



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.06.2011 Bulletin 2011/24

(51) Int Cl.:
E04F 15/024 (2006.01)

(21) Application number: **10192166.6**

(22) Date of filing: **23.11.2010**

(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

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(30) Priority: **26.11.2009 IT MI20090381 U**

(54) **Column for supporting panels of raised floors**

(57) Column (200) for supporting panels (3) of raised floors (100), comprising a stem (201) provided, at its lower end, with a base (202) for resting on the ground and, at the upper end, with a head (203) on which to rest panels, in which said stem (201) is tubular and open at least

at the upper end where it has a perimeter edge (230) that defines said resting head (203) and in which the inner diameter of said tubular stem, inner diameter that, at said perimeter edge (230) defines the minimum resting diameter (D1) of said panel (3), is greater than or equal to 30mm.

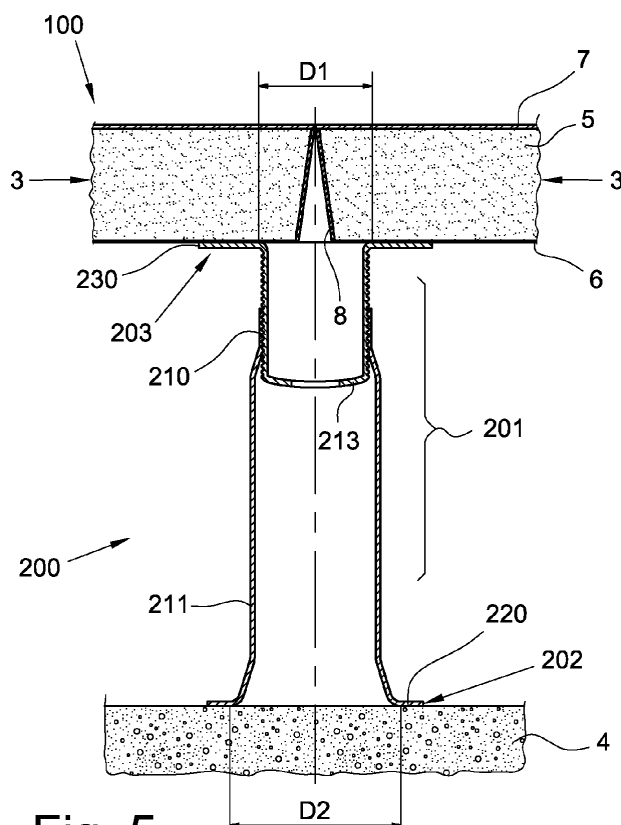


Fig. 5

Description

[0001] The present invention refers to a column for supporting panels of raised floors.

[0002] In the building sector, it has been known for a long time to make raised floors, also called "elevated" or "floating" floors, in which the ground surface is supported at a certain height from the floor slab or sub-flooring, so that between the intrados of the ground surface and the extrados of the floor slab or floor is defined an interspace.

[0003] Such an interspace, in the field also known as "technical area", is used for receiving services and/or plants.

[0004] A raised flooring is made up of a series of modular panels that rest on a supporting structure that has a certain height, that can generally be adjusted, and that, in turn, rest on the floor slab or floor. The panels simply rest on the supporting structure so as to be able to be removed through lifting, for example with the help of suction cups, to access the "technical area" or to provide for their replacement.

[0005] The modular panels are in turn made up of a set of elements:

- a plate, known in the field as "core" or support and the function of which is to support the loads bearing upon the panel,
- a lower covering layer, arranged, that is to say, at the surface of the panel that, once installed, defines its intrados, the function of which is that of improving the mechanical, electrical, physical, chemical, thermal properties, and of protecting the panel itself from humidity and consists of, for example, a sheet of aluminium;
- an upper covering layer, arranged, that is to say, at the surface of the panel that, once installed, defines its ground surface, the function of which is that of giving the latter a certain appearance, also contributing to define the mechanical, electrical, physical or chemical properties of the panel itself; such a layer is, for example, made up of wooden, ceramic, linoleum slabs or slabs made from other material, and
- a perimeter edge that covers the edge of the panel acting as a gasket, as a protection, or seal, for example from water and that, for example, is made from polyvinyl chloride (PVC).

[0006] According to the current standards, the modular panels have the shape of a square with sides of 600mm, thickness of between 20mm and 50mm, including the upper covering layer, and edges chamfered downwards with an inclination of about 3°—4°.

[0007] Typically, the core of a panel is made up of a wooden chipboard, of a layer of calcium sulphate or by lightweight and reinforced concrete, recycled materials that bring together lower costs and satisfactory mechanical properties, even with wide tolerance of constructive

homogeneity.

[0008] The load-bearing structure, which transmits the loads from the panels to the floor slab, consists of a plurality of columns and of possible cross-members.

[0009] The columns are normally made up of a stem the height of which can be adjusted and made up of a threaded bar coupled with a sleeve and provided with an adjustment nut. The threaded bar is typically of the M16-M20 type and the sleeve has a diameter of the order of 20-25mm and a thickness of between 1.5mm and 2.5mm. The stem is provided, at its lower end, with a base resting on the floor slab and, at the upper end, with a resting head for the panels.

