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(54) **SANDWICH-STRUCTURED COMPOSITE PANEL**

VERBUNDPANEEL MIT SANDWICHSTRUKTUR

PANNEAU COMPOSITE DOTÉ D'UNE STRUCTURE EN SANDWICH

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Description

BACKGROUND

[0001] The invention relates to a sandwich-structured composite panel.

[0002] It is known to use composite panels in buildings and constructions as a façade cladding panel element. Horizontal joints between the composite panels are susceptible to get dirty and retain moisture. This may cause the appearance of the joint or the whole façade to become untidy, and even reduce the life span of the composite panels.

[0003] GB 2571396 discloses a sandwich-structured composite panel that comprises a first face skin of sheet metal, a second face skin of sheet metal, providing the back surface of the panel, and a core arranged between the first face skin and the second face skin. AT 506954 discloses a wall or façade element composed of profile boards which are fastened to a substructure at a distance from one another by means of retaining clips. FR 1495776 discloses a building facade cladding which comprises suspension profiles having upwardly open retaining wings and cladding profile strips having connecting wings which can be inserted from above into the retaining wings.

BRIEF DESCRIPTION

[0004] Viewed from a first aspect, there can be provided a sandwich-structured composite panel, comprising a first face skin of sheet metal, providing the façade surface of the panel, a second face skin of sheet metal, providing the back surface of the panel, and a core arranged between the first face skin and the second face skin, the first and second face skins being attached to the core, an upper edge, comprising an upper edge skin construed from the sheet metal establishing the first face skin, a lower edge, comprising a lower edge skin construed from the sheet metal establishing the first face skin, an upper attachment element arranged in the upper edge, wherein the upper attachment element comprises a first fixing surface, the first fixing surface being attached to the second face skin of sheet metal, wherein the façade surface of the panel is arranged in a first angle in relation to the upper edge skin and the first fixing surface, the upper attachment element comprises an upper extension for attaching another composite panel above the composite panel, a lower attachment element arranged in the lower edge, said lower attachment element comprising a third fixing surface attached to the second face skin in the lower edge, the façade surface of the panel is arranged in a second angle in relation to the lower edge skin and the third fixing surface, wherein said first angle is more than 90°, that the second angle is less than 90°, and that the lower attachment element comprises a groove-like counterpart arranged to receive the upper extension of the panel arranged beneath, wherein the

groove-like shape allows the upper extension to move therein.

[0005] Thereby a composite panel that reduces cumulation of dirt and moisture in the horizontal joint between the composite panels may be achieved.

[0006] The composite panel according to the invention is characterised by what is stated in the independent claim. Some other embodiments are characterised by what is stated in the dependent claims. Inventive embodiments are also disclosed in the specification and drawings of this patent. Features of the different embodiments of the invention may, within the scope of the basic inventive idea, be applied to other embodiments.

[0007] In one embodiment, the first angle is 91° - 150°. An advantage is that cumulation of dirt and moisture may be effectively reduced.

[0008] In one embodiment, the first angle is 95° - 135°. An advantage is that cumulation of dirt and moisture may be effectively reduced, and manufacturing of the panel is simple to realize.

[0009] In one embodiment, the first angle is 100° - 115°. An advantage is that cumulation of dirt and moisture may be effectively reduced, and the appearance of the panel is close to rectangular prism.

[0010] In one embodiment, the upper attachment element comprises a second fixing surface attached to the second face skin in the upper edge, the second fixing surface being arranged in the first angle in relation to the first fixing surface. An advantage is that a very stable structure of the composite panel may be achieved.

[0011] In one embodiment, the upper attachment element comprises an attachment surface arranged parallel to the second face skin for fastening the composite panel to a support structure. An advantage is that the panel may be attached easily to the support structure.

[0012] According to the invention, the upper attachment element comprises an upper extension for attaching another composite panel above the composite panel. An advantage is that a simple structure for attaching panels may be achieved.

[0013] According to the invention, the composite panel comprises a lower attachment element arranged in the lower edge, said lower attachment element comprising a third fixing surface attached to the second face skin in the lower edge, wherein the façade surface of the panel is arranged in a second angle in relation to the lower edge skin and the third fixing surface, wherein the second angle is less than 90°. An advantage is that running of water behind the panel may be reduced or even prevented.

