

(19)



(11)

EP 3 447 207 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
21.07.2021 Bulletin 2021/29

(51) Int Cl.:
E04B 2/46 (2006.01) **E04B 2/48** (2006.01)
E04B 2/58 (2006.01) **E04B 2/02** (2006.01)

(21) Application number: **17729195.2**

(86) International application number:
PCT/IB2017/052338

(22) Date of filing: **24.04.2017**

(87) International publication number:
WO 2017/183008 (26.10.2017 Gazette 2017/43)

(54) **BLOCKS AND MODULAR BUILDING SYSTEM**

BLÖCKE UND MODULARES BAUSYSTEM

BLOCS ET SYSTÈME DE CONSTRUCTION MODULAIRE

(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 MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **22.04.2016 PT 2016109348**

(43) Date of publication of application:
27.02.2019 Bulletin 2019/09

(73) Proprietor: **Universidade de Aveiro
3810-193 Aveiro (PT)**

(72) Inventor: **MOURA RELVAS, Carlos Alberto
4500-229 Espinho (PT)**

(74) Representative: **Patentree
Edificio Net
Rua de Salazares, 842
4149-002 Porto (PT)**

(56) References cited:
**EP-A2- 2 549 027 WO-A1-2004/063482
FR-A1- 2 322 988 GB-A- 1 381 791
GB-A- 2 458 317**

EP 3 447 207 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical domain

[0001] The present description relates to a modular construction system based on multifunctional blocks, as well as to the fitting and attachment of said blocks.

Background

[0002] Currently there are several modular or prefabricated construction systems, but the current systems are usually dedicated to a specific engineering field, that is, many of them are dedicated to civil construction and others are dedicated to furniture. The polyvalence of the presented solution is something that differs from all systems currently known and applied in product engineering.

[0003] FR 2 322 988 A1, for which the preamble of claim 1 relates, discloses a permanent shuttering system for use in the casting of walls of concrete or like cementitious material. The system comprises a series of rectangular panels which are moulded out of thermoplastic synthetic resin material. The thermoplastic panels are fitted together and thereafter concrete or other cementitious material is cast between two sets of panels. The panels remain in place to form a permanent surface covering for the faces of the wall. In other words, the system provides a set of panels for use in wall casting, said panels thereafter remain as a wall cladding.

[0004] GB 2 458 317 A discloses a wall-tie comprising a pair of spaced block-engaging bodies linked by an elongate web, wherein the block-engaging bodies include at least one bore for engaging with a securing means. Also included is a prefabricated foamed plastics block comprising said wall tie; a wall building system comprising the prefabricated foamed plastics block comprising said wall tie; a fixing for use with said wall tie.

[0005] GB 1381791 A discloses a lost shuttering system having shuttering plates adapted to be held together by cramps.

[0006] WO 2004/063482 A1 discloses a building system comprising a wall, said wall including an assembly of blocks and a framework, consisting of horizontal elements and vertical elements, to guide and secure the assembly of blocks in a vertical plane and in a horizontal plane. The disclosure includes that at least one block comprises at least one housing extending from one first lateral surface of the parallel block to a first surface of the wall and in a plane perpendicular to said lateral surface, said housing being designed for the passage or the installation of means for fixing a secondary work on the wall. The disclosure also concerns a block suitable for using such a system.

Summary

[0007] A semi-block for modular construction according to the present invention is characterised by the fea-

tures recited in the characterising portion of claim 1.

[0008] This document presents a modular construction system which uses blocks having a specific geometry so as to allow an easy connection and assembly of the elements forming a larger panel. This modular construction system can be used in several fields from civil construction to furniture or other engineering fields.

[0009] Currently there are several modular or prefabricated construction systems, but the current systems are usually dedicated to a specific engineering field, that is, many of them are dedicated to civil construction and others are dedicated to furniture. The proposed innovation allows solutions applicable in different contexts, since the geometry of the blocks (modular elements), as well as their connection and assembly system remain identical, wherein there is mainly, and only if need be, a change in the nature of the material or dimensions of the blocks. Thus, it should be noted that the system differs from the current solutions since it maintains its geometric characteristics and adjusts to dimensional and material nature characteristics depending on the use. Also, and unlike traditional models of construction, this modular system is constituted by pieces of reduced size which allows its easy transportation and also allows self-construction, wherein connection and assembly of parts of the system are carried out by the purchaser. The system can be assembled in panels and requires neither foundations for installation, nor additional work, in the case of its application in civil construction, for example. Inside dwellings its installation is easy and clean, it does not produce residues and can be installed by the own buyer of the system, wherein no specific construction knowhow is required, and it also allows the change and reorganization of the modules whenever so desired, as well as an extension provided that more parts of the system are purchased, these being perfectly compatible with the previous parts, given their specific geometry.

[0010] The production process of the blocks and all parts composing the system is economically feasible and accessible, since it does not require specific procedure or great technological complexity. Blocks can be obtained through conventional industrial processes or by using additive technologies for more specific cases. The remaining components of the system are standard parts and are usually available on the market or easily obtained upon order.

[0011] The constructive system is distributed by a set of individually produced prefabricated components, where each element is independent and thereafter joined to the final structure onsite. The separation into individual components allows the existence of parallel production systems, as well as the storage thereof. Each element is produced independently of the others, being only restricted to the need thereof, which allows them to be produced regardless of the final set. For example, wall panels are produced independently of the pillars or beams. In the assembly phase, the elements are selected for the work. There may be customized elements, which shall

be produced for this purpose without however affecting the normal manufacturing chains.

[0012] The virtues of the system evidenced in civil construction are extended to other engineering fields, namely interior or urban furniture, without any restriction. With great potential for congregating synergies in both production and logistic processes and enhancing the modularity potential of the system, that is, with slight changes in materials and coatings thereof, it is possible to use the system in indoor and outdoor walls, floors or roofs. Also in the furniture field, it is possible to obtain tables, shelves or other indoor modules or shelters and outdoor exhibitors.

[0013] The polyvalence of the presented solution is something that differs from the systems currently known and applied in product engineering.

[0014] The system includes in a proposal for connection and assembly of basic elements, designated as blocks, which, since having a specific geometry, allow the construction of panels or walls that can be used either in the construction of furniture, in the assembly of partitions or in the construction of dwellings.

[0015] The blocks have the following characteristics:

Lightweight, compact and very easy to produce.

Easy to carry and pack.

Allow easy and error-free assembly.

