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(71) Applicant: **COSTAIN BUILDING PRODUCTS LTD.**
Tallington
Stamford, Lincolnshire PE9 4RL(GB)

(72) Inventor: **Taylor, Howard Peter John**
4 Cumberland Gardens, Castle Bytham
Grantham, Lincolnshire, NG33 4SQ(GB)

(74) Representative: **Knott, Stephen Gilbert et al**
MATHISEN, MACARA & CO. The Coach House 6-8 Swakeleys Road
Ickenham Uxbridge Middlesex UB10 8BZ(GB)

(54) Structural cladding members.

(57) A cladding member for structures comprises a panel (10) and a frame (11) of interconnected metal members (21,22,23) to which the panel (10) is connected. The connection is such to allow relative movement between the frame and the panel in order to accommodate differential expansion. Where the panel is of concrete, this can allow the use of frames to support the concrete panel, so reducing the volume of concrete needed and making the panels lighter and easier to handle.

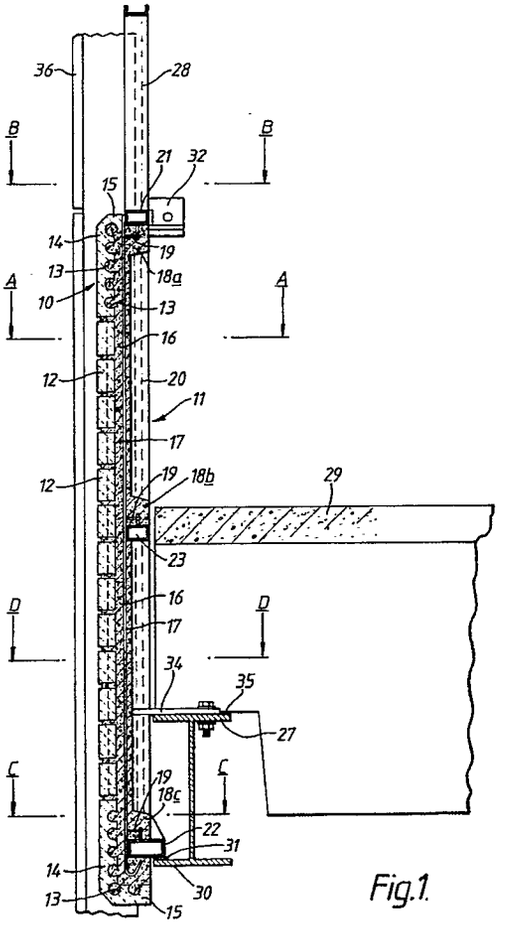

Fig.1.

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STRUCTURAL CLADDING MEMBERS

The invention relates to structural cladding members.

Cladding members are widely used in the construction of buildings. The structure of the building is formed by a framework of metal beams and/or reinforced concrete members which take the structural loads and the cladding members provide a non-load bearing weatherproof exterior surface.

One form of cladding member comprises a panel having a facing material connected to a body of concrete. The facing material may be an exposed aggregate. In order to provide the panels with sufficient strength and rigidity, the concrete is of substantial thickness with the panels being connected directly to the structure.

It is a disadvantage of such cladding panels that the quantity of concrete required to give them sufficient strength and rigidity makes them heavy and difficult to handle and manoeuvre. It also increases their expense.

According to the invention there is provided a structural cladding member comprising a panel including a weatherproof outer surface and a frame of metal members connected to the panel so that the panel is mounted on the frame, the connections being such as to permit relative expansion and contraction between the frame and the panel, and the frame including connectors for connecting the member to a building structure.

By mounting the panel on a metal frame, the panel can be lighter in weight and therefore less expensive and easier to handle. The presence of the connections that permit relative expansion and contraction between the frame and the panel overcome the problem of differential expansion rates of the materials from which panels are made and the metal of the frame members.

Preferably, the panel comprises a facing material connected to a body of concrete, with the frame of metal members being connected to the body of concrete.