[0014] In one embodiment, the lower attachment element comprises a fourth fixing surface attached to the second face skin and arranged in the second angle in relation to the third fixing surface. An advantage is that a very stable structure of the composite panel may be achieved.

[0015] In one embodiment, the second angle is selected so that the lower edge skin is at least substantially parallel with the upper edge skin. An advantage is that a

narrow joint between the panels may be created.

[0016] In one embodiment, the attachment element is a profile, the length of which is about the width of the composite panel. An advantage is that a very good support for the panel may be achieved.

[0017] In one embodiment, the attachment element is an extruded aluminum profile. An advantage is that precise attachment elements may be manufactured.

[0018] In one embodiment, the face skin comprises aluminium.

[0019] An advantage is that the skin is light.

[0020] In one embodiment, the face skin comprises at least one of the following materials: copper, brass, titan-zink, steel, such as stainless steel. An advantage is that the appearance of the skin may be customized.

[0021] In one embodiment, the core comprises a cell configuration. An advantage is that the core and thus the panel may have a light but sturdy structure.

[0022] In one embodiment, the cell configuration comprises aluminium. An advantage is that the core is light.

[0023] In one embodiment, the core comprises polymer material, such as polyethylene. An advantage is that the core is light.

[0024] In one embodiment, the core is made of polymer, such as polyethylene, filled with at least one mineral filler. An advantage is that a core being low-cost and having tailored properties regarding e.g. fire resistance may be achieved.

BRIEF DESCRIPTION OF FIGURES

[0025] Some embodiments illustrating the present disclosure are described in more detail in the attached drawings, in which

Figure 1 is a schematic side view of details of two composite panels in partial cross-section,

Figure 2 is a schematic side view of details of the two composite panels shown in Figure 1,

Figure 3 is another schematic side view of details of the two composite panels shown in Figure 1,

Figure 4 is another schematic side view of the two composite panels shown in Figure 1, and

Figure 5 is a schematic perspective view of a composite panel.

[0026] In the figures, some embodiments are shown simplified for the sake of clarity. Similar parts are marked with the same reference numbers in the figures.

DETAILED DESCRIPTION

[0027] Figure 1 is a schematic side view of details of two composite panels in partial cross-section, Figure 2

is a schematic side view of details of the two composite panels shown in Figure 1, Figure 3 is another schematic side view of details of the two composite panels shown in Figure 1, and Figure 4 is another schematic side view of the two composite panels shown in Figure 1.

[0028] The sandwich-structured composite panel 100 ("panel") may be used in building envelope, such as exterior walls and roofs of buildings. The panel 100 has typically a shape of quadrangle, such as quadrature or rectangle.

[0029] The panel 100 comprises a first face skin 1 of sheet metal, providing the façade surface of the panel 100, a second face skin 2 of sheet metal, providing the back surface of the panel 100, and a core 5 that is arranged between the first face skin and the second face skin such that the first and second face skins 1, 2 are attached to the core 3.

[0030] In an embodiment, the face skin 1, 2 comprises aluminium. In some other embodiments, the face skin 1, 2 comprises at least one of the following materials: copper, brass, titan-zink, steel, such as stainless steel. Typically, the first face skin 1 is made of same material as the second face skin 2, but not necessarily.

[0031] In an embodiment, the core 5 comprises a cell configuration, such as honeycomb structure. The material of the cell configuration may be e.g. aluminium or polymer.

[0032] In an embodiment, the core 5 comprises polymer material, e.g. polyolefin, such as polyethylene. The polymer material may be filled with at least one mineral filler. In another embodiment, the material of the core 5 is at least substantially mineral material or ceramics.

[0033] The panel 100 comprises an upper edge 3 that comprises an upper edge skin 6 construed from the sheet metal establishing the first face skin 1. In an embodiment, the upper edge is made by cutting or milling a groove 17 in the second face skin 2 and the core 3, and then bending the panel 100 in a desired shape.

[0034] The panel 100 further comprises a lower edge 4, comprising a lower edge skin 7 construed from the sheet metal establishing the first face skin 1, and preferably made as the upper edge 3.

