



(11) **EP 4 194 645 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.06.2023 Bulletin 2023/24

(51) International Patent Classification (IPC):
E04H 9/02 (2006.01) E04G 23/04 (2006.01)

(21) Application number: **21425062.3**

(52) Cooperative Patent Classification (CPC):
**E04H 9/0237; E04G 23/04; E04H 9/027;
E04H 9/029**

(22) Date of filing: **07.12.2021**

(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**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicants:
• **Università degli Studi di Camerino
62032 Camerino (MC) (IT)**
• **Università degli Studi dell'Aquila
67100 L'Aquila (AQ) (IT)**
• **Vastarredo Industrie Srl
66054 Vasto (CH) (IT)**
• **Camillo Sirianni di Sirianni Angelo Francesco
SAS
88049 Soveria Mannelli (CZ) (IT)**

(72) Inventors:
• **Pietroni, Lucia
00184 Roma (IT)**
• **Dall'Asta, Andrea
60131 Ancona (AN) (IT)**
• **Leoni, Graziano
60035 Jesi (AN) (IT)**
• **Zona, Alessandro
65123 Pescara (PE) (IT)**
• **Mascitti, Jacopo
63100 Ascoli Piceno (AP) (IT)**
• **Di Stefano, Alessandro
97019 Vittoria (RG) (IT)**

- **Galloppo, Daniele
64010 Colonnella (TE) (IT)**
- **Paciotti, Davide
62019 Recanati (MC) (IT)**
- **Gioiella, Laura
60121 Ancona (AN) (IT)**
- **Scozzese, Fabrizio
65121 Pescara (PE) (IT)**
- **Morici, Michele
60041 Sassoferrato (AN) (IT)**
- **Micozzi, Fabio
62100 Macerata (MC) (IT)**
- **Fragiacomo, Massimo
34122 Trieste (IT)**
- **Tamagnone, Gabriele
10023 Chieri (TO) (IT)**
- **Sciomenta, Martina
67100 L'Aquila (AQ) (IT)**
- **Ciuffetelli, Edoardo
67100 L'Aquila (AQ) (IT)**
- **Peditto, Alfredo
67019 Scoppito (AQ) (IT)**
- **Salvatorelli, Emidio
Vasto (CH) (IT)**
- **Sirianni, Angelo Francesco
88049 Soveria Mannelli (CZ) (IT)**

(74) Representative: **Picarelli, Gennaro
Via Monte San Michele, 15
Ancona 60124 (IT)**

Remarks:

Amended claims in accordance with Rule 137(2)
EPC.

