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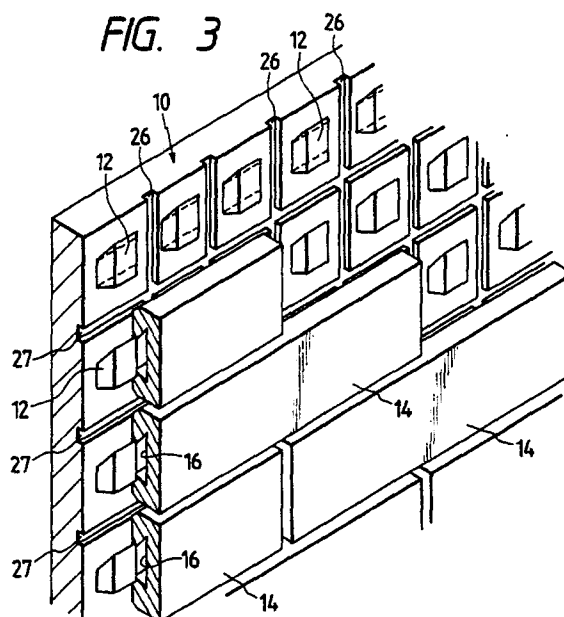
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London WC2A 3SZ(GB)(54) **Tiled panel assembly and support structure therefor.**

(57) A support structure for a tiled wall assembly supports tiles (14) hanging on a board (10). The tile hanging board (10) such as a cement board can constitute a wall and is provided with a plurality of protrusions (12) each of which has an upwardly directed hook portion (121) at an upper end. The tile (14) has an engaging groove (16) on the inside. The groove (16) terminates at a downwardly directed hook portion (141) at an upper end. The downward hook (141) of the tile (14) is hung on the upward hook (121) of the protrusion (12). The lower inside of the tile (14) is secured to the board (10) by an adhesive (30).



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TILED PANEL ASSEMBLY AND SUPPORT STRUCTURE THEREFOR

The present invention relates to a tiled panel assembly, especially a wall assembly, and a support structure therefor.

Heretofore, in a support structure for a tiled wall assembly, tiles have been secured to a board such as a cement board. In this construction, when water enters from the outside of the tiles to the inside of the tiles, the water collects on the board, and penetrates the board and enters into the inside of the building. The soaked board is also caused to warp, as it is affected by changes when the board dries out. Also the water entering between the inside of the tile and the outside of the board stays therebetween, and causes further damage upon freezing.

In another example of a prior art construction for a tiled wall assembly, a plate made for example of aluminium is securely applied by nails to a board which constitutes a wall of a building. A wall assembly is constructed by hanging tiles on protrusions formed on the plate by projecting protrusions from the plate. This construction requires the steps of fixing the plate on the board, and fixing the tiles upon the plate, thus producing the problem of many work processes.

An object of this invention in one aspect is to provide a support structure for a tiled wall assembly in which water entering into the inside of the tiles can flow out readily, making the work easy.

According to the present invention there is provided in one aspect a support structure for mounting tiles to form a tiled panel assembly, the support structure comprising a tile supporting board characterised in that the board is provided with a plurality of protrusions each for engaging with an engaging groove on the inside of a tile.

In accordance with one particular feature of the invention, the board has a plurality of drain slots formed in the surface of the board. Preferably the drain slots comprise vertical drain slots, most preferably vertical and horizontal drain slots, formed in the surface of the board and positioned between the protrusions.

In accordance with another particular feature of the invention, it may be arranged that each protrusion has an upper portion having the shape of an upwardly directed hook, adapted to cooperate with an upper portion of a tile which has the shape of a downwardly directed hook, when the tile is hung on the board.

In accordance with another feature, it may be arranged that the board is provided with a plurality of protrusions adapted to cooperate with tiles hung on the board in use, so that the inside of a tile hung on a protrusion is spaced from the surface of

the board.

There is also provided in accordance with the invention, a tiled panel assembly comprising a tile-supporting board and a plurality of tiles mounted on the board, characterised in that the board is provided with a plurality of protrusions, each tile having an engaging groove formed on the inside thereof, and the tiles being mounted on the board by engagement of the grooves with the protrusions. Such a tiled panel assembly may incorporate any of the features set out hereinbefore, or hereinafter, with reference to a support structure for a tiled panel assembly.

In the tiled panel assembly, conveniently the tiles are hung on the protrusions, and a lower portion of each tile is secured to the board by adhesive.

In accordance with another feature of the invention, it may be arranged that tiles adjacent to each other vertically are coupled to each other in a connection in which a lower edge of an upper tile (14) engages an upper edge of a lower tile.

In accordance with another feature it may be arranged that tiles adjacent to each other horizontally are spaced apart, and the board is provided with a plurality of vertical drain slots in the surface of the board, the gaps between horizontally adjacent tiles being positioned in register with vertical drain slots.

The said protrusions may be formed integrally with the board, or each protrusion may be provided by an element formed separately from the board and secured thereto.

It is to be appreciated that the terms horizontal and vertical are intended to describe the orientation of the drain slots when the tiled panel assembly, or support structure therefore, is placed vertically as a wall assembly. The vertical and horizontal slots may be strictly vertical or horizontal, or approximately so. Moreover where a panel assembly is itself inclined to the vertical for example when used as a roof panel, the vertical slots will of course be slots lying in vertical planes, but inclined to the vertical with the inclination of the panel assembly.

There will now be set out a number of further aspects of the present invention.

In accordance with a first further aspect of the invention there may be provided a working construction for hanging tiles in juxtaposition on a facing wall and the like to form a tile wall body, said working construction for the tile wall body having a tile-hanging board such as a cement board which can constitute a wall being provided with a plurality of protrusions each of which has an upward hook at an upper end, said tile having an

engaging groove on the inside, said groove terminating at a downward hook at an upper end, said downward hook of said tile being hung on said upward hook of said protrusion, and the lower inside of said tile being secured to said board by an adhesive.

In accordance with a second further aspect of the invention there may be provided a working construction for arranging and attaching tiles to tile-hanging board secured to a structure, said working construction for a tile wall body comprising said tile-hanging board being provided with a plurality of protrusions, said tile having an engaging groove formed on the inside to be engaged with said protrusions, and a plurality of vertical and lateral drain slots being formed on the surface of said board.

