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(54) **SUPPORTING FRAME FOR A RAISED FLOOR, SUPPORTING SYSTEM FOR THE RAISED FLOOR, AND METHOD FOR MAKING THE SUPPORTING SYSTEM**

(57) Supporting frame for a raised or technical floor (9), comprising a first and a second main rails (21a, 21b) each comprising a first and a second end (41a, 41b) supportable by supporting columns (11) for the raised floor (9). The frame comprises a set of secondary rails (22a, 22b) comprising at least one secondary rail (22a, 22b) configured to connect the first main rail (21a) to the second main rail (21b) at a predetermined distance from the first and said second end (41a, 41b) of the first and the second main rail (21a, 21b). The first and second main rail (21a, 21b) are parallel each other and shaped so as to define together with the set of secondary rails (22a, 22b) a single supporting surface. The invention further relates to a supporting system for a raised floor and to a method for making the supporting system.

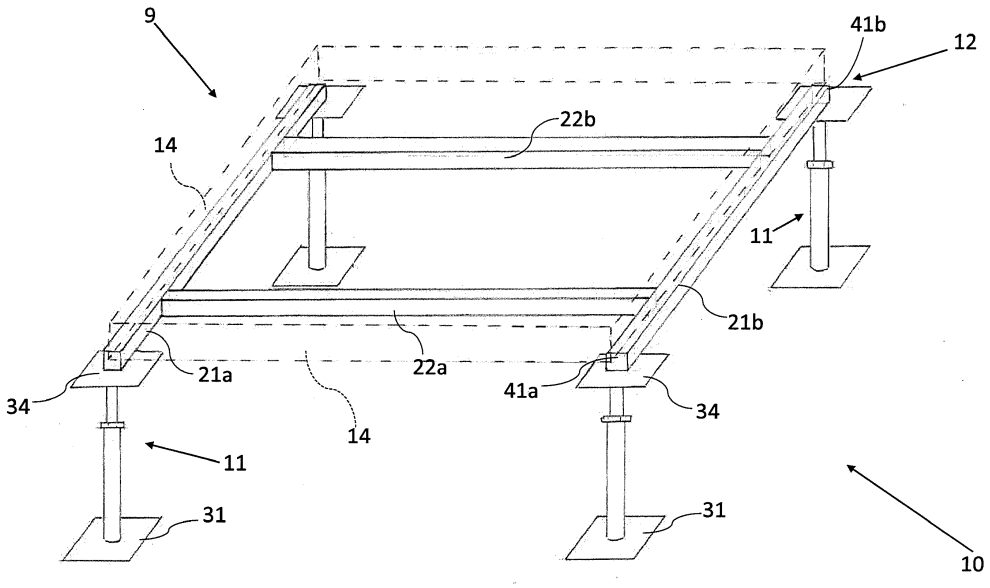

Fig. 1

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Description

Technical Field

[0001] The present invention relates, in general, to a supporting frame and a supporting system suitable for making an elevated or raised floor, also referred to as a technical floor.
In particular, the present invention relates to a raised floor supporting system configured to define a hollow space or technical compartment arranged to contain services and/or installations such as, for example, electrical wires, communications cables, etc.

Background Art

[0002] In general, technical floors and supporting systems arranged to enable the technical floors to be made are known.
Known raised floors include, for example, a plurality of modular panels having an upper tread surface and a lower surface resting on the supporting system or structure. The supporting structure, in turn, rests on a slab and generally determines between the slab and the lower surface of the panels, a generally adjustable height.
[0003] Modular panels, generally, have the lower surface simply resting on the supporting system so as to

- be removable by lifting the panels, for example, with the aid of suction cups,
- allow access to the technical floor, or
- allow replacement of the panels.

[0004] According to known art, a supporting structure generally comprises vertical components or columns that transmit the loads to the slab and, if required, bars or rails connecting the columns.
[0005] Columns generally include two elements (referred to as "base" and "head" respectively) to create the technical compartment, i.e. the hollow space between the slab (extrados of the slab) and the lower surface of the panels (intrados of the tread plane).
Columns are made of materials of different types, sizes and thicknesses, depending on the structural requirements required and may generally be adjusted micrometrically so as to vary the desired height of the technical compartment.
[0006] Rails, if present, are usually attached to the "heads" of the columns, they may be different by their shape and thickness, and have the purpose of capacity load and/or of simple linkage between the columns.
[0007] The hollow space or technical compartment may be used for a plurality of reasons, for example for the passage of cables and installations.
[0008] The modular panels generally realize, by way of the upper surface, the horizontal supporting part of the raised floor and are supported by the underlying supporting structure comprising columns and, if required, rails.
[0009] The panels are generally square in shape and are positioned above the grid created by the supporting columns and rails, if present.
The columns are generally arranged so as to support a panel at the crossing of pairs of sides or vertices of the sides of the panel which is generally of a modular type.
The panels may be of different surface size, different material, different thickness, all depending on the required load and/or finishing characteristics.
For example, the panels may have the upper tread surface square shaped measuring 600x600 mm, which is the most common measure, and may have a thickness comprised between 25 and 50 mm.
The panels comprise, for example, a core consisting of chipboard or calcium sulphate, and a finishing applied over the core.
The core and finishing coupling defines the thickness and the load characteristics of the panel.
[0010] Technical floors generally require compliance with some international standards such as European Standard UNI EN 12825.
Such standards provide in particular that the technical floor is classified in increasing capacity load classes in relation to load checks carried out, for example with certain types of punches, in specific technical floor positions such as:

