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Remarks:
The references to figure one are deemed to be deleted (Rule 43 EPC).

(54) A panel for external covering of buildings

(57) The panel comprises a first layer (5) made of metal, a second layer (6) of metal and an insulating layer (4) made of an insulating material. The insulating layer (4) is interposed between the first layer (5) and the second layer (6) and exhibits a thickness which is more or less constant over the whole areas of the panel. The panel has a corrugated conformation, exhibiting convex parts and concave parts which extend along the whole longitudinal development of the panel for facilitating drainage of water. A first and a second lateral parts are included, which project from the panel and which make the panel assemblable to other panels.

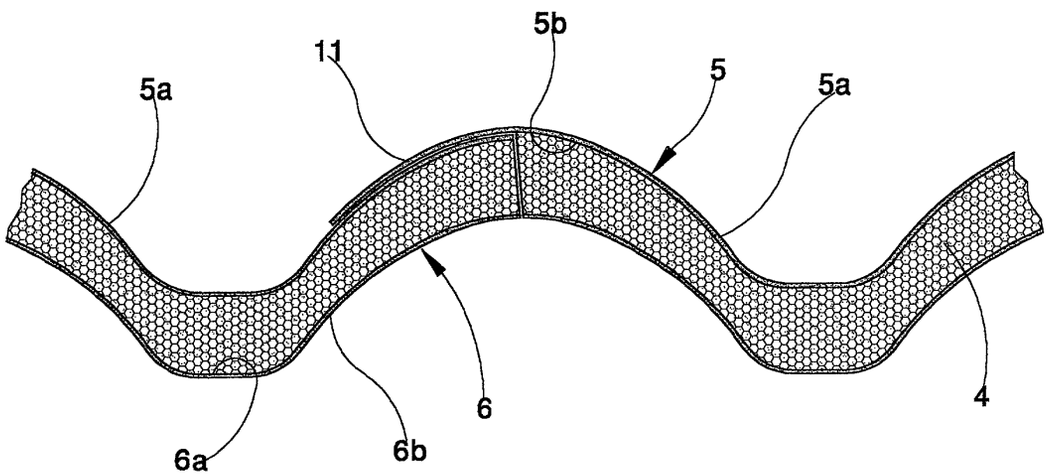

Fig.4A

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Description

[0001] The invention has particular application in the sector of coverings for the upper parts of buildings, for weather protection. The covering panels are preferably used for gabled or pitched roofs, i.e. roofs having a certain downwards rake for draining off rain, snow, or ice.

[0002] A further function of these covering panels is to provide adequate heat insulation.

[0003] As is well known, covering panels are generally rectangular and are constituted by two metal sheets having a layer of thermally-insulating and waterproof material between them.

[0004] These panels can be constrained to the bearing structure of the building, by associating the flat lower sheet to the bearing beams of the building, by means of special fixture elements such as nails, screws and the like.

[0005] Further, these panels are assemblable, so as to be able easily to cover any type of roof, with no need for differently-shaped panels according to the conformation of the structure to be covered.

[0006] The prior art teaches a first type of covering, where the panel exhibits an upper sheet having a regular plurality of longitudinally-developing projections and channels which describe adequate-volume water draining channels. Each panel has at a lateral edge thereof recesses which develop along the whole length of the edge itself. The panel further exhibits at a second lateral edge, opposite the first, expansions which negatively match the recesses and can be fitted therein. In this way the panels can be associated to each other by inserting the corresponding expansions in the recesses so that a fit is obtained and a constrained modular structure obtains.

[0007] These panels, however, exhibit various drawbacks both on aesthetic and technical levels.

[0008] Firstly, owing to the presence of projections and channellings on the upper sheet, the breadth of the panels is not constant, as a consequence, the sheet of insulating material between the two sheets is not of a constant thickness over the whole area of the panel.

[0009] This lack of homogeneity means that the thermal insulation offered by a panel of this type varies from zone to zone, which can lead to the creation of mould and condensation.

[0010] Finally, the shape of these panels is considerably different from the shape of traditional coverings made of usual building materials, so their use can be very problematic where architectural and preservation laws exist to conserve traditional looks, such as in historical town centres.

[0011] In a second teaching in the prior art, the aesthetic problems are overcome by using a single-sheet covering, and doing without the insulation layer. This sheet is corrugated and is offset longitudinally, thus reproducing the covering designs obtained using normal slates or Roman-type curved tiles. In greater detail, the sheet is constituted by concave parts, constituting the drainage channels, and convex parts. The concave and convex parts are alternated and develop in a longitudinal direction across the panel.

