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(54) Laminated insulating panel, use of such an insulating panel and method for arranging such an insulating panel

(57) The invention relates to a laminated insulating panel, use of such an insulating panel and methods for placing such an insulating panel. The invention relates more particularly to laminated insulating panels comprising a base layer of an insulating material and a cover layer of a mechanically stronger material. Owing to judiciously positioned recesses, which in placed position create a space between the attaching side of the insulating panel and the structure for covering, the insulating panel is suitable for vertical applications. The invention also relates to the use, and methods for use, of such an insulating panel for placing against a wall and as formwork for cast structures.

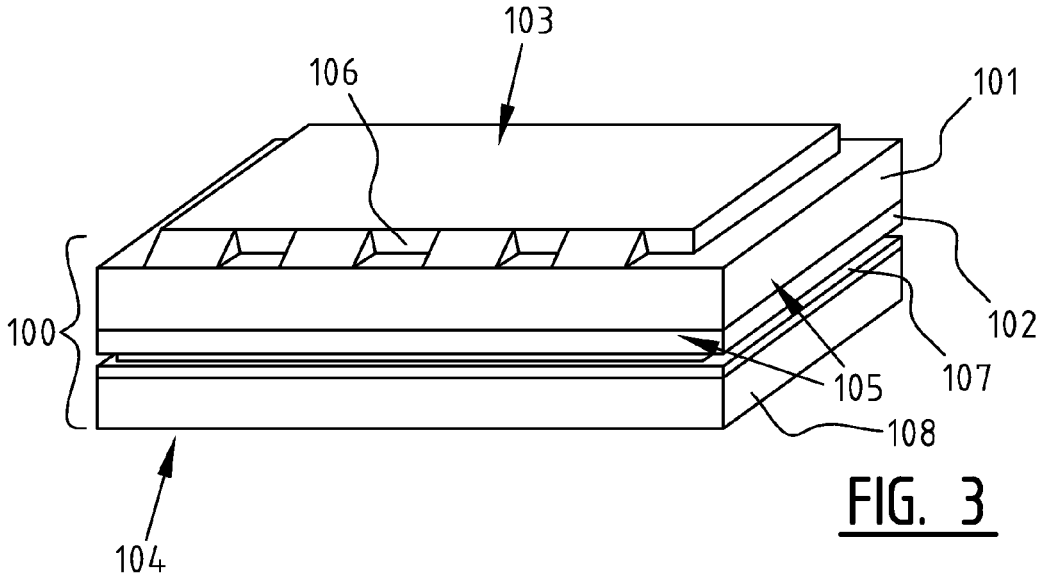

FIG. 3

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Description

[0001] The present invention relates to insulating panels, more particularly to laminated insulating panels comprising a base layer of an insulating material and a cover layer of a mechanically stronger material.

[0002] Laminated insulating panels for use in roof covering applications are known in the field. In a known embodiment the base layer consists of an insulating panel of extruded polystyrene and the cover layer of a hard cement layer adhering thereto. These insulating panels provide the advantage that using a single product both insulation and a weather-resistant finishing layer can be arranged on existing flat roofs. In this application the insulating panels are hooked into each other with a tongue and groove system and the arranged insulating panels remain in place on the flat roof due to their own weight and/or weights arranged on the panels along the edge of the roof. Rainwater seeping through between the joins of the insulating panels flows over the watertight underlying roof structure to the provided discharge points.

[0003] American patent no. 4,587,164, granted to Thurman Freeman, describes a composite panel for constructing a roof surface, consisting of three layers. The base layer is an insulating foam plastic such as polystyrene. The cover layers consist on the one hand of an inorganic cement layer enriched with wood fibres and on the other of a specific type of chipboard.

[0004] A drawback of the known combined insulating and finishing panels is that they are only suitable for horizontal applications.

[0005] It is an object of the present invention to provide a laminated insulating and finishing panel which can also be applied vertically. This object is achieved with the characterizing measures of the independent claim.

[0006] According to an aspect of the invention, a laminated insulating panel is provided with an attaching side for placing against a wall, a free side and a number of side walls, and comprises a base layer of an insulating material and a cover layer of a mechanically stronger material, wherein at least one side wall is formed such that in the placed situation one or more spaces adjacent to the attaching side are created between two insulating panels arranged adjacently of each other.

[0007] According to another aspect of the invention, the use of such a laminated insulating panel is provided as insulating layer for an upright wall.

[0008] According to yet another aspect of the invention, the use of such a laminated insulating panel is provided as lost formwork for erecting cast structures.

[0009] According to yet another aspect of the invention, a method is also provided for placing such a laminated insulating panel against an upright wall, the method comprising the steps of: arranging a first adhesive between the wall and the attaching side; and arranging a second adhesive in the one or more spaces adjacent to the attaching side. In a preferred embodiment at least one of the side walls comprises a second recess, and the method also comprises of arranging a sealing strip in the second recess.

[0010] Finally, according to yet another aspect of the invention a method is provided for arranging a formwork for a cast structure with such a laminated insulating panel, the method comprising the steps of: arranging a sealing means in the one or more spaces adjacent to the attaching side and arranging a connecting means in the second recess.