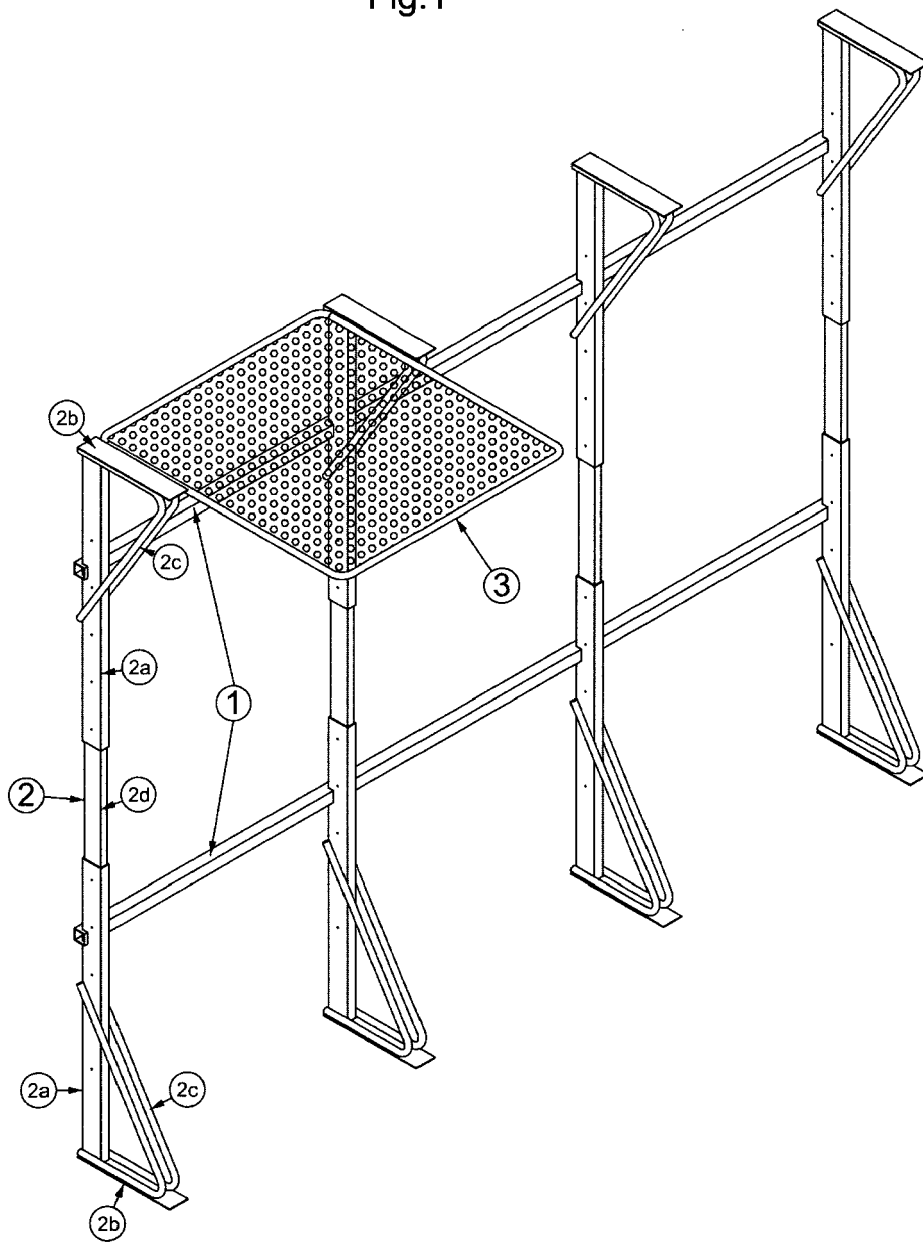
(54) **SUPPORT SYSTEM FOR PARTITION WALLS**

(57) The present invention describes an equipped wall capable of ensure the life-saving function during an earthquake against anyone in its proximity. All that happens thanks to the structural shelter placed at its top which protects against falling bodies from damage to the

floors. In addition, the equipped wall, during an earthquake, is able to contribute to the anti-rollover of the masonry partition walls against which the equipped wall is leaned.

EP 4 194 645 A1

Fig.1



Description

[0001] The present invention describes a particular equipped wall. This invention might be described as a conventionally furniture wall, however, in case of seismic events, it reveals properties aimed to the safety of the nearby individuals, indeed, it guarantees their protection against falling object due to the damage of the floors and it tackles the overturning of the partition wall itself, just in case it is leaned to a partition wall.

[0002] Generally, the equipped wall is settled next to a masonry or other partition wall, to which it is attached through mechanical fixings, alternatively, the equipped wall can be assembled by means of a ceiling-floor connection with adjustment devices for upright height and which determine the independent support of the wall, thus defining a self-supporting structure.

[0003] The state of the art describes equipped walls that can be specified as resistant to the actions of an earthquake if they are anchored to partition walls that have been designed to be seismically resistant. An important drawback of these solutions is represented by the fact that, if the partition walls do not meet the seismic requirements, the equipped walls anchored to them follow the fate of the partition walls, as well as the equipped walls which, used as a dividing wall with a sky-earth connection, do not have elements capable of stabilizing their structural behaviour under seismic actions.

[0004] It is clear that a large majority of existing buildings do not have earthquake-resistant partition walls. In this respect, the partition walls are likely to tip over in the event of seismic events, and so they are a danger for the safety of people nearby.

[0005] The purpose of this invention is to ensure that the structural elements of the equipped wall provide "*intrinsic anti-rollover*" properties on it, thanks to the union between structural metal elements defined as crossbeams (horizontal development) and the ones defined as uprights (vertical development), together they develop a frame which is able to withstand the stress induced by an earthquake.

[0006] This equipped wall is settled next to a masonry or other partition wall and it allows the anti-rollover property to be transferred to this partition wall in the event that it is subjected to seismic actions.

[0007] The self-supporting partition wall cannot transfer the anti-rollover property, since it is not connected to any partition wall. However, if it is installed as a self-supporting partition wall, it is able to contribute to the safety of people nearby, since it expresses the other fundamental characteristic, which is the protection against falling bodies due to the damage of the floors. This equipped wall has the advantage of not transferring loads to the partition walls, as it can only be discharged onto the floor.