[0010] Both the base and the resting head consist of a load plate or plate, circular or quadrangular, obtained through pressing and blanking of sheet metal.

[0011] The resting head typically consists of a load plate with a diameter of between 80mm and 90mm or having a side of between 75mm and 110mm, and a thickness of between 2mm and 4mm.

[0012] The resting base typically consists of a load plate with a diameter of between 80mm and 100mm and a thickness of between 1.5mm and 2.5mm.

[0013] The cross-members, if foreseen, are also connected to the resting head, for example through snap coupling or through resting and screwing. The cross-members connect the columns to one another so as to improve the stability and the rigidity of the load-bearing structure and to increase their load-bearing capability.

[0014] As it is known, the installation of a raised flooring is carried out by arranging, on the floor slab, the columns to the nodes of a lattice the mesh of which has dimensions equal to those of the panels, i.e. typically of 600x600mm. After having adjusted the height of the columns and fixed, if foreseen, the cross-members and possible gaskets, the single panels are installed, which are rested on the heads of the columns so as to close the mesh of the lattice. Each panel thus rests on four columns arranged at its vertices. In particular each vertex, or angular portion of each panel rests on a quadrant of the resting head of the underlying column thereto, on an area moreover that, due to the chamfer, does not extend to the centre of the quadrant.

[0015] As it is known, the raised floors must satisfy, according to where they are installed and to the conditions in which they operate, certain requirements of mechanical resistance, behaviour in a fire, electrical and noise properties, each regulated by a respective standard.

[0016] With particular reference to the mechanical resistance properties, the standard currently in force, UNI EN 12825, foresees carrying out concentrated static load tests, based upon which the panels are classified in a series of load classes and bending strength classes. The load classes distinguish the panels according to the maximum load or ultimate tensile strength that they can withstand before starting to yield. The bending classes distinguish the panels according to the maximum bending

allowed under working load, meaning with working load, the maximum load divided by the safety factor.

[0017] Such tests are carried out on the single panels considered in assembled condition, i.e. resting on the respective columns, at their maximum height possible, and possible cross-members.

[0018] The testing load is applied through an indenter located in different positions of which three are compulsory: at the centre of the panel, at the centre of one side and on the diagonal at a distance of 70mm from the edge of the head of the column or in any point that the testing laboratory considers the weakest.

[0019] The worst result obtained, i.e. the lowest value of the maximum load or ultimate tensile strength, determines the load-bearing class.

[0020] The third position, i.e. that on the diagonal at 70mm from the edge of the head of the column, is generally the heaviest, since the load applied bears down upon a single column or better on the portion of the quadrant of the head of such a column on which the tested panel rests.

[0021] In such a testing condition, the panel yields at its own vertex (angular portion) that breaks up and crumbles. Such an effect is, at least partially, related to the material with which the core of the panel itself is made.

[0022] Currently, in order to limit such yielding and to satisfy the requirements set by the standards, the trend is that of increasing, with the same stems, the dimensions of the load plates or of the plates that make up the resting head of the columns, increasing both their thickness, and the diameter or the side. This, of course, leads to an increase in the manufacture costs of the columns themselves.

[0023] Moreover, the increase in the diameter or of the side of the resting head, for the same stems, offers a reduced contribution to the overall load-bearing capability, since as the portions of the resting head get farther away from the stem, they are more likely to undergo yielding under a load.

[0024] The purpose of the present invention is that of avoiding the drawbacks of the prior art.

[0025] In particular, one purpose of the present invention is that of providing a column for supporting panels of raised floors that makes it possible to increase the maximum load or ultimate tensile strength that can be withstood by a panel, in particular considered in assembled conditions and undergoing load testing and again more in particular with an indenter on the diagonal at 70mm from the edge of the head of the supporting column.

[0026] Another purpose of the present invention is that of providing a column for supporting panels of raised floors that, when used, is stable and does not undergo oscillations that can be felt by the users.

[0027] Another purpose of the present invention is that of providing a column for supporting panels of raised floors that has a simple structure and the manufacture costs of which are low.

[0028] These and other purposes according to the present invention are achieved by making a column for supporting panels of raised floors as outlined in claim 1.

[0029] Further characteristics of a column for supporting panels of raised floors are object of the dependent claims.

[0030] These purposes are moreover achieved with a structure for supporting panels of raised floors according to claim 12.

[0031] The characteristics and the advantages of a column for supporting panels of raised floors according to the present invention shall become clearer from the following description, given as an example and not for limiting purposes, with reference to the attached schematic drawings, in which:

- figure 1 schematically shows, and in a partial section view, a portion of a raised floor according to the prior art;
- figure 2 schematically shows a top plan view of the angular portions of four panels resting on a supporting column according to the prior art;
- figure 3 is a perspective and exploded view of a supporting column according to the present invention;
- figure 4 is a perspective and overall view of the supporting column of figure 3;
- figure 5 is a schematic section view of a supporting column according to the present invention, in its configuration in use, as a load-bearing structure of a raised floor, only partially shown;
- figure 6 schematically shows a top plan view of the angular portions of four panels resting on a supporting column according to the present invention;
- figure 7 is a perspective and exploded view of an alternative embodiment of the column according to the invention with two cross-members applied to it;
- figure 8 is a perspective view of the column of figure 7 in an assembled configuration.

