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(54) Structure comprising main profiles and auxiliary profiles extending perpendicular thereto

(57) The invention relates to a flat structure, comprising two elongate parallel carriers and metal main profiles extending substantially transversely of the carriers, wherein this measure results in a considerably stronger construction, this being caused mainly by the fact that a load on the structure, in particular a transverse load, is distributed over several main profiles by the auxiliary profiles. Such a structure can hereby be loaded more heavily or it can be given a smaller construction for the same load, which results in lower costs.

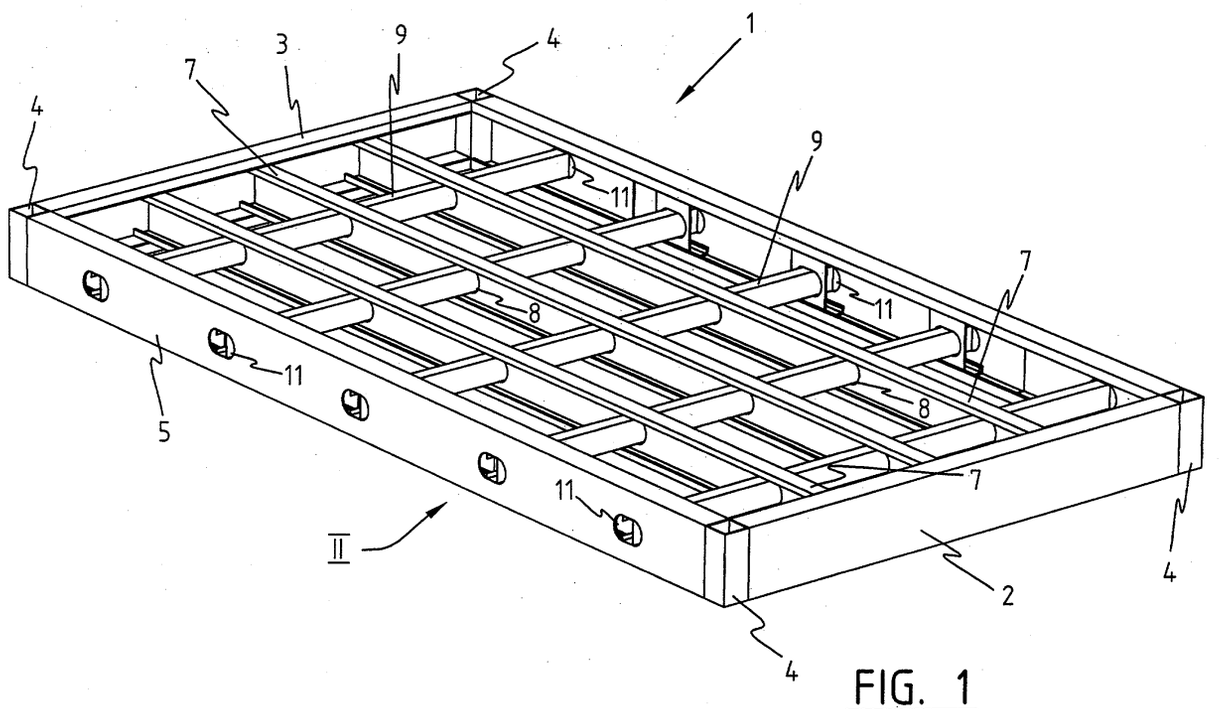

FIG. 1

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Description

[0001] The invention relates to a flat structure, comprising two elongate parallel carriers, metal main profiles extending substantially transversely of the carriers and metal auxiliary profiles which extend parallel to the carriers and through openings arranged in the main profiles, wherein the main profiles comprise a first wall, which extends transversely of the main plane of the structure and in which openings are arranged, and a second wall which extends parallel to the first wall and which is interrupted at least at the position of the openings arranged in the first wall.

[0002] Such a structure is known from US-A-5 048 254.

[0003] A C-profile is used herein as main profile. The strength of such a structure is not very great however. This relates particularly to the strength and rigidity in the case of loads transversely of the main plane of the structure. This is not however of particular importance in the application for outside walls described in this document.

[0004] The object is to provide such a structure which can be loaded more heavily, particularly in its transverse direction, so that it can be used as a floor.

[0005] This objective is achieved in that the size of the openings in the first wall is the same as the size of the interruptions in the second wall in the same direction.

[0006] This measure results in a considerably stronger construction, this being caused mainly by the fact that a load on the structure, in particular a transverse load, is distributed over several main profiles by the auxiliary profiles. The distribution over the auxiliary profiles herein takes place due to the form-locking between the main profiles and the auxiliary profiles. Such a structure can hereby be loaded more heavily or it can be given a smaller construction for the same load, which results in lower costs.

[0007] The advantages of these measures are not only manifest in the application as floor; in the application as wall the thickness of the wall can be greatly reduced.

[0008] According to a first preferred embodiment the size of the cross-section of the auxiliary profiles in a first direction is greater than that in the direction extending perpendicularly thereof, and the auxiliary profiles are placed with their large dimension transversely of the main plane of the structure.