- next to the columns,
- in an intermediate area among the columns provided at the crossing of pairs of sides,
- in a central area of the panel,
- in an area at a predetermined distance from the crossing of pairs of sides and the centre of the panel, for example 70 mm from the edge of the column head towards the centre of the panel.

[0011] A first technical problem in known technical floors is the ability to comply with the international standards provided so that the technical floor classification is, for example, the highest possible, even irrespective of the thickness of the panel and/or of the panel load characteristics.
The capacity load of a technical floor can be increased, for example, by increasing the number of columns that support each panel.
[0012] An example of technical floor wherein the number of columns per panel is greater than the number of vertices in the panel is disclosed in the patent document CA_2303950.
In the known document, the position of the columns representing the support frame for the support structure of the panels is distributed not only on the four vertices of the sides of a panel but also in intermediate positions between the vertices of the panel and in the central position of the panel.
The known technical floor, as disclosed, requires a frame consisting of a large number of columns so that it is more complex and more expensive than a floor requiring four

columns per panel.

[0013] A second problem of known art, partly linked to the first one, is that to technical floors not only high capacity load features are required but also the possibility of installing, in addition to services and/or installations such as, for example, electrical wires and communication cables, even services and/or facilities for heating or cooling environments or rooms is required.

[0014] A solution to this type of technical problem is known, for example, from the patent document GB_2375815. The known document provides that heating or cooling panels (heating panels) are supported by brackets, secured by means of screws or clamps to the technical floor columns, and are placed under the panels of the technical floor near the columns.

According to the prior art, the heating panels, thanks to the support provided by the brackets fixed by screws or clamps to the technical floor columns, are in direct contact with the lower surface of the technical floor panels and transmit heating and cooling to the panels of the floor and to the overhanging room.

[0015] The known solution involves the problem that the heating panels must be supported by brackets or clamps fixed to the columns that also in this case constitute the support frame of the supporting structure.

[0016] Applicant has noted that the known art, in order to solve load problems, provides to increase the number of columns provided in the supporting structure of a technical floor, while to solve heating or cooling problems, known art provides heating panels fixed to the columns. The consequence of the known solutions is that the first type of solution, suggesting the presence of a large number of columns, contrasts with the second type of solution that suggests, in order to limit the support brackets that are fixed to each column, the presence of a very limited number of columns.

Disclosure of the Invention

[0017] The object of the present invention is thus to solve the technical problems of the known art outlined above.

[0018] Such an object is achieved by a supporting frame for a supporting system and by a supporting system for a raised floor as claimed.

[0019] The present invention also relates to a method for making the supporting system according to present invention.

[0020] The following summary of the invention is provided in order to provide a basic understanding of some aspects and features of the invention.

This summary is not an extensive overview of the invention, and as such it is not intended to particularly identify key or critical elements of the invention, or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented below.

[0021] According to a feature of a preferred embodiment, the supporting frame comprises a pair of main rails parallel to each other and with ends connectable to supporting pillars of a technical floor, and a set of secondary rails having respective ends connected in predetermined positions along the main rails.

[0022] According to a further feature of the present invention, the set of secondary rails comprises two secondary rails having respective attachment members configured to support accessory components, in particular heating/cooling components to be positioned between the two secondary rails.

[0023] According to another feature of the present invention, the frame is configured so as to provide supporting systems for technical floors with load characteristics higher than those found in the known art by positioning a reference frame on four columns and each adjacent frame 90° rotated with respect to the reference frame.

Brief Description of Drawings

[0024] These and further features and advantages of the present invention will appear more clearly from the following detailed description of preferred embodiments, provided by way of non-limiting examples with reference to the attached drawings, wherein components designated by same or similar reference numerals indicate components having same or similar functionality and construction and wherein:

Fig. 1 shows a schematic axonometric view of a supporting system for a technical floor panel;
Fig. 2 shows a schematic top view of a single supporting frame;
Fig. 3 shows a schematic top view of the supporting frame applied, in use, so as to realise the technical floor;
Fig. 4 shows a partial lateral view of a technical floor comprising the supporting frame, the supporting system and a heating/cooling component; and
Fig. 5 shows by way of an example an application of the supporting frame arranged for environments heating.