Allow perfect alignment between the various elements creating a larger flat surface. Allow assembly in different orientations, taking the symmetry of the joining fittings into account.

The joining between the elements is guided, self-adjustable, stable and disassemblable.

Allow different types of finishing on external surfaces and customization by the customer.

Can be produced in different types of materials.

Can be produced in a single material or using several materials.

[0016] Blocks can be obtained from materials of diverse nature, in particular from natural recyclable materials and can be customized according to aesthetic or functional aspects. They have a specific geometry that facilitates their production and assembly. The assembly of several aligned blocks allows the construction of a panel or wall of higher dimensions. This assembly can be improved by the use of internal metal elements, locked at the ends by a metal sheet. This system locks the set of blocks making them behave as a single larger and rigid element, as a result of the assembly and coupling system between blocks that is reinforced by the internal metal structure.

[0017] The panel assembly system can be used in the furniture industry for obtaining table tops and tables, or in civil construction industry, for the manufacture of modular houses, where the assembly system can be used to obtain internal or external walls or even the roof.

[0018] A prefabricated modular system for construc-

tion is described, characterized by using multifunctional blocks with specific geometry, which are joined in a continuous manner and in two directions.

[0019] An embodiment is characterized in that the multifunctional blocks are self-adjustable.

[0020] An embodiment is characterized in that the multifunctional blocks are constructed with a plurality of single or multi-material materials, namely natural or recyclable materials, by the creation and filling of a core in the manufacturing phase.

[0021] The invention is characterized in that the multifunctional construction blocks have two main faces, an inner and an outer, and an upper face, a lower face, and two side faces, for the construction by connection of a panel, a wall or a partition by incorporating blocks, one after the other and one on top of the other so that their upper and lower faces are in mutual contact, as well as their side faces, these faces designated as "contact" faces, and so that both main faces of each block can form a continuous surface constituted by the inner and outer wall faces.

[0022] An embodiment is characterized in that the multifunctional construction blocks are obtained by connection and closing of two equal semi-blocks.

[0023] An embodiment is characterized in that the multifunctional construction blocks have a symmetrical geometry longitudinally on each of the four fitting and uniaxial extraction faces.

[0024] An embodiment is characterized in that the multifunctional construction blocks have symmetrical geometry of the fittings, according to two planes orthogonal between them and which intersect on a central axis perpendicular to the main face.

[0025] An embodiment is characterized in that the side fittings of the multifunctional blocks are bi-angular, symmetrical, inverted and self-locking.

[0026] An embodiment is characterized in that each multifunctional construction block has at least one vertical hole that crosses the entire block, for passage of a structure reinforcing element or block attachment, the axis of which is coplanar with the outer face of the block and perpendicular to the closing faces, the holes being equidistant between them, forming with the blocks arranged, at least, one aligned rail of constant section.

[0027] An embodiment is characterized in that the semi-blocks have semi-cylindrical channels, preferably three or four, arranged perpendicular among them two by two or 2 by 1 and which, after being closed and the block being obtained, the semi-cylinders form through-holes through a tunnel-like space, for passage of other elements.

[0028] An embodiment is characterized in that the connection system of the parts can be reinforced with a tubular structure assembled in the longitudinal direction thereof, taking advantage of the existing internal holes and which form a tunnel.

[0029] An embodiment is characterized in that in the tubular structure the positioning and attachment are en-

sured by a profiled sheet.

[0030] An embodiment is characterized in that the tubular support structure works as a cage and the coating thereof through blocks creates a separation and insulation surface.

[0031] An embodiment is characterized in that the joining between the parts whose use of a more rigid internal structure, e.g. said tubular support structure, allows improving the behaviour of the set.

[0032] An embodiment is characterized in that it is customizable by the application of face coating foils which may be developed, namely for solar energy retention, incorporation of light sensors, structural analysis of the system, or the like.

[0033] A semi-block for modular construction is described comprising:

two main faces, designated as inner main face and outer main face;

two side faces, left and right, and two end faces, upper and bottom, referred to as contact faces; characterised in that, when the semi-block is fitted in with another equal (or identical) semi-block by the respective contact faces, the main faces of the semi-blocks form a contiguous surface;

and in that the contact faces, particularly each of the contact faces comprises a fitting with a protrusion with a ramp and a fitting with a recess with a ramp, so that the protrusion ramp stays in contact with the recess ramp of the other semi-block, in particular in contact with the recess ramp of the other equal (or identical) semi-block, when the semi-block is fitted in with the other semi-block, particularly when fitted in with the other equal (or identical) semi-block; and in that, the inner face comprises one or more fittings for fitting in with yet another semi-block, particularly the other semi-block being equal (or identical) by the respective inner main faces, so as to form a block with the yet another semi-block, particularly the other semi-block being equal (or identical).

[0034] In the invention, the fittings of the contact faces have 90° rotational symmetry on a central axis perpendicular to the main face.

[0035] In an embodiment, the fitting with a protrusion comprises an end surface perpendicular to the outer main surface of the block and the fitting with a recess comprises an end surface perpendicular to the outer main surface of the block, so that the end surface of the protrusion stays in contact with the end surface of the recess of another semi-block, when the semi-block is fitted in with another semi-block.

[0036] In an embodiment, the fittings of the contact faces have symmetry according to two planes orthogonal among them and which intersect on a central axis perpendicular to the main face.

[0037] In an embodiment, the semi-block has a symmetrical geometry longitudinally on each of four fitting

and uniaxial extraction faces.

[0038] In an embodiment, the inner main face comprises one or more channels opened for receiving a longitudinal support element.

5 **[0039]** In an embodiment, the channels are semi-cylindrical.

[0040] An embodiment comprises two horizontal channels and two vertical channels, or comprises two vertical channels and one horizontal channel.

10 **[0041]** In an embodiment, the inner main face comprises one or more coupling elements for joining the semi-block to another semi-block, in particular the other semi-block being equal (or identical) when the semi-block is fitted in with another semi-block, in particular the other semi-block being equal (or identical).

15 **[0042]** In an embodiment, the inner main face comprises two complementary coupling elements, symmetrically placed with respect to the geometric centre of the semi-block.

20 **[0043]** An embodiment of the semi-block has a substantially quadrangular shape.

[0044] In an embodiment, the inner main face comprises two complementary coupling elements, symmetrically placed with respect to the geometric centre of the semi-block.

