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(54) **Set of honeycomb panels for covers and walls**

Satz aus wabenförmigen Platten für Abdeckungen und Wände

Ensemble de panneaux en nid d'abeilles pour revêtements et parois

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(73) Proprietor: **Koscon Industrial SA  
6855 Stabio (CH)**

(72) Inventor: **Conterno, Cosimo  
6850 Mendrisio (CH)**

(74) Representative: **Modiano, Micaela Nadia et al  
Modiano & Partners (IT)  
Via Meravigli, 16  
20123 Milano (IT)**

(56) References cited:  
**WO-A1-03/102324 WO-A1-2011/151850  
FR-A1- 2 516 572 GB-A- 2 453 864  
JP-U- H0 393 522 US-A- 5 502 939**

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## Description

**[0001]** The present invention relates to a set of honeycomb panels for producing covers and walls.

**[0002]** The covers to which the present invention refers are those according to claim 1.

**[0003]** These covers are normally used as roofs for verandas, warehouses or the like, and are therefore in either a horizontal or tilted position.

**[0004]** Alternatively (even if very rarely) these sets of honeycomb panels can also be positioned vertically, to create perimetric buffers or dividers of a building structure or part of it, such as the walls.

**[0005]** In some types of panels, the grooves and protuberances are adjacent and substantially extend for the whole surface of the panel, creating a corrugated conformation.

**[0006]** Although they should be produced at a low cost, when these sets of honeycomb panels form covers, they must provide a high insulation with respect to both water and air infiltrations, in order to keep the area delimited by them as insulated as possible from the outside.

**[0007]** FR-A-2401288 very simply discloses a joining system between panels created by means of an outer metal shell containing an expanded product. In this type of composite panel, facing ends of two coupled panels, composed of the material of the outer shell, are curved and/or wound over each other to form the junction. An insulating tape or sealing tape is inserted between the parts of the shell to improve the coupling and seal. This technique can certainly not be used in the case of honeycomb panels.

**[0008]** The panels are in fact produced with an outer sheet containing an insulating core, such as polyurethane foam. The construction and applicative complexity of these panels with coupling borders that must be folded over each other and blocked, is evident.

**[0009]** A further example of a set of panels for covers is illustrated in US-A-4759165. This patent discloses a set produced by coupling corrugated metal panels with shaped ends. One end of these metallic panels comprises a sealing washer in one of its curved portions, assembled at the moment of production of each panel, before forming the curved end. In any case, the curved portion is shaped so as to hold the washer and it occupies the whole curved portion. Again, this application cannot be used in the case of honeycomb panels.

**[0010]** US-A-3841094 illustrates a panel structure in which an insulating or sealing material is inserted in spaces created between the panels only at the moment of assembly.

**[0011]** Specific connectors are actually used for joining the panels as taught by GB-A-2238808. This patent, in fact, discloses panel connectors made of expanded material that must be specifically constrained to the end of the panel and sealed between the junction parts. In this document, specific connectors made of a drawn or extruded material are constrained or immersed in the ends

of outer metallic sheet shells forming panels. These shells contain expanded or similar material. A series of sealing elements having an appropriate form for the seats situated in the connectors, are arranged between the end connectors of the panels.

**[0012]** Again, this solution cannot be adopted in the case of honeycomb panels.

**[0013]** In this case, in fact, the panels are panels made of an extruded plastic material in a single piece, without any outer metallic shell and without insulating material immersed in the interior, where they are produced directly in the extrusion phase of the honeycombs. In this case, in fact, the production of panels is normally effected by the extrusion of plastic material creating so-called honeycomb panels completely made of plastic material without the need for a filling material. This production process, which considerably simplifies the construction of panels, does not guarantee a perfect complementarity between the grooves and protuberances, with the result that both rainwater and the outside air can filter through by falling into the empty spaces created in the joining areas of two adjacent panels. Furthermore, even when the grooves and protuberances are complementary, water is still able to filter through between two adjacent panels, due to the capillarity.

**[0014]** The presence of sealing elements between one panel and another in the assembly phase, as in the case of known composite panels composed of a metallic shell and an expanded or insulating filling, is equally complicated, with a considerable time consumption and increase in the costs. This operation does not guarantee the production of a perfect seal between one panel and another as the sealing element thus arranged can move to a position not conformant with the requirements.

**[0015]** GB 2 453 864 discloses a set of honeycomb panels according to the preamble of claim 1.

**[0016]** A general objective of the present invention is therefore to provide a set of panels of the honeycomb type comprising at least a first and a second adjacent panel which is capable of overcoming all the drawbacks of the known art.

**[0017]** A further objective of the present invention is to define a set of panels of the honeycomb type which provides a safe and stable seal between the panels directly in the joining phase of two consecutive panels forming a cover or wall.

**[0018]** Another objective of the present invention is to provide a set of honeycomb panels which guarantees a sealed fixing between consecutive panels also in the presence of blockage means between subsequent panels.

**[0019]** These and other objectives are achieved by a set of honeycomb panels according to the enclosed claims.

**[0020]** The Applicant has in fact considered producing a set of panels according to claim 1.

**[0021]** The presence of this sealing element advantageously solves the problems of insulation from air and

water mentioned above, common to covers and walls of the state of the art.

**[0022]** The sealing element consists of a flap arranged in a protruding and tilted position in the production phase with respect to the internal profile of the single honeycomb panel which is automatically positioned in a sealing arrangement between the two end portions of honeycomb panels when coupled.

**[0023]** In this way, possible deficiencies in the complementarity between adjacent honeycomb panels in their end-sections can be recovered.

**[0024]** In principle, the sealing element could (in certain applications) be applied during the extrusion phase of the honeycomb panel or in an immediately subsequent phase, before the extruded honeycomb panel is cooled.

**[0025]** The sealing element is situated in correspondence with an intermediate portion of the groove to protect it during the movement and transportation of the single honeycomb panels, therefore also in phases prior to their assembly and joining.

**[0026]** It should in fact be noted that the application of a sealing element having a significant thickness (necessary for the reasons indicated above) creates a problem: the sealing element in fact has such considerable dimensions and juts from the surface of the panel to such a great extent that there is the risk of its being damaged during the movement of the honeycomb panels by contact with the ground, a transport pallet or the like.

**[0027]** Positioning the sealing element in correspondence with the intermediate portion of a groove, on the other hand, guarantees its protection during the movement of the honeycomb panel, as, when resting on the ground, for example, the sealing element remains protected by the shoulders of the groove.

**[0028]** In this way, sealing elements having a significant thickness can be adopted, to improve the seal between one honeycomb panel and another when the cover or wall has been assembled.

**[0029]** The structural and functional characteristics of the invention and its advantages with respect to the known art will appear more evident from the following description, referring to the enclosed drawings, which show a possible practical embodiment of the invention itself.

**[0030]** In the drawings:

- figure 1 illustrates a first example of a section of a covering unit not forming part of the present invention in a non-assembled condition of the honeycomb panels;
- figure 2 illustrates a second example of a covering section not forming part of the present invention in a non-assembled condition of the honeycomb panels;
- figure 3 illustrates a third example of a section of a covering unit not forming part of the present invention in an assembled condition of the honeycomb panels;
- figure 4 illustrates a fourth example of a section or

single covering honeycomb panel not forming part of the present invention ;

- figure 5 illustrates a fifth example of a section or single covering honeycomb panel not forming part of the present invention;
- figure 6 illustrates a sixth example of a section or single covering honeycomb panel not forming part of the present invention;
- figure 7 illustrates a seventh example of a section of a covering unit not forming part of the present invention in an exploded view, in a non-assembled condition of the honeycomb panels;
- figure 8 illustrates a covering unit according to the present invention in a non-assembled condition of the honeycomb panels;
- figure 9 illustrates the cover of figure 8 in a partially assembled condition of the honeycomb panels forming the set;
- figure 10 illustrates the cover of figure 8 in a completely assembled condition of the honeycomb panels forming the set;
- figure 11 illustrates a further example of a section of a covering unit according to the present invention similar to that of figures 8-10 in an assembled condition of the honeycomb panels;
- figures 12 and 13 illustrate a further example of a unit of a covering section not forming part of the present invention in a non-assembled condition of the honeycomb panels and in a completely assembled condition;
- figures 14, 15 and 16 illustrate examples of single honeycomb panels or sections of covering units not forming part of the present invention with hollow or tubular sealing elements arranged in different positions.

**[0031]** With reference to figure 1 enclosed, this shows a portion of cover 10 composed of two honeycomb panels 11 and 12.

**[0032]** The two honeycomb panels 11 and 12, all made of plastic material and extruded, for example, are positioned adjacent to each other and are destined for being joined to each other in correspondence with end-sections.

**[0033]** In Figure 1, the honeycomb panels 11 and 12 are shown in a non-assembled condition (i.e. not in contact) for a clearer reading of the drawing: in an operative condition of the cover 10, on the other hand, the honeycomb panels are close to each other.

**[0034]** As can be observed, the end-section of the first honeycomb panel 11 comprises a groove 14 and the end-section of the second honeycomb panel 12 comprises a protuberance 15 having a form which is substantially complementary to the groove 14 and destined for being housed in the latter when the honeycomb panels are in an operative or assembled condition.

**[0035]** The cover 10 also comprises a sealing element 13 applied in correspondence with an intermediate por-

tion of the groove 14, thus providing the advantages discussed above and to which no further reference will be made.