[0035] An upper attachment element 8 is arranged in the upper edge 3 of the panel. The upper attachment element 8 comprises a first 9 of said fixing surfaces is attached to the second face skin 2 in the upper edge 3. The first fixing surface 9 is in a first angle A, that is more than 90°, in relation to the façade surface of the panel 100.

[0036] In an embodiment, the upper attachment element 8 further comprises a second fixing surface 10 that is attached to the second face skin 2 behind of and thus parallel to the façade surface of the panel.

[0037] In Figures, the second fixing surface 10 is attached to the upper edge 3 by rivets 19. Additionally or alternatively, the attachment may be realized by screws, gluing etc. Additionally, the first fixing surface 9 may be attached to the panel by similar means.

[0038] In an embodiment, the first angle A is selected

in range of 91° - 150°. In an embodiment, the first angle A is selected in range of 100° - 135°. In a still another embodiment, the first angle A is selected in range of 100° - 115°. In an embodiment, the first angle A is 105°.

[0039] In an embodiment, the upper attachment element 8 comprises an attachment surface 11 that is arranged parallel to the second face skin 2 for fastening the panel 100 to a support structure 12. In the embodiment shown in Figures, the panel is fastened by screws 18, however another fastening means may also be used.

[0040] According to the invention, the panel 100 comprises a lower attachment element 14 that is arranged in the lower edge 4. The lower attachment element 14 comprises a third fixing surface 15 attached to the lower edge 3 of the panel.

[0041] The third fixing surface 15 is arranged in a second angle B in relation to the façade surface of the panel 100. According to the invention, the second angle B is less than 90°.

[0042] In an embodiment, the second angle B is selected so that the lower edge skin 7 is at least substantially parallel with the upper edge skin 6.

[0043] In an embodiment, the lower attachment element 14 comprises also a fourth fixing surface 16 that is attached to the second face skin 2. The fourth fixing surface 16 is arranged in the second angle B in relation to the third fixing surface 15.

[0044] According to the invention, the upper attachment element 8 comprises an upper extension 13 for attaching another panel above the panel 100. As shown in Figures, the lower attachment element 14 comprises a groove-like counterpart 20 that receives the upper extension 13 of the panel arranged beneath. The groove-like shape allows the upper extension 13 to move therein, thus dimensional changes of the panels 100 caused by e.g. temperature variations do not cause stresses to the fastening of the panels. The structure of the attachment elements 8, 14 makes it also possible to adjust the width of the joint 23 between the panels. In an embodiment, the width of the joint 23 may be selected in range of 5 mm - 35 mm.

[0045] Figure 5 is a schematic perspective view of a composite panel.

[0046] In an embodiment, for instance as shown in Figure 5, the attachment element 8, 14 is a profile element, the length of which is about the width of the panel 100.

[0047] In another embodiment, at least one of the attachment elements 8, 14 comprises plurality of attachment elements arranged to the respective edge 3, 4 and spaced apart from each other.

[0048] In an embodiment, the attachment element 8, 14 is an extruded aluminum profile.

[0049] At least one of side edges of the panel 100 may be provided with a side skin 21. In an embodiment, the side skin 21 is construed from the first skin 1 that is bent in a desired shape. In another embodiment, the side skin 21 is construed from a separate element that is attached to the structure of the panel 100.

[0050] In an embodiment, the side skins 21 are attached to the attachment element(s) 8, 14 by cover plates 22. In an embodiment, the cover plates 22 are not fixed stationary to the attachment element (s) 8, 14, but they may move or glide in a slot 24 (best seen in Fig. 3) in direction of the profile. Thus, problems caused by thermal expansions may be eluded.

[0051] The invention is not limited solely to the embodiments described above, but instead many variations are possible within the scope of the inventive concept defined by the claims below. Within the scope of the inventive concept the attributes of different embodiments and applications can be used in conjunction with or replace the attributes of another embodiment or application.

[0052] The drawings and the related description are only intended to illustrate the idea of the invention. The invention may vary in detail within the scope of the invention as defined in the following claims.