[0012] The above-described prior art, however, has the serious drawback of offering only very limited insulation due to the lack of a layer of insulating material.

[0013] The main aim of the present invention is to solve the problems existing in the prior art, by providing a covering panel for the outsides of building which has good thermal insulation, homogeneous over the whole surface of the panel.

[0014] A further aim of the present invention is to provide a covering panel which enables air to pass through, for ventilation of the underlying roof area.

[0015] A further aim of the present invention is to provide an economic covering panel, which is aesthetically pleasant and which is easily assemblable with panels of the same type.

[0016] Finally, an aim of the invention is to realise a shaping of the panel which will ensure good and even distribution of external loads applied thereon.

[0017] Finally, an aim of the invention is to provide a panel which can be assembled during storage or transport, so as to occupy as little space as possible when stacked.

[0018] These aims and others besides, which will better emerge during the following description, are substantially attained by a panel for external covering of buildings, comprising the characteristics as set out in the accompanying claims. Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of a nonlimiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic perspective view of a covering panel according to the invention, with some parts removed better to evidence others;
figure 2 is a section of the panel made according to line II-II of figure 1;
figure 2a is the panel of figure 2, dissociated from an adjacent panel;
figure 3 is an enlargement of a detail of figure 2;
figure 4 is a front view of the covering panel according to the invention;
figure 4a is a detail of figure 4 with the panel associated to a second panel.

[0019] With reference to the figures of the drawings, the covering panel of the present invention is denoted in its entirety by number 1.

[0020] The panel 1 advantageously exhibits a polygonal peripheral shape, preferably rectangular, in which there are two straight longitudinal sides 2 and two transversally-undulated sides 3 (as can be seen in figure 1).

[0021] The panel 1 is constituted by an insulating lay-

er 4, advantageously made of a polyurethane material. In particular, the applicant has found that the best results are obtained using an insulating layer 4 made of expanded (or foamed) polyurethane.

[0022] The insulating layer 4 is interposed between a first layer 5 of waterproof material (especially for rainwater), and a second layer 6. The first and second layers 5 and 6 are advantageously made of a metal material, for example aluminium.

[0023] In greater detail, as can better be seen in figures 2 and 4, the first layer 5 exhibits an upper surface 5a and a lower surface 5b, opposite to the upper surface 5a and associated to the insulating layer 4. The second layer 6 exhibits an upper surface 6a associated to the insulating layer 4 and a lower surface 6b opposite to the upper surface 6a.

[0024] The panel 1 further exhibits a corrugated surface in transversal section.

[0025] In particular, the first layer 5 and the second layer 6 exhibit a predetermined number of concave parts 13, 14, alternated with a predetermined number of convex parts 8, 7, as better illustrated in figure 4. In this configuration, each convex part 8 of the first layer 5 corresponds to a convex part 7 of the second layer 6, and each concave part 13 of the first layer 5 corresponds to a concave part 14 of the second layer 6.

[0026] Overall, the convex and the concave parts of the layers 5 and 6 are arranged to unite perfectly with the corrugated shape of the panel 1. The concave parts 14 of the second layer 6 are predisposed to be engaged to the building structure using special fixtures such as nails or screws, which are not illustrated in the figures of the drawings. According to needs, only one or more concave parts 14 of the second layer 6 can be engaged to the building structure.

[0027] Further, the concave parts 13, 14 and the convex parts 8, 7 extend along the whole longitudinal development of the panel 1, so as to realise, together with the concave parts 13 of the first layer 5, drainage channels for rainwater.

[0028] The distance between the first layer 5 and the second 6 layers is the same both at the concave parts and at the convex parts. Therefore the thickness of the insulating layer 4 interposed between the first layer 5 and the second layer 6 is constant.

[0029] The degree of curvature of the concave parts 13, 14, can be made different to the degree of curvature of the convex parts 8, 7 (see figures 4 and 4a); in particular, if the degree of curvature of the concave parts 13,14 is slightly smaller than the degree of curvature of the convex parts 8,7, the rainwater drainage channels defined by the concave parts will have a smaller section than if there were no differentiation in the above-mentioned degrees of curvature.

[0030] In this case, apart from obtaining a pleasant aesthetic effect, a smaller section of the drainage channels would increase drainage speed.