In accordance with a third further aspect of the invention there may be provided a working construction for arranging and attaching oblong tiles to a tile-hanging board secured to a structure, said working construction for a tile wall body comprising said tile-hanging board being provided on the surface side thereof with a plurality of protrusions, said tile having an engaging groove formed on the inside to be engaged with said protrusions, said tiles adjacent vertically to each other being coupled to each other in a scarf connection in which a lower edge of an upper tile engages an upper edge of lower tile, a plurality of vertical slots being formed on the surface of said board in a given pitch corresponding to a space between abutting ends of said tiles adjacent laterally to each other, said slots facing to the insides of said tiles, and water which enters into the insides of said tiles through their abutting ends flowing out of said slots.

The abutting ends of said tiles adjacent laterally to each other may be positioned in a staggered arrangement or off-set by a given distance out of the entire length of said tile. Preferably, the inside of said tile may be secured to the surface of said board by an adhesive in a close contact or in a little space. The surface of said board may be engraved among said protrusions to form said drain slots.

In accordance with a fourth further aspect of the invention there may be provided a working construction for arranging and attaching tiles to a tile-hanging board secured to a structure, said working construction for a tile wall body comprising said tile-hanging board being provided with a plurality of protrusions, said tile having an engaging groove formed on the inside, and said protrusions engaging the inside of said tile to support said tile so that the inside of it is spaced from the surface of said board.

Where a panel assembly embodying the invention is used vertically, or at an angle to the vertical,

as a wall or part of a wall, it will be referred to generally as a tiled wall assembly, or tiled wall body. In a tiled wall assembly in accordance with preferred aspects of the invention, since the tile-hanging board, which can constitute a wall, is provided with protrusions having an upward hook when the board is disposed in place, a facing wall of a building may be formed by the board. It is possible to obtain the wall body merely by hanging the tiles in juxtaposition on the hooks of the board without using the plates as carried out in conventional working.

Since the downward hook of the tile is hung on the upward hook of the protrusion on the board, the lower inside of the tile can be secured to the board by adhesive, and thus the tile can be easily engaged with the protrusions of the board for firmly fixing the tiles to the board using the adhesive. This will dispense with sliding laterally the tile into the engaging portion of the plate as has conventionally been required, and the operation of hanging the tiles becomes easier.

Further, in a preferred working construction of this invention, since the tile has particularly shaped portions for scarf connection at the upper and lower edges thereof, and tiles adjacent vertically to each other are coupled to each other through the scarf connection, it is possible to prevent water from entering into the inside of the tile through the abutting edges of the tiles.

On the other hand, if water enters into the inside of the tiles through the abutting ends of the tiles adjacent laterally to each other, the water can readily flow out through the slots formed on the surface of the board. Accordingly, the water does not flow along the lateral space between the surface of the board and the inside of the tiles. In other words, the water does not stay in the space. Consequently, this invention can overcome or reduce the conventional problems with the board in soaking and bending with water, allowing water into a building, or freezing damage caused by the collection of water.

In addition, in a preferred working construction of this invention, since the plurality of the protrusions provided on the board engage the insides of the tiles to support the tiles so that the insides of the tiles are spaced away from the surface of the board, when water enters into the insides of the tiles, the water can readily flow out through the space between the insides of the tiles and the surface of the the board. That is, the space can serve as a drain space for preventing the board from being soaked in water, preventing the side of the building from being penetrated by water coming through the board. At the same time, the problem of deformation of the board by bending etc. is removed, along with the problem of the harm caus-

ed by freezing of the penetrating water.

Preferred constructions of this invention can form an air layer in the space between the insides of the tiles and the surface of the board. Such air layer serves as a heat-insulation layer and thus inhibits transmission of heat from the tiles to the boards and vice versa.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 and Figures 2(A) and 2(B) are perspective views and cross sections, respectively of the main parts of a tiled wall assembly embodying the invention;

Figure 3 and Figures 4(A) and 4(B) are perspective views and cross sections of the main parts of another embodiment of this invention respectively;

Figures 5 and 6 are front views and perspective views of the main part of still another embodiment of this invention, respectively;

Figures 7 and 8 are front views of still another embodiment of this invention, respectively;

Figure 9 is a perspective view of still another embodiment of this invention;

Figures 10(A) and 10(B) are cross sections of the main parts of still another embodiment of this invention, respectively; and

Figure 11 and Figures 12(A) and 12(B) are perspective views and cross sections of the main parts of still another embodiment of this invention, respectively.

Referring now to the drawings, embodiments of this invention will be explained.

Figure 1 is a perspective view of the main part of an embodiment of a board 10 of a base member on which tiles 14 are hung directly in juxtaposition. The board 10 is made of hardwood piece cement plate formed by mixing wood pieces and cement for pressing after kneeding, cement plate formed by extruding cement, wood plate, plywood plate, asbestos plate, calcium silicate plate, gypsum board, plastic board, or metal composite plate etc. When the board 10 is attached to a building, the board per se constitutes a facing wall of the building.

The outside of the board 10 is provided with protrusions 12 spaced away from each other laterally and vertically. The protrusions 12 are formed integrally with the board 10 when the board 10 is manufactured in a factory.

As shown in Figure 2(A), the protrusion 12 has an upward hook 121 at its upper end. An engaging groove 16 formed on the inside of the tile 14 can engage the upward hook 121 at an upper end of the groove 16. The groove 16 terminates at a downward hook 141 at its upper end. The downward hook 141 has the opposing slant to that of the

upward hook 121.

Accordingly, it is possible to hang the downward hook 141 on the upward hook 121. The tile 14 can be readily hung on the protrusion from the outside of the board 10, since there is a clearance between the hooks 121 and 141 so that the tile 14 can fall to press on the protrusion 12 so that the protrusion 12 can be readily engaged.

An adhesive 30 may be applied on the surface of the board 10 opposite to the inside of a lower portion 142 of the tile 14 so that the lower portion 142 may be securely fixed on the board 10 by adhesive 30. The adhesive 30 may be applied to the inside of the lower portion 142.

In this construction, after the board 10 is attached to a building to form a wall body, it is possible to obtain a tiled wall body by hanging directly the tile 14 on the protrusion 12 and securing the inside of the lower portion 142 to the surface of the board 10 by the adhesives 30 thereby making the work simple.

Figure 2(B) shows an alternative of the protrusion 12 which is made as a part separated from the board 10 and is previously secured to the board 10 by means of a nail 11 in a factory. The tile 14 can be easily hung on the protrusion 12 after the board 10 is attached to the building.