25 **[0045]** An embodiment comprises a hollow, recess or alveolus on its inner face.

[0046] An embodiment comprises a coating on its outer main face.

30 **[0047]** In an embodiment, the semi-block is a semi-block obtained by pressure-forming, in particular by pressure-forming of aggregate or laminate composite materials.

35 **[0048]** In an embodiment, the semi-block is a semi-block obtained by injection moulding, in particular by injection moulding of ceramic, composite or polymeric materials.

[0049] A block for modular construction is further described comprising two semi-blocks for modular construction of any of the described embodiments, fitted in to each other by their inner main faces.

[0050] A modular construction wall is further described comprising a plurality of semi-blocks according to any of the described embodiments, fitted into each other by their side and/or end faces.

[0051] A modular construction wall is further described comprising a plurality of described blocks, fitted into each other by their side and/or end faces.

50 **[0052]** A piece of furniture is described comprising a modular construction wall according to any of the described embodiments.

[0053] A support structure is described for a modular construction of semi-blocks according to any of the described embodiments or of blocks according to any of the described embodiments, comprising a lower beam, an upper beam and a plurality of bars joining the lower beam to the upper beam, in particular wherein the bars are parallel to one another.

[0054] In an embodiment, the bars are tubes, in particular cylindrical tubes.

[0055] In an embodiment, the lower and upper beams have a sheet profile.

[0056] The embodiments described are combinable.

Brief Description of the Drawings

[0057] For an easier understanding, drawings are herein attached, which represent preferred embodiments which are not intended to limit the scope of the present disclosure.

Figure 1: Representation of an embodiment of the proposed modular system, with the construction of a building.

Figure 2: Representation of an embodiment of a module, of substantially quadrangular shape, of the proposed modular system.

Figure 3: Representation of an embodiment of a module of the proposed modular system obtained by connection and closing of two equal semi-blocks.

Figure 4: Representation of a module, of substantially rectangular shape, of a modular system, that falls outside the scope of claim 1.

Figure 5: Representation of an embodiment of the proposed modular system, with the construction of a wall.

Figure 6: Representation of an embodiment of the proposed modular system with the inclusion of a structure with support tubes, the positioning and attachment of which is ensured by two profiled sheets, an upper and a lower sheet.

Detailed Description

[0058] The proposed system is based on an assembly of self-adjustable blocks, which can be obtained from materials of different nature, and are also compatible with the use of natural and recyclable materials. The developed system uses blocks that can be locked through two metal tubes that pass longitudinally and are fixed at the extremities through two profiled sheets. The assembly of the tubes and the locking sheets form a cage-like structure and the blocks work as a coating of the metal structure, forming a larger panel that can be used as a partition or wall. The metal structure is rigid and self-supporting and the blocks undertake the insulation and surface finishing.

[0059] **Figure 1** shows an embodiment of the proposed modular system with the construction of a building, wherein the block with a specific geometry, allowing its inter-relational assembly forming a larger surface or wall

1, a foundation base of the building 2, locking tubes of the assembly 3, lower sheet profile 4, upper sheet profile 5, and column 6 are shown.

[0060] In the system, there is a block 1 with a specific geometry that allows its inter-relational assembly forming a larger surface or wall. In construction, there is a foundation base 2 where the set will be assembled. In the base 2 a sheet profile 4 is applied where the locking tubes 3 of the assembly are attached. At the side ends there is a column 6, the blocks are placed into the tubes through through-holes therein. The end geometry of the blocks will allow their alignment and assembly, increasing the size of the wall in both height and length. Subsequently to the last upper block being assembled and once the wall assembly is completed, it is fixed by assembling the upper sheet profile 5. In the proposed system, elements 3, 4, 5, 6 form a rigid wall support cage-like structure, where the blocks 1 enclose the structure thus promoting its insulation and creating a single separation surface.

[0061] **Figure 2** shows an embodiment of a module, of substantially quadrangular shape, of the proposed modular system. The multifunctional construction semi-block 10 has two main faces, an inner and an outer face, and an upper face, a lower face, and two side faces. The upper and bottom faces of blocks contiguously placed are in mutual contact, as well as their side faces, these faces being designated as "contact" faces 11, and so that at least one of the main faces of each block can form at least a continuous surface constituted by the main faces, either the inner, outer, or inner and outer faces of a set of blocks.

[0062] The multifunction construction blocks 10 preferably have symmetrical and biaxial geometry in the fittings. An embodiment is characterized in that the side fittings of the multifunctional blocks are bi-angular, symmetrical, inverted and self-locking. The fittings comprise for each contact face 11, preferably adjacent to contact face 11, two fitting parts. One part has a protrusion which includes a ramp surface 13, preferably with an end surface 18 perpendicular to the outer main face of the block 10. The other part has a recess including a ramp surface 12, preferably with an end surface 15 perpendicular to the outer main face of the block 10. The protrusion ramp 13 stays in contact with the recess ramp 12 of the subsequent block, when the blocks are placed contiguously. Preferably, the end surface of the protrusion 18 stays in contact with the end surface of the recess 15 of the subsequent block, when the blocks are placed contiguously.

[0063] Each block may have at least one vertical hole that passes through the entire block, for passage of a structure reinforcing element or block attachment, the axis of which is coplanar with the outer face of the block and perpendicular to the closing faces. Preferably, with the blocks placed contiguously, the holes are equidistant from each other, forming at least one aligned rail of constant section along vertically aligned blocks. A possible embodiment for this hole includes the semi-blocks having semi-cylindrical channels 14, preferably three or four, ar-

ranged perpendicular between them two by two or 2 by 1 and which, after being closed and the block being obtained, the semi-cylinders form through-holes through a tunnel-like space, for passage of a structure reinforcing element or block attachment, or of other elements.

[0064] Figure 3 shows an embodiment of a module of the proposed modular system obtained by joining and closing two equal semi-blocks. The inner closure faces of the block may contain hollows or alveoli, in particular a hollow in the form of a quadrangular recess 17, preferably placed centrally on the inner face of the semi-block, and which, among other advantages, lighten the structure and create a insulating airgap from heat and/or noise.

[0065] An embodiment is characterized in that the multifunctional construction blocks are obtained by connection and closing of two equal semi-blocks through coupling elements 16a/16b.

