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(54) **MODULAR CONSTRUCTION SYSTEM**

(57) The present invention relates to a modular building system, which consists of a structure for building construction, this structure being sectioned into several independent modules or parts, each module being composed of several metal profiles cold-formed from sheet metal. Each module has vertical profiles (3) that fit together, horizontal profiles (1) at the base and top of the module, and central vertical profile (4) located between two vertical profiles (3). The modules may have diagonal bars (6) between the profiles, for counter-locking and housing thermal and/or acoustic insulation material (2), (7) and (8). The solution developed for the connection/coupling between the wall modules is considered innovative, due to its simplicity, fast assembly, strength and functionality.

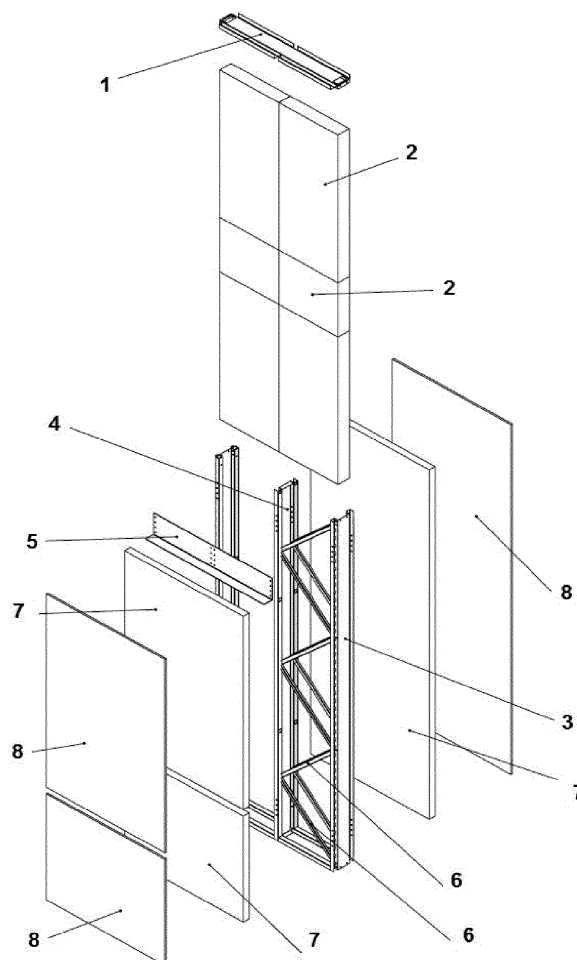


Fig. 1

Description

SUMMARY OF THE INVENTION

[0001] The present invention relates to a modular building system, which consists of a structure for building construction, this structure being sectioned into several independent modules or parts, each module being composed of several metal profiles cold-formed from sheet metal. These profiles are later connected with screws, thus forming the different modules necessary to the construction of the building. The modules are sequentially connected to each other through a mechanical coupling with notches in said profiles and locked with a screw connection, ensuring the perfect structural connection of the assembly.

FIELD OF THE INVENTION

[0002] The present invention is in the field of building construction and, in particular, relates to a modular building system

BACKGROUND OF THE INVENTION

[0003] The present invention relates to a modular building system, which consists of a structure for building construction, this structure being sectioned into several independent modules or parts, factory produced and subsequently sent to the assembly site, being an innovative solution regarding the connection and/or coupling between the module due to its simplicity, fast assembly, strength, functionality and integration of the thermal and structural components into a single product.

[0004] The development of this constructive system aims at accelerating the constructive process of a building, especially the structural part. The modules that constitute the sectioned structure connect with each other, promoting the structural skeleton of the building, that is forming walls, decks floor slabs and floors, roofs, etc. On this "skeleton", all the other components of the various specialties necessary for the construction of a building will be placed or laid

STATE-OF-THE ART OF THE INVENTION

[0005] The construction system, object of the present invention, is based on the principles of modular construction of Light Steel Framing (LSF), this being the designation used internationally to describe a constructive system that uses galvanized steel as the main structural element. There are several state-of-the-art solutions related to LSF technology for building constructions, examples of which are US 2017058515 (A1), US 2012291378 A1 and US 2012174523 A1.

