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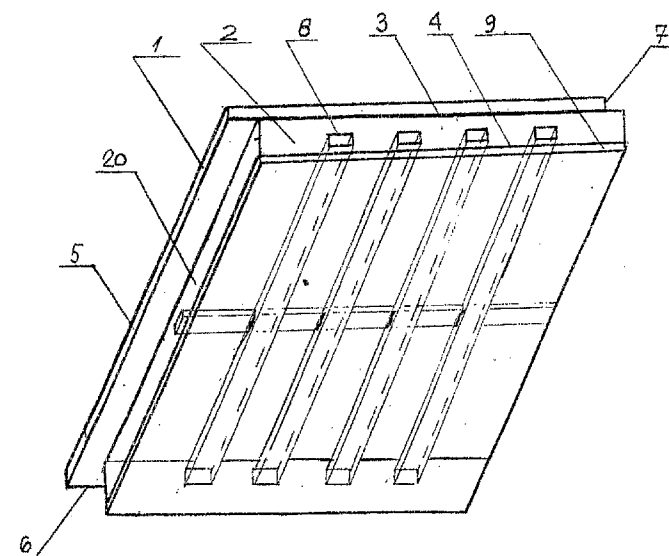
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(54) Title: THERMAL INSULATING COMPOSITE PANEL, METHOD OF ITS PRODUCTION AND BUILDING STRUCTURES FROM SUCH PANELS



(57) Abstract: The panel contains thermal insulating layer (2) made of polyurethane foam with external surface (3) and internal surface (4), strengthening framework consisting of arranged at a distance vertical ribs (8) and protective layer (9) placed on the internal surfaces (4) of the thermal insulating layer. An external facing layer (1) is glued to the external surface (3), one vertical edge (5) and the bottom horizontal edge (6) of which are protruded out of the thermal insulating layer (2) at a distance, and the other vertical edge (7) is shifted inward at the same distance, the load-bearing structure is entirely embedded in the thermal insulating layer (2) and the vertical ribs (8) are fixed to each other with one horizontal rib at least and the protective layer covers entirely the internal surface (4) of the thermal insulating layer (2).

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Thermal insulating composite panel, method of its production and building structures from such panels

Scope of technics

The invention relates to a thermal insulating composite panel for walls, floors, roofs and similar building structure for civil, industrial and other type of buildings, method of its production and building structures from such panels.

Former state of technics

A thermal insulating panel for wall construction, which includes a thermal insulating layer of polyurethane foam or porous plastic with protective layer of additional insulation plates glued to its internal surface, and a strengthening framework, consisting of vertical ribs placed at certain distance, embedded partially in the thermal insulating layer is known. The vertical ribs are protruded out of the thermal insulating layer at a distance equal to the thickness of the thermal insulating plates. There is a groove and corresponding protrusion in the vertical butts of the thermal insulating layer to join the panels with a tongue-and-groove joint. /1/

When a wall with such panels is constructed the external facing layer and the internal protective layers are made on the building site. There is no possibility to insert building installations in the panel's bodies, what leads to a big amount of additional operations and treatments on the building site

Object of the invention

The object of the invention is creation of a thermal insulating composite panel with wide sphere of application in the construction, considerable strength and durability, fast and simple assembling without additional treatments and operations, possibility to incorporate the building installations and to shape different surfaces and configurations with good aesthetic appearance. Another object of the invention is to

offer a method for composite panel production and building structures from such panels.

According to this invention the thermal insulating composite panel includes thermal insulating layer of polyurethane foam with internal surface and external surface, strengthening framework of vertical and horizontal ribs arranged on distance; and protective layer situated on the internal surface of the thermal insulating layer. An external facing layer is glued on the external surface of the thermal insulating layer. The lower edge and one vertical edge of the external facing layer are protruded out of the thermal insulating layer at a distance and the other vertical edge is shifted inward at the same distance. The strengthening framework is entirely embedded in the thermal insulating layer, the vertical ribs are attached to each other with one horizontal rib at least, and the protecting layer is covering entirely the surface of the thermal insulating layer. The connection between the vertical and the horizontal ribs is realized with known in the practice means such as welding, bolting, screwing etc.

The totally embedded in the thermal insulating layer strengthening framework, increases the strength of the panel and respectively allows forming big variety of shapes and sizes. The horizontal and the vertical ribs of the strengthening framework could be placed at distance from 10 mm to 2000 mm and could be from different building materials and elements, for example, hollow metal or plastic profiles in which cables or insulating gases could be arranged. Wood or plastic or reinforcement bars could be used also for the ribs construction.

The external face layer could be produced from different building materials such as stone-like materials (stone plates, terra-cotta, faience, etc.), or shaped metal sheet, or wooden lagging, or mineral plaster, or glass, or polystyrene, or other polymer materials, or combinations of these materials. In floor structures with composite panels the external face layer could be wooden flooring and/or laminate and/or porous rubber, or another suitable flooring.

The protective layer also could be made from different building materials, such as fire-resistant foil or cover, or stone-like materials (stone plates, terra-cotta, faience, etc.), or wooden lagging, or plaster, or gypsum board, or fiber-board, or glass, or combination of these materials

In one of the preferred embodiment of thermal insulating composite panel, the strengthening framework is reinforced with additional load-bearing structure, mounted

on the protective layer, consisting of two vertical columns with mainly rectangular cross-section, each of them having external wall, rear wall and front wall. The vertical columns are placed on the two vertical edges of the thermal insulating layer respectively, in a way, that their external walls and the vertical butts are in one plane. The vertical columns are attached to the vertical ribs of the strengthening framework with tapping screws or bolts, and at least two lateral load-bearing elements for attaching an internal facing layer are fixed on the front walls of the columns, at a distance. Mounting holes for attaching of the adjacent panels and special holes for the appropriate building installations are made at a distance in the vertical columns perpendicularly to the external walls. The attachment between the vertical columns and lateral load-bearing elements is realized by known in the practice means such as welding, bolting, screwing etc.

Different versions of realization of vertical columns are possible. In a preferable embodiment the vertical columns are made from U-shape metal or plastic profiles which have external wall with rear and front walls bended to it. The U-shape profiles are located on the vertical edges of thermal insulating layer with the bended walls oriented inward in a way that their external walls and vertical butt are located in one plane. The U-shape profiles are fixed with their rear walls to the vertical ribs of strengthening framework by self-tapping screws or bolts, the mounting and the special holes are made in the external walls. The bended sides of U-shape profiles could have equal or different width. When necessary, a fixing hole for mounting the panel to the guides in the top and/or in the bottom end of U-shape profile walls, could be made.

In another possible version of realization the vertical columns are from wooden profile with square or rectangular cross-section, or metal profile with box-like cross-section.

The internal facing layer for the embodiment of composite panel with strengthening structure also could be made of stone-like materials, or wooden lagging, or plaster, or gypsum board, or fiber-board, or glass, or polystyrene, or polycarbonate or another polymer and textile materials, leather or combinations from these materials.

According to the invention the thermal insulating composite panel in all the embodiments is with high degree of completeness and due to combination of constructive materials could be produced in different sizes and shapes including curved

forms. Openings for doors and windows with previously provided limiting profiles could be done in the panel. These openings could be with different shapes and sizes too.