This is particularly advantageous, because the problems of differential contraction and expansion are particularly acute with concrete which has heretofore prevented the use of metal frameworks with panels including a concrete body. By use of such a frame, the volume of concrete can be reduced considerably.

The facing material may comprise a plurality of separate facing members arranged over the surface of the concrete body and including apertures into which the concrete is cast to lock the concrete to the facing members.

Facing members may be clay bricks or bricks, panels or slabs of other materials.

The panel may be generally planar with the framework comprising a rectangular grid of coplanar members with the plane of the grid being generally parallel to the plane of the panel, the frame including at least two pins extending in directions lying in the plane of the frame and extending into portions of the panel such as to connect the panel to the frame and to permit relative movement between the panel and the frame.

Preferably, each pin extends into a corresponding hole in the panel with a sleeve of an elastomeric material being provided between the pin and the hole to accommodate said movement.

In an alternative arrangement, the panel may be of uniform material such as a stone or a reconstituted stone.

The following is a more detailed description of an embodiment of the invention, by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a vertical cross-section through a cladding member connected to a building structure and taken on the line F-F of Figure 2,

Figure 2 is a section on the line A-A of Figure 1 and showing a horizontal section through a portion of the cladding panel of Figure 1 and through a portion of the building structure,

Figure 3 is a section on the line B-B of Figure 1 and showing the connection between an upper corner of the cladding member and the building structure,

Figure 4 is a section on the line C-C of Figure 1 and showing a connection between a member of the frame of the cladding member of Figure 1 and a horizontal joist of the building structure,

Figure 5 is a section on the line D-D of Figure 1 showing a connection of the joist of Figure 3 to a vertical frame member of the cladding member,

Figure 6 is a section on the line E-E of Figure 2 and showing the connection of vertical cladding to the building structure, and

Figure 7 is an elevation of a frame forming part of the cladding member of Figures 1 to 6.

Figure 8 is a cross-section of a connection between a member of a frame of the cladding member of Figures 1 to 7 and a flange of a cladding panel of the member.

Referring to Figures 1 and 2, the cladding member comprises two main components, a cladding panel 10 and a frame 11.

As best seen in Figures 1 and 2, the panel comprises a facing material in the form of a plurality of bricks 12. All the bricks are provided with cavities 13 in their rear surfaces. At the upper and

lower edges, special bricks 14 are provided which have edge flanges 15 to protect the upper and lower edges of the panel.

A body of concrete 16 extends into the cavities 13 to lock the body to the cavities. As seen in Figures 1 and 2, the concrete is reinforced by a steel mesh 17 and it may also contain a reinforcement of polypropylene fibres, for a purpose to be described below.

The panel 10 is provided with three parallel ribs 18a,18b,18c extending along the upper edge, along the lower edge and intermediate the upper and lower edges, as best seen in Figure 1. As also seen in that Figure, the intermediate and lower ribs 18b,18c have lower surfaces lying in a horizontal plane, whereas the upper rib 18a has its upper surface lying in a horizontal plane. The ribs are reinforced by reinforcing bars 19 which are connected to the steel mesh 17 and extend generally horizontally, as seen in Figure 1.

The frame 11 is best seen in Figure 7. It is formed by rolled steel members of box-section and arranged in a rectangular grid with five equally spaced vertical members 20 top and bottom members 21 and an intermediate member 23. The members 21-23 are generally coplanar.

The frame 11 is attached to the panel 10 in the following way.

The top, intermediate and lower members 21,22 and 23 are provided on their horizontal surfaces with a number of pins 24 at spaced intervals therealong. In the intermediate and bottom members 22,23 these pins 24 extend from the upper surfaces of the members, while in the top member, the pins 24 extend from the lower surface of the member.

As best seen in Figure 8, each pin 24 is received in a hole 25 in an associated rib 18a,18b,18c. A rubber sleeve 26 is provided between the pin 24 and the hole, for a purpose to be described below.