[0008] This equipped wall is set up to be modular and so it allows the composition of modelling as required.

[0009] Each module of the equipped wall can rigidly

insert a shelter at its top with a structural function that makes it possible to contain any falls of bricks due to damage to the floor slabs. It has the function of preventing them from hitting the people below and thus creating a life-saving area.

[0010] Another advantage of this system is that it is made up of prefabricated elements which are easy to assemble and transport.

[0011] The following part describes in more detail the elements that define this equipped wall; in this respect please make reference to the graphical representations of the attached figures, which have the sole purpose of facilitating the understanding of the representation, although they are not binding in terms of shape or dimensions.

[0012] The reference figures are:

Fig.1 - represents an axonometric view of the metal structure with a life-saving function.

Fig.2 - represents a side view of the uprights.

Fig.3 - represents an axonometric and exploded view of the far-end elements of the uprights.

Fig.4 - represents a view of the uprights/slab and uprights/floor coupling system.

Fig.5 - describes the floating superstructure covering the main structure.

[0013] With reference to these figures, we can say that the equipped wall consists of a structure characterised by steel uprights (2) and crossbeams (1). The uprights are made up of three parts, two of them are of the same shape and they are the far-end of the uprights; they are made up of welded elements such as a tubular bar (2a) with a rectangular cross-section with a welded rectangular plate (2b) at one end that acts as a foot, and which allows it to be connected with both the slabs and the floors; there are also two other tubular elements (2c) with a circular cross-section welded to both the shaft and the plate that act as struts/tie-beams. The third part (2d) is a tubular element that fits inside the rectangular profiles of the end parts, which allows them to be connected, making it possible to adjust the length of the whole uprights telescopically according to the height of the floor. Two further rectangular steel profile parts, which are called crosspieces, are arranged horizontally, they connect the various uprights used in the configuration with a removable coupling.

[0014] In order to ensure better alignment of the foot plates (2b) with the surfaces of the slab or floor, a movable plate (5) is interposed between said foot (2b) and the slab or floor. Said movable plate, on the side of interfacing with the slab or floor, has a suitable thickness (4) of elastomeric material of equal surface dimensions. Said mobile plate together with the elastomeric thickness interposed, allows both to recover any misalignments with the interfaces (plate / ceiling or plate / floor) and to be able to apply a coupling preload with the surfaces of the slab and floor thanks to the screw adjustment system of

said movable plate (5). Said screw adjustment system allows the movable plate (5) to be moved away from the foot (2b). All this makes it possible to maintain contact even in situations where dynamic stresses are applied to the structure as well as, due to the effect of the improved adhesion between the elastomer (4) and the contact surface, being more effective in counteracting reciprocal slippage. Depending on the conditions encountered in the building, the fixings of the movable plates (5) to the ceiling and floor can be integrated with mechanical anchors (6). All the above ensures the structure of said equipped wall to work according to the static arched scheme, it also satisfies at its best the purposes for which it has been conceived; here it is a short summary:

- it has the function of preventing the overturning of partition walls
- it has a life-saving function thanks to the presence of a structural shelter (3) and also thanks to the intrinsic anti-rollover condition.

[0015] So far, this is what the wall system offers in terms of safety, obviously it also guarantees functional aspects for housing accessories such as: shelves, containers and anything else that may be useful for the finalization of the wall system.

[0016] For this purpose, said equipped wall separates the life-saving structural function from the function of supporting the accessories. For this it makes use of a coating (7) (which can be made of various kinds of materials from wood to polymeric to metal as well as to composites) which rests directly on the ground and adds aesthetic value (it partially or totally hides the structural elements) as well as functional allowing to support all the accessories provided for the customized set-ups. These accessories are fixed directly to the coating without placing their weight on the steel structure. The fact that the coating (7) itself constitutes the structural part for the application of the accessories means that it does not affect the load transfers on the steel safety structure, which can carry out its functions freely.

[0017] The connection between the coating and the steel structure allows the coating itself to move on the floor plane independently from the movements of the steel structure, thanks to a floating coupling, which is determined according to the chosen coating geometry.

Claims

1. Modular system of life-saving equipped wall with intrinsic anti-overturning function in the event of an earthquake, comprising two interconnected load-bearing structures with floating connection designed to guarantee the reciprocal freedom of movement of said structures in conditions of dynamic stress of the same.

