

INSULATED WALL AND COMPONENTS THEREFOR

FIELD OF THE INVENTION

5 This invention relates to novel wall structures for housing and other buildings and novel components therefor.

 More particularly the invention relates to the creation of a wall structure of confined poured concrete which is fully insulated at the time of its
10 erection and novel components for use in forming same.

BACKGROUND OF THE INVENTION

15 Conventionally poured concrete walls used, for example, as basement and other exterior walls for housing and other building structures involve the erection of suitable form work defining the wall shape, pouring concrete into the form work, and, when same is sufficiently set, removing the form work.

20 It has been proposed in European Patent Application EP O 320 745 to erect a wall of hollow interlocking thermoplastic components which then can be filled with cementitious material if desired.

25 In my early PCT application PCT/CA94/00274, I disclosed an arrangement of extruded thermoplastic components which can be interlocked together to form a wall structure for receiving concrete therein with internal communication provided between the interlocking components so that concrete poured therein can flow therebetween to provide a thermoplastic
30 wall structure held in interlocked relation and converted to a permanent wall by the concrete confined therein.

 In all such previous wall structures, the need to insulate the walls against heat transfer requires the carrying out of entirely separate operations
35 and procedures usually by different trades which add significantly to the building costs.

SUMMARY OF THE INVENTION

5 The present invention is directed to eliminating the aforesaid need to separately insulate building walls by creating the walls as fully insulated walls at the time of their erection.

10 According to the present invention, the novel insulated wall structure is formed with upright hollow thermoplastic extrusions connected together in a row, with the extrusions presenting a row of compartments adapted to receive concrete extending along the length of the wall structure and a row of compartments containing or adapted to receive insulation material also extending along the length of the wall along side or in parallel
15 with said row of concrete receiving compartments whereby when said compartments adapted to receive concrete are filled with concrete and said insulation receiving compartments are filled with insulation, the insulation in said insulation receiving compartments is positioned to block heat transfer through the wall.

20 According to the preferred embodiment of the invention, the hollow thermoplastic extrusions are provided with interlocking means to interlock with adjoining extrusions and the row of concrete receiving compartments are in internal communication so that concrete can flow between compartments.

25 As will be understood, any suitable insulating material such as fiberglass or the like may be introduced into the insulation receiving compartments or the insulation receiving compartments may be filled with foamed insulation such as polyurethane foam or the like as desired.

30 The present invention also resides in providing novel wall forming units or components in the form of elongated hollow thermoplastic extrusions adapted to be assembled into a wall structure and having internal walls to provide the requisite concrete receiving and insulation receiving or containing
35 compartments.

- 3 -

In this aspect of the invention, the novel wall forming units or components are in the form of an elongated hollow thermoplastic extrusion presenting two spaced walls which, when the unit or component is incorporated in an upright position into a wall structure, form upright exterior wall segments of the wall structure, the spaced walls being held in spaced relation by at least two transverse walls extending therebetween with at least one internal wall extending between the at least two transverse walls intermediate of the spaced walls to divide the interior of said unit or component into at least two compartments, one to receive concrete or the like, the other to receive insulating material to block heat transfer between said spaced walls.

In the preferred embodiment of the invention, the units or components are provided with interlocking means to interlock with adjoining components and the transverse walls of the component have openings therein providing communication with the interior of the concrete receiving compartment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a broken away perspective view illustrating the erection of an insulated basement wall in accordance with the invention utilizing novel wall forming components of the invention.

Figure 2 is a top plan view on an enlarged scale of a corner section of the wall of Figure 1;

Figure 3 is a broken away perspective view of one of the wall forming panel extrusions according to the invention;

Figure 4 is a broken away perspective view of one of the extruded box connector wall forming components embodying the invention;

Figure 5 is a broken away perspective view of one of the extruded wall forming corner components according to the invention;

Figure 6 is a broken away perspective view of the panel component of Figure 3 with the insulation receiving compartments filled with insulation;

5 Figure 7 is a broken away perspective view illustrating the panel component of Figure 3 as it would appear in the finished wall with the insulation receiving compartments filled with insulation and the concrete receiving compartments filled with concrete, the adjoining components being omitted for sake of clarity.

10

 Figure 8 is a broken away perspective view of the box connector Figure 4 as it would appear in the finished wall with the insulation receiving compartment filled with insulation and the concrete receiving compartment filled with concrete, the adjoining wall components being omitted for sake of clarity.

15

 Figure 9 is a perspective view of the corner component of Figure 5 as it would appear in the finished wall with the insulation receiving compartments filled with insulation and the concrete receiving compartment being filled with concrete, the adjoining connected wall components being omitted for sake of clarity.

20

 Figure 10 is a broken away perspective view of an extruded panel component as it would appear in a finished wall according to the invention having a single insulation receiving compartment filled with insulation and a single concrete receiving compartment filled concrete, the adjoining components being omitted for sake of clarity.

25

 Figure 11 is a plan view looking down on a section of a wall embodying the invention in which the wall forming components present central concrete receiving compartments bordered on each side by insulation receiving compartments.

30

 Figure 12 is a plan view of a segment of a wall structure according to the invention in which the wall forming components present a central

35

insulation receiving compartment bordered on each side by concrete receiving compartments.

5 Figure 13 is a broken away plan view of the section of a wall structure according to the invention in which individual insulation receiving and concrete receiving sections are integrated into the interlocked wall structure of the invention to provide an interlocked wall which presents a row of insulation receiving compartments filled with insulation bordering a row of concrete receiving compartments filled with concrete.

10

Figure 14 is a view similar to Figure 13 showing another arrangement of components to provide an interlocked wall according to the invention presenting a row of insulation receiving compartments filled with insulation bordering a row of concrete receiving compartments filled with concrete.

15

Figure 15 is a broken away perspective view illustrating the assembly of interlocking components corresponding to the components of Figures 3 and 4 in which the components comprise extrusions having a protective skin covering surfaces thereof which become exposed when the components are interlocked together for use in above ground insulated walls exposed to strong ultraviolet radiations and the like.

20

Figure 16 is a broken away perspective view showing the assembly of wall forming components similar to Figures 3 and 4 but showing the insulation receiving compartments as having openings in the walls thereof to provide internal communication between these compartments as well as the openings in the concrete receiving compartments providing internal communication therebetween.

30

Figure 17 is a broken away perspective view of a panel extrusion corresponding to Figure 3 as it issues from the extruder but without the cut outs in the walls of the concrete receiving compartments.

35

Figure 18 is a perspective view of a box connector corresponding to Figure 4 as it issues from the extruder but without the cut outs in the walls

- 6 -

of the concrete receiving compartment but showing the insulation receiving compartment filled with insulation.

Figure 19 is a broken away perspective view of a narrow panel component similar to Figure 10 as it issues from the extruder but without the cut outs in the walls of the concrete receiving compartment.

DETAILED DESCRIPTION ACCORDING TO THE PREFERRED
EMBODIMENTS OF THE PRESENT INVENTION

Figure 1 illustrates the erection of an insulated basement wall embodying the invention employing novel wall forming components of the invention.

As illustrated in Figure 1 in erecting the basement wall generally designated at 1 an excavation 2 is made and preferably a poured concrete basement floor 3 is provided with upright reinforcing rods 4 arranged around the perimeter in appropriately spaced relation.

The wall illustrated in Figure 1 is made up of wall forming panels 5, wall forming members in the form of box connectors 6 and corner members 7 only one of which is shown.

As illustrated in Figure 3, each of the wall forming panels 5 comprises an elongated hollow extrusion of thermoplastic material of generally rectilinear form presenting opposing faces 8 and 9 which when the panel is integrated into the wall 1 form exterior faces of the wall. The faces 8 and 9 of the panel are formed with longitudinal grooves 10 adjacent to the edge or end walls 11 which complete the rectilinear form of the extrusion.

The walls 11 have a width slightly less than the spacing between the opposed walls 8 and 9 so that they form with the grooves 10 a tongue and groove interlock formation for interlocking engagement with an adjoining component in the form of a box connector 6 as hereinafter more fully explained.

The interior of the wall forming panel 5 is divided by partitions 12, 13 and 14 to divide the interior of the panel into compartments 15 adapted to receive concrete and compartments 16 adapted to receive an insulating material.

The edge or end walls 11 and the partitions 12 have material cut out therefrom to provide openings 17 of generally ovoid form to provide internal communication between the compartments 15 and between interlocked wall components as hereinafter more fully explained.

The wall forming panels 5 are preferably formed as extrusions of polyvinyl chloride using suitable fillers or reinforcing agents such as calcium carbonate as required. These extrusions are cut to a length corresponding to the desired height of the wall and in use are arranged in an upright position with the compartments 15 and 16 opening to the top and bottom of the wall.

Figure 4 is an enlarged view of the one of the box connectors 6 adapted to interlockingly engage with the wall forming panels 5.

The box connector like the wall panels 5 and as well the corner members 7 are formed as longitudinal extrusions of thermoplastic material preferably PVC with suitable fillers or reinforcing agents such as calcium carbonate to give appropriate stability and strength as will be understood by those skilled in the art.

Box connector 6 again has a generally rectilinear profile presenting opposed faces 18 and 19 which are adapted to form exterior wall segments when the box connector is connected into a wall structure as illustrated in Figures 1 and 2.

The opposed walls 17 and 18 are connected by transverse walls or webs 20 to define the hollow configuration of the box connector while a wall or web 21 extending between the walls 20 divide the interior of the box connector into two compartments, a larger compartment 22 adapted to receive concrete and a smaller compartment 23 adapted to receive insulation material.

The walls 18 and 19 extend outwardly beyond the transverse walls 20 and have at their extremities intumed fingers 24 which provide locking fingers to engage in the longitudinal grooves 10 of the wall forming panels 5.

5

The transverse walls or webs 20 have material cut out therefrom to provide openings 25 corresponding to the openings 17 in the wall forming panels 5 so that when the box connectors are interlockingly engaged with the panels communication is provided therethrough with the interior of the panels to allow for the concrete introduced into the wall structure, preferably into the box connectors to flow internally through the wall.

10

The box connectors 6 preferably are formed with spaced undercut rails 26 for slideable engagement with a suitable channel member, not shown, whereby an isolated compartment can be provided to receive wiring and the like which can be kept out of contact with concrete in the compartment 22.