Thus, the protrusions 12 are formed beforehand on the board 10, the board 10 is then attached to the building on the spot, the tiles 14 are hung on the protrusions 12, and the tile wall body is formed. Since this construction requires no step for securing plate on the board as has been carried out in the prior art, the construction according to this invention can decrease the cost of the tile wall body and make the working simple.

When the board 10 is used for an individual house, the thickness of the board is preferably 6 to 25 mm, while for a building, the thickness thereof is preferably 30 to 100 mm.

When the board 10 is made of pottery material such as cement, the wall body has a great strength and good protection against fire.

The protrusion 12 may be formed continuously in a lateral direction so that the tiles 14 can be hung in series.

Figure 3 and Figures 4(A) and 4(B) show another embodiment of this invention.

A plurality of vertical and lateral drain slots 26 and 27 are formed on the surface of the board 10. The drain slots comprise the longitudinal drain slots 26 and the lateral drain slots 27.

In this embodiment, since the drain slots 26 and 27 cross perpendicularly to each other on the surface of the board 10, even if water enters into the inside of the tiles 14, the water will flow out readily through the slots 26 and 27.

Accordingly, the board 10 can not be soaked

or deformed by the water, which will not penetrate into the room.

Figure 4(A) illustrates a cross section of the main part of Figure 3. In this embodiment, the protrusion 12 substantially occupies the engaging groove 16.

Figure 4(B) shows an alternation of the protrusion 12. The protrusion 12 is made separately from the board 10. It may be previously secured to the board 10 by the nail 11 in a factory.

Figures 5 and 6 show another embodiment of this invention.

The oblong tile 14 has the engaging groove 16 on the inside. The protrusion 12 of the board 10 engages the groove 16. In this embodiment, the tiles 14 are laterally disposed apart by a small space (at adjacent ends 18). The tiles 14 are longitudinally (or vertically for illustration) disposed in a scarf connection. The tiles 14 adjacent vertically to each other are coupled to each other at the upper and lower edges. In other words, the tile 14 has a shoulder 20 at the upper end portion 141 and a recess 22 at the lower end portion 142. The shoulders 20 and the recess 22 are engaged with the recess 22 and the shoulder 20 of the upper tile 14 and the lower tile 14 respectively. In this embodiment, the abutting ends 18 of the tiles adjacent laterally to each other are positioned in a staggered arrangement so that the ends 18 are at the center of the longitudinal (or lateral) side of the tile 14.

A number of protrusions 12 are disposed so as to be juxtaposed vertically. Vertical slots 24 with a given width are defined between rows of the adjacent protrusions 12. The vertical slots 24 are defined on the surface of the board 10 in a given pitch corresponding to a space between the abutting ends 18 of the tiles 14 adjacent laterally to each other (in the embodiment shown in Figure 6, the pitch is a half of the distance between the ends 18). The slots 24 are aligned to the inside of the ends 18 of the tiles 14.

In this embodiment, since the tiles 14 adjacent vertically to each other are coupled to each other in the scarf connection, it is possible to prevent water from entering from the coupled edges.

On the other hand, as there is a small space in the abutting ends 18, there is a possibility that water might enter into the insides of the tiles 14 through the abutting ends 18.

However, since the vertical slots 24 are defined between the protrusions 12 on the surface of the board 10, even if water enters into the insides of the tiles 14 through the ends 18, the water will flow out to the outside through the vertical slots 24, and thus the water does not move laterally along the space between the surface of the board 10 and the insides of the tiles 14. Consequently, according to the working construction of this embodiment, water

will not stay in the space between the surface of the board 10 and the insides of the tiles 14, and troubles of freezing damage due to the collection of water and others will not be caused.

It should be noted from the above embodiment that further alternatives may be possible in accordance with the present invention.

For example, various arrangement of the tiles 14 may be made other than the arrangement mentioned above. Figures 7 and 8 show other arrangements. In Figure 7, the abutting ends 18 of the tile 14 are off-set in a lateral direction by the amount of one-third of the length of the tiles 14 from the position of the ends 18 of the upper or lower tiles 14. In Figure 8, the abutting ends 18 are aligned vertically.

In the present invention, the inside of the tile 14 may be secured to the surface of the board 10 either in close contact or with a small space provided therebetween. As shown in Figure 9, the vertical slots 26 may be formed to provide recesses between the protrusions 12.

As shown in Figures 10(A) and 10(B) the adhesive 30 may be applied laterally on the surface of the board 10 opposite to the inside of the lower portion 142 of the tile 14, the lower portion 142 being secured to the board 10 through the adhesives 30 to fix the tile 14 on the surface of the board 10. The adhesive 30 may be applied on the inside of the lower portion 142.

In this construction, after the board 10 is attached to a building to form a wall body, it is possible to obtain a tiled wall body by hanging directly the tile 14 on the protrusion 12 and securing the inside of the lower portion 142 to the surface of the board 10 by the adhesives 30, thereby making the work simple.

Figure 10(B) shows an alternative of the protrusion 12 which is made of a part separated from the board 10 and is previously secured to the board 10 by means of a nail 11 in a factory. The tile 14 can be easily hung on the protrusion 12 after the board 10 is attached to the building.

This embodiment can be applied to the case in which the tiles 14 adjacent laterally to each other are abutted with each other. Further, this embodiment can be applied to another working construction for the tile wall body such as a slant wall and a substantially horizontal wall as well as a vertical wall.

Figures 11 and 12 show still another embodiment of this invention.

The oblong tile 14 has the engaging groove 16 in the inside. The protrusion 12 engages the groove 16. That is, a number of tiles 14 are hung on the surface of the board 10 to form the tile wall body.

The board 10 is provided on the surface with

numerous protrusions 13 which are in contact with the inside of the tiles. That is, the tile 14 is mounted on the board 10 with the inside of the tile being spaced away by a certain distance from the surface of the board 10 to form a space between the inside of the tile 14 and the surface 10 of the board.

Figure 12(A) illustrates a cross section of the main part of Figure 11. The inside of the tile 14 contacts with the protrusion 13 and is secured to the protrusion by the adhesive 30.

Figure 12(B) shows an alternative of the protrusion 12. The protrusion 12 is made as a part separated from the board 10. It may be previously secured to the board 10 by the nail 11 in a factory.