[0009] The strength of the auxiliary profiles is hereby utilized optimally.

[0010] A second preferred embodiment teaches that the largest dimension of auxiliary profiles is smaller than the largest dimension of the openings in the profiles.

[0011] As a result of these measures the auxiliary profiles can be pushed easily into the openings of the main profiles at a later stage, i.e. during assembly on site.

[0012] It is furthermore not necessary according to the invention for the auxiliary profiles to be connected to the main profiles at the position of intersection of the main profiles other than by the form-locking of the auxiliary profiles by the main profiles. It will however be apparent that it is indeed possible to make such a connection, for instance by welding or glueing, or by a bolt connection.

[0013] According to yet another preferred embodiment, the main profiles are formed by C-profiles, and the distance between the longitudinal edges of the C-profiles is equal to the size of the opening in the back of the C-profiles in the same direction.

[0014] The effects of the form-locking are improved if the openings arranged in the main profiles comprise two opposite edges which converge in at least one direction. It hereby becomes possible to place the auxiliary profiles without too much friction in the openings arranged in the main profiles, while the converging edges of the openings result in an improved form-locking.

[0015] The increased strength of this construction makes it possible to apply the structure for assembles which heretofore required other, i.e. heavier, structures.

[0016] The invention therefore teaches that the structure is incorporated in a floor.

[0017] In such a situation the structure is preferably provided on its top side with a cover layer which can be formed by concrete, but which can also be formed by wood-like material. It is pointed out that, particularly in the case of concrete, the structure according to the invention is so rigid that the concrete can be applied in a relatively thin layer without the risk of cracking occurring. A spectacular weight reduction is hereby achieved compared to a construction wholly embodied in concrete.

[0018] It will be apparent that the advantages of the invention also become manifest when the structure is formed by a wall or a partition. It is then attractive if the main profiles extend in vertical direction.

[0019] Particularly, although not exclusively, in the application as floor or ceiling, situations will occur in which structures according to the invention are arranged connecting to each other in a construction. It is then attractive when the auxiliary profiles can be coupled to coupling profiles extending inside the contour of the auxiliary profiles. These coupling profiles can then extend over several structures according to the invention, whereby the forces exerted on the structures are distributed over a larger area and the strength of the construction increases.

[0020] These advantages are shown particularly when at least one of the coupling profiles extends as far as the first main profiles.

[0021] The structure according to the invention can be assembled on site from the separate components. It is after all easy to connect the metal main profiles to the two elongate parallel carriers, for instance by means of a bolt connection. The auxiliary profiles can then be placed through the openings arranged in the main profiles.

[0022] The invention therefore relates to a kit of parts for manufacturing a structure according to any of the claims 1-13, which is formed by two parallel carriers, a number of metal main profiles provided with openings

and a number of auxiliary profiles which are dimensioned to extend through the openings arranged in the main profiles.

[0023] The invention also relates to a method for assembling a structure according to any of the claims 1-13, which method can be carried out on site or in a factory. In the latter case it is moreover attractive when a cover layer is already arranged on the thus obtained structure in the factory.

[0024] This measure is wholly in keeping with the aim of prefabrication currently standard in the construction industry.

[0025] When the cover layer is formed by concrete, it is attractive to apply a method wherein the cover layer is applied by placing the structure upside down on a formwork, pouring the concrete, allowing it to cure and then turning over the thus obtained structure.

[0026] The present invention will be elucidated hereinbelow with reference to the annexed drawings, in which:

fig. 1 shows a schematic perspective view of a first embodiment of a structure according to the present invention;
fig. 2 is a detail view according to arrow II in fig. 1;
fig. 3 shows a construction provided with two structures according to the invention which are provided with a concrete cover layer,
fig. 4 is a detail view according to arrow IV in fig. 3;
fig. 5 shows a schematic perspective view of an embodiment of the invention wherein a wooden cover layer is applied;
fig. 6 shows a detail view of a structure according to the invention wherein coupling profiles are applied; and
fig. 7 shows a perspective view of a construction wherein walls are applied which are built with a structure according to the present invention.

[0027] Fig. 1 shows a structure designated as a whole with 1 which is formed by two elongate, parallel extending carriers 2,3 which are manufactured in the present case from profiled steel plate. These carriers have a substantially C-shaped structure. At their ends both elongate carriers are connected to short pieces of tubular profile 4. It will be apparent that other corner structures can be applied instead. Along the long sides of the structure the tube profiles 4 are mutually connected by profiles 5,6, which in the present case are manufactured from the same profile material as elongate carriers 2,3.

[0028] Elongate carriers 2,3 are mutually connected by main profiles 7. Main profiles 7 have a C-shaped cross-section. They can however also be formed by rectangular tube profiles. Openings 8 are arranged in main profiles 7. These latter are connected to elongate carriers 2,3 by means of bent parts and bolt connections, but can also be connected thereto by welded joins.

