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(54) Improvements in and relating to insulated walls

(57) The cladding sheet (10) is for use in an insulated wall. The cladding sheet (10) comprises a first external surface having shaped portions (18) defined thereon. The shaped portions (18) increase the adhesion and cohesion between the cladding sheet (10) and a building material to be coated thereon. The building material may be a cementitious slurry to enable brick slips or bricks to be adhered to the external surface of the wall. The shaped portions (18) on the cladding sheet (10) indicate the correct position for the rows of brick slips or bricks. The internal surface of the cladding sheet (10) also includes shaped portions (30) in order to increase the adhesion or cohesion with the internal wall.

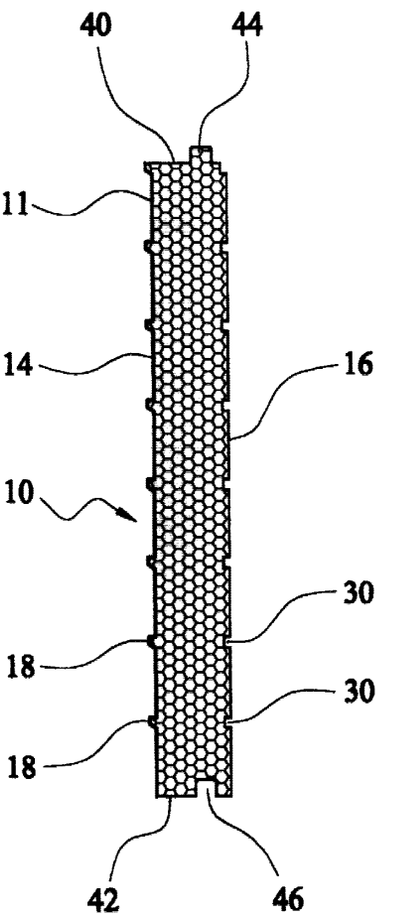

FIG. 1

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Description

Field of the Invention

[0001] The invention relates to cladding sheets, a method of constructing a wall and a wall incorporating a cladding sheet.

Background to the Invention

[0002] Residential buildings and their supporting community buildings are in demand now world wide, whether as result of expanding populations and raising social standards, or from man made disasters such as wars or natural disasters of earthquake, tornado and flood which have so horrendously struck in recent time on all continents. Construction companies need a range of construction methods to best compete in many markets and to use the skills available in the locations. There is also an increasing need to build low cost, sustainable housing overseas and in the UK. Improved methodologies are required to achieve performance and profitability targets and this has lead to the generation of quicker, easier and less robust methods of construction of houses and commercial buildings. In areas of high demand and high activity, alternative construction methods will be avidly sought to try to provide more units both within a time unit and a cost unit.

[0003] In the construction of houses and other buildings, alternatives are sought to address the problems of lack of availability of skilled brick layers and to address the quest for cost and time economies and ways of compliance with more stringent regulations. Alternatives to the traditional brick and block construction in the provision of the structural shell of the building, include timber frame and galvanised steel frame. These are then cladded, either by a traditional finish or a modern lighter panel type construction. Another alternative is to use prefabricated masonry construction.

[0004] To encourage work on site but to permit adoption of a factory like process, GB 2 340 530 offers a system of forming the structural shell of the building by pouring concrete into an aluminium mould. In order to retain a traditional appearance for the completed building, the concrete structural wall may be faced with brick slip cladded thermal insulation, as an alternative to a double concrete sandwich wall, or whole facing bricks or other external facing materials may be bonded to the wall insulation.

[0005] The panel systems available however are relatively expensive and most are not completed on site. Also they are not designed to be included into an on-site moulding formwork system.

[0006] It is an aim of the present invention to overcome at least one problem associated with the prior art whether referred to herein or otherwise.

Summary of the Invention

[0007] According to a first aspect of the present invention there is provided a cladding sheet for use in a wall, the cladding sheet comprising an insulation material, the cladding sheet further comprising a first surface having equally spaced shaped portions defined thereon.

[0008] The shaped portions may be arranged, in use, to increase the adherence between the cladding sheet and a layer of a building material to be located thereon. The building material may comprise a cementitious material. The building material may comprise render. The building material may comprise a cementitious slurry or a concrete slurry.

[0009] The shaped portions may comprise alignment means in order to indicate the position of building elements to be located within the wall.

[0010] The shaped portions may comprise raised portions defined on the first surface of the cladding sheet and preferably on the external surface of the cladding sheet. Preferably, the shaped portions are arranged, in use, to align building elements to be located on the external surface of a construction unit.

[0011] The shaped portions may extend laterally across the cladding sheet.

[0012] The shaped portions may comprise an upper face, an outer face and a lower face. The upper face may be substantially perpendicular to the first surface of the cladding sheet. The outer face may be substantially perpendicular to the upper face. The lower face may extend upwardly from the first surface of the cladding sheet to the outer face at an acute angle relative to the first surface of the cladding sheet.

[0013] The cladding sheet may incorporate reinforcement means. The reinforcement means may be located over the first surface of the cladding sheet. The reinforcement means may comprise reinforced cementitious building materials and preferably comprising polypropylene fibres.