[0032] It should be made clear, in the present description, that adjectives such as "upper" and "lower" refer to the installation condition of a raised floor.

[0033] With reference to figures 1 and 2, a raised floor 1 is shown according to the prior art.

[0034] The raised floor 1 comprises a supporting structure made up of a plurality of columns 2, only one of which is represented in the attached figures, which support a plurality of panels 3 that are raised with respect to a floor slab 4.

[0035] Each panel 3 consists of a core 5, one lower covering layer 6, which covers the lower face of the core 5, one upper covering layer 7, which covers the upper face of the core 5 defining the ground surface, and of a perimeter edge 8, that covers the edge of the core 5.

[0036] Purely as an example, the core 5 is made from a chipboard, from calcium sulphate or from lightweight and reinforced concrete, the lower covering layer 6 con-

sists of a sheet of aluminium, the upper covering layer 7 consists of wooden, ceramic, linoleum slabs or slabs made from other material and the perimeter edge 8 consists of PVC or another polymeric material.

[0037] The column 2 comprises a stem with adjustable height of the type known in the field as "tie rod", consisting of a threaded bar 9, coupled with a sleeve 10 and provided with an adjustment nut 11. According to one typical embodiment of the prior art, the bar 9 is of the M16-M20 type and the sleeve 10 has a diameter of $20 \div 25$ mm.

[0038] At the lower end of the stem, in such a case consisting of the lower end of the bar 9, is fixedly connected to a base 12 resting on the floor slab 4, whereas at the upper end of the stem, in such a case consisting of the upper end of the sleeve 10, is fixedly connected to the resting head 13 of the panels 3.

[0039] According to one typical embodiment of the prior art, the base 12 consists of a plate with a diameter of between 80 mm and 100 mm and with a thickness of between 1.5 mm and 2.5 mm, whereas the head 13 consists of a load plate with a diameter of between 80 mm and 90 mm and a thickness of between 2 mm and 4 mm.

[0040] As can be noted from figures 1 and 2, in the assembled configuration, the angular portions of four panels 3 rest on the head 13 of each column 2. Each of such angular portions rests on a quadrant of the head 13 at an area thereof that extends from the edge of the head 13 towards the axis of the column 2, without however reaching it due to the chamfer formed on the edge of the panel 3.

[0041] In figure 2, the areas A of the angular portions of the panels 3 at which the panels themselves, under a load, yield and crumble and the areas B of the head 13 which are more likely to yield under a load, are schematically shown with the broken line.

[0042] With reference to the figures 3 ÷ 8, a column 200 and a raised floor 100 are shown made by using columns 200 according to the present invention.

[0043] The column 200 according to the present invention comprises a stem 201 provided, at its lower end, with a base 202 for resting on the ground and, at the upper end, with a head 203 on which to rest panels 3. The structure of the panels 3 is of the known type and is not object of the present invention.

[0044] According to a special characteristic of the present invention, the stem 201 is tubular and open at the upper end, where it has a perimeter edge 230 that defines the resting head 203, and has an inner diameter, which, at the perimeter edge 230, defines the minimum resting diameter D1 of the panel 3, which is greater than or equal to 30 mm.

[0045] It should be made clear that by minimum resting diameter D1 we mean to indicate the minimum inner diameter of the tube that forms the stem 201 on which the panel 3 rests. The minimum resting diameter D1 can also not coincide with the inner diameter at the upper end of the tube that forms the stem 201 due for example to the radius of curvature of the perimeter edge 230 and/or to

the thickness thereof.

[0046] Such a perimeter edge 230 widens radially towards the outside of the stem 201 defining a top flange that supports the maximum load at the minimum resting diameter D1, no matter what the outer diameter or its thickness is. In particular, the perimeter edge 230 consists of an end portion of the stem 201 bent outwards.

[0047] Analogously, the stem 201 is also open at its lower end and the base 202 is made up of a base flange 220 that extends radially towards the outside of the stem 201.

[0048] In particular, also the base flange 220 is made up of a lip or by an end portion of the stem 201 bent outwards.

[0049] The stem 201 is of the telescopic type and comprises an upper tubular element 210 and a lower tubular element 211 which are coupled to one another in a telescopic manner so as to be able to adjust the height of the column 200.

[0050] The upper tubular element 210 has a cross section that is substantially constant with an inner diameter that is smaller than or equal to the minimum resting diameter D1.

[0051] The lower tubular element 211, on the other hand, has an upper portion that is intended to receive, inside it, the upper tubular element 210 and from which a body with an inner diameter greater or equal to the inner diameter of the upper portion extends and that widens at the bottom in the base 202.

[0052] In the embodiment represented in figures 3-5, the upper tubular element 210 has an outer threading that engages with a threading inside the lower tubular element 211.

[0053] In the embodiment represented in the figures 7 and 8, the upper tubular element 210 has an outer threading that engages with a threading inside a metal ring 240 that can be inserted, with the possibility of rotating around the axis of the column 200, in the upper portion of the lower tubular element 211.

[0054] The metal ring 240 is provided with a collar 241 resting on the top of the lower tubular element 211; such a collar 241 makes it possible to grip and manoeuvre the metal ring 240.

