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(54) MODULAR POLYCARBONATE PANEL FOR COVERINGS ON BUILDINGS

(57) The present invention relates to a modular polycarbonate panel for roofs of buildings. The panel (1) comprises a cell structure defining a plurality of chambers (4), such that a first side (1a) is suitable for being coupled to a second panel (3) having at least one tab (6) defining a cavity (6a). A second side (1b) of the panel (1) is suitable for being coupled to a third panel (2) and has a projection (7) defining a geometry complementary to the cavity (6a) defined by said tab (6) of the first side (1a). The modular panel can be coupled to successive adjacent panels for covering a surface of a roof or enclosure rapidly and safely while reducing the installation time.

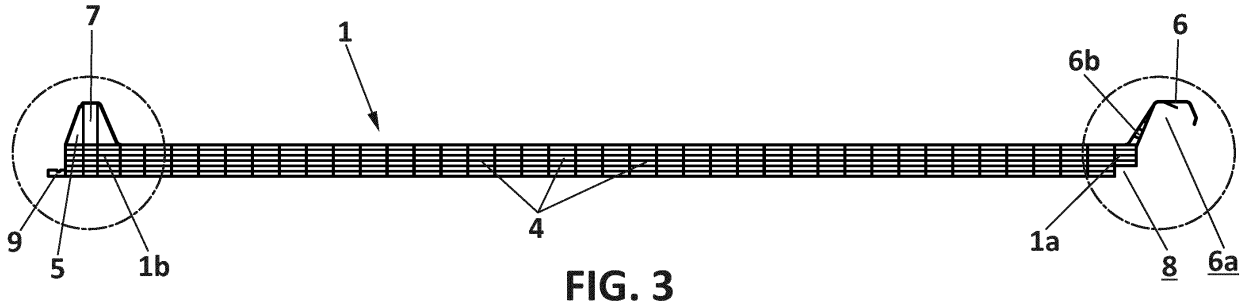

FIG. 3

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Description

Technical Field of the Invention

[0001] The present invention relates to a modular polycarbonate panel for roofs of buildings, suitable for being coupled both to sandwich-type panels and to successive modular panels through its respective sides, and where said panel is comprised within the sector of roof and enclosure construction and insulation.

[0002] The main purpose of the modular polycarbonate panel object of the invention is to provide a panel which can be coupled to successive adjacent panels, either sandwich-type panels or modular polycarbonate panels, such that they cover a given surface of a roof or enclosure rapidly, safely and effectively, allowing light from the outside into the building, and which additionally does not require inner reinforcement elements for the panel, therefore lowering its cost compared to its competition, in addition to simplifying its placement, and therefore reducing the installation time thereof.

Background of the Invention

[0003] As an introduction, polycarbonate panels which are laterally coupled to sandwich-type panels are known to be used and applied on roofs of industrial buildings in general, the main purpose of which is to allow light into the building, to protect the region of the roof from inclement weathers, and to provide a certain degree of insulation to the upper part of the building.

[0004] Such sandwich-type panels for a roof can be classified into two main types, including:

- A first sandwich-type panel with exposed nuts and bolts, referred to as European-type panel, which is formed by a structure consisting of two sheet metals and a filler material, where there are formed on the ends thereof a protrusion-like tab on one side, and a projection on the other side; where each projection is configured to allow the superimposition of the contiguous tab of an adjacent panel, such that once the tab of a sandwich-type panel is superimposed on the projection of another sandwich-type panel, a threaded screw-type fixing means in charge of fixing the sandwich-type panels to the adjacent panels are introduced.
- A second panel with concealed nuts and bolts, which has the same physical entities as the panels with exposed nuts and bolts, but where a bent sheet metal covers the upper part of the threaded screw without allowing viewing and accessing said fixing means from the outside; this being a simple and effective solution for improving the appearance and for allowing an operator to walk on the roof without possibly running into said fixing means.