[0066] Figure 4 shows a module 20, of substantially rectangular shape, of a modular system, that falls outside the scope of claim 1. This module 20 may be seen to be half of the substantially quadrangular block 10. The multifunctional construction blocks 20 preferably have biaxial symmetrical geometry in the fittings on the vertical ends, as was the case in the substantially quadrangular module 10. An embodiment is characterized in that the fittings on the side faces of the multifunctional blocks comprise for each contact face 21, preferably adjacent to the contact face 21, a fitting part. On one of the side faces, the fitting part has a protrusion including a ramp surface 23, preferably with an end surface 28 perpendicular to the outer main face of the block 20. On the other side face, the fitting part has a recess including a ramp surface 22, preferably with an end surface 25 perpendicular to the outer main face of the block 20. The protrusion ramp 23 stays in contact with the recess ramp 22 of the subsequent block, when the blocks are placed contiguously. Preferably, the end surface of the protrusion 28 stays in contact with the end surface of the recess 25 of the subsequent block, when the blocks are placed contiguously.

[0067] Figure 5 shows an embodiment of the proposed modular system, with the construction of a wall with a plurality of blocks 10 fitted in as described above.

[0068] Figure 6 shows an embodiment with a set comprising a support structure for a modular construction and comprising a plurality of semi-blocks or a plurality of blocks, with the inclusion of the structure with support tubes, the positioning and attachment of which is ensured by two profiled sheets, an upper and a lower sheet.

[0069] Figure 6a shows a plurality of blocks 10 fitted in as described above and joined through the tubular structure 30 which passes through the blocks through the aforementioned semi-cylindrical channels, contributing to an even more solid and robust structure.

[0070] Figure 6b shows the construction of the tubular support structure 30 comprising a plurality of bars 32, e. g. cylindrical elements or tubes, which are sustained on a lower beam 33 and an upper beam 31. Preferably, the

beams are designed in sheet profiles.

[0071] This concept can be used to create exterior walls or interior partitions, and even be used for floors or roofing instead of tile.

5 **[0072]** In relation to the current construction systems, the system proposed in this innovation is perfectly compatible with the conventional methods in specialised civil construction, namely in water and energy arrangements. It also allows to combine constructive solutions adopted in this system with other more conventional ones, for example the use of a conventional tile roof on walls built in this system.

10 **[0073]** The proposed solution allows adopting more conventional work planning and logistic methods such as on-site wall surveys, since the blocks can be used as substitutes for blocks in cement or clay, or assembling the panels in factory and then transporting them to the site, thus lowering costs and construction time.

15 **[0074]** The modular construction system based on this multifunctional block concept also has the following advantages:

When applied in civil construction, it can be used for the construction of exterior or interior walls.

It is very easy to produce, transport and assemble which makes its application in prefabricated or modular construction excellent.

The walls built using this concept do not crack, do not need maintenance and the interior and exterior finish thereof can be completely customized.

20 The use of these modular elements in civil construction is perfectly compatible with the conventional methods used in civil construction.

The assembly, disassembly or alteration of interior walls is absolutely clean and free of dust.

25 It allows easy and error-free assembly.

It allows perfect alignment between the various elements creating a larger flat surface.

It allows assembly in different orientations, taking the symmetry of the connection fittings into account.

30 The connection between the elements is guided, self-adjustable, stable and disassemblable.

It allows different types of finishing on external surfaces and customization by the customer.

45 Application Examples

[0075] In civil construction it can be used for the construction of housing modules - by pre-fabricated construction or modular construction - as well as walls and partitions.

[0076] The system can also be used in the manufacture of furniture, tables, desks, shelves, among others.

50 **[0077]** It is obvious that the virtues of the system evidenced in civil construction can be extended to other engineering fields, namely indoor or urban furniture, without any restriction. With great potential for congregating synergies in both production and logistic processes and enhancing the modularity potential of the system, i.e. with

slight changes in material and coating thereof, it is possible to use the system in interior walls, exterior walls, floors or roofs. Also in the furniture field, it is possible to obtain tables, shelves or other indoor modules or shelters and external exhibitors.

[0078] The embodiments described are combinable. The following claims set out particular embodiments of the disclosure.

[0079] Blocks may be manufactured by pressure-forming processes using aggregate or laminate composite materials.

[0080] Blocks can be manufactured by injection moulding processes when ceramic, composite or polymer materials are used.

Claims

1. Semi-block for modular construction comprising:

two main faces, designated as inner main face and outer main face;

two side faces, left and right, and two end faces, upper and bottom, referred to as contact faces (11, 21);

wherein when the semi-block (10) is fitted in with another identical semi-block (10) by the respective contact faces (11, 21), the main faces of the semi-blocks form a contiguous surface;

and wherein each of the contact faces comprises a fitting with a protrusion with a ramp (13) and a fitting with a recess with a ramp (12), so that the protrusion ramp (13) is in contact with the recess ramp (12) of the other identical semi-block, when the semi-block (10) is fitted in with the other identical semi-block;

and wherein, the inner face comprises one or more fittings for fitting in with yet another identical semi-block by the respective inner main faces, so as to form a block with the yet another identical semi-block;

characterised in that the fittings of the contact faces have a 90° rotational symmetry on a central axis perpendicular to the main face.

2. Semi-block for modular construction according to the previous claim, wherein the fitting with a protrusion comprises an end surface (18) perpendicular to the outer main surface of the block and the fitting with a recess (15) comprises an end surface perpendicular to the outer main surface of the block, so that the end surface of the protrusion is in contact with the end surface of the recess of another semi-block, when the semi-block is fitted in with another semi-block.

3. Semi-block for modular construction according to any previous claim, wherein the inner main face com-

prises one or more channels (14) opened for receiving a longitudinal support element, preferably where-in the channels are semi-cylindrical.

4. Semi-block for modular construction according to the previous claim, comprising two horizontal channels and two vertical channels, or comprising two vertical channels and one horizontal channel.

5. Semi-block for modular construction according to any previous claim, wherein the inner main face comprises one or more coupling elements (16a, 16b) for joining the semi-block to another identical semi-block when the semi-block is fitted in with another identical semi-block.

6. Semi-block for modular construction according to the previous claim, wherein the inner main face comprises two complementary coupling elements (16a, 16b), symmetrically placed with respect to the geometric centre of the semi-block.

7. Semi-block for modular construction according to any previous claim, having a substantially quadrangular shape.

8. Semi-block for modular construction according to any previous claim comprising a hollow, recess or alveolus on the inner face thereof.

9. Semi-block for modular construction according to any previous claim comprising a coating on the outer main face thereof.