REFERENCE SYMBOLS

[0053]

1	first face skin
2	second face skin
3	upper edge
4	lower edge
5	core
6	upper edge skin
7	lower edge skin
8	upper attachment element
9	first fixing surface
10	second fixing surface
11	attachment surface
12	support structure
13	upper extension
14	lower attachment element
15	third fixing surface
16	fourth fixing surface
17	groove
18	screw
19	rivet
20	counterpart
21	side skin
22	cover plate
23	joint
24	slot

100 composite panel

A first angle
B second angle

Claims

1. A sandwich-structured composite panel (100), comprising

- a first face skin (1) of sheet metal, providing the façade surface of the panel (100),
- a second face skin (2) of sheet metal, providing the back surface of the panel (100), and
- a core (5) arranged between the first face skin and the second face skin, the first and second face skins being attached to the core,
- an upper edge (3), comprising an upper edge skin (6) construed from the sheet metal establishing the first face skin (1),
- a lower edge (4), comprising a lower edge skin (7) construed from the sheet metal establishing the first face skin (1),
- an upper attachment element (8) arranged in the upper edge (3), wherein
- the upper attachment element (8) comprises a first fixing surface (9),
- the first fixing surface (9) being attached to the second face skin (2) of sheet metal, wherein
- the façade surface of the panel (100) is arranged in a first angle (A) in relation to the upper edge skin (6) and the first fixing surface (9),
- the upper attachment element (8) comprises an upper extension (13) for attaching another composite panel (100) above the composite panel (100),
- a lower attachment element (14) is arranged in the lower edge (4), said lower attachment element (14) comprising
- a third fixing surface (15) attached to the second face skin (2) in the lower edge (3), and
- the façade surface of the panel (100) is arranged in a second angle (B) in relation to the lower edge skin (7) and the third fixing surface (15)

characterized in that

- said first angle (A) is more than 90°, that
 - the second angle (B) is less than 90°, and that
 - the lower attachment element (14) comprises a groove-like counterpart (20) arranged in use to receive the upper extension (13) of an identical panel arranged beneath, wherein
 - the groove-like shape allows the upper extension to move therein.
2. The composite panel as claimed in claim 1, wherein the first angle (A) is 91° - 150°, preferably 95° - 135°, more preferably 100° - 115°.
 3. The composite panel as claimed in claim 1 or 2, wherein the upper attachment element (8) comprises an attachment surface (11) arranged parallel to the second face skin (2) for fastening the composite panel (100) to a support structure (12).
 4. The composite panel as claimed in any of the pre-

ceding claims, wherein the upper attachment element (8) comprises a second fixing surface (10) attached to the second face skin (2) in the upper edge (3), the second fixing surface (10) being arranged in the first angle (A) in relation to the first fixing surface (9).

5. The composite panel as claimed in any of the preceding claims, wherein the lower attachment element (14) comprises a fourth fixing surface (16) attached to the second face skin and arranged in the second angle (B) in relation to the third fixing surface (15).
6. The composite panel as claimed in any of the preceding claims, wherein the second angle (B) is selected so that the lower edge skin (7) is at least substantially parallel with the upper edge skin (6).
7. The composite panel as claimed in any of the preceding claims, wherein the attachment element (8, 14) is a profile, the length of which is about the width of the composite panel (100).
8. The composite panel as claimed in any of the preceding claims, wherein the attachment element (8, 14) is an extruded aluminum profile.
9. The composite panel as claimed in any of the preceding claims, wherein the face skin (1, 2) comprises aluminium.
10. The composite panel as claimed in any of the preceding claims, wherein the face skin (1, 2) comprises at least one of the following materials: copper, brass, titanzink, steel, such as stainless steel.
11. The composite panel as claimed in any of the preceding claims, wherein the core (5) comprises a cell configuration.
12. The composite panel as claimed in claim 9, wherein the cell configuration comprises aluminium.
13. The composite panel as claimed in any of the preceding claims, wherein the core (5) comprises polymer material, such as polyethylene, optionally filled with at least one mineral filler.