[0014] The cladding sheet may comprise a second surface having equally spaced shaped portions defined thereon which may provide adhesion means in order to adhere a material to the second surface. Preferably the first surface is substantially parallel to the second surface. The shaped portions may comprise grooves defined in the second surface. The shaped portions may extend laterally across the cladding sheet. The grooves may have an inverted castellated cross section. The shaped portions may be located at substantially identical vertical positions on the cladding sheet to the vertical position of the shaped portions defined on the first surface of the cladding sheet.

[0015] The cladding sheet may comprise connection means in order to connect the cladding sheet to a further cladding sheet. The connection means may comprise means for use in a tongue and groove joint. The connection means may be located on the upper surface of the cladding sheet. The connection means may be lo-

cated on the lower surface of the cladding sheet. The connection means may be located on both the upper surface and lower surface of the cladding sheet.

[0016] The connection means may comprise a projection in order to locate in a cavity in a further cladding sheet. The projection and the cavity may extend laterally across the respective surface of the cladding sheet.

[0017] Preferably the first surface is an internal surface. Preferably the second surface is an external surface.

[0018] Preferably the first surface is an internal surface and the second surface is an external surface.

[0019] The cladding sheet may be arranged, for use, in an elevation facing panel system.

[0020] The cladding sheet may comprise a high strength rigid material.

[0021] The cladding sheet may comprise an extruded polystyrene.

[0022] The cladding sheet may comprise a section of a thermal insulation board.

[0023] According to a second aspect of the present invention there is provided a method of constructing a wall comprising providing a cladding sheet in accordance with the first aspect of the present invention.

[0024] Preferably the method comprises adhering a building material to the first surface of the cladding sheet. The building material may comprise a cementitious material. The building material may comprise render. The building material may comprise a concrete slurry.

[0025] The method may comprise locating building elements at a position as indicated by the shaped portions of the cladding sheet. The building elements may comprise full bricks. The building elements may comprise brick slips.

[0026] The method may comprise adhering a building material adjacent to the second side of the cladding sheet. The building material may comprise a layer of concrete and preferably is a concrete inner wall.

[0027] The method may comprise locating the cladding sheet in a former. The method may comprise locating the cladding sheet in a former and then introducing a fluid building material into the former in order to adhere to the second surface of the cladding sheet. Preferably, the fluid building material forms an inner wall. The method may comprise removing the former.

[0028] Preferably the method comprises forming a wall at the final location of the wall.

[0029] According to a third aspect of the present invention there is provided a wall incorporating at least one cladding sheet wherein the cladding sheet is in accordance with the first aspect of the present invention.

[0030] Preferably the wall is an insulated wall.

[0031] Preferably the wall comprises a concrete inner wall, a layer of cladding sheets, and an outer cementitious layer. The wall may have an external layer of brick slips. The wall may have an outer layer of full bricks.

Brief Description of the Drawings

[0032] The present invention will now be described by the way of example only, and with reference to the drawings that follow, in which :

Figure 1 is a cross-section through an insulation sheet.

Figure 2 is a cross-section through part of an insulation sheet.

Figure 3 is a vertical cross-section through an embodiment of the present invention.

Figure 4 is a vertical cross-section through an embodiment of the present invention.

Figure 5 is a horizontal cross-section through an embodiment of the present invention.

Figure 6 is a horizontal cross-section through an embodiment of the present invention.

Figure 7 is a cross-section of part of a wall after moulding in a former.

Figure 8 is a cross-section of a wall comprising full bricks on the external surface.

Figure 9 is a cross-section of a wall comprising brick slips on the external surface.

Figure 10 is a cross-section of a wall with render on the external surface.

Figure 11 is a cross-section of a wall, eaves, a ceiling/flat roof section.

Figure 12 is a cross-section of a former for use in forming a wall incorporating an embodiment of the present invention.

Description of the Preferred Embodiment

[0033] As shown in Figure 1 and Figure 2, the cladding sheet 10 comprises an insulating material and incorporates reinforcement means in the form of reinforced cementitious building materials on the outer face 14 of the cladding sheet 10 . The cladding sheet 10 comprises a first external surface 14 and a second internal surface 16. In use, in a construction unit (for example a building) external surface 14 is arranged to face externally and internal surface 16 is arranged to face internally. The cladding sheet 10 comprises a section of an insulation board which may have a honeycomb structure.

[0034] The external surface of the cladding sheet 10

may be coated with a polypropylene mesh embedded in a thin fibre cementitious building materials covering 11. This provides the cladding sheet 10 with reinforcement means.

[0035] The external surface 14 has shaped portions in the form of raised portions 18 defined thereon. The raised portions 18 are equally spaced and extend laterally across the external surface 14 of the cladding sheet 10. The raised portions 18 extend across the full width of the external surface 14 of the cladding sheet 10.

[0036] Each raised portion 18 comprises an upper face 20, an outer face 22 and a lower face 24. The upper face 20 extends substantially perpendicularly to the external surface 14 of the cladding sheet 10. The outer face 22 extends substantially perpendicularly downwards from the upper face 20. Finally, the lower face 24 extends upwardly from the external surface 14 of the cladding sheet 10 at an acute angle to the external surface 14 to the outer face 22.

