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(54) **A high-insulation concrete panel, its method of production and its use**

(57) A high-insulation concrete panel (18) as well as a method of producing a high-insulation concrete panel (18) made in a lightweight structure, having a load-bearing rear wall (8), an insulation (11,14), and which eliminates thermal bridges in the finished construction and also satisfies the requirements of resistance to moisture, maximum heat accumulation capacity, load-bearing structure for storey partitions, low weight, optimized thickness, great tightness after mounting, cast tight connections, great production friendliness, and where as much work as possible is carried out under cover at the factory. Use of the high-insulation concrete panel (18) is also described.

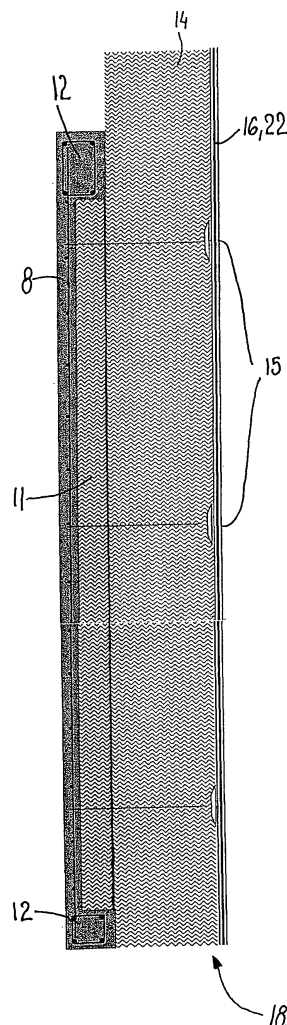


Fig. 2

Description

[0001] The present invention relates to an insulated concrete panel and a method of producing an insulated concrete panel comprising a rear wall with reinforcement, insulation and render or a front plate.

[0002] The invention also relates to use of the insulated concrete panel.

The prior art

[0003] In connection with the increasing requirements with respect to the reduction of thermal losses from buildings, the thickness of the facades will increase to very thick structures indeed. This means that the prior art with a load-bearing concrete rear wall - insulation - concrete facade plate (the concrete sandwich panel) is vitiated by considerable drawbacks. The relatively heavy facade plate cannot be supported by the prior art technology, when it is to be disposed 30 - 40 cm out from the load-bearing rear wall. A bracket, which must be capable of supporting the front plate 30 - 40 cm out from the stable rear plate, will be very sturdy and of stainless steel, and thereby causes a considerable thermal bridge, which results in a reduction of the insulation capacity. A load-bearing sandwich panel typically has a structure with a 150 mm load-bearing rear wall and for instance 300 mm insulation in order to satisfy the implemented new national and prospective international insulation requirements, and a front plate which is typically 70 mm thick. This gives an overall wall thickness of 520 mm. In comparison with the rules on insulation requirements previously in force, and thus the smaller thicknesses of the wall panels, this involves a considerable reduction in the net area of the buildings, typically of 5 - 7 m² per flat/dwelling.

[0004] Therefore, the use of lightweight structures, such as wooden panels, has been adopted to an increasing extent, in order to save panel thickness and panel weight in that way.

[0005] One of the drawbacks of this is the difficulties of controlling the moisture impact during the erection, there being a great risk that moisture in the panels results in rot and mould attacks in the finished construction.

[0006] Another drawback of using wooden panels as the load-bearing structure is that the houses do not provide for the possibility of heat accumulation which, in connection with the erection of low-energy houses, is of great importance to the total energy account.

[0007] A further drawback of wooden panel construction is the missing tightness, as it is very difficult to control the tightness in the many joints and connections which such a construction involves. Wooden panel constructions can only be sealed by a membrane, which must then be joined in a completely tight manner in all connections. This is almost impossible in practice, not least where wooden panels are used together with brick or concrete construction. Thus, the drawbacks of the erection of buildings of organic materials are very great.

[0008] It is a further drawback that wooden panels, if they are load-bearing panels, do not readily satisfy the current requirements of fire safety. This reduces the number of storeys. The pilot multi-storey houses which have been built with load-bearing wooden elements, contain large amounts of fire protecting slabs externally on the wooden constructions (usually 2 - 4 layers of plaster boards). This fact alone makes the building extremely sensitive to moisture.

[0009] US 4512126 A discloses a concrete panel structure, which comprises a load-bearing front wall with reinforced columns and beams as well as insulation. A first layer of insulation is disposed between columns and beams, and a second layer covers the columns and the upper beam, while the lower beam is not covered by insulation. This structure is inexpedient, as the joint between foundation, ground deck and load-bearing front wall is not insulated, as a result of which a strong thermal bridge will be generated at floor level. In addition, no heat accumulation in the concrete walls is achieved, which, otherwise, can make a positive contribution to the heat account of the dwelling. In total, this means that a dwelling erected with the known concrete panels will not observe the current national and prospective international requirements with respect to low-energy or zero-energy houses. The known concrete panel is moreover mounted with the load-bearing wall toward the facade, which results in great heat and cold impacts, which may cause cracking, partly in the front wall/facade, and partly between the unreinforced front wall and the reinforced beams and columns. Finally, the known concrete panels are not useful for the construction of multi-storey buildings, since a concrete deck for storey partition must rest on a load-bearing beam in the front wall/facade wall, for which reason thermal bridges will occur at the storey partitions. In terms of strength, the structure of the concrete panel is not suitable for the construction of buildings in two or more storeys because of thermal movements of the load-bearing front plate with columns and beams.

The object of the invention

[0010] Accordingly, it is an object of the invention to avoid the above-mentioned drawbacks of the prior art and to provide a high-insulation concrete panel and a method of producing it. The concrete panel is an insulated unit constructed as a lightweight structure, where the insulation layer may be constructed in thicknesses exactly corresponding to the energy class desired by the client, and which is without thermal bridges and therefore satisfies national and prospective international requirements with respect to the thermal loss of buildings. Also achieved are: resistance to moisture, maximum heat accumulation capacity, structures of load-bearing capacity for roof panels and/or storey partitions, low weight, optimized thickness, great tightness after mounting, cast tight connections, great production friendliness, and as much work as possible is carried out under cover at the

factory.

[0011] Like in other concrete panel construction, the connections between the concrete panels are carried out traditionally with toothed and optionally reinforced connections, which favour in-plane action that ensures the stability of the building and the coherence (sturdiness) in the finished building.

[0012] It is a further object of the entire panel production that it is rational (short production time), and that variants of the panels may readily be produced with small production changes.

Summary of the invention

[0013] The object stated above is achieved by a method as described in claim 1, wherein the rear wall is cast in concrete so that the face of the rear wall which is visible on the finished concrete panel, faces toward the concrete panel mould, and so that the load-bearing beams and columns are integrated in the thickness of the rear wall by means of the reinforcement, which is cast together with the rear wall before a pressure-proof insulation, which is e.g. formed by hard mineral wool, polystyrene, glass foam or a combination thereof, is mounted between the beam and column reinforcement, said insulation having the same level as the edge shuttering. This makes it possible to carry out casting of beams and columns in concrete, said casting being defined by the edge shuttering on the one side and the pressure-proof insulation on the other side. Then, the second insulation layer of the concrete panel is mounted, which is likewise pressure-proof, and which is secured to the rear wall through the first insulation layer, and at least right out to the outer side of the concrete beams and the concrete columns, which is perpendicular to the plane of the concrete panel.

[0014] Rabbet elements for windows and doors may be mounted with e.g. self-drilling stainless steel anchors, as stated in claim 2, and they are advantageously mounted prior to the laying of the first layer of insulation.

[0015] A fire retardant material, e.g. hard mineral wool is used for the outermost layer of the pressure-proof insulation, as stated in claim 4.

[0016] Then, as stated in claim 5, a glass fibre net is applied as a reinforcement in a layer of mineral render, and, subsequently, a layer of wind and water repelling base render is applied.

[0017] The concrete panel is stripped, and, following the erection of the concrete panel to a vertical position, windows and doors, if any, are mounted in the rabbets, the joints may be finished at the factory, for instance with wind-and water-proof two step joints, with an external rain shield and internal wind sealing, and connecting edges from the rabbet to the rear wall of the panel are rendered with a glass fibre net.