[0011] Deemed to be insulating material are, among others, the insulating materials usual in the building industry, such as materials having a heat conduction coefficient (λ—value) of less than 0.05 to 0.06 W/mK, and preferably those having a heat conduction coefficient (λ—value) of less than 0.035 W/mK.

[0012] Deemed to be mechanically stronger material are, among others, the finishing materials usual in the building industry, and particularly materials with a sufficient hardness to resist possible impact by small objects, hail, pebbles and the like, and sufficient stiffness to remain planar in vertical position under possible load.

[0013] The invention is based inter alia on the insight that in vertical applications the laminated insulating panels must be adhered fixedly to the wall on which they are arranged. The invention is moreover based on the insight that it is not desirable for bolts, nails or other connecting pieces to remain visible on the outside of these panels, which also serve as outer wall finishing.

[0014] It is an advantage of the invention that an adhesive product which expands significantly after being applied, such as for instance a product on the basis of polyurethane foam, can be used at the position of the space created on the attaching side. The use of such products combines a good adhesion of the insulating panels at the position of the edges with thermal sealing of the joins between mutually adjacent insulating panels, whereby possible undesirable cold bridges are avoided at the position of these joins.

[0015] In a specific embodiment said side wall comprises a recess extending over the whole periphery of the insulating panel. In a specific embodiment said at least one side wall has a chamfering of the edge of the insulating panel on the attaching side.

[0016] The stated "recess" and "chamfering" must be understood to be a specification of the shape characteristics of determined embodiments of the invention in respect of an elementary panel with the form of a rectangular prism or parallelepiped. This terminology does not imply that the insulating panels according to the invention are necessarily brought about by the physical removal of material from a prior, rectangular prism-like configuration.

[0017] In an embodiment of the insulating panel of the invention at least a part of the attaching side has a structure which improves the adhesion to the wall.

[0018] It is an advantage of embodiments of the invention that the structure of the attaching side enhances the adhesion to an existing wall using a glue or adhesive

product, such as for instance a silicone-based product. This is for instance achieved by giving the attaching side a certain roughness or by arranging an uneven pattern thereon. An additional advantage of such a structure is that the adhesive spreads evenly when the insulating panel is pressed on and positioned, without the adhesive producing a significant counterpressure and pushing the insulating panel back.

[0019] It is an additional advantage of the invention that the structure of the attaching side enables the use of the insulating panels as lost formwork for cast structures, particularly concrete structures, wherein the cast structure has a suitable insulating layer and a finishing layer immediately after curing. In this application the structure of the attaching side enhances the adhesion of the cast material to the base layer.

[0020] In a preferred embodiment at least one of the side surfaces comprises a recess for receiving a sealing strip. In a specific embodiment this recess is a groove substantially parallel to an edge of the outer surface of the cover layer.

[0021] An embodiment of the invention is based inter alia on the insight that the laminated insulating panels must form a watertight whole in some vertical applications, particularly on outside walls, in order to avoid accumulation of water occurring between the insulating panels and the underlying wall.

[0022] It is an advantage of this embodiment that a sealing strip of a watertight material, such as for instance rubber or silicone-based adhesive, can be arranged in the joins between mutually adjacent panels without the joins having to be widened for this purpose. As a result a continuous watertight whole of insulating panels can be obtained without unnecessary cold bridges occurring between the mutually adjacent panels.

[0023] In a preferred embodiment the cover layer consists substantially of cement. This embodiment has the advantage that the cover layer is weather-resistant and is substantially non-expanding.

[0024] In a preferred embodiment the base layer consists substantially of a foam-like plastic or a plastic foam. In a specific embodiment said foam-like plastic comprises polystyrene. In another embodiment the base layer consists substantially of cellular glass or a similar mineral foam.

[0025] An embodiment of the present invention consists of the use of said laminated insulating panels as lost formwork for erecting cast structures. It is an advantage of this use that the cast structure has a suitable insulating layer and a finishing layer immediately after curing.

[0026] American patent no. 4,459,334, granted to Robert Blanpied et al., describes a composite panel for use in the construction industry, consisting of a core of plastic foam and a cover layer consisting of a combination of aluminium foil and glass fibre mat. The core has a good thermal insulation and fire-retardant properties, while the cover layer provides an improved mechanical strength. This patent describes none of the above described measures necessary for a vertical application of the panels.

[0027] The foregoing and other advantages of the invention will be further elucidated with reference to the following figures and descriptions, in which:

Figure 1 illustrates a prior art insulating panel;

Figure 2 illustrates a preferred embodiment of the insulating panel according to the present invention;

Figure 3 illustrates another embodiment of the insulating panel according to the present invention;

Figure 4 illustrates the use of an insulating panel according to the present invention as lost formwork for a cast structure;

Figure 5 illustrates a preferred embodiment of the insulating panel according to the invention;

Figure 6 is a schematic view of the use of the insulating panel according to the invention as formwork panel; and

Figure 7 is a schematic view of the use of the insulating panel according to the invention as insulating and finishing layer on an existing wall.