**[0036]** In this example, the sealing element 13 has a substantially rectangular and curved transversal section and a thickness preferably ranging from 1 mm to 4 mm.

**[0037]** The sealing element 13 can be continuous and applied to the whole transversal length of the honeycomb panel 11, or non-continuous, even if, in order to obtain a better seal, the first solution is preferable.

**[0038]** The sealing element 13 is applied after the production phase (for example by extrusion) of the honeycomb panel 11 on which it is applied, or by gluing, but in any case before it leaves the factory.

**[0039]** The sealing element 13 is advantageously composed of a thermoreactive material (also called hot-melt) which is deposited in the molten state onto the surface of the honeycomb panel 11 in the form of the sealing element 13, in order to avoid a preliminary gluing operation which would prolong the production times.

**[0040]** In short, the sealing element 13 is composed of a simple curb (having a predetermined form and dimensions) which is applied in the molten state onto the surface of the honeycomb panel 11, where it reacts, solidifying and creating the sealing element 13 itself.

**[0041]** In this sense, a material of a polyurethane nature can be used, such as thermo-adhesive polyurethane (for example of an aliphatic or aromatic nature such as HDI or IPDI and polyols of a polyester, polyether, caprolactone or polycarbonate nature) or a material of an acrylic nature based on mixtures of polymers, copolymers or thermopolymers with an acrylic functionality that can comprise the use of hydrogenated hydrocarbon resins, terpene phenolic resins and polyterpene resins or structuring polymers such as PMMA, MBS, SIS/SBS, EVA or TPE, depending on the requirements.

**[0042]** As a valid alternative, the sealing element 13 can also be applied in an expanded version, for example by introducing into the formulation, one or more suitable additives of the type generally known to experts in the field.

**[0043]** A further alternative consists of forming the sealing element as a tubular element or hollow element which allows a crushing effect and therefore a better seal between the honeycomb panels where it is applied right from the production, as can be seen hereunder.

**[0044]** In this respect, it can be noted that the application may also be effected during the extrusion phase of the honeycomb panel 11, using the heat supplied in this last phase to cause expansion of the sealing element 13 following the production (under the action of heat) of gas which creates microbubbles, giving the sealing element 13 the desired expanded conformation.

**[0045]** It should be pointed out that, due to the thickness of the sealing element 13 and its positioning, it also exerts an important soundproofing and prevention function of assessment noises of the cover or wall: it guarantees, in fact, that two adjacent honeycomb panels 11, 12

are mainly, or solely, in contact by the interpositioning of the sealing element 13.

**[0046]** Possible deformations of one or both of the adjacent honeycomb panels 11, 12, due for example to the action of the ambient temperature, may produce undesired noises, such as creaking or the like, which in the cover 10, on the other contrary, are avoided thanks to the specific action of the sealing element 13.

**[0047]** The damping action of the latter also provides benefits in the case of atmospheric precipitations (rain, hail) on the cover: it prevents the honeycomb panels 11, 12, in fact, from causing an unpleasant percussive noise or, more generally, this noise is reduced.

**[0048]** As far as the honeycomb panels 11, 12 are concerned, these can generally have various conformations.

**[0049]** In the example of Figure 1, the panels 11, 12 are honeycomb and undulating. In the light of the disclosures so far provided, a series of variants are available, illustrated in the enclosed figures.

**[0050]** In all the examples the characteristics so far described can be found: absence of additional connection elements between two consecutive honeycomb panels, absence of specific extensions of the honeycomb panels to be twisted or connected to form a single unit, absence of expanded material inside a shell of the panel, absence of a shell of the single panel as the same is of the honeycomb type, complicated assembly operations between the single honeycomb panels.

**[0051]** The example of Figure 2, for example, has a covering unit 20 comprising two honeycomb panels 21, 22 having a corrugated form with straight sections. In this cover or covering unit, a sealing element 23 analogous to that described above is situated in correspondence with a groove 24 of a honeycomb panel 21, destined for entering into contact with a protuberance 25 of the other honeycomb panel 22 and creating a seal with it.

**[0052]** The differences with the first example 10 therefore lie in the fact that the honeycomb panels 21 and 22 are of the corrugated type.

**[0053]** A further difference is that the sealing element 23 has the form of an actual curb with a semicircular section, rather than flattened, which can also be used in the first example shown in Figure 1 and viceversa. The material and type of application of the sealing element 23 are analogous to what is specified above.

**[0054]** Another example of the covering unit is indicated with 30 in Figure 3: in this embodiment, honeycomb panels 31 and 32 are respectively provided, one with a groove 34, and the other with a protuberance 35, analogously to the honeycomb panels 21 and 22 described above, with the addition of a clamping screw 38.

**[0055]** In this case, a sealing element 33, also analogous to 13 and 23 described above, is positioned in correspondence with fixing means, for example a screw 38, which engages the end-sections of the honeycomb panels 31 and 32, fixes them to each other and possibly also fixes them to an optional supporting wall P.

**[0056]** Also in this case, the material and type of ap-

plication of the sealing element 33 are analogous to what is specified above and therefore no further reference will be made to them, except that it should be noted that its positioning in correspondence with the fixing means 38 allows its preliminary compression providing a better airtight and waterproof seal.

**[0057]** "Self-sealing" is in fact created i.e. the creation of an airtight and waterproof seal and sealing between the two panels without the addition of further devices suitable for creating said seal.

**[0058]** Passing to Figure 4, this shows a honeycomb panel 41 of a covering unit 40. Also in this case, the important features are the same as those described above for the covers 10, 20, 30 and therefore no further reference will be made to these. It should also be noted that, in this case, a throat 47 is situated in correspondence with a groove 44 of the honeycomb panel in the extrusion or formation phase, in which a sealing element 43 is partly housed in order to prevent its undesired displacement during movement, stacking or installation and a stable positioning.

**[0059]** In this example, the throat 47 has a substantially "V"-shaped transversal section, but it may equivalently be rounded, rectangular or have other forms.

**[0060]** The "V"-shape of the throat 47 is particularly suitable for use in combination with a sealing element 43 having a substantially semi-circular section.

**[0061]** In this respect, it has already been mentioned that the sealing element can have any section: in the case of a covering unit 50 (Figure 5) produced with honeycomb panels or corrugated sheets 51, of which only one is illustrated, a groove 54 could have a bottom with a flat section (see Figure 5).

**[0062]** In this case, the sealing element 53 advantageously has a rectangular section which extends to substantially occupy the whole extension of the flat bottom part of the groove 54, thus exploiting the maximum surface available and improving the seal.

**[0063]** Multiple sealing elements can also be envisaged, alternatively or in combination, as shown in the example in Figure 6. In said Figure 6, part of a covering unit 60 can be observed, comprising a honeycomb panel 61 in a groove 64 in which two sealing elements 63 and 63A are positioned. Said sealing elements 63 and 63A, in this case, have a substantially semi-circular section, but they can also have other sections.

**[0064]** Also in these cases, the sealing elements 53, 63, 63A are produced analogously to what is indicated above and no further reference will be made to this.

**[0065]** An additional sealing element 73B can also be envisaged, as in a covering unit 70 shown in Figure 7. In this example, a first honeycomb panel 71 comprises two sealing elements 73, 73A positioned in a groove 74 and an additional sealing element 73B positioned on a protuberance 75 of a second consecutive honeycomb panel 72 and partially superimposed and facing in the terminal part.

**[0066]** In order to improve the seal, the additional seal-

ing element 73B is positioned on a honeycomb panel 72 so that with the covering unit 70 assembled, it is in an offset position with respect to the two facing sealing elements 73, 73A of the other honeycomb panel 71.

**[0067]** In principle, there can obviously be only one sealing element instead of two sealing elements 73, 73A, without substantially changing the arrangement. The additional sealing element 73B, as also the sealing elements 73, 73A, is also produced analogously to what is indicated above.

**[0068]** Figures 8, 9 and 10 illustrate an embodiment of a section of a covering unit according to the present invention in a non-assembled condition of the honeycomb panels, in a partially assembled condition, and finally, in a completely assembled condition.

**[0069]** In this embodiment, a set of honeycomb panels for a cover 120 comprises at least two honeycomb panels 121, 122 having a corrugated form with straight sections. In this covering unit, there is a sealing element 123 in correspondence with a groove 124 of the honeycomb panel 121, destined for entering into contact with a protuberance 125 of the honeycomb panel 122 and creating a seal with this.

**[0070]** This sealing element 123 is produced in the form of a flap positioned in a part 123A integral with the groove 124 of the honeycomb panel 121, and in a detached part 123B, protruding and tilted, again with respect to the groove 124.

**[0071]** In this way, said flap-shaped sealing element 123 is, in the production phase, at least partially protruding and detached from the groove 124 of the single honeycomb panel 121. When the first honeycomb panel 121 is brought into contact with the second honeycomb panel 122, the flap-shaped sealing element 123 is automatically positioned in a sealing arrangement between the two end-portions of honeycomb panels coupled with each other.

**[0072]** In this way, any possible deficiencies in the complementarity (visible in Figure 9) between the two adjacent honeycomb panels 121, 122, superimposed at least in their end section, can be recovered. A perfect sealing arrangement of the two honeycomb panels 121 and 122 is therefore obtained, forming a covering unit, as shown in Figure 10.