Patentansprüche

1. Sandwich-strukturierte Verbundplatte (100), umfassend
 - eine erste Randschicht (1) aus Metallblech, welche die Fassadenfläche der Platte (100) bildet,

- eine zweite Randschicht (2) aus Metallblech, welche die Rückseite der Platte (100) bildet, und
- einen Kern (5), der zwischen der ersten und der zweiten Randschicht angeordnet ist, wobei die erste und die zweite Randschicht an dem Kern befestigt sind,
- eine obere Kante (3), die eine obere Kantenschicht (6) umfasst, welche aus dem die erste Randschicht (1) bildenden Blech hergestellt ist,
- eine untere Kante (4), die eine untere Kantenschicht (7) umfasst, welche aus dem die erste Randschicht (1) bildenden Blech hergestellt ist,
- ein oberes Befestigungselement (8), das in der oberen Kante (3) angeordnet ist, wobei
- das obere Befestigungselement (8) eine erste Befestigungsfläche (9) aufweist,
- die erste Befestigungsfläche (9) an der zweiten Randschicht (2) aus Blech befestigt ist, wobei
- die Fassadenfläche der Platte (100) in einem ersten Winkel (A) in Bezug auf die obere Kantenschicht (6) und die erste Befestigungsfläche (9) angeordnet ist,
- das obere Befestigungselement (8) eine obere Verlängerung (13) zur Befestigung einer weiteren Verbundplatte (100) oberhalb der Verbundplatte (100) aufweist,
- ein unteres Befestigungselement (14) in der unteren Kante (4) angeordnet ist, wobei das untere Befestigungselement (14) umfasst
- eine dritte Befestigungsfläche (15), die an der zweiten Randschicht (2) am unteren Rand (3) befestigt ist, und
- die Fassadenfläche der Platte (100) in einem zweiten Winkel (B) in Bezug auf die untere Kantenschicht (7) und die dritte Befestigungsfläche (15) angeordnet ist

dadurch gekennzeichnet, dass

- der erste Winkel (A) größer als 90° ist, dass
 - der zweite Winkel (B) kleiner als 90° ist, und dass
 - das untere Befestigungselement (14) ein rinnenartiges Gegenstück (20) aufweist, das im Gebrauch so angeordnet ist, dass es die obere Verlängerung (13) einer darunter angeordneten identischen Platte aufnimmt, wobei
 - es die rinnenartige Form der oberen Verlängerung erlaubt, sich darin zu bewegen.
2. Verbundplatte nach Anspruch 1, wobei der erste Winkel (A) 91°-150°, vorzugsweise 95°-135°, besonders bevorzugt 100-115° beträgt.
 3. Verbundplatte nach Anspruch 1 oder 2, wobei das obere Befestigungselement (8) eine parallel zur zweiten Randschicht (2) angeordnete Befestigungsfläche (11) zur Befestigung der Verbundplatte (100)

an einer Trägerstruktur (12) aufweist.

4. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei das obere Befestigungselement (8) eine zweite Befestigungsfläche (10) aufweist, die an der zweiten Randschicht (2) in der oberen Kante (3) befestigt ist, wobei die zweite Befestigungsfläche (10) in einem ersten Winkel (A) in Bezug auf die erste Befestigungsfläche (9) angeordnet ist.
5. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei das untere Befestigungselement (14) eine vierte Befestigungsfläche (16) aufweist, die an der zweiten Stirnseite angebracht und in dem zweiten Winkel (B) in Bezug auf die dritte Befestigungsfläche (15) angeordnet ist.
6. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei der zweite Winkel (B) so gewählt ist, dass die untere Kantenschicht (7) zumindest im Wesentlichen parallel zur oberen Kantenschicht (6) verläuft.
7. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei das Befestigungselement (8, 14) ein Profil ist, dessen Länge etwa der Breite der Verbundplatte (100) entspricht.
8. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei das Befestigungselement (8, 14) ein Aluminiumstrangpressprofil ist.
9. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei die Randschicht (1, 2) aus Aluminium besteht.
10. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei die Randschicht (1, 2) mindestens eines der folgenden Materialien umfasst: Kupfer, Messing, Titanzink, Stahl, wie z. B. rostfreier Stahl.
11. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei der Kern (5) eine Zellkonfiguration aufweist.
12. Verbundplatte nach Anspruch 9, wobei die Zellkonfiguration Aluminium umfasst.
13. Verbundplatte nach einem der vorhergehenden Ansprüche, wobei der Kern (5) aus einem Polymermaterial, wie Polyethylen, besteht, das gegebenenfalls mit mindestens einem mineralischen Füllstoff gefüllt ist.