In this working construction, since the space defined between the surface of the board 10 and the insides of the tiles 14 functions as a drain space, even if water may enter into the insides of the tiles 14, the water will flow out through the drain space, and thus the water does not move laterally along the space between the surface of the board 10 and the insides of the tiles 14. Consequently, according to the working construction of this embodiment, water will not stay in the space between the surface of the board 10 and the insides of the tiles 14, and no trouble such as freezing damage due to the retention of water will be caused.

In addition, the space between the surface of the board 10 and the inside of the tiles 14 may also function as a heat-insulation layer and thus heat-insulation of the tile wall body will be extremely improved.

Claims

1. A support structure for mounting tiles to form a tiled panel assembly, the support structure comprising a tile supporting board (10) characterised in that the board (10) is provided with a plurality of protrusions (12) each for engaging with an engaging groove (16) on the inside of a tile (14).

2. A support structure according to claim 1 in which the board (10) has a plurality of drain slots (26 or 27) formed in the surface of the board (10).

3. A support structure according to claim 2 in which the drain slots comprise vertical draining slots (26) formed in the surface of the board (10) and positioned between the protrusions (12).

4. A support structure according to claim 2 or 3 in which the drain slots comprise vertical and horizontal drain slots (26 and 27) formed in the surface of the board (10) and positioned between the protrusions (12).

5. A support structure according to any preceding claim in which each protrusion (12) has an

upper portion having the shape of an upwardly directed hook (121), adapted to cooperate with an upper portion of a tile (14) which has the shape of a downwardly directed hook (141), when the tile (14) is hung on the board (10).

6. A support structure according to any preceding claim in which the board (10) is provided with a plurality of protrusions (13) adapted to cooperate with tiles (14) hung on the board (10) in use, so that the inside of a tile (14) hung on a protrusion (12) is spaced from the surface of the board (10).

7. A tiled panel assembly comprising a support structure according to any preceding claim and a plurality of tiles (14) mounted on the board (10) by engagement of the grooves (16) with the protrusions (12).

8. An assembly according to claim 7 in which the tiles (14) are hung on the protrusions (12), and a lower portion (142) of each tile (14) is secured to the board (10) by adhesive (30).

9. An assembly according to claim 7 or 8 in which tiles (14) adjacent to each other vertically are coupled to each other in a connection in which a lower edge (142) of an upper tile (14) engages an upper edge (141) of a lower tile (14).

10. An assembly according to claim 7, 8 or 9 in which tiles (14) adjacent to each other horizontally are spaced apart, and the board (10) is provided with a plurality of vertical drain slots (26) in the surface of the board, the gaps between horizontally adjacent tiles (14) being positioned in register with vertical drain slots (26).

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FIG. 1

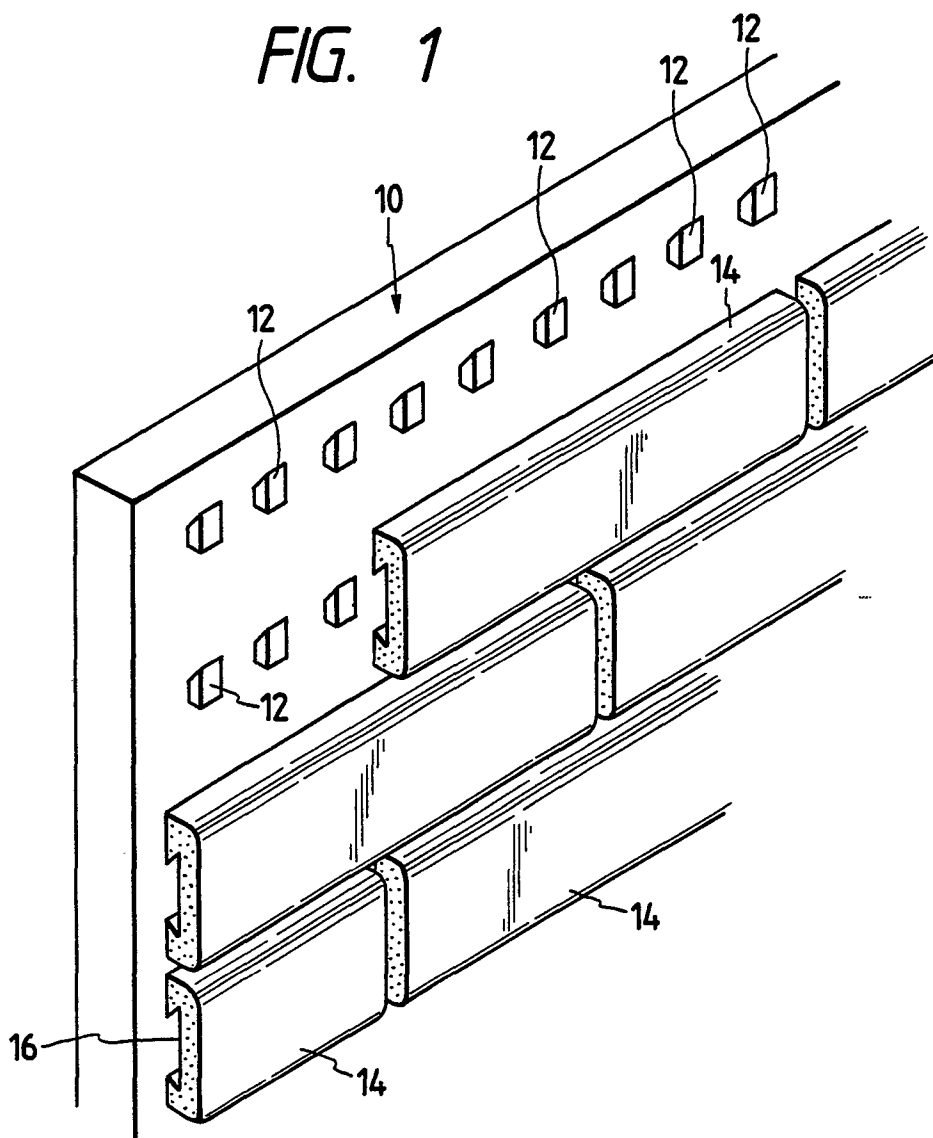


FIG. 2(A)

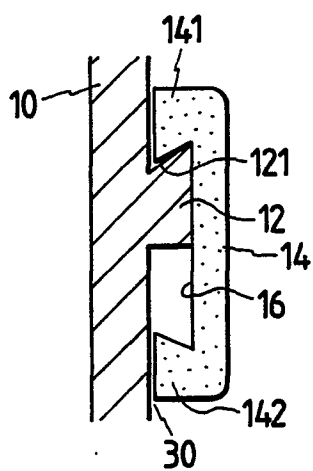


FIG. 2(B)