**[0073]** In a further embodiment of the covering unit (see Figure 11) there are also fixing means, for example, in the form of a screw 138, which engages end-sections of the corrugated honeycomb panels 131 and 132, passing through them and into a flap-shaped sealing element 133, such as that described above.

**[0074]** According to this embodiment, in fact, the honeycomb panels 131 and 132 are respectively provided with a groove 134 and a protuberance 135 analogously to the honeycomb panels already described, with the addition of a clamping screw 138. The flap-shaped sealing element 133 is situated in correspondence with the clamping screw 138 and therefore engages the end-sections of the honeycomb panels 131 and 132, connects

them to each other and possibly connects them to an optional supporting wall P.

**[0075]** The clamping screw 138 passes into a part 133A of the flap-shaped sealing element 133, integral with the groove 134 of the honeycomb panel 131. A detached part 133B of the flap-shaped sealing element 133, protruding and tilted, again with respect to the groove 134, forms the seal when the panels are packed against each other.

**[0076]** Also in this case, the flap-shaped sealing element 133 with its two integral 133A and protruding 133B parts from the groove 134, is automatically positioned in a sealing arrangement between the two end-ports of honeycomb panels 131, 132 coupled with each other.

**[0077]** An apparently different example is shown in Figures 12 and 13, which, with reference to 80, illustrate a part of an overall covering unit, also functioning as a vertical wall for particular applications.

**[0078]** Two consecutive honeycomb panels 81 and 82, instead of being simply superimposed, as in the previous examples, are provided with an actual wedge-insertion. This wedge-insertion consists of a groove 84 positioned in the honeycomb panel 81 and a protuberance 85 which extends or juts from the honeycomb panel 82.

**[0079]** A sealing element 83 is applied to the interior of the groove 84, in a substantially intermediate position to the latter.

**[0080]** The latter is also produced analogously to what is described above and can have any form.

**[0081]** The protuberance 85 is destined for cooperating with the groove 84 to form an actual wedge-insertion, as shown in the assembled condition shown in Figure 13.

**[0082]** Also in this case, there can be a combination of additional sealing elements situated on the protuberance 85, which are not shown in the figures for the sake of brevity and which are generally analogous to what is described in Figure 7.

**[0083]** Finally, it should be observed that the groove 84 and protuberance 85 do not have a perfect complementary form, but an insulating chamber 90 is defined between the two, in a coupled condition (see Figure 13), forming a horizontal cover. This insulation chamber 90 serves for separating the facing walls of the panels 81 and 82 to contribute to preventing a capillarity phenomenon, should water succeed in penetrating this area.

**[0084]** As previously indicated, in a further example, the sealing element is produced as a tubular or hollow element as shown for example in Figures 14, 15 and 16, which are similar in their general conformation to examples already illustrated, and show said tubular or hollow sealing element 93. In Figure 14, the tubular or hollow sealing element 93 is positioned in the groove 24 of the panel 21, whereas in Figures 15 and 16 it is positioned in the groove 84 of the panel 81 and is shown in both a non-assembled and assembled condition on both the bottom and on a side of the groove 84. Figure 16 illustrates a crushing effect of the tubular and hollow sealing element 93 with an improved seal between the honey-

comb panels where it is applied right from their production.

**[0085]** It can generally be noted that the sealing element

13,23,33,43,53,63,63A,73,73A,73B,83,93,123,123A,123B can be completely transparent or at least partly coloured to assist a user during assembly, especially when the panels 11,21,31,41,51,61,71,81,121 and/or 12,22,32,42,52,62,72, 82,122 are at least partly transparent or translucent.

**[0086]** It should be repeated that in a set of honeycomb panels for forming covers and walls according to the invention, complex connection elements between the single honeycomb panels, the folding of shells of single honeycomb panels, the presence of an expanded filling product for minimizing noise, the passage of heat, insulation, transparency, etc., have been eliminated.

**[0087]** Further variants and/or combinations of the solutions described above and illustrated in the enclosed figures are also possible, and should be considered as being equivalent to the examples described so far and therefore within the scope of the present set of claims.

**[0088]** The objectives mentioned in the preamble of the description have therefore been achieved.

**[0089]** The scope of the invention is defined by the following claims.

## Claims

1. A set of honeycomb panels for producing covers and walls (120) comprising at least a first honeycomb panel (121; 131) and a second honeycomb panel (122; 132) which are positioned adjacently, to be joined to each other by overlapping with end-sections, wherein said end-sections are isosceles trapeziums in which the oblique sides are arranged mirror-like, wherein the end-section of the first honeycomb panel comprises a groove (124; 134) formed by said trapezium shape and the end-section of the second honeycomb panel comprises a protuberance (125; 135) formed by said trapezium shape, and has a substantially complementary form with respect to said groove (124; 134) and is destined for being housed in said groove; each of said first honeycomb panels and second honeycomb panels (122 132) is made of a plastic material; - there is at least one sealing element (123; 123A; 123B; 133; 133A; 133B) firmly applied right from the production phase of the single honeycomb panel (121; 131; 122; 132) within said groove (124; 134); **characterized in that** said at least one sealing element is in the form of a flap having an attached part (123A; 133A) integral with said trapezium shape forming said groove (124; 134)

of the first panel (121; 131) and being arranged on the inside of the horizontal part of said isosceles trapezium forming the groove and a detached part (123B; 133B), integral with said attached part (123A 133A) and protruding and tilted with respect to said attached part (123A; 133A).

2. The set of honeycomb panels according to claim 1, wherein said attached part (123A, 133A) of said sealing element (123, 133) juts from said horizontal part of said isosceles trapezium forming said groove for a thickness ranging from 1 mm to 4 mm. 10
3. The set of honeycomb panels according to claim 1 or 2, wherein said sealing element (123, 123A, 123B) is composed of a thermo-reactive material which is deposited in the 10 molten state on said first honeycomb panel where it reacts, solidifying and forming said sealing element (123, 123, 123B). 20
4. The set of honeycomb panels according to claim 3, wherein said sealing element (123, 123A, 123B) is a material of a polyurethane nature, such as thermo-adhesive polyurethane, preferably of an aliphatic or aromatic nature, such as HDI or IPDI and polyols of a polyester, 20 polyether, caprolactone or polycarbonate nature. 25
5. The set of honeycomb panels according to claim 3, wherein said sealing element (123, 123A, 123B) is a material of an acrylic nature based on mixtures of polymers, copolymers or thermopolymers with an acrylic functionality preferably comprising hydrogenated hydrocarbon resins and/or terpene phenolic resins and/or polyterpene resins and/or structuring polymers such as PMMA, MBS, SIS/SBS, EVA or TPE. 30 35
6. The set of honeycomb panels according to claim 3, wherein said sealing element (123, 123A, 123B) is of the expanded type and comprises one or more additives that cause expansion in relation to the quantity of heat received. 40
7. The set of honeycomb panels according to one or more of the previous claims, wherein said sealing element (123, 123A, 123B) is suitable for exerting a damping action. 45
8. The set of honeycomb panels (120) according to one or more of the previous claims, wherein said sealing element (123, 123A, 123B) is produced by means of a tubular or hollow element (93). 50

## Patentansprüche

1. Ein Satz von wabenförmigen Platten zur Herstellung von Abdeckungen und Wänden (120), der Folgendes umfasst:

mindestens eine erste wabenförmige Platte (121; 131) und eine zweite wabenförmige Platte (122; 132), die nebeneinander positioniert sind, um miteinander durch Überlappung mit Endabschnitten verbunden zu werden, wobei die Endabschnitte gleichschenklige Trapeze sind, deren schräge Seiten spiegelartig angeordnet sind,

wobei der Endabschnitt der ersten wabenförmigen Platte eine Vertiefung (124; 134) umfasst, die von der Trapezform gebildet wird, und der Endabschnitt der zweiten wabenförmigen Platte eine Ausstülpung (125; 135) umfasst, die von der Trapezform gebildet wird

und eine im Wesentlichen zu der Vertiefung (124; 134) komplementäre Form hat und dazu bestimmt ist, in der Vertiefung aufgenommen zu werden;

wobei jede der ersten wabenförmigen Platten und der zweiten wabenförmigen Platten (122, 132) aus einem Kunststoffmaterial besteht;

wobei es mindestens ein Abdichtelement (123; 123A; 123B; 133; 133A; 133B) gibt, das schon ab der Produktionsphase der einzelnen wabenförmigen Platte (121; 131; 122; 132) fest in die Vertiefung (124; 134) eingebracht ist,

**dadurch gekennzeichnet, dass**

mindestens eine Abdichtelement die Form einer Lasche mit einem anliegenden Teil (123A; 133A) hat, der integral mit der Trapezform ist, die die Vertiefung (124; 134) der ersten Platte (121; 131) bildet, und auf der Innenseite des horizontalen Teils des gleichschenkligen Trapezes angeordnet ist, das die Vertiefung bildet, und

einen nicht anliegenden Teil (123B; 133B), der integral mit dem anliegenden Teil (123A, 133A) ist und im Verhältnis zu dem anliegenden Teil (123A; 133A) hervorsteht und geknickt ist.

