(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 281 981 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.12.2015 Bulletin 2015/49

(21) Application number: **09166993.7**

(22) Date of filing: **31.07.2009**

(51) Int Cl.:
G09F 15/02 *(2006.01)* ***G09F 19/22*** *(2006.01)*
E04H 6/10 *(2006.01)*

(54) **Parking garage**

Parkgarage

Garage

(84) Designated Contracting States:
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 SE SI SK SM TR

(43) Date of publication of application:
09.02.2011 Bulletin 2011/06

(73) Proprietor: **G.S. Hofman Holding B.V.**
2676 NB Maasdijk (NL)

(72) Inventor: **Hofman, Gerardus Stephanus**
2676 NB, MAASDIJK (NL)

(74) Representative: **van Kooij, Adriaan**
Arnold & Siedsma
Bezuidenhoutseweg 57
2594 AC The Hague (NL)

(56) References cited:
DE-A1- 19 906 097
DE-A1- 19 932 254
DE-U1-202004 016 416
GB-A- 2 226 591
US-A- 4 875 549

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

EP 2 281 981 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a parking garage, comprising a load bearing structure and a facade.

[0002] Buildings, such as for instance houses, high-rise flats or garages, can be build by first providing a body as a load bearing structure for said building. In order to provide a building of solid build, said load bearing structure is usually manufactured from concrete.

[0003] To finish the building, the inner structure of said building, for instance in the form of rooms, stairways, elevators etc, and the outer structure, for instance in the form of roofing and a facade, can be applied to said load bearing structure.

[0004] Manufacturing such a building may be costly and time consuming.

[0005] An example of a parking garage according to the prior art is shown in DE-A-19932254. DE-A-19906097, US 4,875,549, GB 2 226 591 are examples of the use of textiles in buildings.

[0006] It is therefore a goal of the present invention, amongst other goals, to provide an improved parking garage which can be manufactured more efficiently.

[0007] The above goal is met by the present invention, amongst other goals, by a parking garage as defined in the appended claim 1.

[0008] Specifically, the above goal, amongst other goals, is met by the present invention by a parking garage comprising a load bearing structure, wherein at least a part of a facade of said building is formed by a textile. Using a textile as a facade, instead of for instance glass or concrete slabs, reduces the weight of said facade. This allows the use of a lighter load bearing structure. The textile can be applied to an outside of a load bearing structure efficiently, for instance by tensioning said textile with suitable connecting means known in the art. The means for connecting the textile are adapted to the load on said textile, for instance due to the wind. The load bearing structure may hereto be provided with a framing for connecting the textile.

[0009] It should be noted that with a facade, an outer wall of a building is meant. When a facade is formed by a textile, the textile extends between an inner space of said building and the open air and is adjacent to both. The facade formed by said textile is thereby a non-load bearing facade. This improves the resistance of said building against for instance earthquakes and explosions. The textile according to the invention is arranged as a permanent facade, in contrast to for instance shielding a broken window using plastic.

[0010] Substantially the whole facade is formed by a textile. This further reduces the load bearing impact of the facade on the load bearing structure and further increases the efficiency of the building process of the building according to the invention. The facade may be formed by a single sheet of textile. However, it is preferred to provide a plurality of adjacent sheets. This is more efficient to apply to the load bearing structure, or a frame provided thereto. Preferably the sheets extend vertically, i.e. the height of the sheets is larger than the width with respect to the building, facilitating the application of said sheets. It is however also possible to apply the sheets in a horizontal orientation.

[0011] According to a preferred embodiment of the building according to the invention, the textile is manufactured from a material chosen from the group of natural or artificial fibres or a combination thereof. Preferably the textile comprises polyester. The textile is preferably weather proof and resistant to wear. More preferably, the textile has fire resistant properties.

[0012] According to a further preferred embodiment, the facade comprises a plurality of layers of textile. This improves the isolation properties. The layers may extend adjacently. It is however also possible to provide a space between the layers for further improving the isolation properties. Between said layers, isolation material may be provided.