The panel 10 is manufactured by known techniques in which the bricks 12 are laid in the required pattern in a mould and the steel mesh 17 and the bars 19 located in the mould. The frame is placed in the mould with the sleeves 26 around the pins 25 and the box members 21-23 coated with a bond-break paint. The concrete is then poured into the mould and as the ribs 18a,18b,18c are formed, so the holes 25 and the pins 24 are formed. The bond-break paint ensures that there is no interconnection between the frame 11 and the panel 10.

Of course, the panel may be formed in other ways, such as that described in our U.K. Patent No. 2145651.

The cladding member is connected to a building structure in the following way. As best seen in Figures 1,2 and 3, the structure is formed by a framework of horizontal and steel joists 27,28 respectively, together with a floor 29. The panel 10 is located with the bottom frame member 22 resting on a lower flange 30 of a horizontal joist 27. As best seen in Figure 4, a pad 31 is provided between the member 22 and the flange 30 in order to allow the drainage of water, to prevent corrosion. At the upper corners of the frame, brackets 32 are welded to the vertical members 20 and bolted to the flange 33 of a vertical joist 28. This is best seen in Figure 3.

A number of plates 34 are welded to the vertical frame members 20 between the bottom and intermediate frame members 22,23, so that the plates can be bolted to an upper flange 35 of the horizontal joist 27. This is seen in more detail in Figure 5.

All of these connections are such that flexing of the structure relative to the panel is possible, so that the panels do not transmit any structural loads which might damage the panels.

In this way, the panel 10 is firmly mounted on the structure. Differential expansion between the concrete body 16 and the frame 11 is accommodated by compression of the sleeves 26 in the holes 25. Differential expansion between the bricks 12 and the concrete body 16 is accommodated by the flexibility given to the concrete by the polypropylene fibres.

The cladding of the building can be completed by the connection to the vertical joists 28 of a vertical succession of cladding blocks 30 connected to flanges 37 by expansion bolts 38. This is best seen in Figures 3 and 6.

It will be appreciated, of course, the panel may be attached to the building structure in any other suitable way, depending on the arrangement of the structure. It will also be appreciated that, while there are particular benefits in the method of connecting the frame 11 to the panel 10 where the panel has a concrete body 16, a similar frame can be used with a panel 10 formed from a single material such as natural or artificial stone. In addition, the concrete body need not be clad with bricks or the like, it could be clad with exposed aggregate.

Further, the frame 11 may be formed by members in any convenient array. The members need not be of box-section, they could be, for example, of Z-section. The connection between the frame 11 and the panel 10 need not be by pins 24, any other suitable connection that allows the required relative movement could be used.

Claims

1. A structural cladding member characterised in that a panel (10) includes a weatherproof outer

surface (12) and a frame (11) of metal members connected to the panel so that the panel is mounted on the frame, the connections (24,25,26) being such as to permit relative expansion and contraction between the frame (11) and the panel (10), and the frame (11) including connectors (32) for connecting the member to a building structure.

2. A structural cladding member according to claim 1 characterized in that the panel (10) comprises a facing material (14) connected to a body of concrete (16), with the frame (11) of metal members being connected to the body of concrete (16).