2. Der Satz von wabenförmigen Platten gemäß Anspruch 1, wobei der anliegende Teil (123A, 133A) des Abdichtelements (123, 133) von dem horizontalen Teil des gleichschenkligen Trapezes, der die Vertiefung bildet, mit einer Dicke im Bereich von 1 mm bis 4mm herausragt.

3. Der Satz von wabenförmigen Platten gemäß Anspruch 1 oder 2, wobei das Abdichtelement (123, 123A, 123B) aus einem hitzereaktiven Material besteht, das im 10 geschmolzenen Zustand auf die erste wabenförmige Platte aufgetragen wird, wo es re-

agiert, erstarrt und das Abdichtelement (123, 123A, 123B) bildet.

4. Der Satz von wabenförmigen Platten gemäß Anspruch 3, wobei das Abdichtelement (123, 123A, 123B) ein Material der Art von Polyurethan ist, wie zum Beispiel thermoadhäsives Polyurethan, vorzugsweise von aliphatischer oder aromatischer Art, wie zum Beispiel HD I oder IPDI und Polyole einer Art Polyester, 20 Polyether, Caprolacton oder Polycarbonat. 5 10
5. Der Satz von wabenförmigen Platten gemäß Anspruch 3, wobei das Abdichtelement (123, 123A, 123B) ein Material einer Art von Acryl ist, basierend auf Mischungen von Polymeren, Copolymeren oder Thermopolymeren mit einer Acryl-Funktionalität, vorzugsweise Folgendes umfassend: 15 20 25
 

hydrierte Kohlenwasserstoffharze und/oder Terpenphenolharze und/oder Polyterpenharze und/oder Strukturpolymere, wie zum Beispiel PMMA, MBS, SIS/SBS, EVA oder TPE.
6. Der Satz von wabenförmigen Platten gemäß Anspruch 3, wobei das Abdichtelement (123, 123A, 123B) vom geschäumten Typ ist und einen oder mehrere Zusatzstoffe umfasst, die eine Expansion in Relation zu der Menge an aufgenommener Wärme verursachen. 30
7. Der Satz von wabenförmigen Platten gemäß einem oder mehreren der obigen Ansprüche, wobei das Abdichtelement (123, 123A, 123B) geeignet ist, eine dämpfende Wirkung auszuüben. 35
8. Der Satz von wabenförmigen Platten (120) gemäß einem oder mehreren der obigen Ansprüche, wobei das Abdichtelement (123, 123A, 123B) mit Hilfe eines rohrförmigen oder hohlen Elements (93) hergestellt wird. 40

## Revendications 45

1. Ensemble de panneaux en nid d'abeilles (120) pour produire des couvertures et des murs (120) comprenant au moins un premier panneau en nid d'abeilles (121 ; 131) et un deuxième panneau en nid d'abeilles (122 ; 132) qui sont positionnés de façon adjacente, pour être reliés l'un à l'autre par un chevauchement de sections d'extrémités, dans lequel lesdites sections d'extrémités sont des trapèzes isocèles dans lesquels les côtés obliques sont agencés en miroir, dans lequel la section d'extrémité du premier panneau en nid d'abeilles comprend une rainure (124 ; 50 55

134) formée par ladite forme de trapèze et la section d'extrémité du deuxième panneau en nid d'abeilles comprend une protubérance (125 ; 135) formée par ladite forme de trapèze, et a une forme substantiellement complémentaire par rapport à ladite rainure (124 ; 134) et est destinée à être logée dans ladite rainure ;

chacun desdits premiers panneaux en nid d'abeilles et deuxièmes panneaux en nid d'abeilles (122 ; 132) est en matière plastique ;

il y a au moins un élément d'étanchéité (123 ; 123A ; 123B ; 133 ; 133A ; 133B) solidement appliqué directement depuis la phase de production du panneau en nid d'abeilles simple (121 ; 131 ; 122 ; 132) dans ladite rainure (124 ; 134) ;

**caractérisé en ce que** ledit au moins un élément d'étanchéité se présente sous la forme d'un rabat ayant une partie attachée (123A ; 133A) intégrée à ladite forme de trapèze formant ladite rainure (124 ; 134) du premier panneau (121 ; 131) et qui est placée sur l'intérieur de la partie horizontale dudit trapèze isocèle formant la rainure et une partie détachée (123B ; 133B), intégrée à ladite partie attachée (123A ; 133A) et faisant saillie et inclinée par rapport à ladite partie attachée (123A ; 133A).

2. Ensemble de panneaux en nid d'abeilles selon la revendication 1, dans lequel ladite partie attachée (123A ; 133A) dudit élément d'étanchéité (123, 133) fait saillie sur ladite partie horizontale dudit trapèze isocèle formant ladite rainure sur une épaisseur allant de 1 mm à 4 mm.
3. Ensemble de panneaux en nid d'abeilles selon la revendication 1 ou 2, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est composé d'un matériau thermoréactif qui est déposé dans l'état fondu 10 sur ledit premier panneau en nid d'abeilles où il réagit, en se solidifiant et en formant ledit élément d'étanchéité (123, 123A, 123B).
4. Ensemble de panneaux en nid d'abeilles selon la revendication 3, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est un matériau de type polyuréthane, comme du polyuréthane thermo-adhésif, de préférence de type aliphatique ou aromatique, comme le HDI ou l'IPDI et les polyols de type polyester, polyéther 20, caprolactone ou polycarbonate.
5. Ensemble de panneaux en nid d'abeilles selon la revendication 3, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est un matériau de type acrylique basé sur des mélanges de polymères, de copolymères ou de thermopolymères avec une fonction acrylique comprenant de préférence des résines hydrocarbures hydrogénées et/ou des résines terphénoliques et/ou des résines polyterpéni-



ques et/ou des polymères structurants comme le PMMA, le MBS, le SIS/SBS, l'EVA ou le TPE.

6. Ensemble de panneaux en nid d'abeilles selon la revendication 3, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est du type expansé et comprend un ou plusieurs additifs qui provoquent l'expansion relativement à la quantité de chaleur reçue. 5  
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7. Ensemble de panneaux en nid d'abeilles selon l'une ou plusieurs des revendications précédentes, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est adapté pour exercer une action d'amortissement. 15
8. Ensemble de panneaux en nid d'abeilles (120) selon l'une ou plusieurs des revendications précédentes, dans lequel ledit élément d'étanchéité (123, 123A, 123B) est produit au moyen d'un élément tubulaire ou creux (93). 20

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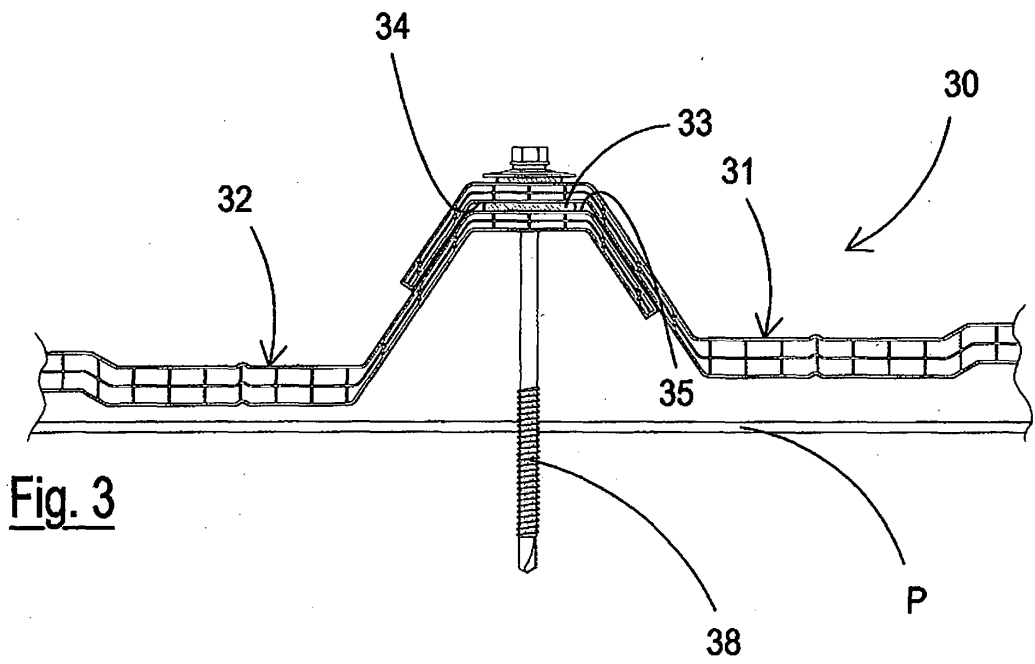
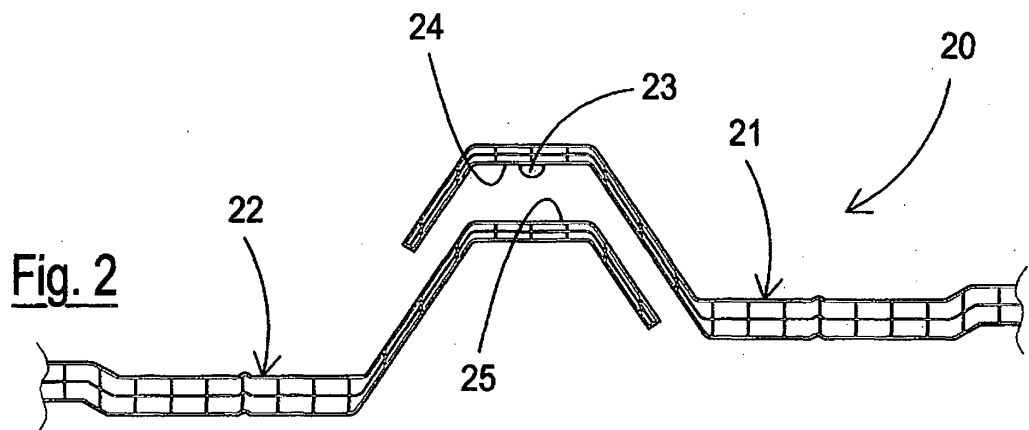
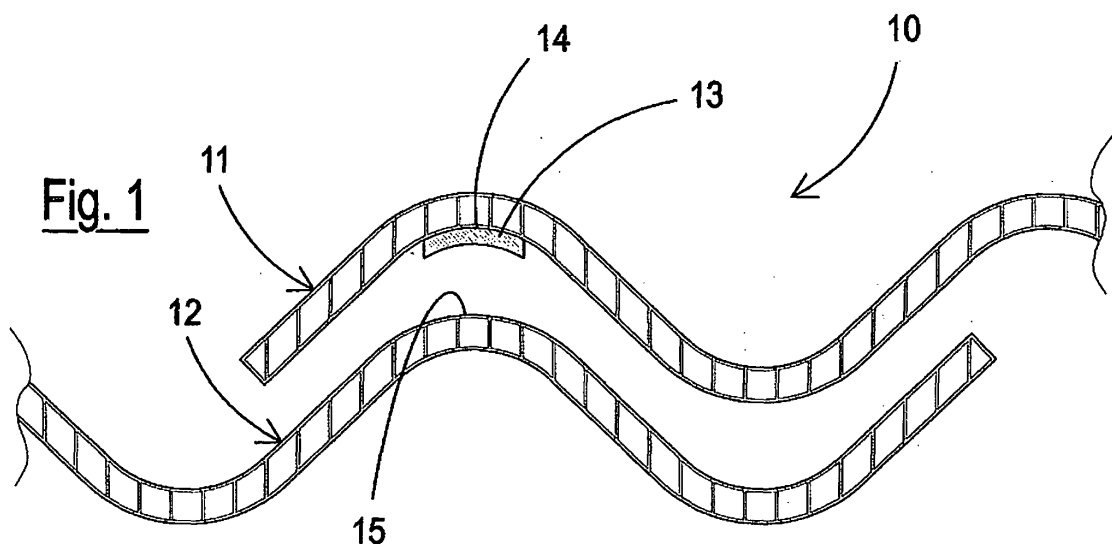