[0006] The distinction between the state-of-the-art and the present invention is that the modules of the present invention have a built-in locking system which facilitates

and expedites the on-site assembly, rather than the other known systems, in which the assembly of the modules is made using self-drilling screws during the in situ assembly.

DESCRIPTION OF THE FIGURES

[0007] Definition of the reference numbers:

- (1) Horizontal profile;
- (2) Insulation material, preferably rock wool;
- (3) Vertical profile;
- (4) Central vertical profile;
- (5) Floor support;
- (6) Bars for counter-locking;
- (7) Insulation material, preferably extruded polystyrene (XPS);
- (8) Insulation material, preferably thermal and acoustic insulation (e.g. coretech);
- (9) Drilling;
- (10) Zones for fixation to the foundations;
- (11) Notches.

Fig. 1 - exploded representation of a module and its constituents, being the components defined in the abovementioned reference numbers, so we inhibit its repetition.

Fig. 2 - front and side view representations of a module, only with the metallic structure and its connections. In the side view, the drillings (9) for passage of the electric system, located in the vertical profiles (3) are perceptible.

Fig. 3 - perspective representation of the module and representation in detail of the region A, where the location of vertical (3) and horizontal (1) profiles for fixation to the foundations, referred to as fixation zones (10), are shown.

Fig. 4 - representation of the assembly of two modules, in which their fastening can be observed in greater detail in region B. In the detailed region B, it is observed that for the fitting of two modules it is necessary that one of the modules is raised, so that the notches (11), present on the outer sides of each vertical profile (3), couple; also visible is the zone of fixation (10) to the foundations.

Fig. 5 - perspective representation of two assembled modules, with the notches (11) already coupled, in which the upper peripheral region C is visible, in which screws were placed for a permanent fixation of the modules.

Fig. 6 - detailed representation of the vertical profiles (3) on the left, the central vertical profiles (4) at the center, and the horizontal profiles (1) on the right. Preferably the measure **a** should be between 60 and 240mm, and the measure **b** between 30 and 70 mm. The thickness of the sheet metal of the profiles (1) (3) (4) can be between 1.00 and 4.00 mm.

DETAILED DESCRIPTION OF THE INVENTION

[0008] As mentioned above, the present invention relates to a modular building system, which consists of a structure for building construction, this structure being sectioned into several independent modules or parts, each module being composed of several metal profiles cold-formed from sheet metal.

[0009] These profiles have different positions and characteristics, so each module consists of:

- at least two vertical profiles (3), which form the outer structure of the module, these vertical profiles (3) having on the outer surface of the module the sets of notches (11) that allow the engagement between vertical profiles (3) and consequent connection between the preceding module and the next;
- at least two horizontal profiles (1) at the base and top of the module;
- at least a central vertical profile (4);
- and wherein said profiles (1) (3) (4) are fitted through a plurality of notches (11) and subsequently connected with screws, thus forming the different modules required for the construction of the building.

[0010] It should be noted that each module has the vertical profiles (3) and the central vertical profile (4) equally spaced from each other, and two horizontal profiles (1) at the top and the base, totalizing four profiles.

[0011] The dimensions of all the profiles (1) (3) (4) and their composition may be changed depending on the level of thermal insulation and structural strength to be achieved. The layout or configuration of each profile (1) (3) and (4) is always identical. It should be noted that they may have drillings for the fixation to the foundations in certain zones (10), and drillings (9) to meet the requirements of the electrical wiring design.

[0012] The plug-in connection between modules is made permanent through the installation *in situ* of two screws close to the top end of the profile (detail C), and the fixation of the modules to the ground is done in two points per module, the zones of fixation (10) to the foundations, for example through a metal bushing in building foundations (detail B).

[0013] The structure counter-locking is made by diagonal bars (6), between the vertical profiles (3) and the central vertical profile (1) of the modules, and there may be modules without counter-locking if the loads on the structure allow it.