15

Figure 5 is an enlarged view of the corner member 7 which comprises an elongated extrusion of the same thermoplastic material as the wall forming panels 5 and box connectors 6.

20

Again the corner extrusion 7 is of hollow rectilinear form and has two solid walls 27 and 28 which are at right angular relation to each other and which, when the corner member is incorporated into a wall structure as illustrated at 1, form exterior walls of the structure.

25

Right angular walls or webs 29 complete the hollow form of the corner extrusion 7, the interior of which is divided into a main compartment 30 by the rectangularly arranged walls or webs 29. An angled wall or web 32 connecting the corner juncture of the outside walls 27 and 28 and the corner juncture of the walls 29 defines a pair of compartments 33.

30

The compartments 33 are adapted to receive an insulating material while the main compartment 30 is adapted to receive concrete which can flow into the compartment from adjoining interconnected panel members through the openings 34 in the walls 29.

35

The corner members 7 are provided with interlocking means similar to the box connectors 4 for engaging in the grooves of the panel members 5. In this connection, the walls 27 and 28 of the corner member opposite their corner juncture extend outwardly beyond the walls 29 and terminate in inturned locking fingers 35 while the walls 29 extend outwardly beyond their juncture 36 and present corresponding inturned locking fingers 37.

The opposing inturned locking fingers 35 and 37 are adapted to slidingly interlock in the longitudinal grooves on opposite sides of the wall panels 5 as illustrated in Figure 2.

It will be understood that the compartmentalized extrusions 5, 6 and 7 will be transported to the job site and erected into the desired wall structure, or a portion thereof, before concrete is introduced into the concrete receiving compartments. Normally however the insulation receiving compartments will be filled with insulation material following the extrusion process and prior to delivery to the job site.

Thus for example as illustrated in Figure 6 the wall forming panel 5 has the compartments 16 filled with insulating material 38 of any suitable material such as fiber glass, rock wool and the like or polyurethane or similar material may be foamed into these compartments.

Thus normally the wall forming components as comprised for example by the wall forming panels 5, box connectors 6, and corner members 7 will be shipped to the job site as insulation containing components ready to be assembled in interlocking engagement as illustrated in Figure 2 into the desired wall formation. It will be noted that the arrangement of the insulation receiving compartments 16, 23 and 33 of these wall forming members 5, 6 and 7 are all disposed in a position to block heat transfer through from the outside of the wall structure 1 to the interior of the wall structure.

When the wall or an appropriate portion of the wall has been assembled together, concrete is introduced, preferably into the box connectors 6 which have been sleeved down unto the reinforcing rods 4 in the basement

- 10 -

wall illustrated in Figure 1, and this concrete can flow laterally internally of the wall through the various openings 17, 25 and 34 to fill the interior of the wall and convert same into a concrete encased fully insulated wall structure.

5 For purposes of illustration, one of the panels 5 is shown isolated out of the finished wall structure with the adjoining box connectors removed to show how the concrete 39 fills the concrete receiving compartments 15 while the insulation receiving compartments are shown as filled with insulation 38 of cellular form.

10

 It will be understood that reinforcing rods 40 running longitudinally of the wall may be employed as desired for added structural strength of the wall.

15 Figure 8 is a view similar to Figure 7 of a box connector 6 isolated from the wall showing its compartment 22 filled with concrete and its compartment 23 filled with insulating material.

20 Similarly Figure 9 illustrates a corner member 7 isolated from the wall and after its compartment 30 has been filled with concrete.

 Figure 10 is a perspective view of a wall forming panel member 41 having a single concrete receiving compartment 42 and a single insulation receiving compartment 43, but otherwise the same as panel 5 being provided
25 with locking grooves 44 and openings 45 opening into the interior of the concrete receiving chamber 42. As illustrated, the chamber 42 is shown as filled with concrete 39 and the insulation receiving compartment 43 filled with insulation 38 as it would appear with the panel 41 incorporated into a finished wall structure.

30

 While it will be appreciated that the invention is not limited to specific dimensions of the wall forming components such as the panels 5, box connectors 6 and corner members 7 and the walls formed thereby when same are interlockingly engaged, testing has shown that an efficiently insulated
35 permanent wall of great strength is provided with the width of the components between their walls which become exterior walls when they are

- 11 -

assembled into the wall formation is of the order of 8 inches. Thus the spacing between walls 8 and 9 of the panels 5 and the walls 18, 19 of the box connectors 6 would be of the order of 8 inches. The thickness of these walls 8, 9, 18 and 19 would be of the order of 1/10th of an inch.

5

Of the 8 inches of width of the components, the insulation compartments, eg. compartments 16 of the wall forming panels, compartments 23 of the box connectors, would occupy of the order of 2 inches while the concrete receiving compartments of these members 15 and 22 respectively
10 have a width occupying the rest of the space being of the order of 6 inches.

It will be understood that the narrow wall forming panel members 41, and the corner member 7, will have similar dimensions to provide for an insulation barrier having a thickness of the order of 2 inches and providing,
15 when the concrete compartments are filled with concrete, a concrete core of the order of 6 inches.

The walls or webs of the components such as the webs 20 and 21 of the wall forming panels 5 which divide the components into internal
20 compartments may have a thickness somewhat less than the walls, such as 8 and 9, which become external walls of the wall structure.

It will be understood that the components of the invention can be interlockingly connected into a wall formation with the insulation containing
25 compartments either at the outside of the wall or the inside of the wall as desired.

While the invention in its basic form provides wall forming components which, when interlocked together as illustrated in Figure 2,
30 provide a single row of insulation containing compartments arranged to block heat transfer through the wall between the exterior and inner surfaces and single row of intercommunicating concrete receiving compartments to be filled with concrete, other walls embodying the invention, such as illustrated in Figures 11 and 12, can also be provided. In each case there is provided a
35 concrete encased insulated wall without the need for additional insulation.

- 12 -

In Figure 11, the wall structure designated at 46 is comprised of panels 47 and box connectors 48 interlocked together in the same manner as the panels 5, and box connectors 6, shown in Figure 2, but differ from these panels 5 and 6 by the provision of two spaced rows of insulation receiving compartments 49 which, in the completed wall, are filled with insulation material 50, and a central row of concrete receiving compartments 51 which, in the completed wall, are filled with concrete 52 interposed between the insulation compartments 49. As in the case of the components 5 and 6, the concrete receiving compartments will be in communication with each other through suitable openings (not shown) corresponding to the openings 17.

Figure 12 is the reverse of Figure 11 in which the panels 53 and box connectors 54 present a central row of insulation receiving compartments 55 bordered on each side by rows of concrete receiving compartments 56. In the completed wall, the compartments 55 will be filled with insulation material 57 and the concrete compartments filled with concrete 58 with the compartments 56 providing for flow of concrete internally and through to adjoining compartments.

In an alternative arrangement illustrated in Figure 13, an interlocking wall embodying the invention is formed by the utilization of a box connector 59 having an insulation compartment filled with insulation indicated at 60 and a concrete receiving compartment 61 adapted to be filled with concrete 62.

The box connector 59 has at each side thereof projections 63 in line with the exterior faces 64 of the box connector and terminating in intumed locking Figures 65 and as well an extension 66 in line with the wall 67 dividing the insulation 60 from the concrete 62. The extension 66 has a pair of fingers 68 one facing and arranged to cooperate with one of the locking fingers 65 and the other facing and adapted to cooperate with the other locking finger 65.

In this case, a separate insulation panel 69 filled with insulation material 70 and provided with locking grooves 71 is adapted to be slideably interlocked with the one set of locking fingers 65 and 68 as illustrated.

A separate hollow panel 72 provided with compartments 73 for receiving concrete is also provided with grooves 74 which are adapted to slideably interlock with the other pair of fingers 65 and 68 as illustrated.

5 Again the box connectors 59 containing the insulation 60 are interlockingly engaged with the insulation containing panels 69 and the concrete receiving panels 72 into a interlocked wall formation ready to receive concrete 62 poured into the box connector, it being understood that the box connector and panels 72 will be provided with the requisite openings to allow internal
10 flow of concrete both internally of the components and of the wall to result in an integral concrete encased insulated wall structure.

Figure 14 shows another alternative arrangement in which a box connector 75 having an insulation receiving chamber 76 is used to connect
15 together concrete receiving panels 72' corresponding to the panels 72 of Figure 13 and an extrusion 77 having grooves 78 for interlocking engagement with fingers 79 of the box connector 75 and end legs 80 and intermediate legs 81 to define when interlocked in conjunction with the panels 72' compartments which can be filled with insulating material 82.

20 Figure 15 is a perspective view illustrating wall panels 5' and box connector 6' that are the same as wall panels 5 and box connectors 6 except that they are coextruded to provide a thin covering skin or cap stock 83 on surfaces which become exterior surfaces of the wall formed thereby when
25 they are interlockingly connected. This cap stock may be PVC or other suitable thermoplastic material and may contain additives to provide resistance to ultraviolet radiations, weathering and impact as will be understood by those skilled in the art.

30 The components 5' and 6' and corresponding corner elements not shown are for use in erecting above ground external walls that are subjected to excessive weathering and ultraviolet radiation. In addition, the cap stock 83 can incorporate colouring agents to provide an exterior colour if desired.

35 Figure 16 illustrates wall forming panels 5b corresponding to wall forming panel 5 and box connector 6b corresponding to box connector 6

- 14 -

differing only in that holes 84 are provided to afford communication interiorly between the insulation compartments 16b of the panels and as well communication between the interlocked components with the insulation receiving compartment 23b of the box connector 6b.

5

With this arrangement, insulation can be foamed into the wall structure when it is interlocked to flow between the compartments 16b and 23b in the same manner that concrete can be introduced into the box connector 6b and flow into the interlocked panels 5b.

10

Figure 17 illustrates a wall forming panel 5c which corresponds in all respects to wall forming panel 5 as it issues from the extruder but without, or before, any coring so that no openings corresponding to the openings 17 in panel 5 have been provided. However the panel does have concrete receiving compartments 15c and insulation receiving compartments 16c arranged to block heat transfer through the panel.

15

Figure 18 illustrates a box connector 6c which is in all respects the same as box connector 6 as it issues from the extruder but without, or before, any coring so that no openings corresponding to the openings 25 are provided into the interior of the concrete receiving compartment 22c.

20

Figure 19 illustrates a short wall forming panel 41b corresponding in every respect to wall forming panel 41 as it issues from the extruder but without, or before, any coring so that no openings corresponding to the openings 45 in panel 41 are present.