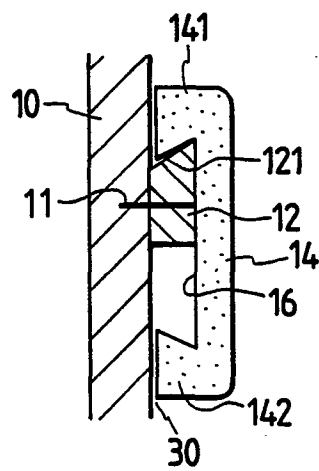


FIG. 3

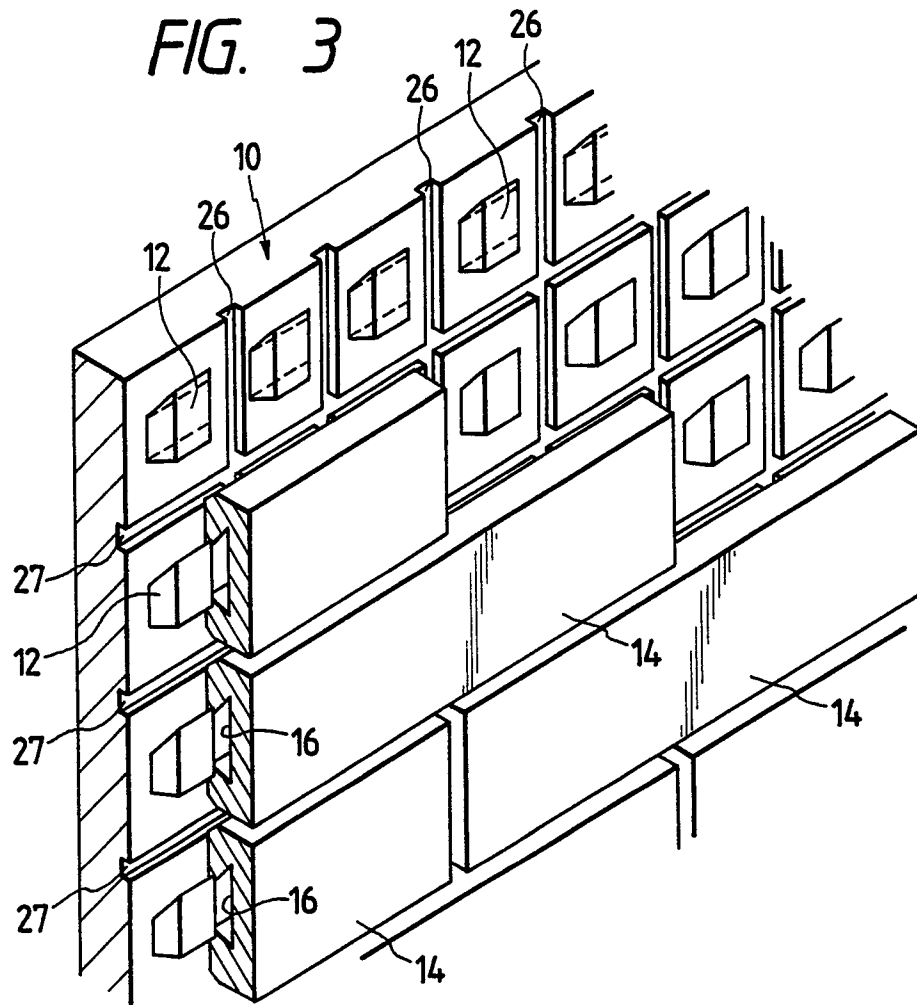


FIG. 4(A)

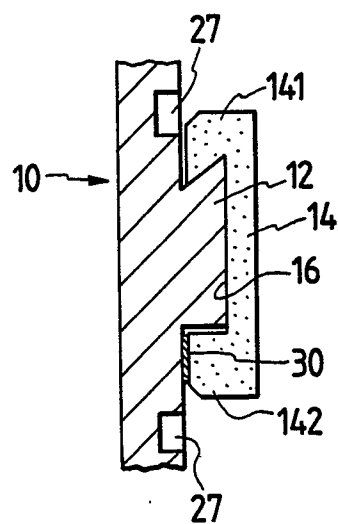


FIG. 4(B)