[0014] Along the thickness of the profiles there is space for housing material for thermal and acoustic insulation, material (2), (7) and (8), wherein this material may preferably have the thickness given by the dimension **a** represented in the Figs., which may vary between 60 and 240 mm. In the case of the material (2) placed in the free space of the profile thickness, it may preferably be low density rock wool.

[0015] It is also noted that the space where the counter-

locking works is empty and serves as an air box on both sides of the module, with thickness given by the dimension **b** shown in the Figs., which can vary between 30 and 70mm.

[0016] For a better insulation of buildings constructed from these modules, these can be covered along its width by a layer of another insulation material (7), for example XPS, with the required thickness, on the outer or both faces, and then further covered by a layer of thermal and acoustic insulation material, for example coretech or OSB, which provides a finishing to the module and serves as a basis for the surface finishing of the housing.

[0017] The module composition can be adapted to meet the requirements in terms of energy performance.

[0018] The solution developed for the connection/coupling between the modules of the wall is considered innovative, due to its simplicity, fast assembly, strength, functionality and integration of the thermal and structural components into a single product.

Claims

1. Modular building system **characterized by** at least two modules, each module comprising:

- a) at least two vertical profiles (3), these vertical profiles (3) presenting on one of their surfaces a plurality of notches (11) which allow engagement between vertical profiles (3);
- b) at least two horizontal profiles (1) at the base and at least two horizontal profiles (1) at the top of the module;
- c) at least a central vertical profile (4);
- d) the central profile (4) being located between two vertical profiles (3), and the vertical profiles (3) and the central vertical profile (4) being equally spaced from each other.

2. Modular construction system according to the preceding claim, wherein the modules have diagonal bars (6) between the vertical profiles (3) and the central vertical profile (4).

3. Modular construction system according to the preceding claims, wherein the inner thickness of the vertical profiles (3) and (4) and the horizontal profile (1) is between 30 and 70mm.

4. Modular construction system according to the preceding claims, wherein **characterized in that** the profiles (1) (3) (4) are connected to one another by means of screws.

5. Modular construction system according to the preceding claims, wherein the vertical profiles (3) and the horizontal profiles (1) have drillings (9) and zones of fixation (10) to the foundations.

6. Modular construction system according to the preceding claims, wherein vertical profiles (3), the vertical central profile (4) and the horizontal profiles (1) house insulation material (2), (7) and (8).

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7. Modular building system according to the preceding claim, wherein the insulation material (2) is low density rock wool and may preferably have a thickness between 60 and 240 mm.

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8. Modular construction system according to claim 6, wherein the insulation material (7) is a thermal insulation, preferably extruded polystyrene.

9. Modular construction system according to claim 6, wherein the insulation material (8) is a thermal and acoustic insulation.