[0005] Having indicated the configuration of the physical entities of a sandwich-type panel, as well as the coupling between them, the use and application of polycarbonate panels configured for being laterally coupled to said sandwich-type panels is known, where the polycarbonate panels of the state of the art have a cell structure defining a plurality of insulating chambers, and have on each side respective protrusion-like tabs suitable being coupled, on one side, to the projection of a sandwich-type panel, and on the other side, to a tab of the other sandwich-type panel.

[0006] Taking the panel with exposed nuts and bolts as a reference, it can be deduced that a decrease in mechanical strength occurs in the region of attachment between the tabs of two adjacent panels, one being a polycarbonate panel and the other generally being a sandwich-type panel, given that there is only one polycarbonate tab of reduced thickness fixed to another tab of the sandwich-type panel, both of them being attached between the mentioned fixing means. This is a region of the roof that is prone to breakages and flaws due to overpressure brought about by the wind, rain, etc.

[0007] For this reason, in order to solve said problems, the use of sheet metal profiles located both in the gap existing between both tabs, and in the upper region with respect to said tabs is known, the partial strength of the region located between both tabs is significantly increased, at the cost of making the product thus obtained more expensive as it leads to the need to install said sheet metal profiles by way of reinforcement between each attachment of the panels; in addition to causing a hold-up in the placement of the panels on the corresponding roof due to the installation of the mentioned sheet metal profiles. It must be pointed out that said sheet metal profiles are used to protect the polycarbonate panel from possible damage caused by expansion, and are also used for esthetic reasons, since having a visible gap between both panels is not pleasing to the eyes, and where the sheet metal profile located in the upper region with respect to both tabs conceals it from the exposed part of the roof.

[0008] For this reason and in view of the drawbacks existing both in the absence of sheet metal profiles between both tabs, which leads to a reduced mechanical strength in the attachment between panels, and in the inclusion of reinforcement sheet metal profiles, which affect the overall cost of the panel and lead to a hold-up in its placement, there is a need for a new modular polycarbonate panel for roofs of buildings which can solve said problems without making the product thus obtained more expensive, reducing the placement times, assuring a suitable mechanical strength as well as a versatility for use in different types of roofs that is not known up until now, and can be perfectly coupled to sandwich-type panels for roofs or for adjacent modular polycarbonate panels by way of a continuous skylight.

Description of the Invention

[0009] The present invention relates to a modular polycarbonate panel for roofs of buildings configured for being coupled to a second panel on a first side and to a third panel on a second side, wherein said modular polycarbonate panel comprises a cell structure defining a plurality of chambers, wherein:

- the first side suitable for being coupled to the second panel has at least one tab defining a cavity; and
- the second side suitable for being coupled to the third panel has a projection defining a geometry complementary to the cavity defined by said tab of the first side, allowing the modular panel to be coupled to the third panel through the superposition of said tab on said projection; and wherein said projection of the second side has a cell structure defining a plurality of chambers.

[0010] To clarify, the concept of a projection is understood as a part that sticks out of the cell structure itself, where it can be seen that the projection has the same cell structure defining the plurality of chambers as the rest of the structure of the modular polycarbonate panel, such that unlike the state of the art, one of the sides has said projection that can be coupled to a tab of an adjacent second panel, such that once both panels are superposed through the projection of the first panel and the tab of the second panel, a strong attachment that does not require the need to include reinforcement sheet metal profiles to increase its resistant capacity is achieved.

[0011] Therefore, in addition to not requiring external elements for reinforcing the attachment, the time for placing each of the panels object of the invention is reduced, since the panel itself is formed from a single part and the skilled operator will only need to position the panels by coupling the tab of a first side of a first panel to the projection of a second side of a second panel in a quick and effective placement.

[0012] Therefore, unlike polycarbonate panels that have tabs on both sides, in the panel object of invention one of the sides does indeed have the mentioned tab, but the other side has the projection suitable for being coupled to the tab, so it is not a symmetrical panel like in the state of the art, and it assures an increase in mechanical strength in the attachment between panels without having to use reinforcement sheet metal profiles.