[0031] As can be better seen in figures 2 and 2a, the panel 1 exhibits a stepped longitudinal shape, according to the axis of the greatest rake of the panel 1. In greater detail, the first layer 5 exhibits flat parts 9, horizontal and alternated with no break with inclined parts 10. In this configuration the upper surface 5a of the first layer 5 exhibits a stepped downwards progression in which the flat parts 9 are located on parallel planes.

[0032] The inclined parts 10 can exhibit different inclinations according to the desired rake on the roof of the building, or according to the climate the building is subject to.

[0033] Similarly to the first layer 5, the second layer 6 exhibits flat parts 9, horizontal and alternated with no break with inclined parts 10. In this configuration the lower surface 6a of the second layer 6 exhibits a stepped downwards progression.

[0034] Further, as better illustrated in figure 4, the first layer 5 exhibits in plan view a first lateral part 11 which projects with respect to the insulating layer 4 and the second layer 6. This first lateral part 11 extends along one of the longer and longitudinal sides 2. Also, the first layer 5 exhibits a second lateral part 12 which projects with respect to the insulating layer 4 and the second layer 6 of aluminium. This second lateral part 12 extends along one of the shorter sides 3 (see figure 2).

[0035] In this situation, the first layer 5 has a longer plan development than the second layer 6 and the insulating layer 4.

[0036] The lateral parts 11 and 12 are laid over the first layer 5 of an adjacent panel 1, with the result that the panels 1 are assemblable one to another.

[0037] In greater detail, the lateral part 11, which is an extension of a convex part 8 of the first layer 5, is overlaid on the convex part 8 of an adjacent panel 1. In this way, as illustrated in figure 4a, the lower surface 5b of the first lateral part 11 is overlaid on the upper surface 5a of the first layer 5 of the adjacent panel. Similarly, the second lateral part 12 which is an extension of the shorter side 3 of the first layer 5 is overlaid on the shorter side 3 of an adjacent panel 1. In this way, as illustrated in figures 2 and 2a, the lower surface 5b of the second lateral part 12 is overlaid on the upper surface 5a of the first layer 5 of the adjacent panel 1.

[0038] The invention leads to important advantages.

[0039] First and foremost, the panel 1 maintains good and even thermal insulation over its whole development, obviating a situation in which there are better-insulated and worse-insulated zones.

[0040] A further advantage is that the panel 1 enables good ventilation at the second layer 6. This advantage is due to the corrugated conformation of the panel 1, also at the lower surface 6b of the second layer 6. The lower surface 6b includes the concave parts 7 which enable air to pass through.

[0041] A further advantage is the high tolerance of heavy weights on the upper surface 5a of the first layer 5.

[0042] Finally, a further advantage is the simplicity of

the operations of assembly of a plurality of panels 1, as well as the fine aesthetic effect obtained, which faithfully imitates a covering made of Roman-type tiles.

Claims

1. A panel (1) for external covering of buildings, comprising:

   a first layer (5) of waterproof material;
   a second layer (6); and
   an insulating layer (4) interposed between the first layer (5) and the second layer (6);

   characterised in that the panel (1) exhibits a corrugated shape in transversal section.

2. The panel of claim 1, **characterised in that** the first layer (5) and the second layer (6) exhibit a predetermined number of concave parts (13, 14) alternated with a predetermined number of convex parts (8, 7), the concave parts (13, 14) and the convex parts (8, 7) being coordinated to correspond with corrugations of the corrugated shape of the panel.

3. The panel of claim 2, **characterised in that** the concave parts (13, 14) exhibit a degree of curvature which is smaller than the degree of curvature of the convex parts (8, 7).

4. The panel of any one of the preceding claims, **characterised in that** the insulating layer (4) exhibits a practically constant thickness.

5. The panel of any one of the preceding claims, **characterised in that** the panel (1) exhibits a step-shaped longitudinal profile.

6. The panel of any one of the preceding claims, **characterised in that** the first layer (5) is longer in longitudinal plan view than the second layer (6) and the insulating layer (4).