[0037] The raised portions 18 increase the cohesion and adhesion between the cladding sheet 10 and a layer of a building material 15 which is to be coated thereon. The building material may simply comprise a layer of render 17 to finish the external surface of the wall, as shown in Figure 10. Alternatively, the cladding sheet 10 may be coated with a cementitious material 15, preferably with a concrete slurry to which brick slips 19 are then embedded therein, as shown in Figure 9. Alternatively, the cladding sheet 10 may be coated with a concrete slurry 15 in order to adhere to conventional full bricks 21 to the cladding sheet 10, as shown in Figure 8. The building material may be a low-water mortar to which the bricks or brick slips are adhered to the cladding sheet. Alternatively, timber boarding effect elements (not shown) may be secured to the cladding sheets 10.

[0038] The cladding sheet 10 has shaped portions on the second internal surface 16. The shaped portions comprise grooves 30 which cut into the cladding sheet 10. The grooves 30 may create an inverted castellated shape within the cladding sheet 10. The grooves 30 increase the adhesion and cohesion of the cladding sheet 10 with a layer of a building material located adjacent thereto. The building material may comprise a cementitious material but preferably is concrete. The layer of concrete creates an internal wall 34, as shown in Figures 3 to 10.

[0039] The raised portions 18 on the external surface 14 of the cladding sheet 10 also provide alignment means in order to indicate the correct vertical position for each row of building elements to be located on the external wall. As shown in Figure 3 and Figure 4, the raised portions 18 project outwardly from the external surface 14 and locate underneath the brick slips 19. This indicates to the builder the correct position for each row of building elements. Accordingly, the skill of correctly aligning the bricks or brick slips is no longer required and an unskilled builder is able to correctly align the rows of building elements.

[0040] The vertical height of the raised portions 18 corresponds to the height of conventional spacing between rows of building elements. In addition, the raised portions 18 project outwardly from the external surface 14 of the cladding sheet 10 by a distance which is greater than the thickness of the concrete slurry that is required to adhere the bricks 21 or brick slips 19 to the cladding sheet 10. Accordingly, the upper surface 20 of the raised portions 18 locate underneath the lower surfaces of the bricks or brick slips.

[0041] The cladding sheet 10 has connection means on its upper surface 40 and its lower surface 42, as shown in Figure 1. The connection means enables the cladding sheet 10 to be easily aligned and connected to an adjacent cladding sheet either above or below. The connection means essentially comprises a tongue and groove connection between two adjacent cladding sheets 10. The connection may further be secured by the use of an adhesive. The connection means comprises a projection 44 located on the upper surface 40 of the cladding sheet 10. In addition, the connection means comprises a cavity or groove 46 in the lower surface of the cladding sheet. Both the projection 44 and the groove 46 extend laterally across the cladding sheet 10 and preferably to the full width of the cladding sheet 10. Accordingly, in use, the projection 44 of a lower cladding sheet locates in the groove 46 of a cladding sheet located above. In addition, the cladding sheet may have connection means in order to connect the cladding sheet to a laterally adjacent cladding sheet or sheets. Again, this connection means may incorporate a tongue and groove joint as described above in relation to connecting vertically adjacent cladding sheets. Each cladding sheet may be connected to each adjacent cladding sheet both vertically and horizontally. The connection means for each joint comprise both a tongue and groove joint and an adhesive.

[0042] A wall incorporating cladding sheets 10 is constructed using a former 50 on site, as shown in Figure 12. The former comprises a metal frame for forming the wall. Initially, the cladding sheets 10 are located in the former adjacent to the part of the former 50 for creating external walls. Following this, a building material, for example concrete, in a fluid state, is poured into the former in the space 52 defined between the cladding sheets 10 and the former 50 for creating an internal wall. The concrete is allowed to cure or set, following which the former can be removed, as shown in Figure 7. The external surface of the wall can then be completed using render, brick slips or bricks as previously described, and as shown in Figures 8 to 10.

[0043] The cladding sheet 10 may comprise a polystyrene and may be formed using an extrusion method.

[0044] The cladding sheet 10 may be located adjacent to completed masonry walls rather than in the method described above using a former.

[0045] The edges of the walls may be completed, as

shown in Figures 3 to 6, for example around windows and door apertures in the wall. Such edges may incorporate "L" shaped building members for example "L" shaped brick slips 23.

[0046] As shown in figure 11, cladding sheets 10 can be used within a roof section. The cladding sheets 10 are incorporated in the external walls as described previously. The upper cladding sheet 10 may be cut to size if it does not require a full sized cladding sheet. The roof section 60 is then located on cladding sheets which extend across the ceiling. The roof section 60 may comprise screed concrete. The internal wall section 34 may comprise dense fibre concrete and may have conduits 62 incorporated therein during formation.

[0047] The present invention further provides an elevation facing panel system, comprising of a contoured and partially, with reinforced cementitious building materials and coated high strength, rigid, extruded polystyrene, thermal insulation board or cladding sheet 10, to which brick slips or other facing components are applied.