[0055] It should be noted that in both cases, i.e. both in the case in which the lower tubular element 211 is threaded inside it, and in the case in which the inner threading is formed in a metal ring 240, thanks to the configuration of the upper tubular element 210 and of the lower tubular element 211 the loads bearing down upon the panel 3 are continuously transmitted until they are discharged in an area outside from the minimum resting diameter D1 where the base 202 rests on the ground. This is advantageous for a greater stability of the column 200.

[0056] The upper tubular element 210 has, at its top, the perimeter edge 230 that defines the resting head 203 of the panels 3 and that is formed in a single piece with it.

[0057] Such a perimeter edge 230 can have an outer

perimeter that is circular, square-shaped or rectangular.

[0058] The lower tubular element 211 has, at its lower end, the base flange 220 that defines the base 202 resting on the floor slab 4 and that is formed in a single piece with it.

[0059] The stem 201 has, near to the perimeter edge 230, a minimum resting diameter D1 that is greater than or equal to 30mm and, preferably, smaller or equal to 50mm.

[0060] The stem 201 has, near to the base 202 resting on the floor slab 4, an inner diameter D2 that is greater than the minimum resting diameter D1 that the stem 201 itself has near to the perimeter edge 230.

[0061] In the attached figures, the upper tubular element 210 has, at its lower end, an edge 213 that is bent inwards. It should be made clear that such an edge 213 is purely for constructive purposes, acting as a stiffening element of the upper tubular element 210 itself during the threading processing.

[0062] In figure 4 the column 200 is shown in its overall configuration.

[0063] Figures 7 and 8 represent an alternative embodiment of the column 200 in which, as already indicated above, the upper tubular element 210 has an outer threading that is engaged with a threading formed inside a metal ring 240 coupled at the upper end of the lower tubular element 211.

[0064] In such figures *per se* known cross-members 300 are also represented, resting on the head 203 and fixed to it through screws 301 or mechanical fastening with the aid of suitable gaskets 302.

[0065] The important thing is that the same cross-members 300 must rest on the head 203 in such a way that their end edge does not fall inside the minimum resting diameter D1. It is therefore important that also the cross-members 300 bear down upon the column 200 at the minimum resting diameter D1.

[0066] The installation of the columns 200 according to the present invention is analogous to that of known type columns and it is immediately clear to the man skilled in the art from what is shown in figure 5, in which the centring gaskets for the installation have been omitted for the sake of clarity of the representation.

[0067] Such a figure, indeed, shows a schematic section view of a portion of a raised floor 100 the load-bearing structure of which is made up of only columns 200 according to the present invention, only one of which is represented. Once installed, each column 200 is positioned resting on the floor slab 4 with its axis coinciding with the node of a mesh of the lattice covered by the panels 3. Therefore, the angular portions of four panels 3 rest on the head 203 of each column 200.

[0068] As can be gathered from figures 5 and 6, in the assembled configuration, the angular portions of the panels 3 rest only on the perimeter edge 230 of the columns 200, i.e. on a circular crown with a minimum resting diameter D1 that is greater or equal to 30mm, on which the load applied to the panels 3 acts.

[0069] The angular portions of the panels 3 that, in the assembled configuration, are at the area with minimum resting diameter D1 do not rest on any element of the head 203. On such portions of the panels 3 - those which have been found more likely to undergo yielding - there is thus no acting load.

[0070] Moreover, by sizing the perimeter edge 230 so that the minimum resting diameter D1 is smaller than the inner diameter D2 at the base 202 resting on the floor slab 4, the tilting torque that, in operation acts upon the column 200, is limited.

[0071] In figure 6 the areas C of the angular portions of the panels 3 resting on the perimeter edge 230 that defines the head 203 of the columns 200, have been schematically shown with a broken line.

[0072] If there are any cross-members 300, they are assembled by arranging their ends so as to rest on the edge 230 of the respective column 200 so that they also bear down upon a crown with an inner diameter that is substantially equal to the minimum resting diameter D1.

[0073] The supporting column object of the present invention has the advantage of minimising if not eliminating the risk of yielding of the weaker vertex portions of the panels, considered during operation. In particular the supporting column object of the present invention has the advantage of being able to increase the maximum load meant as the ultimate tensile strength which can be supported by the panels, considered in their assembled condition; this makes it possible to use tubular elements with a thickness that is smaller than or equal to 2mm or lower than 1.5mm to make it, with consequent advantages in terms of costs.

[0074] The supporting column object of the present invention also has the advantage of having a simple structure, being easy to manufacture and assemble and having low production costs.

[0075] The column according to the present invention, indeed, in a preferred embodiment, is made up of only two tubular elements coupled with one another in a telescopic manner, for example through threaded coupling, and the free ends of which have an edge that is folded and widened outwards so as to define a top flange for the panels to rest on and a base flange resting on the floor slab, respectively.

[0076] It should finally be clear that the invention thus conceived may undergo numerous modifications and variants, all covered by the invention; moreover, all the details can be replaced by technically equivalent elements. In practice, the materials used, can be any according to the technical requirements.