[0013] It must be clarified that the modular polycarbonate panel object of the invention is designed for being coupled to the first panel and to the second panel, where these panels can also be modular polycarbonate panels having the same technical features described in the panel object of the invention. Furthermore, it can also be coupled to a first and second sandwich-type panel for roofs, where a sandwich-type panel for roofs is formed by two generally metallic plates having therein a filler material which can be an insulating material such as polyurethane, rock wool, polystyrene or other materials.

[0014] Likewise, and according to the production of the modular polycarbonate panel for roofs of buildings object of the invention, said modular polycarbonate panel can be produced by means of a process of extruding it through a head or mold, then cutting it to the pre-established dimensions, so it can be seen how said projection of the second side has the same cell structure defining a plurality of chambers as the cell structure of the panel itself given that it is produced as a whole, making the production process and the subsequent commercialization simpler and more cost-effective. Additionally, the cell structure of said projection gives it an optimum resistant capacity by acting as an ideal tubular structure for withstanding compressive and traction forces suffered by said panel throughout its service life.

[0015] The following preferred option is described for the purpose of increasing the capability of attachment between each of the sides of the respective modular panels:

- the first side having said tab comprises a space, and
- the second side having said projection comprises a protrusion defining a geometry complementary to the space of said first side, wherein the protrusion is configured for being coupled in the space of the first side of a third panel, either a polycarbonate modular-type or sandwich-type panel.

[0016] It therefore constitutes additional fixing means between the panels which can be easily made in the process of forming the panel object of the invention; and entails an additional fastening between each of the panels since fixing means like pins or similar means can be introduced between the protrusion and the associated space between both panels.

[0017] In turn, the possibility of the first side of the modular polycarbonate panel, which has said tab, being designed such that said tab comprises a protuberance on the surface thereof intended for coming into contact with the projection of the second panel, configured to prevent air or water from seeping in between the attachment between panels, is contemplated, where this is a simple and highly practical solution.

[0018] In order to increase the mechanical strength not only in the regions of attachment between panels, but also in the central regions thereof, the possibility of the modular panel comprising a plurality of intermediate projections between the first side and second side is contemplated, where multiple geometries can be made available: trapeziums, trapezoids, semicircles, etc., where the geometry of said projections are preferably identical to the geometry of the projection located on the second side of each panel.

[0019] Specifically, in a preferred embodiment the tab of the first side has a trapezoidal profile with an open base, and said projection of the second side has a trapezoidal section suitable for being introduced through the

open base of the tab of a first side of a third panel, such that it acts like a fretwork between both panels, where it is one of the most commonly used solutions in the state of the art due to its excellent behavior in the event of external stress.

[0020] Likewise, and in order to increase the mechanical strength in the region of attachment between panels, the option of a preferred embodiment in which the tab of the first side of the panel object of the invention has a thickening in the base thereof close to the first side is described, such that rigidity in the region of attachment of the tab with the panel is increased in a simple and effective manner, where said thickening optionally tapers towards the free end of the tab.

[0021] Finally and in relation to the way to fix each of the modular polycarbonate panels for roofs integrally to the rest of the panels of the roof (sandwich-type or polycarbonate modular panels), the possibility of each panel comprising a fixing element configured for attaching said tab of the first side to said projection of the second side of a third panel is contemplated, where said fixing element is preferably a threaded screw. Said threaded screw constitutes a safe, removable and quick-to-install fixing means.

[0022] The proposed invention therefore allows obtaining a modular polycarbonate panel for roofs of buildings which can be coupled to different adjacent panels such that they cover a given surface of a roof or enclosure rapidly, safely and effectively; where additionally, said panel does not require inner reinforcement elements for the panel, therefore lowering its cost compared to its competition, in addition to simplifying its placement, and therefore reducing the installation time thereof compared to the currently known state of the art.

Description of the Drawings

[0023] To complement the description that is being made and for the purpose of helping to better understand the features of the invention according to a preferred practical embodiment thereof, a series of drawings is attached as an integral part of said description in which the following has been depicted in an illustrative and non-limiting character:

Figure 1 shows a two-dimensional view of a modular polycarbonate panel of the state of the art, where the respective coupling side tabs can be seen.