2. Modular system of equipped wall according to claim 1 where a first structure is a metal frame with adjustable height fixed to the floor and ceiling and composed of vertical uprights 2, horizontal crossbeams 1 and protection shelters 3 interconnected with removable or fixed connections. Said frame is able to counteract the overturning of non-earthquake resistant partition walls to which it is leaning and to contain the fall of bodies from floors damage thanks to the shelters 3.

3. Modular system of equipped wall according to claim 1 where a second structure 7 is formed by covering structural elements resting on the ground and connected to said first structure with a floating connection.

4. Modular system of equipped wall according to claims 1 and 3 wherein said second structure has an aesthetic-functional value and is able to cover said first structure and to host the fixing seats for the insertion of accessories such as panels, shelves, containers.

5. Modular system of equipped wall according to claims 1 and 2 wherein the connection between the upright and the ceiling and the upright and the floor comprises a viscoelastic element 4 which is interposed between them and has the function of compensating for geometric misalignments between the parts and the further function of improving the adhesion between the contact surfaces.

6. Modular system of equipped wall according to claims 1, 2 and 5 wherein that said viscoelastic element 4 is integral with a mobile steel plate 5 connected to the foot of the upright with adjustment screws. Said movable plate 5 allows to apply a compression preload between the viscoelastic element and the ceiling / floor.

7. Modular system of equipped wall according to claims 1,2,5 and 6 wherein that said movable plate 5 in some cases can be connected to the ceiling or to the floor with further fixing elements to prevent possible sliding between them if the admissible preload to the ceiling does not guarantee this.

Amended claims in accordance with Rule 137(2) EPC.

1. Modular system of equipped wall with intrinsic anti-overturning function **characterized in that** it comprises two bearing structures connected but free to move independently if dynamically stressed thanks to a floating connection and having different features as a first bearing structure performs the functions of:

- safety given by its intrinsic anti-overturning property,
- life-saving in case of seismic events given by protective shelters (3)

and it is composed of a metal frame with adjustable height, comprising:

i-at least four vertical uprights (2), each composed of:

- two equal parts, that make up the ends of the upright, obtained by welding one end of a tubular profile of rectangular section (2a) with a rectangular plate (2b) which acts as the foot of the upright and welding with two tubular elements with a circular section (2c) joined both to the profile (2a) and to the plate (2c),
- a part consisting of rectangular section tubular profile (2d) which fits inside the rectangular section tubular profiles (2a) of the said end parts of the upright, allowing the telescopic connection and guaranteeing the height adjustment of the upright,
- a movable plate (5) joined on one side to said foot (2b) of the upright with height adjustable screw connection, bearing on the opposite side a coating in glued elastomeric material (4) which interfaces both with the floor and with the ceiling and which has at least one housing for fixing dowels (6),

ii at least two horizontal crossbeams in rectangular section tubular profile (1) connected to the uprights (2) with removable fixing,

iii at least one protection shelter (3) connected to a pair of said uprights (2) with removable fixing,
and

a said second structure (7) comprising a plurality of vertical load-bearing elements leaning on the floor, made of various materials and various shapes, that are connected to the said first structure and contain the anchors of the furnishing accessories, such as shelves, drawers, sliding doors etc.

2. Modular system of equipped wall according to claim 1 **characterized in that** said first structure is formed by a frame with adjustable height fixed to the floor and to the ceiling by said movable plates (5) and composed of four vertical uprights (2), two horizontal crossbeams (1) and a protection shelter (3) connected with removable fixings, designed to counter the overturning of non-earthquake-resistant partition walls against which said frame is leaning and to contain the fall of bodies from ceiling damage thanks to

the said protection shelter (3).

3. Modular system of equipped wall according to claims 1 and 2 **characterized in that** said second supporting structure (7) leaning on the floor and connected to said first structure with floating connection and comprising a plurality of vertical elements of various shapes and materials, is able to contain anchors for furnishing accessories such as panels, shelves, containers, etc. allowing them not to load their own weight and the weight of the accessories on the first structure.

4. Modular system of equipped wall according to one or more of preceding claims **characterized in that** said second structure has an aesthetic-functional value and is able to cover said first structure to improve the aesthetic appearance.