25

It will be understood that the wall panel of Figure 17 (5c), the box connector of Figure 18 (6c), and the small panel of Figure 19 (41b) without being cored can be interconnected by tie rods or the like (not shown) into a connected wall formation to provide an insulated wall when the respective insulation receiving compartments are filled with insulation but that concrete would have to be poured individually into the concrete receiving compartments or into such of them as desired.

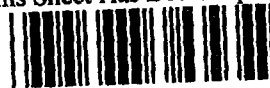
30

35

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THIS SHEET HAS BEEN
REPLACED

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED



WO 97/32095

THIS SHEET HAS BEEN
REPLACED

PCT/CA97/00135

- 16 -

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A wall forming component comprising an elongated hollow
5 extrusion of thermoplastic material for assembly with other corresponding
components to form a wall, said wall forming component having an internal
wall arrangement to divide the interior thereof into at least one compartment
for receiving concrete or the like and at least one compartment for receiving
insulation material, the relationship of said compartments being such that
10 insulation when introduced into said insulation receiving compartment is
positioned to block heat transfer through the wall.
2. A wall forming component comprising an elongated hollow
extrusion of thermoplastic material having means for interlocking engagement
15 with mating adjoining components in the forming of a wall, said wall forming
component having an internal wall arrangement to divide the interior thereof
into at least one compartment for receiving concrete or the like and at least
one compartment for receiving insulation material, said insulation material
receiving compartment having as one of its borders a wall of said component
20 which is exposed when said component is interlockingly engaged with
adjoining mating components and as its opposite border a wall of said
concrete receiving compartment.
3. A wall forming component as claimed in Claim 1 or 2 having a
25 generally rectilinear cross section.

This Sheet Has Been Replaced



SUBSTITUTE SHEET (RULE 26)

THIS SHEET HAS BEEN
REPLACED



4. A wall forming component as claimed in Claim 1, 2, or 3 in which said concrete receiving compartment is substantially larger than said insulation receiving compartment.
- 5 5. A wall forming component as claimed in Claims 1, 2, 3 or 4 having a plurality of openings through the walls thereof to provide for flow of concrete between the concrete receiving compartments of adjoining mating wall components when same are assembled into a wall.
- 10 6. A wall forming component as claimed in any of the preceding claims in which said insulation material receiving compartment is filled with insulating material.
7. A wall forming component as claimed in any of the preceding claims
15 extruded from a thermoplastic material having a PVC base.
8. A wall forming component as claimed in Claim 7 in which said PVC base includes a reinforcing agent.
- 20 9. A wall forming component as claimed in Claim 7 in which the walls of said component which become external walls when same is incorporated into a wall have a coextruded protective skin covering.
10. A wall forming component comprising a four sided elongated
25 hollow extrusion of thermoplastic material having means for interlocking engagement with mating adjoining components in the forming of a wall, said hollow wall forming component having two walls which form external wall



**THIS SHEET HAS BEEN
REPLACED**

segments when interlocked with adjoining mating components and two walls which abut adjacent mating components when interlocked therewith, said hollow wall forming component having an internal wall arrangement to divide the interior thereof into at least one compartment for receiving concrete or the like and at least one compartment for receiving insulation material, such

5 insulation material receiving compartment having as one of its borders one of said external wall segments and as its opposite border a wall of said concrete receiving compartment.

10 11. A wall forming component as claimed in Claim 10 in the form of a panel having a plurality of insulation receiving and concrete receiving compartments, with said concrete receiving compartments being in communication through a plurality of openings to provide for concrete flow therebetween.

15

12. A wall forming component as claimed in Claim 10 in the form of a box connector.

13. An insulated wall comprising a plurality of extruded hollow

20 interlocked wall components of thermoplastic material having an internal wall arrangement to form concrete receiving compartments bordered at least on one side of said wall by insulation receiving compartments, said components having a plurality of openings through the walls thereof to provide concrete flow paths between said concrete receiving compartments of said interlocked

25 components, said insulation receiving compartments having insulation material mounted therein and at least some of said concrete receiving compartments being filled with concrete.

This Sheet Has Been Replaced

**SUBSTITUTE SHEET (RULE 26)****THIS SHEET HAS BEEN
REPLACED**



14. An insulated wall comprising a plurality of wall forming units of extruded thermoplastic material arranged in an upright row, means coupling said units together in said row, said coupled units forming hollow wall panels
5 presenting spaced exterior walls constituting exterior wall segments of said wall and having an internal wall formation to provide at least two internal compartments having a common boundary wall lying intermediately between and extending in the direction of said spaced exterior walls, one of said at least two compartments of at least some of said coupled wall forming units
10 being filled with concrete, the other of said at least two compartments of said coupled wall forming units being filled with insulation material.

15. An insulated wall as claimed in Claim 14 in which all of said compartments of said coupled wall forming units not filled with insulation are
15 filled with concrete with said concrete filled compartments being in communication with each other providing concrete flow passages therebetween whereby concrete filling said concrete receiving compartments flows through said flow passages to interlock said wall forming units with concrete.

20

16. An insulated wall as claimed in Claims 14 or 15 in which said insulation filled compartments of said coupled wall forming units are in communication with each other providing for flow of insulation material therebetween.

25

17. An insulated wall as claimed in Claims 14, 15 or 16 in which said means connecting said wall forming units comprises a box connector having



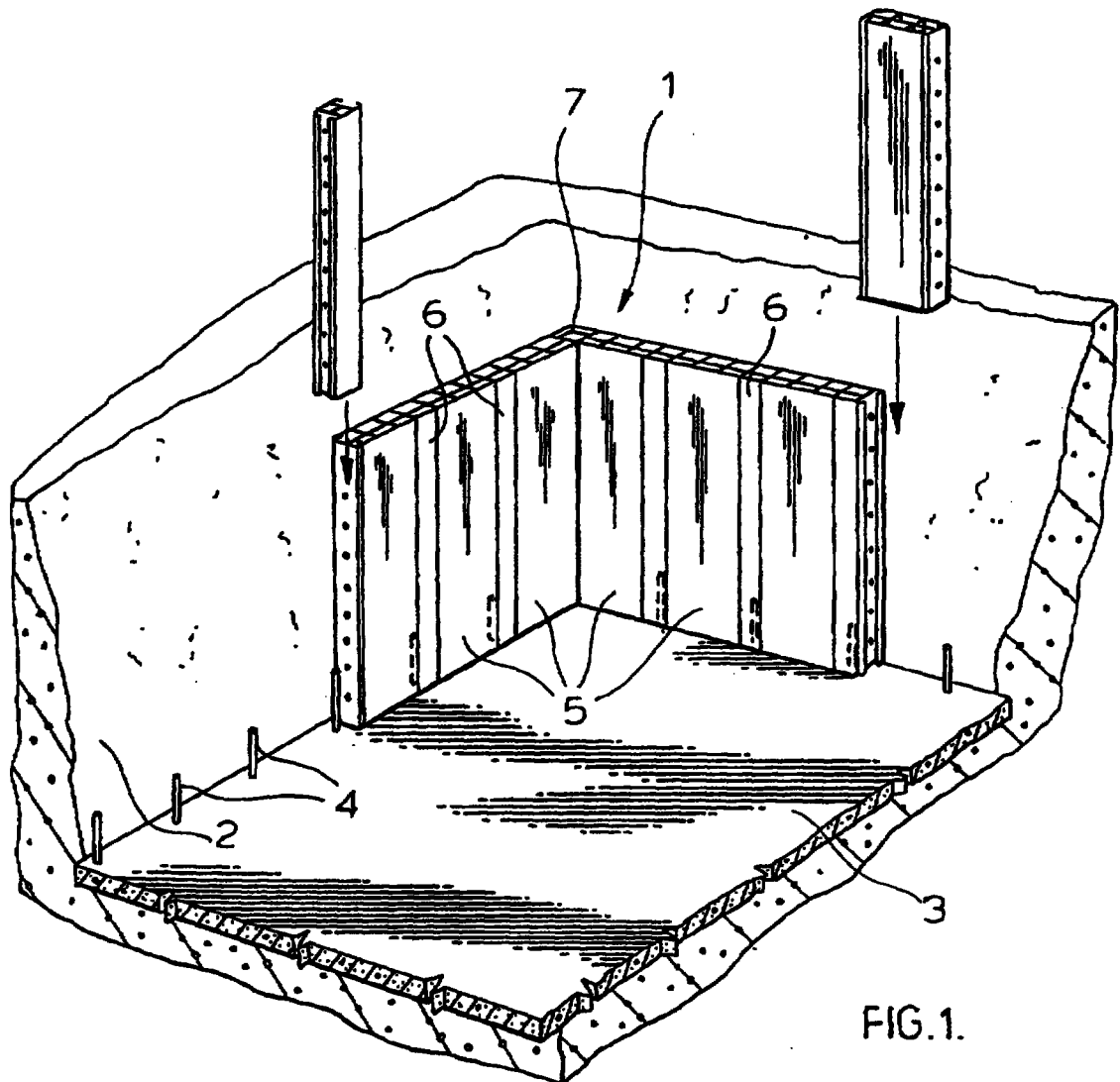


an internal concrete receiving compartment in communication with the concrete receiving compartments of the wall units it connects and having an insulation receiving compartment having a common border wall with said concrete receiving compartment located internally in said box connector.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED