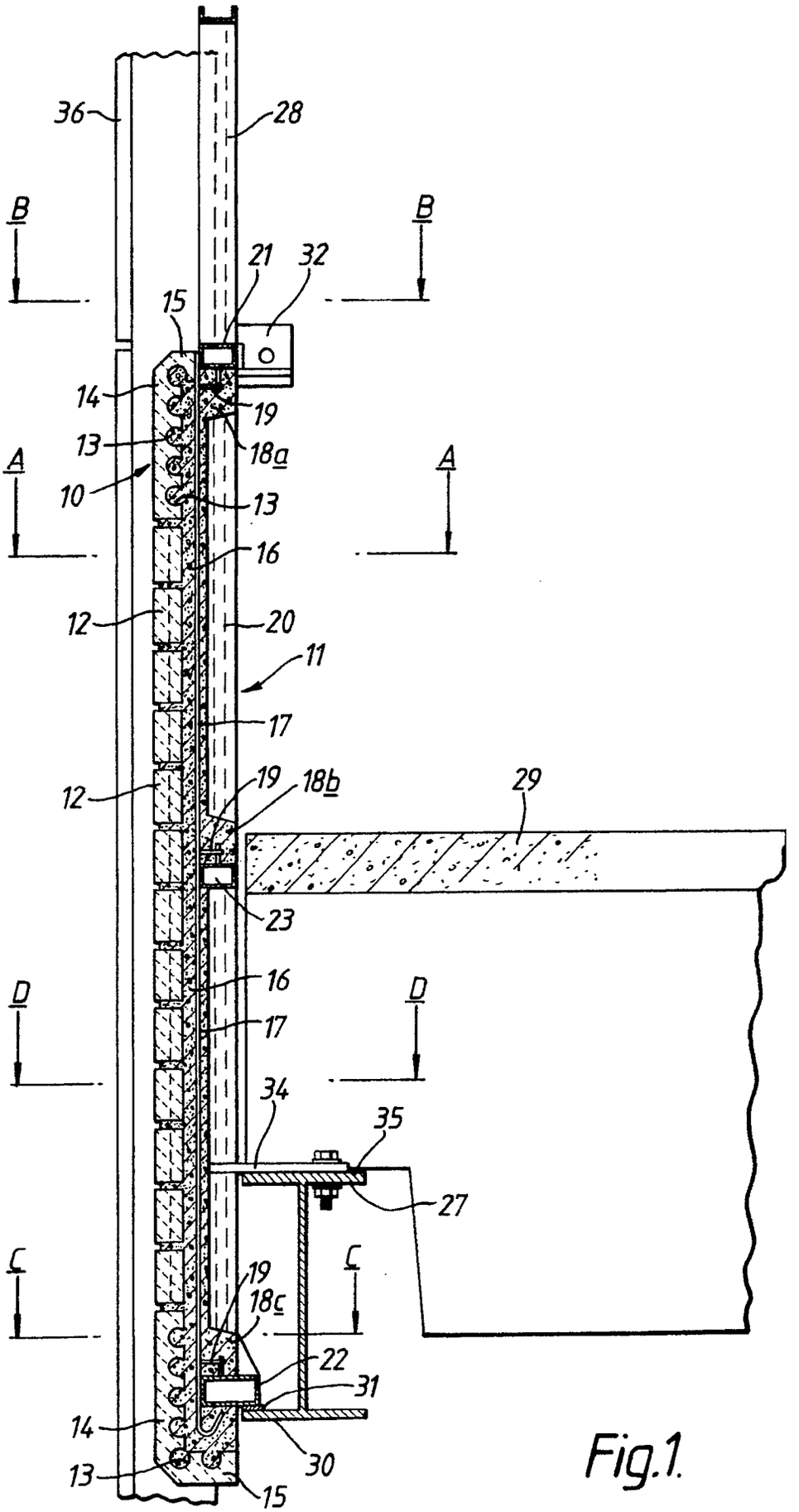
3. A structural cladding member according to claim 2 characterized in that the facing material comprises a plurality of separate facing members (12) arranged over the surface of the concrete body (16) and including apertures (13) into which the concrete is cast to lock the concrete to the facing members (12).

4. A structural cladding member according to claim 3 wherein the facing members are clay bricks or bricks (12) or panels or slabs of other materials.

5. A structural cladding member according to any one of claims 1 to 4 characterized in that the panel (10) is generally planar with the frame (11) comprising a rectangular grid of coplanar members (21,22,23) with the plane of the grid being generally parallel to the plane of the panel, the frame including at least two pins (24) extending in directions lying in the plane of the frame and extending into portions of the panel such as to connect the panel (10) to the frame (11) and to permit relative movement between the panel (10) and the frame (11).

6. A structural cladding member according to claim 5 characterized in that each pin (24) extends into a corresponding hole (25) in the panel (10) with a sleeve (26) of an elastomeric material being provided between the pin (24) and the hole (25) to accommodate said movement.