5. Modular system of equipped wall according to one or more of preceding claims **characterized in that** said elastomeric element (4) integrated with the mobile plate (5) interfaces both with the ceiling and with the floor, compensating geometric misalignments and improving adherence in interfacing both with the ceiling and with the floor.

6. Modular system of equipped wall according to one or more preceding claims **characterized in that** said movable plate (5) integrated with said elastomeric element (4), is connected to the foot of the upright (2b) with adjustment screws allowing to apply a compression preload between elastomeric element (4) and ceiling and elastomeric element (4) and floor.

7. Modular system of equipped wall according to one or more of preceding claims **characterized in that** said movable plate (5) can be connected to the ceiling or to the floor with further fixing dowels (6) to prevent the possible sliding if the admissible preload to the ceiling is not sufficient.

Fig.1

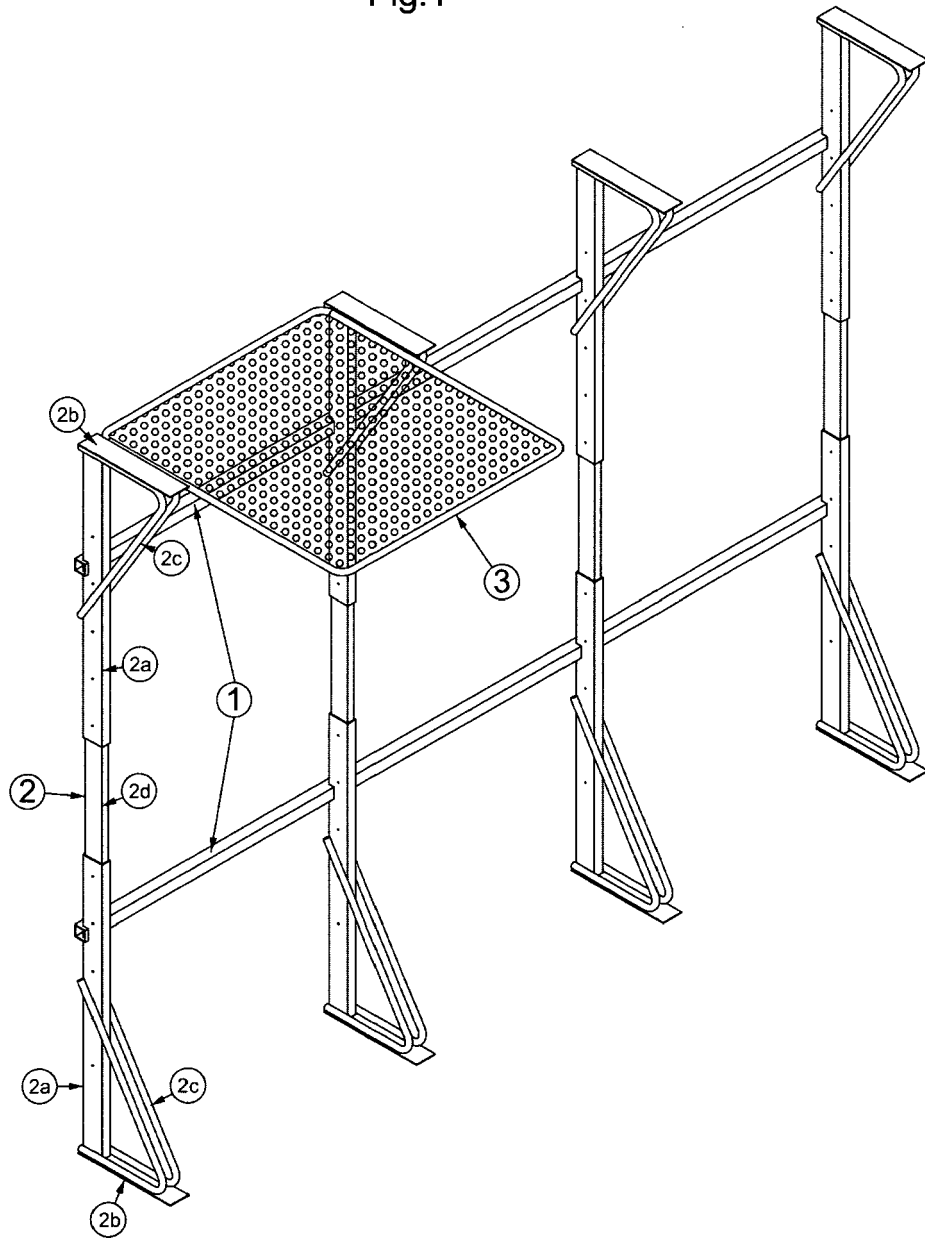


Fig.2

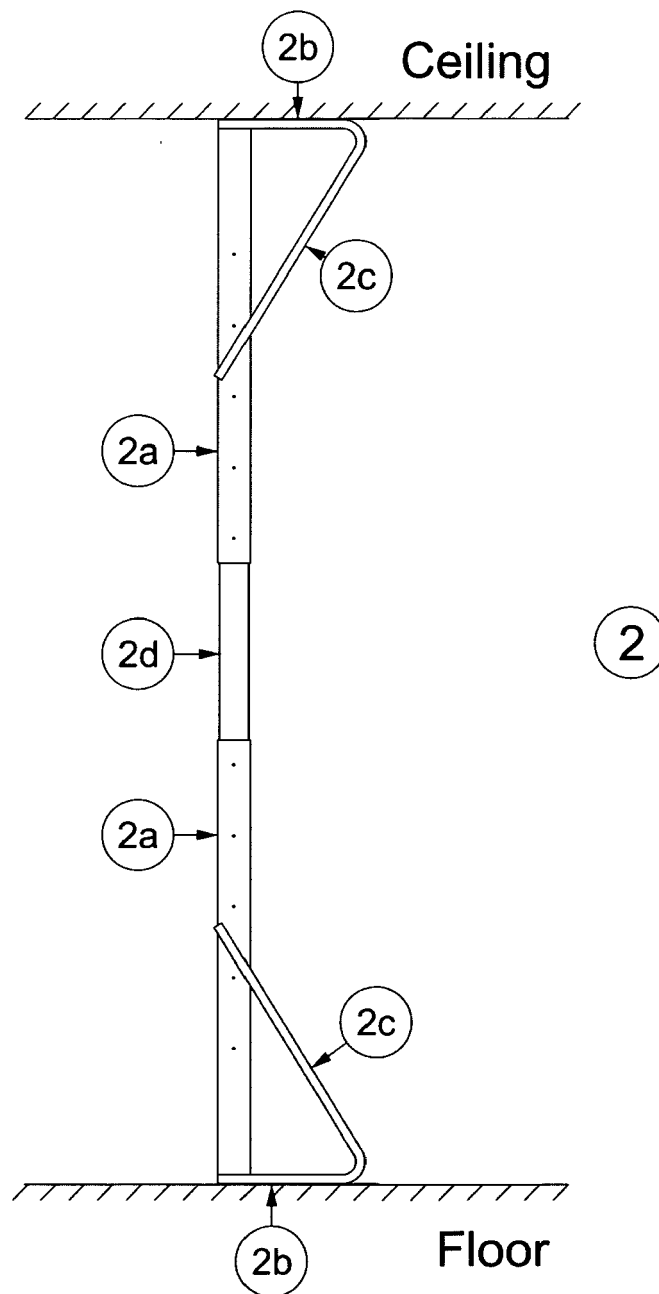


Fig.3

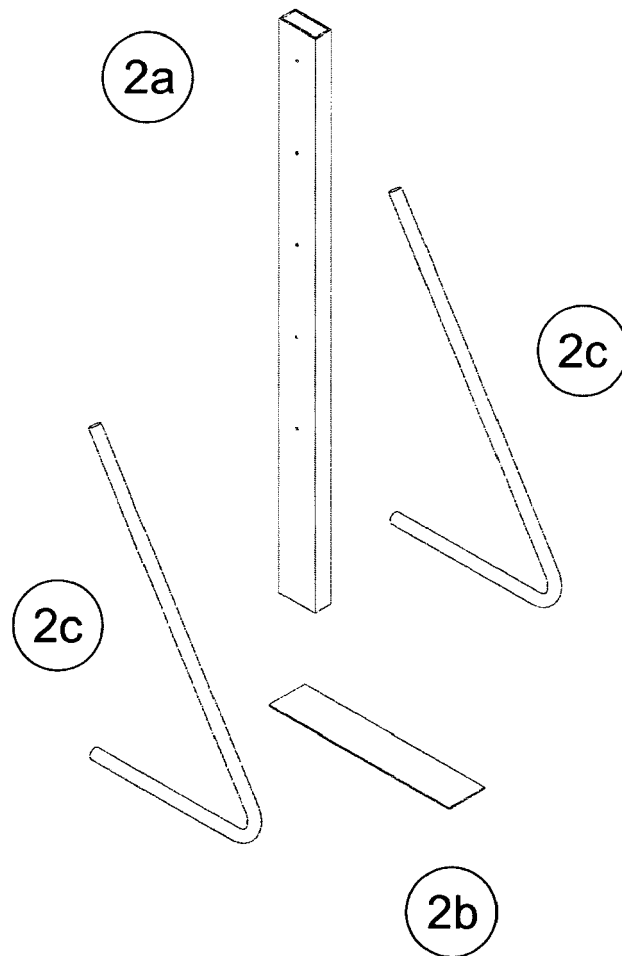


Fig.4

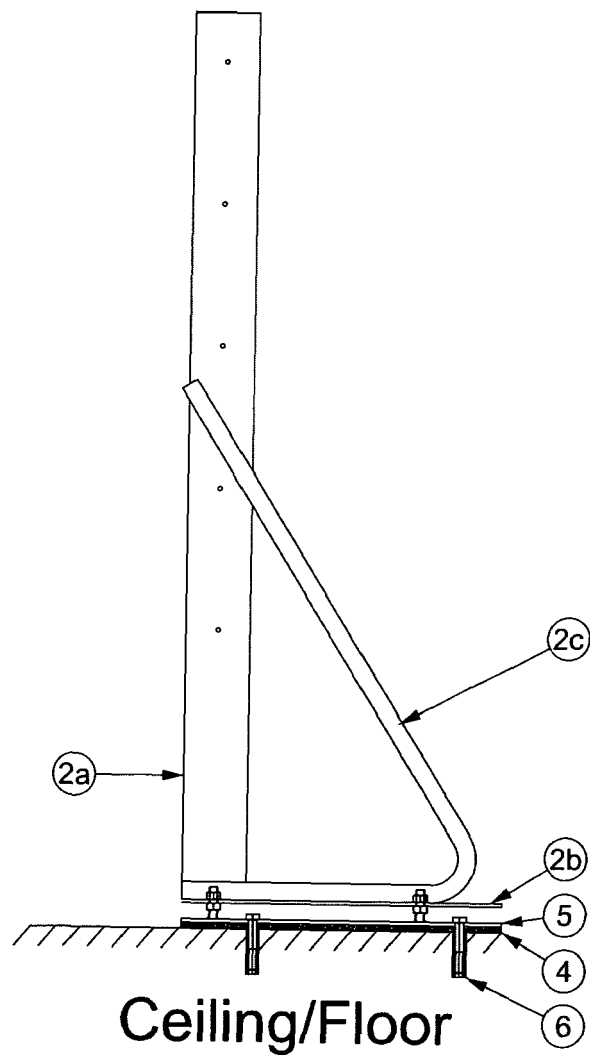
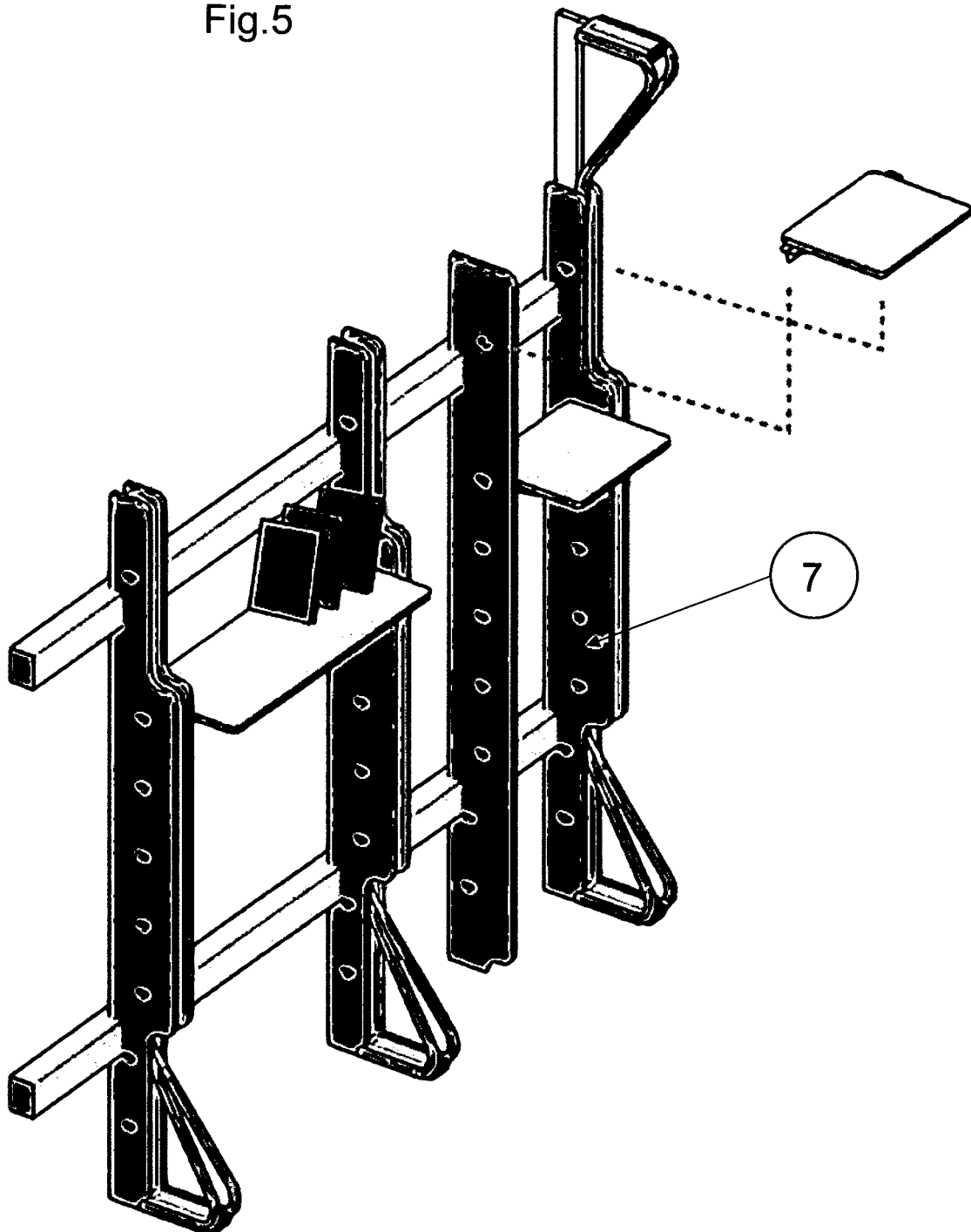