2/16

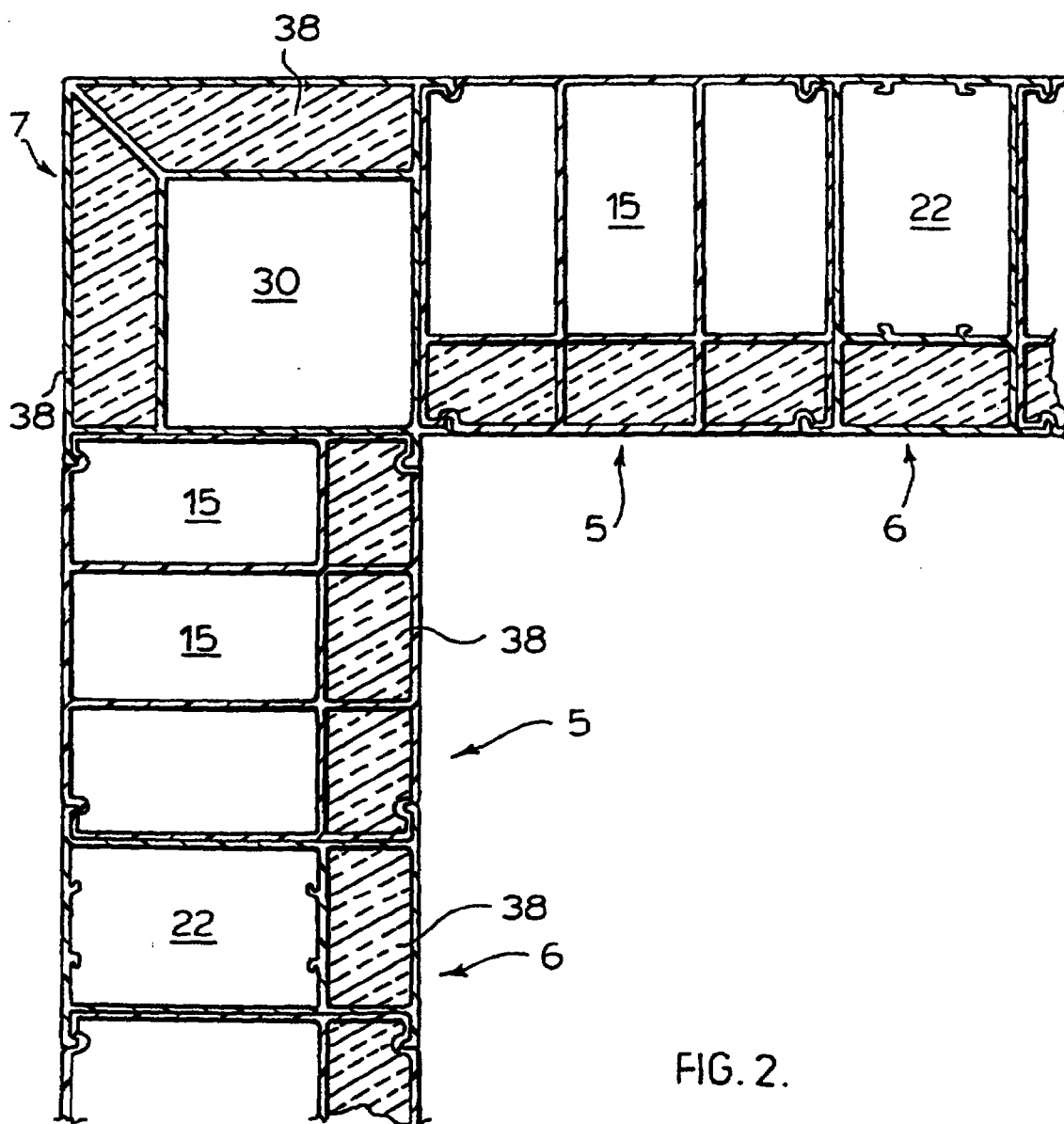
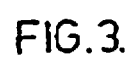
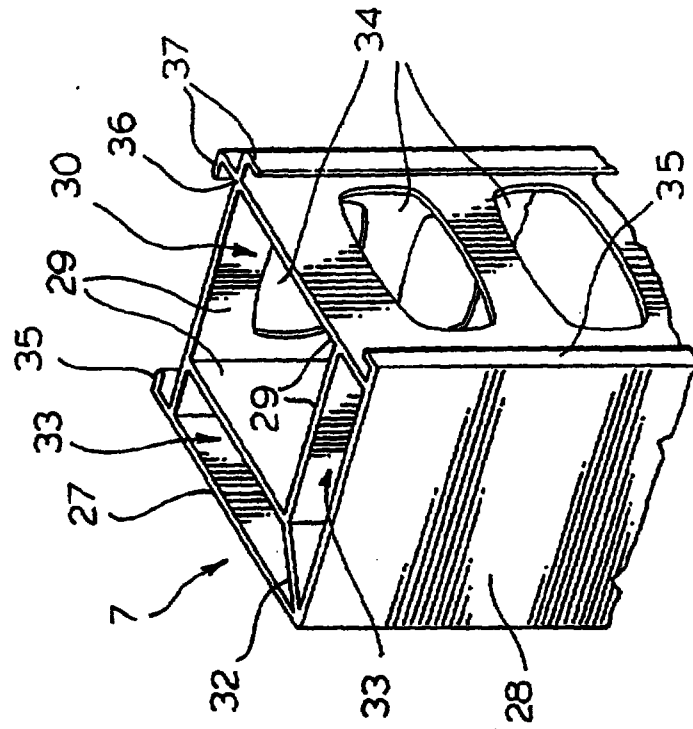
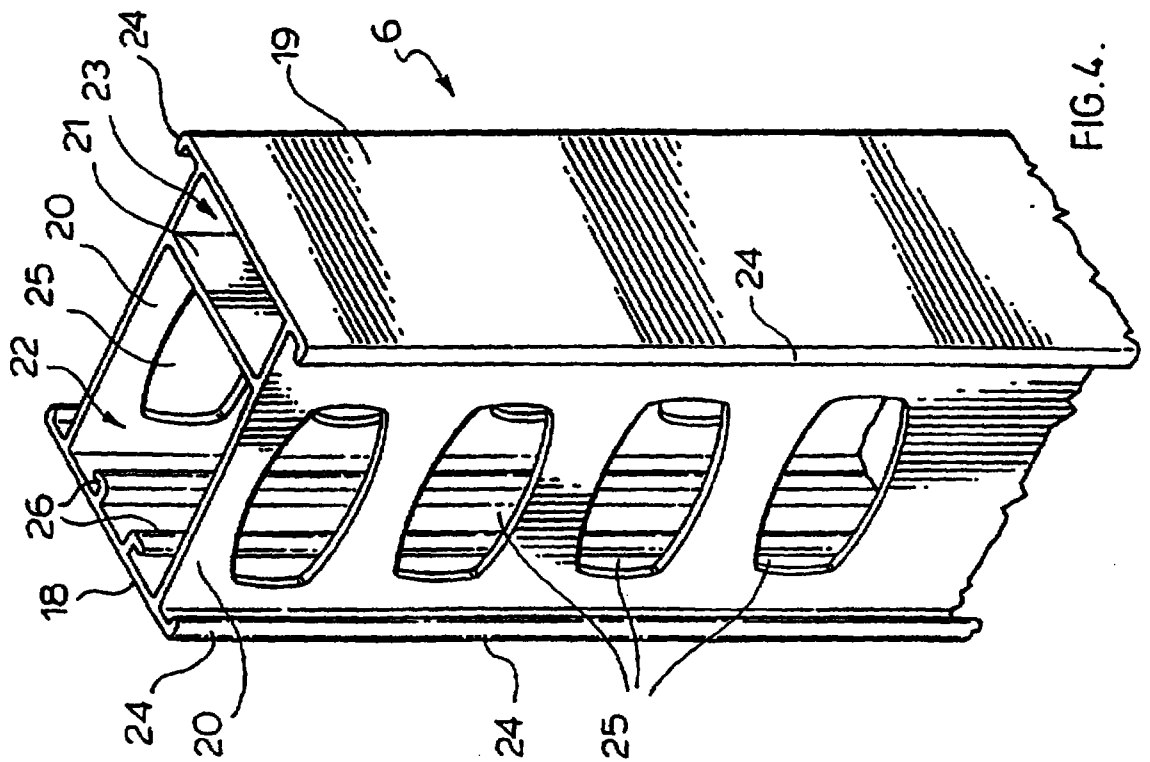


FIG. 2.





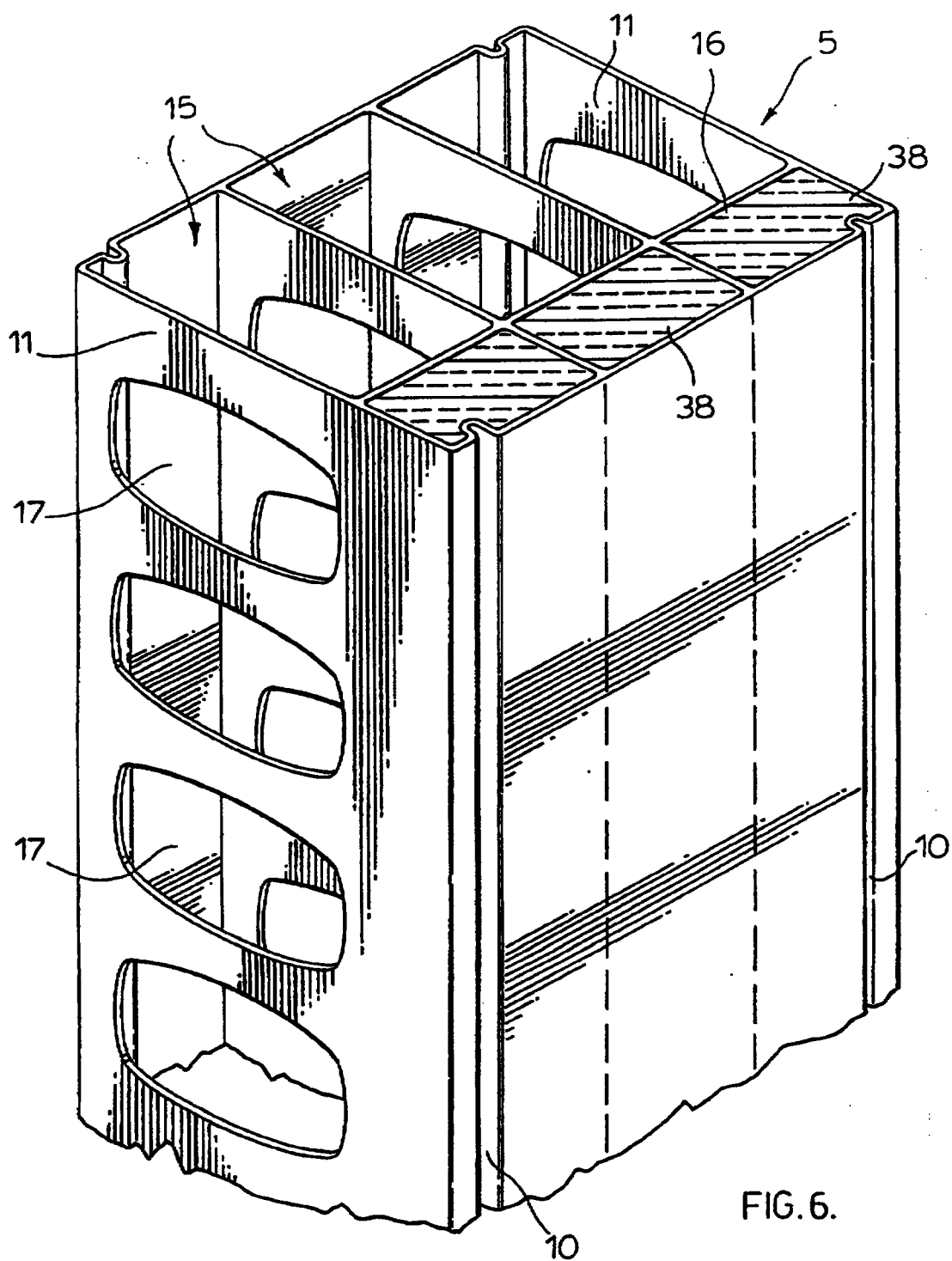


FIG. 6.