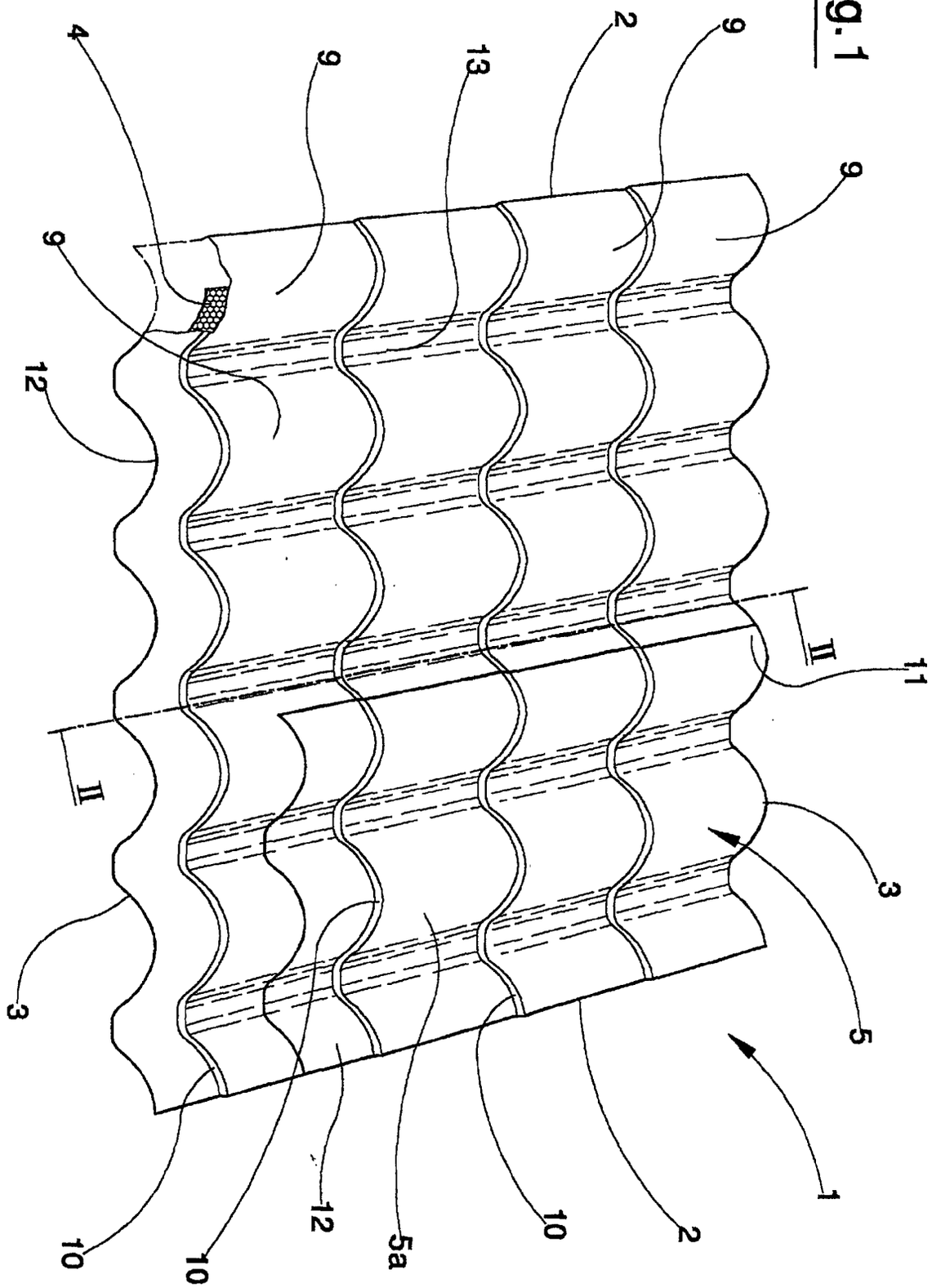
7. The panel of any one of the preceding claims, **characterised in that** the first layer (5) exhibits in transversal section at least a first lateral part (11) which projects with respect to the insulating layer (4), the first lateral part (11) extending in a longitudinal direction.

8. The panel of any one of the preceding claims, **characterised in that** the first layer (5) exhibits in longitudinal section at least a second lateral part (12) which projects with respect to the insulating layer (4), the second lateral part (12) extending in a transversal direction.

9. The panel of any one of the preceding claims, **characterised in that** the first layer (5) and the second layer (6) are made of metal.

10. The panel of any one of the preceding claims, **characterised in that** the insulating layer (4) is made of polyurethane.