[0048] The sheets 10 are assembled, by fitting together their tongue and groove shaping and secured together by adhesive, within the aluminium mould of the former. The formed walls of cladding sheets or panels are separated from the face of the inner mould panels and secured against the face of the outer mould panels by spacer rods. The assembled panels are also secured round the window and door openings.

[0049] The pattern on the internal surface 16 of the cladding sheet 10 gives guidance to the alignment of the profiling on the external surface 14, to ensure that the intended brick beds are normally aligned. The rough and contoured surface of the internal surface 16 of the cladding sheet 10 is to provide good cohesion and bonding to the concrete of the structural wall. Fixings and particularly plastic fixings (not shown) may also be used to increase the securement between the cladding sheet and the internal wall.

[0050] Alternatively, the panels can be secured to a completed masonry wall.

[0051] Following completion of the structural wall and exposure of the insulation panelling or cladding sheets 10, brick slips or other facing components are applied to the exposed outer face of the panel, located along the tracks between adjacent raised portions, with adhesion by waterproof and low water mortar. The mortar between the bricks is then pointed. L-shaped brick slips are applied round the reveals of the window and door openings.

[0052] Figure 1 shows the tongue and groove thermal insulation board or cladding sheet 10, typically but not of necessity 600 mm wide and 2500 mm long, and the thickness of 80 mm may be increased to 100 mm or more to satisfy stringent thermal regulations or requirements. The internal surface 16 to be in contact with the concrete of the superstructure shell is shown with a contouring of indentations or shaped portions 30 which mirror the protrusions or raised portions 18 of the external surface 14.

[0053] The cladding sheets are for use in an elevation facing panel system in which the cladding sheet may be incorporated into the walls of a building and provide insulation to the building.

[0054] Figure 2 illustrates the covering to the external surface 14, which comprises polypropylene fibre embedded in a thin cementitious building materials covering 11. The protrusions or raised portions 18 on the coated insulation board or cladding sheet 10 are vertically spaced, such that the centre to centre distance is 75 mm, to neatly receive a brick slip or whole facing brick.

[0055] Figure 3 and figure 4 show a typical window sill and head vertical section with the insulation panel or cladding sheet 10 secured around a window opening.

[0056] Figure 5 and figure 6 show the cladding sheet 10 or panel detail in horizontal section at a typical window reveal, with brick slips applied to the exposed outer face of the panel by waterproof and low water mortar and L-shaped brick slips into the reveal.

[0057] The brick slips shown in Figures 3 to 6 can be replaced by whole facing bricks or other facing materials, similarly applied on site to the incorporated cladding sheets or insulation panels.

[0058] The arrangement of the grooves or indentations and the raised portions or protrusions can be altered to accommodate the application of bricks of a different size, tiles of a different size and shape and surface covering components such as timber boarding or timber effect boarding.

[0059] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0060] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0061] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0062] The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A cladding sheet for use in a wall, the cladding sheet comprising an insulation material, the cladding sheet further comprising a first surface having equally spaced shaped portions defined thereon.

2. A cladding sheet according to claim 1 in which the shaped portions are arranged, in use, to increase the adherence between the cladding sheet and a layer of a building material to be located thereon.

3. A cladding sheet according to any preceding claim in which the shaped portions comprise alignment means in order to indicate the position of building elements to be located within the wall.

4. A cladding sheet according to any preceding claims in which the shaped portions comprise raised portions defined on the first surface of the cladding sheet.

5. A cladding sheet according to any preceding claim in which the shaped portions extend laterally across the cladding sheet.

6. A cladding sheet according to any preceding claims in which the cladding sheet incorporates reinforcement means.

7. A cladding sheet according to any preceding claim in which the cladding sheet comprises a second surface having equally spaced shaped portions defined thereon.

8. A cladding sheet according to claim 7 in which the shaped portions provide adhesion means in order to adhere a material to the second surface.

9. A cladding sheet according to claim 7 or claim 8 in which the shaped portions comprise grooves defined in the second surface.

10. A cladding sheet according to any one of claims 7 to 9 in which the shaped portions on the second surface are located at substantially identical vertical positions on the cladding sheet to the vertical position of the shaped portions defined on the first surface of the cladding sheet.

11. A cladding sheet according any preceding claim in which the cladding sheet comprises connection means in order to connect the cladding sheet to a further cladding sheet.

12. A cladding sheet according to any preceding claim in which the first surface is an internal surface and the second surface is an external surface.

13. A wall incorporating at least one cladding sheet wherein the cladding sheet is in accordance with any one of claims 1 to 12.

14. A wall according to claim 13 in which the wall comprises a concrete inner wall, a layer of cladding sheets, and an outer cementitious layer.