[0028] As shown in Figure 1, the known laminated insulating panels **100** have substantially an insulating base layer **101** and a cover layer **102** for improving the mechanical properties, particularly on the outer side of the structure to be insulated.

[0029] By way of reference Figure 1 also shows attaching side **103,** free side **104** and several side walls **105**.

[0030] The preferred embodiment of insulating panel 100 according to the invention illustrated in Figure 2 has the same laminated structure.

[0031] For insulating base layer **101** a material is chosen which has a sufficiently low thermal (and optionally acoustic) conduction. The material is chosen such that the base layer is sufficiently stiff per se and is suitable for adhering. Diverse types of plastic foam are thus suitable among others. It is moreover advantageous to select a fireproof material.

[0032] For the manufacture of cover layer **102** a material is chosen which has the desired hardness and stiffness and can well withstand the atmospheric conditions to be expected. Cement mixtures such as concrete are suitable materials for cover layer **102** because they are weather-resistant and substantially non-expanding. They moreover provide a good fire resistance. Other materials with similar properties can likewise be used, preferably materials with a density of around 2000 kg/m^3.

[0033] Side walls **105** are chamfered on attaching side **103**, this forming recesses **106** which create a space or

cavity between the wall and insulating base layer 101 when two identical insulating panels 100 are placed adjacently of each other. This cavity allows the use of highly expanding types of adhesive, such as polyurethane foam, which on the one hand ensure an excellent adhesion of insulating panels **100** to the wall and to each other, and on the other form a thermal break of the cold bridges which could occur at the position of the joins. Because all side walls **105** are chamfered in this manner in the illustrated preferred embodiment, the resulting space **106** extends over the whole periphery of insulating panel **100.** It is however also possible that not all sides of the panel have such a chamfering.

[0034] In a preferred embodiment two mutually opposite sides, for instance the sides which stand vertically after placing of the panel, have a chamfering extending in each direction up to a distance of about 15 mm from the imaginary edge.

[0035] In another preferred embodiment two mutually opposite sides, for instance the sides which stand vertically after placing of the panel, have a chamfering extending in each direction up to a distance of about 10 mm from the imaginary edge. This preferred embodiment has the advantage of being particularly suitable for the use of the insulating panel as formwork for cast structures, wherein said chamferings form recesses for receiving a known concrete formwork triangular prism.

[0036] In yet another preferred embodiment two mutually opposite sides, for instance the sides which stand vertically after placing of the panel, have a chamfering extending in each direction up to a distance of about 25 mm from the imaginary edge. This preferred embodiment has the advantage that, when applied to very flat walls, the adhesion to the wall can be improved by increasing the adhesion surface area at the position of the vertical joins.

[0037] Attaching side **103** has a structure which improves the adhesion to a wall, for instance by an improved adhesion to adhesive products. This effect is obtained by making attaching side **103** sufficiently rough or uneven. The structure is preferably arranged by milling grooves into the base layer in one or more directions. It is also possible to arrange a structure by pressing an optionally heated die or template into the material of the base layer.

[0038] Fixedly adhering insulating panels **100** to an underlying existing wall preferably takes place with an adhesive product on the basis of silicone. It is advantageous to use an adhesive product which produces a tensile strength of at least about 2.65 MPa.

[0039] In the base layer, in the cover layer, or partially in both, side walls **105** have a recess **107** embodied as a groove for receiving a sealing strip, for instance a sealing strip of rubber. This strip has the purpose of making the entirety of mutually adjacent insulating panels **100** watertight. Thus avoided is that accumulation of water occurs between a wall, in particular an outside wall, and insulating panels **100** arranged thereon. In a preferred embodiment recess **107** is situated about 15 mm from outer wall **104.** Recess **107** is preferably a groove of about 15 mm. The form of the groove moreover preferably corresponds with the profile of the sealing strip to be inserted.

[0040] A judiciously formed sealing strip can be used to realize a pivoting connection. Required for this purpose is that during placing the sealing strip is sufficiently flexible to seal the join completely when the insulating panels are placed in the desired relative position. Such a pivoting connection in the horizontal joins for instance allows placing of insulating panels against a wall which is not perfectly vertical, without undesirable openings thereby occurring between the adjacent insulating panels. It is likewise possible to provide such a pivoting connection in the vertical joins.

[0041] The embodiment of Figure 3 illustrates an alternative form for recesses **106**, which are embodied only partially as chamfering. Insulating panel **100** is moreover provided on the free side **104** with an additional layer **108**, which can be arranged because of its specific mechanical properties or for decorative purposes.

[0042] Figure 4 illustrates the use of insulating panels according to the invention as lost formwork for cast structures. The arrangement of figure 4 shows two mirrored rows of insulating panels according to the invention which are placed opposite each other and form a channel in which concrete can be cast such that an already insulated and finished wall results immediately after curing of the concrete.

[0043] The channel is bounded by insulating panels according to the invention, only four of which are shown for the sake of simplicity in the figure, and optionally one or more traditional removable formwork plates **401** at the position of the sides where connection to further cast structures is provided. The insulating panels are placed with base layer **101** directed toward the space in which the concrete is cast, and cover layer **102** is directed toward the outer side of the wall. Known fixing means **402** can be used to hold the insulating panels in the correct position during casting of the concrete and during curing. Reinforcement **403** can also be arranged in known manner in the channel, for instance in the form of so-called concrete reinforcing bars, so that the resulting structure will comprise a core of reinforced concrete.