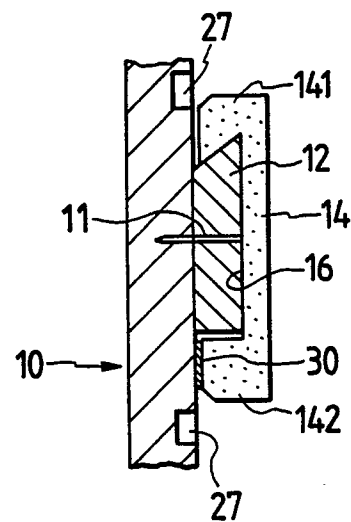


FIG. 5

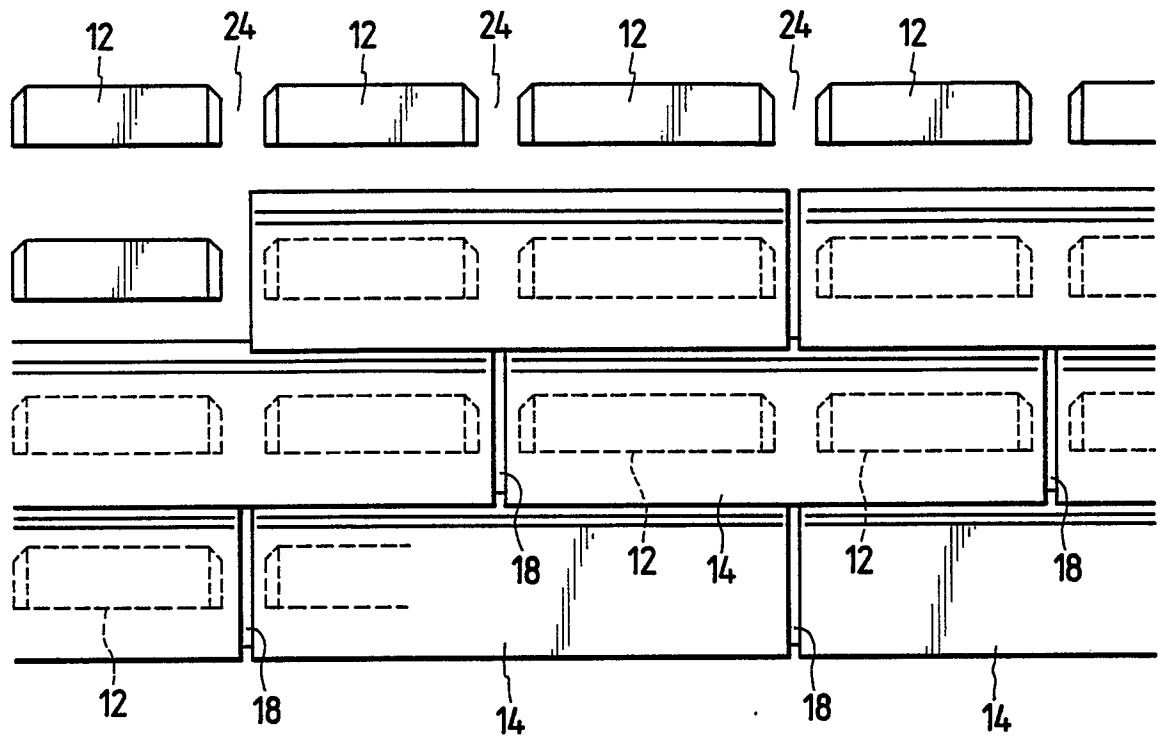


FIG. 7

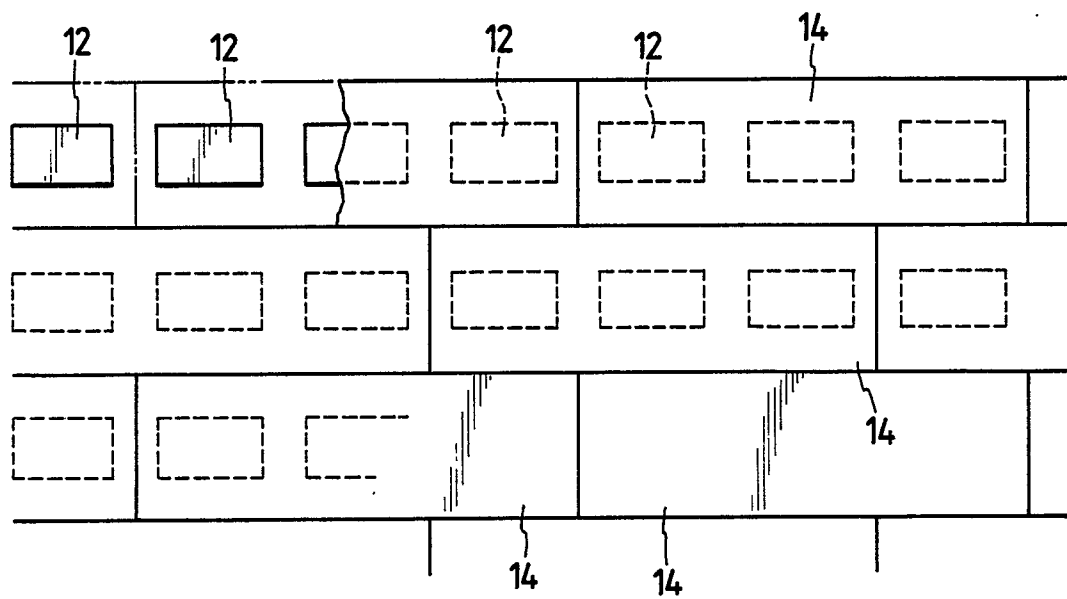


FIG. 6

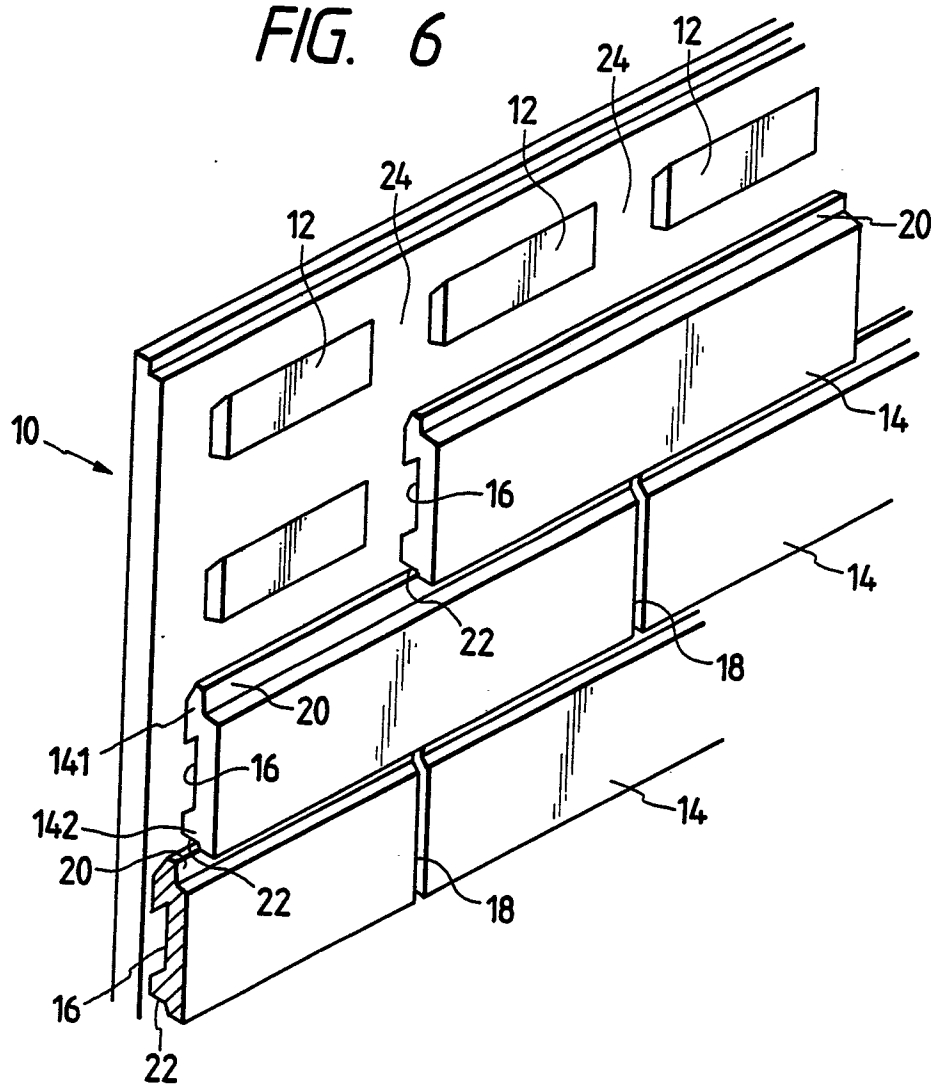
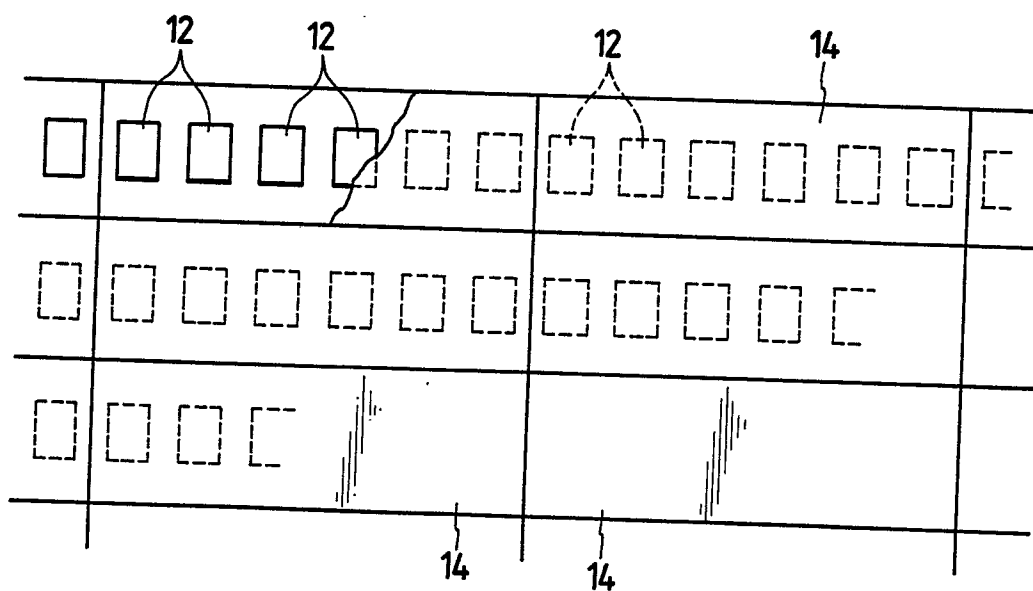