7. A structural cladding member according to claim 1 characterized in that the panel (10) is of uniform material such as a stone or a reconstituted stone.


36
28
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18a
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12
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11
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18b
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Fig.1.

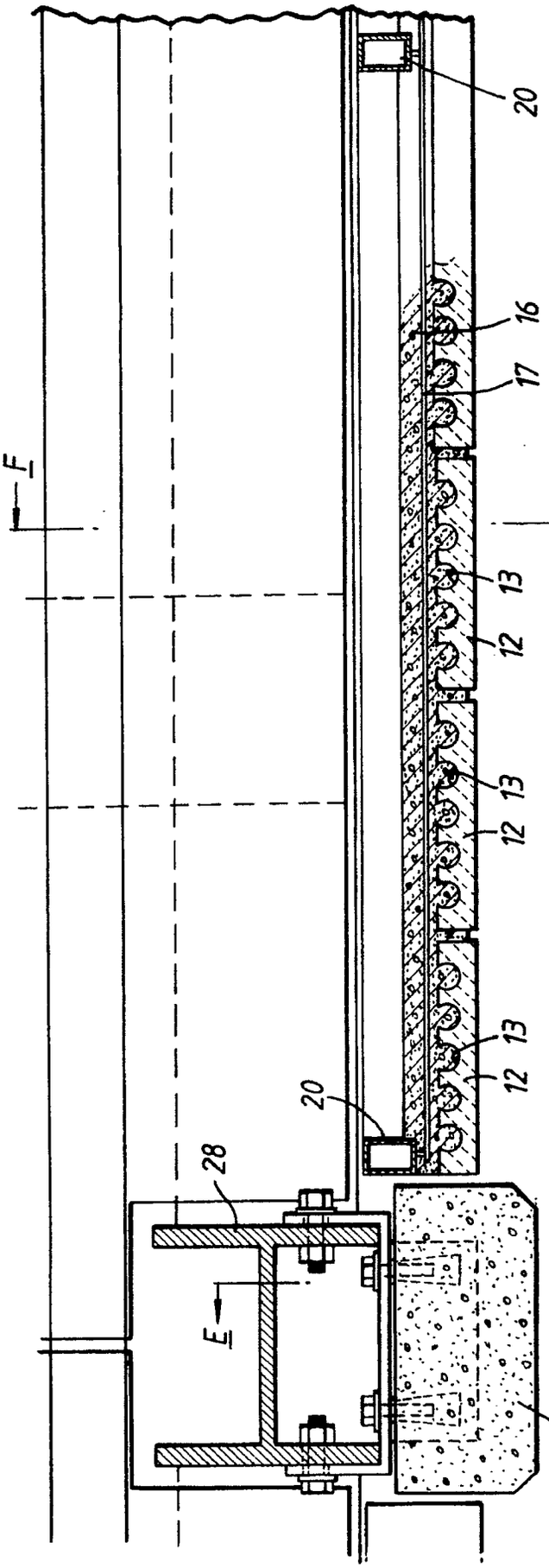

Fig.2.