Fig. 4

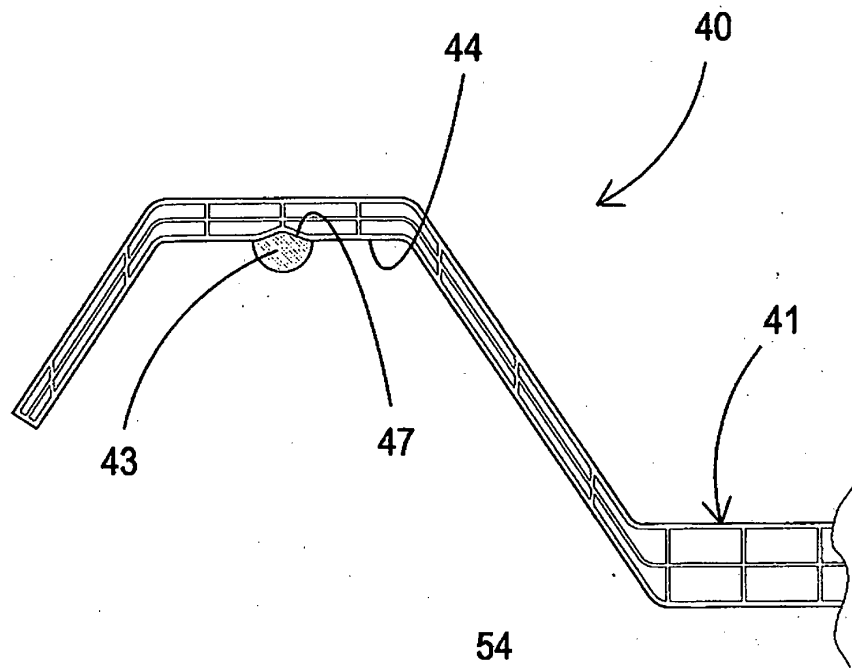


Fig. 5

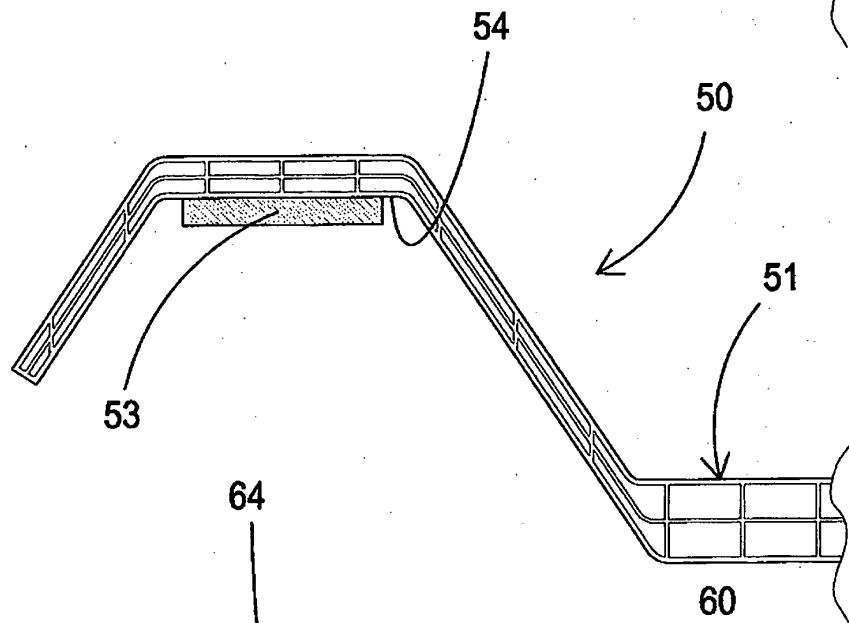
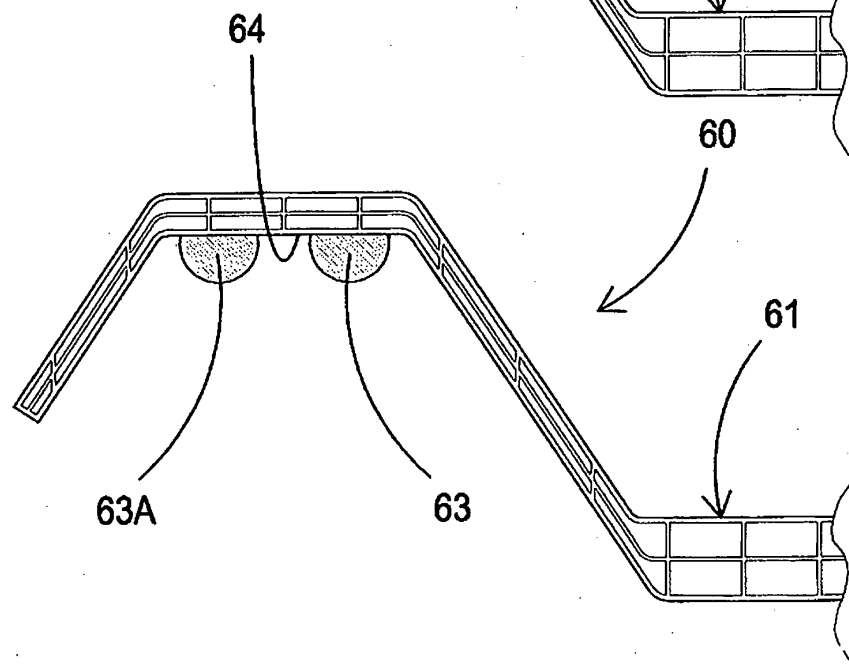