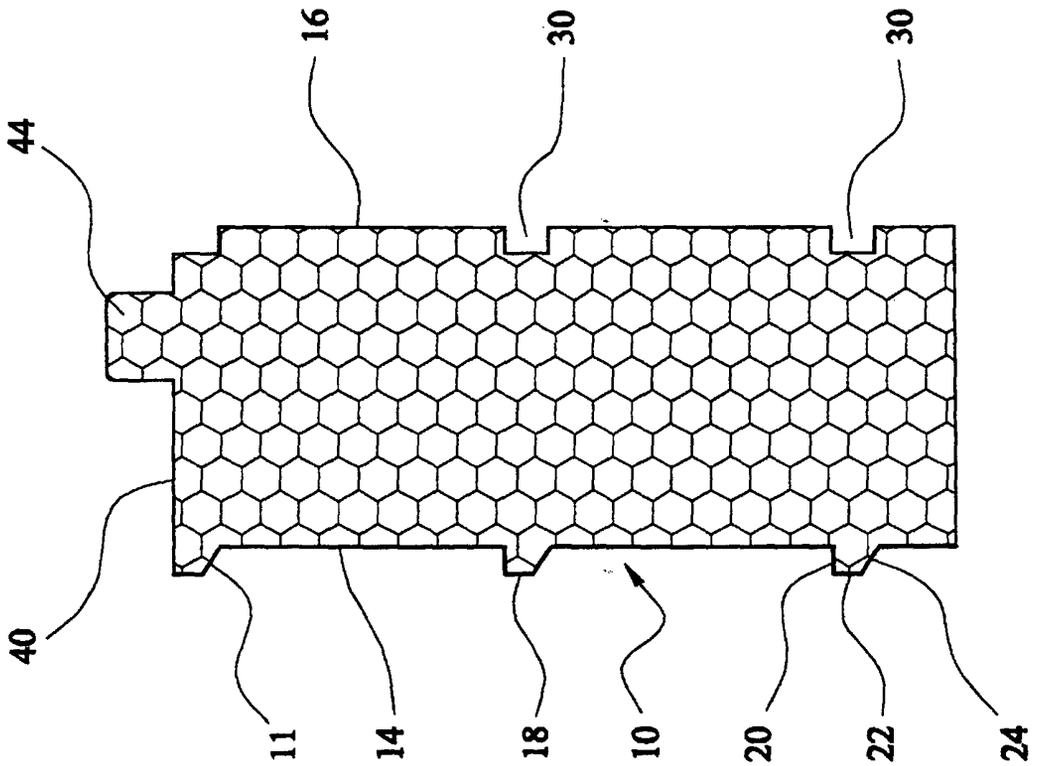

FIG. 2

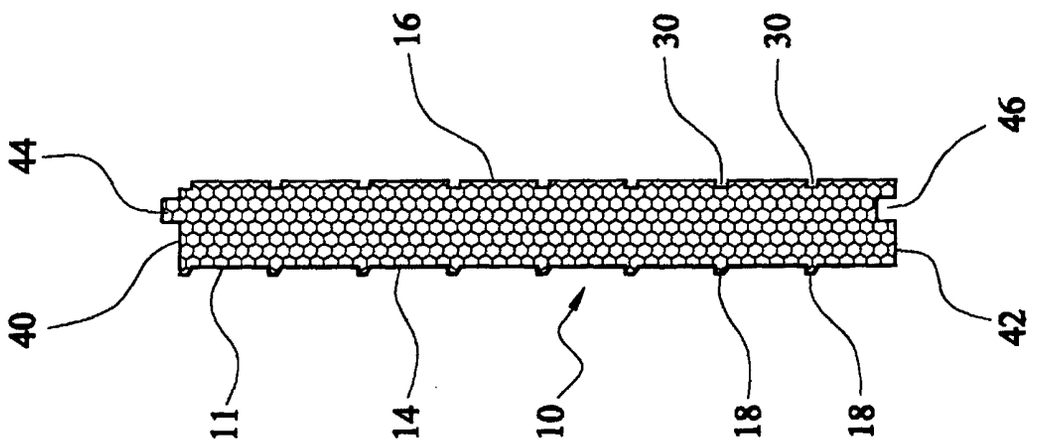

FIG. 1

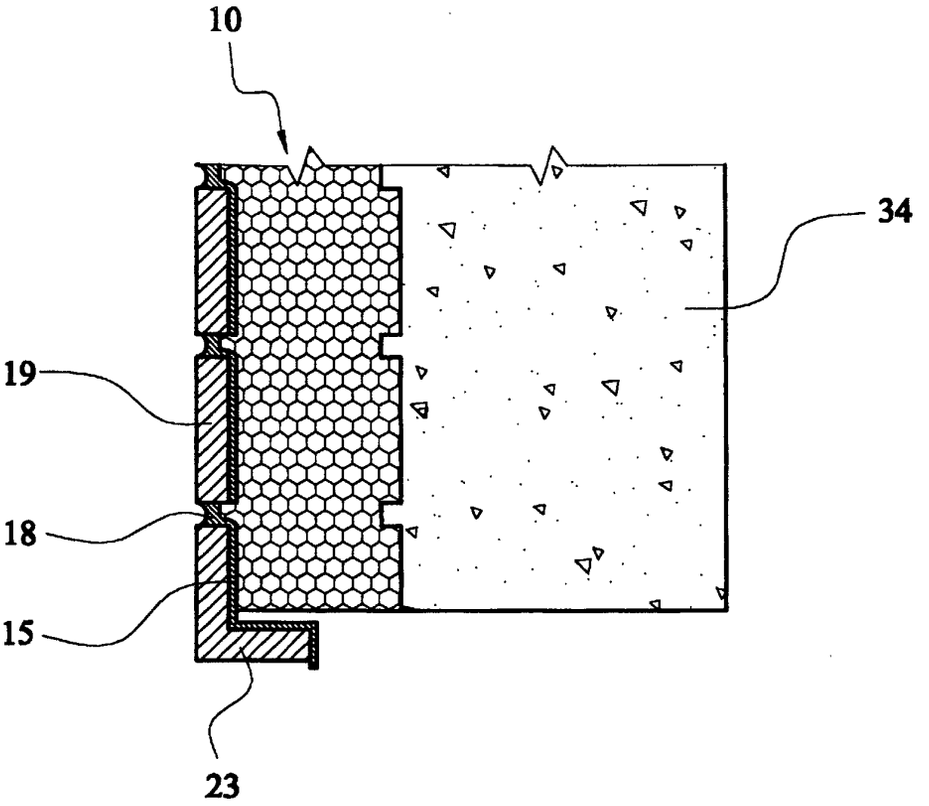

FIG. 3