[0018] With this method it is possible to produce a high-insulation concrete panel, as stated in claim 6, which comprises a concrete wall, an insulation and a plurality of columns and beams, which is **characterized in that**

the concrete panel has a rear wall with a reinforcement, in which a plurality of load-bearing columns are integrated, as well as at least one upper and one lower load-bearing beam, said columns and said beams being cast together with the rear wall, and wherein a first insulation layer is mounted towards the rear wall in the areas between the columns and the beams and with the surface of the first insulation layer at the level of the front side of the columns and the beams, that a second insulation layer is mounted externally on the first insulation layer, said second insulation layer also covering the front side of the columns and the beams, and that the outer surface of the concrete panel is covered by wind and water repelling layers, which comprise a layer of mineral render reinforced by a glass fibre net. This results in a lightweight concrete panel in the form of an insulated unit, which simultaneously satisfies wishes and/or national and prospective international rule relating to requirements with respect to:

- thermal loss of buildings, e.g. around the transition between foundation and wall panel, as the insulation in the concrete panel also covers the lowermost load-bearing beam and thus insulates the connection between foundation, ground deck and wall panel, thereby avoiding a thermal bridge in precisely this area,
- resistance to moisture, as the glass fibre reinforced surface is resistant to wind and water and also has a negligible tendency to crack relative to thicker facade plates, e.g. of concrete, which is especially due to the ability of the strong glass fibre net to absorb shear forces in the facade layer. The thin surface finish has a negligible tendency to crack, which reduces the risk of ingress of moisture,
- heat accumulation capacity, as the load-bearing concrete wall faces inwardly toward the inner, warm side of the building and thereby absorbs heat therefrom and is capable of releasing it again, which contributes to reducing the total heat consumption of the building,
- reduced risk of cracking in the concrete structure itself and in the facade, as the load-bearing wall in the concrete panel faces inwardly toward the inner and warm side of the building. Hereby, the load-bearing wall stands at fairly constant temperatures, which reduces the expansion and contraction of the concrete panel because of temperature fluctuations. This, too, reduces the risk of cracking, partly in the rear wall and partly between columns or beams and the rear wall, which is also additionally reduced in that the board reinforcement is connected with the column and beam reinforcement prior to the casting of the rear wall,
- good load-bearing capacity of panels for roofs or sto-

rey partitions, as the concrete panel lends itself to and has a suitable strength for being used as a wall panel in multi-storey buildings. The reinforced rear wall, which is cast together with columns and beams, provides a good in-plane action in the finished wall, which is thereby capable of absorbing horizontal forces and of being included in the system which ensures the stability of the building,

- optimized thickness, as the concrete panel according to the invention has a smaller thickness than traditional concrete sandwich panels with the same insulation capacity,
- great tightness after mounting, which facilitates the subsequent finishing of the interior of the building at the construction site,
- cast, reinforced, tight connections, which reduce the risk of draught and ingress of moisture,
- great production friendliness, since as much work as possible is carried out under cover at the factory.

[0019] When, as described in claim 7, the second insulation layer of the concrete panel comprises an outer layer of a fire retardant insulation material, preferably of hard mineral wool, a good fire protection of the concrete panel is moreover achieved.

[0020] As stated in claim 8, the glass fibre net reinforced mineral base render of the concrete panel has applied thereto a further layer of mineral render, and hereby the panel has a finished appearance.

[0021] When, as stated in claim 9, the second insulation layer of the concrete panel extends beyond the upper edge of the upper load-bearing beam of the concrete panel in a length at least corresponding to the thickness of a roof or storey partition panel, the storey partition may be insulated without thermal bridges being generated. When the second layer of insulation extends beyond the edge at at least one of the load-bearing columns along the vertical edge of the concrete panel and corresponding to the thickness of the concrete panel, the panel may be used at the termination of corners of the building.

[0022] Finally, as stated in claim 10, the concrete panel may have protruding dowels on the outer surface to connect the concrete panel with an outer facing wall.

[0023] Further, as stated in claims 11 and 12, the invention also relates to use of a high-insulation concrete panel according to the invention for buildings having a load-bearing rear wall of concrete, followed by insulation layers and an outer covering thin layer of wind and water repelling render. Advantageously, the concrete panel according to the invention may be used where the outer thin layer of wind and water repelling render is covered completely or partly by an outer covering, a facing wall or combinations thereof.

The drawing

[0024] The invention will be explained more fully below with reference to the drawing, in which

- fig. 1 shows a traditional concrete sandwich panel,
- fig. 2 shows an insulated concrete panel according to the invention,
- fig. 3 shows a detail of an insulated concrete panel,
- fig. 4 shows a concrete panel mould with an edge shuttering,
- fig. 5 shows a mounted board, beam and column reinforcement placed in the mould prior to the casting of the rear wall,
- fig. 6 shows the rear wall cast in concrete,
- fig. 7 shows mounted rabbit elements for the subsequent mounting of windows/doors,
- fig. 8 shows a mounted pressure-proof insulation as shuttering sides for beams/columns,
- fig. 9 shows beams and columns cast in concrete,
- fig. 10 shows a second layer of insulation mounted,
- fig. 11 shows the outer side of the hard mineral wool with an applied glass fibre net with base render (protection render),
- fig. 12 shows the finished stripped concrete panel,
- fig. 13 shows a section of a high-insulation concrete panel according to the invention, which is mounted on a foundation, and
- fig. 14 shows a section of a storey partition between two high-insulation concrete panels according to the invention.

Detailed description of the invention

[0025] Figure 1 shows a vertical section of a traditionally produced sandwich panel having a solid load-bearing rear wall 8 and an inclined structural reinforcement 19. There is a limit to how thick the insulation 11 may be, as the relatively heavy front plate 20 loads the structural reinforcement too much. With the usual insulation thickness, the panel shown contains only half as much insulation 11 as is necessary according to national and prospective international heat loss requirements in low-energy or zero-energy houses.

[0026] Figure 2 shows a vertical section of a high-in-

sulation concrete panel 18 according to the invention, shown with the same thickness as the panel of figure 1, but with a double insulation capacity. A concrete panel 18 of this type satisfies national and prospective international heat loss requirements in low-energy or zero-energy houses.

[0027] Figure 3 shows a horizontal section of a detail of the edge of the concrete panel 18 at a column 13. Shear locks 21 are arranged, with an optional reinforcement, which are used in the assembly of the concrete panels 18. The shear locks 21 may optionally be replaced by other generally known means for the assembly of concrete panels. Concrete columns 13 and concrete beams 12 are defined in the casting on the one side by the shuttering 2 and on the other side by the first layer of the pressure-proof insulation 11, which is e.g. formed by hard mineral wool, polystyrene, glass foam or a combination thereof, arranged so as to form a permanent shuttering for the columns 13 and the beams 12. An additional layer 14 of insulation covers the first insulation layer of the entire concrete panel as well as the front side of the columns 13 and of the beams 12, and thus extends at least right out to the edge of the concrete panel 18 which is perpendicular to the plane of the panel. In an alternative embodiment, the insulation layer 14 is configured with two sub-layers, where the inner layer is of polystyrene and the outer layer 14b is of hard mineral wool. This makes the concrete panels fire-proof to a significant degree, as the inflammable polystyrene insulation is encapsulated in inorganic materials in the form of the concrete panel wall toward the inner side and the hard mineral wool toward the outer side of the concrete panel.

[0028] An example of a method of producing a high-insulation concrete panel 18 according to the invention is illustrated by means of figures 4 - 12, where figure 4 shows a concrete panel mould 1 with an edge shuttering 2, said edge shuttering 2 having the same height as the height of the desired beams 12 and columns 13. Figure 4 also shows a shuttering 3 for windows and doors, where the height of the shuttering 3 is the same as the height of the thickness of the desired rear wall 8. The shuttering 3 is optional, as the concrete panel 18 may also be produced without door or window openings.

[0029] In figure 5, the concrete panel mould 1 has mounted therein a board 4, beam 5 and column reinforcement 6, which is statically optimized for each individual concrete panel 18, with spacer blocks provided below the reinforcements 4, 5, 6 in order to cast concrete therearound. Likewise, supports 7 for electricity and domestic water installations, etc., may be mounted, as desired and needed.

[0030] In figure 6, the concrete panel mould 1 has had the rear wall 8 cast in concrete, so that the concrete has been cast around the board reinforcement 4. The face of the rear wall which is visible on the finished concrete panel, and is thus intended to face inwardly toward the interior of the finished building, faces toward the bottom of the concrete panel mould. The reinforcement 5, 6 for

the load-bearing beams 12 and columns 13 are partially embedded in the rear wall 8 during the casting. After the casting and complete or partial hardening of the rear wall 8, rabbet elements 9, if any, for windows and/or doors may be mounted subsequently with e.g. self-drilling stainless steel anchors 10, as shown in figure 7. Alternatively, rabbet elements 9 are anchored in the rear wall in that screws, inserted in the end edge of the rabbet element 9, are pressed down into the still wet concrete layer of the rear wall 8.

[0031] In figure 8, a first layer of pressure-proof insulation 11 is mounted in the concrete panel mould 1, formed e.g. by hard mineral wool, polystyrene, glass foam or a combination thereof. The insulation material 11 is mounted so as to fill the areas on top of the rear wall 8 and out to the load-bearing columns 13 and beams 12 so as to create a permanent shuttering in the casting of the statically optimized beams 12 and columns 13, which are shown cast in concrete in figure 9, where the concrete has been cast around the beam 5 and column reinforcement 6. Hereby, the columns 13 and the beams 12 are integrated with the rear wall 8.

[0032] When the pressure-proof insulation 11 is used as a permanent shuttering for the load-bearing beams 12 and columns 13 in the rear wall structure, the dimensioning, i.e. the width and the height of the load-bearing beams 12 and columns 13, may be varied in consideration of the strength requirements in the individual buildings by a simple tailoring of the first insulation 11 to variations of the width of beams 12 and columns 13. The depth of columns 13 and beams 12 may be varied by varying the thickness of the insulation layer as well as the height of the edge shuttering 2 of the concrete panel mould 1.

[0033] The second insulation layer 14 of the concrete panel 18, which is likewise pressure-proof, is mounted in figure 10. In an alternative embodiment in which the insulation layer 14 is made of polystyrene, the outermost part 14b (see figs. 13 - 14) of the insulation 14 is made of hard mineral wool owing to the fire safety. As will be seen in figure 10, the insulation layer 14 is applied to the concrete panel 18 right out to the outer side of the concrete beams 12 and the concrete columns 13, perpendicularly to the plane of the concrete panel 18. The insulation 14 is secured to the rear wall 8 (and beams 12 / columns 13) by gluing to the first insulation layer and/or with insulation dowels 15. The total insulation thickness is dimensioned according to the task and can cover anything from national and international minimum requirements and up to the requirements of a zero-energy building. In practice, however, there should be at least 100 mm insulation in front of columns and beams to avoid thermal bridges. It is advantageous for the fire protection of the concrete panel, if the outermost sub-layer 14b of the insulation is 25 - 50 mm or perhaps more and made of hard mineral wool or other fire-proof insulation.