Claims

1. Column (200) for supporting panels (3) of raised floors (100), comprising a stem (201) provided, at its lower end, with a base (202) for resting on the ground and, at the upper end, with a head (203) on which

to rest panels, **characterised in that** said stem (201) is tubular and open at least at the upper end where it has a perimeter edge (230) that defines said resting head (203) and **in that** the inner diameter of said tubular stem, inner diameter that, at said perimeter edge (230), defines the minimum resting diameter (D1) of said panel (3), is greater than or equal to 30mm.

2. Column (200) according to claim 1, **characterised in that** said perimeter edge (230) widens radially towards the outside of said stem (201) defining a top flange. 10
3. Column (200) according to claim 1 or 2, **characterised in that** said perimeter edge (230) consists of a portion of said stem (201) bent outwards. 15
4. Column (200) according to one or more of the previous claims, **characterised in that** said stem (201) is open at said lower end and **in that** said base (202) for resting on the ground is made up of a base flange (220). 20
5. Column (200) according to claim 4, **characterised in that** said base flange (220) is made up of a lip of said stem (201) bent outwards. 25
6. Column (200) according to one or more of the previous claims, **characterised in that** said minimum resting diameter (D1) is smaller than or equal to 50mm. 30
7. Column (200) according to one or more of the previous claims, **characterised in that** the inner diameter (D2) of said stem (201) at said base (202) for resting on the ground is greater than said minimum resting diameter (D1). 35
8. Column (200) according to one or more of the previous claims, **characterised in that** said stem (201) is of the telescopic type. 40
9. Column (200) according to claim 8, **characterised in that** said stem (201) comprises an upper tubular element (210), that has said perimeter edge (230) formed in a single piece with it, and a lower tubular element (211), that has said base (202) for resting on the ground formed in a single piece with it, which are coupled to one another in a telescopic manner. 45 50
10. Column according to claim 9, **characterised in that** the body of said upper tubular element (210) has a substantially constant cross section with an inner diameter that is smaller or equal to said minimum resting diameter (D1) and said lower tubular element (211) has an upper portion that is intended to receive said upper tubular element (210) inside it and from 55

which a body with an inner diameter greater or equal to the inner diameter of said upper portion extends and that widens at the bottom in said base (202).

- 5 11. Column (200) according to claim 9 or 10, **characterised in that** said upper tubular element (210) has an outer threading that engages with a corresponding threading inside of said lower tubular element (211) or inside a metal ring arranged between said upper tubular element (210) and said lower tubular element (211), so as to continuously transmit the loads bearing upon said panel 3 and to discharge them outside from the inner diameter (D2).
- 10 12. Structure for supporting panels of raised floors comprising a plurality of columns (200) according to one or more of claims from 1 to 11, wherein said columns (200) are connected in pairs to one another by a respective cross-member (300) and wherein the free ends of each of said cross-members rest on the perimeter edge (230) of the respective column (200) on a crown with an inner diameter that is substantially equal to said minimum resting diameter (D1) .

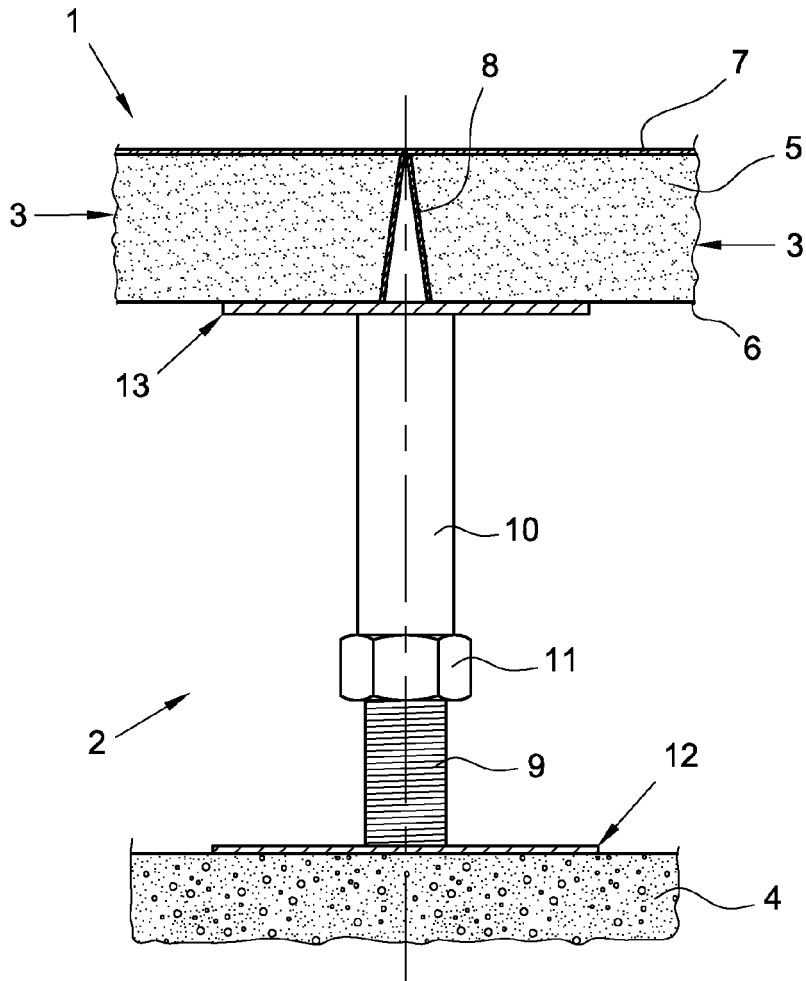


Fig. 1
(PRIOR ART)