Figure 2 shows a two-dimensional view of the attachment of a modular polycarbonate panel with two adjacent sandwich-type panels, all of which of the state of the art, where the different sheet metal reinforcement profiles located in the attachments between panels on the upper part, and internally with respect to the tabs, can be seen.

Figure 3 shows a two-dimensional view of the modular polycarbonate panel object of the invention.

Figure 4 shows a two-dimensional view of a detail of the second side of the modular polycarbonate panel object of the invention, where the projection and the corresponding protrusion can be seen.

Figure 5 shows a two-dimensional view of a detail of the first side of the modular polycarbonate panel object of the invention, where the tab and the corresponding space can be seen.

Figure 6 shows a two-dimensional view of the attachment of the modular polycarbonate panel object of the invention with two adjacent sandwich-type panels, where the attachments between panels with the corresponding tabs and associated projections can be seen.

Figure 7 shows a two-dimensional view of a sandwich-type panel suitable for being coupled to the modular polycarbonate panel object of the invention, where said sandwich-type panel comprises a plurality of intermediate projections having a trapezoidal geometry.

Preferred Embodiment of the Invention

[0024] In view of Figures 1 and 2, a panel (1') of the state of the art, which is coupled to a second sandwich-type panel (2') and a third sandwich-type panel (3') through the respective tabs (6', 7') located on the sides of each panel (1', 2', 3') can be seen; the attachment between panels (1', 2', 3') is thereby made through the respective tabs (6', 7') aided by lower sheet metal profiles (5') in charge of making the attachment between panels (1', 2', 3') more rigid, and upper sheet metal profiles (5") in charge of concealing the attachment between the panels (1', 2', 3'). Additionally, the cell structure of the chambers (4') formed during the production of the mentioned panel (1') is seen.

[0025] To solve the problems relating to the use of sheet metal profiles (5') for making the attachment between panels (1', 2', 3') more rigid, Figures 3 to 6 show the existence of the modular polycarbonate panel (1) for roofs of buildings object of the invention, which is configured for being coupled to a second sandwich-type panel (3) on one its side, and to a third sandwich-type panel (2) on the other side, wherein said modular panel (1) comprises a cell structure defining a plurality of chambers (4), and wherein:

- the first side (1a) suitable for being coupled to the second sandwich-type panel (3) has a tab (6) defining a cavity (6a); and
- the second side (1b) suitable for being coupled to the third sandwich-type panel (2) has a projection (7) defining a geometry complementary to the cavity (6a) defined by said tab (6) of the first side (1a), allowing the coupling of respective panels (1, 3) through the superposition of said tab (6) on said projection (7).

[0026] Likewise, Figure 4 shows a detail of the second

side (1b) of the modular panel (1) depicting therein the projection (7) with a trapezoidal geometry, which has a cell structure defining a plurality of chambers (5), as well as the existence of a protrusion (9) intended for being coupled to the first side (2a) of a second sandwich-type panel (2).

[0027] In that sense, Figure 5 shows a detail of the first side (1a) of the modular panel (1) depicting therein the tab (6) with a trapezoidal geometry, the existence of a space (8) defining a geometry complementary to the protrusion (9) of said first side (1b), and said space (8) configured for the coupling of the protrusion (9) of the second side (3b) of a second sandwich-type panel (3); where said Figure 5 also depicts how the tab (6) of the first side (1a) has, in the base thereof close to the first side (1a), a thickening (6b) having a tapering section intended for increasing rigidity in said region of the first side (1a).

[0028] Additionally, said Figure 5 shows that the first side (1a) having said tab (6) comprises a protuberance (11) on the surface of the tab (6) intended for coming into contact with the projection (7) of the third panel (2); where said protuberance (11) is configured to prevent air or water from seeping in through the attachment between respective panels (1, 2, 3).

[0029] As regards the way for coupling the panels (1, 2, 3), Figure 6 shows the attachment of respective panels (1, 2, 3) through the attachment between the tab (6) located on the first side (2a) of the third sandwich-type panel (2) with the projection (7) of the second side (1b) of the first modular polycarbonate panel (1); and on the other side, through the attachment between the projection (7) of the second side (3b) of the second sandwich-type panel (3) with the tab (6) of the first side (1a) of the first modular polycarbonate panel (1).