Best Modes for Carrying Out the Invention

[0025] With reference to Fig. 1, a supporting module or supporting system 10 is shown configured to realise a raised or technical floor 9 defining an inspection technical compartment.

[0026] The supporting system 10 is shown in Figure 1 in a minimum configuration arranged to support a square or quadrangular shaped panel 14 of the technical floor 9. The supporting system 10 in the minimum configuration comprises, in the preferred embodiment, four columns 11 and a supporting frame (frame) 12.

[0027] Each column 11 of known type comprises, for example, a base 31 configured to rest, in a known way,

on a slab and a head 34 configured to support two-sides or vertices of at least one panel 14 of the technical floor 9. The base 31 and the head 34 are configured to allow, preferably, a height adjustment of column 11, in a known way.

Columns 11, according to different embodiments, may have different shapes than those represented and may be made of different materials such as steel, aluminium or plastic.

[0028] The frame 12, according to the preferred embodiment, comprises two main rails or bars, 21a, 21b, and preferably two secondary rails or bars, 22a, 22b.

[0029] Each main bar 21a, 21b respectively comprises ends 41a, 41b configured to rest on the heads 34 of the columns 11, for example by a simple bearing or by a fixing with screws.

The main bars 21a 21b are made of high-load materials, for example steel, and preferably have a square, rectangular or even "H" section.

[0030] Preferably, the secondary bars 22a, 22b comprise ends 51a, 51b which are fixedly attached in predetermined positions to the main bars 21a, 21b, by using, for instance, all possible ways of fixing tubes each other (e.g. welding, riveting, fastening, etc.).

For example, in the case of square panels of 600 x 600 mm, the end 51a or 51b of each secondary bar is positioned at a distance between 100 and 200 mm from the ends of the main bars, i.e. at a different to zero distance from the ends of the main bars.

The above values may vary according to the shape and size of the panels, i.e. proportionally to the dimensions of the main panels.

The secondary bars, 22a 22b, are made of high-load materials, for example steel, and preferably have a square, rectangular or even "H" section.

[0031] According to the preferred embodiment, the main rails 21a, 21b and the secondary rails 22a, 22b respectively are parallel to each other and the arrangement of the main rails 21a, 21b with the secondary rails 22a, 22b is such as to give to the frame 12 a shape which here, for simplicity of description, is referred to as "H" shape.

[0032] Applicant has noted that the supporting structure 10 comprising the frame 12 as disclosed, comprises, for a same panel load characteristics, a load characteristic of about 40% to 60% higher than that of a supporting structure comprising four columns per panel and four rails fixed to the column heads.

[0033] Applicant has also noted that the supporting structure 10 comprising the frame 12 with the secondary bars 22a, 22b as disclosed, comprises, for a same panel characteristics, bending characteristics of about 30% to 40% lower than a supporting structure comprising four columns per panel and four rails fixed to the column heads.

[0034] Thanks to the frame as disclosed, it is also possible to use panels having a thickness lower than that provided in known art, for example less than 25 mm, for equal load characteristics; for example, Applicant has noted that the frame 12 as disclosed may allow the use of panels 14 with a thickness of between 10 and 25 mm, while guaranteeing the required load characteristic provided by panels having a thicknesses of between 25 and 50 mm.

[0035] According to a possible variant of the frame as disclosed, it is foreseeable that the frame 12 comprises a set of secondary bars which comprise, for example, only one secondary bar, particularly in the case of rectangular panels, or even more than two secondary bars in case of particularly high load conditions, without departing from the scope of the invention as disclosed and claimed.

[0036] The description has preferably referred to a technical floor 9 comprising 600 x 600 mm square panels 14.

[0037] According to possible variants of the present invention, as easily understandable by a technician in the field, the described frame, by appropriate variations in the size or number of secondary bars, may also be applied to technical floors comprising panels, for example, of 500 x 500 mm, 300 x 600 mm, 600 x 1200 mm or even 1200 x 1200 mm.

[0038] Preferably, the main bars, depending on the size of the panels and the required load, may have, for example, a section of between 20 x 20 mm and 60 x 60 mm with material thicknesses between 0.5 and 4.0 mm.

[0039] Preferably, secondary bars, depending on the size of the panels and the required load, may have, for example, a cross section of 10 x 10 mm to 40 x 40 mm with material thicknesses comprised between 0.5 and 2.0 mm.

[0040] In use, i.e. when laying of the technical floor 9, adjacent frames 12 are arranged rotated by 90° as to the adjacent frames so as to obtain a complete grid in which all the adjacent columns 11 are connected to each other by the main rails 21a, 21b as shown in Fig. 3.

[0041] Thanks to the "H" frame, the frame 12 is also able to support the panels 14 not only along the four sides of the panel but also centrally to the panel as easily understandable by a technician in the field whereby frame 12 allows to improve the load characteristics of the support structure 10 of each panel 14 without the need to increase the number of columns per panel.