[0029] Auxiliary profiles 9 extend through these openings. These profiles are arranged loosely in the relevant openings. They provide a considerable increase in the strength of the structure in question.

[0030] Fig. 2 shows in more detail an opening 8 through which extends an auxiliary profile 9. It can be seen herefrom that the height of profile 9 is slightly smaller than the height of opening 8, so that auxiliary profiles 9 can be pushed easily into holes 8 at a later stage.

[0031] The side walls of openings 8 are here semicircular. The profile will hereby seek a position wherein it becomes fixed. Important here is the measure that these side walls converge on at least one side.

[0032] Fig. 2 further shows that profile 9 is moreover limited in its movement through the upright or dependent edges 10 of the C-profile. Fig. 1 shows that the lateral carriers 5,6 are likewise provided with openings 8. When such a structure is assembled on site, this is necessary on at least one of the lateral carriers 6,5 for placing of the auxiliary profiles. When such a structure is wholly prefabricated, this is not necessary. These holes 9 do however have a function which will be elucidated in the following with reference to fig. 6.

[0033] Fig. 3 shows a construction wherein two structures 1 according to the present invention are applied. The lower structure 1 rests on a ground not shown in the drawing and the upper structure 1 rests on four uprights 12 which fit into corner profiles 4. Uprights 12 are fixed in corner profiles 4 by means of means not shown in the drawing.

[0034] In this embodiment structures 1 are both provided with a cover layer 13 which is formed in the present case by concrete. In the upper structure 1 the concrete 13 is shown broken away so that the reinforcement 14 arranged therein is visible.

[0035] This structure is shown in more detail in fig. 4. This figure shows that the concrete layer 13 has a small thickness. A great strength is nevertheless imparted to the relevant construction by the structure according to the invention, so that it is possible to suffice with a considerably thinner concrete layer, which results in a spectacular weight reduction.

[0036] Fig. 5 shows a similar construction wherein the cover layer is formed by sheets of multiply 15. Other wood-like material can be applied instead of multiply, such as chipboard, so-called underlayment or wooden planks. These can be directly covered by for instance parquet. This is also the case for the floor provided with a concrete top layer; this can be covered with a random floor covering, such as ceramic floor covering, wooden floor covering or textile floor covering.

[0037] Fig. 6 once again shows a structure 1 which, just as the structure shown in fig. 1, is provided with openings 11 in carriers 5,6. Auxiliary profiles 9 end close to openings 11. It will be apparent that, in order to increase the strength, auxiliary profiles 8 extend into holes 11.

[0038] In some constructions it is the case that several

structures according to the invention are placed in a building connecting onto each other or at a short distance from each other. It is then structurally attractive to bring about a coupling between these structures, which results after all in a greater strength, whereby the whole structure can be given an even lighter form. Use is made for this purpose of coupling pieces 16 which are dimensioned such that they extend inside auxiliary profiles 9 and are movable inside auxiliary profiles 9.

[0039] Although the present exemplary embodiment relates to a C-shaped profile 16, it will be apparent that other types of profile can also be applied. It is also possible to make use of two profiles when for instance the auxiliary profile 9 has an H- or I-structure. It is however attractive if the coupling pieces are movable along the auxiliary profiles.

[0040] Fig. 7 shows a number of structures according to the present invention which are used to construct a part of a building. The structures according to the invention are here not only used to make a ceiling but also to construct walls. The structure according to the invention can thus be very readily combined for instance with the optionally corrugated metal plates commonly applied in the construction of factories. These can be applied on both sides of the structure according to the invention. The cavity inside the structure can then be filled with an insulating material such as a mineral wool. This figure furthermore shows that main profiles 7 extend in vertical direction because they have to absorb the major part of the forces. This construction moreover shows how the structure according to the invention can be used to make vertical partitions and for horizontal ceilings or floors.

[0041] It will be apparent that other possible applications, such as for instance support for sloping roofs, are by no means precluded.

Claims

1. Flat structure, comprising:

- two elongate parallel carriers;
- metal main profiles extending substantially transversely of the carriers; and
- metal auxiliary profiles which extend parallel to the carriers and through openings arranged in the main profiles,

wherein the main profiles comprise:

- - a first wall which extends transversely of the main plane of the structure and in which openings are arranged; and
- - a second wall which extends parallel to the first wall and which is interrupted at least at the position of the openings arranged in the first wall,

characterized in that the size of the openings in the first wall is the same as the size of the interruptions in the second wall in the same direction.

2. Structure as claimed in claim 1, **characterized in that** the main profiles are C-profiles and that the distance between the longitudinal edges of the C-profiles is equal to the size of the opening in the back of the C-profiles in the same direction.

3. Structure as claimed in claim 1, **characterized in that** the main profiles are tubular profiles and that openings are arranged in both walls of the tube profiles, the dimensions of these openings being substantially the same in the direction transversely of the main plane of the structure.