[0030] Finally, Figure 7 shows the existence of a plurality of intermediate projections (10) between the first side (2a) and the second side (3b) of the sandwich-type panels, which have, respectively, a trapezoidal section, where they can be formed in the modular polycarbonate panel (1) object of the invention.

[0031] In view of this description and drawings, the person skilled in the art will understand that the embodiments of the invention that have been described can be combined in many ways within the object of the invention. The invention has been described according to several preferred embodiments thereof, but it will be evident for the person skilled in the art that many variations can be introduced in said preferred embodiments without exceeding the object of the claimed invention.

Claims

1. Modular polycarbonate panel (1) for roofs of buildings configured for being coupled to a second panel (3) on a first side (1a), and to a third panel (2) on a second side (1b), wherein said modular polycarbonate panel (1) comprises a cell structure defining a plurality of chambers (4), the modular panel (1) being **characterized in that**:

   - the first side (1a) suitable for being coupled to the second panel (3) has at least one tab (6) defining a cavity (6a); and
   - the second side (1b) suitable for being coupled to the third panel (2) has a projection (7) defining a geometry complementary to the cavity (6a) defined by said tab (6) of the first side (1a); allowing the modular panel (1) to be coupled to the third panel (2) through the superposition of said tab (6) on said projection (7); and wherein said projection (7) of the second side (1b) has a cell structure defining a plurality of chambers (5).

2. Modular polycarbonate panel (1) according to claim 1, **characterized in that**:

   - the first side (1a) having said tab (6) comprises a space (8), and
   - the second side (1b) having said projection (7) comprises a protrusion (9) defining a geometry complementary to the space (8) of said first side (1a); and the protrusion (9) is configured for being coupled in the space (8) of the first side (2a) of a third panel (2).

3. Modular polycarbonate panel (1) according to any of the preceding claims, **characterized in that** the first side (1a) having said tab (6) comprises a protuberance (11) on the surface of the tab (6) intended for coming into contact with the projection (7) of the second panel (3).

4. Modular polycarbonate panel (1) according to any of the preceding claims, **characterized in that** said tab (6) of the first side (1a) has a trapezoidal profile with an open base; and said projection (7) of the second side (1b) has a trapezoidal section suitable for being introduced through the open base of the tab (6) of a first side (2a) of the third panel (2).

5. Modular polycarbonate panel (1) according to any of the preceding claims, **characterized in that** said tab (6) of the first side (1a) has, in the base thereof close to the first side (1a), a thickening (6b).

6. Modular polycarbonate panel (1) according to any of the preceding claims, **characterized in that** it comprises a fixing element configured for attaching said tab (6) of the first side (1a) to said projection (7) of the second side (3b) of the second panel (3).

7. Modular polycarbonate panel (1) according to the preceding claim, **characterized in that** the fixing element is a threaded screw.

8. Modular polycarbonate panel (1) according to any of the preceding claims, **characterized in that** the second panel (3) and/or the third panel (2) is a sandwich-type panel.

9. Modular polycarbonate panel (1) according to any of claims 1 to 7, **characterized in that** the second panel (3) and/or the third panel (2) is a modular polycarbonate panel (1).