FIG. 8



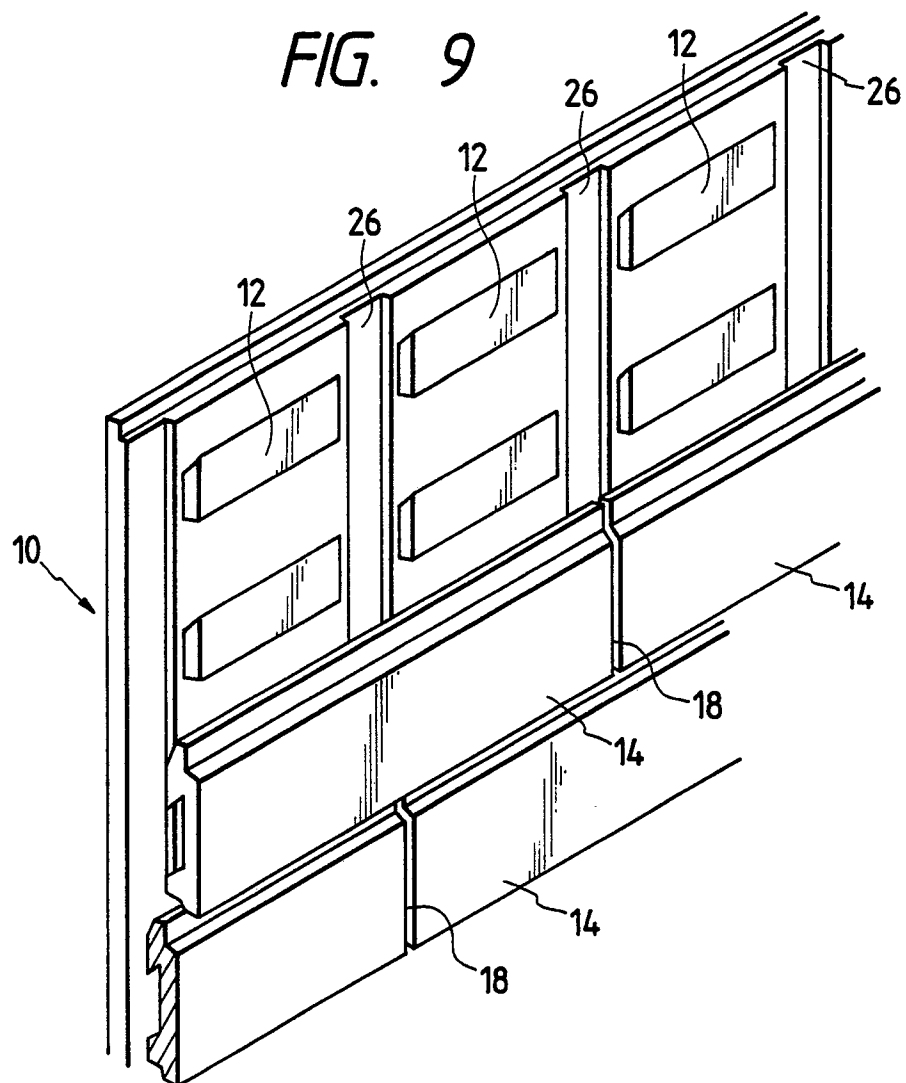


FIG. 10(A)

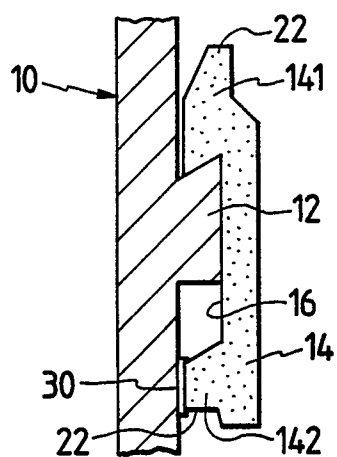


FIG. 10(B)