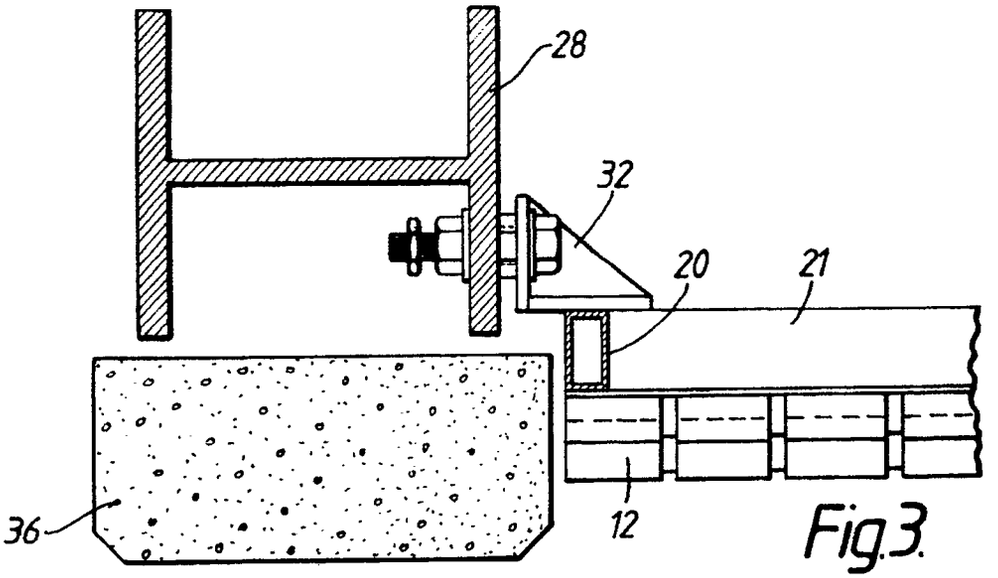

Fig.3.

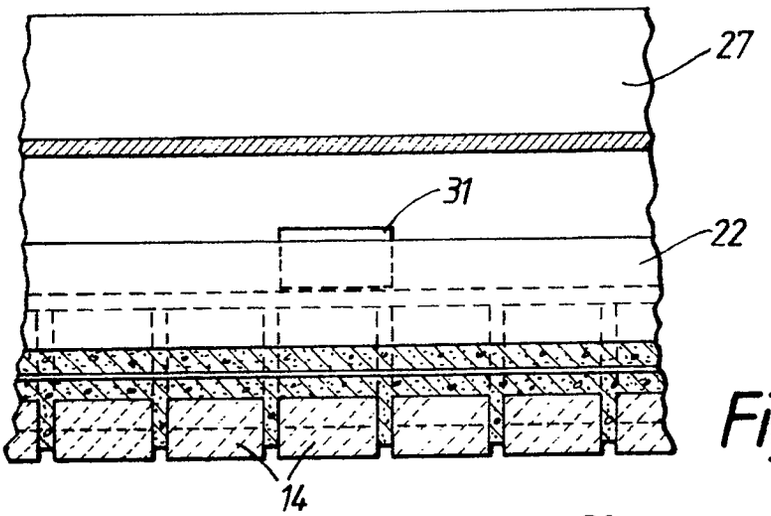

Fig.4.

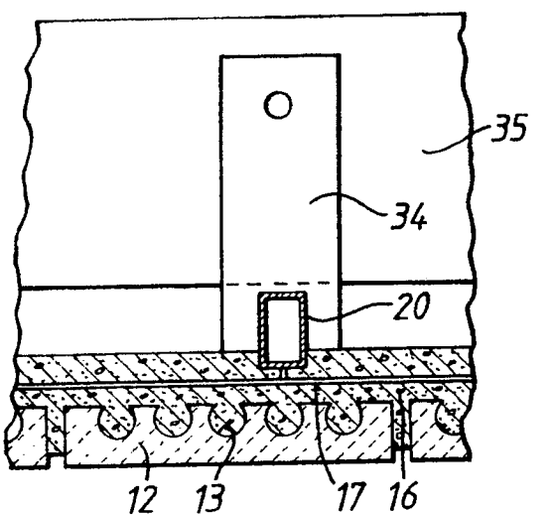

Fig.5.

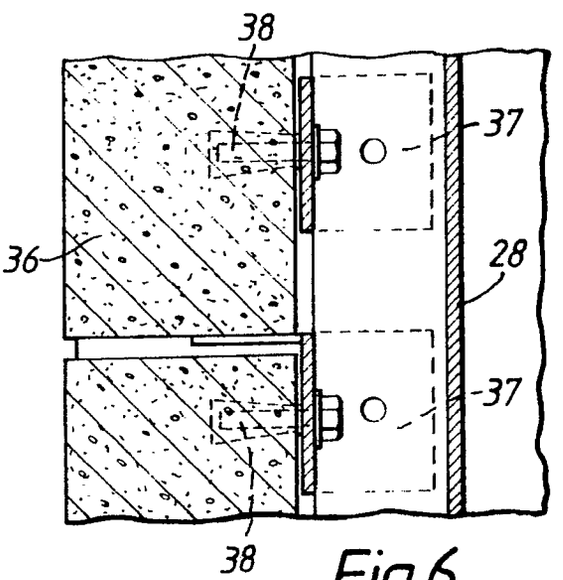

Fig.6.