Fig. 6



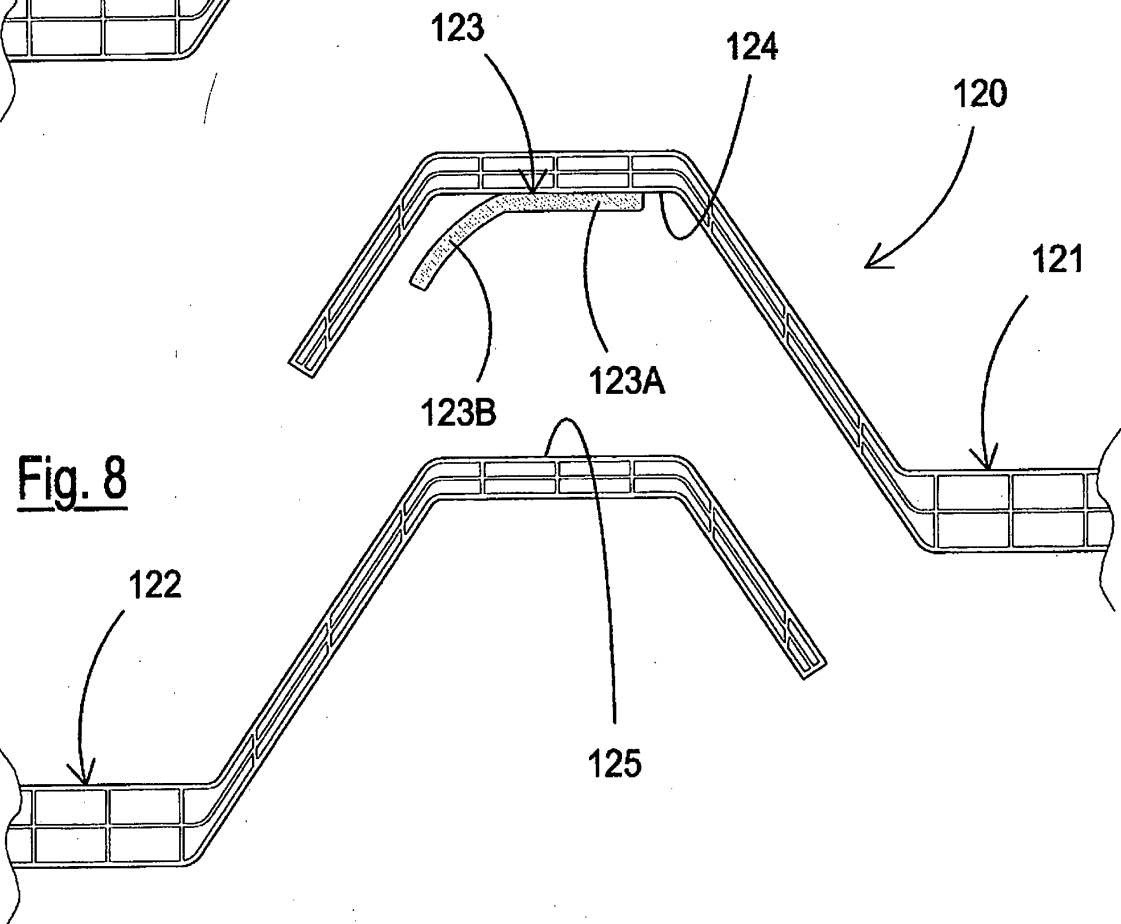
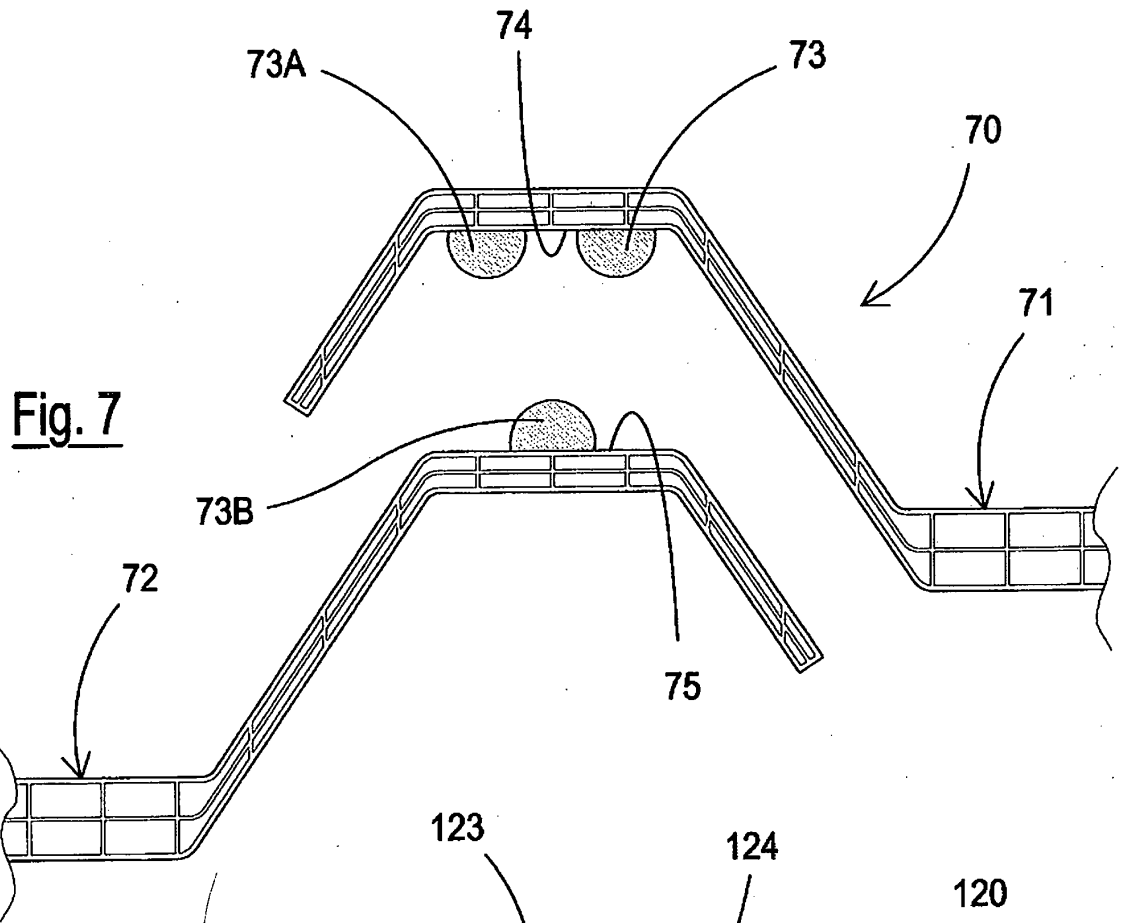