Revendications

1. Panneau composite à structure sandwich (100),

comprenant

- une première peau de face (1) en tôle, fournissant la surface de façade du panneau (100),
- une deuxième peau de face (2) en tôle, fournissant la surface arrière du panneau (100), et
- un noyau (5) agencé entre la première peau de face et la deuxième peau de face, les première et deuxième peaux de face étant attachées au noyau,
- un bord supérieur (3), comprenant une peau de bord supérieur (6) construite à partir de la tôle établissant la première peau de face (1),
- un bord inférieur (4), comprenant une peau de bord inférieur (7) construite à partir de la tôle établissant la première peau de face (1),
- un élément d'attache supérieur (8) agencé dans le bord supérieur (3), dans lequel
- l'élément d'attache supérieur (8) comprend une première surface de fixation (9),
- la première surface de fixation (9) étant attachée à la deuxième peau de face (2) en tôle, dans lequel
- la surface de façade du panneau (100) est agencée dans un premier angle (A) par rapport à la peau de bord supérieur (6) et à la première surface de fixation (9),
- l'élément d'attache supérieur (8) comprend une extension supérieure (13) pour attacher un autre panneau composite (100) au-dessus du panneau composite (100),
- un élément d'attache inférieur (14) est agencé dans le bord inférieur (4), ledit élément d'attache inférieur (14) comprenant
- une troisième surface de fixation (15) attachée à la deuxième peau de face (2) dans le bord inférieur (3), et
- la surface de façade du panneau (100) est agencée dans un deuxième angle (B) par rapport à la peau de bord inférieur (7) et à la troisième surface de fixation (15)

caractérisé en ce que

- ledit premier angle (A) est supérieur à 90°, **en ce que**
- le deuxième angle (B) est inférieur à 90°, **et en ce que**
- l'élément d'attache inférieur (14) comprend une contre-pièce en forme de rainure (20) agencée en cours d'utilisation pour recevoir l'extension supérieure (13) d'un panneau identique agencé en dessous, dans lequel
- la forme de rainure permet à l'extension supérieure de se déplacer dans celle-ci.

2. Panneau composite tel que revendiqué dans la revendication 1, dans lequel le premier angle (A) est

de 91° à 150°, de préférence de 95° à 135°, plus préférentiellement de 100° à 115°.

3. Panneau composite tel que revendiqué dans la revendication 1 ou 2, dans lequel l'élément d'attache supérieur (8) comprend une surface d'attache (11) agencée parallèlement à la deuxième peau de face (2) pour fixer le panneau composite (100) à une structure de support (12).
4. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel l'élément d'attache supérieur (8) comprend une deuxième surface de fixation (10) attachée à la deuxième peau de face (2) dans le bord supérieur (3), la deuxième surface de fixation (10) étant agencée dans le premier angle (A) par rapport à la première surface de fixation (9).
5. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel l'élément d'attache inférieur (14) comprend une quatrième surface de fixation (16) attachée à la deuxième peau de face et agencée dans le deuxième angle (B) par rapport à la troisième surface de fixation (15).
6. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel le deuxième angle (B) est choisi de sorte que la peau de bord inférieur (7) soit au moins sensiblement parallèle à la peau de bord supérieur (6).
7. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel l'élément d'attache (8, 14) est un profilé dont la longueur est à peu près égale à la largeur du panneau composite (100).
8. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel l'élément d'attache (8, 14) est un profilé en aluminium extrudé.
9. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel la peau de face (1, 2) comprend de l'aluminium.
10. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel la peau de face (1, 2) comprend au moins l'un des matériaux suivants : le cuivre, le laiton, le zinc-titane, l'acier, tel que l'acier inoxydable.
11. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel le noyau (5) comprend une configuration cellulaire.
12. Panneau composite tel que revendiqué dans la re-

vendication 9, dans lequel la configuration cellulaire comprend de l'aluminium.

13. Panneau composite tel que revendiqué dans l'une des revendications précédentes, dans lequel le noyau (5) comprend un matériau polymère, tel que le polyéthylène, facultativement chargé d'au moins une charge minérale.