[0013] According to a further preferred embodiment of the building according to the invention, the textile is provided with a print. By applying a textile with a print to a building, the appearance of said building can be efficiently determined. It may even be possible to removable apply a textile to a building as a facade. This allows the appearance of the building to be changed efficiently by applying another textile as a facade.

[0014] The textile is permeable to air, providing exchange of air between the inner space of said building and the open air. It may also be possible to use a sufficient coarse textile to provide an at least partially transparent facade.

[0015] When the textile is used as a facade of a building such as for instance an office or a house, the textile is preferably sufficiently fine to prevent precipitation, i.e. rain, hail or snow, from entering the inner space of said building.

[0016] The building according to the invention is a parking garage, wherein at least 30%, of the total surface area of the facade is open to air. This ensures in a sufficient refreshment of air in said garage and ensures fire safety for the garage.

[0017] The textile has a coarseness such that at least 30%, of the total surface of said textile is open to air. On a given surface of said textile, at most 70% of this area is formed by the fibres of the textile. The at least 30% remaining surface area is formed by the meshes between said fibres. This allows substantially the whole facade of a garage to be provided with a textile according to the invention. This results in a garage that appears to be provided with a totally closed facade, while air is still allowed to pass through said facade. The textile further protects parked cars from precipitation.

[0018] It should be noted that the facade being open for 30% is based on a fire safety regulation. It may be possible that different countries have different regulations concerning fire safety of parking garages in terms of facades being open to air. The invention, defined in

the appended claims, is therefore not limited to the above mentioned ranges in case regulations require a different permeability. According to the invention, a textile is provided which is sufficiently coarse allowing enough air to pass to meet the regulations for fire safety in parking garages.

[0019] It will be appreciated that a facade in the form of a textile can be applied to said load bearing structure efficiently. Further, by forming a facade of a garage from textile, the load bearing structure of said garage can be manufactured lighter compared to garages provided with steel, concrete or glass facades.

[0020] Therefore, according to the invention, the load bearing structure of the parking garage comprises structural steel framing. This improves the efficiency of the building process. In particular parking garages usually comprise load bearing structures manufactured from concrete. Although the load bearing structure may be assembled from pre-cast elements, forming said load bearing structure from concrete is a labour intensive work, whereas a load bearing structure from structural steel framing can be formed relatively efficient. Structural steel framing furthermore allows the design of a parking garage to be adapted efficiently. It even allows - in a preferred embodiment of the present invention - the members of the framing to be reused after disassembly.

[0021] It should be noted that with structural steel framing a framework of steel members is meant, wherein the steel members are provided with a specific shape or cross section and certain standards of chemical composition and strength. In particular, structural steel members, such as I-beams, have high second moments of area, providing a high stiffness in respect to their cross-sectional area.

[0022] Preferably at least the stands of said load bearing structure are formed by structural steel framing. The vertical members or columns are at least formed of structural steel members. In particular, no concrete columns are provided. This results in a compact and light composition.

[0023] A further preferred embodiment of the parking garage according to the invention comprises at least one floor, wherein said floor is formed by at least one profiled concrete slab. Using a profiled concrete plate, large areas of the building can be spanned. In particular in a parking garage this is advantageously, since providing columns for supporting the floors decreases the efficiency of the parking space. Profiled concrete slabs further have relative small heights and weight with respect to their stiffness. Preferably said profiled concrete plate comprises a hollow core slab. Hollow core slabs have a high stiffness, allowing spanning of large areas in the building.

[0024] Preferably a slab has a length of approximately 16 meters. This allows accommodating two cars in length with a driving passage provided there between. Other lengths are however possible. For instance, when cars are parked under an angle on a floor, the spanned space can be reduced.

[0025] According to a further preferred embodiment of the parking garage according to the invention, the load bearing structure is arranged to support said slab at the short edges of said slab and/or at the perimeter of said floor. Preferably a floor is formed by a plurality of slabs provided in a row. Preferably, the floor is then only supported at its perimeter, i.e. the edges of a floor. All the slabs in the row are thereby supported at their short edges, whereas the outer slabs can further be supported along long edges. The space below said floor is thereby free of columns, which is in particular advantageously in parking garages.