Fig. 9

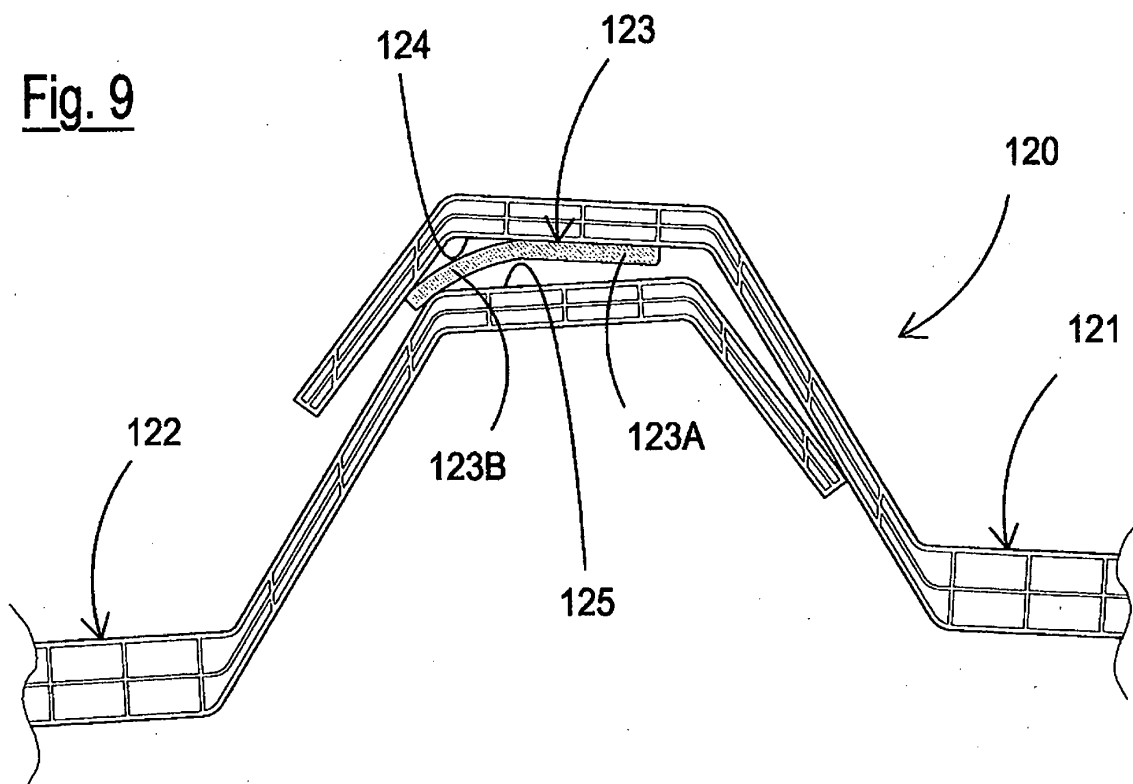


Fig. 10

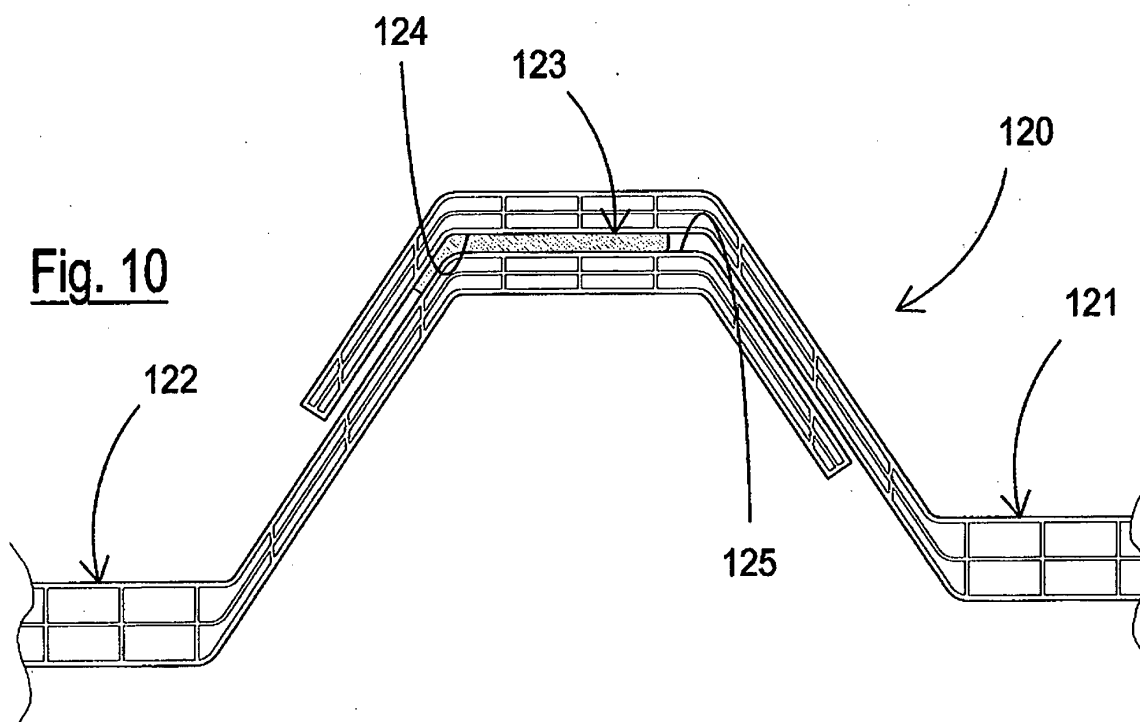


Fig. 11

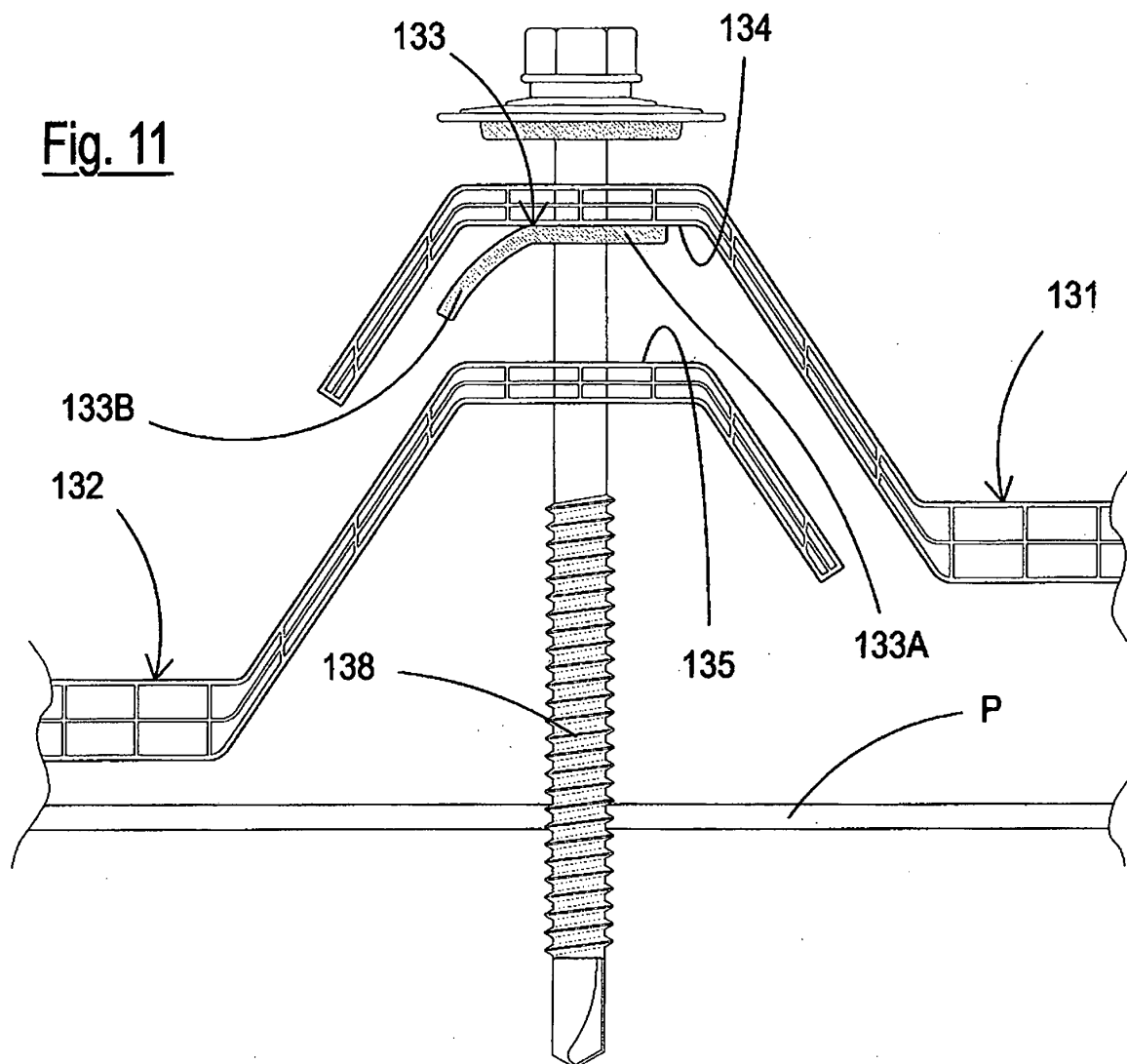


Fig. 14

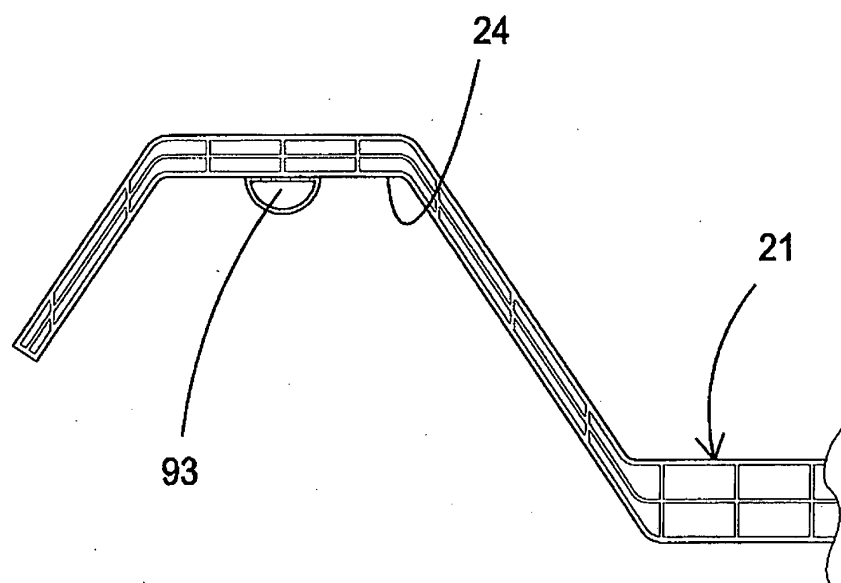


Fig. 12

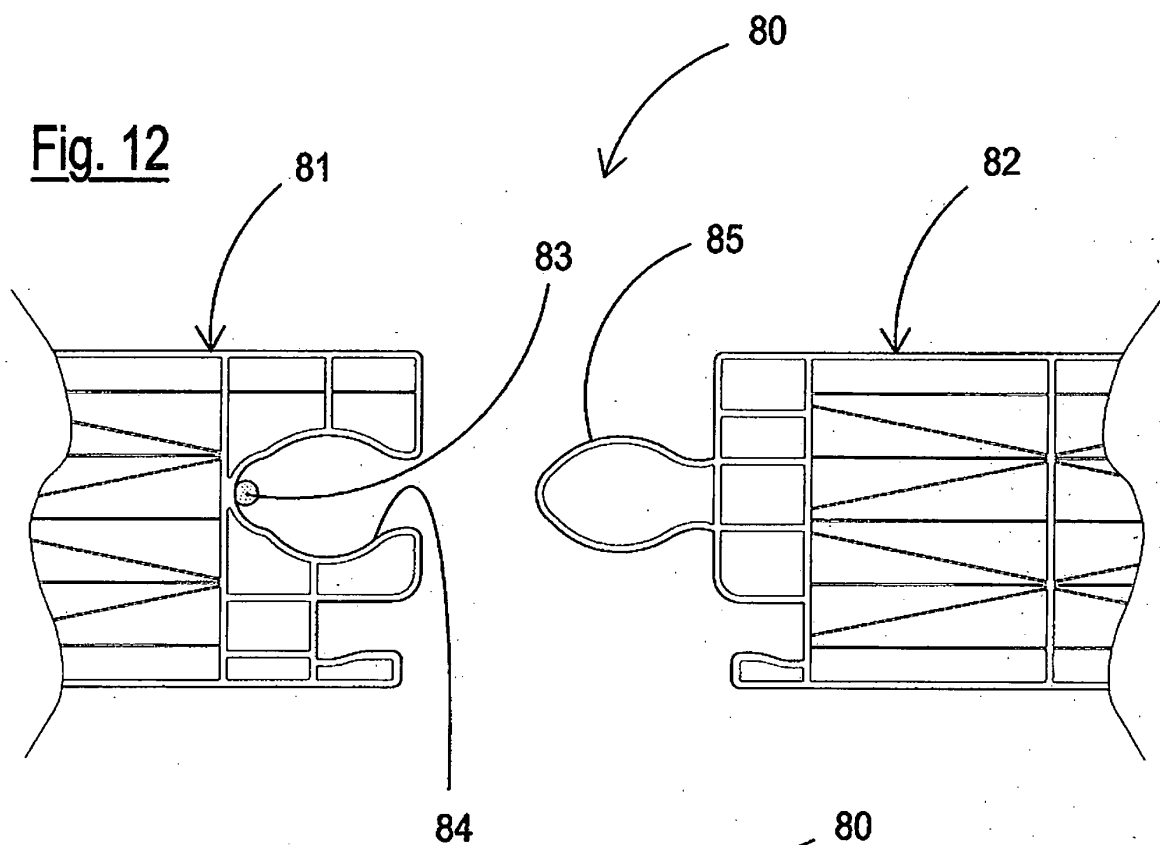
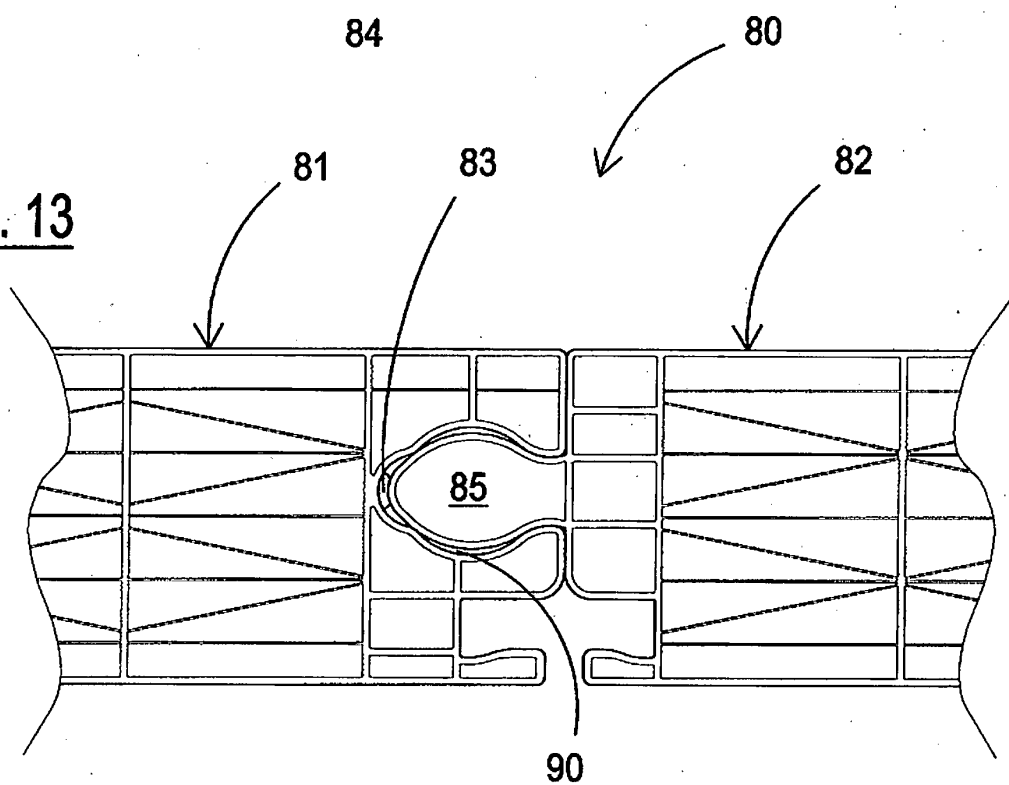
