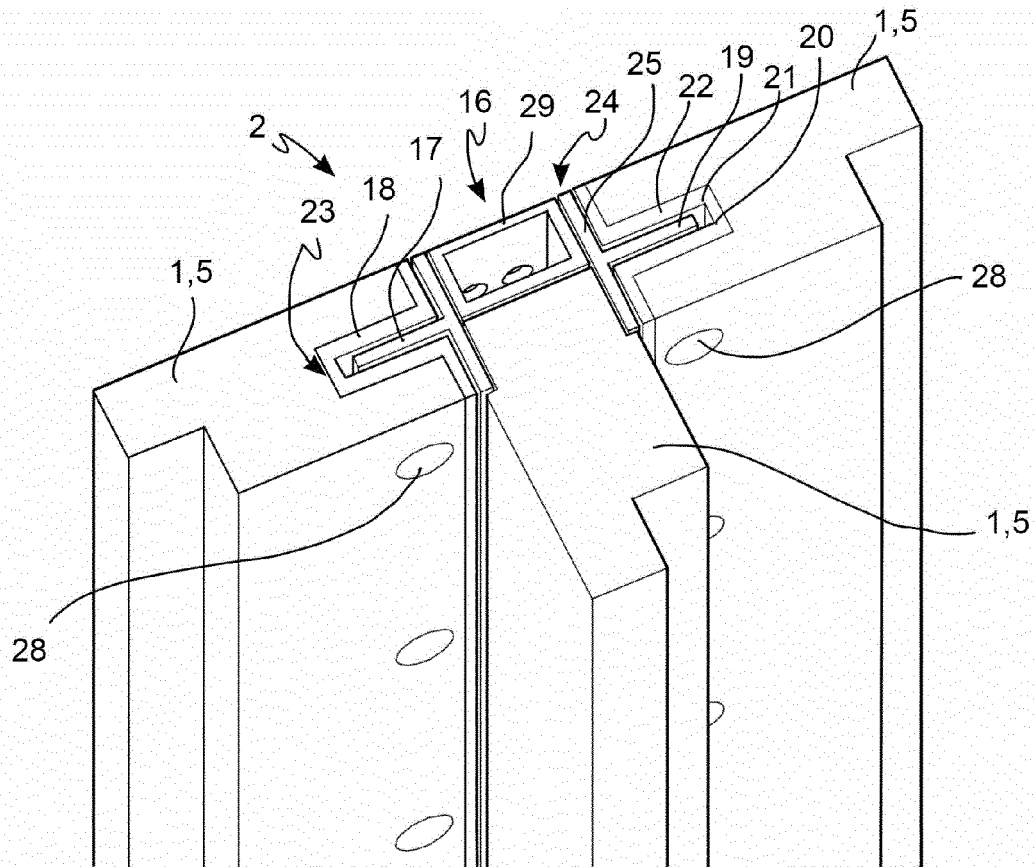


FIG. 20

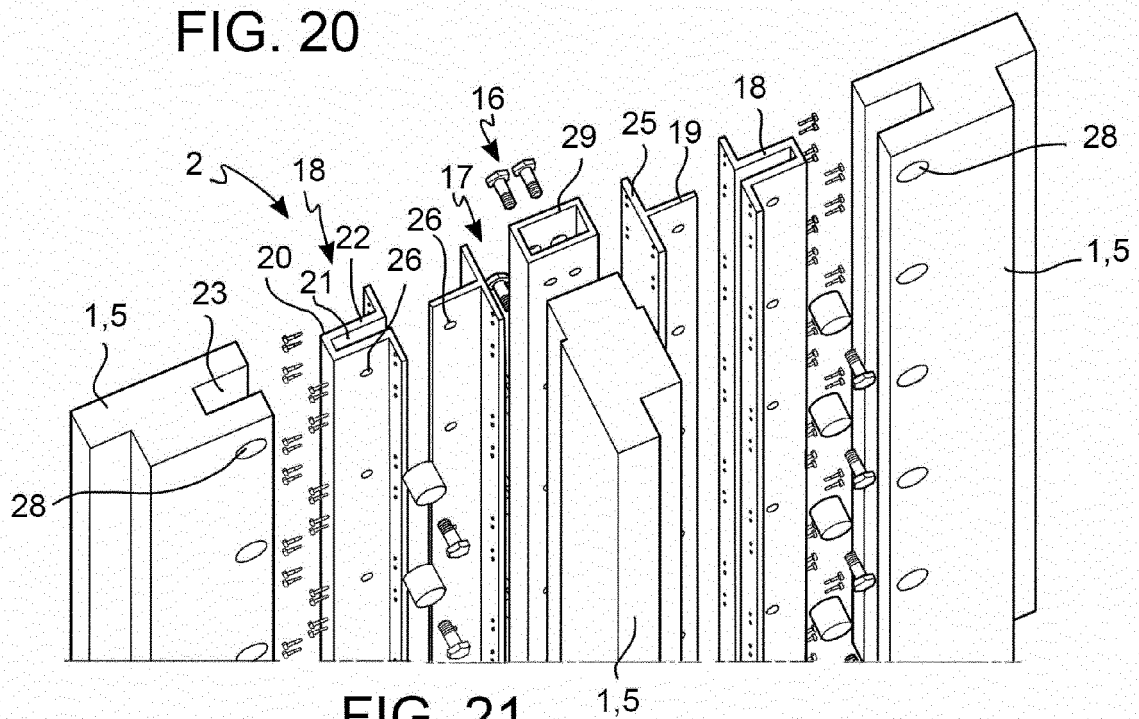


FIG. 21

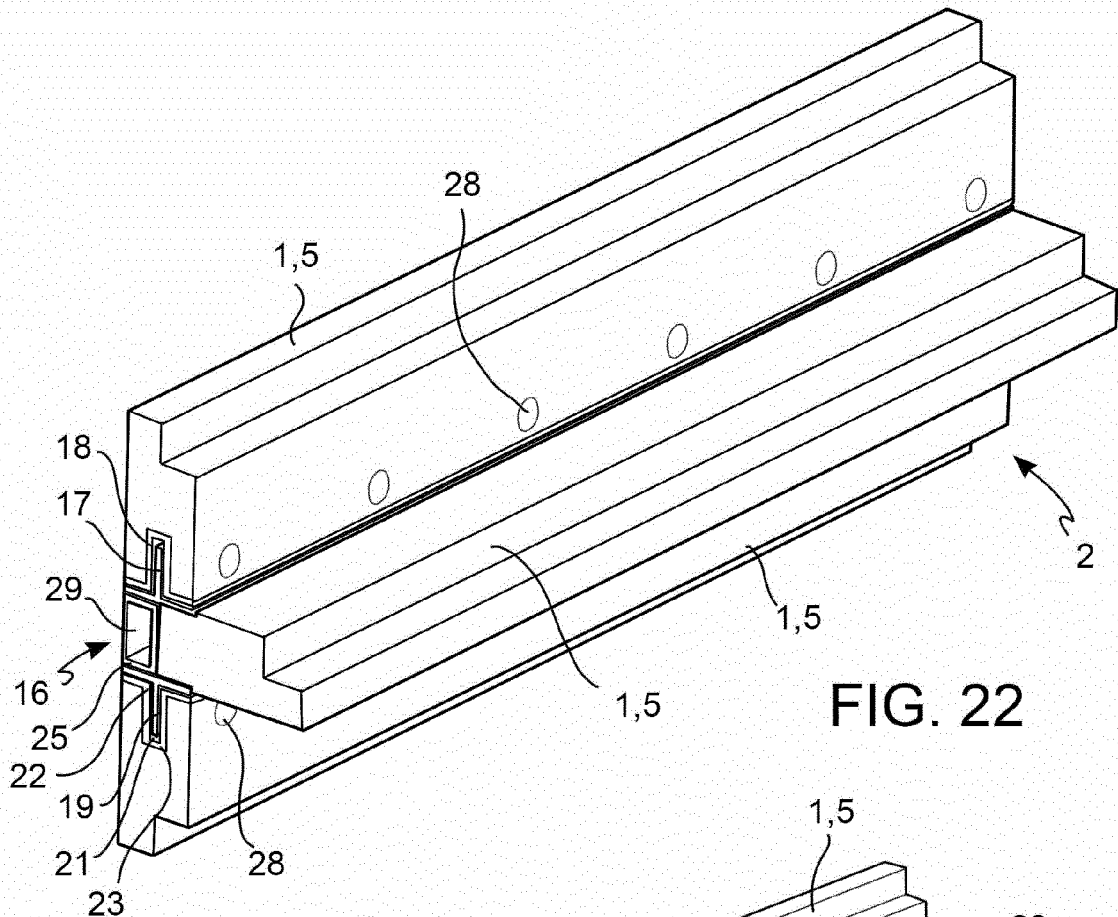


FIG. 22

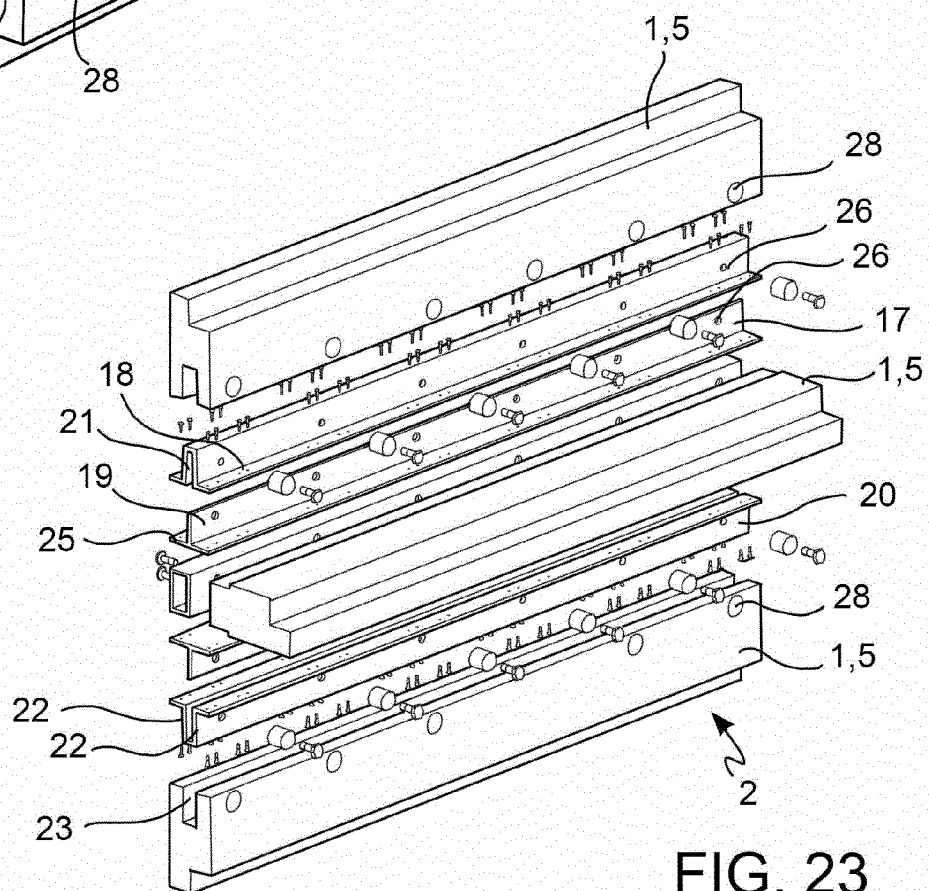


FIG. 23



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 7499

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2021/144612 A1 (VALENTE CARMINE FRANCO [IT]; CORVI CARLO GRAZIANO [CH]) 22 July 2021 (2021-07-22)	1, 3, 4, 6-14	INV. E04B1/02 E04B1/14
A	* paragraph [0051] - paragraph [0131]; figures 1-2, 23A, 23B *	2	E04B1/61 E04B1/70 E04B5/02
X	US 9 151 046 B1 (FRANCAVILLA JOHN JOSEPH [US]) 6 October 2015 (2015-10-06) * column 7, line 11 - column 10, line 17; figures 1-6 *	1, 3-9, 14	E04B5/04 E04B5/08 E04B5/10 E04B5/12
			TECHNICAL FIELDS SEARCHED (IPC)
			E04B E04C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 January 2024	Examiner Melhem, Charbel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ON EUROPEAN PATENT APPLICATION NO.

EP 23 21 7499

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-01-2024

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WO 2021144612 A1	22-07-2021	EP 4090806 A1 WO 2021144612 A1	23-11-2022 22-07-2021
US 9151046 B1	06-10-2015	NONE	

REFERENCES CITED IN THE DESCRIPTION

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- EP 0921243 A2 **[0004]**
- EP 1273729 A2 **[0004]**
- US 6625948 B2 **[0004]**
- EP 1892350 A2 **[0004]**
- WO IB2018058161 A **[0004]**