Fig.5





EUROPEAN SEARCH REPORT

Application Number

EP 21 42 5062

5

10

15

20

25

30

35

40

45

50

55

1

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 99/20859 A1 (TIPPING STEVEN B [US]; MAR DAVID [US]) 29 April 1999 (1999-04-29) * claim 1; figure 4 *	1, 3, 4	INV. E04H9/02 E04G23/04
X	US 2001/054785 A1 (BERTON STEFANO [US]) 27 December 2001 (2001-12-27) * paragraph [0051]; claim 1; figures 1, 4 *	1, 3, 4	
A	CN 210 636 581 U (SHENZHEN HUISHEN BOYUE SMART CONSTRUCTION TECH CO LTD) 29 May 2020 (2020-05-29) * claim 1; figures 1-3 *	1-7	
A	WO 97/43928 A1 (BOUCHENY HENRI [FR]) 27 November 1997 (1997-11-27) * claim 1; figures 1-3 *	1-7	
A	US 10 829 950 B1 (FRIED MICHAEL [US]) 10 November 2020 (2020-11-10) * column 5, lines 4-18; claim 1; figures 5, 6 *	1-7	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04H E04G A47C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 May 2022	Examiner Rosborough, John
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	

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

EP 21 42 5062

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-05-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9920859 A1	29-04-1999	AU 1099499 A	10-05-1999
		CN 1281525 A	24-01-2001
		JP 2001521079 A	06-11-2001
		US 6233884 B1	22-05-2001
		WO 9920859 A1	29-04-1999
<hr/>			
US 2001054785 A1	27-12-2001	AU 7549301 A	02-01-2002
		US 2001054785 A1	27-12-2001
		WO 0198607 A1	27-12-2001
<hr/>			
CN 210636581 U	29-05-2020	NONE	
<hr/>			
WO 9743928 A1	27-11-1997	FR 2749035 A1	28-11-1997
		WO 9743928 A1	27-11-1997
<hr/>			
US 10829950 B1	10-11-2020	NONE	
<hr/>			