According to the invention the method of producing of thermal insulating composite panel comprises the next sequence of operations:

- arrangement of the external facing layer in a matrix (not shown) with the facing surface

toward the bottom of the matrix;

- placing of the protective layer on the cover of the matrix, and bolting of the strengthening framework of vertical ribs, fixed to each other with at least one horizontal

rib on this layer;

- injecting of the thermal insulating layer, consisting of polyurethane foam with thickness

according the design in the matrix warmed up to 50 °C, closing and tightening of the matrix cover;

- opening of the matrix and taking out of the panel after hardening of the polyurethane foam from 5 min to 30 min.

When shaping an opening in the thermal insulating composite panel, the method comprises the next sequence of operations:

- arrangement of the external facing layer in a matrix (not shown) with the facing surface

toward the bottom of the matrix;

- shaping of the openings for doors and/or windows with previously provided limiting profiles in the protective layer placed on the cover of the matrix and bolting of the strengthening framework on this layer;

- injecting of the thermal insulating layer, consisting of polyurethane foam with thickness

according the design in the matrix warmed up to 50 °C, closing and tightening of the matrix cover;

- opening of the matrix and taking out of the panel after hardening of the polyurethane foam from 5 min to 30 min.

The invention also concerns about building structures constructed by attached thermal insulating panels, each of them consisting of polyurethane foam thermal insulating layer with glued to it external facing layer, one vertical edge and the bottom horizontal edge of which are protruded out of the thermal insulating layer, and the other vertical edge is shifted inward at the same distance. A strengthening framework is embedded in the thermal insulating layer, consisting of vertical ribs placed at a distance, attached with horizontal ribs. The protective layer is installed on the internal surface of the thermal insulating layer.

The strengthening framework consisting of two vertical columns with rectangular cross-section mainly is reinforced with load-bearing structure mounted to the protective layer. Every vertical column has external wall, rear wall and front wall, the columns are placed on the two vertical edges of the thermal insulating layer in a way that their external walls and vertical butt of the thermal insulating layer are in one plane. The vertical columns are fixed to the vertical ribs of the strengthening framework by tapping screws or bolts, and lateral load-bearing elements are fixed, at a distance on the columns front walls. The vertical columns of the adjacent panels are connected to each other by bolts passing through mounting holes, in other special holes building installations are arranged. The internal facing layer is attached to the lateral load-bearing elements, and a sealant is introduced in the gaps between the panels. There are different versions of realization of the vertical columns by U-shape profiles, or wooden profiles, or metal profiles with box-like cross-section.

In one version of realization of the building construction, an additional insulation from thermal insulating and/or sound insulating and/or fire-resistant material is mounted in the empty space between the two vertical columns and the lateral load-bearing elements of each panel.

The thermal insulating composite panel according this invention is compact with wide area of application in the building structures. It is with considerable strength and durability, there is possibility for fast and simple mounting without additional treatments and operations. The panel sizes can be specified in a way that prefabricated building and facing materials, could be used thus reaching technology without waste.

The configuration of the thermal insulating composite panel gives the possibility to produce plane and curved surfaces, and slopes, necessary for precise mounting. External and interior walls, floors, roofs etc. could be built by these panels.

Description of the appended drawing figures

The invention is described with examples of realization, shown on the appended figures, wherein:

Figure 1 shows a view of the internal side of thermal insulating composite panel, according to the invention.

Figure 2 shows a view of the internal side of thermal insulating composite panel, in the embodiment with load-bearing structure, in which the vertical columns are made by U-shape profiles with different width of the bended walls.

Figure 2a shows a view of the internal side of thermal insulating composite panel, in the embodiment with load-bearing structure, where one of the vertical columns is with box-like cross-section, and the other is made by U-shape profile with equal width of the bended walls.

Figure 2b shows a view of the internal side of thermal insulating composite panel, in the embodiment with load-bearing structure, in which the both vertical columns are from wooden profiles with rectangular cross-section

Figure 3 shows a view of the internal side of thermal insulating composite panel, with an opening for a door.

Figure 4 shows a view from the external side of thermal insulating composite panel, with an opening for a door.

Figure 5 shows a partial view of the bottom side of the vertical column with cut-off opening.

Figure 6 shows a partial view of the top side of the vertical column with cut-off opening.

Figure 7 shows a view of the external side of thermal insulating composite panel, with an opening for a window.

Figure 8 shows a partial view of the external side of thermal insulating composite panel, with curved form.

Figure 9 shows a partial cross-sectional view through a building structures constructed by thermal insulating composite panels.

Figure 10 shows a view of a wall, built by thermal insulating composite panels.

Examples of realizations of the invention

The thermal insulating composite panel, shown on the figure 1, consists of polyurethane foam thermal insulating layer (2), with external surface (3) and internal surface (4). The external facing layer is glued on the external surface (3), where one of the vertical edges (5) and the lower horizontal edge (6) are protruded out of the thermal insulating layer (2), and the other vertical edge (7) is shifted inward at the same distance. The strengthening framework consisting of vertical ribs (8) placed at a distance is entirely embedded in the thermal insulating layer (2), vertical ribs (8) are fixed to each other with at least one horizontal rib. The protection layer (9) covers entirely the internal surface (4) of the thermal insulating layer (2). The external facing layer (1) is realized from stone-like material (stone plates, terra-cotta, faience etc.). The vertical ribs (8) and the horizontal ribs are from hollow metal, or plastic profiles. The internal facing layer (9) is from gypsum board, glued on the protective layer made by fire-resistant foil.

Figures 2, 2a and 2b show embodiments of the thermal insulating composite panel designed for use in wall structure, where the strengthening framework is reinforced with additional load-bearing structure mounted to the protective layer (9). According to the invention the load-bearing structure consists of two vertical columns made of U-shape profiles (10) with external wall (11) bended rear wall (12) and bended front wall (13). The U-shape profiles (10) are placed on the two vertical edges of the thermal insulating layer (2) respectively, the bended walls are oriented inward in a way that their external walls (11) and the vertical butts (20) of the thermal insulating layer (2) are in one plane. The rear bended walls (12) are attached to the vertical ribs (8) of the strengthening framework by tapping screws and at least two lateral load-bearing elements (18) for attaching an internal facing layer are fixed at a distance to the front bended walls (13). Mounting holes (14) for connection with the adjacent panels and also special holes (15) for installations are made at certain distance in the wall (11) of

the U-shape profiles (10). A fixing hole (16) for fixing of the panel to the guide (21) attached to the floor construction is made in the bottom end of the walls (11). The U-shape profiles (10) are made from cold-bended metal profiles with different sizes of the bended walls. The lateral load-bearing elements (18) are metal and holes for attaching of an internal facing layer are made in them at a distance.

Figure 2a shows an embodiment with load-bearing structure one vertical column of which is with box-like cross-section, and the other is by of U-shape profile with equal width of the bended walls.

Figure 2b shows an embodiment with load-bearing structure, where the both vertical columns are made of wooden profile with rectangular cross-section.

Figure 3 shows an embodiment of thermal insulating composite panel intended for a wall structure realized according to the figure 2, with an opening for a door, and on figure 7 – a panel with an opening for a window.

Figures 4 and 7 show embodiments of the external facing layer (1), made by combination of terra-cotta and fibran. An internal facing layer (19) made of gypsum-board is attached to the front bended walls (13) of the U-shape profiles.