[0026] It may however also be possible that a floor is formed by for instance two rows of slabs. The load bearing structure is then arranged to support the slabs at their short edges, wherein the load bearing structure forms columns beneath said floor. This however still results in a floor with relative few columns compared to garages known in the art due to the large areas spanned by the slabs.

[0027] A slab is usually formed as a rectangular body with a height. The height of said slab is usually smaller than the dimensions of the sides of said rectangular. Further, one side, the long edge, is usually longer than the other side, the short edge. Supporting the slabs only at the short sides allows larger areas to be spanned.

[0028] It will further be appreciated that by using profiled concrete slabs or plates, no additional support beams, i.e. structural steel members extending horizontally, are needed extending under said floors for support. This reduces the height needed for manufacturing a floor.

[0029] The invention further relates to the use of a textile as a facade for a parking garage according to the invention. Using a textile for forming a facade is efficient and reduces the weight of the parking garage, allowing a lighter load bearing structure to be used. This allows substantially the whole facade of a garage to be covered, while still providing sufficient air circulation inside said garage.

[0030] The invention furthermore relates to a method for manufacturing a parking garage according to the invention, comprising providing a load bearing structure and providing a textile as facade.

[0031] The present invention is further illustrated by the following Figures, which show a preferred embodiment of the device according to the invention, and are not intended to limit the scope of the invention in any way, wherein:

- Figure 1 schematically shows a parking garage according to the invention in perspective;
- Figure 2 schematically shows the garage in side view;
- Figure 3 schematically shows two floors in top view;
- Figure 4 schematically shows a front view of the garage, and;
- Figure 5 schematically shows a cross-section along

line V-V in figure 3.

[0032] In figure 1 a parking garage 1 according to the invention is shown. The parking garage 1 is provided with a load bearing structure in the form of structural steel framing 2. The structure comprises columns 21, beams 22 and ties 23 to provide a solid framework.

[0033] To enclose the structural steel framing, a facade in the form of textile 3 is provided. The facade is formed by sheets of textile 31 having a height h and a width d. The edges of the sheets 31 are provided with holes for connecting said sheets to framing 2. Other suitable connecting means can however be provided. The textile 3 is in this example provided with a print in the form of a ball. Adjacent sheets 31 hereby form said image. The entrance 11 of the parking garage 1 is kept open and can be provided with a barrier or a gate.

[0034] The textile 3 has a coarseness allowing air circulation in said garage. In this example 30% of the surface of said textile is open for air. This provides good ventilation properties to the garage, while still providing sufficient protection to parked cars from for instance rain.

[0035] The garage 1 is shown in more detail in figures 2- 5. The garage comprises eight floors, wherein the floors are provided staggered. Between the floors ramps 6 are provided allowing cars to move between floors.

[0036] As can be seen in figure 3, a single floor 12, as also indicated in figure 2, is formed by a row of five hollow core slabs 4. The slabs 4 provided in the middle, indicated with 4a, have a length of 16 meter. The edges of the floor 12 are supported by beams 22 and columns 21. For slabs 4a provided in the middle of a floor, only the short edges indicated with 41 are supported. For the outer slabs 4b of a floor, also the long edge 42 along the edge of the floor 12 is supported. The inner area of a floor is therefore not supported, providing a column free parking area beneath said floor.

[0037] Although also floor 13 is visible in figure 3, this floor actually extends higher than floor 12, wherein ramp 6 can be used to get from floor 12 to floor 13. However, as an example, it may be possible to form a floor from two rows of slabs. In this case, floor 12 and 13 then form a single floor. The shorts edges 41 of the slabs are then supported along the centre, indicated with V, of said floor by columns 21 and beams 22.

[0038] Since the floors are however provided staggered, the middle section as shown in figure 5 comprises twice as much beams 21 to support the slabs 4 as the end section as shown in figure 4.