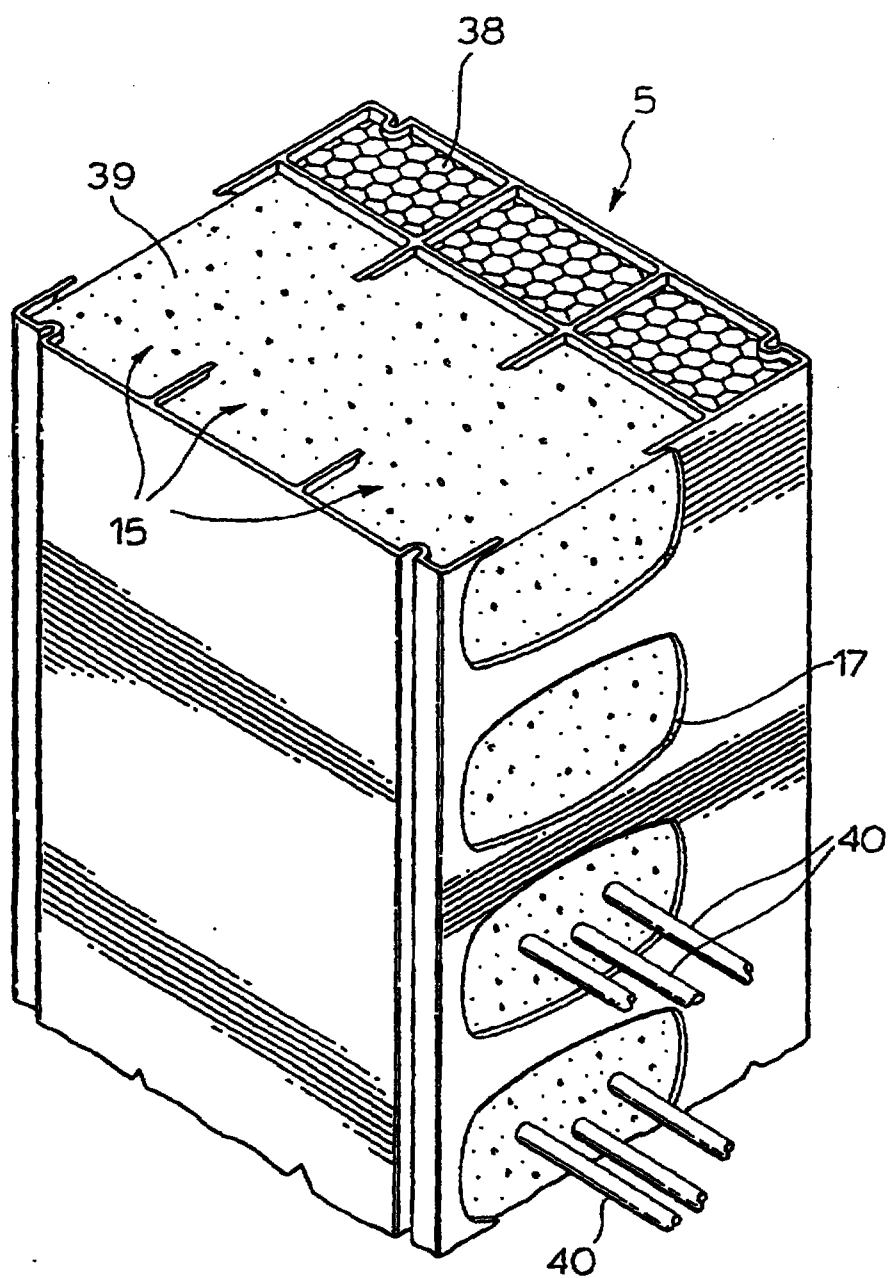


FIG. 7.

7/16

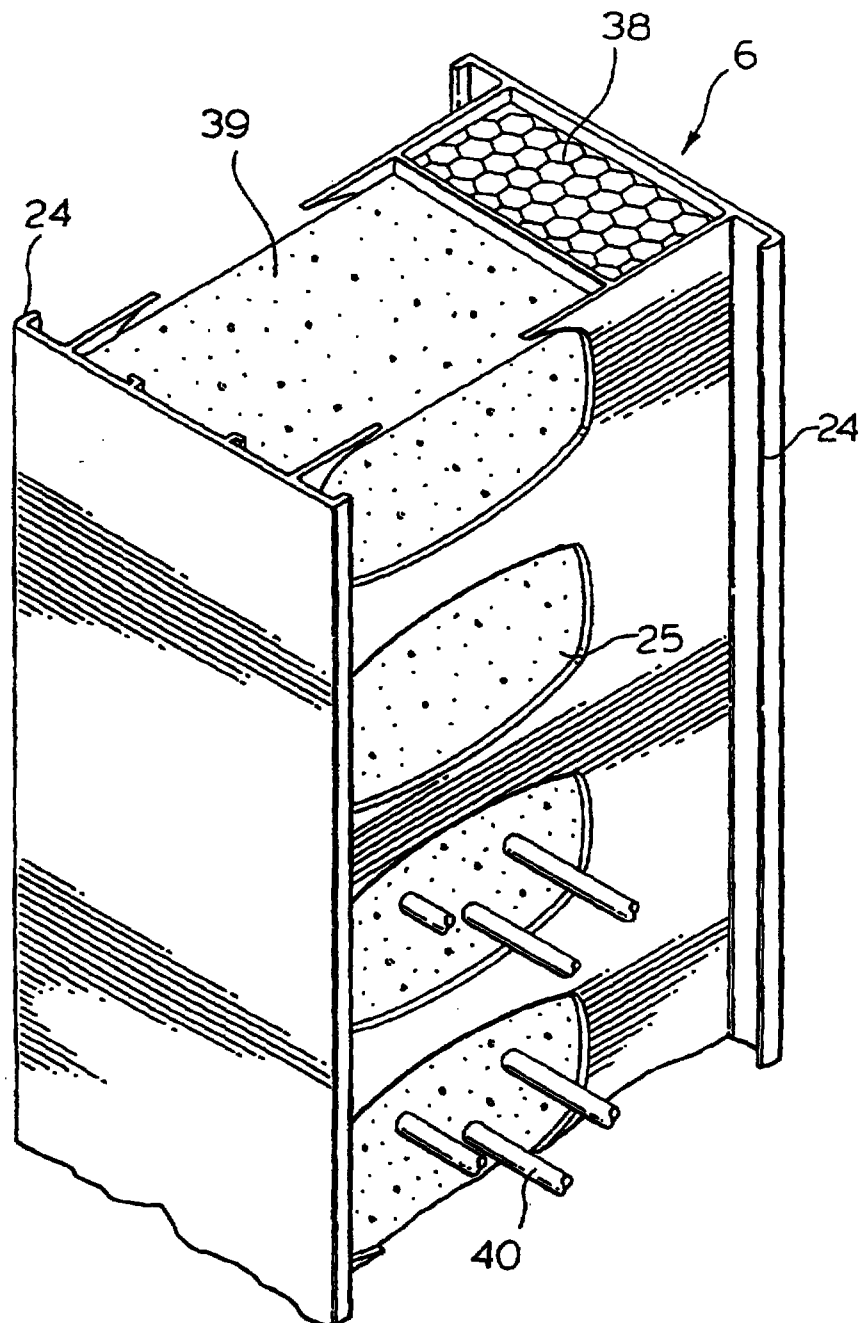
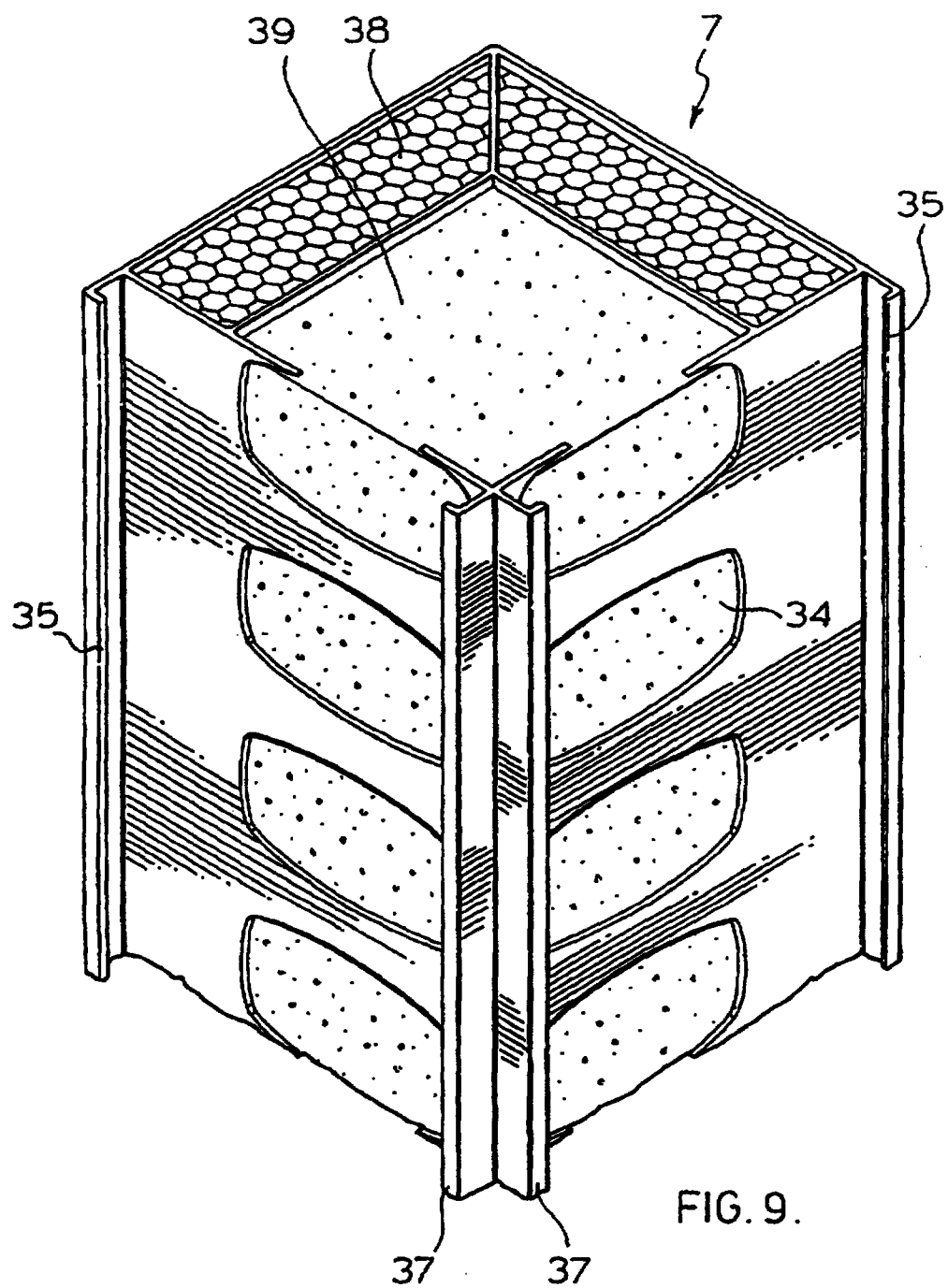