[0044] In this application the adhesion of the insulating panels to the wall only takes place as the wall cures. It is therefore advantageous in the construction of the formwork structure to already mutually connect the insulating panels by providing a suitable connecting means in recesses **107**. This connecting means can comprise a flexible material or a semi-hard or hard material. A flexible material is appropriate when the different insulating panels do not have lie in the same plane as each other, for instance in order to form a slightly curved wall. A hard, straight connection will provide a straight wall with additional formwork strength.

[0045] In the application of the insulating panels as lost

formwork, recesses **106** are preferably formed such that seepage of concrete liquid into the join is prevented. In a specific preferred embodiment recesses **106** are formed such that the free space formed by these recesses can be efficiently sealed before casting of the concrete. It can thus be advantageous to provide chamfering of the vertical sides in the insulating panels which, after erection of the insulating panels, forms intermediate spaces which can be efficiently sealed, for instance by arranging a quantity of insulating material in solid form or as sprayed foam. If insulating material is arranged in solid form, it can be very easily cut to size because the space to be filled is suitable for receiving a wedge-shaped piece of material. It is not therefore necessary here to produce filling pieces of a complex form. In an alternative embodiment recesses **106** are formed such that a flat bar can be adhered in efficient manner over the formed seam. After placing the recesses **106** preferably form a wide, shallow groove in which the flat bar can be precisely arranged.

[0046] Although the above description related to the formation of a channel for erecting a wall, it will be apparent to the skilled person that the insulating panels according to the invention can equally well be used for horizontal applications such as ceiling formwork. The insulating panels can be placed inter alia on available concrete beams, irrespective of whether these are of the prefabricated type, or be cast in situ.

[0047] In addition to the above described embodiments, wherein the insulating panels according to the invention are used as direct concrete formwork, it is also possible, among other applications, to place the insulating panels according to the invention against a formwork wall of the known type.

[0048] Figure 5 shows a preferred embodiment of the insulating panel according to the invention. Such an insulating panel is for instance 1200 mm wide and 60 mm high, with a thickness depending on the desired application. The thickness of the insulating base layer **101** here substantially determines the insulating capacity of the insulating panel. Cover layer **102** preferably consists substantially of cement. Free side **104** and attaching side **103** are also indicated, wherein attaching side **103** is provided with a structure in the form of a groove pattern which improves the adhesion to the wall. Recesses **106** are embodied as chamferings of the side walls which are vertical when placed. Recess **107** is provided in the vertical joins in order to receive an elastic sealing strip.

[0049] The components of a longitudinal ball hinge are also visible on those side walls of the insulating panel situated at the top and bottom in the figure. The insulating panel is preferably embodied such that, in placed situation, a male (protruding) part of the ball hinge is provided at the top and a female (recessed) part at the bottom. During placing the male part of an insulating panel placed in a lower position couples to the female part of an insulating panel placed in a higher position. The male part and the female part are preferably rounded so that a pivotable hinge is formed and so that mutually connecting insulating panels can be placed at a small mutual angle without the horizontal join becoming visibly larger. Small variations in verticality of the wall to be covered can thus be compensated. The combination of a male part provided on the upper side of the insulating panel and a female part provided on the underside of the insulating panel has the additional advantage that, in placed situation, seeping of rainwater into the horizontal joins is prevented. It is useful in this embodiment to adapt the course of groove **105** for receiving a sealing strip to the presence of the ball hinge, for instance by having the groove slope from the onset of the male part at the top of the insulating panel. The groove preferably runs obliquely toward a point closer to the free side at the bottom of the insulating panel. In this way inseeping rainwater is guided away from the ball hinge by the sealing strip of the wall.

[0050] In addition to the described ball hinge, wherein a protruding and a recessed part couple to each other, a simpler overlapping hinge is also possible, wherein the edge of the insulating panel situated at the top in the placed situation has a recess on the free side, which recess couples to a modified recess on the attaching side in the bottom edge of a higher placed insulating panel.

[0051] Figure 6 is a schematic top view serving to illustrate the use of the insulating panel according to the invention as formwork for a cast structure **603**, preferably a concrete structure. The insulating panels are placed in continuous planes on either side of the structure to be erected, wherein a connecting means **601** is provided in recesses **107** in order to consolidate the whole. Recesses **106** are filled with a suitable sealing means in order to prevent penetration of concrete liquid into the joins, shown here as a concrete formwork triangular prism **602**, preferably of PVC. The joins between the insulating panels and between the insulating panels and wedge **106** are shown enlarged in Figure 6 for the sake of clarity. The space between the thus formed formwork surfaces is filled up with the casting mortar, preferably concrete, which when cured will form structure **603.**

[0052] Figure 7 is a schematic top view serving to illustrate the use of the insulating panel according to the invention as insulating and finishing layer on an existing wall **701**. The insulating panels are adhered with their attaching side **103** to wall **701** at diverse locations by means of an adhesive **702**. Adhesive **702** preferably ensures an immediate stabilization of the insulating panel during the placing operations. The recesses provided at the position of the vertical side walls are filled with another adhesive **703,** preferably a foam-like adhesive. Sealing strips **704** are arranged in the recesses provided for this purpose so that a watertight whole is formed with the free sides **104** of the placed insulating panels.