Figure 8 shows part of thermal insulating composite panel realized in wavy form. It is very suitable for interior walls.

Figure 9 shows a cross-section view of building structure consisting of thermal insulating composite panels connected to each other, according to the invention. Each panel has a thermal insulating layer made of polyurethane foam with external facing layer (1) glued to it, one vertical edge (5) of which and the bottom horizontal edge (6) are protruded out of the thermal insulating layer (2) at a distance, and the other vertical edge (7) is shifted inward at the same distance. The strengthening framework embedded in the thermal insulating layer (2) is made of arranged at a distance vertical ribs, connected with horizontal ribs. The protective layer (9) is placed on the internal surface (4) of the thermal insulating layer (2). The load-bearing structure consists of two vertical stands made of U-shape profiles, which profiles (10) are placed on the two vertical edges of the thermal insulating layer (2) with their bended walls oriented inward, in a way that their walls (11) and the butts (20) of the thermal insulating layer (2) are in one plane. The rear bended walls (12) of the U-shape profiles (19) are attached to the vertical ribs (8) of the strengthening framework and at least two lateral load-bearing elements (18) are fixed at a distance on the front bended walls (13). The

U-shapes profiles (10) of the adjacent panels are connected with bolts passing through the mounting holes (14) and the building installations are inserted in the special holes (15). On the lateral load-bearing elements (18) an internal facing layer is attached, and in the gaps between the panels a sealant (22) is introduced. An additional insulation (17) from thermal insulating and/or sound-insulated and/or fire-resistive material is mounted in the space between the both U-shape profiles (10) and the lateral load-bearing elements (18) of each panel.

Figure 10 shows part of a wall erected of thermal insulated composite panels, where every subsequent panel is mounted between guides (21) by means of fixing holes (16) corresponding to the contour of the guides (21), the panels are fixed to every guide (21). Metal plates (23) are embedded in the concrete of the floor structures in the vertical columns places where the guides and the vertical columns are fixed.

/1/. WO 9534721/1995-12-21/NESTE OY (FI);
(IPC 1-7): E04B 1/88;E04C 2/22.

Items specification

- (1) – external facing layer
- (2) – thermal insulating layer from polyurethane foam
- (3) – external surface of the thermal insulating layer
- (4) – internal surface of the thermal insulating layer
- (5) – protruded vertical edge of the external facing layer
- (6) – bottom horizontal edge of the external facing layer
- (7) – shifted inward vertical edge of the external facing layer
- (8) – vertical ribs of the strengthening framework
- (9) – protective layer
- (10) – vertical column of the load-bearing structure
- (11) – external wall of the vertical column
- (12) – rear wall of the vertical column
- (13) – front wall of the vertical column
- (14) – mounting hole for connecting the columns each to other
- (15) – a hole in the column for building installations
- (16) – a fixing hole
- (17) – additional insulation
- (18) – lateral load-bearing element for internal facing layer
- (19) – internal facing layer
- (20) – vertical butt of the thermal insulating layer
- (21) – guide
- (22) – a sealant in the gap
- (23) – metal plate

Claims

1. Thermal insulating composite panel containing thermal insulating layer (2) made of polyurethane foam, with external surface (3) and internal surface (4), strengthening framework consisting of arranged at a distance vertical ribs (8) and protective layer (9) placed on the internal surface (4) of the thermal insulating layer (2) **characterized in that** an external facing layer (1) is glued on the external surface (3) one vertical edge (5) and the bottom horizontal edge (6) of which are protruded out of the thermal insulating layer (2) at a distance and the other vertical edge (7) is shifted inward at the same distance, where the strengthening framework is entirely embedded in the thermal insulating layer (2), the vertical ribs (8) are fixed to each other with at least one horizontal rib, and the protective layer (9) covers entirely the internal surface (4) of the thermal insulating layer (2).

2. Thermal insulating composite panel, according to claim 1, **characterized in that** the strengthening framework is reinforced with additional load-bearing structure mounted to the protective layer (9) consisting of two vertical columns with rectangular cross-section, each of them having external wall (11), rear wall (12) and front wall (13), the vertical columns are placed on the vertical edges of the thermal insulating layer (2) in a way that their external walls (11) and the vertical butt ends (20) of the thermal insulating layer (2) are in one plane, the vertical columns (10) are attached to the vertical ribs (8) of the strengthening framework by tapping screws or bolts, and to the front walls (13) at least two lateral load-bearing elements (18) for attaching an internal facing layer are fixed at a distance, mounting holes (14) for connecting the adjacent panels, as well as special holes (15) for installations are made at a distance in the vertical columns (10) perpendicularly to the external walls(11).

3. Thermal insulating composite panel according to claim 2 **characterized in that** the vertical columns (10) are from U-shape metal or plastic profile with external wall (11) and bended to it rear wall (12) and front wall (13), the U-shape profiles are arranged in the both vertical edges of the thermal insulating layer (2) respectively with its bended sides inward, in a way that their external walls (11) and the vertical

butts of the thermal insulating layer (2) are in one plane, U-shape profiles are attached to the vertical ribs (8) of the strengthening framework with their rear walls (12) by tapping screws or bolts and the mounting holes (14) and the special holes (15) are made in the external walls (11).

4. Thermal insulating composite panel according to claim 2 **characterized in that** the vertical columns (10) are from wooden profiles with rectangular or square cross-section or from metal profile with box-like cross-section.

5. Thermal insulating composite panel according to claim 3 **characterized in that** a fixing opening (16) for mounting of the panel to the guide (21) is made in the top and/or the bottom end of the external wall (11) of the U-shape profiles.

6. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** the external facing layer (1) is made from stone-like materials or metal corrugated sheet or wooden lagging, or mineral plaster, or glass, or polystyrene, or other polymeric materials, or combination of these materials.

7. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** the vertical ribs (8) and the horizontal ribs of the strengthening framework are made of hollow metal or plastic profiles and are positioned on distance from 10 mm to 2000 mm.

8. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** the vertical ribs (8) and the horizontal ribs of the strengthening framework are made from wooden profiles or reinforcement bars.

9. Thermal insulating composite panel according to claim 1 **characterized in that** the protective layer (9) is made from fire-resistive foil or cover and/or stone-like materials or wooden lagging or plaster or gypsum-board or fiber-board or glass or combination of these materials.

10. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** the external facing layer (1) is made from wooden floorings and/or laminate flat-sheets or porous rubber.

11. Thermal insulating composite panel according to claim 2 **characterized in that** the protective layer (9) is from fire-resistive foil or cover.

12. Thermal insulating composite panel according to claim 2 **characterized in that** the internal facing layer (19) is from stone-like materials, or wooden lagging,

or plaster, or gypsum-board, or fiber-board, or glass, or combination of these materials .

13. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** its cross-section has a curved form.

14. Thermal insulating composite panel according to claims 1 and 2 **characterized in that** there are openings in it for doors and/or windows formed by prefabricated limiting profiles.

15. Production method of thermal insulating composite panel according to claim 1 **characterized** with the next sequence of operations:

- the external facing layer is arranged in a matrix (not shown) with the facing surface toward the bottom of the matrix;
- the protective layer is placed on the cover of the matrix, the strengthening framework of vertical ribs, fixed to each other with at least one horizontal rib is bolted on this layer;
- the thermal insulating layer, consisting of polyurethane foam with thickness according the design is injected in the matrix warmed up to 50 °C, the matrix cover is closed and tightened;
- the matrix is opened and the panel is taken out after hardening of the polyurethane foam from 5 min to 30 min.