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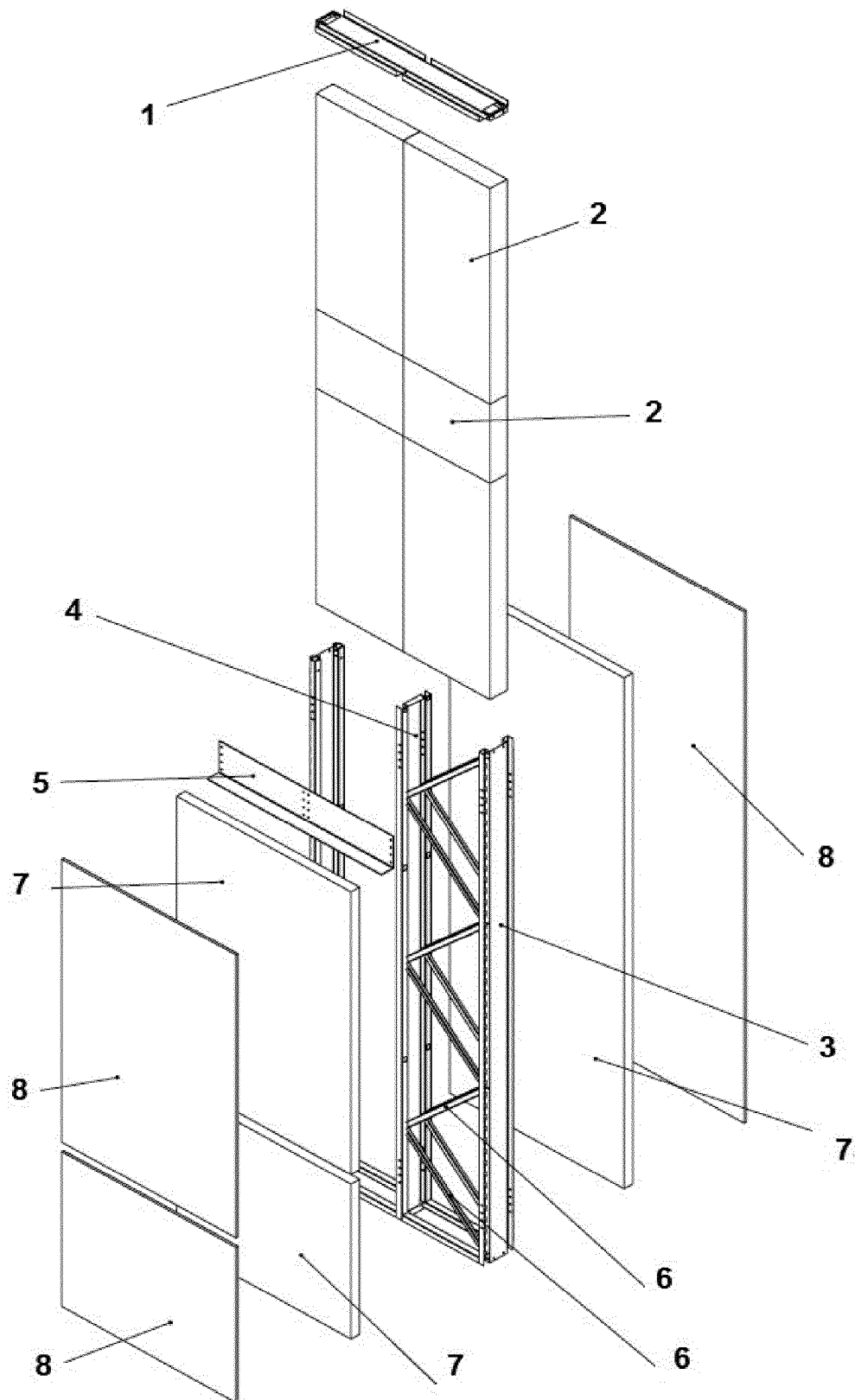