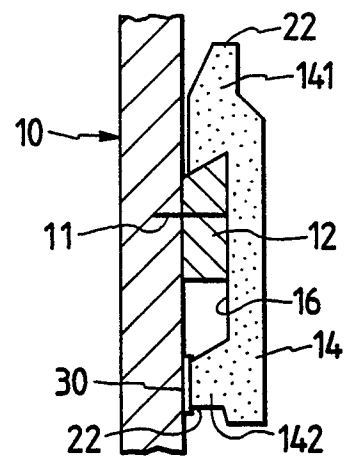


FIG. 11

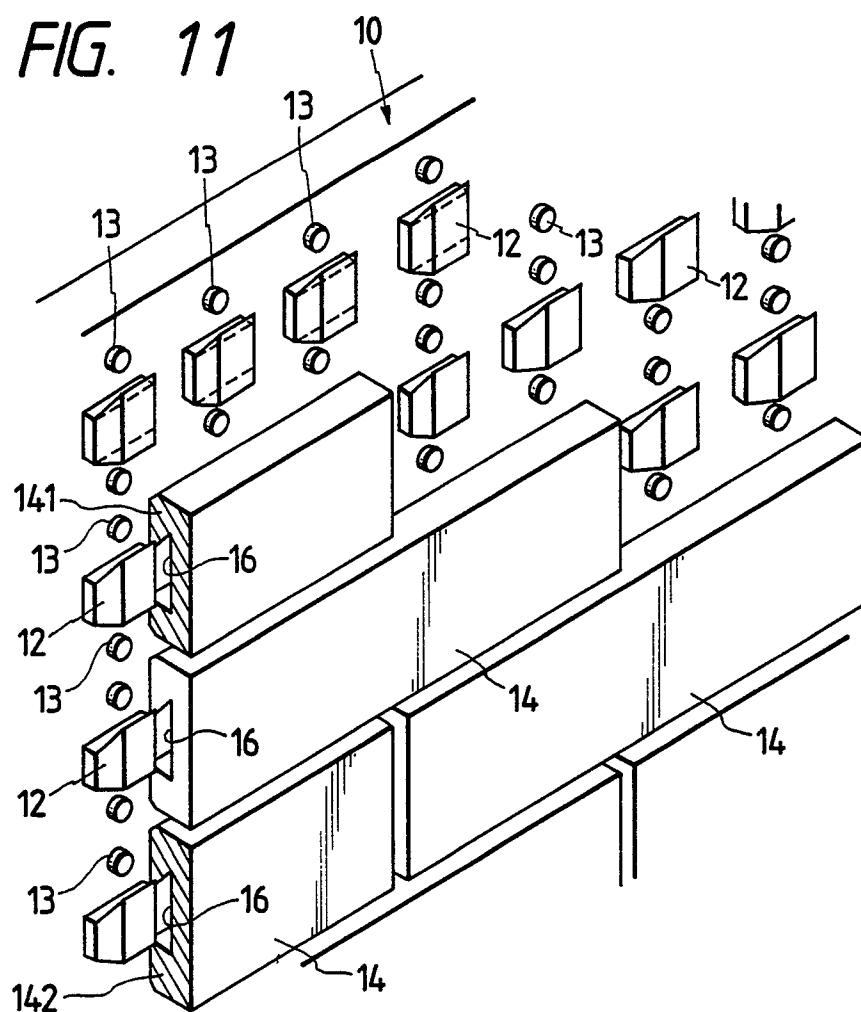


FIG. 12(A)

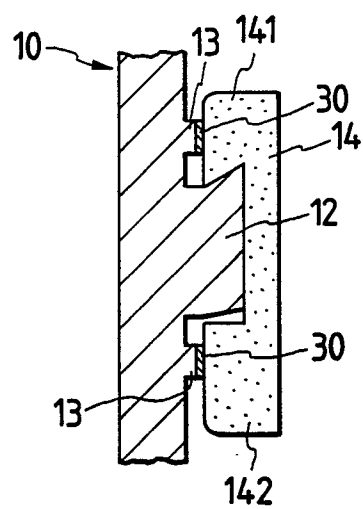
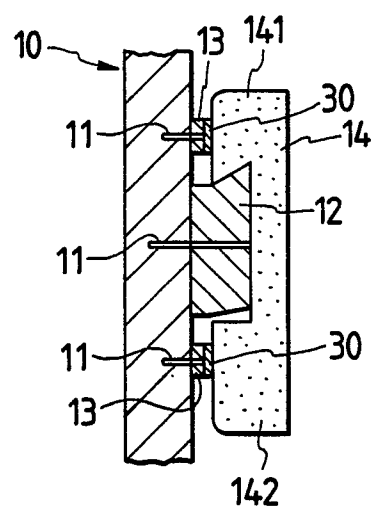


FIG. 12(B)





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	DE-U-8806379 (SCHRÖTER) * page 1, line 17 - page 2, line 9; figures * ----	1, 7 2, 5, 6, 9	E04F13/08
X	DE-U-8809461 (SCHRÖTER) * page 1, line 17 - page 2, line 9; figures * ----	1, 7	
Y A	US-A-4803821 (FUNAKI) * column 3, line 28 - column 10, line 22 * * figures 1-20 * ----	2, 5, 9 1, 3, 7, 10	
Y A	US-A-3015193 (AMORUSO) * column 2, line 3 - column 4, line 11 * * figures 1-4 * ----	6 1, 5, 7, 9	
A	US-A-3533206 (PASSENO, JR) * column 2, line 46 - column 3, line 17 * * line 70 - column 4, line 17; figures 1, 2, 6 * ----	1, 2, 4, 7	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	GB-A-2155970 (NIPPON LIGHT METAL COMPANY LIMITED) * page 2, line 67 - page 7, line 74; figures 1-21 * ----	1, 5, 7, 9	E04F E04C
A	GB-A-2012342 (HOKKAIDO NOZAI KOGYO CO. LTD.) * page 1, line 90 - page 3, line 72; figures 1-10 * ----	1, 5, 7	
A	US-A-2022363 (VERTUNO) * page 1, column 2, line 14 - page 2, column 1, line 62; figures 1-11 * ----	1, 5, 7	
A	US-A-4773201 (TREZZA) * column 2, line 61 - column 5, line 5; figures 1, 2 * -----	1, 7, 8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 JUNE 1990	Examiner AYITER J.
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