[0034] Figure 11 shows the concrete panel 18 with the outer pressure-proof insulation layer 14 or the optional

fire retardant insulation layer 14b, whose surface has applied thereto a layer of mineral render 22 reinforced with a glass fibre net 16, which constitutes the building envelope, i.e. wind and water protection, of the concrete panel. This layer is rather thin and constitutes e.g. only 10 - 15 mm of the thickness of the entire concrete panel. When applying the render layer 22 externally on the glass fibre net reinforcement on a horizontally disposed concrete panel 18 at the factory (under cover), it is possible to control and adjust the thickness and planeness of the render layer.

[0035] If the panel 18 is to be used at the construction site with a final covering of facade boards, a facing wall or the like, the panel 18 is ready for transport and mounting. Windows 17 and doors may optionally be mounted in the rabbets 9 at the factory with factory-made tight and insulated joints, before the panel is transported to the construction site.

[0036] If, in contrast, the concrete panel 18 is to have a finish-rendered surface in the finished building, a fine render 23 e.g. in the form of a fibre reinforced mineral render is applied. Along the edges, the panels 18 may optionally be kept clear of fine render in a width of for instance 10 - 20 cm, which may then be rendered subsequently at the construction site. Hereby, the facade will be without marked connections, and the connections between the panels are tight.

[0037] Figure 12 shows the finished stripped concrete panel 18 with a finished fine-rendered surface with edges kept clear. If a construction with a coherent facade (without panel markings) is desired, both fine render and coarse render along the edges of the panel may also be omitted, so that just the glass fibre net is left. In this case, the connections are covered after the mounting by a strip of glass fibre net reinforcement, which is subsequently rendered, as described above for the concrete panel itself. Hereby, the facade is without marked connections.

[0038] Following the erection of the concrete panel 18 to a vertical position at the factory, windows 17 and doors, if any, may be mounted in the rabbets 9. The joints around windows and/or doors may be finished, for instance with wind-proof and water-proof two step joints, with an external rain shield and an internal wind seal.

[0039] The sealing plane (for wind pressure), which is disposed in the rear wall, is then passed out to the window/door joint in the rabbets around these, and connection edges from the rabbet to the rear wall of the panel is rendered with a thin layer of highly adhesive mineral render and is reinforced with a glass fibre net.

[0040] Figure 13 shows the concrete panel 18 mounted on a preferred foundation 26, which is mounted on a base foundation 28. The load-bearing structure of beams 29 and columns 30 of the foundation is e.g. cast together with a ground deck 27, and the insulation 31 of the foundation is disposed on the outer side (seen in relation to the interior of the building) of the load-bearing structure. The concrete panel 18 according to the invention is mounted as a wall structure on the foundation 26, with

the beam 12 of the concrete panel being mounted centrally above the load-bearing columns 30 and beams 29 of the foundation. As will be seen, the insulation 11, 14 of the concrete panel covers the connection between the foundation 26 and the wall panel 18. This means that no thermal bridges are generated at the connection between foundation, ground deck and wall panels, or that the risk of the generation of thermal bridges at precisely this location is greatly reduced. If the concrete panel 18 according to the invention is mounted on a traditional foundation, the risk of a thermal bridge along the ground deck will also be reduced owing to the insulation layer 14, 14b of the concrete panel 18 in front of the load-bearing rear wall 8 with the integrated beams 12 and columns 13.

[0041] An alternative embodiment of the concrete panel, which is particularly suitable for multi-storey constructions, is shown in figure 14. Concrete panels 18 according to the invention are mounted as wall panels in the multi-storey construction. A hollow deck 25, which rests on the load-bearing beam 12 in the lowermost concrete panel, is mounted as a storey partition. To insulate the connection at the storey partition, the outer insulation layer 14, 14b has been extended to extend beyond the upper edge of the concrete panel 18 in a length which, as a minimum, corresponds to the thickness of the hollow deck 25. Following the positioning of the storey partition, the panels are cast together with concrete in the cavity 26 between the upper concrete beam 12 and the end edge of the hollow deck 25. The insulation 14, 14b serves here as a permanent shuttering for this casting. The joint 24 is cast in the usual manner with tamping mortar.

[0042] If a concrete panel is to be disposed at a corner in a building, the second insulation layer 14, 14b may also be extended beyond the one, or optionally both vertical edges on the outer edges of the concrete panel 18 at the outermost load-bearing columns 13. The second insulation layer of the concrete panel is extended here corresponding to the thickness of the concrete panel 18 in order to achieve a suitable corner termination.

[0043] According to the method, a factory-made insulated concrete panel 18 is involved, where the insulation 11, 14, which must be present in any event, is integrated in the statically optimized concrete structure, where a usual rear wall is replaced by load-bearing beams and columns and a thin rear wall, which results in a reduced concrete consumption, but with the same strengths and more insulation, no thermal bridges and with a smaller wall thickness compared to a traditionally produced insulated concrete panel of the sandwich type with the same insulation capacity.

[0044] The entire panel production is rational (short production time), and variants of the concrete panels may easily be made with minor production changes.

[0045] A concrete panel 18 according to the invention provides a closed and insulated building immediately after the mounting at the site, which saves building time, as the subsequent internal finishing operations may be started earlier than is common. Further, a panel 18 pro-

duced according to this method gives a larger net area (area of use) compared to a traditionally produced insulated concrete panel.

Claims

1. A method of producing an insulated concrete panel (18) comprising a rear wall (8), a board reinforcement (4) for the rear wall, a beam reinforcement (5) and a column reinforcement (6), and an insulation (11, 14), comprising

- providing a concrete panel mould (1) with an edge shuttering (2) and with a shuttering (3) for optional windows and/or doors, and mounting the board (4), beam (5) and column reinforcement (6) with spacer blocks to the mould bottom and the sides,

characterized in

- **that** the rear wall (8) is cast in concrete,
- **that** a first layer (11) of the insulation, which is pressure-proof and is e.g. formed by hard mineral wool, polystyrene, glass foam or a combination thereof, is mounted between the beam reinforcement (5) and the column reinforcement (6),
- following which beams (12) and columns (13) are cast in concrete between the edge shuttering (2) and the insulation (11), said pressure-proof insulation (11) being used as a permanent shuttering for columns (12) and beams (13) and having the same level as the edge shuttering (2), and
- **that** a second insulation layer (14) of the concrete panel, which is likewise pressure-proof, is secured to the rear wall (8) through the insulation layer (11) and is passed at least right out to the outer edge of the beams (12) and of the columns (13), which is perpendicular to the plane of the concrete panel (18), and thus covers all beams (12) and columns (13).

2. A method according to claim 1, **characterized in that** rabbet elements (9) for windows and doors are mounted by screws in the edge of the rabbet element (9), which is pressed down into the wet concrete of the rear wall (8), or by self-tapping stainless steel anchors (10), which are screwed into the completely or partially hardened concrete rear wall (8), and preferably prior to the laying of the first layer of insulation.
3. A method according to any one of claims 1 - 2, **characterized in that** supports (7) for electricity and domestic water installations, etc., are mounted on the mould bottom, the sides and/or the board reinforcement

ment (4) prior to the casting of the rear wall (8).

4. A method according to any one of claims 1 - 3, **characterized in that** the pressure-proof insulation (14) comprises an outer layer (14b) of a fire retardant material.

5. A method according to any one of claims 1 - 4, **characterized in that** a glass fibre net (16) is applied to the pressure-proof insulation (14) as a reinforcement in a layer of a mineral render (22).

6. A high-insulation concrete panel, which comprises a concrete wall, an insulation and a plurality of columns and beams, **characterized in that**

- the concrete panel (18) has a rear wall (8) with a reinforcement (4), in which a plurality of load-bearing columns (13) are integrated, as well as at least one upper and one lower load-bearing beam (12), said columns (13) and said beams (12) being cast together with the rear wall (8), and

- wherein a first insulation layer (11) is mounted towards the rear wall (8) in the areas between the columns (13) and the beams (12) and with the surface of the first insulation layer (11) at the level of the front edge of the columns (13) and the beams (12),

- that a second insulation layer (14) is mounted externally on the first insulation layer (11), said second insulation layer also covering the front edge of the columns (13) and the beams (12), and

- that the outer surface of the concrete panel (18) is covered by wind and water repelling layers, which comprise a layer of a mineral base render (22) reinforced with a glass fibre net (16).

7. A high-insulation concrete panel according to claim 6, **characterized in that** the second insulation layer (14) comprises an outer layer (14b) of a fire retardant insulation material, preferably of hard mineral wool.

8. A high-insulation concrete panel according to any one of claims 6 - 7, **characterized in that** the thin layer of reinforced mineral base render has applied thereto an additional layer of mineral render (23).

9. A high-insulation concrete panel according to any one of claims 6 - 8, **characterized in that** the second insulation layer (14) extends beyond the upper edge of the upper load-bearing beam (12) of the concrete panel in a length at least corresponding to the thickness of a roof or storey partition panel (25), and/or beyond the edge of at least one of the load-bearing columns (13) along the vertical edge of the concrete panel and corresponding to the thickness of the con-

crete panel (18).