16. Production method of thermal insulating composite panel according to claim 15 **characterized** with the next sequence of operations:

- the external facing layer is arranged in a matrix (not shown) with the facing surface toward the bottom of the matrix;
- the openings for doors and/or windows are shaped with prefabricated limiting profiles in the protective layer placed on the cover of the matrix, the strengthening framework of vertical ribs, fixed to each other with at least one horizontal rib is bolted on this layer;
- the thermal insulating layer, consisting of polyurethane foam with thickness according the design is injected in the matrix warmed up to 50 °C, the matrix cover is closed and tightened;
- the matrix is opened and the panel is taken out after hardening of the polyurethane foam from 5 min to 30 min.

17. Building construction from connected to each other thermal insulating composite panels **characterized in that** every composite panel consists of thermal insulating layer (2) made of polyurethane foam with external facing layer (1) glued to it one vertical edge (5) and the bottom horizontal edge (6) of which are protruded out of the thermal insulating layer (2) at a distance and the other vertical edge (7) is shifted inward at the same distance; a strengthening framework consisting of arranged at a distance vertical ribs (8) connected with horizontal ribs embedded into the thermal insulating layer (2); protective layer (9) placed on the internal surface (4) of the thermal insulating layer (2) and a strengthening framework mounted to the protective layer (9), consisting of two vertical columns (10) with rectangular cross-section each having external wall (11), rear wall (12) and front wall (13), the vertical columns (10) are placed on the vertical edges of the thermal insulating layer (2) in a way that their external walls (11) and the vertical butts (20) of the thermal insulating layer (2) are in one plane, the vertical columns (10) are attached to the vertical ribs (8) of the strengthening framework by tapping screws or bolts and lateral load-bearing elements (18) are fixed at a distance on the front walls (13), the vertical columns (10) of the adjacent panels are connected to each other by bolts passing through mounting holes (14), and the building installations are put in the special holes (15), internal facing layer (19) is attached to the lateral load-bearing elements (18) and a sealant (22) is introduced in the gaps between the panels.

18. Building construction according to claim 17 **characterized in that** in the empty space between the both vertical columns (10) and the lateral load-bearing elements (18) of each panel additional insulation (17), made from thermal insulating and/or sound-insulating and/or fire-resistive material is mounted.