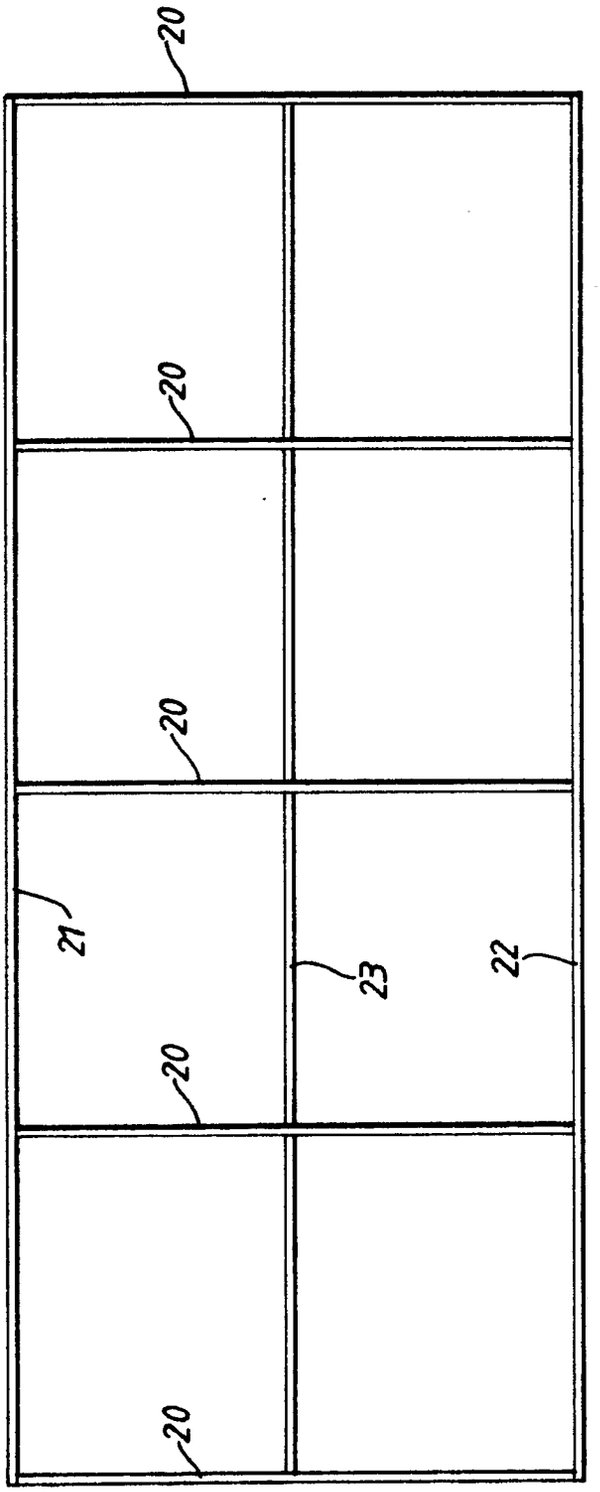

Fig.7

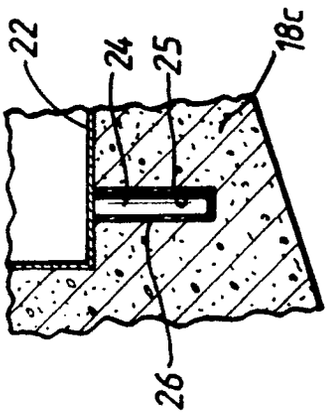

Fig.8.