[0039] It will be appreciated that the design of the garage 1 as shown can be adapted easily. It is for instance possible to provide extra slabs in the rows forming the floors, thereby increasing the parking capacity. The design can also be efficiently modified to include more floors. And as mentioned above, it may even be possible to form a floor using two rows of slabs, thereby further increasing the parking capacity.

[0040] The parking garage can then be efficiently finished by providing a textile 3 around the framework 2. The textile 3 provides an appealing appearance, while still providing sufficient air circulating in the garage 1.

[0041] The present invention is not limited to the embodiment shown, but extends also to other embodiments defined by the appended claims. For instance, it is possible to provide a carrousel instead of the ramps to allow the cars to move between the floors. The framing structure is then adapted accordingly.

Claims

1. Parking garage (1) comprising a load bearing structure, wherein the load bearing structure of the parking garage (1) comprises structural steel framing (2), **characterised in that** substantially the whole façade of said parking garage (1) is formed by a textile (3) arranged as a permanent façade, wherein the textile (3) has a coarseness such that at least 30% of the total surface of said textile is open to air, such that at least 30% of the total surface area of the façade is open to air.

2. Parking garage (1) according to claim 1, wherein the textile (3) is manufactured from a material chosen from the group of natural or artificial fibres or a combination thereof.

3. Parking garage (1) according to claim 1 or 2, wherein the textile (3) is provided with a print.

4. Parking garage (1) according to claim 1 - 3, wherein at least the stands (21) of said load bearing structure are formed by structural steel framing (2).

5. Parking garage (1) according to any of the preceding claims, comprising at least one floor, wherein said floor (12) is formed by at least one profiled concrete slab (4).

6. Parking garage (1) according to claim 5, wherein said profiled concrete plate comprises a hollow core slab.

7. Parking garage (1) according to claim 5 or 6, wherein the load bearing structure is arranged to support said slab (4) at the perimeter (41, 42) of said floor (12).

8. Use of a textile (3) as a facade for a parking garage (1) according to any of the preceding claims, wherein the textile (3) has a coarseness such that at least 30% of the total surface of said textile is open to air.

9. Method for manufacturing a parking garage (1) according to any of the preceding claims, comprising providing a load bearing structure and providing a textile (3) as permanent facade for substantially the whole facade of said packing garage (1), wherein

the load bearing structure of the parking garage (1) comprises structural steel framing (2) and wherein the textile (3) has a coarseness such that at least 30% of the total surface of said textile is open to air, such that at least 30% of the total surface area of the facade is open to air.

Patentansprüche

1. Parkgarage (1), umfassend ein Tragwerk, wobei das Tragwerk der Parkgarage (1) ein Baustahl-Fachwerk (2) umfasst,
dadurch gekennzeichnet, dass im Wesentlichen die gesamte Fassade der Parkgarage (1) durch ein Gewebe (3) gebildet ist, welches als Dauerfassade angeordnet ist, wobei das Gewebe (3) eine solche Grobheit aufweist, dass zumindest 30% der Gesamtfläche des Gewebes luftdurchlässig ist, derart, dass zumindest 30% der Gesamtfläche der Fassade luftdurchlässig ist.

2. Parkgarage (1) nach Anspruch 1, wobei das Gewebe (3) aus einem Material hergestellt ist, welches aus der Gruppe von Natur- oder Kunstfasern oder einer Kombination davon ausgewählt ist.

3. Parkgarage (1) nach Anspruch 1 oder 2, wobei das Gewebe (3) mit einem Druck versehen ist.

4. Parkgarage (1) nach Anspruch 1 bis 3, wobei zumindest die Ständer (21) des Tragwerks durch ein Baustahl-Fachwerk (2) gebildet sind.

5. Parkgarage (1) nach einem der vorhergehenden Ansprüche, umfassend zumindest einen Boden, wobei der Boden (12) durch zumindest eine Profil-Betonplatte (4) gebildet ist.

6. Parkgarage (1) nach Anspruch 5, wobei die Profil-Betonplatte eine Hohlplatte umfasst.

7. Parkgarage (1) nach Anspruch 5 oder 6, wobei das Tragwerk angeordnet ist, um die Platte (4) am Umfang (41, 42) des Bodens (12) zu tragen.