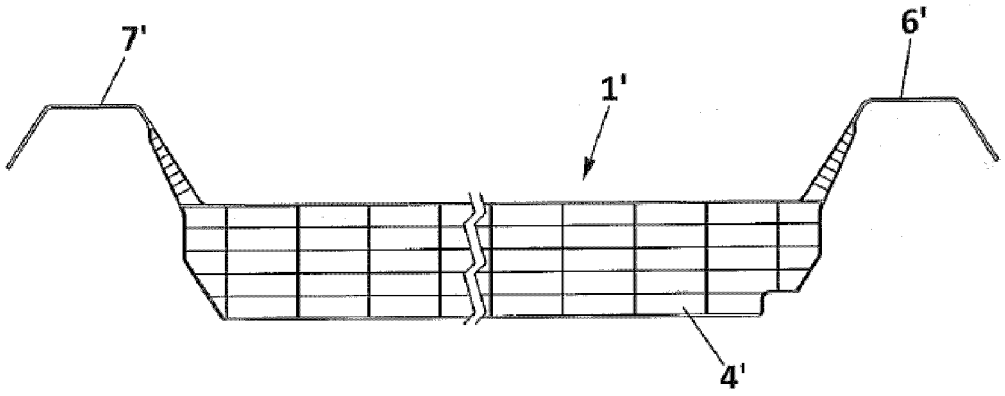

FIG. 1
(STATE OF THE ART)

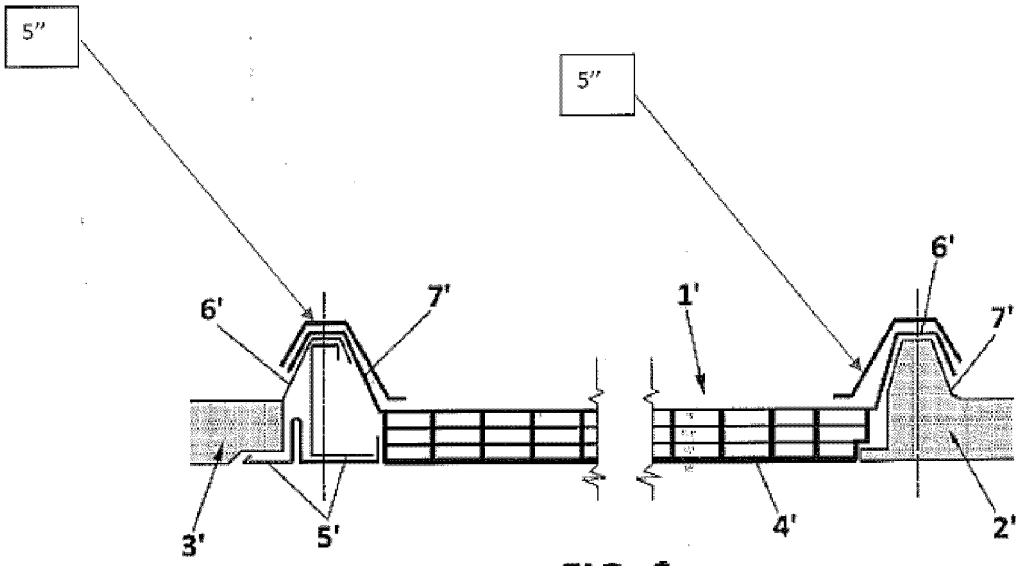

FIG. 2
(STATE OF THE ART)