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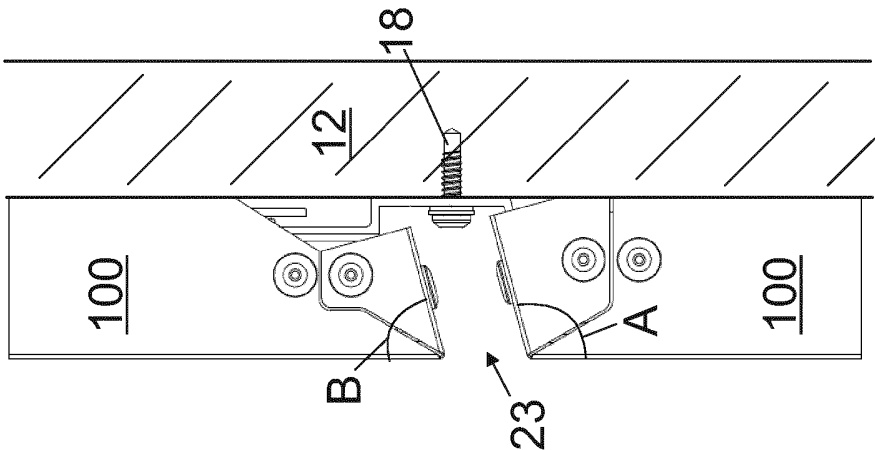