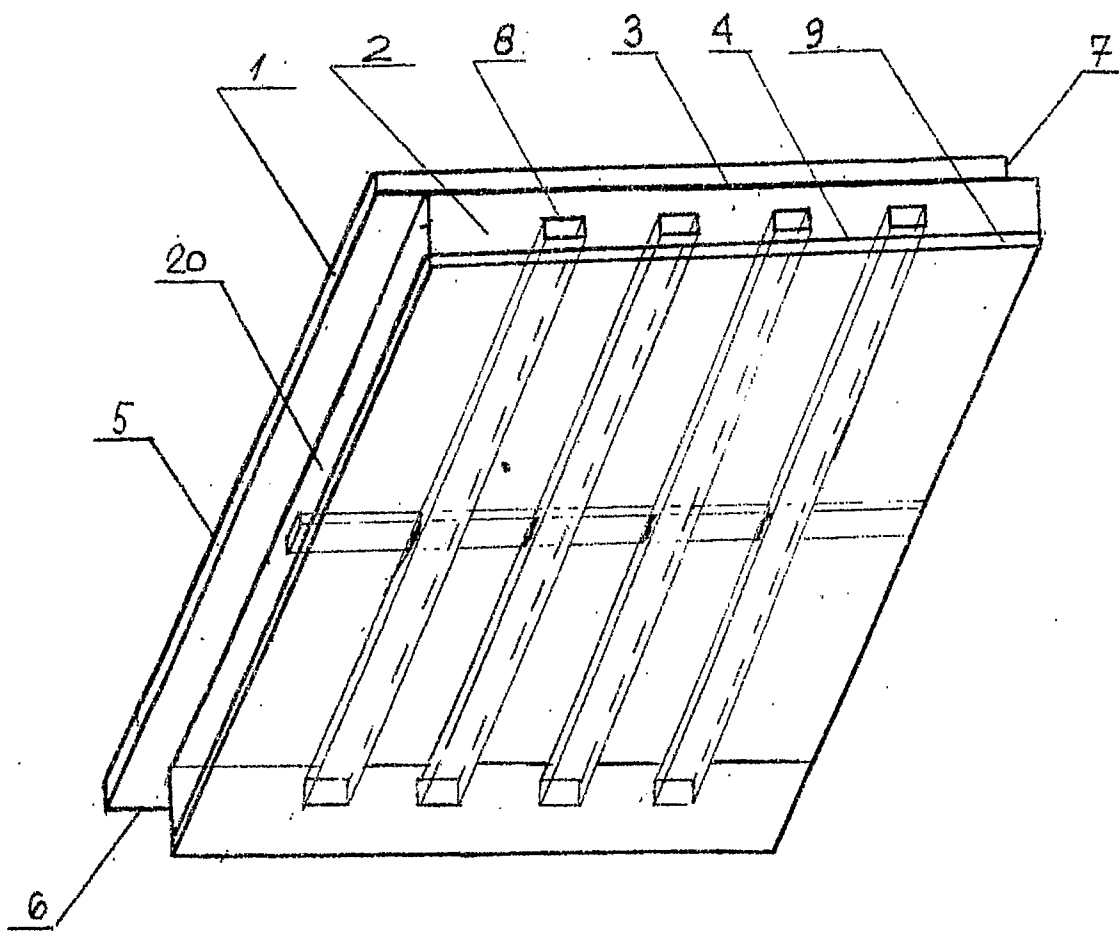


Fig.1

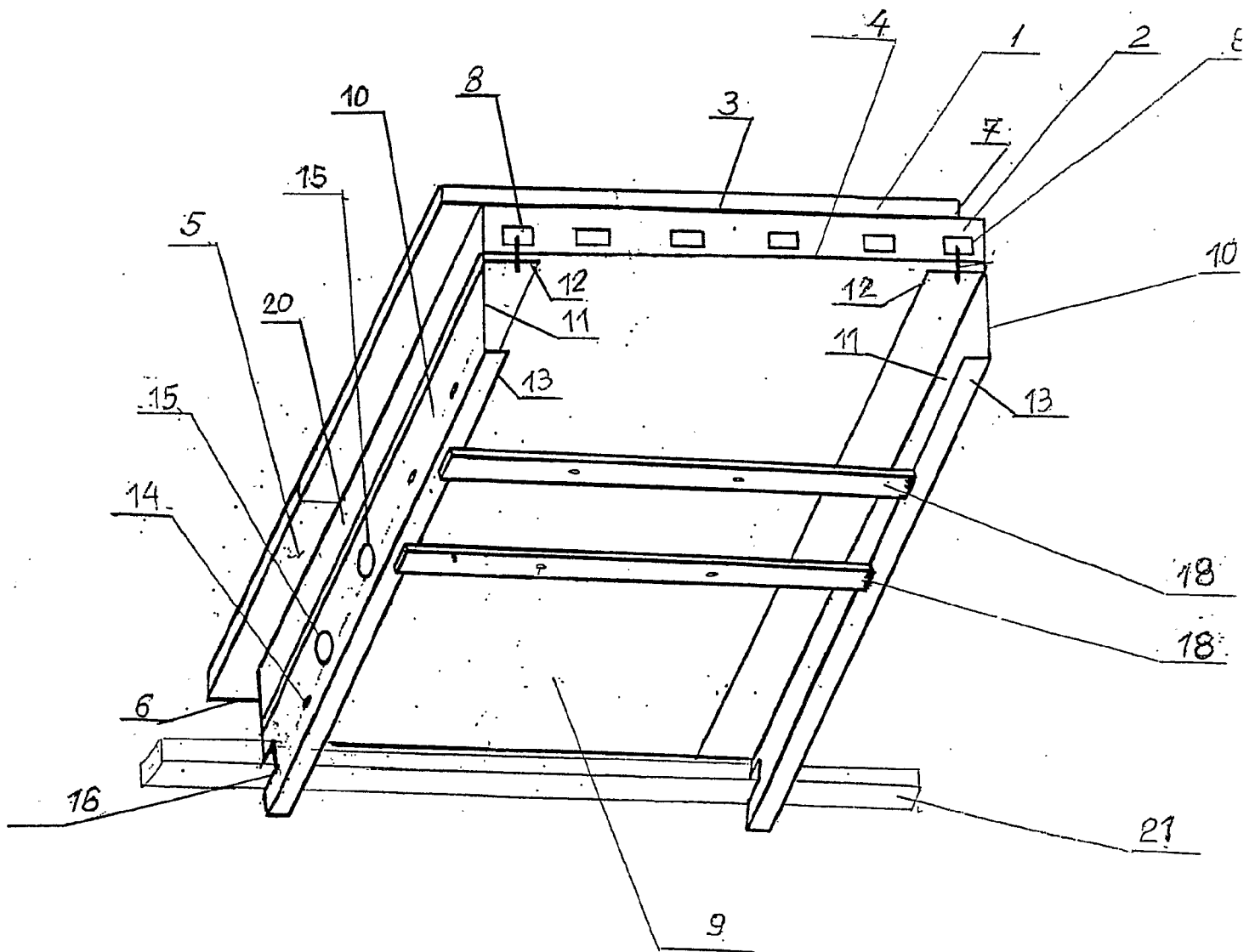


Fig.2

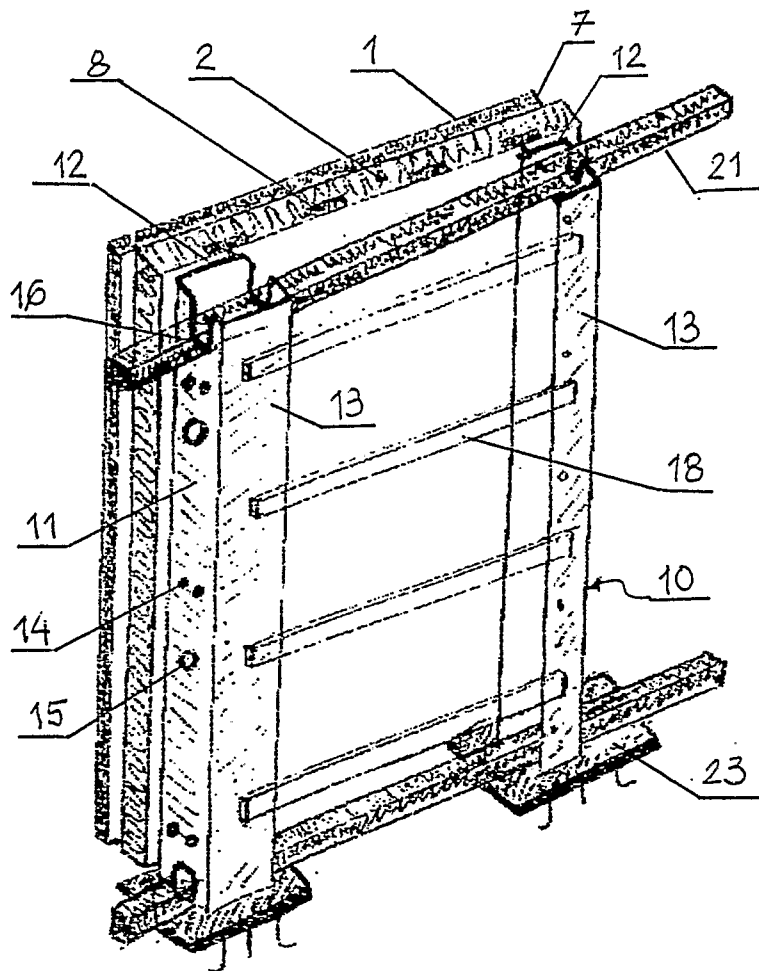


Fig.2a

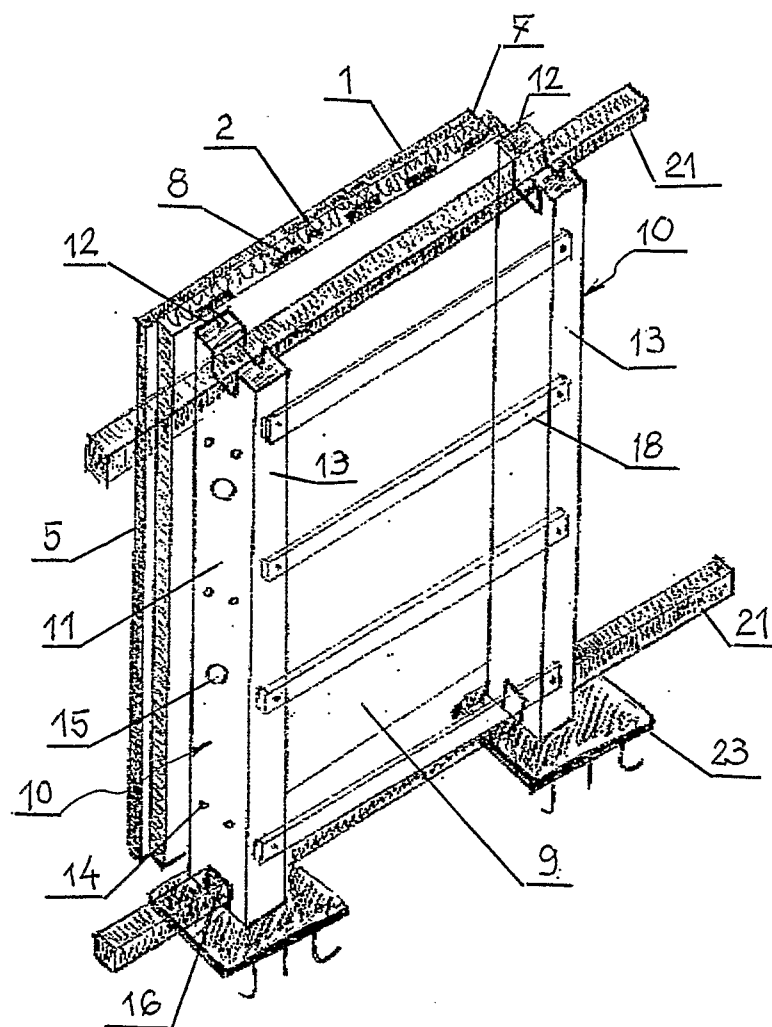


Fig.2b

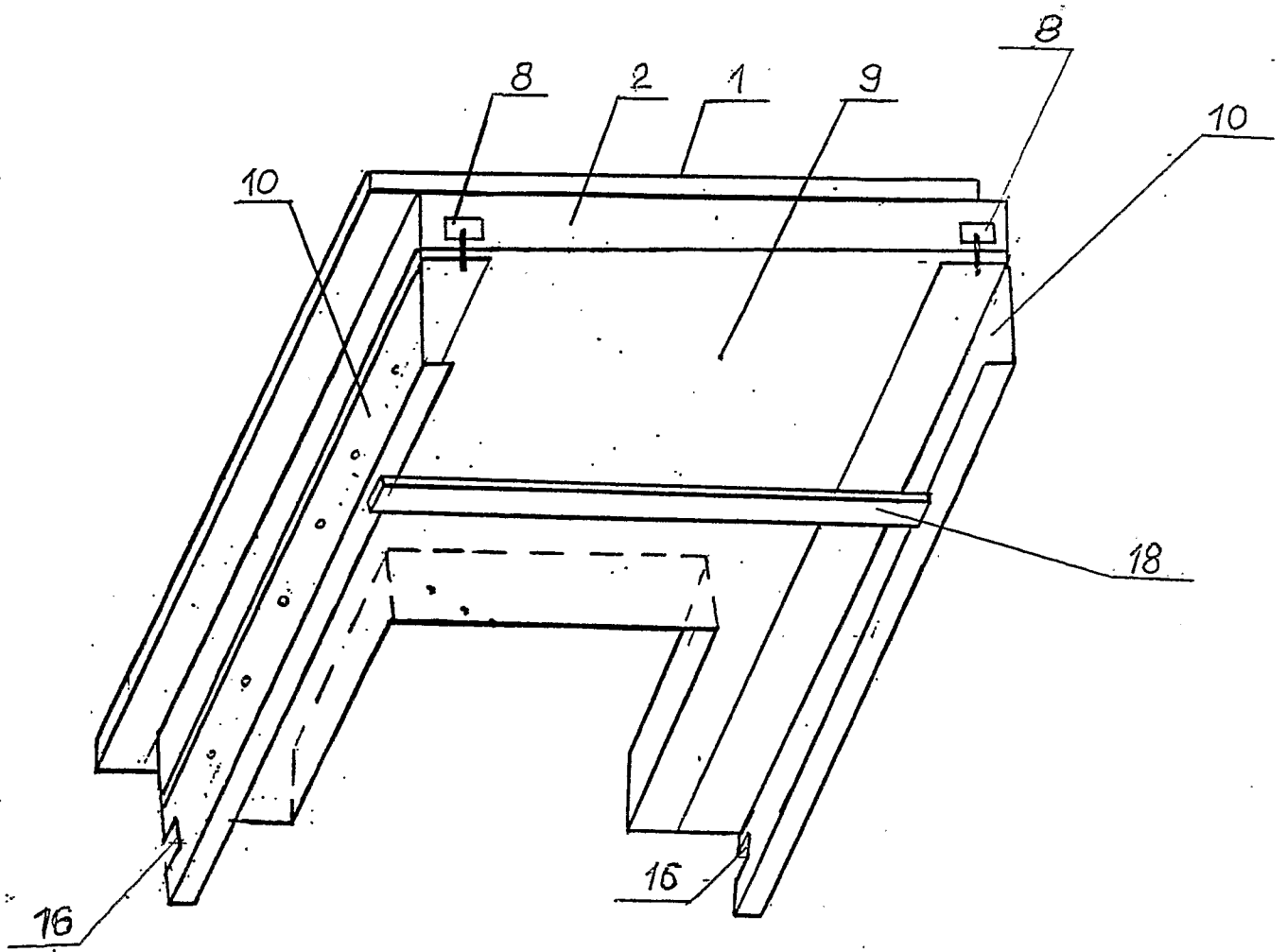


Fig.3

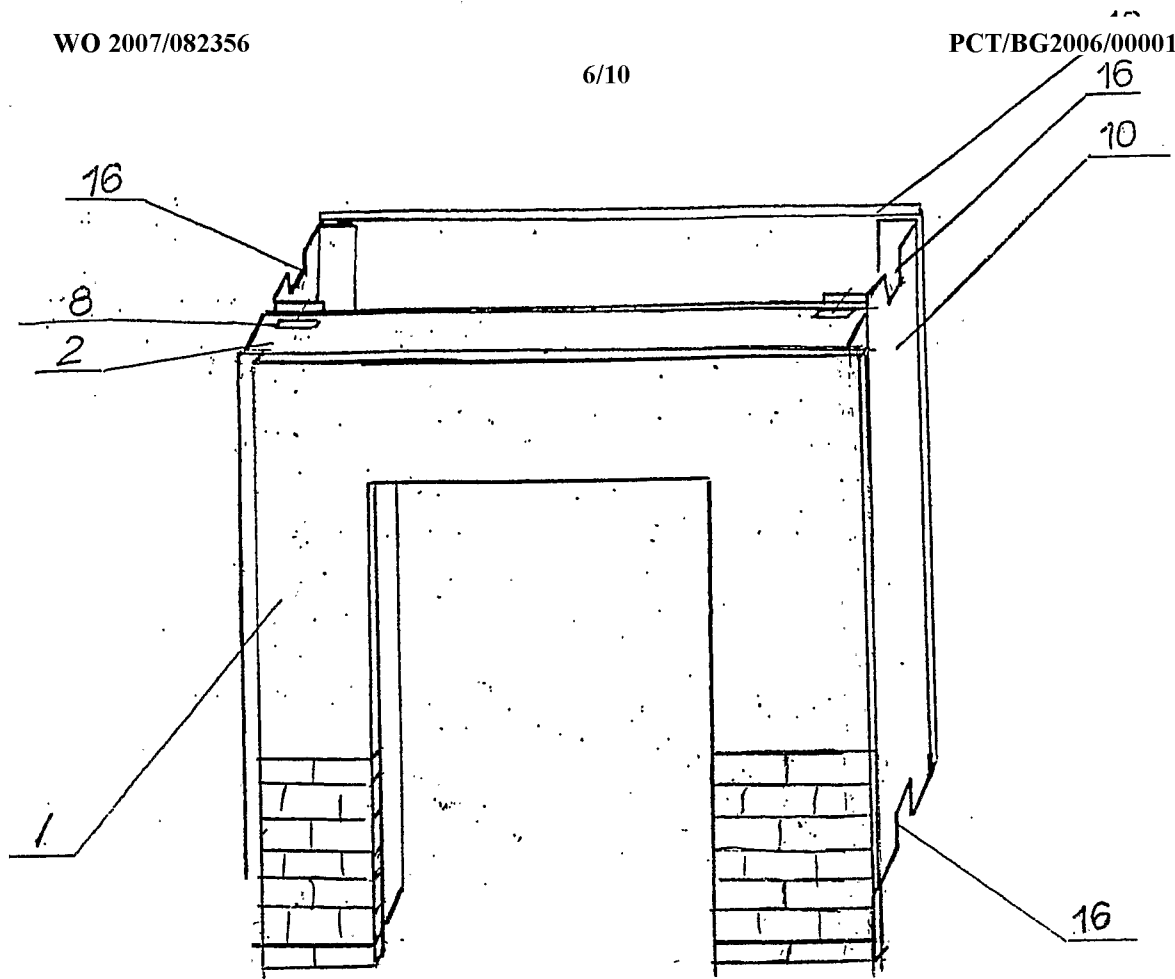


Fig.4

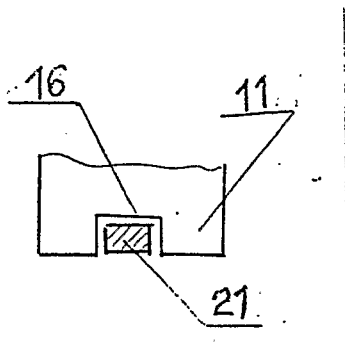


Fig.5

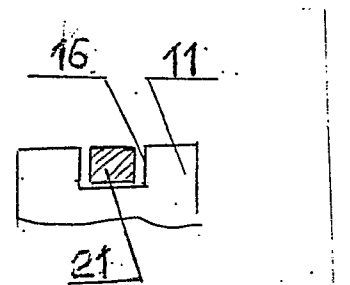


Fig.6

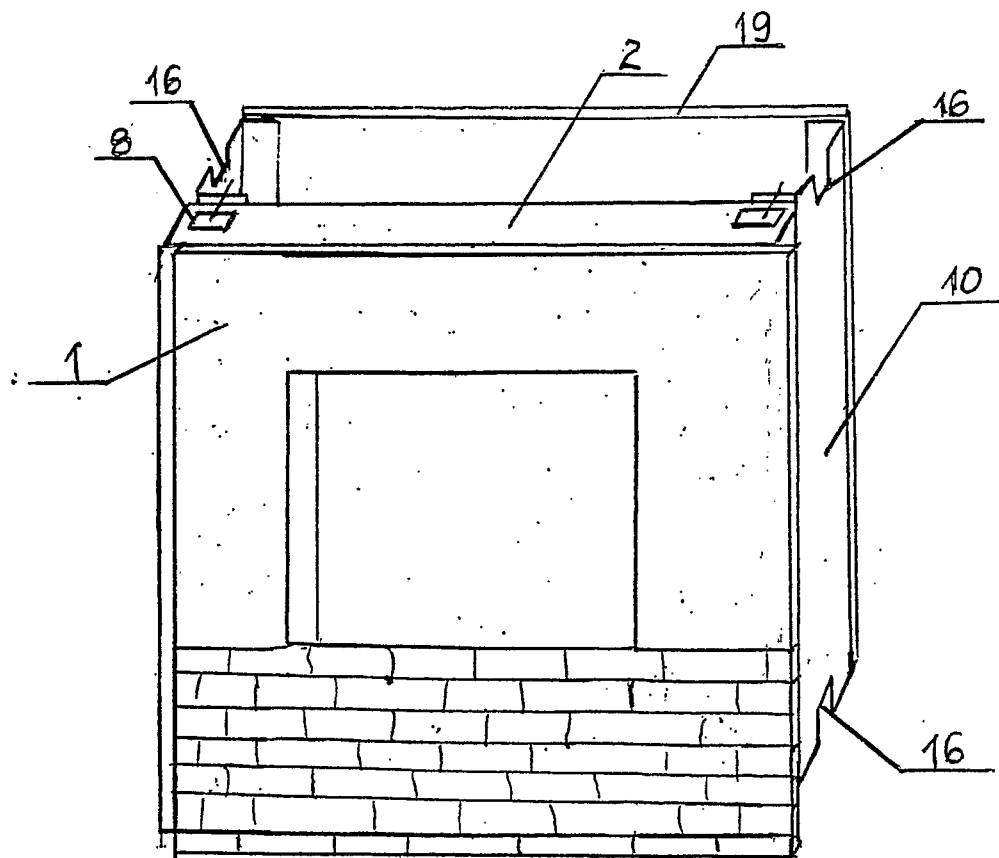


Fig.7