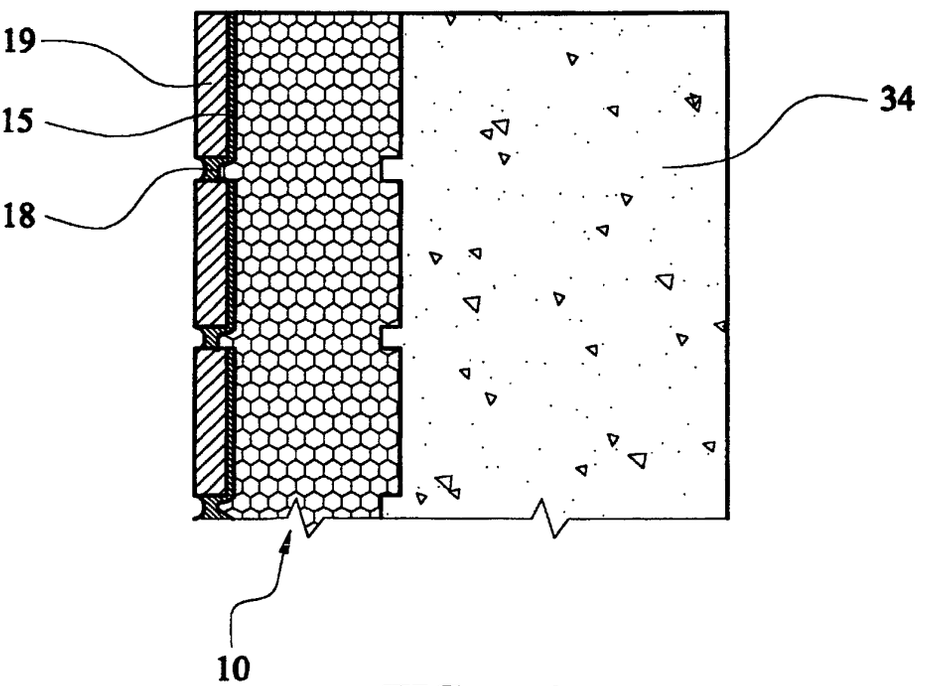

FIG. 4

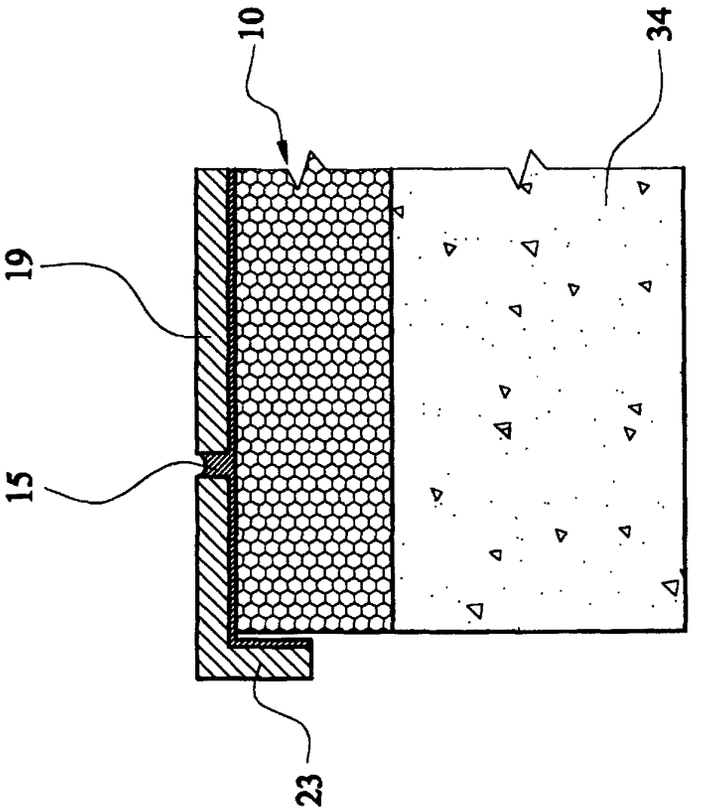

FIG. 6

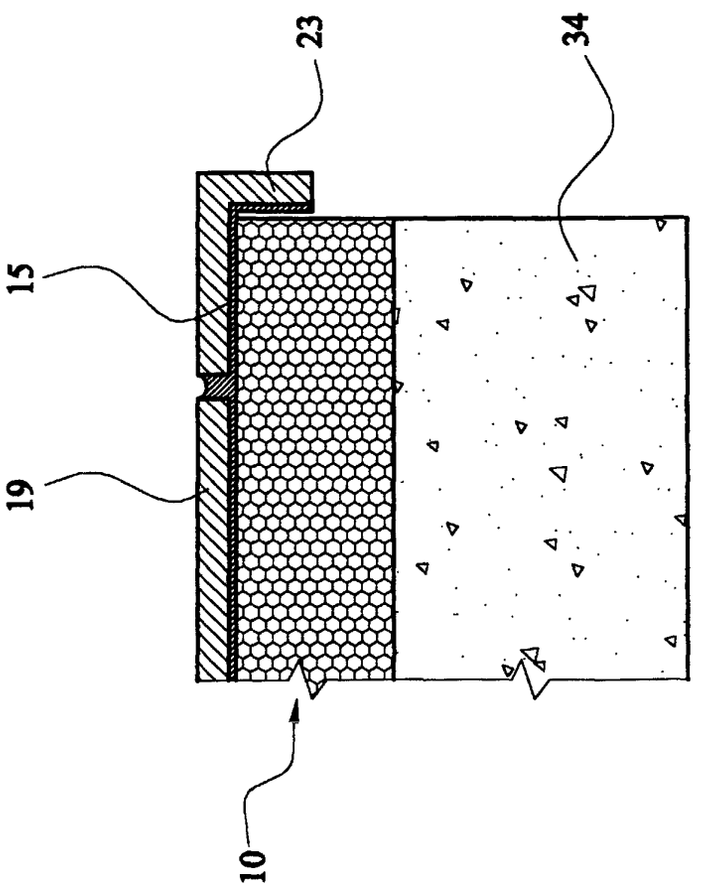

FIG. 5