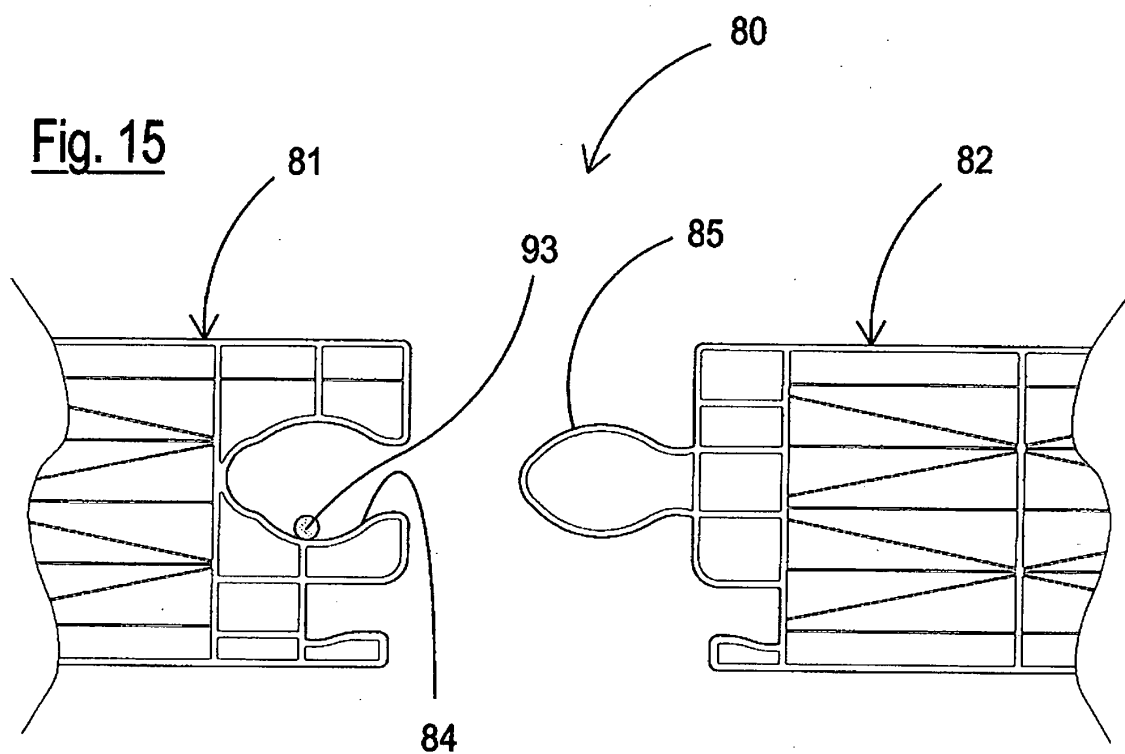


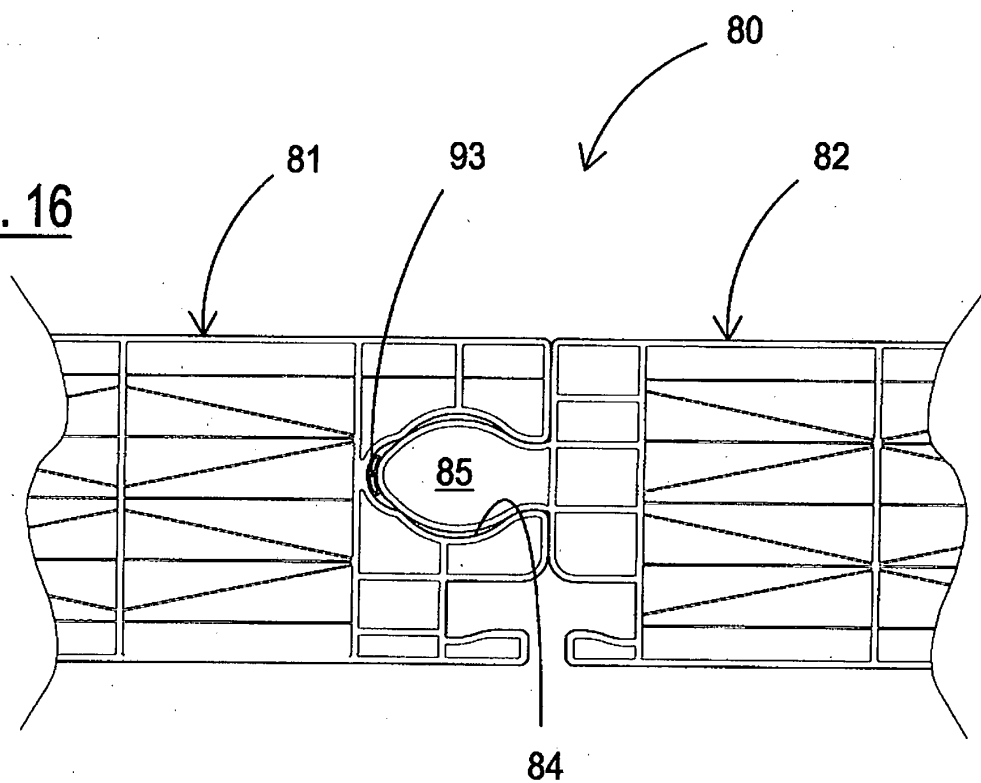
Fig. 13



**Fig. 15**



**Fig. 16**





**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- FR 2401288 A [0007]
- US 4759165 A [0009]
- US 3841094 A [0010]
- GB 2238808 A [0011]
- GB 2453864 A [0015]