10. Semi-block for modular construction according to any previous claim obtained by pressure-forming, in particular by pressure-forming of aggregate or laminate composite materials; or obtained by injection moulding, in particular by injection moulding of ceramic, composite or polymeric materials.

11. Block for modular construction comprising two semi-blocks for modular construction according to any claim 1-10, fitted into each other by their inner main faces.

12. Modular construction wall comprising a plurality of semi-blocks according to any claim 1-10, fitted into each other by their side faces and their end faces.

13. Modular construction wall comprising a plurality of blocks according to claim 11, fitted into each other by their side faces and their end faces.

14. Piece of furniture comprising a modular construction wall according to claim 12 or 13.

15. Set comprising a support structure (30) for a modular

construction, and comprising a plurality of semi-blocks according to any claim 1-10 or a plurality of blocks according to claim 11, wherein the support structure comprises a lower beam (33), an upper beam (31) and a plurality of bars (32) joining the lower beam to the upper beam, in particular wherein the bars are parallel to one another, wherein the bars (32) are tubes, and the cylindrical tubes and the lower and upper beams are in sheet profile.

Patentansprüche

1. Halbblock für Modulbauweise, bestehend aus:

zwei Hauptflächen, bezeichnet als innere Hauptfläche und äußere Hauptfläche;
zwei Seitenflächen, links und rechts, und zwei Endflächen, oben und unten, bezeichnet als Kontaktflächen (11, 21);

wobei die Hauptflächen der Halbblocke eine zusammenhängende Oberfläche bilden, wenn der Halbblock (10) über die entsprechenden Kontaktflächen (11, 21) in einen anderen identischen Halbblock (10) eingepasst wird;

und wobei jede der Kontaktflächen eine Passung mit einem Vorsprung mit einer geneigten Fläche (13) und eine Passung mit einer Aussparung mit einer geneigten Fläche (12) aufweist, so dass die geneigte Fläche des Vorsprungs (13) mit der geneigten Fläche der Aussparung (12) des anderen identischen Halbblocks Kontakt hat, wenn der Halbblock (10) in den anderen identischen Halbblock eingepasst wird;

und wobei die Innenfläche ein oder mehrere Passungen zum Einpassen in einen weiteren identischen Halbblock über die entsprechenden inneren Hauptflächen aufweist, so dass mit einem weiteren identischen Halbblock ein Block gebildet wird;

dadurch gekennzeichnet, dass die Passungen der Kontaktflächen 90° rotationssymmetrisch zu einer senkrecht zu der Hauptfläche verlaufenden Mittelachse sind.

2. Halbblock für Modulbauweise nach dem vorangehenden Anspruch, wobei die Passung mit einem Vorsprung eine senkrecht zu der äußeren Hauptfläche des Blocks angeordnete Endfläche (18) aufweist und die Passung mit einer Aussparung (15) eine senkrecht zur äußeren Hauptfläche des Blocks angeordnete Endfläche aufweist, so dass die Endfläche des Vorsprungs Kontakt mit der Endfläche der Aussparung eines anderen Halbblocks hat, wenn der Halbblock in einen anderen Halbblock eingepasst wird.

3. Halbblock für Modulbauweise nach einem der vor-

angehenden Ansprüche, wobei die innere Hauptfläche einen oder mehrere Kanäle (14) aufweist, die für die Aufnahme eines längslaufenden Tragelements geöffnet sind, wobei die Kanäle vorzugsweise halbzylindrisch sind.

4. Halbblock für Modulbauweise nach dem vorangehenden Anspruch, umfassend zwei horizontale Kanäle und zwei vertikale Kanäle oder umfassend zwei vertikale Kanäle und einen horizontalen Kanal.

5. Halbblock für Modulbauweise nach einem der vorangehenden Ansprüche, wobei die innere Hauptfläche ein oder mehrere Kupplungselemente (16a, 16b) für die Verbindung des Halbblocks mit einem anderen identischen Halbblock aufweist, wenn der Halbblock in einen anderen identischen Halbblock eingepasst wird.

6. Halbblock für Modulbauweise nach dem vorangehenden Anspruch, wobei die innere Hauptfläche zwei komplementäre Kupplungselemente (16a, 16b) umfasst, die symmetrisch in Bezug auf die geometrische Mitte des Halbblocks angeordnet sind.

7. Halbblock für Modulbauweise nach einem der vorangehenden Ansprüche, mit einer im Wesentlichen viereckigen Form.

8. Halbblock für Modulbauweise nach einem der vorangehenden Ansprüche, der einen Hohlraum, eine Aussparung oder eine Vertiefung auf seiner Innenseite aufweist.

9. Halbblock für Modulbauweise nach einem der vorangehenden Ansprüche mit einer Beschichtung auf der äußeren Hauptfläche.

10. Halbblock für Modulbauweise nach einem der vorangehenden Ansprüche, erhalten durch Formenpressen, insbesondere durch Formpressen von Zuschlägen oder Schichtverbundwerkstoffen; oder erhalten durch Spritzgießen, insbesondere durch Spritzgießen von Keramik-, Verbund- oder Polymermaterialien.

11. Block für Modulbauweise, umfassend zwei Halbblocke für Modulbauweise nach einem der Ansprüche 1-10, die über ihre inneren Hauptflächen ineinandergepasst werden.

12. Wand in Modulbauweise, umfassend eine Vielzahl von Halbblocken nach einem der Ansprüche 1-10, die über ihre Seitenflächen und ihre Endflächen ineinandergepasst werden.

13. Wand in Modulbauweise, umfassend eine Vielzahl von Blöcken nach Anspruch 11, die über ihre Sei-

tenflächen und ihre Endseiten ineinandergepasst werden.

14. Möbelstück, umfassend eine Wand in Modulbauweise nach Anspruch 12 oder 13.

5

15. Set, umfassend eine Tragstruktur (30) für eine Modulbauweise und umfassend eine Vielzahl von Halblöcken nach einem der Ansprüche 1-10 oder einer Vielzahl von Blöcken nach dem Anspruch 11, wobei die Tragstruktur einen unteren Träger (33), einen oberen Träger (31) und eine Vielzahl von Stäben (32) umfasst, die den unteren Träger mit dem oberen Träger verbinden, wobei die Stäbe insbesondere parallel zueinander sind, wobei die Stäbe (32) Rohre sind und die zylindrischen Rohre und die unteren und oberen Träger Blechprofile sind.