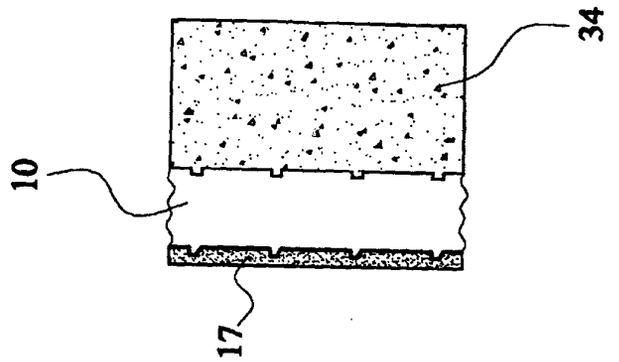

FIG. 10

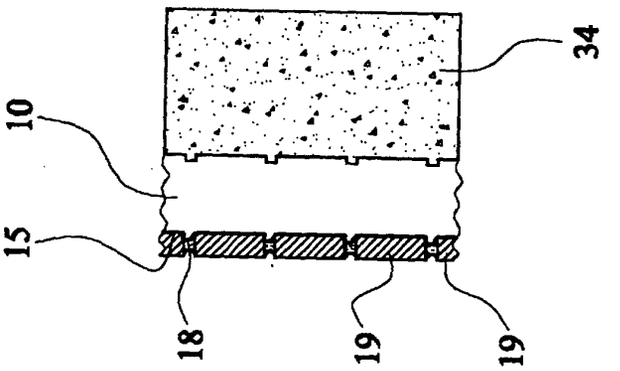

FIG. 9

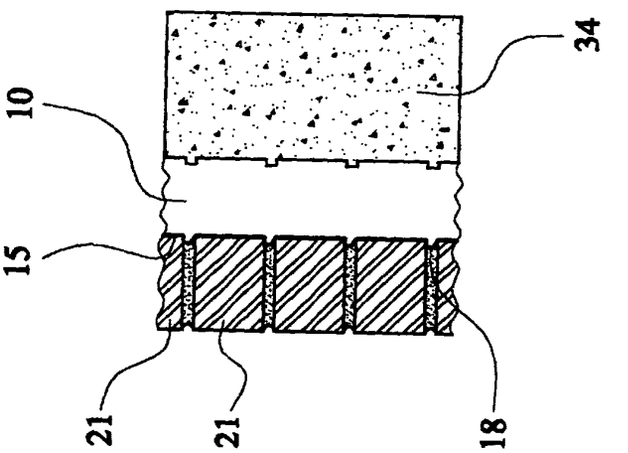

FIG. 8