[0053] Although the invention is described above on the basis of determined embodiments, the skilled person will appreciate that other variants of the stated features are possible which nevertheless fall within the scope of the described invention. The invention is thus not limited

by the described embodiments, but is defined by the appended claims.

Claims

1. Laminated insulating panel (100) with an attaching side (103) for placing against a wall, a free side (104) and a number of side walls (105), comprising a base layer (101) of an insulating material and a cover layer (102) of a mechanically stronger material, **characterized in that** at least one side wall (105) on the attaching side (103) is formed such that in the placed situation one or more spaces adjacent to the attaching side (103) are created between two insulating panels (100) arranged adjacently of each other.

2. Laminated insulating panel (100) as claimed in claim 1, **characterized in that** said at least one side wall (105) has a first recess (106) which extends over the whole periphery of the insulating panel (100).

3. Laminated insulating panel (100) as claimed in claim 1 or claim 2, **characterized in that** said at least one side wall (105) has a chamfering (106) of the edge of the insulating panel on the attaching side (103).

4. Laminated insulating panel (100) as claimed in any of the foregoing claims, **characterized in that** at least a part of the attaching side (103) has a structure improving the adhesion to the wall.

5. Laminated insulating panel (100) as claimed in any of the foregoing claims, **characterized in tha**t at least one of the side walls (105) comprises a second recess (107) for receiving a sealing strip.

6. Laminated insulating panel (100) as claimed in claim 5, **characterized in that** said second recess (107) is a groove substantially parallel to an edge of the free side (104) .

7. Laminated insulating panel (100) as claimed in claim 5 or claim 6, **characterized in that** the second recess (107) extends over the whole periphery of the insulating panel (100) .

8. Laminated insulating panel (100) as claimed in any of the foregoing claims, **characterized in that** the cover layer (102) consists substantially of cement.

9. Laminated insulating panel (100) as claimed in any of the foregoing claims, **characterized in that** the base layer (101) consists substantially of a foam-like plastic.

10. Laminated insulating panel (100) as claimed in claim 9, **characterized in that** said foam-like plastic comprises polystyrene.

11. Use of the laminated insulating panel (100) as claimed in any of the claims 1 to 10 as insulating layer on an upright wall.

12. Use of the laminated insulating panel (100) as claimed in any of the claims 1 to 10 as lost formwork for erecting a cast structure.

13. Method for arranging against a wall (701) a laminated insulating panel (100) with an attaching side (103), a free side (104) and a number of side walls (105), which insulating panel (100) comprises a base layer (101) of an insulating material and a cover layer (102) of a mechanically stronger material, wherein at least one side wall (105) on the attaching side (103) is formed such that in the placed situation one or more spaces adjacent to the attaching side (103) are created between two insulating panels (100) arranged adjacently of each other, the method comprising the steps of: arranging a first adhesive (702) between the wall and the attaching side (103); and arranging a second adhesive (703) in the one or more spaces adjacent to the attaching side (103).

14. Method as claimed in claim 13, wherein at least one of the side walls (105) comprises a second recess (107) for receiving a sealing strip, further comprising of: arranging a sealing strip (704) in the second recess (107).

15. Method for arranging a formwork for a cast structure (603) with a laminated insulating panel (100) with an attaching side (103), a free side (104) and a number of side walls (105), which insulating panel (100) comprises a base layer (101) of an insulating material and a cover layer (102) of a mechanically stronger material, wherein at least one side wall (105) on the attaching side (103) is formed such that in the placed situation one or more spaces adjacent to the attaching side (103) are created between two insulating panels (100) arranged adjacently of each other, the method comprising the steps of: arranging a sealing means (602) in the one or more spaces adjacent to the attaching side and arranging a connecting means (107) in the second recess.