10. A high-insulation concrete panel according to any one of claims 6 - 9, **characterized in that** the outer surface has protruding dowels to connect the concrete panel (18) with an outer facing wall. 5
11. Use of a high-insulation concrete panel according to any one of claims 4 - 10 for buildings having a load-bearing rear wall of concrete, followed by an insulation layer and an outer covering thin layer of wind and water repelling render. 10
12. Use according to claim 11, wherein the thin layer of wind and water repelling render is covered completely or partly by an outer layer of render, an outer covering, a facing wall or combinations thereof. 15

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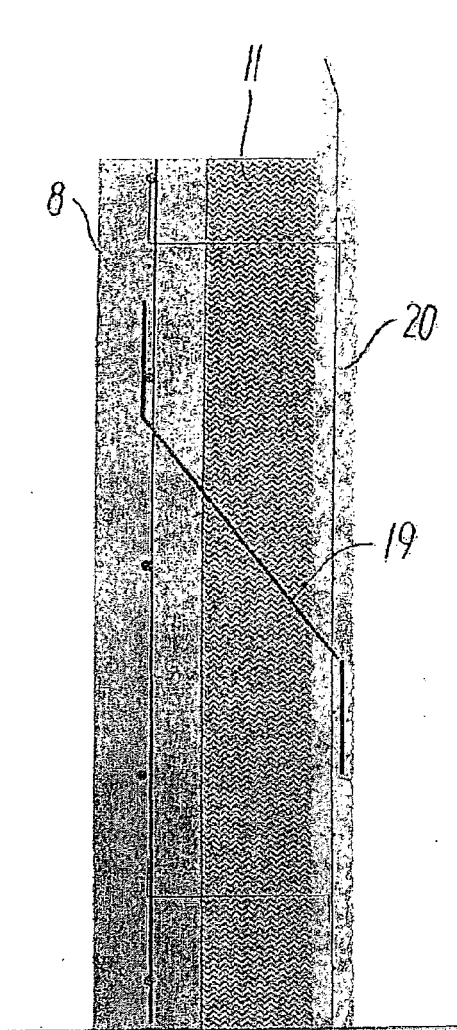