10

15

Revendications

20

1. Semi-bloc pour construction modulaire comprenant:

deux faces principales, désignées comme face principale interne et face principale externe ;
deux faces latérales, gauche et droite, et deux faces d'extrémité, supérieure et inférieure, appelées faces de contact (11, 21) ;

25

dans lequel lorsque le semi-bloc (10) est emboîté dans un autre semi-bloc identique (10) par les faces de contact respectives (11, 21), les faces principales des semi-blocs forment une surface contigüe ;

30

et dans lequel chacune des faces de contact comprend un raccord avec une saillie avec une rampe (13) et un raccord avec un renforcement avec une rampe (12), de façon à ce que la rampe de la saillie (13) soit en contact avec la rampe du renforcement (12) de l'autre semi-bloc identique, lorsque le semi-bloc (10) est emboîté dans l'autre semi-bloc identique ;

35

et dans lequel, la face interne comprend ou un plusieurs raccords pour s'emboîter dans un autre semi-bloc identique par les faces principales internes respectives, de façon à former un bloc avec encore un autre semi-bloc identique ;

45

caractérisé en ce que les raccords des faces de contact ont une symétrie rotationnelle de 90° sur un axe central perpendiculaire à la face principale.

50

2. Semi-bloc pour construction modulaire selon la revendication précédente, dans lequel le raccord avec une saillie comprend une surface d'extrémité (18) perpendiculaire à la surface principale externe du bloc et le raccord avec un renforcement (15) comprend une surface d'extrémité perpendiculaire à la surface principale externe du bloc, de façon à ce que

55

la surface d'extrémité de la saillie soit en contact avec la surface d'extrémité du renforcement d'un autre semi-bloc, lorsque le semi-bloc est emboîté dans un autre semi-bloc.

3. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes, dans lequel la face principale interne comprend un ou plusieurs canaux (14) ouverts pour recevoir un élément de support longitudinal, de préférence dans lequel les canaux sont semi-cylindriques.

4. Semi-bloc pour construction modulaire selon la revendication précédente, comprenant deux canaux horizontaux et deux canaux verticaux, ou comprenant deux canaux verticaux et un canal horizontal.

5. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes, dans lequel la face principale interne comprend un ou plusieurs éléments d'accouplement (16a, 16b) pour joindre le semi-bloc à un autre semi-bloc identique lorsque le semi-bloc est emboîté dans un autre semi-bloc identique.

6. Semi-bloc pour construction modulaire selon la revendication précédente, dans lequel la face principale interne comprend deux éléments d'accouplement complémentaires (16a, 16b), placés symétriquement par rapport au centre géométrique du semi-bloc.

7. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes, ayant une forme substantiellement quadrangulaire.

8. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes comprenant un creux, un renforcement ou une alvéole dans la face interne de celui-ci.

9. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes comprenant un revêtement sur la principale face externe de celui-ci.

10. Semi-bloc pour construction modulaire selon l'une quelconque des revendications précédentes obtenu par formage sous pression, en particulier par formage sous pression de matériaux composites agrégés ou stratifiés ; ou obtenus par moulage par injection, en particulier par moulage par injection de matériaux céramiques, composites ou polymères.

11. Bloc pour construction modulaire comprenant deux semi-blocs pour construction modulaire selon l'une quelconque des revendications 1-10, emboîtés les uns dans les autres par leurs faces principales inter-

nes.

12. Mur de construction modulaire comprenant une pluralité de semi-blocs selon l'une quelconque des revendications 1-10, emboîtés les uns dans les autres par leurs faces latérales et leurs faces d'extrémité. 5
13. Mur de construction modulaire comprenant une pluralité de blocs selon la revendication 11, emboîtés les uns dans les autres par leurs faces latérales et leurs faces d'extrémité. 10
14. Pièce de mobilier comprenant un mur de construction modulaire selon la revendication 12 ou 13. 15
15. Ensemble comprenant une structure de support (30) pour une construction modulaire, et comprenant une pluralité de semi-blocs selon l'une quelconque des revendications 1-10 ou une pluralité de blocs selon la revendication 11, dans lequel la structure de support comprend une poutre inférieure (33), une poutre supérieure (31) et une pluralité de barres (32) joignant la poutre inférieure à la poutre supérieure, en particulier dans lequel les barres sont parallèles les unes aux autres, dans lequel les barres (32) sont des tubes, et les tubes cylindriques et les poutres inférieures et supérieures sont en profil de feuille. 20 25