[0042] According to a first structural variant, the main rails 21a, 21b and the secondary rails 22a, 22b can be provided as mounting KITS so that frame 12 can be assembled directly from a vendor or assembled on installation.

Preferably, in case of mounting KITS, it is provided that each main rail 21a, 21b comprises, for example, a first and a second cavity 44a, 44b (Fig. 1, Fig. 4) and that secondary rails 22a, 22b comprise at the ends 51a, 51b, hook-shaped elements 54a, 54b configured to hook the main rails 21a, 21b at the positions determined by the first and second cavity 44a, 44b.

[0043] Of course, according to the possible variation

of the frame as disclosed, it is foreseeable that the number of cavities in each main rail is equal to the number of possible secondary rails to be used to interconnect the main rails each other.

[0044] According to other embodiments, the hooking on installation of the secondary bars 22a, 22b to the main bars 21a, 21b in predetermined positions can be achieved by way of various types of fixing elements, such as rivets, screws, etc. without departing from the scope of the invention as disclosed and claimed.

[0045] According to this embodiment, the main rails, 21a, 21b, and the secondary rails 22a, 22b of the KIT can be provided with dimensional characteristics and load characteristics diversified depending on different dimensional or standard requirements in a manner similar to that provided for the frames.

[0046] In all embodiments described hereinabove, it is preferably provided that the secondary bars 22a, 22b and the main bars 21a, 21b define, on installation, a single support plane (top support plane) for the panels 14 of the technical floor 9.

[0047] According to a further embodiment, it is provided that the secondary bars 22a, 22b comprise fastening members 55 which can be used to support accessorial components complementary to the raised floor, e.g. room heating/cooling components (heating components) 57 (Fig. 1, Fig. 4, Fig. 5).

According to this embodiment, the fastening members 55 comprised in the secondary bars 22a, 22b are configured to support the heating components 57 in direct and close contact with the panels 14.

Thanks to the fact that the secondary bars 22a, 22b, according to the preferred embodiment, are in contact with the panel 14 since it is supported therefrom, no adjustment is necessary to bring the heating component 57 to direct contact of the panel 14.

Advantageously, a substantial alignment of the secondary bars 22a, 222b, considered preferred, may contribute to the use of heating components 57 with modular dimensions.

[0048] The heating components can be of electric or hydraulic type, known per se, and, for example, may be connected to each other in known manner by way of connections 58, as shown in Fig. 5.

[0049] According to this further embodiment, frame 12 thus fulfils a double function:

- a supporting function of the panel 14 with characteristics higher than those noticeable in case of supporting structures comprising four columns per panel and four cross members attached to the "heads" of the columns;
- a function of maintaining the heating components 57 in close contact with the technical floor 9 panels 14 so as to improve heat exchange between the heating components 57 and the panels 14.

[0050] The arrangement of a supporting system 9 for a technical floor 9 preferably comprises, according to the current exemplified embodiment, the following steps.

[0051] A step in which columns 11 are provided, preferably adjustable in height.

[0052] A step in which the main rails 21a, 21b are provided and a step in which the secondary rails 22a, 22b are provided.

[0053] Preferably, the step of providing the main rails comprises, for example, the steps of:

- arranging the ends 41a, 41b of the main rails so that they can be supported or fastened to columns 11, and
- providing cavities or attachment references for the secondary rails 22a, 22b in predetermined positions along the main rails 21a, 21b.

[0054] Preferably, the step of providing the secondary rails comprises, for example, the step of:

- arranging the ends 51a, 51b of the secondary rails so that they can be fixed at the predetermined positions along the main rails 21a, 21b. For example, this step comprises the step of arranging hook shaped elements 54a, 54b configured to engage the cavities 44a, 44b provided along the main rails.

[0055] After completion of the steps of providing the main and secondary rails, a step is provided of:

- fastening of the secondary rails to the main rails, or, alternatively,
- providing mounting KITS designed to be distributed and sold so as to be assembled, for example, on installation to shape supporting frames 12 of the technical floor 9.

[0056] The construction of the supporting system 10 of the technical floor 9 provides, preferably, the steps of:

- positioning the columns 11 according to a grid comprising sides corresponding to the length of the sides of the panels 14,
- positioning and fixing the frames to the columns so that a frame rotated by 90° is adjacent in all directions to each frame 12.

This last step may also comprise a step of direct assembly of the main and secondary rails on the grid shaped by the columns 11.

[0057] Once the supporting structure 10 is completed, the technical floor 9 can be completed by laying the panels 14 so that the crossing of pairs of sides of the panels or vertices of the panels is supported in correspondence of the heads 34 of the columns 11.

[0058] If the heating components 57 are provided, they are installed during the step of providing the supporting structure and before laying the panels 14 on the frames

12, by fastening the heating elements 57 to the fastening members 55 and connecting in known way the heating components 57 to each other, by way of electric cables or hydraulic ducts 58, respectively.