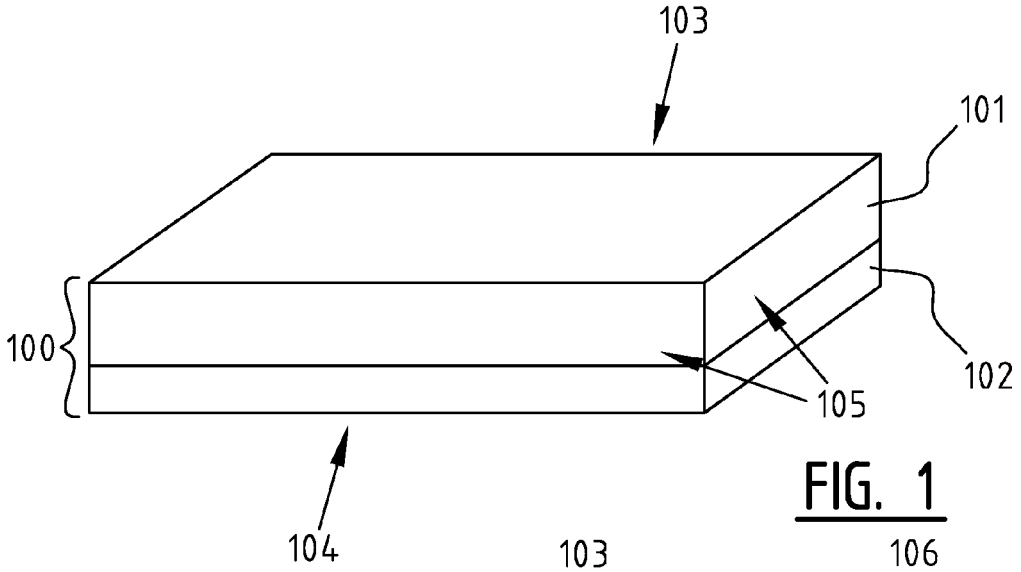

FIG. 1

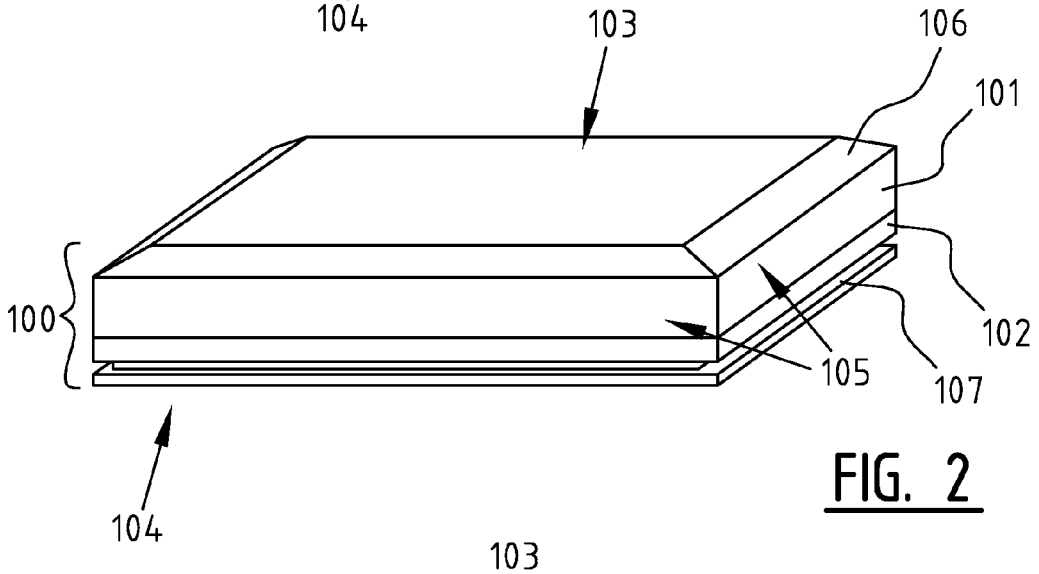

FIG. 2

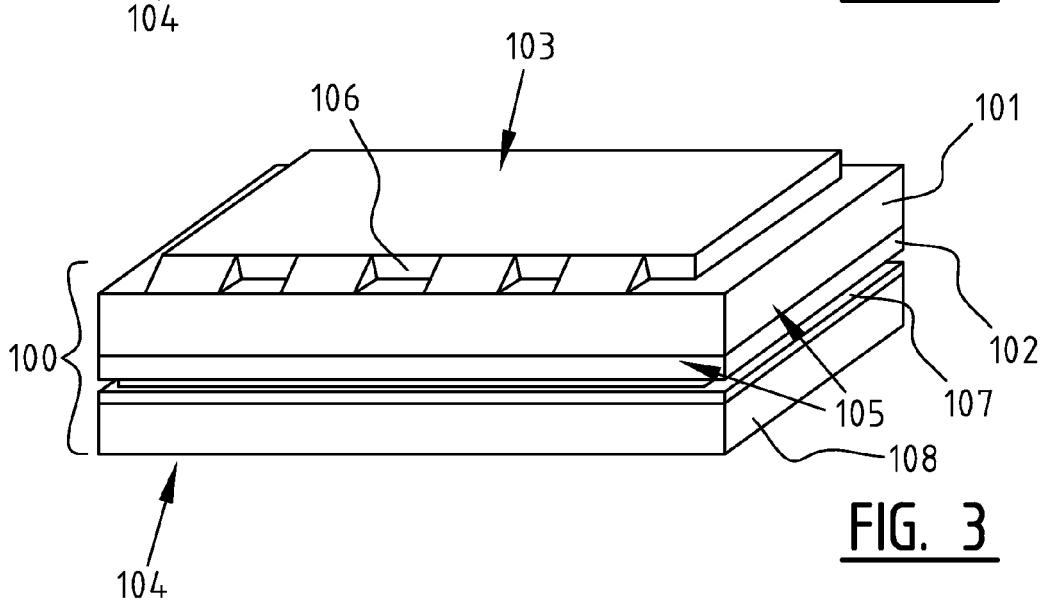

FIG. 3

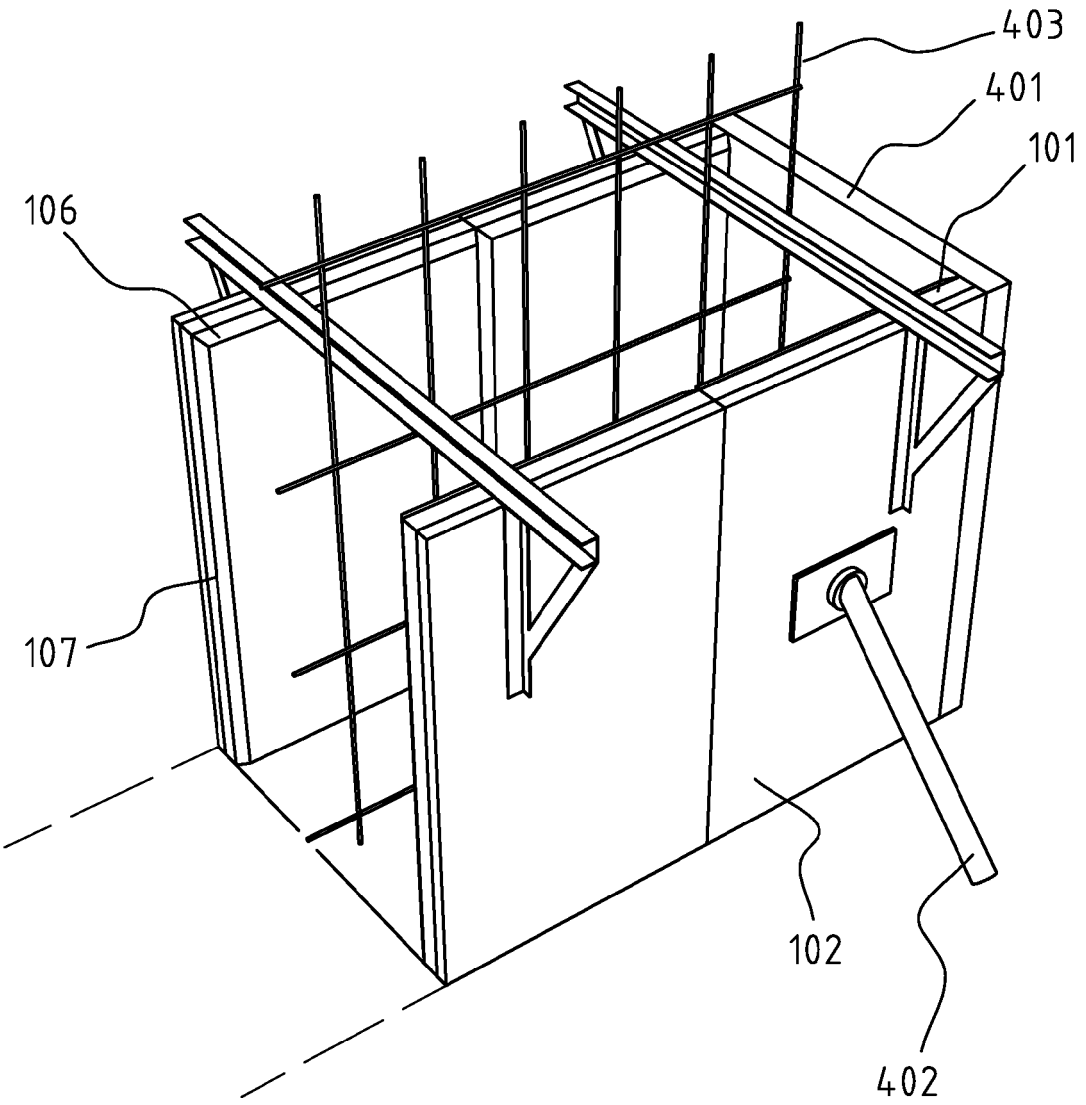

FIG. 4

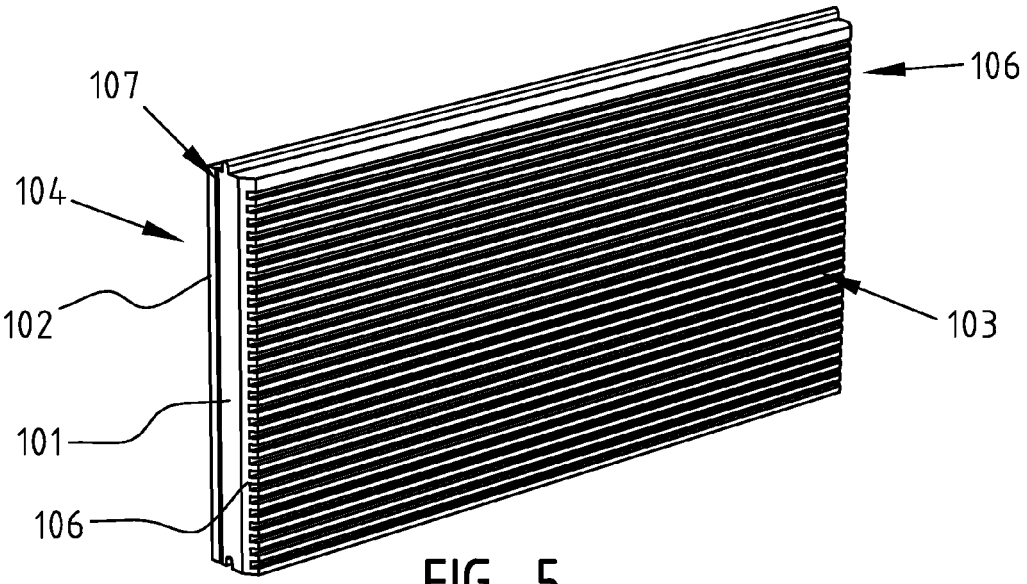

FIG. 5

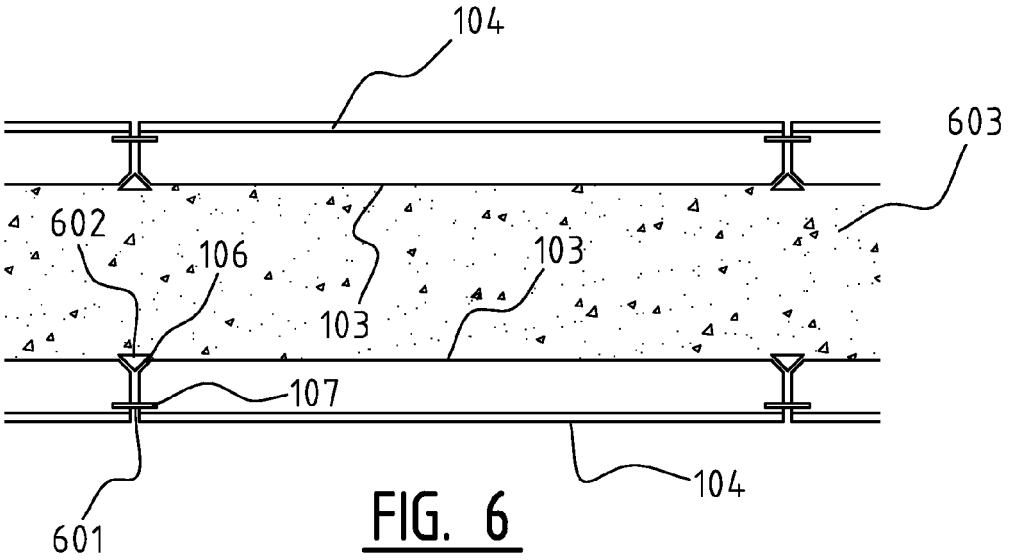

FIG. 6

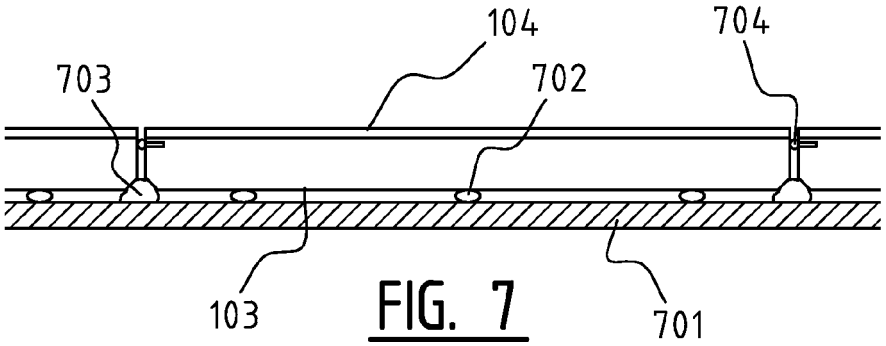

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 10 18 8500

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 485 590 A1 (MOURNAUD PATRICK [FR]) 31 December 1981 (1981-12-31)	1,3-5, 7-11,13, 14	INV. E04B1/76 E04B2/86