FIG. 8.

8/16



9/16

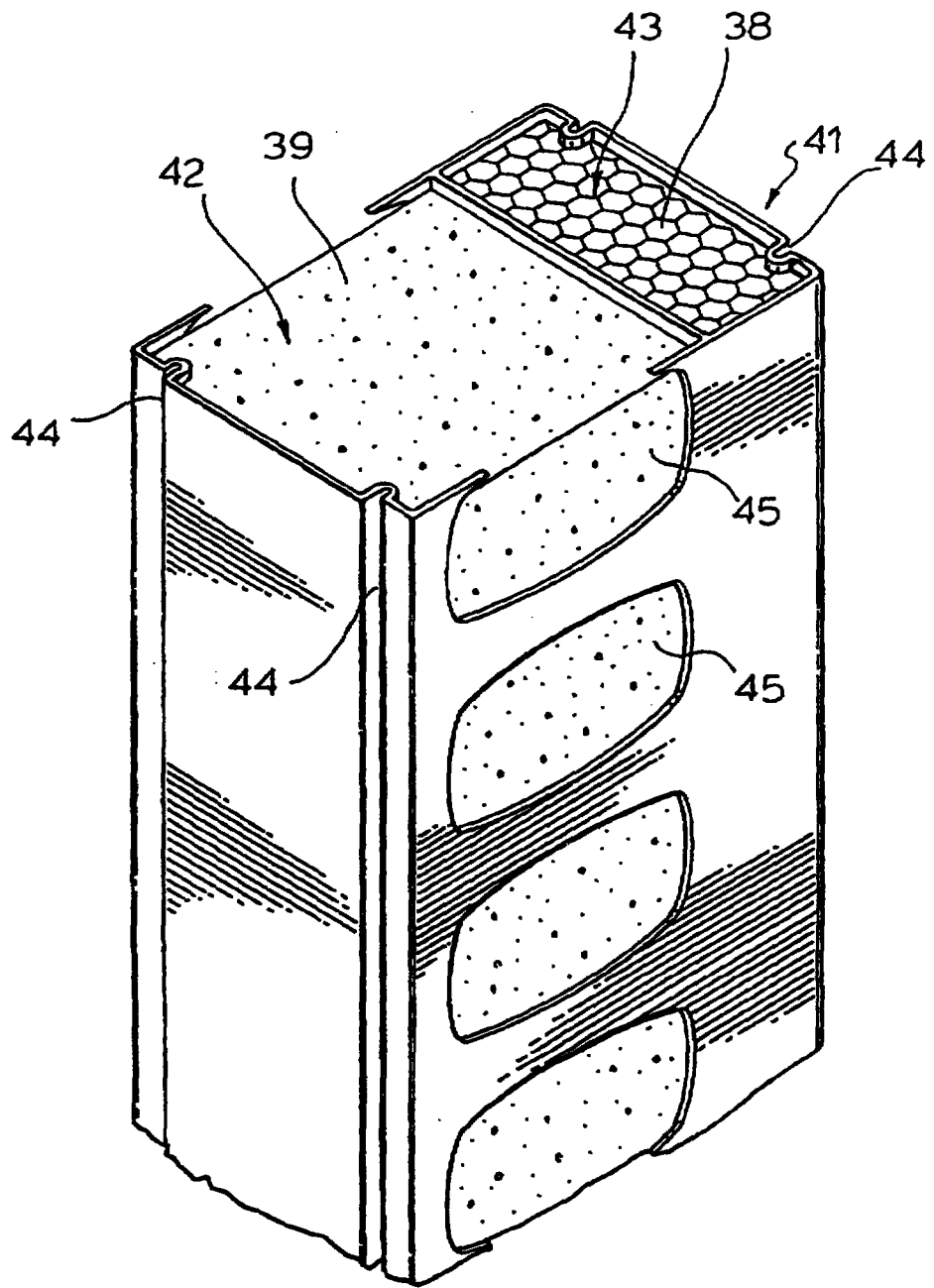


FIG. 10.

10/16

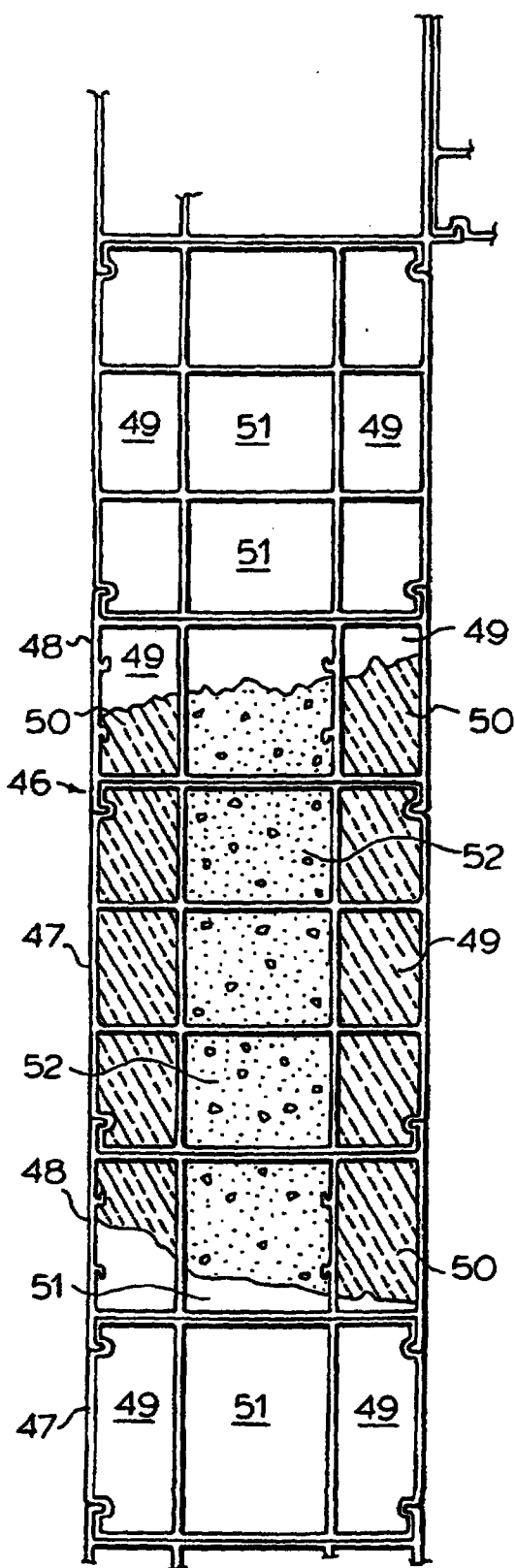


FIG. 11.

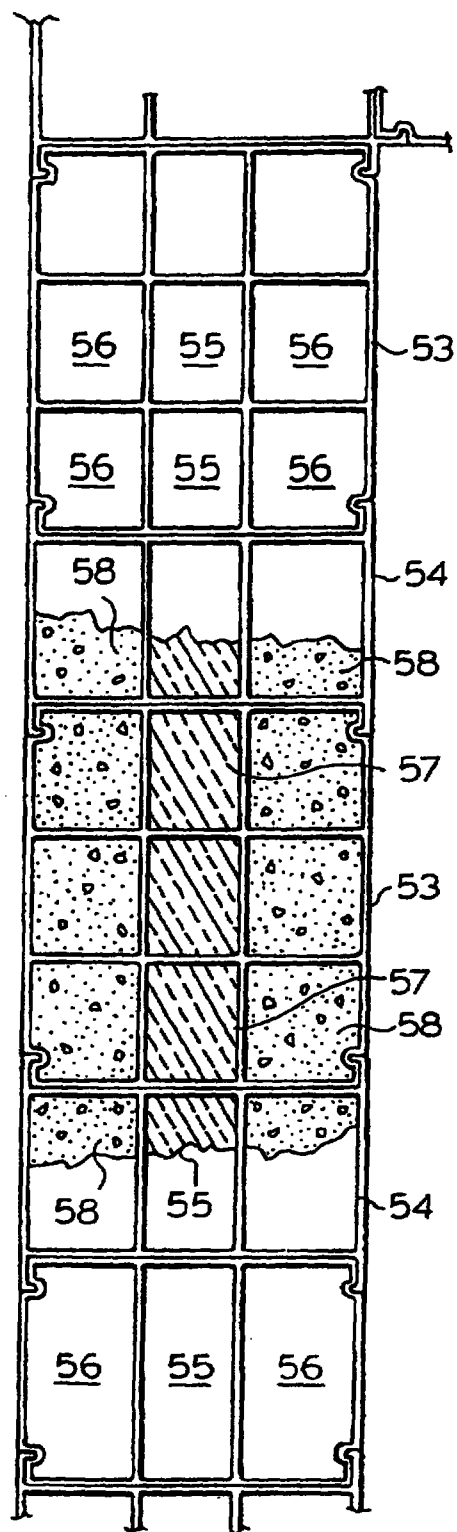


FIG. 12.