Fig. 1

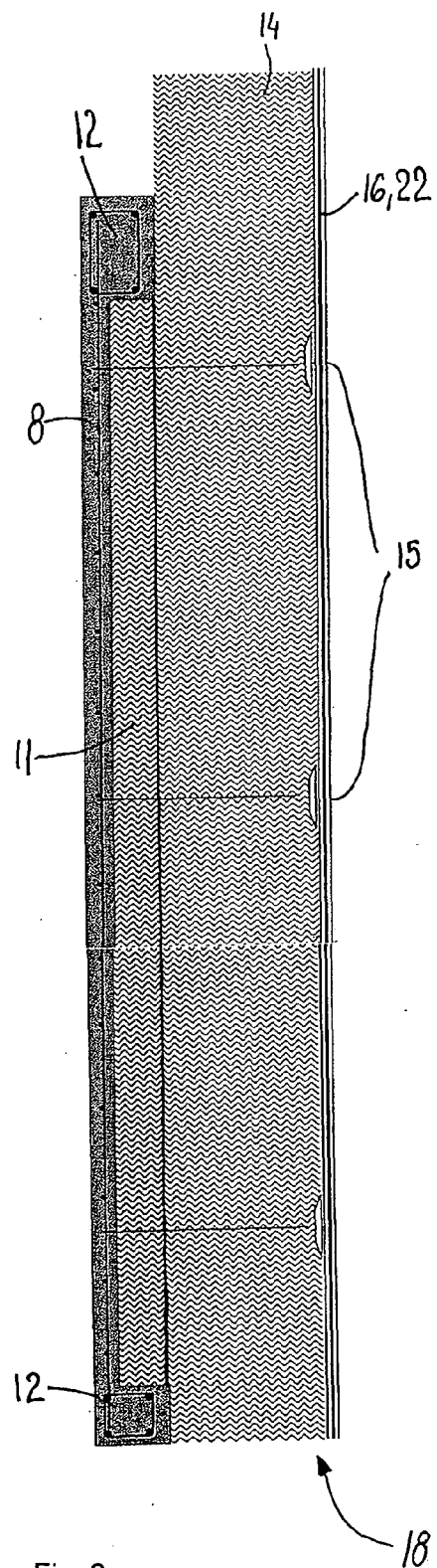


Fig. 2

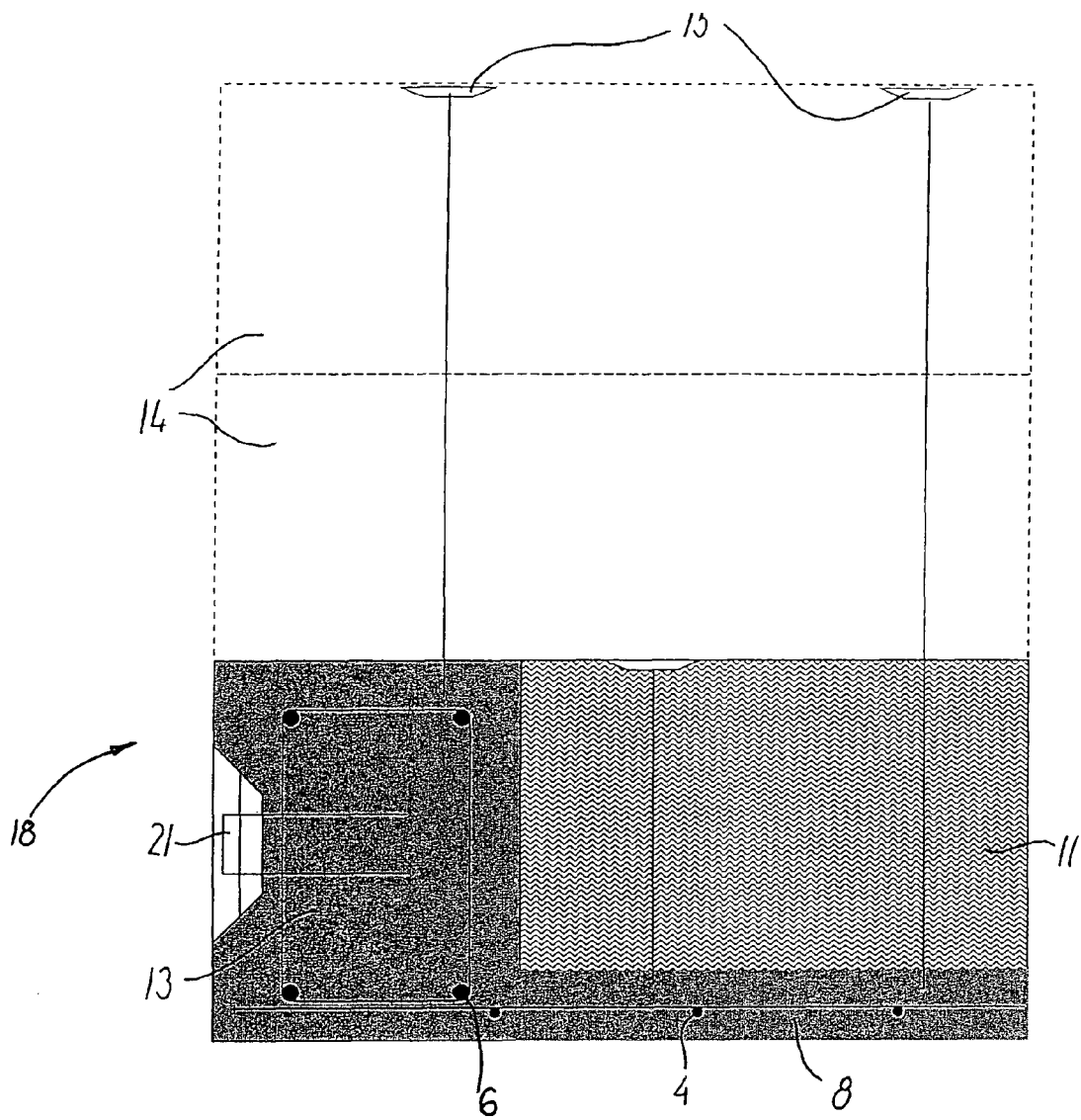


Fig. 3

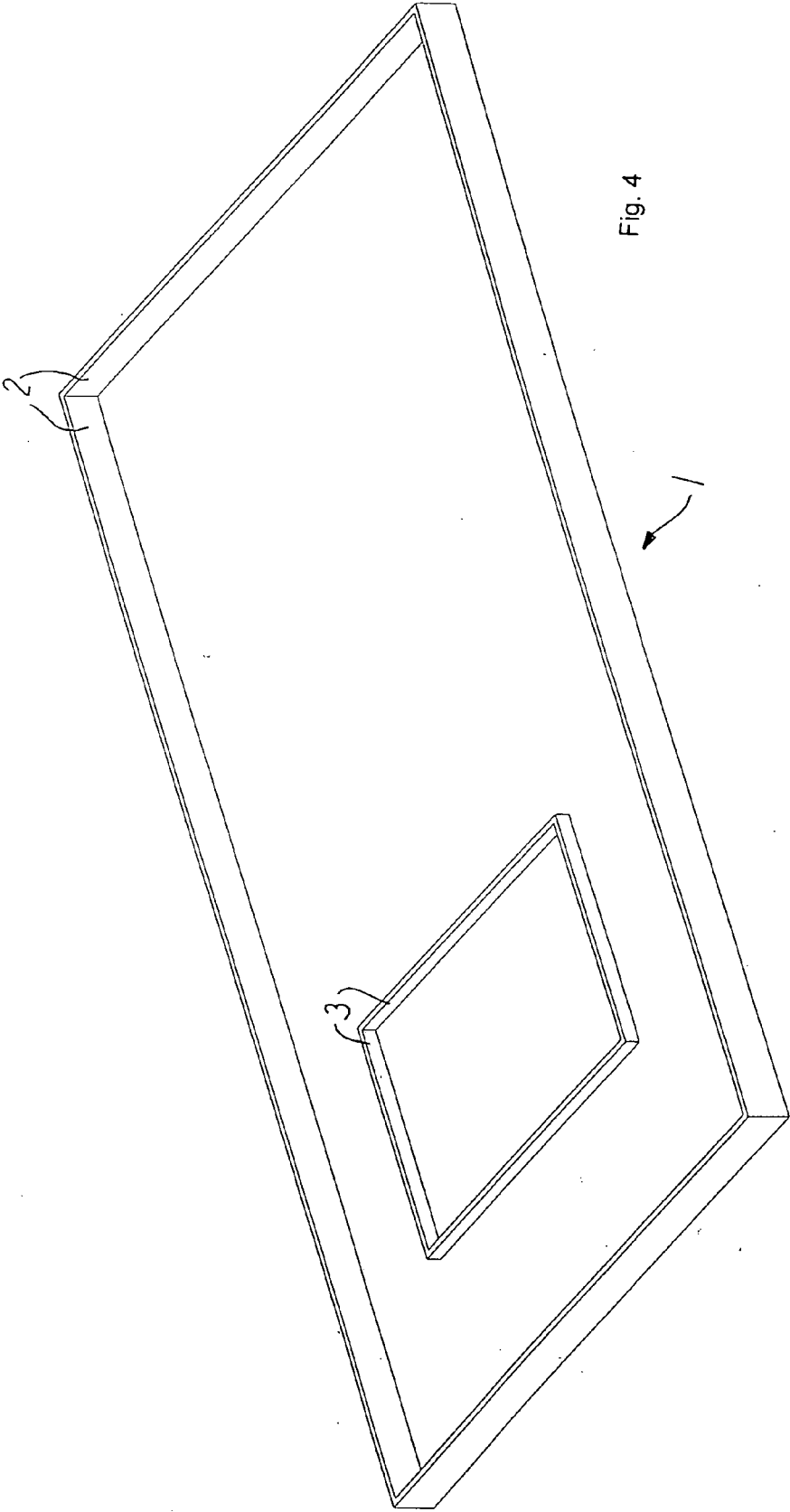