4. Structure as claimed in claim 1, 2 or 3, **characterized in that** the size of the cross-section of the auxiliary profiles in a first direction is greater than that in the direction extending perpendicularly thereof, and that the auxiliary profiles are placed with their large dimension transversely of the main plane of the structure.

5. Structure as claimed in claim 1, 2, 3 or 4, **characterized in that** the largest dimension of auxiliary profiles is smaller than the largest dimension of the openings in the profiles.

6. Structure as claimed in any of the foregoing claims, **characterized in that** the openings arranged in the main profiles comprise two opposite edges which converge in at least one direction.

7. Structure as claimed in any of the foregoing claims, **characterized in that** the structure is incorporated in a floor.

8. Structure as claimed in claim 7, **characterized in that** the structure is provided on its top side with a cover layer.

9. Structure as claimed in claim 8, **characterized in that** the cover layer is formed by concrete.

10. Structure as claimed in claim 8, **characterized in that** the cover layer is formed by wood-like material.

11. Structure as claimed in any of the claims 1-6, **characterized in that** the structure is formed by a wall or partition.

12. Structure as claimed in claim 11, **characterized in that** the main profiles extend in vertical direction.

13. Structure as claimed in any of the foregoing claims, **characterized in that** the auxiliary profiles can be

coupled to coupling profiles extending inside the contour of the auxiliary profiles.

14. Assembly of at least two structures as claimed in claim 13, **characterized in that** the coupling profiles extend inside two structures.

15. Assembly as claimed in claim 14, **characterized in that** at least one of the coupling profiles extends into the first main profiles.

16. Kit of parts for manufacturing a structure as claimed in any of the claims 1-13, **characterized by** two parallel carriers, a number of metal main profiles provided with openings and a number of auxiliary profiles which are dimensioned to extend through the openings arranged in the main profiles.

17. Method for assembling a structure as claimed in any of the claims 1-13, **characterized in that** the main profiles are initially connected to the carriers and that the auxiliary profiles are then pushed into the openings arranged in the main profiles.

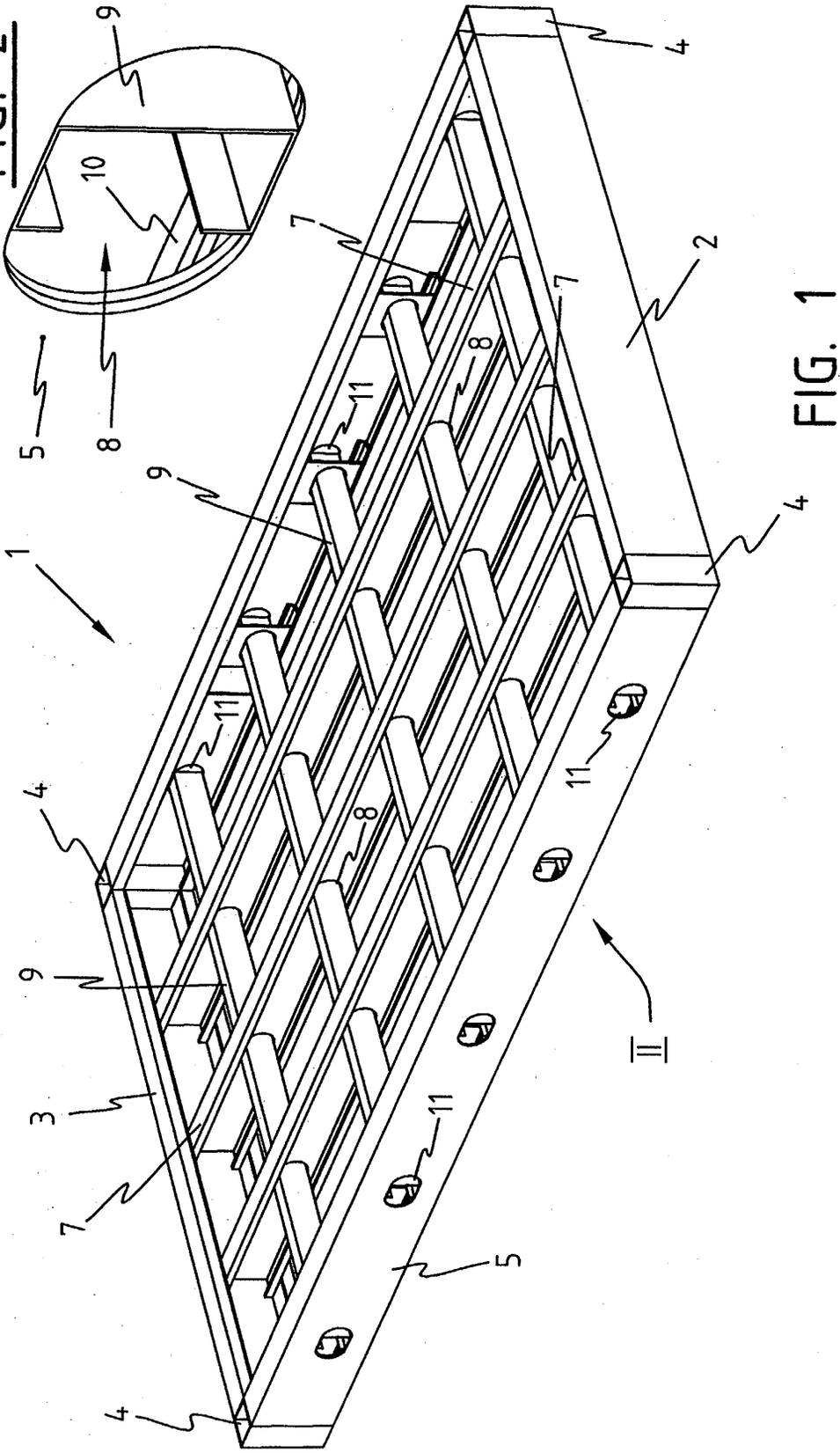
18. Method as claimed in claim 17, **characterized in that** the method is carried out on site.