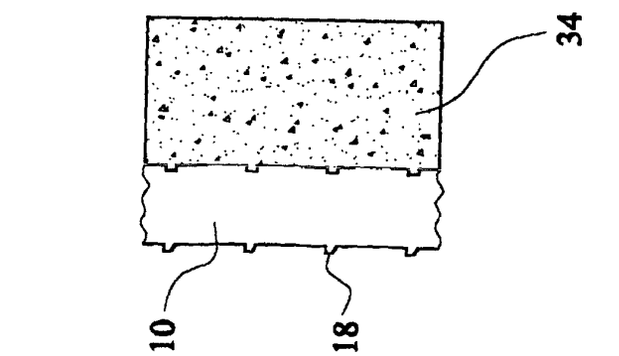

FIG. 7

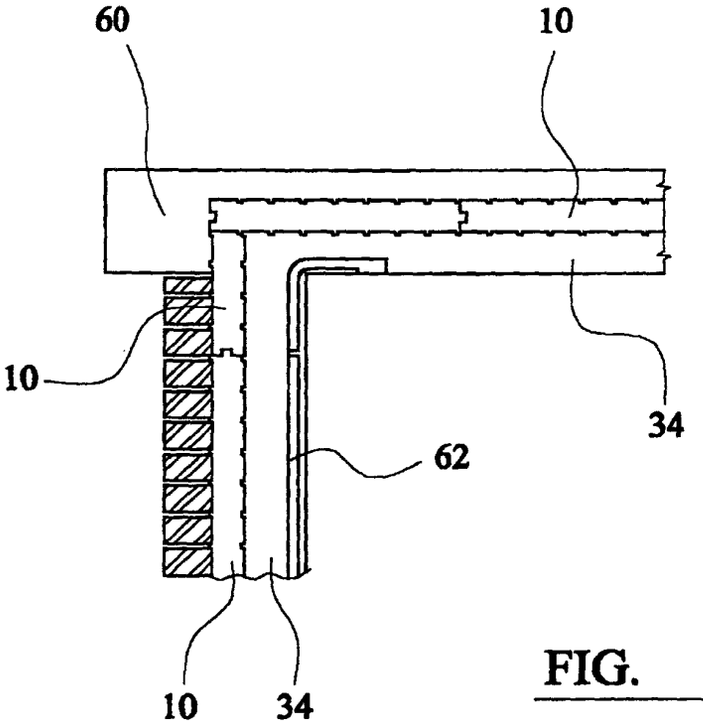

FIG. 11

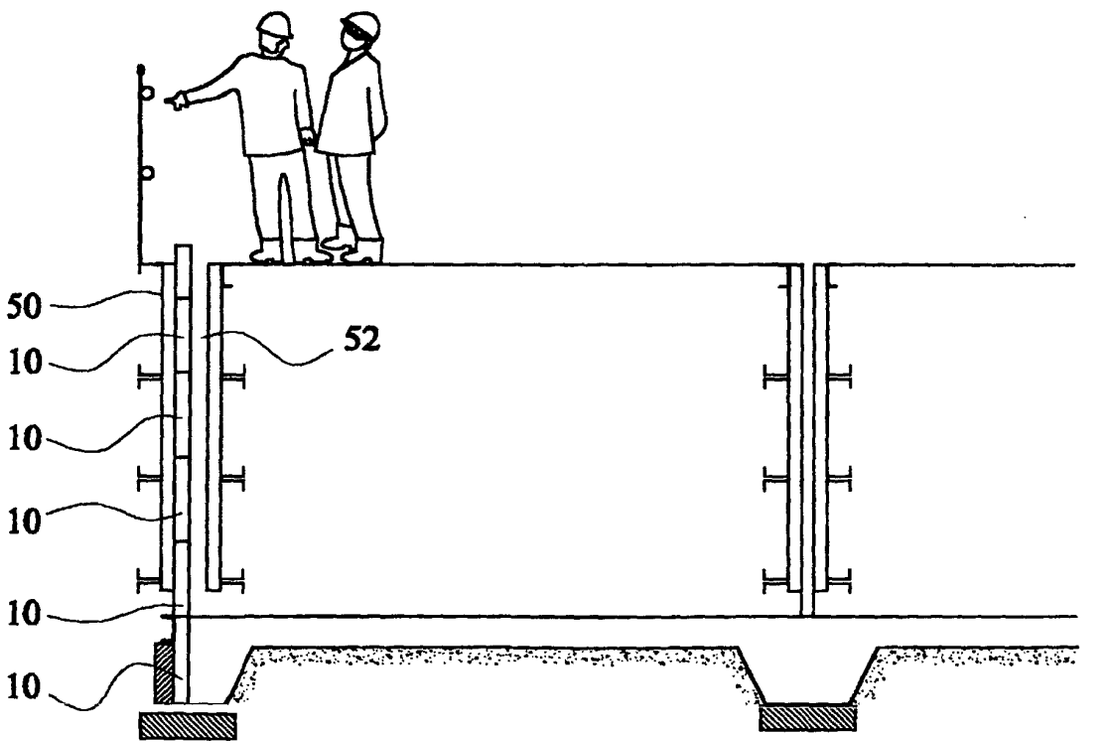

FIG. 12