12/16

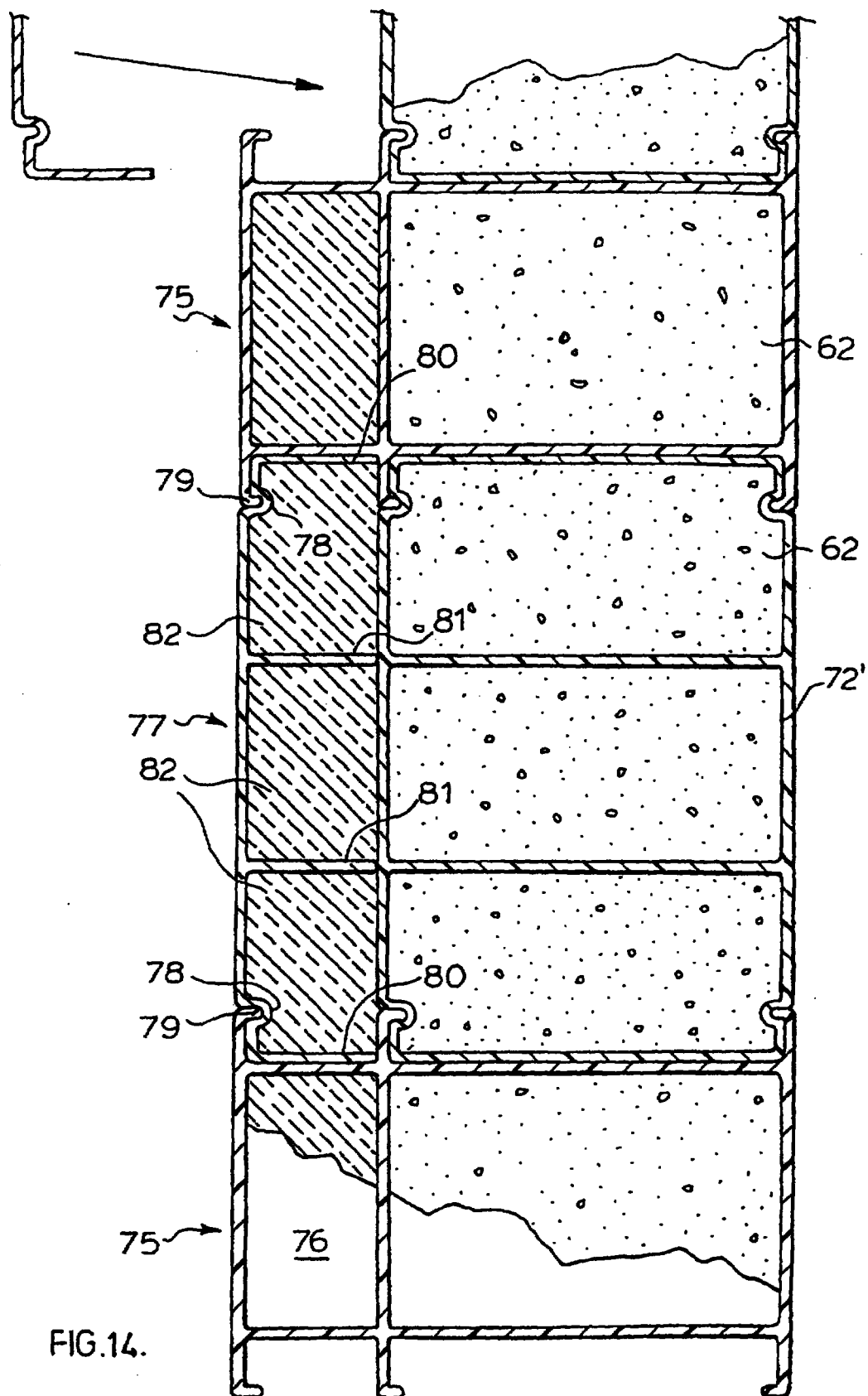
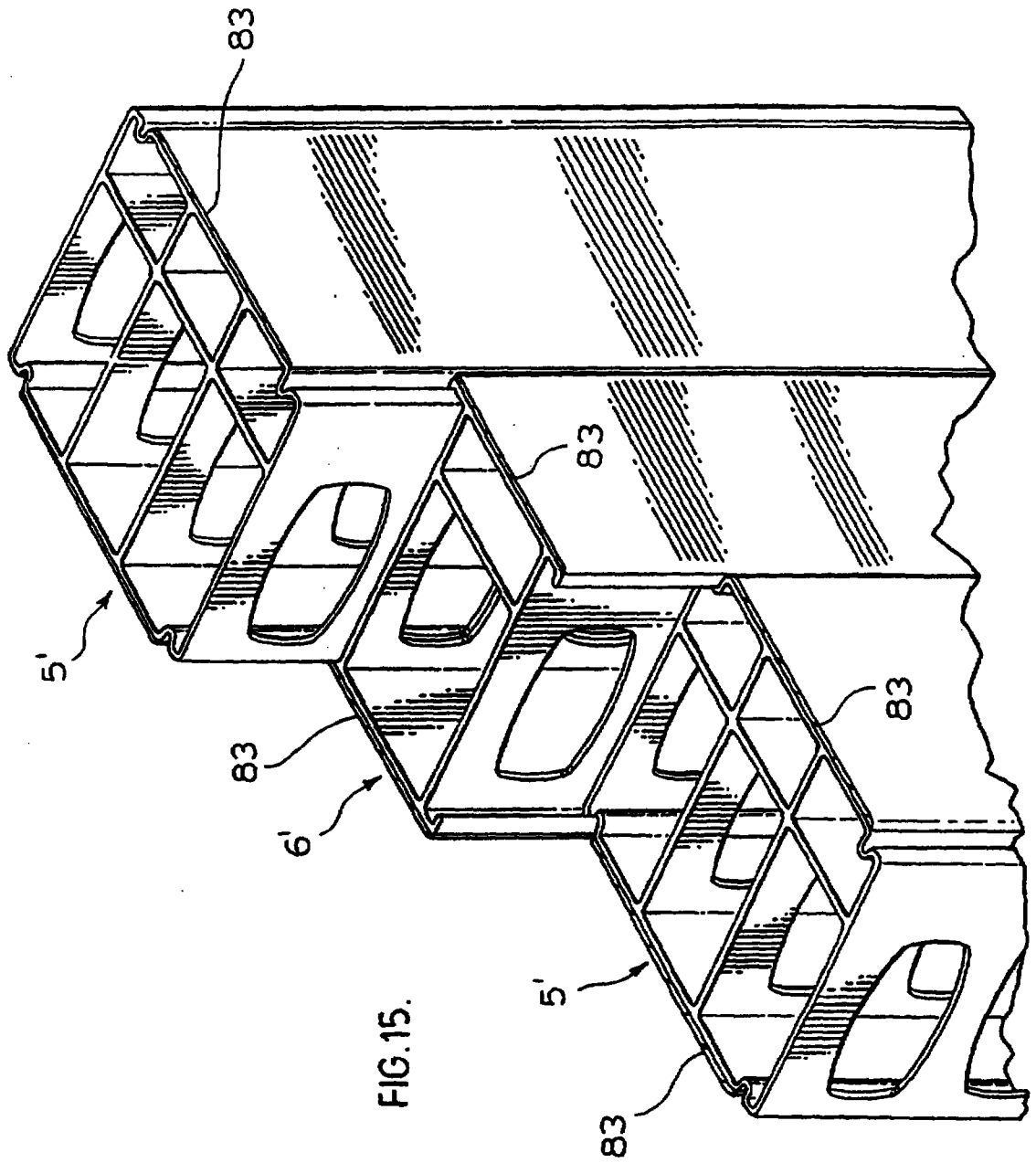


FIG. 14.