8. Verwendung eines Gewebes (3) als Fassade für eine Parkgarage (1) nach einem der vorhergehenden Ansprüche, wobei das Gewebe (3) eine solche Grobheit aufweist, dass zumindest 30% der Gesamtfläche des Gewebes luftdurchlässig ist.

9. Verfahren zur Herstellung einer Parkgarage (1) nach einem der vorhergehenden Ansprüche, umfassend die Bereitstellung eines Tragwerks und die Bereitstellung eines Gewebes (3) als Dauerfassade für im Wesentlichen die gesamte Fassade der Parkgarage (1), wobei das Tragwerk der Parkgarage (1) ein Baustahl-Fachwerk (2) umfasst und wobei das Gewebe (3) eine solche Grobheit aufweist, dass zumindest 30% der Gesamtfläche des Gewebes luftdurchlässig ist, derart, dass zumindest 30% der Gesamtfläche der Fassade luftdurchlässig ist.

Revendications

1. Garage (1) comprenant une structure porteuse, dans lequel la structure porteuse du garage (1) comprend une ossature structurale en acier (2), **caractérisé en ce que** sensiblement toute la façade dudit garage (1) est formée par un textile (3) agencé en tant que façade permanente, dans lequel le textile (3) présente une grosseur de grain telle qu'au moins 30 % de la surface totale dudit textile est exposée à l'air, de sorte qu'au moins 30 % de la superficie totale de la façade soit exposée à l'air.

2. Garage (1) selon la revendication 1, dans lequel le textile (3) est fabriqué à partir d'un matériau choisi dans le groupe constitué de fibres naturelles ou artificielles ou d'une combinaison de celles-ci.

3. Garage (1) selon la revendication 1 ou 2, dans lequel le textile (3) est pourvu d'un imprimé.

4. Garage (1) selon la revendication 1-3, dans lequel au moins les pieds (21) de ladite structure porteuse sont formés par l'ossature structurale en acier (2).

5. Garage (1) selon l'une quelconque des revendications précédentes, comprenant au moins un plancher, dans lequel ledit plancher (12) est formé par au moins une dalle de béton profilée (4).

6. Garage (1) selon la revendication 5, dans lequel ladite plaque de béton profilée comprend une dalle à âme creuse.

7. Garage (1) selon la revendication 5 ou 6, dans lequel la structure porteuse est agencée pour supporter ladite dalle (4) sur la périphérie (41, 42) dudit plancher (12).

8. Utilisation d'un textile (3) en tant que façade pour garage (1) selon l'une quelconque des revendications précédentes, dans laquelle le textile (3) présente une grosseur de grain telle qu'au moins 30 % de la surface totale dudit textile est exposée à l'air.

9. Procédé de fabrication d'un garage (1) selon l'une quelconque des revendications précédentes, comprenant la fourniture d'une structure porteuse et la fourniture d'un textile (3) comme façade permanente pour sensiblement toute la façade dudit garage (1), dans lequel la structure porteuse du garage (1) com-

prend une ossature structurale en acier (2) et dans lequel le textile (3) présente une grosseur de grain telle qu'au moins 30 % de la surface totale dudit textile est exposée à l'air, de sorte qu'au moins 30 % de la superficie totale de la façade est exposé à l'air.