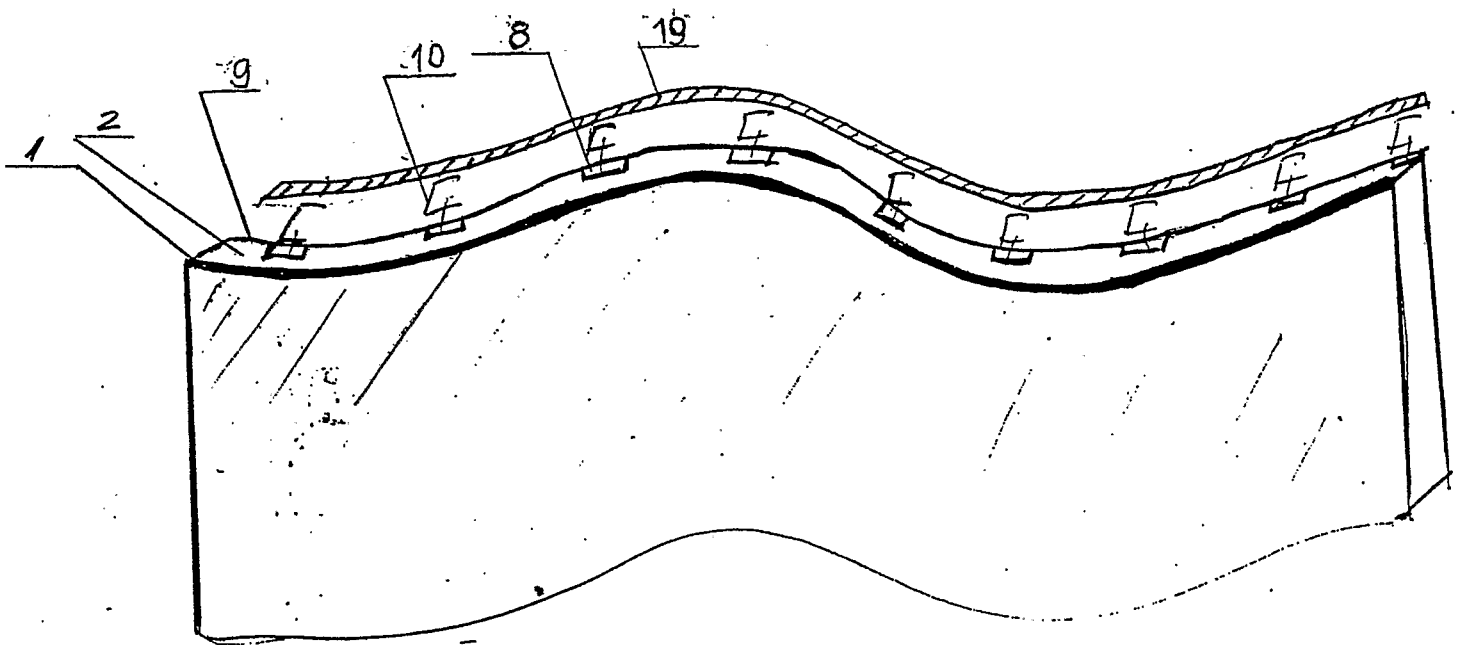


Fig.8

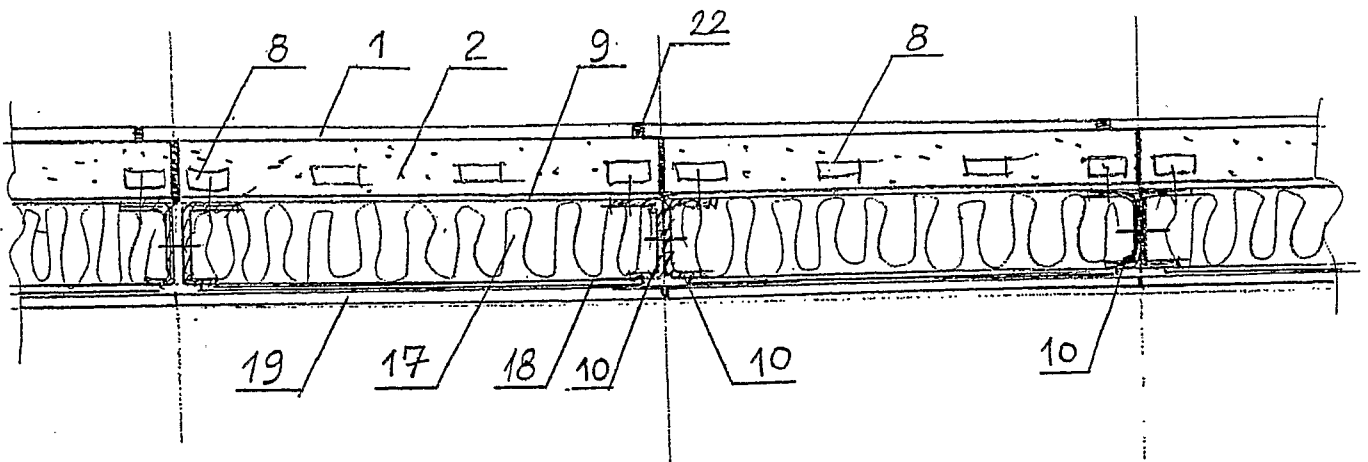


Fig.9

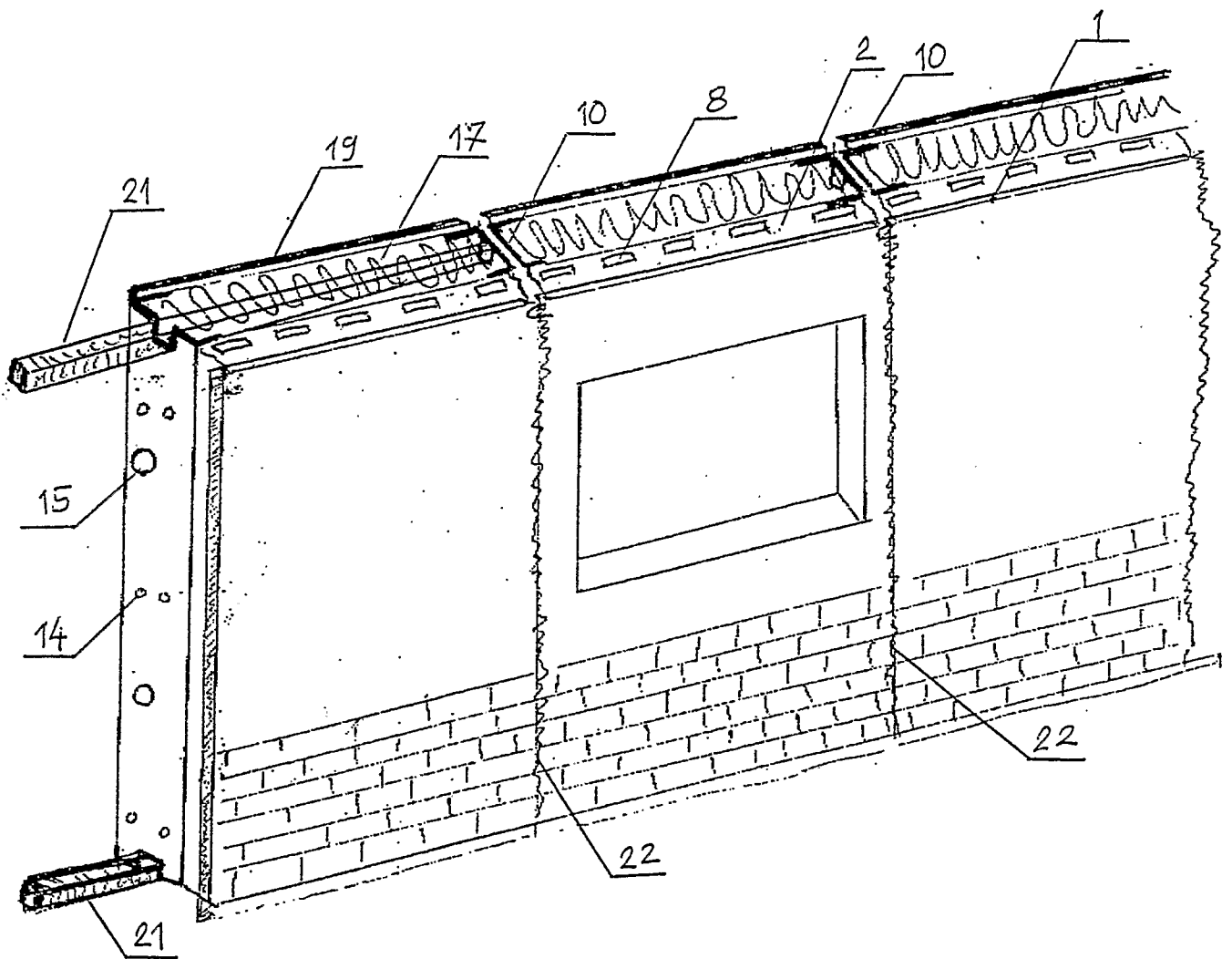


Fig.10

INTERNATIONAL SEARCH REPORT

International application No
PCT/BG2006/000014

A. CLASSIFICATION OF SUBJECT MATTER

INV. E04B1/76 E04B1/14 E04C2/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04B E04C

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95/20711 A (RAMIREZ, PETER, B) 3 August 1995 (1995-08-03) page 6, lines 20-23 page 11, lines 25-28 page 12, lines 12,13 page 13, lines 4-15 page 16, lines 26-28 page 17, lines 11-13; figures 1,5,9,10	1,6,14
A	US 2003/033774 A1 (PORTER WILLIAM H) 20 February 2003 (2003-02-20) figures 4A,7	1,2,17
A	US 5 505 031 A (HEYDON ET AL) 9 April 1996 (1996-04-09) column 18, lines 45-48; figures 6,11,12,14	1,17
	----- -/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

26 September 2006

Date of mailing of the international search report

02/10/2006

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INTERNATIONAL SEARCH REPORT

International application No

PCT/BG2006/000014

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4 349 796 A (CHIN ET AL) 14 September 1982 (1982-09-14) figure 9 -----	1,17
A	US 4 813 193 A (ALTIZER ET AL) 21 March 1989 (1989-03-21) the whole document -----	1,17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/BG2006/000014

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