Fig. 4

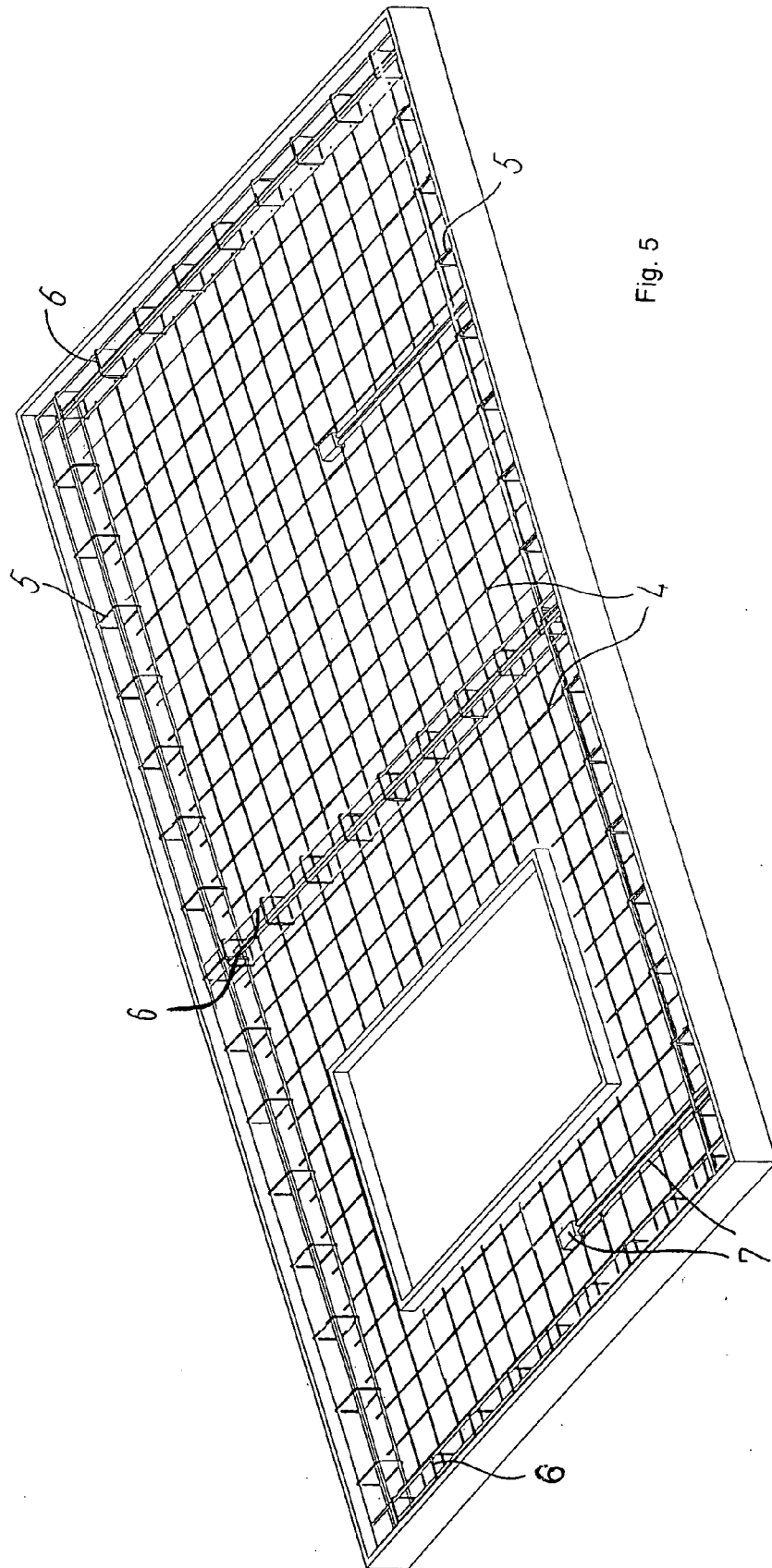


Fig. 5

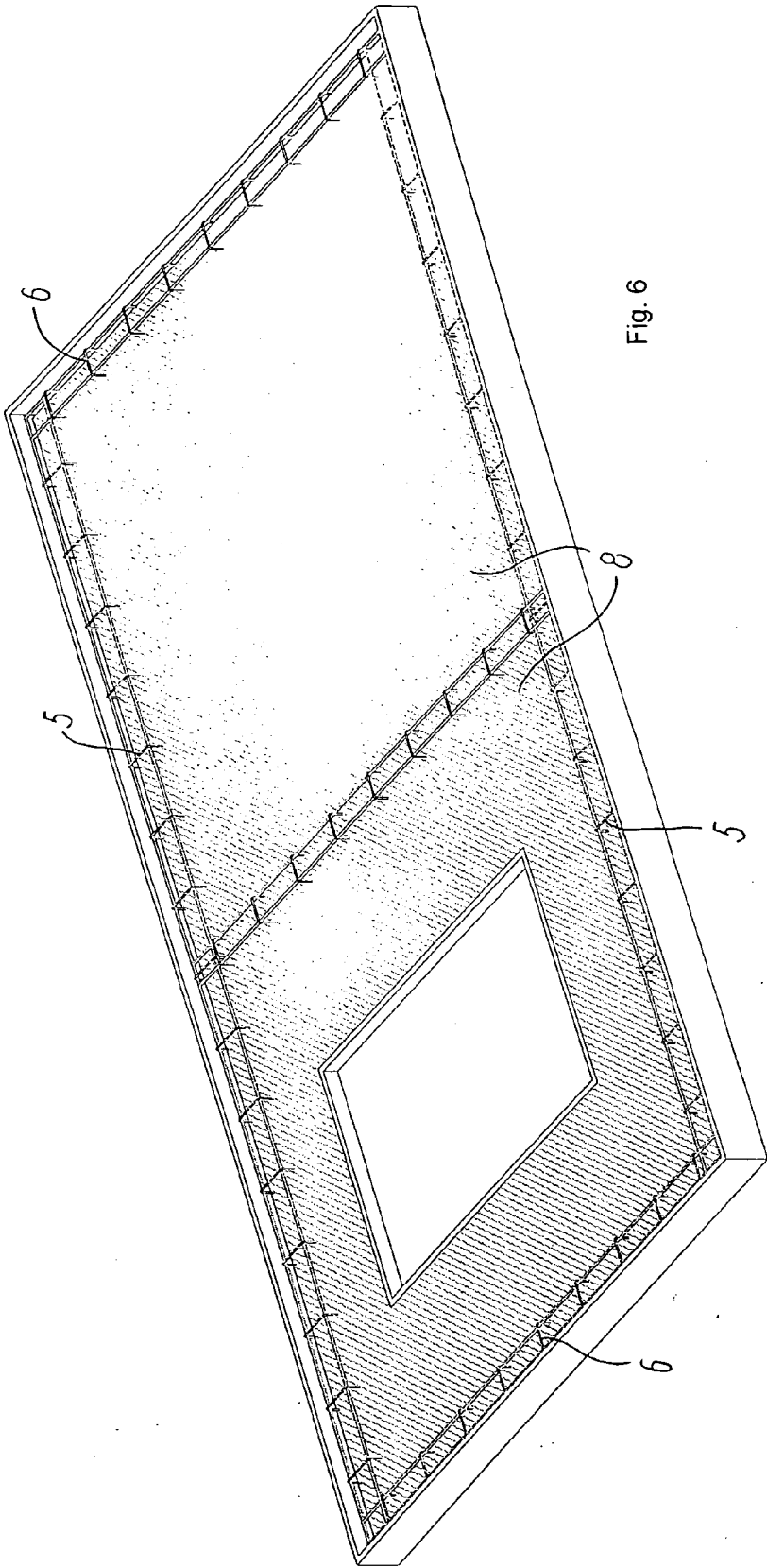
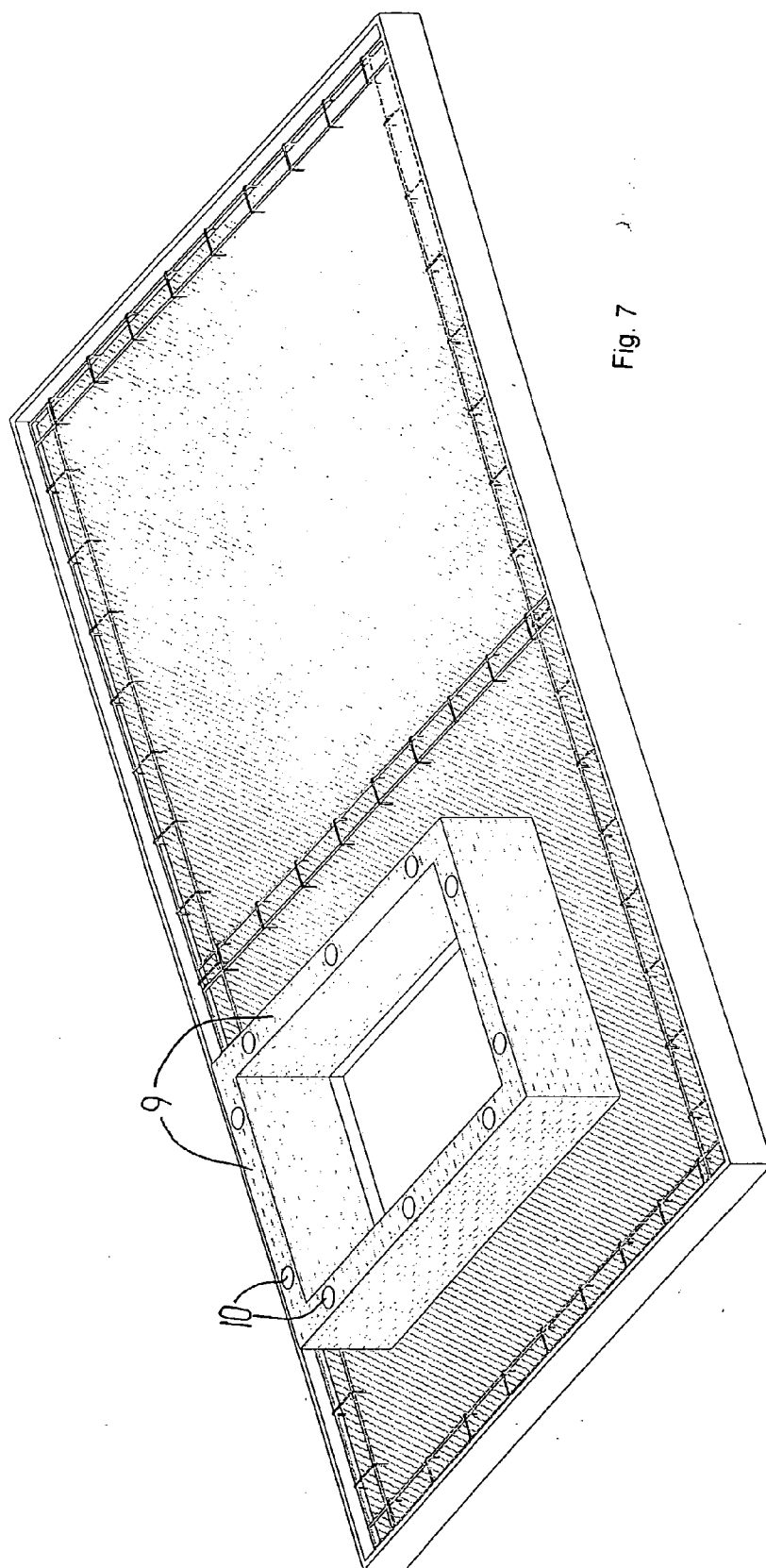