A	* page 3, last paragraph - page 4, line 25; figures *	2	
X	GB 1 202 871 A (STEADMAN WILLIAM D) 19 August 1970 (1970-08-19)	1-3,5, 7-12	
A	* page 2, line 90 - page 3, line 19 * * page 3, line 84 - line 88; figures 1,2 *	4	
X	FR 2 629 505 A1 (PAOLI JEAN [FR]; HERISSON DOMINIQUE [FR]) 6 October 1989 (1989-10-06)	1-3,5,6, 9-11	
A	* claims; figures *	12	
X	CH 345 140 A (BERTHIER GEORGES [CH]; DESJACQUES EDMOND [CH]) 15 March 1960 (1960-03-15)	1,3,5, 11,12	
A	* the whole document *	15	
X	EP 0 285 518 A2 (LE GROUPE MAXIFACT INC [CA]) 5 October 1988 (1988-10-05) * the whole document *	1,3,9, 10,12	TECHNICAL FIELDS SEARCHED (IPC) E04B
X	DE 299 04 476 U1 (OESTERR HERAKLITH GMBH [AT]) 2 June 1999 (1999-06-02)	1-3,12	
A	* page 6, paragraph 4 - paragraph 5; figure 4 *	15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 February 2011	Fordham, Alan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 18 8500

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-02-2011

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