[0059] Advantageously, the supporting structure 10, and in particular the supporting frame 12 as disclosed, supports each panel 14 also at points considered weaker or critical such as, for example, at panel centre and at diagonal positions, for instance 70 mm from the edge of the column 11 head 34, as required, for example, by UNI EN 12825 standard.

[0060] Advantageously, thanks to the fact that the supporting structure 10, and in particular the supporting frame 12, comprise, as disclosed, higher capacity load and lower bending characteristics, it is possible to realize technical floors 9 which, while using less performing panels for what concerns load and bending characteristics, provide results of load and bending characteristics similar to those obtainable with more performing panels.

[0061] The Applicant has also noted that the "H" shape of the frame 12, as disclosed, is optimal during the laying step.

As a matter of fact, by rotating the supporting frame 12, it is possible to provide four main rails 21a, 21b on the heads 34 of four adjacent columns 11 supporting a panel, despite the fact that the main rails 21a, 21b of each frame are only two and not four.

[0062] The Applicant has also noted that a technical floor, made by using heating components fixed directly to parts of the supporting structure, and completely kept apart from the panels, has obvious advantages as it does not limit the possibility of inspecting the technical compartment under the technical floor while guaranteeing the maximum of thermal efficiency.

[0063] Of course, obvious changes and/or variations to the above disclosure are possible, as regards dimensions, shapes, materials, components, elements and connections, as well as details of the described construction and realisation method without departing from the scope of the invention as defined by the claims that follow.

Claims

1. A supporting frame for a raised or technical floor (9), comprising

- a first and a second main rail (21a, 21b) each comprising a first and a second end (41a, 41b) supportable by supporting pillars (11) for the raised floor (9),

characterized by

- a set of secondary rails (22a, 22b) comprising at least one secondary rail (22a, 22b) configured to connect said first main rail (21a) to said second main rail (21b) at a predetermined distance from said first and said second end (41a, 41b) of said first and said second main rail (21a, 21b),

and in that

- said first and said second main rail (21a, 21b) are parallel each other and shaped so as to define together with said set of secondary rails (22a, 22b) a single supporting surface.

2. The frame according to claim 1, wherein said at least one secondary rail (22a, 22b) comprises ends (51a, 51b) shaped so as to be solidly fastened to said first main rail and to said second main rail (21a, 21b), respectively.

3. The frame according to claim 1 or 2, wherein

- said first and said second main rail (21a, 21b) comprise one or more cavities (44a, 44b) in predetermined positions,

and wherein

- said at least one secondary rail (22a, 22b) comprises hook-shaped ends (54a, 54b) arranged to fasten said one or more cavities (44a, 44b) of said first and of said second main rail (21a, 21b).

4. The frame according to any one of claims 1 to 3, wherein

- said set of secondary rails (22a, 22b) comprises a first and a second secondary rail (22a, 22b) that are parallel each other.

5. The frame according to claim 4, wherein said first and said second secondary rail (22a, 22b) respectively comprise fastening members (55) shaped to support accessorial components arranged to be located between said first and said second secondary rail (22a, 22b).

6. A supporting system for a raised or technical floor (9), said system comprising

- a plurality of pillars (11) arranged according to a grid comprising sides of predetermined length, said grid being shaped so as to define a plurality of predetermined size quadrangular shapes comprising four pillars,

said system (10) being **characterised in that** it further comprises

- a plurality of frames (12) as claimed in claims 1 to 5, respectively fastened to each group of four pillars,

and **in that**

- each frame (12) of said plurality, considered as a datum, is adjacent to adjacent frames (12) 90° degrees rotated as to the frame considered as a datum.

7. The system according to claim 6, further comprising

- accessorial components (57) supported between a first and a second secondary rail (22a, 22b) of said frames.

8. A method for making a supporting system for a raised or technical floor (9), comprising the steps of

- providing a plurality of pillars (11) arranged to support a raised floor (9),
- providing at least one first and one second main rail (21a, 21b), each comprising a first and a second end (41a, 41b) arranged to be supported by a pair of said pillars (11),
- providing a set of secondary rails (22a, 22b) comprising at least one secondary rail (22a, 22b) configured to connect said first main rail (21a) to said second main rail (21b) at a predetermined distance from said first and said second end (41a, 41b) of said first and second main rail (21a, 21b),
- making at least one frame defining a single supporting surface by way of said first and said second main rail (21a, 21b) parallel each other and said set of secondary rails,
- fastening said frame to a set of four pillars.

9. The method according to claim 8, wherein said step of providing a set of secondary rails (22a, 22b) comprises the steps of

- providing a first and a second secondary rail (22a, 22b) that are parallel each other,
- providing fastening members (55) shaped to support accessorial components arranged to be located between said first and said second secondary rail (22a, 22b),
- fastening said accessorial components to said first and said second secondary rail (22a, 22b) by way of said fastening members (55).