Fig. 1



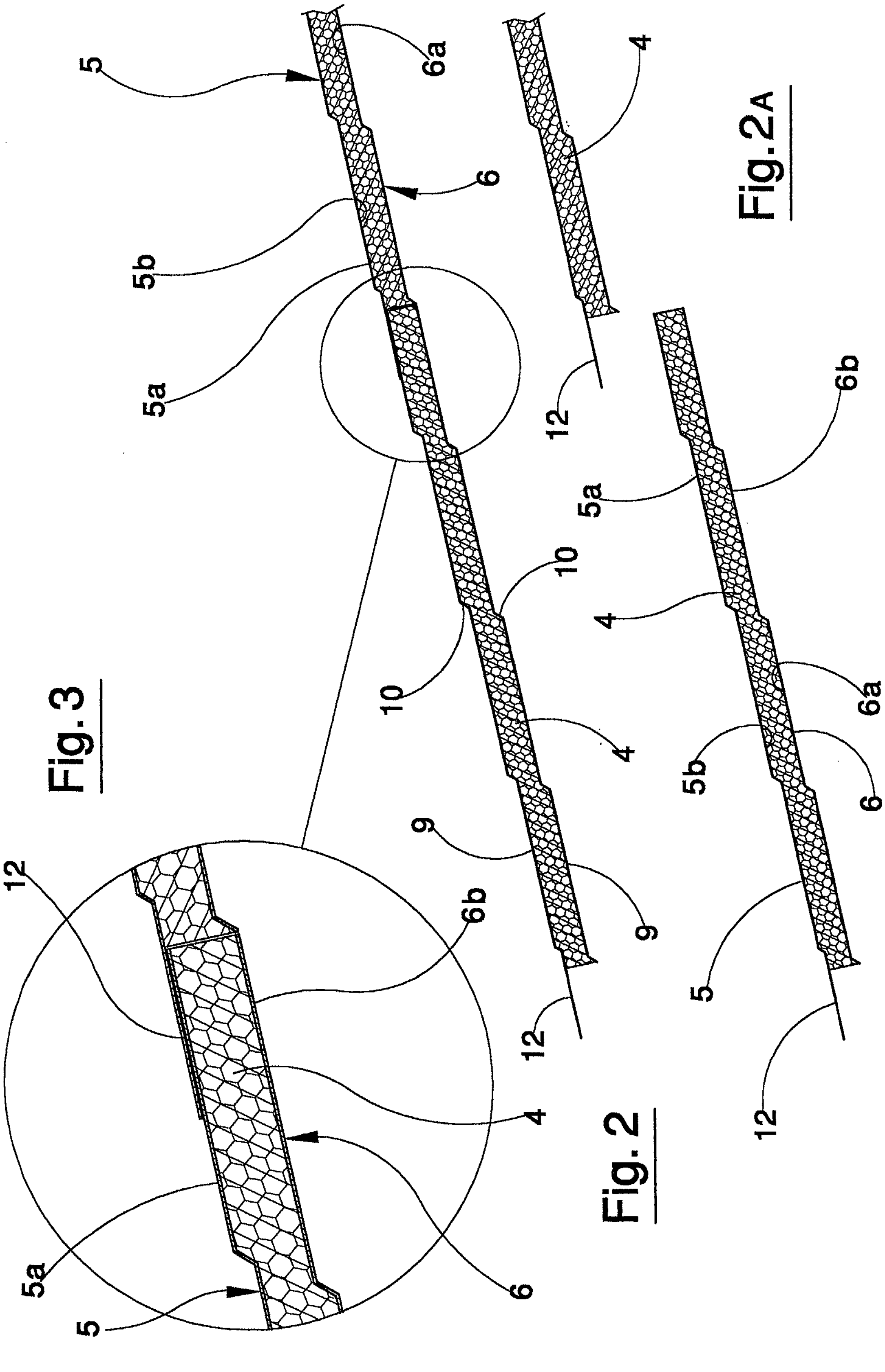


Fig. 2A

Fig. 3

Fig. 2

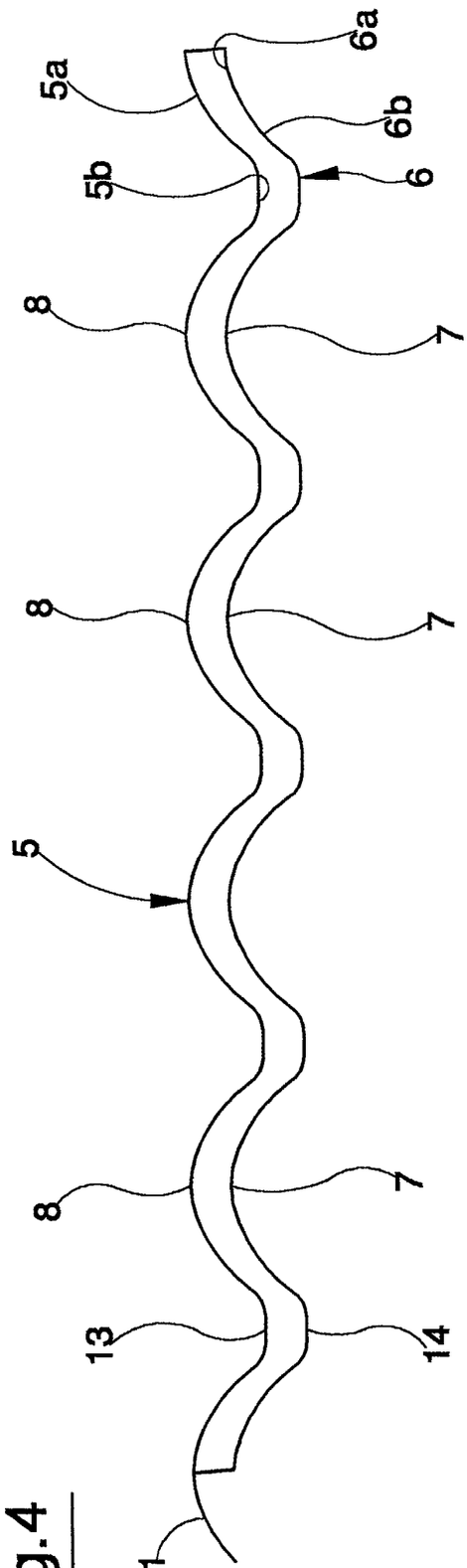


Fig.4

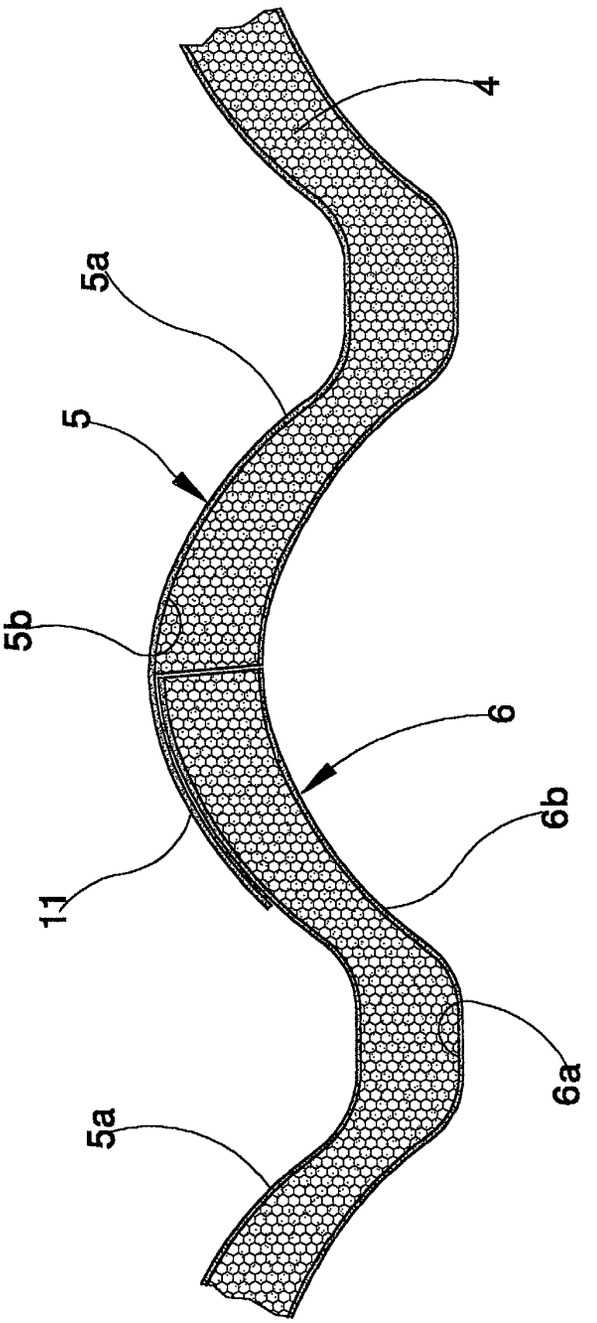


Fig.4A

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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5194

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 December 2002	Hendrickx, X

CATEGORY OF CITED DOCUMENTS

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