Fig. 1

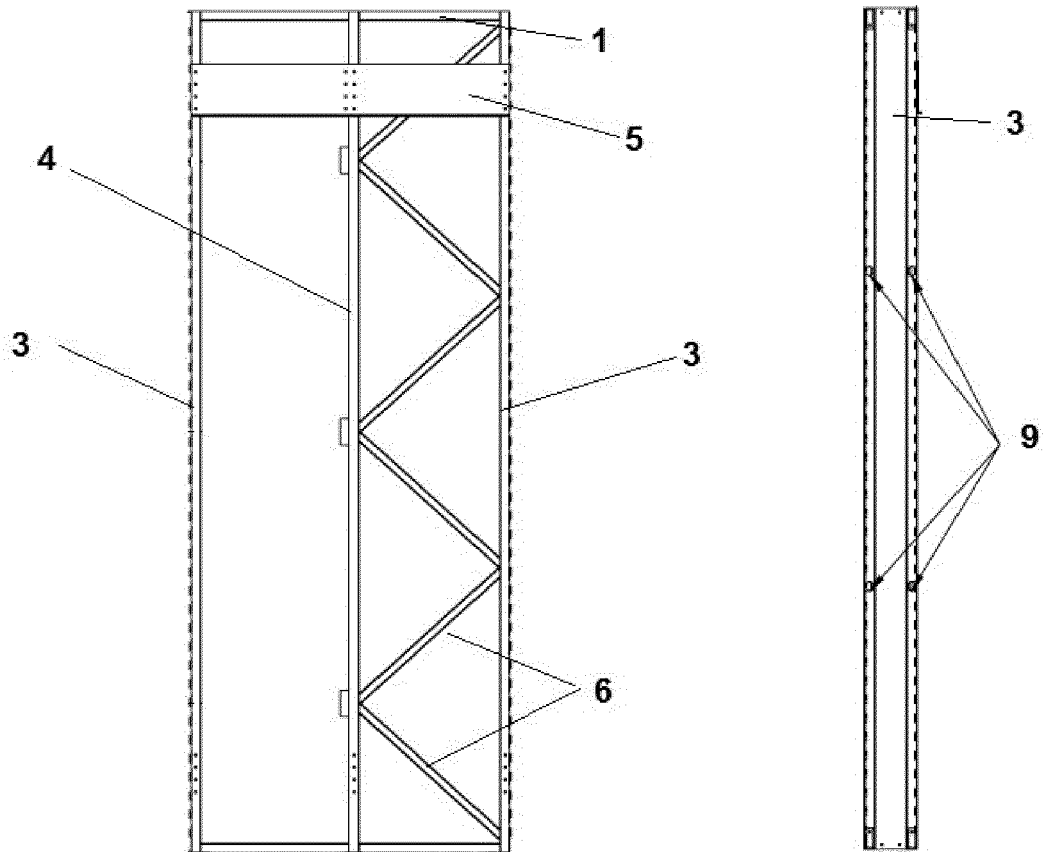


Fig. 2

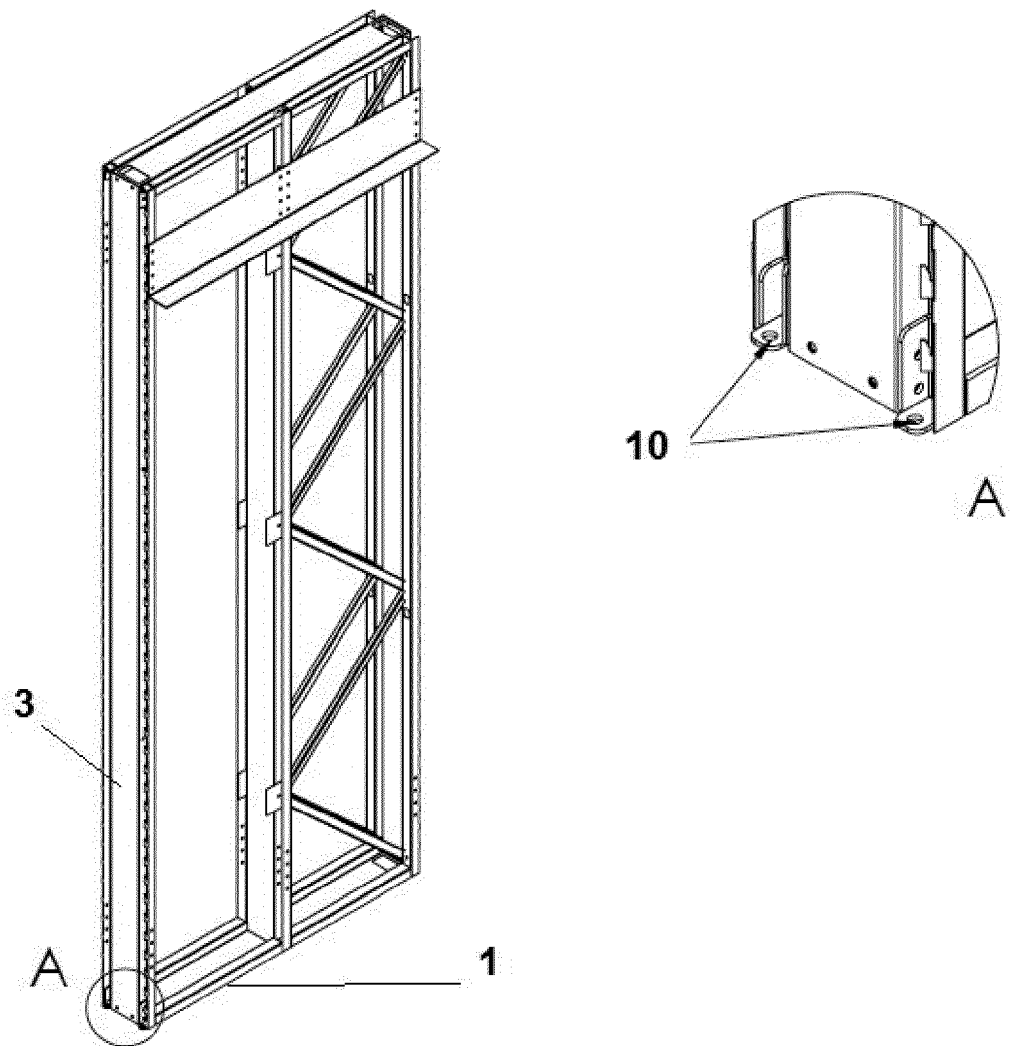


Fig. 3

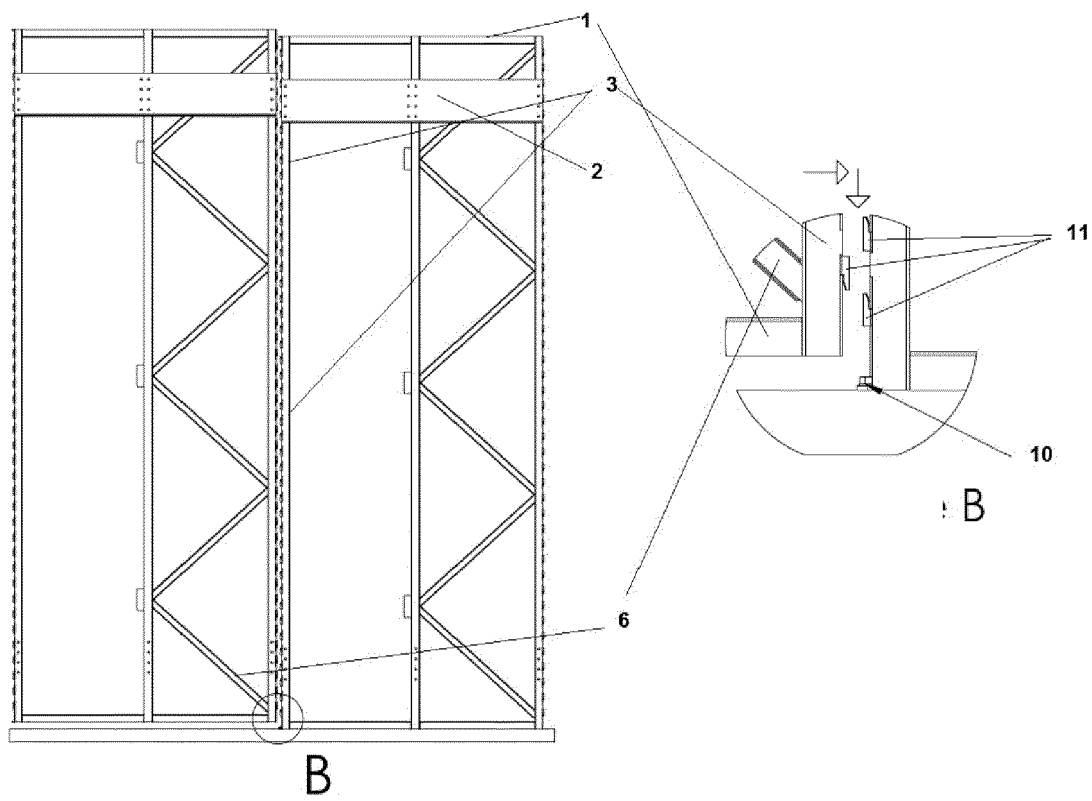


Fig. 4

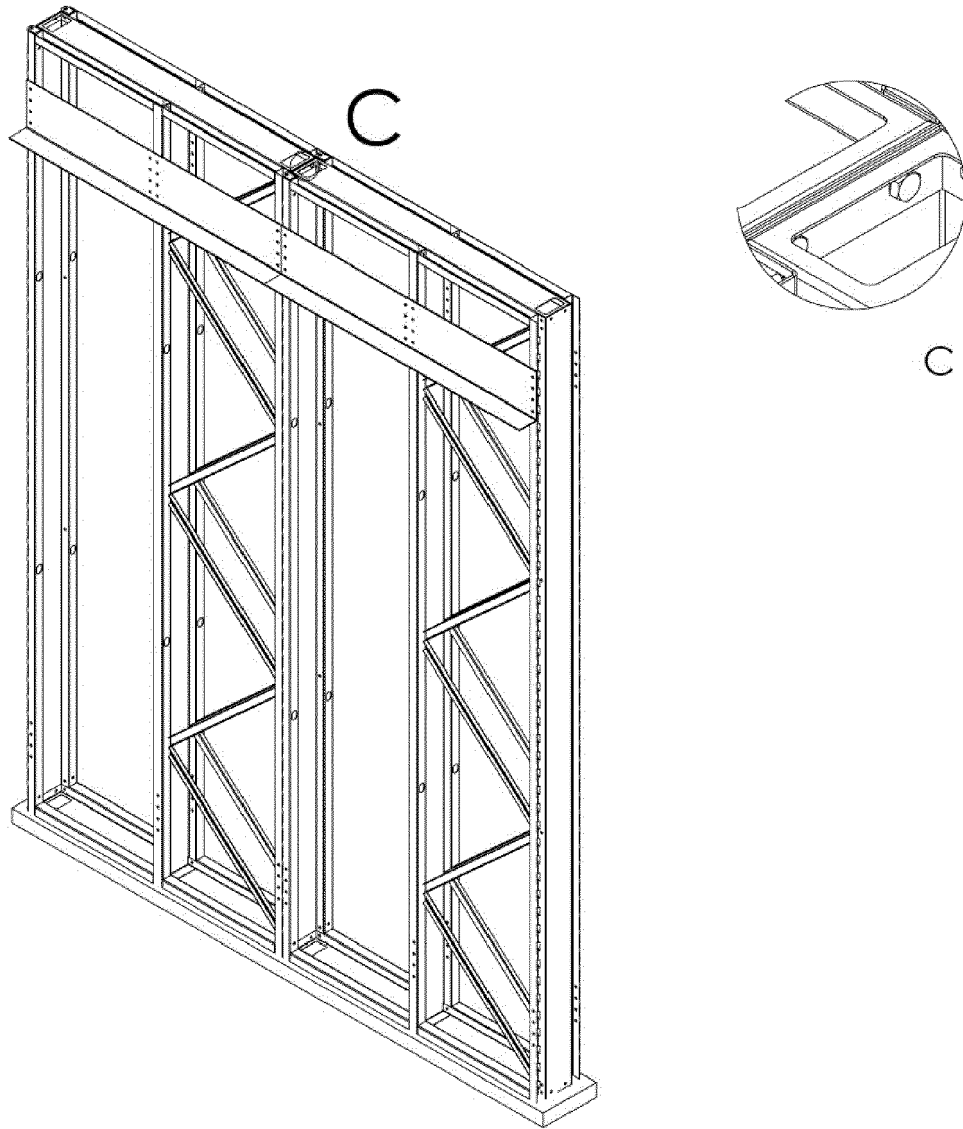


Fig. 5

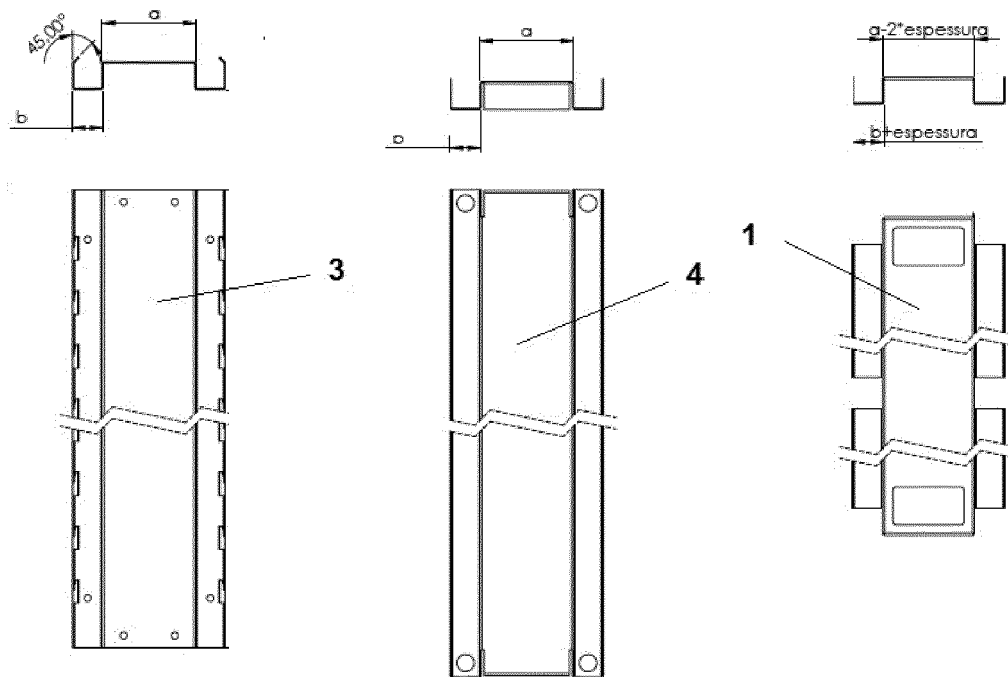


Fig. 6



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 18 3022

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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 2018/164646 A1 (MMS MODUELER VE MOBIL SISTEMELER SAN VE TIC A S [TR]) 13 September 