10. An assembly KIT of a supporting frame for a raising or technical floor (9) **characterised by**

- pairs of main rails (21a, 21b) each comprising
  - pairs of ends (41a, 41b) connectable to supporting pillars (11) for the raised floor (9), and
  - at least one set of cavities (44a, 44b) located in predetermined positions apart from said pairs of ends (41a, 41b), and
- a set of secondary rails (22a, 22b) comprising at least one secondary rail (22a, 22b) for each pair of main rails (21a, 21b), each of said secondary rails comprising
- pairs of hook-shaped ends (54a, 54b) shaped to fasten in said predetermined positions to said set of cavities of said pairs of main rails (21a, 21b).

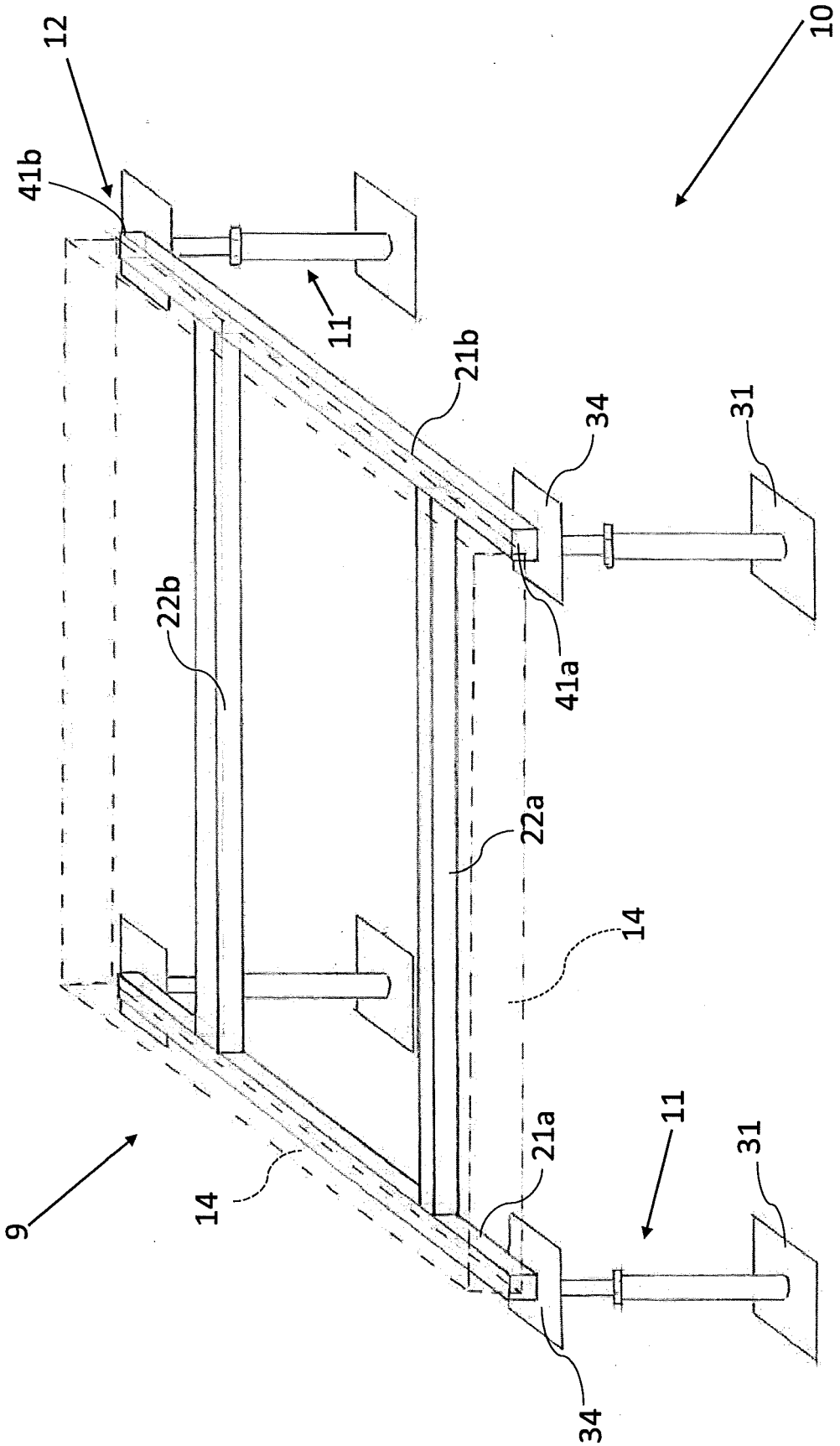

Fig. 1

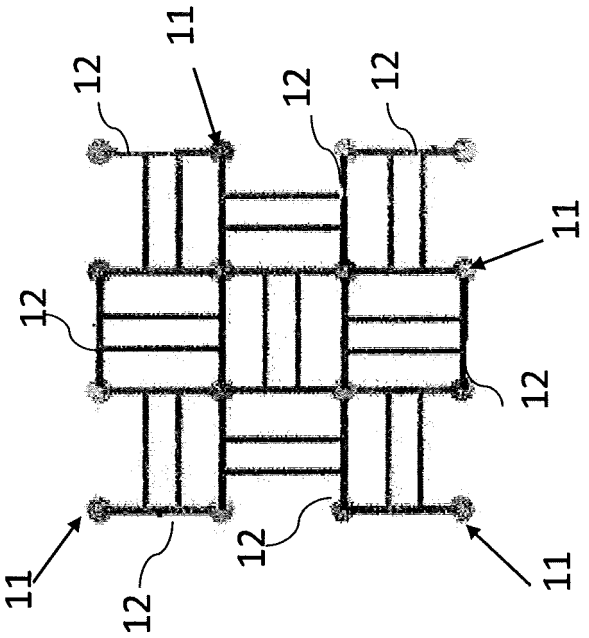

Fig. 3

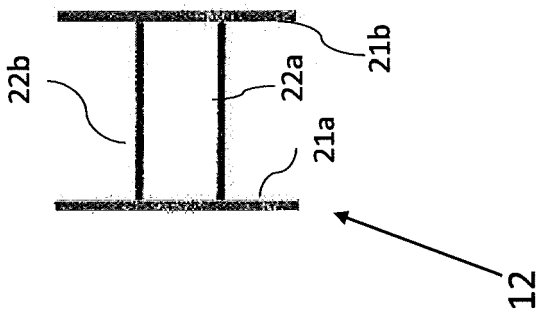

Fig. 2

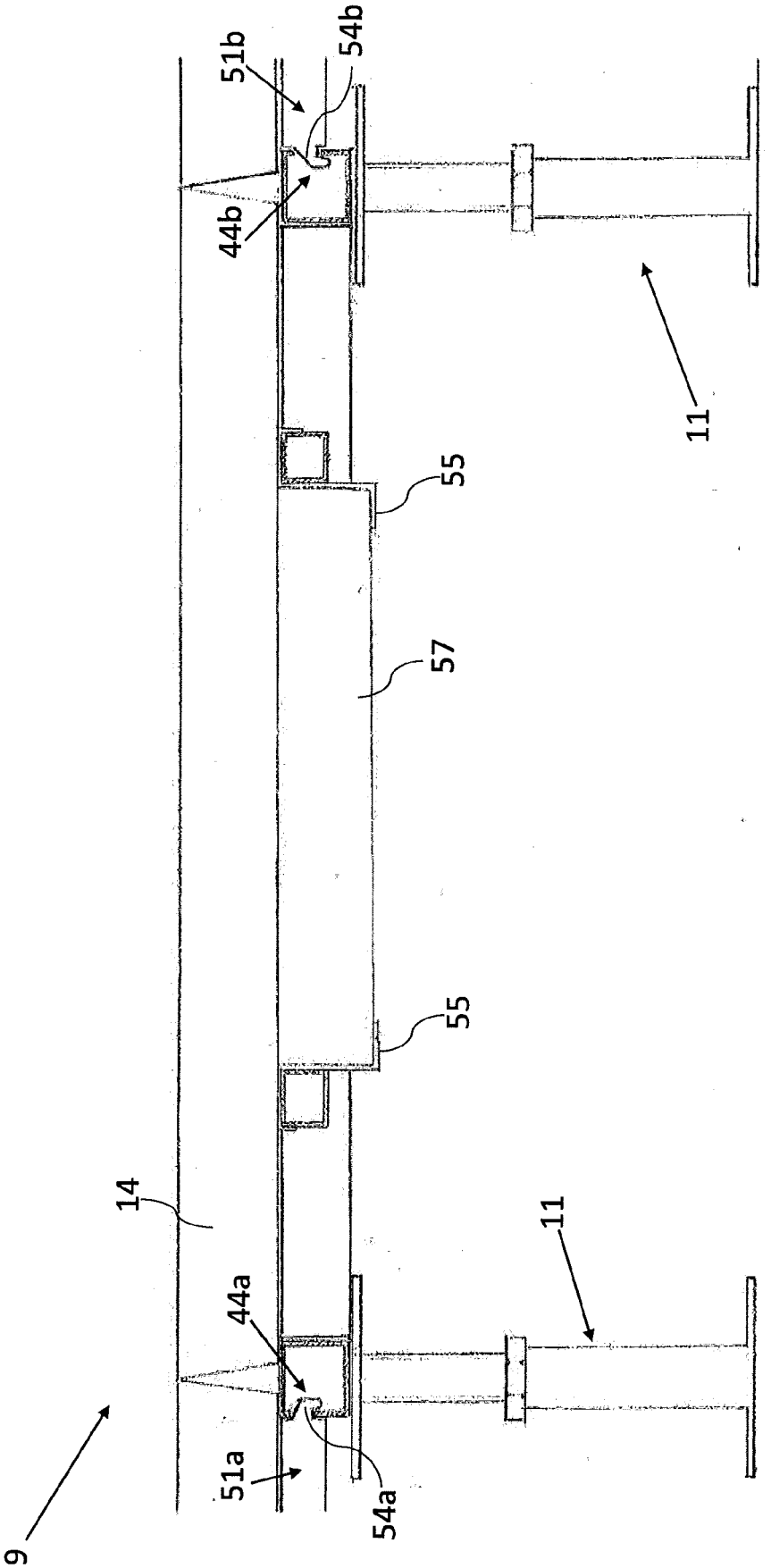

Fig. 4

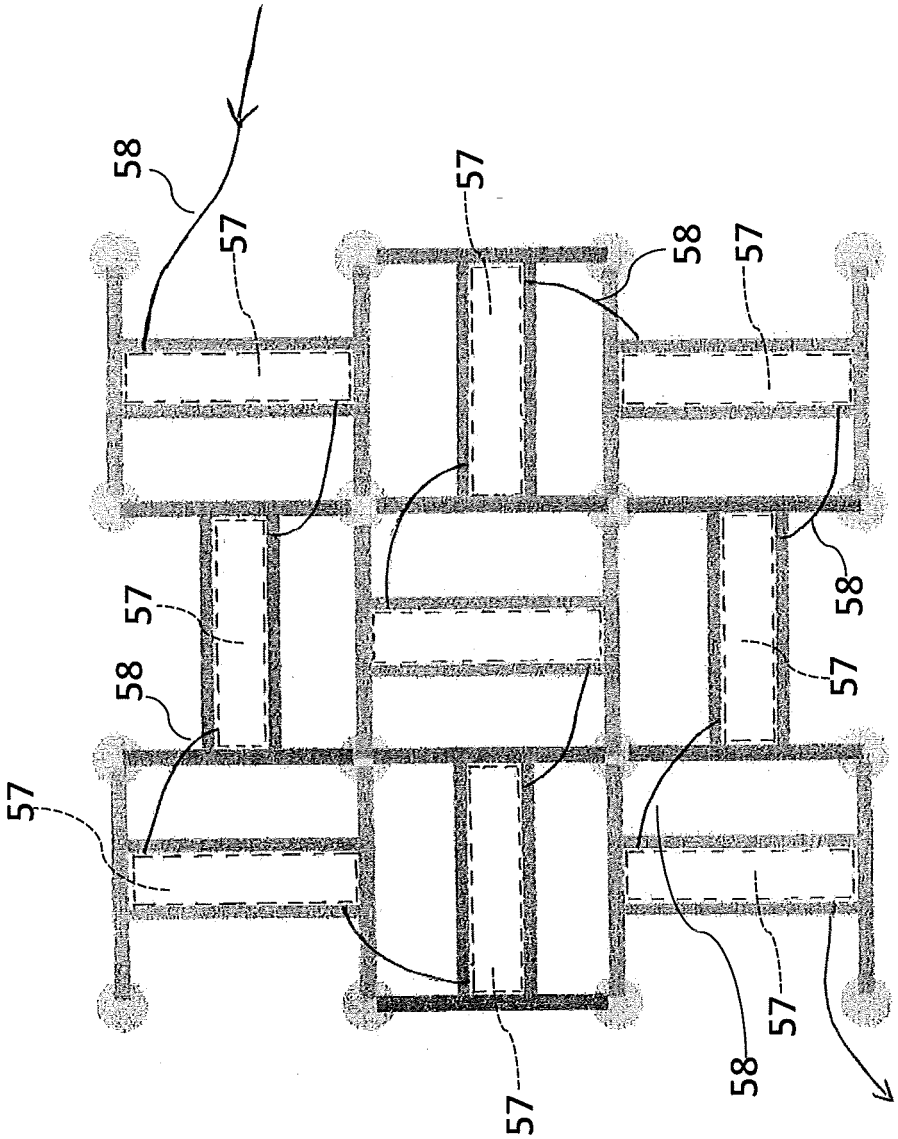

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 17 7181

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	ES 1 063 345 U (INSCA INT SL [ES]) 16 October 2006 (2006-10-16)	1-5,8-10	INV. E04F15/024
A	* the whole document *	6,7	
A	DE 298 22 764 U1 (HWANG HSIN TSAI [TW]) 18 March 1999 (1999-03-18) * figures 1,2 *	1-10	
A	FR 2 905 395 A1 (SIMON CONNECT S L [ES]) 7 March 2008 (2008-03-07) * the whole document *	1-10	
A	DE 39 40 530 A1 (LINDNER AG [DE]) 13 June 1991 (1991-06-13) * the whole document *	5-7,9	

TECHNICAL FIELDS SEARCHED (IPC)

E04F
F24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 July 2017	Cornu, Olivier

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 17 7181

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