30

35

40

45

50

55

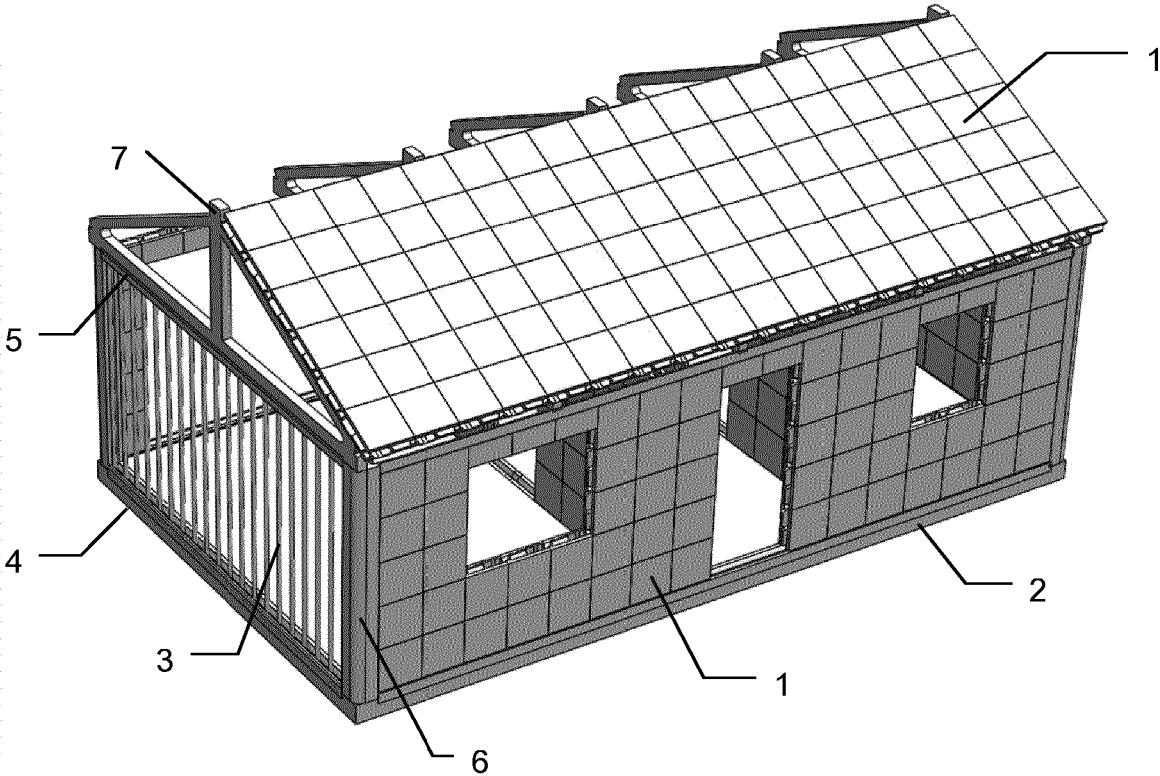


Fig. 1

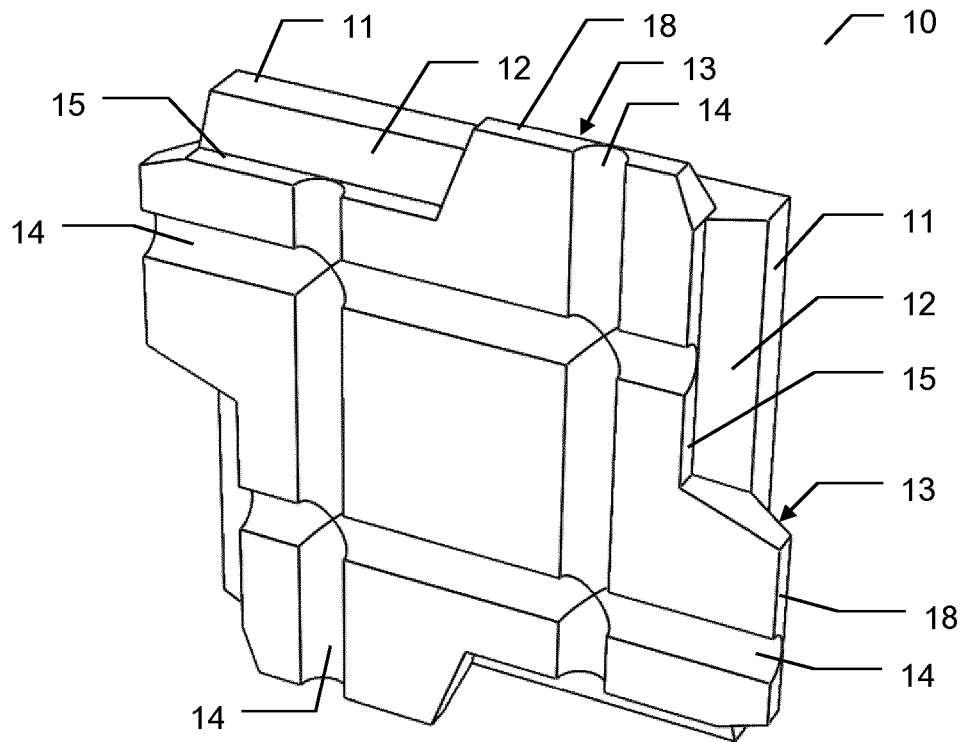


Fig. 2

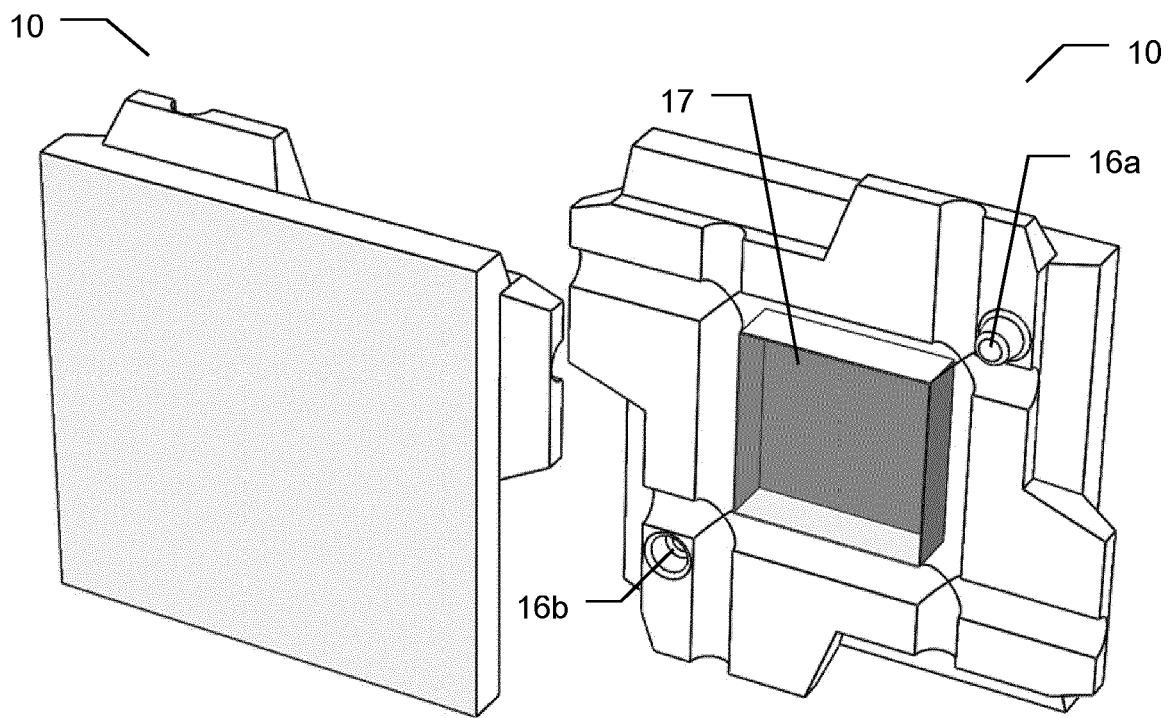


Fig. 3

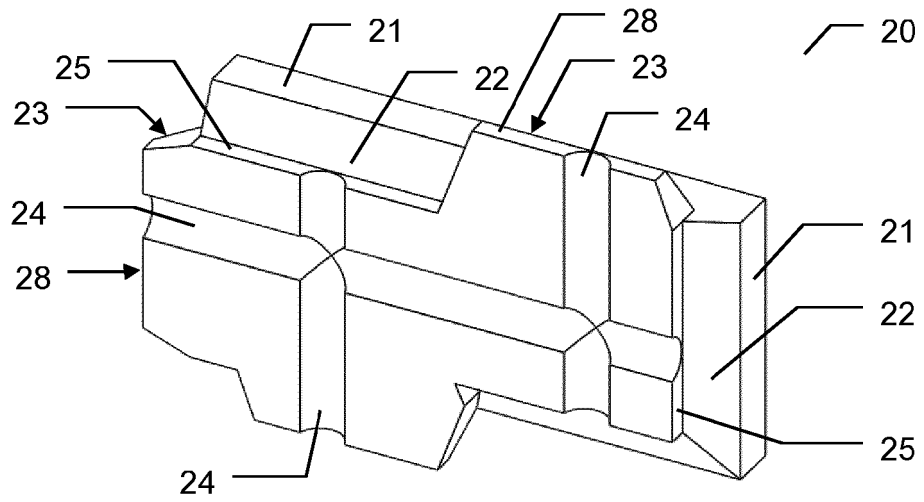


Fig. 4

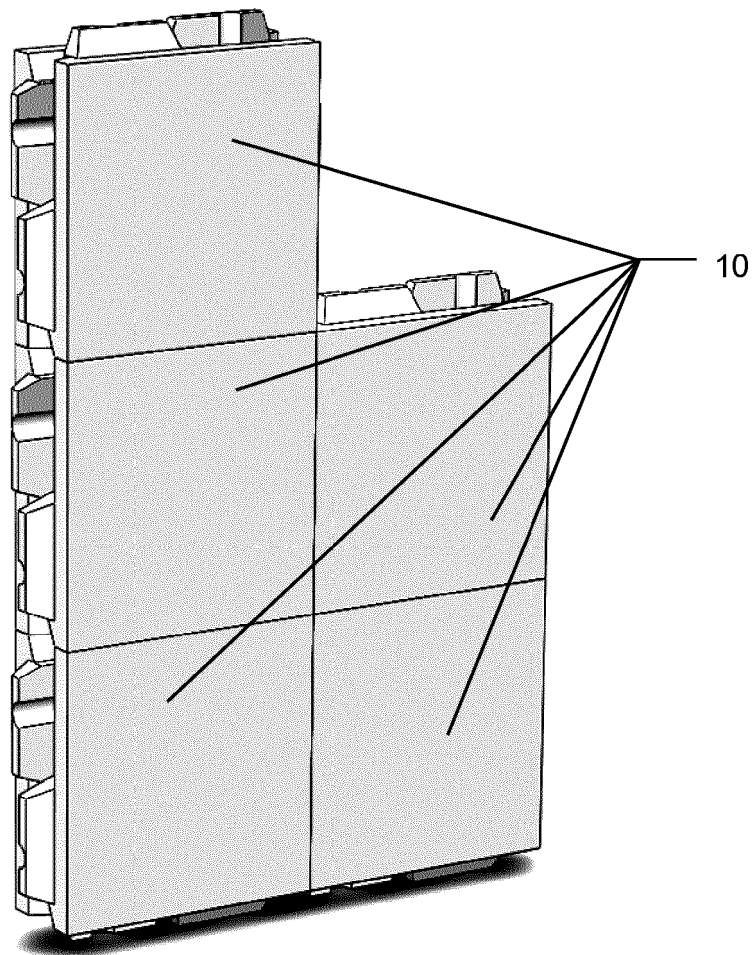