Fig. 6



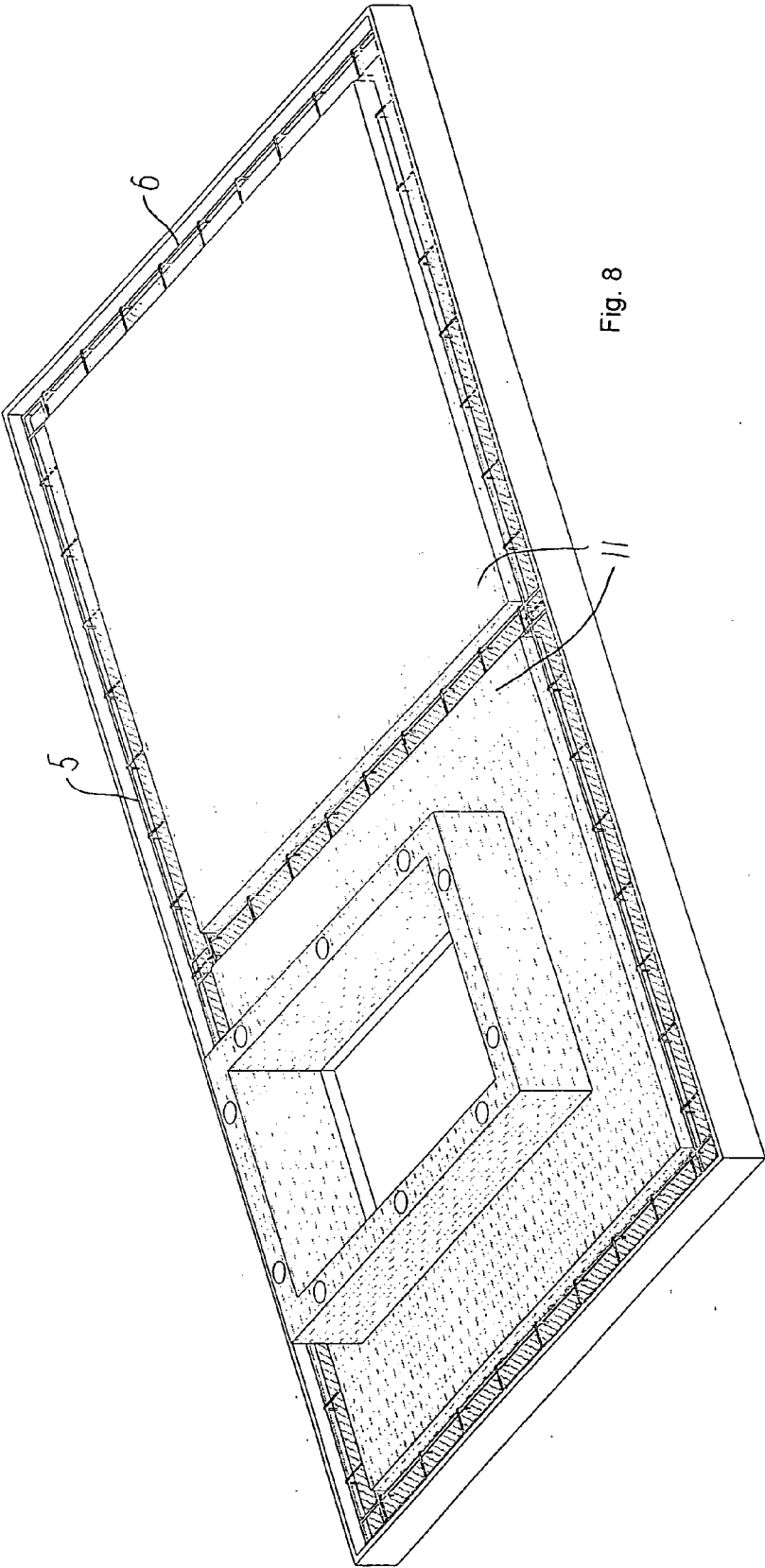
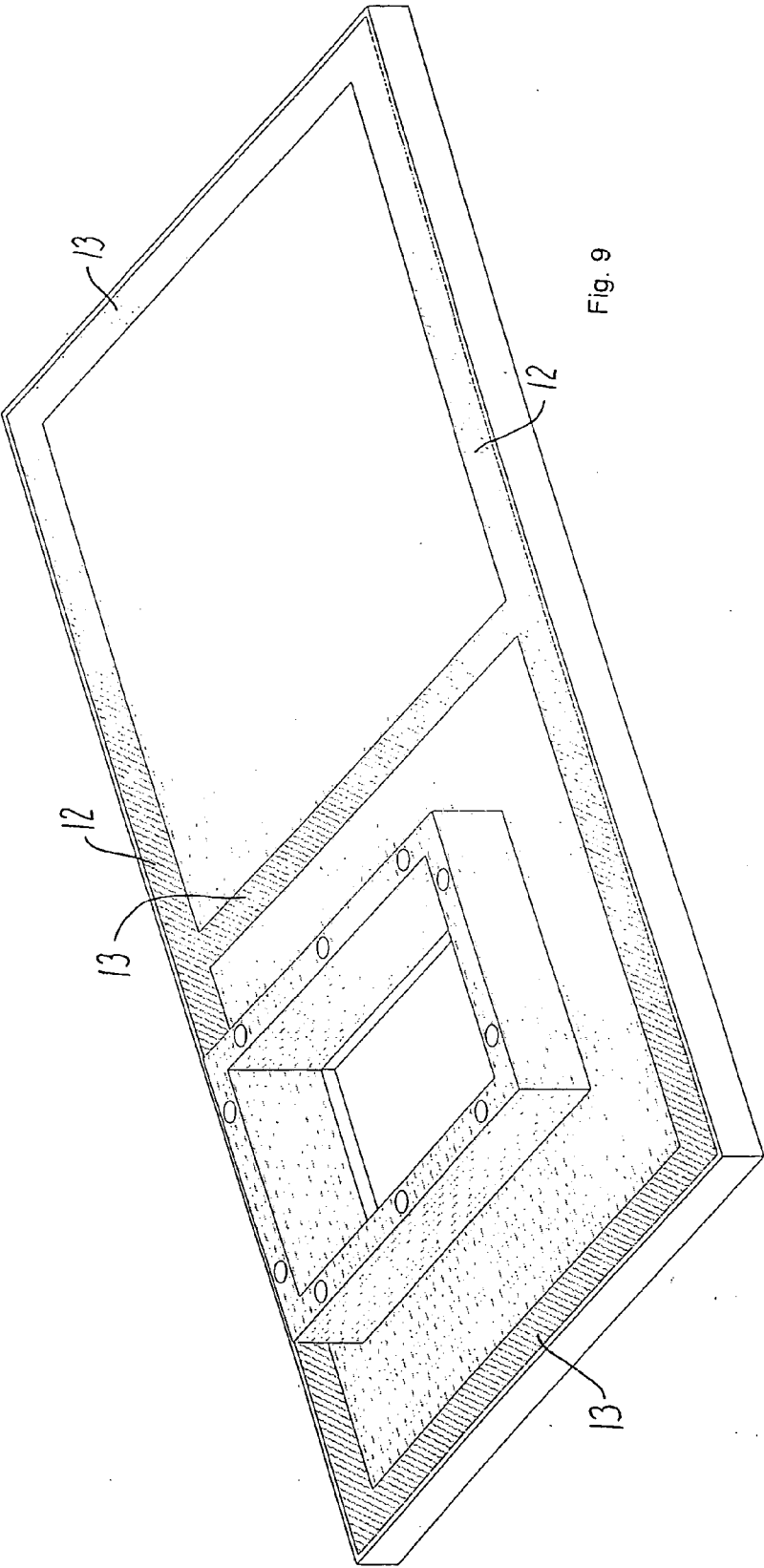
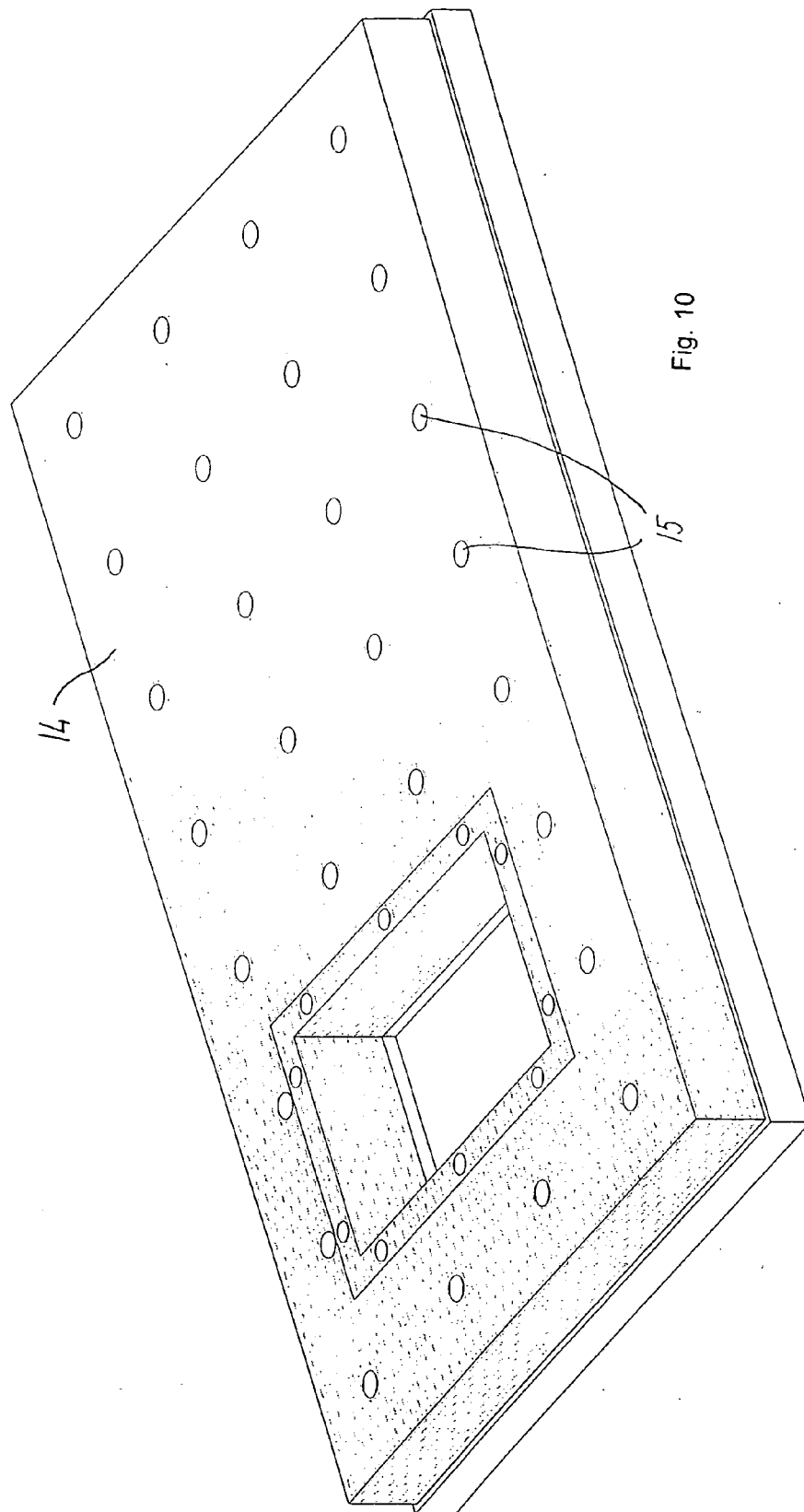
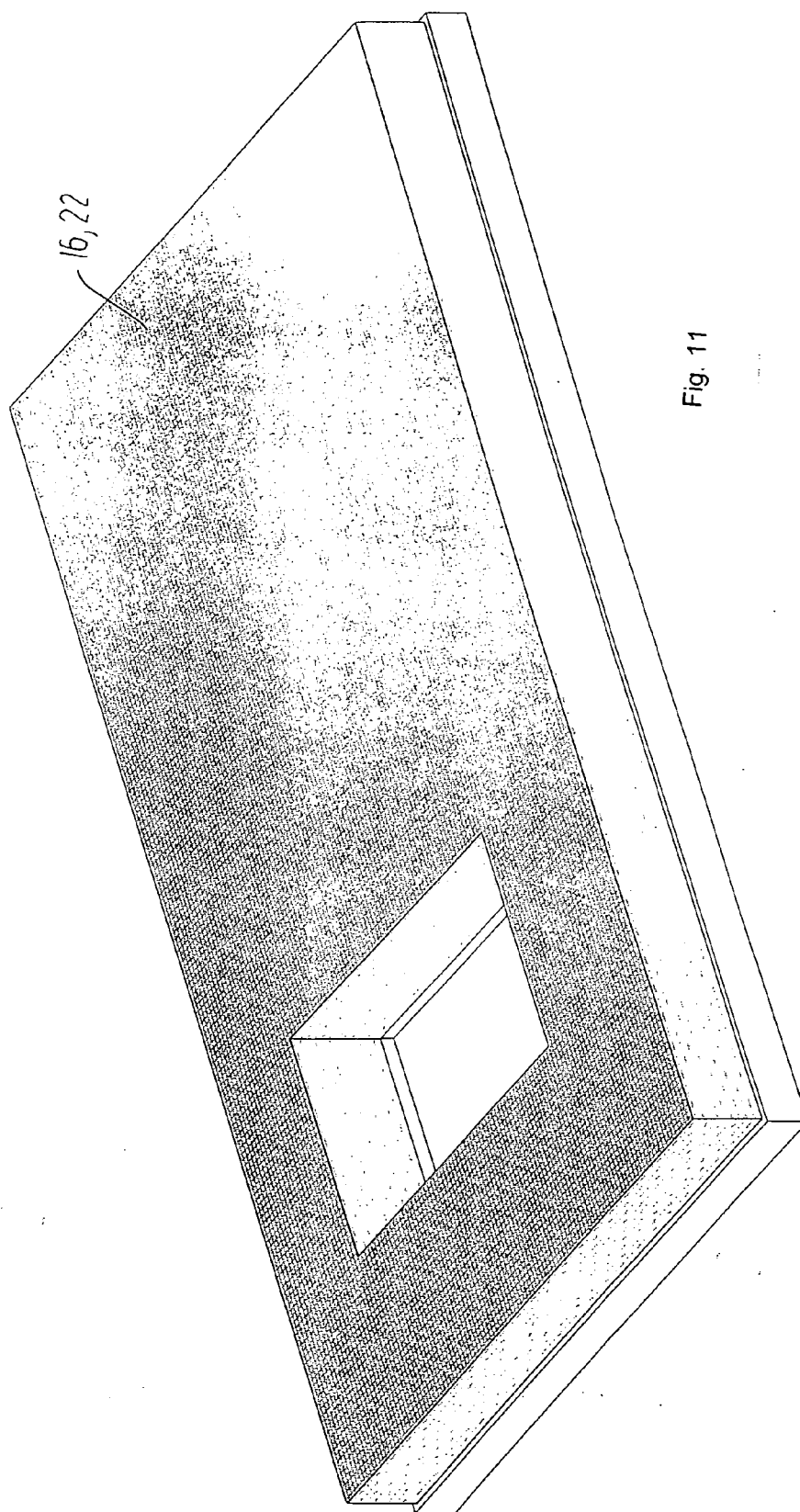