2018 (2018-09-13) * page 4, line 13 - page 5, line 27; figures 1-5 *	1-9	INV. E04B1/08 E04B1/61
X	GB 1 181 857 A (P AND A INVEST INC [PA]) 18 February 1970 (1970-02-18) * page 2, line 24 - line 55; figure 2 *	1-9	
X	EP 3 168 379 A1 (FEVRIER GILLES [FR]) 17 May 2017 (2017-05-17) * paragraph [0036] - paragraph [0042]; figures 5, 6, 10, 17 *	1-9	
X	US 2011/107712 A1 (INOUE TADASHI [JP] ET AL) 12 May 2011 (2011-05-12) * paragraph [0081] - paragraph [0122]; figures 5-7 *	1-9	
A	GB 759 545 A (BOULTON & PAUL LTD) 17 October 1956 (1956-10-17) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) E04B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 November 2019	Examiner Galanti, Flavio
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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 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 18 3022

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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07-11-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2018164646 A1	13-09-2018	NONE	
GB 1181857 A	18-02-1970	AU 410985 B2 GB 1181857 A	01-03-1971 18-02-1970
EP 3168379 A1	17-05-2017	EP 3168379 A1 FR 3043418 A1	17-05-2017 12-05-2017
US 2011107712 A1	12-05-2011	BR PI0919383 A2 CN 102037195 A JP 4944937 B2 JP 2010168887 A US 2011107712 A1 WO 2010073896 A1	12-01-2016 27-04-2011 06-06-2012 05-08-2010 12-05-2011 01-07-2010
GB 759545 A	17-10-1956	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2017058515 A1 [0005]
- US 2012291378 A1 [0005]
- US 2012174523 A1 [0005]