Fig. 5

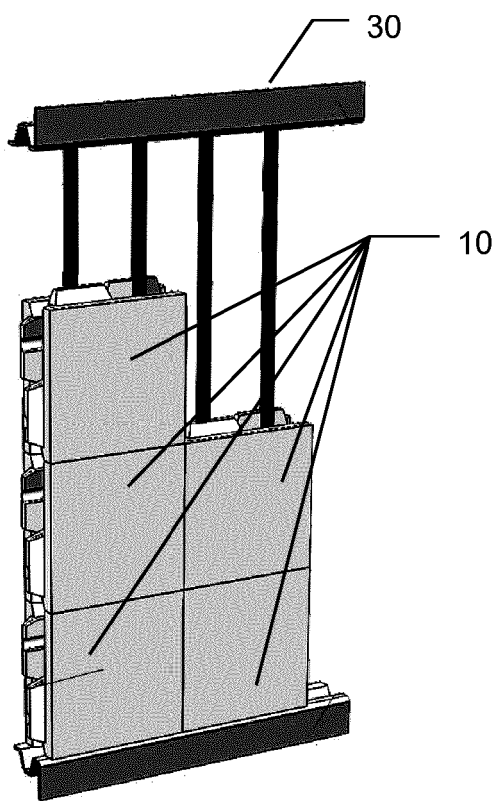


Fig. 6a

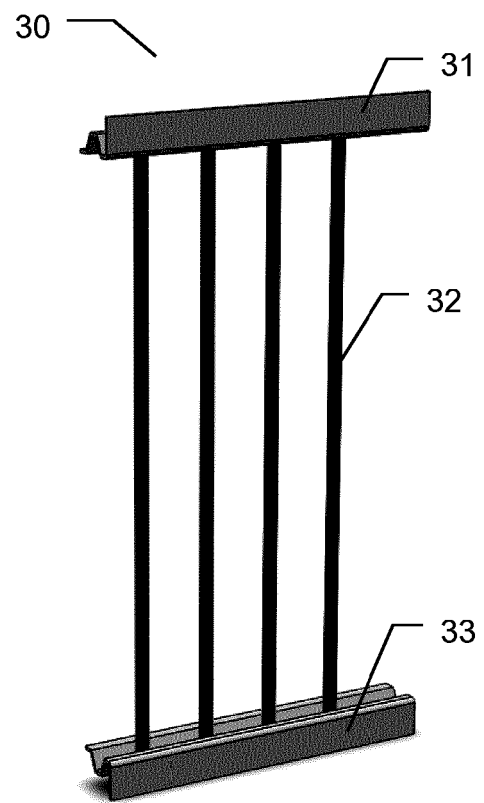


Fig. 6b

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- FR 2322988 A1 [0003]
- GB 2458317 A [0004]
- GB 1381791 A [0005]
- WO 2004063482 A1 [0006]