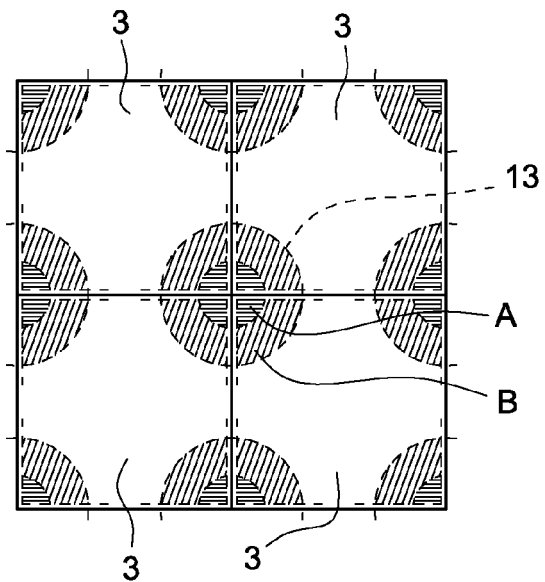


Fig. 2
(PRIOR ART)

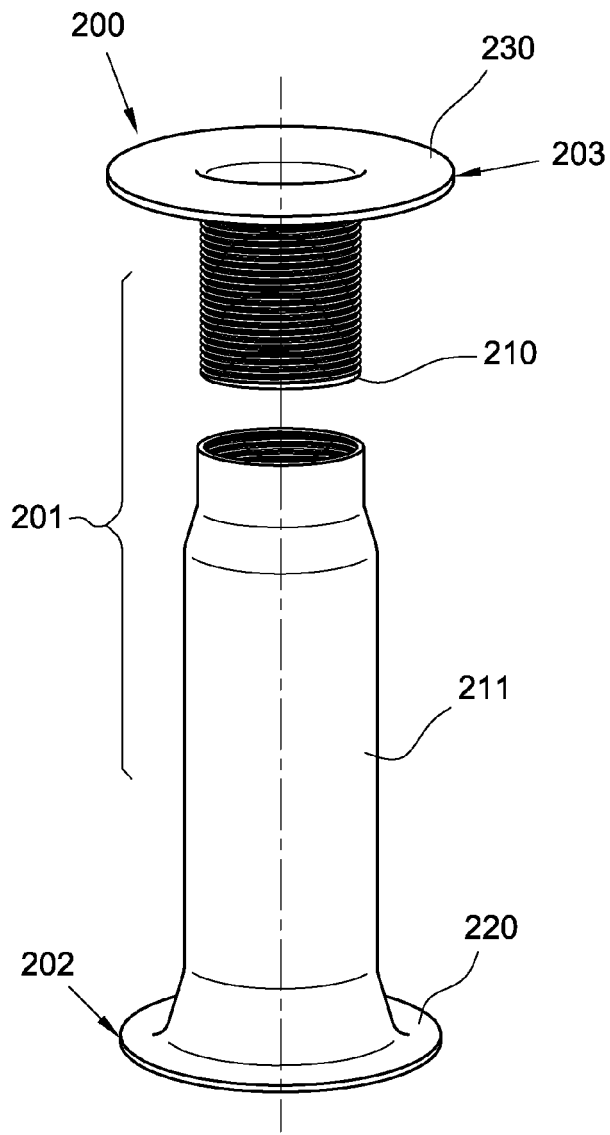


Fig. 3

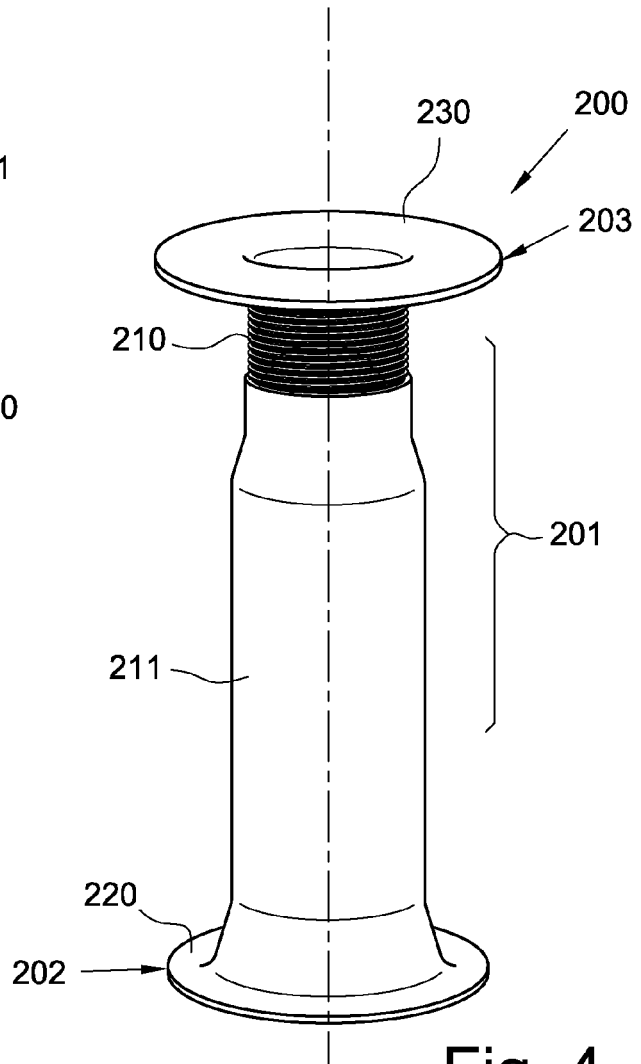


Fig. 4

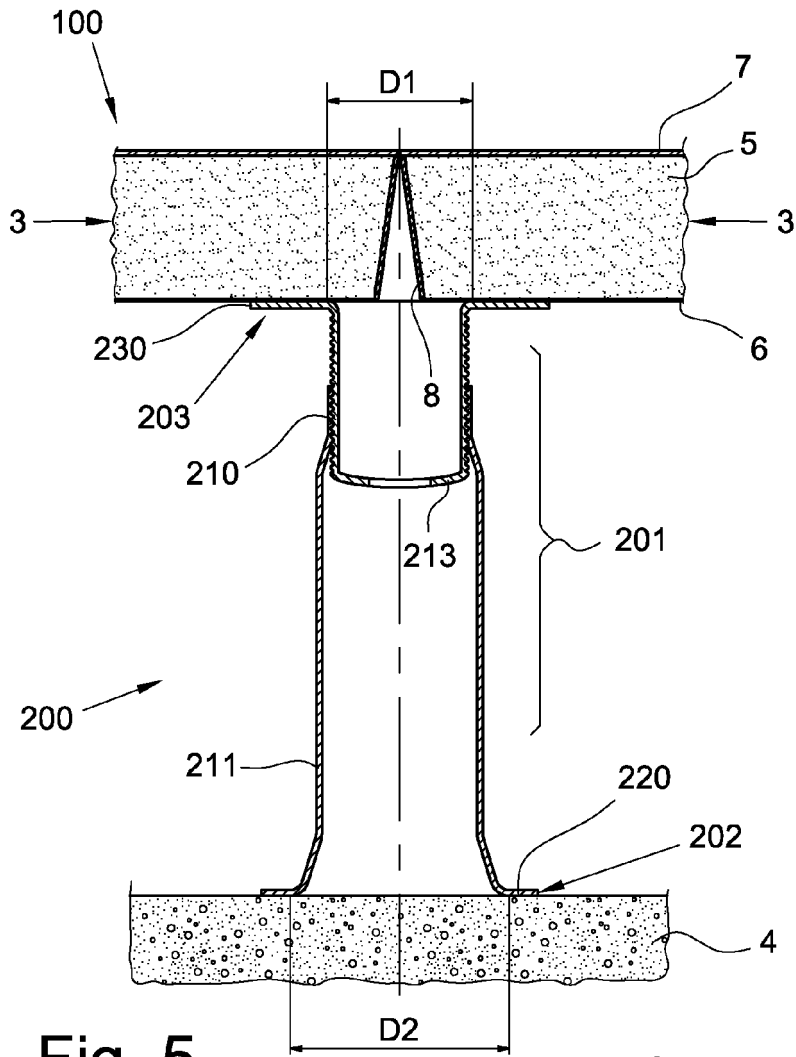


Fig. 5

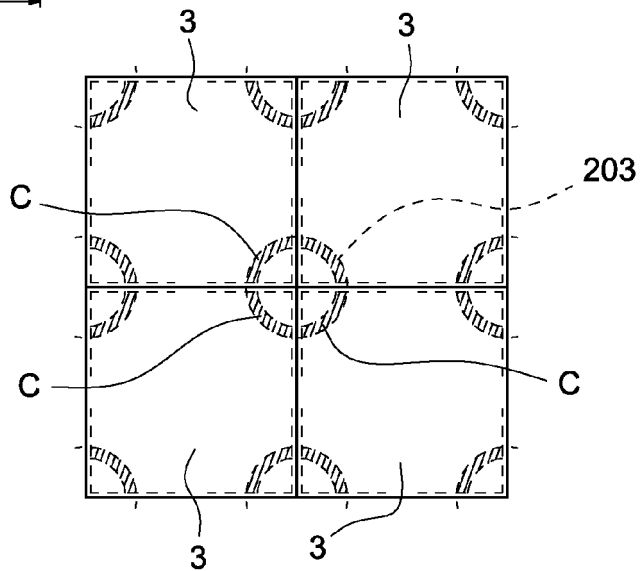


Fig. 6

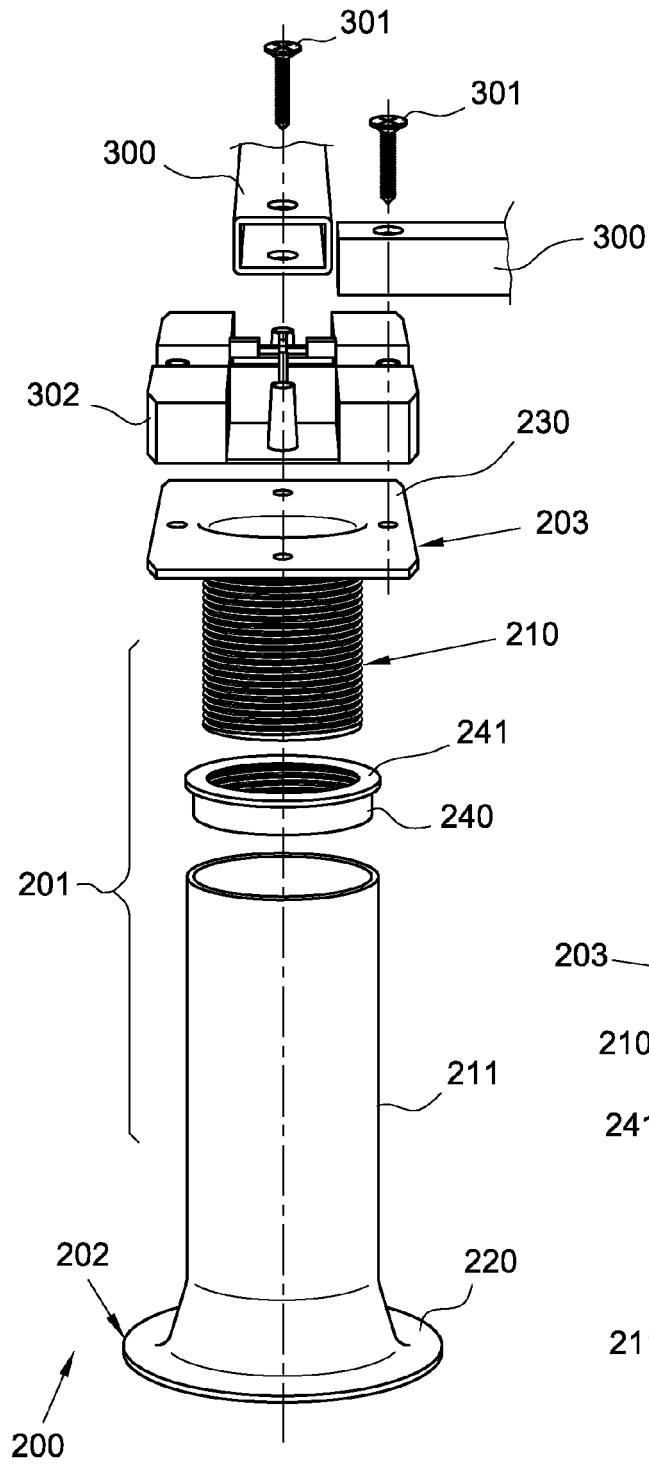


Fig. 7

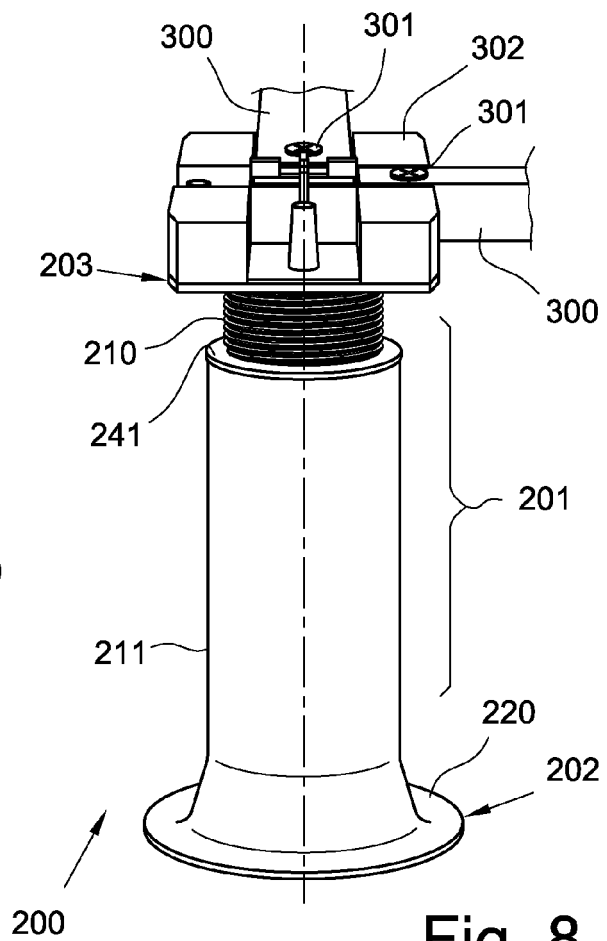


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 10 19 2166

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	DE 20 2007 017241 U1 (LINDNER AG [DE]) 16 April 2009 (2009-04-16)	1-8,12	INV. E04F15/024
A	* the whole document *	9	

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			TECHNICAL FIELDS SEARCHED (IPC)
			E04F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 April 2011	Examiner Bouyssy, Vincent
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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EPO FORM 1503 03/02 (P04C01)

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

EP 10 19 2166

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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13-04-2011

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