Fig. 4

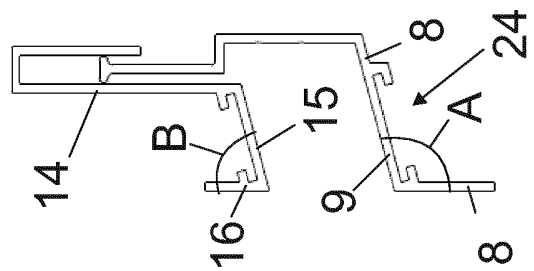


Fig. 3

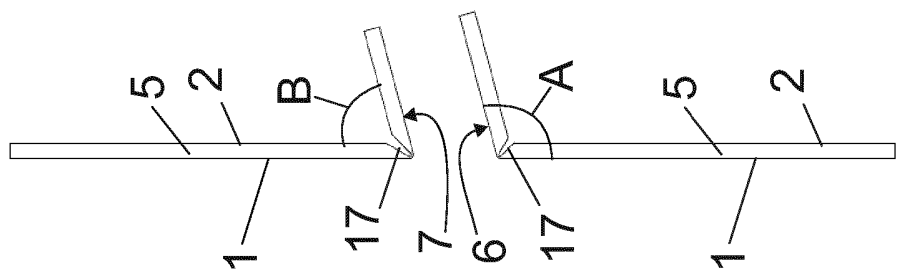


Fig. 2

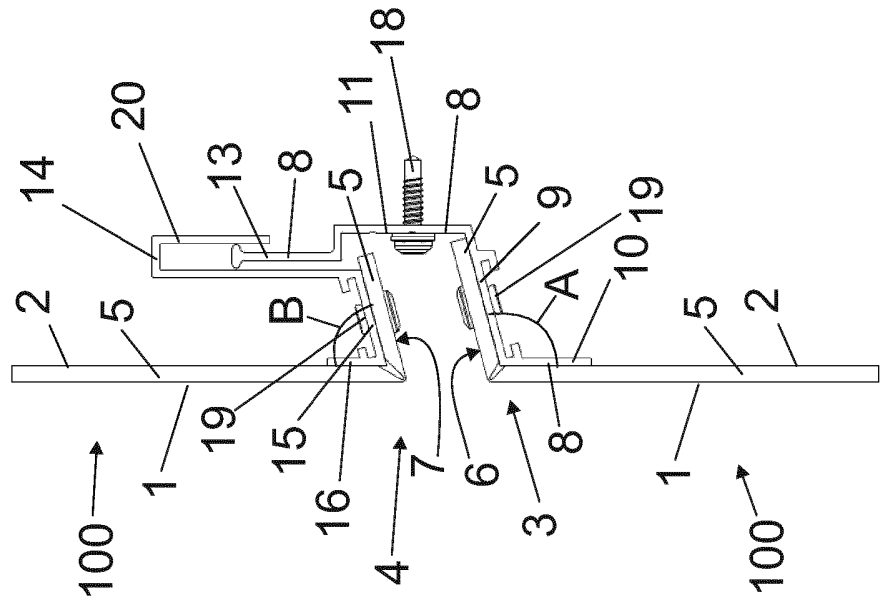


Fig. 1

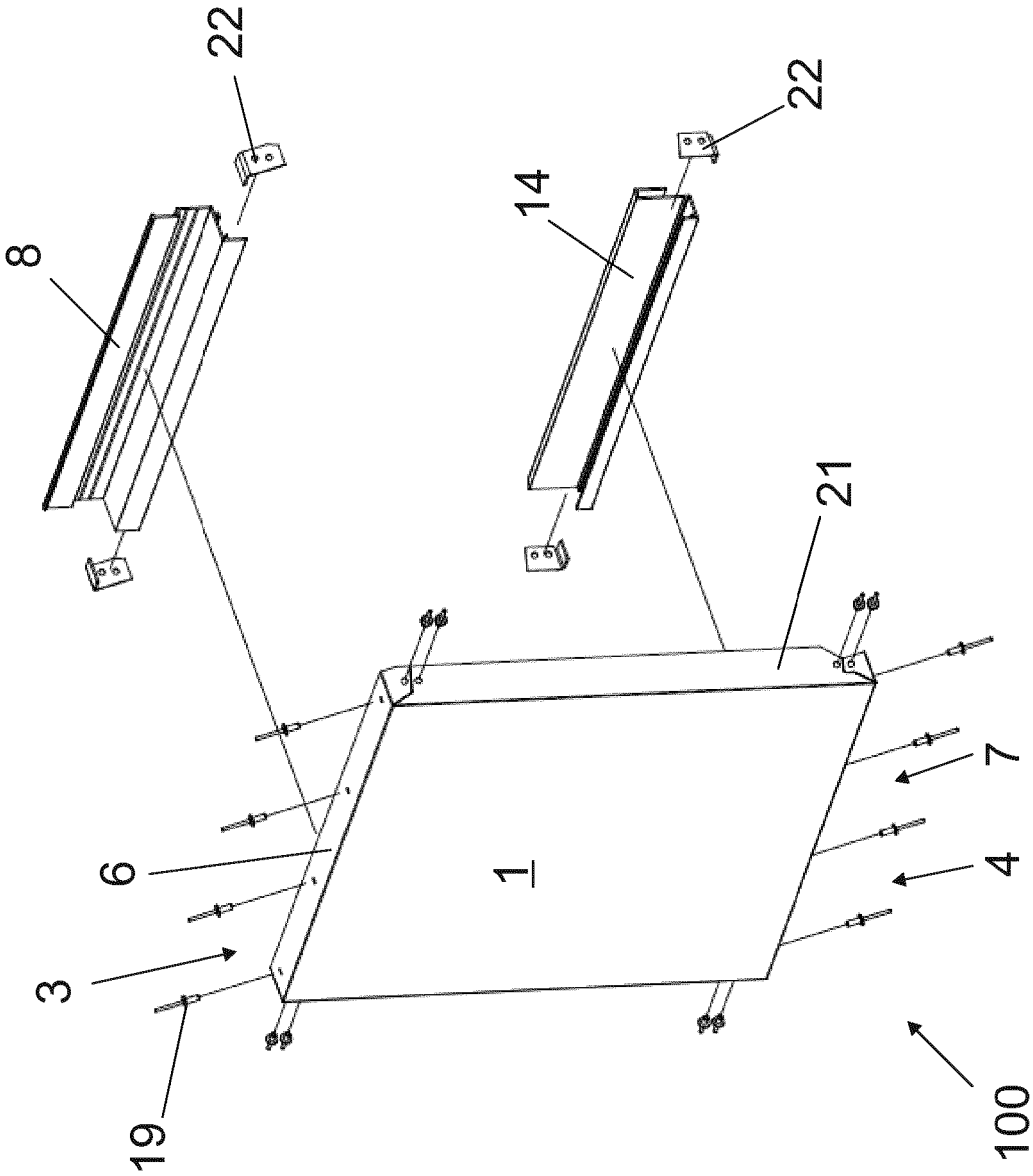


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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