19. Method as claimed in claim 17, **characterized in that** the method is carried out in the factory and that a cover layer is arranged on the thus obtained structure.

20. Method as claimed in claim 19, **characterized in that** the cover layer is formed by concrete, that the cover layer is applied by placing the structure upside down on a formwork, pouring the concrete, allowing it to cure and then turning over the thus obtained structure.

FIG. 2

FIG. 1



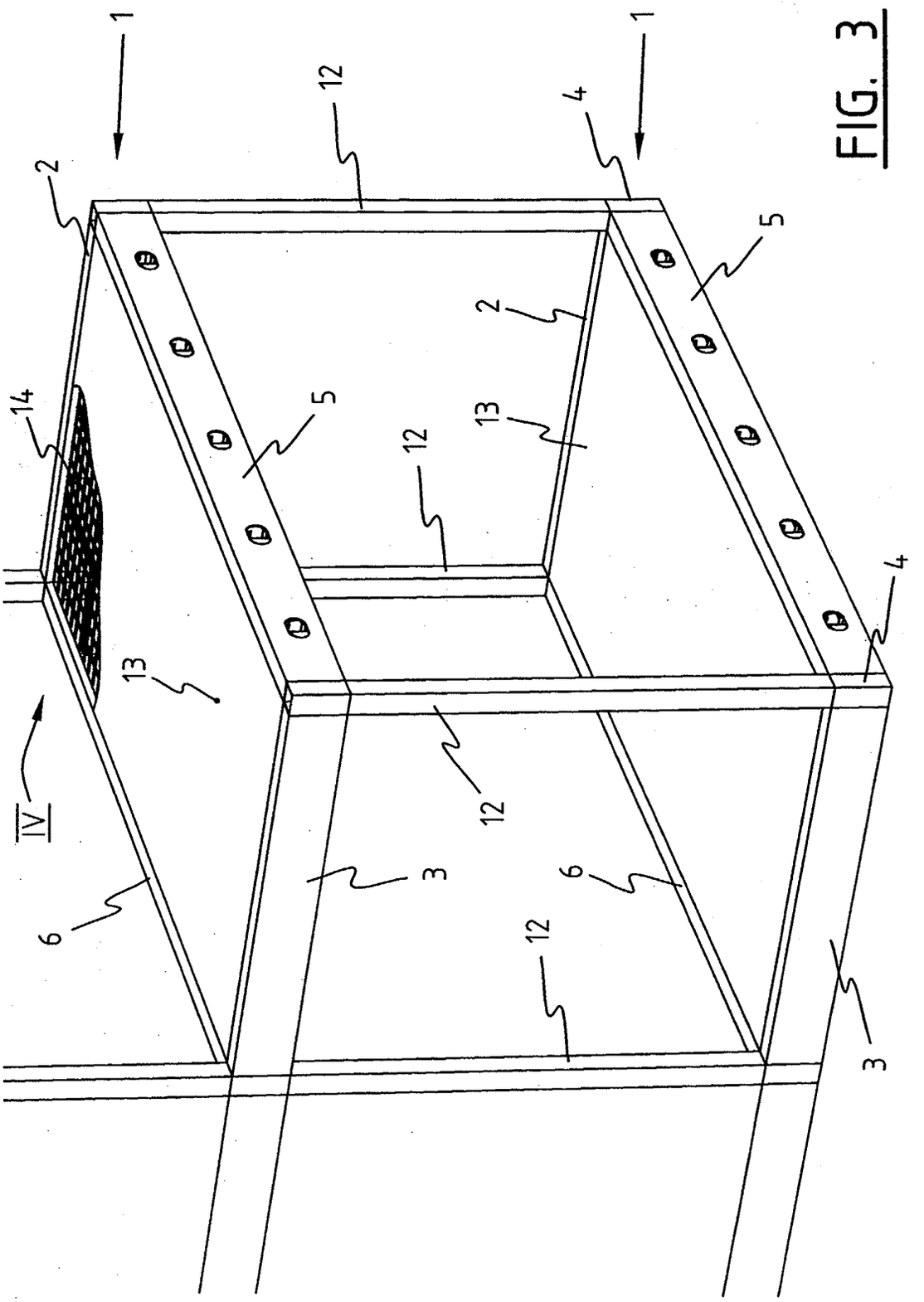


FIG. 3

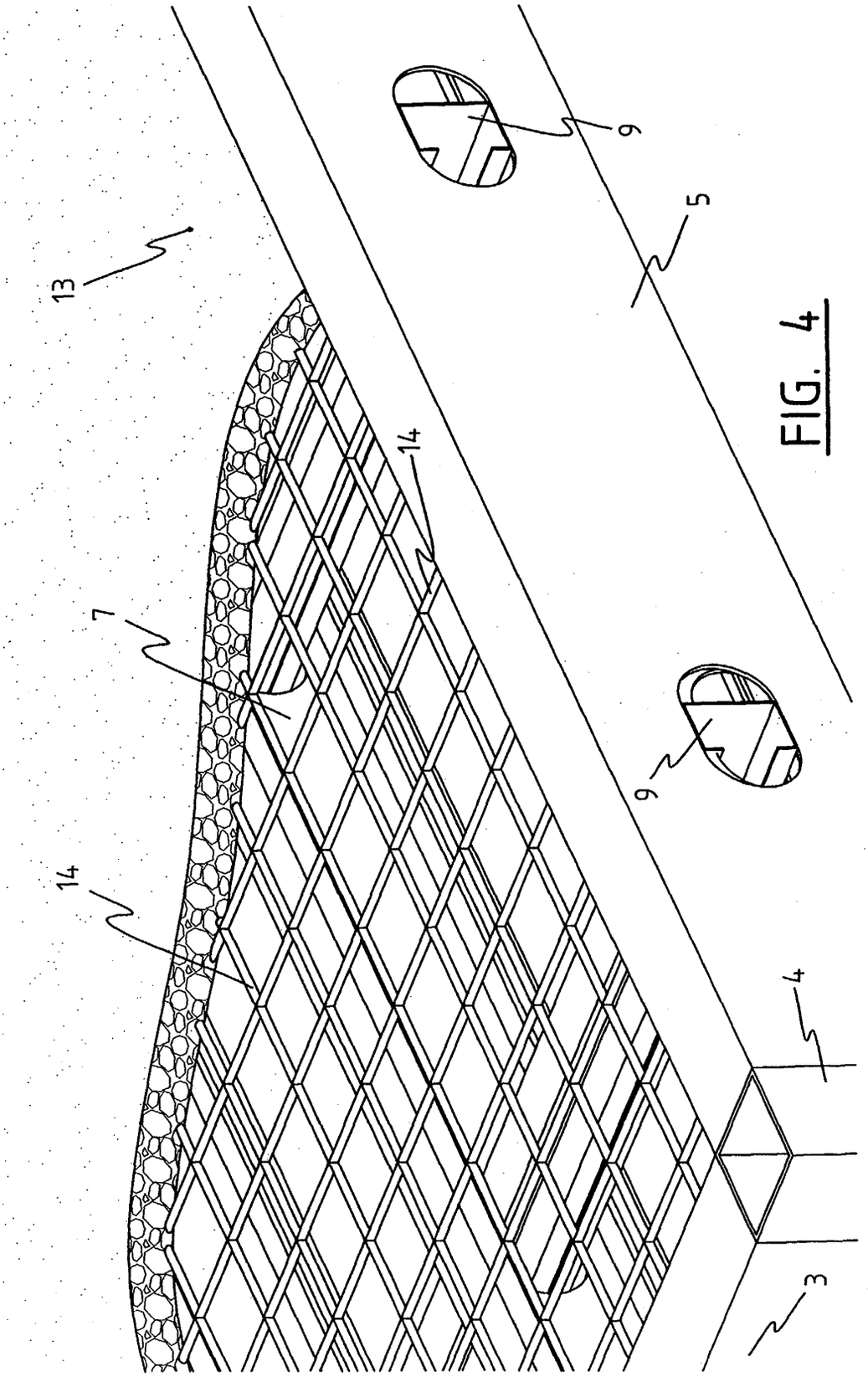


FIG. 4

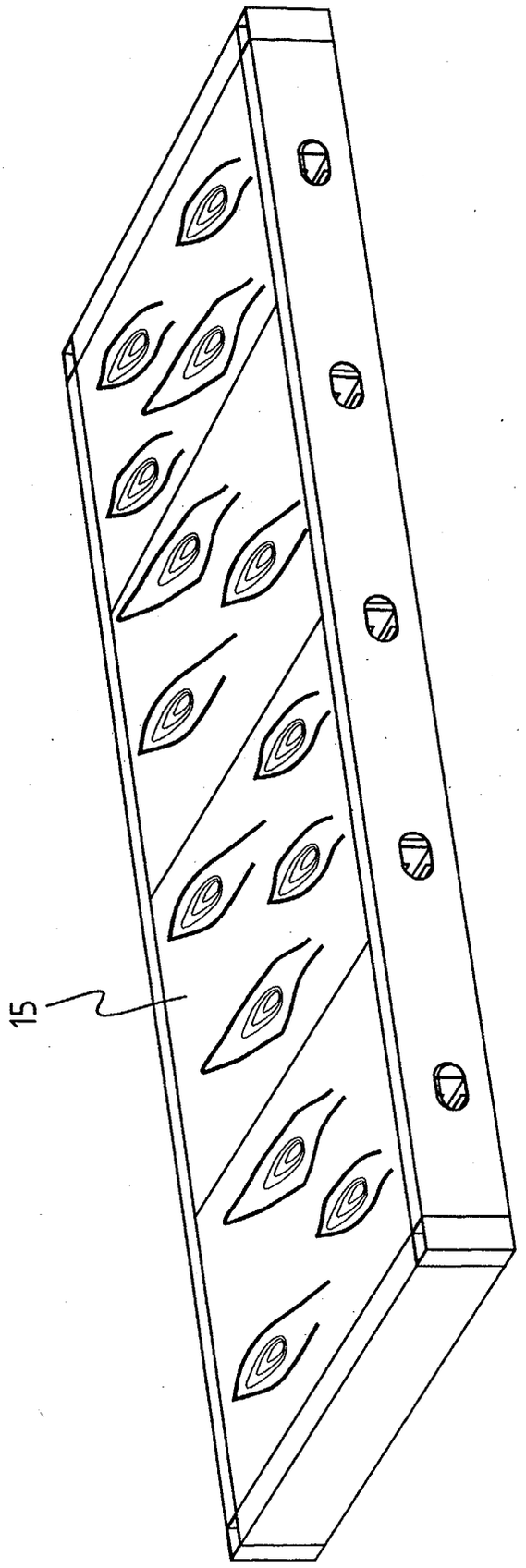


FIG. 5

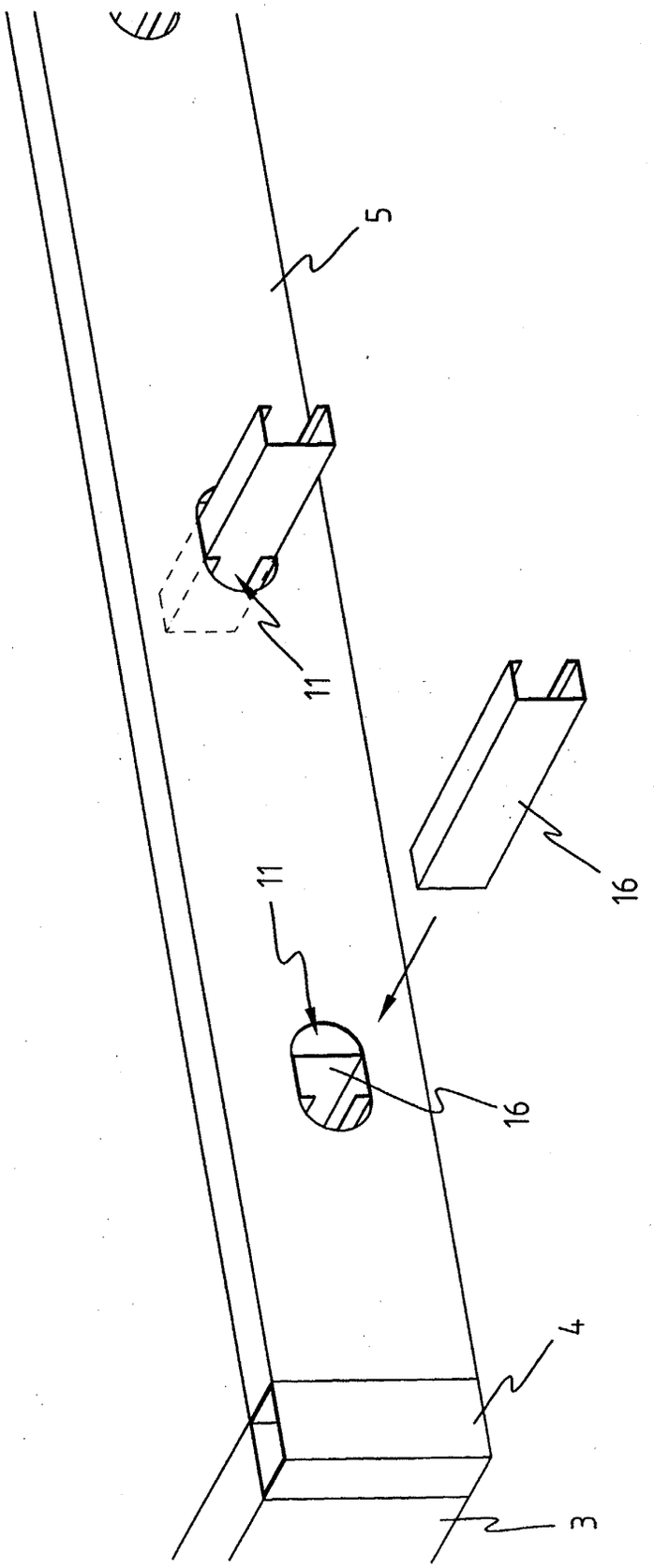


FIG. 6

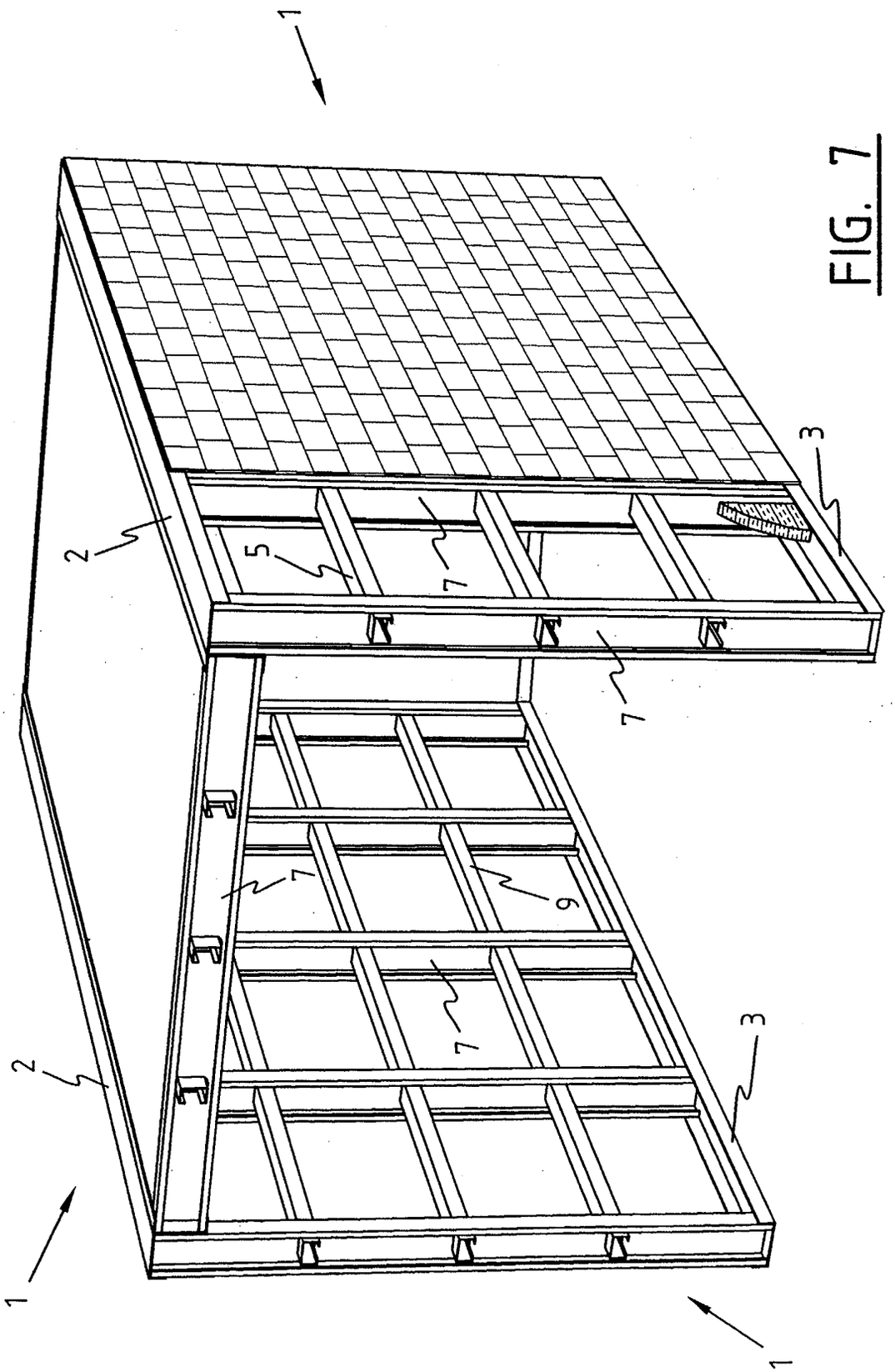


FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 07 5321

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X,D	US 5 048 254 A (MERLAU) 17 September 1991 (1991-09-17)	1-6,11, 12,14, 16-19	E04C2/38 E04B5/14
Y	* column 2, line 59 - column 3, line 34; figures 1,2A-C *	7	

Y	US 2 580 185 A (NAGIN) 25 December 1951 (1951-12-25) * column 1, line 49 - column 2, line 23; figures 1-3 *	7	

A	US 2003/014934 A1 (BODNAR) 23 January 2003 (2003-01-23) * page 5, paragraph 87 - page 6, paragraph 92 *	8,9	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E04C
E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 May 2004	Mysliwetz, W

CATEGORY OF CITED DOCUMENTS

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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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