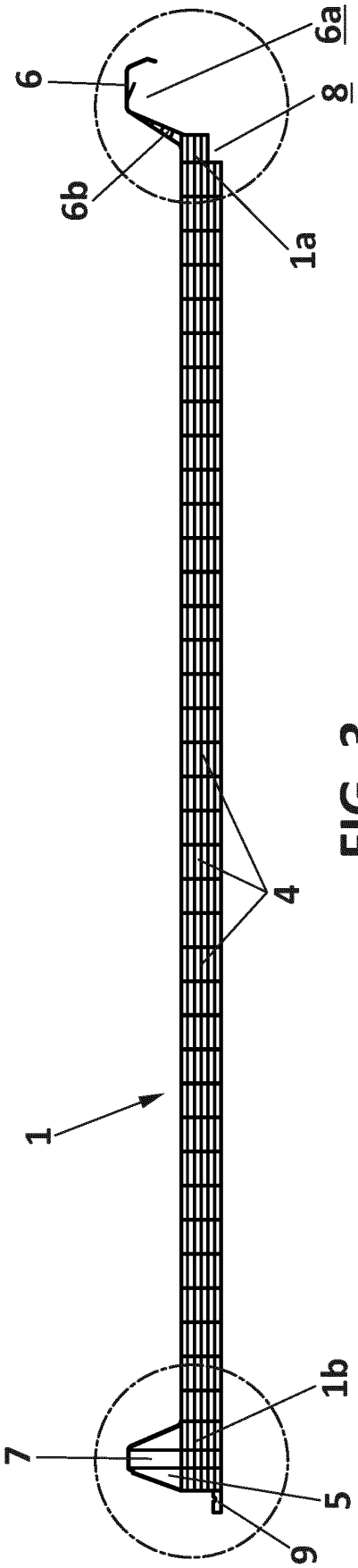

FIG. 3

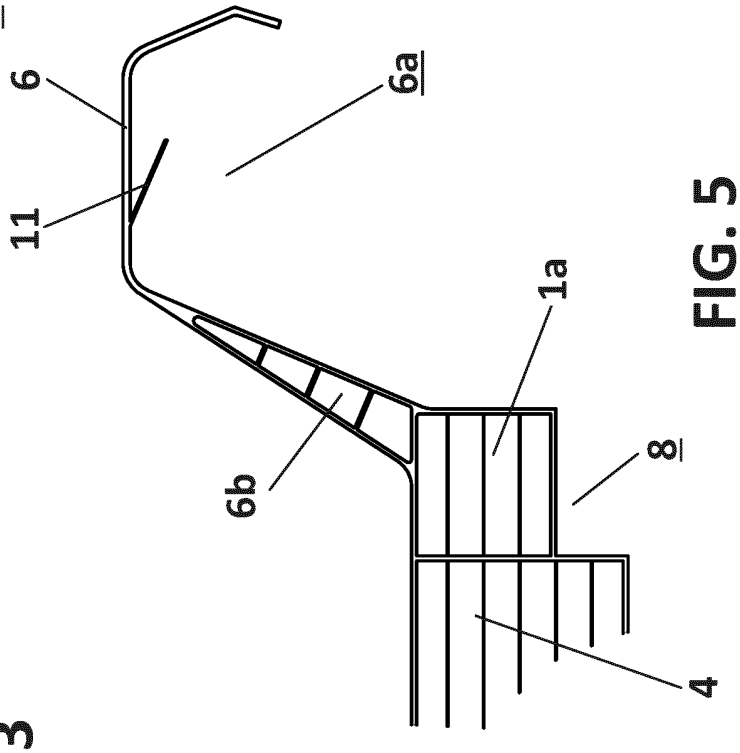

FIG. 5

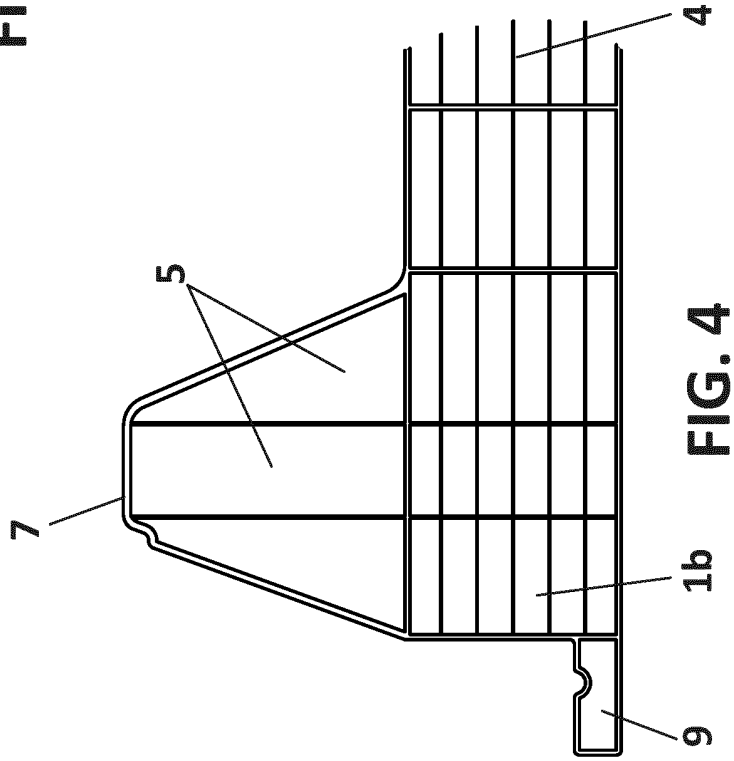

FIG. 4

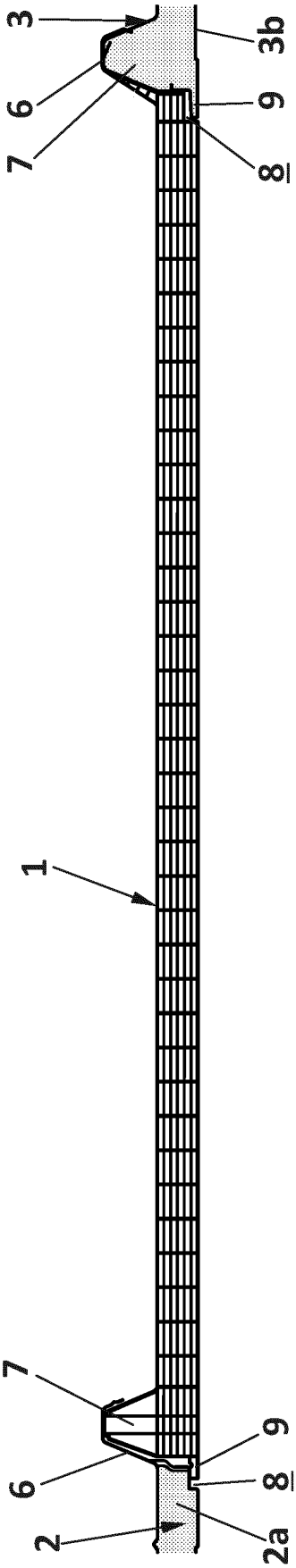

FIG. 6

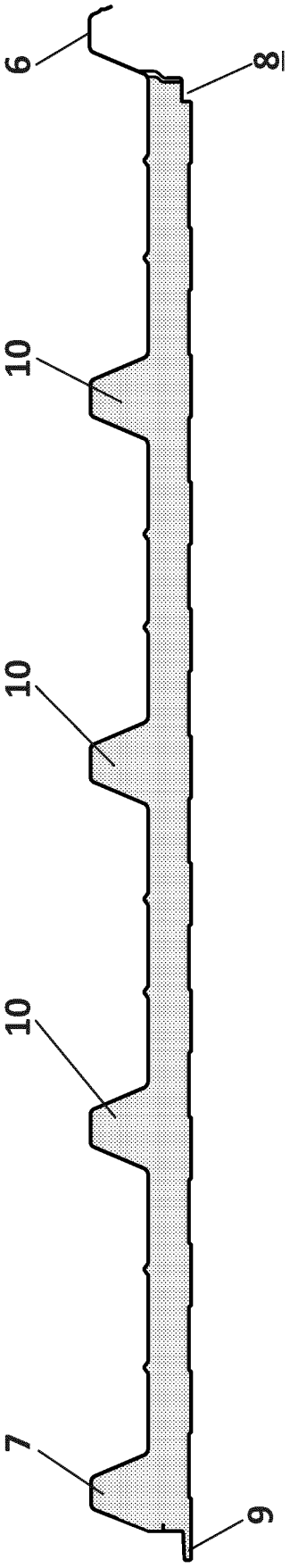

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2016/070331

A. CLASSIFICATION OF SUBJECT MATTER

E04D3/28 (2006.01)
E04C2/54 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04D, E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ES 2187053T T3 (ULTRAFRAME UK LTD) 16/05/2003, column 3, line 45 - column 4, line 54; figures.	1-9
X	GB 2453864 A (KINGSPAN RES & DEV LTD) 22/04/2009, page 4, line 14 - page 6, line 3; figures.	1,4-9
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X	EP 2672033 A1 (KOSCON IND SA) 11/12/2013, the whole the document.	1,3-9
A	EP 0381339 A2 (POLYGAL) 08/08/1990, the whole document.	1-9

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
07/06/2016	**(09/06/2016)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer R. Peñaranda Sanzo Telephone No. 91 3493051

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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