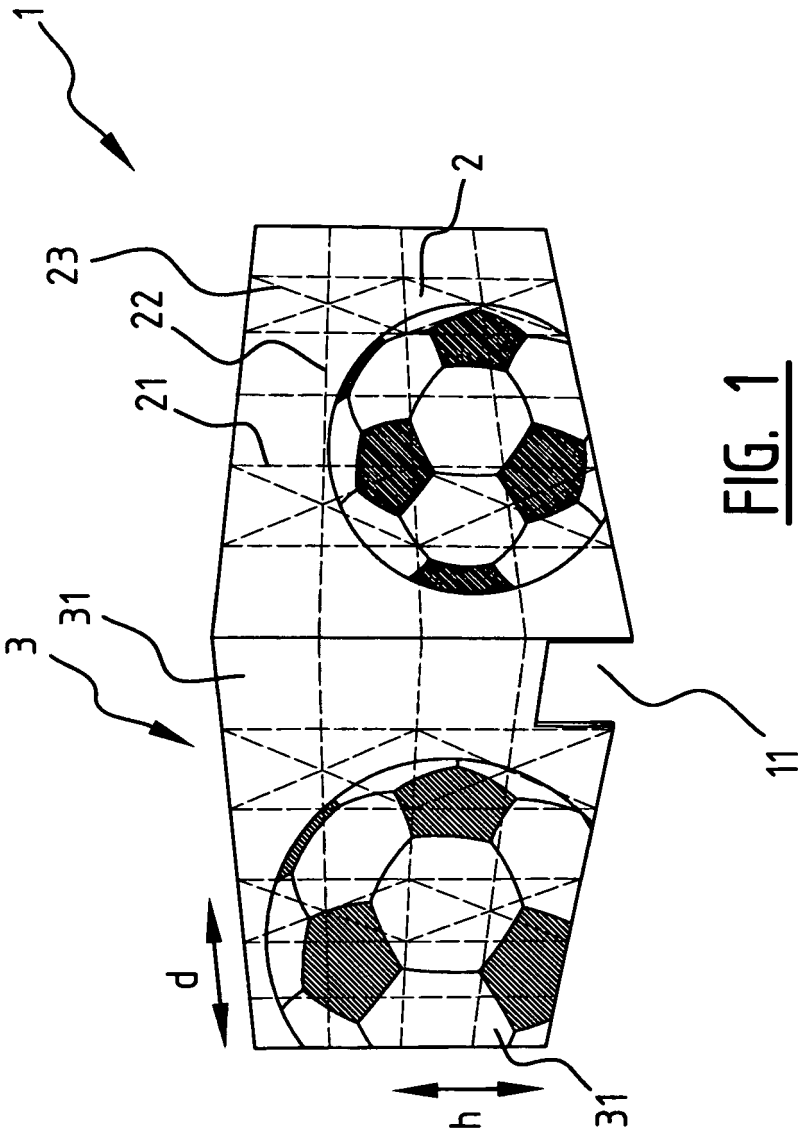


FIG. 1

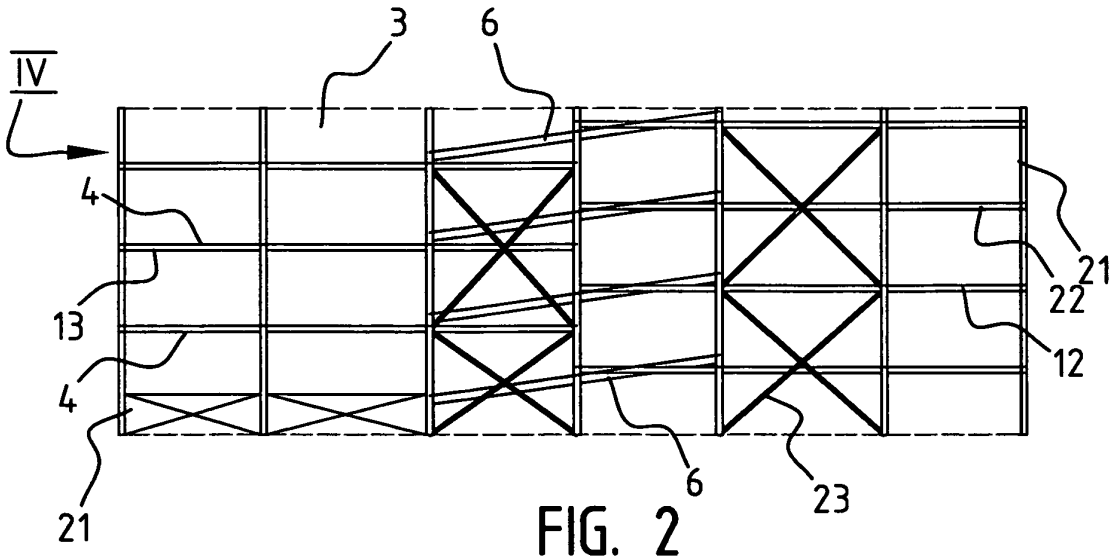

IV
3
6
4
13
4
21
22
12
6
23

FIG. 2

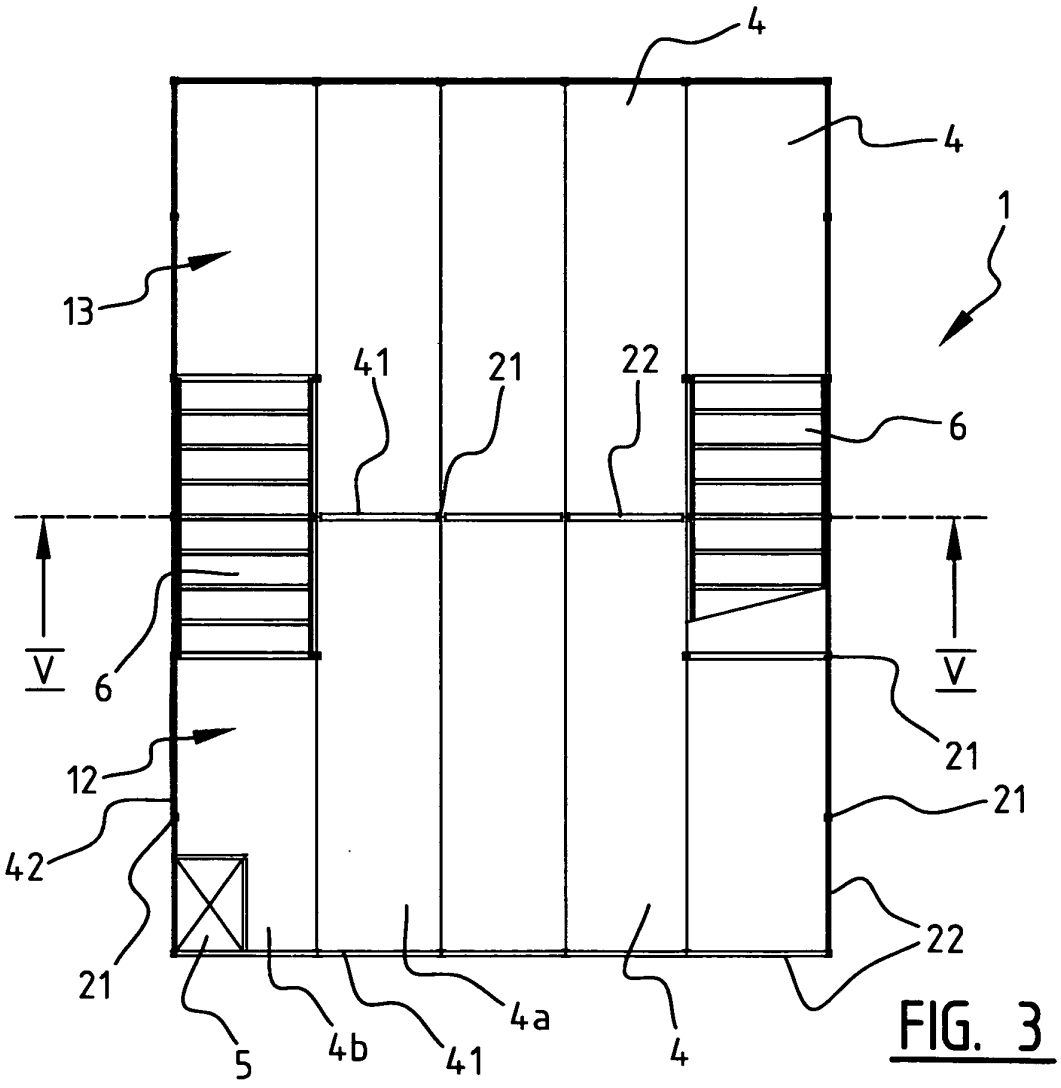