Fig. 8







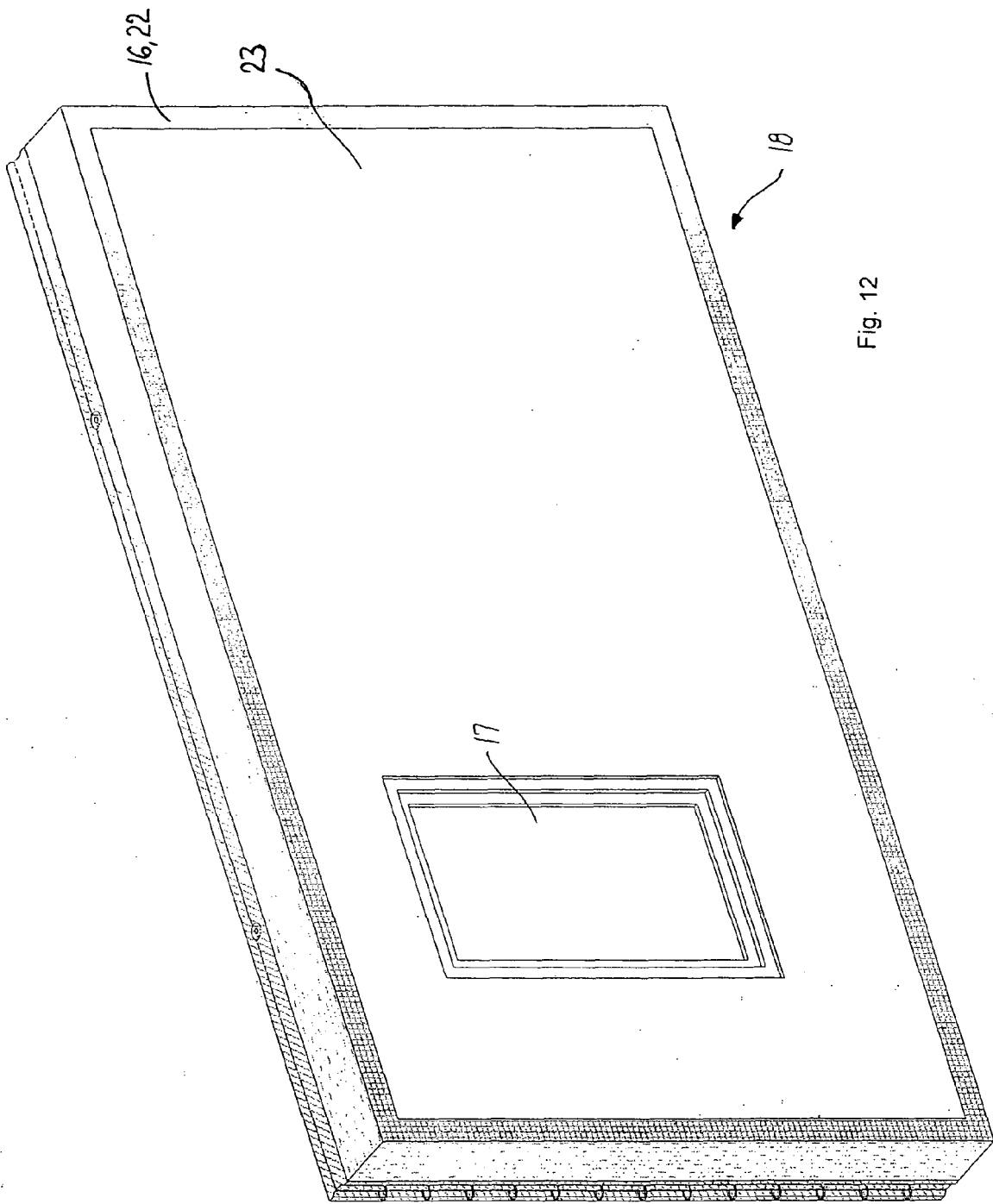


Fig. 12

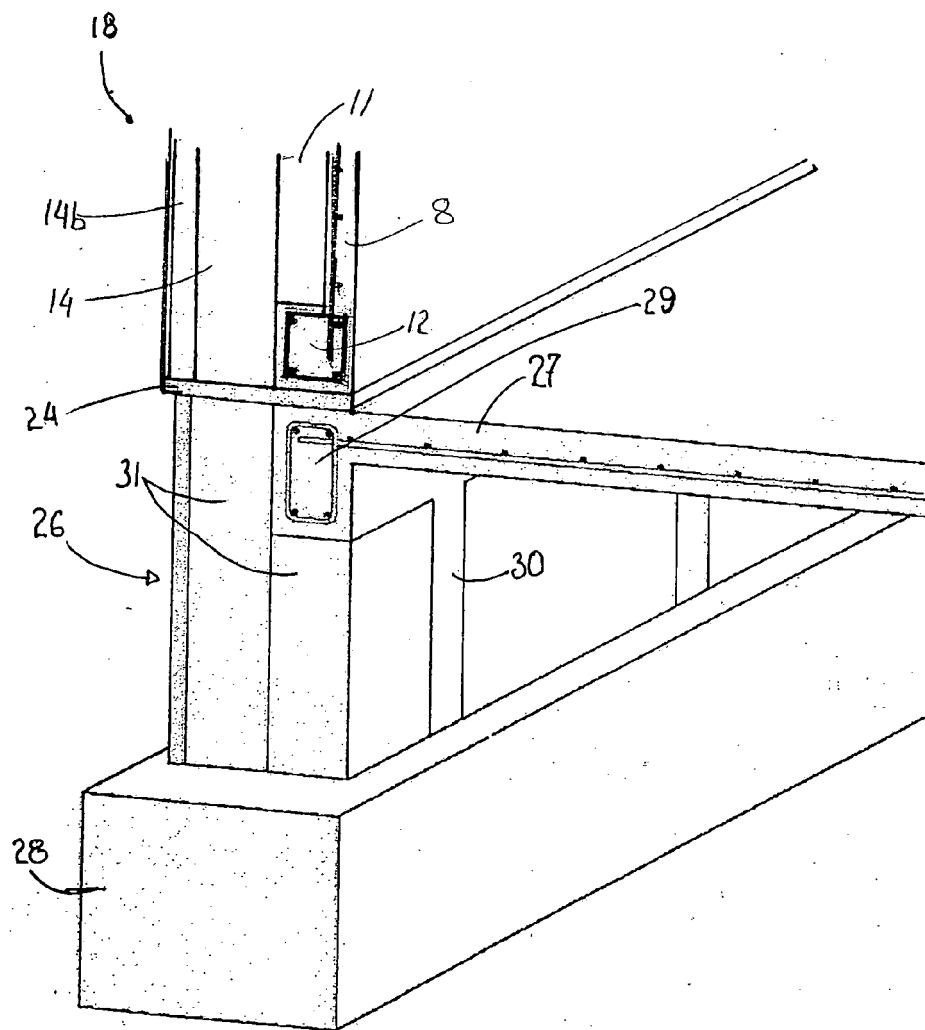


Fig. 13

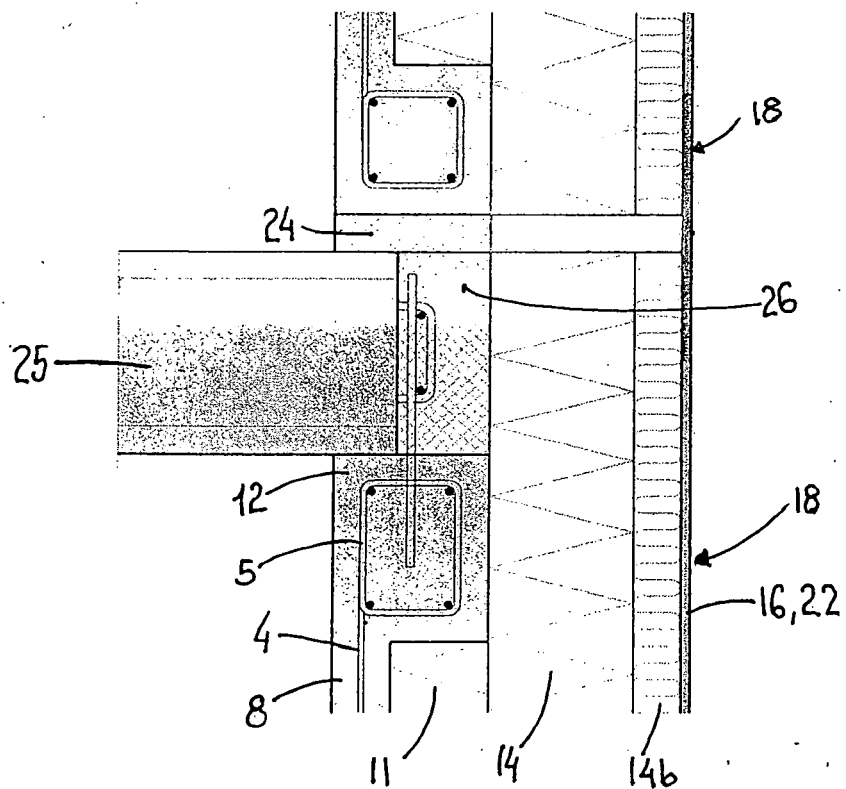


Fig. 14

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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