4
4
1
13
41
21
22
6
V
V
6
21
12
21
42
21
22
5
4b
41
4a
4

FIG. 3

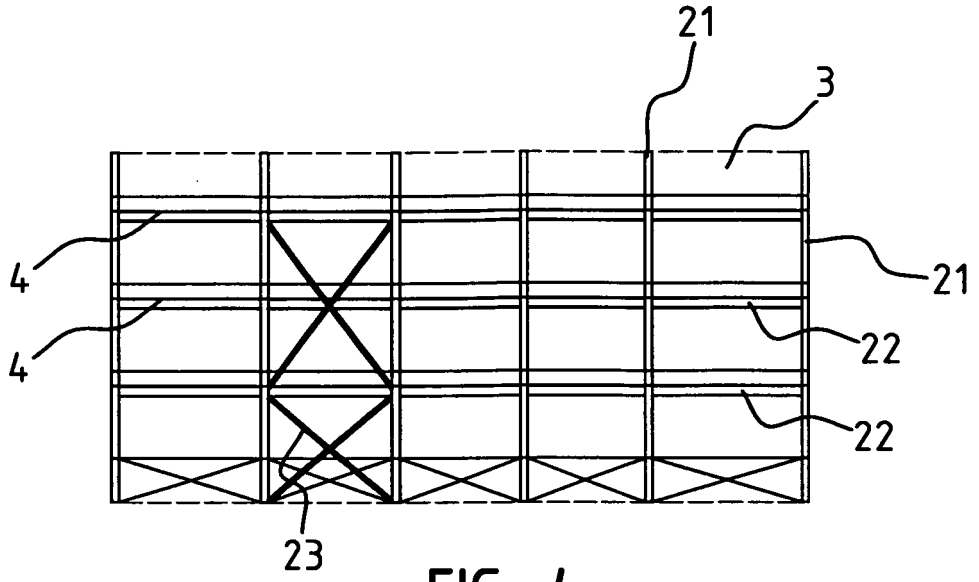


FIG. 4

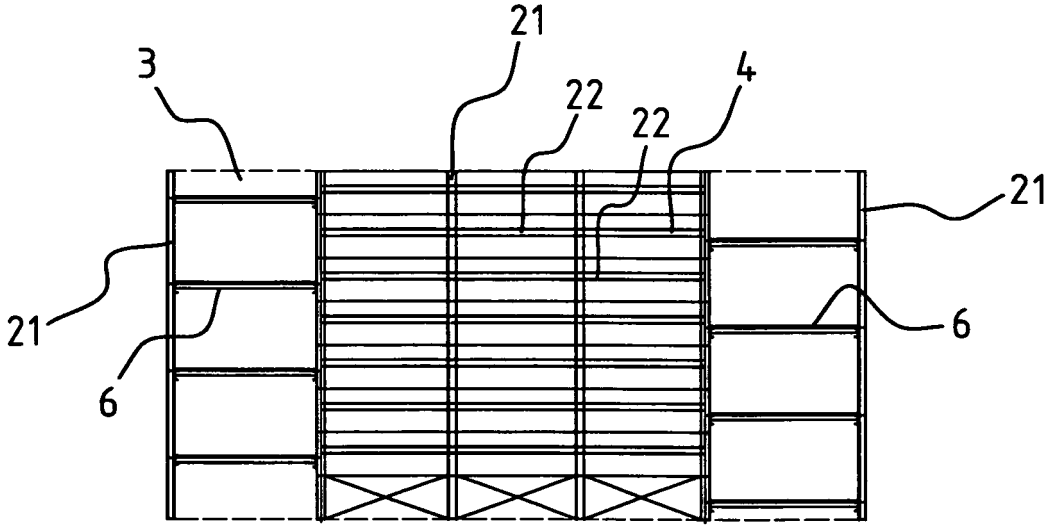


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- DE 19932254 A **[0005]**
- DE 19906097 A **[0005]**
- US 4875549 A **[0005]**
- GB 2226591 A **[0005]**