13/16



14/16

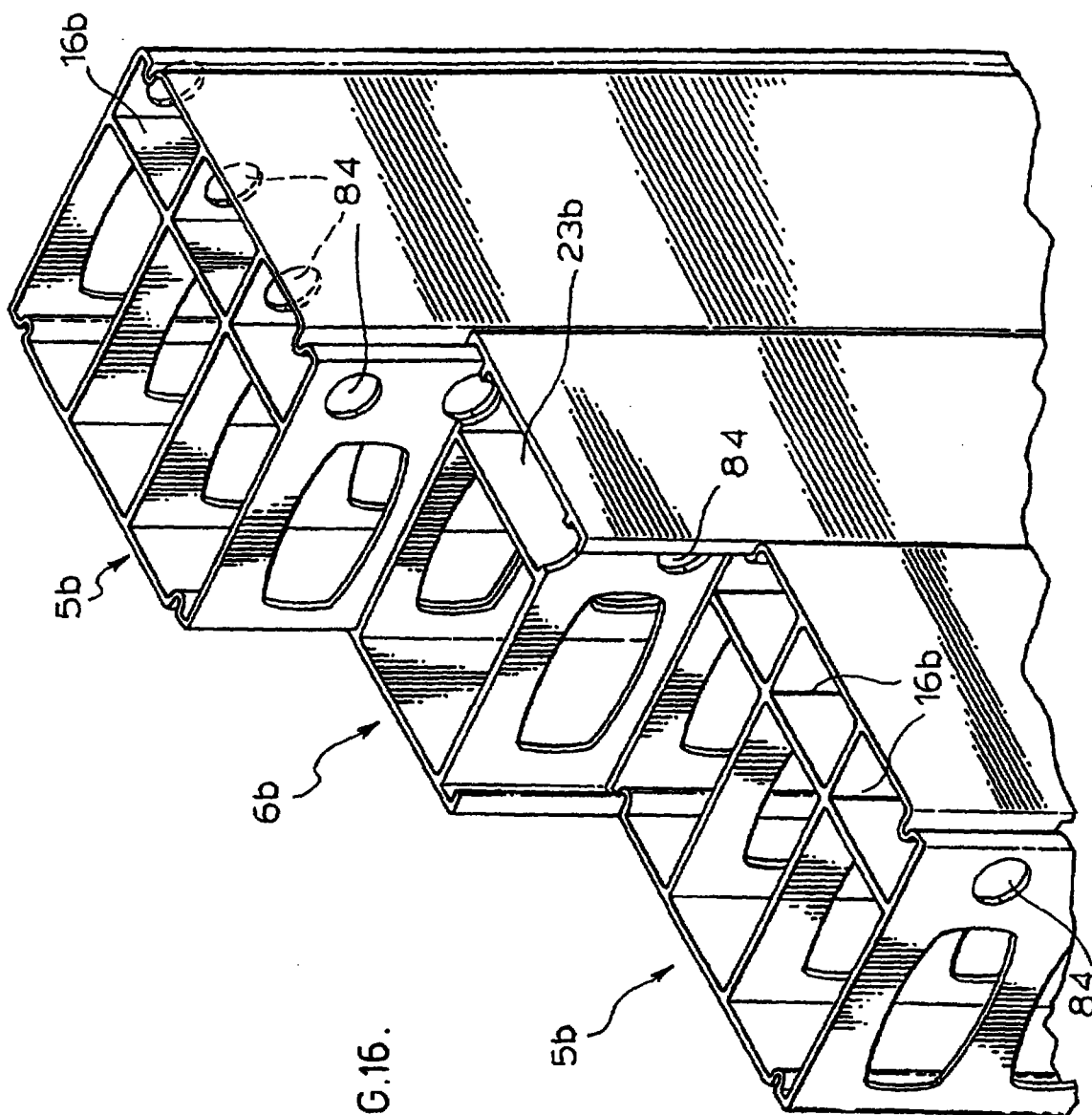


FIG.16.

15/16

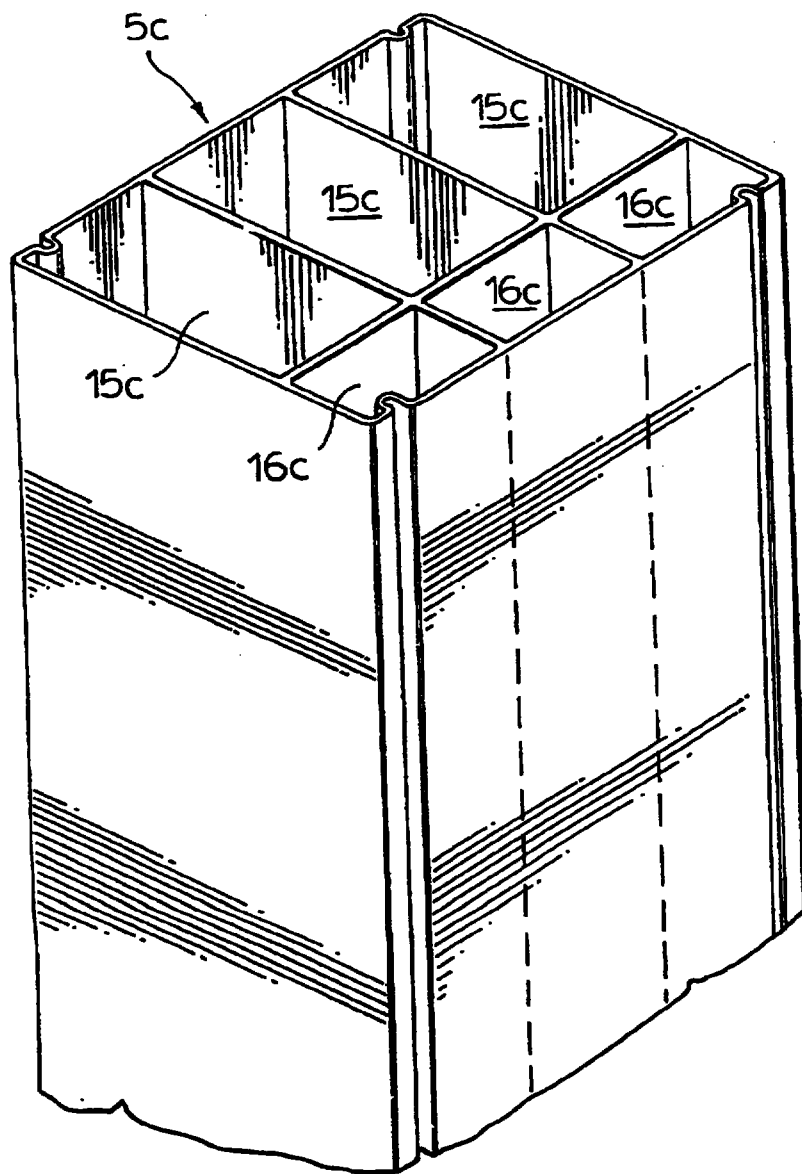


FIG. 17.

16/16

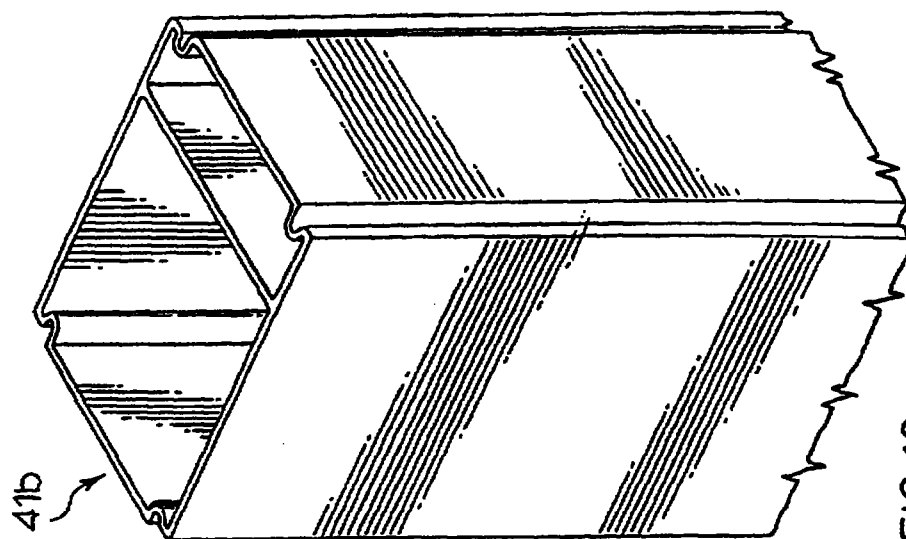


FIG. 19.

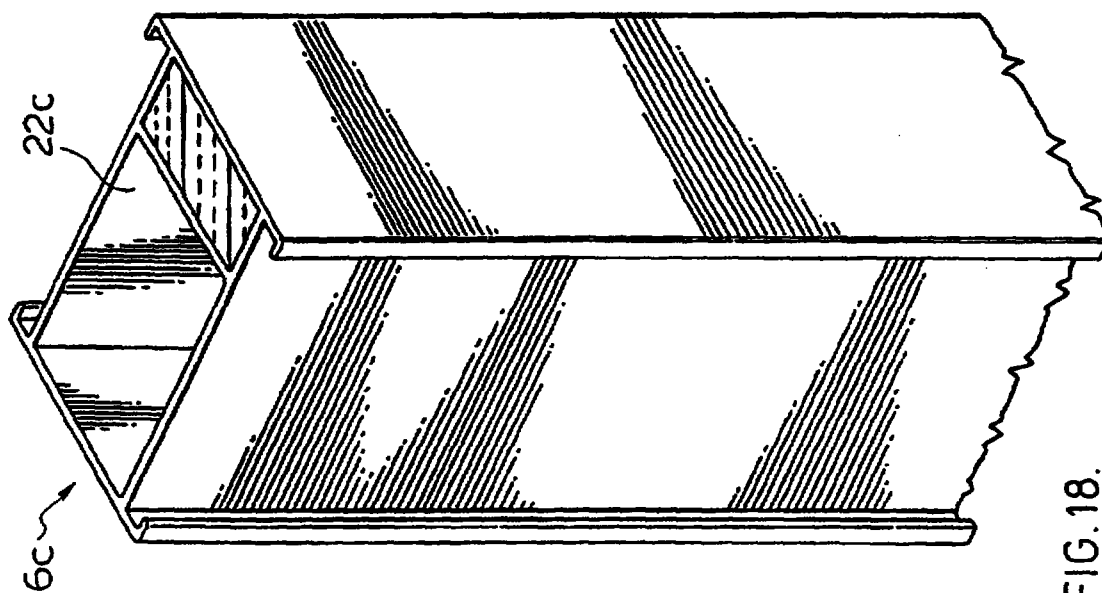
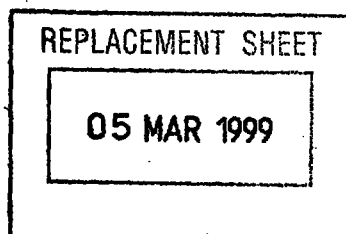


FIG. 18.



THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A wall forming component comprising an integral elongated rectilinear hollow extrusion (5, 6) of plastic material provided with interengaging means (19, 24) for assembly with mating components into a wall structure in which a pair of spaced walls (8, 9, 18, 19) of said component form exterior wall segments of said wall structure characterized in that said component is extruded to have a wall formation (11, 12, 13, 12, 13, 14; 20, 21, 20) which become internal walls when said component is incorporated into said wall structure, said wall formation providing at least one wall (14; 21) extending parallel to and spaced from said pair of spaced walls (8, 9; 18, 19) and connected at least at each end thereof to a web (11, 11; 20, 20) spanning between and integrally connected to said pair of spaced walls to divide the interior of said component into at least one rectilinear insulation receiving compartment (16, 23) and at least one rectilinear concrete receiving compartment (15, 22).
2. A wall forming component as claimed in Claim 1 characterized in that it is a box connector (6) having a single rectilinear insulation receiving compartment (23) and a single concrete receiving compartment (22).
3. A wall forming component as claimed in Claim 1 characterized in that it is a panel (5), having additional partitions (12, 13) connected between said spaced walls (8, 9) and forming a plurality of insulation receiving compartments (16) and a plurality of concrete receiving compartments (15).
4. A wall forming component as claimed in Claims 1, 2 or 3 characterized in that each of said rectilinear insulation receiving compartments (16, 23) is narrower than each of said rectilinear concrete receiving compartments (15, 22).
5. A wall forming component as claimed in any of the preceding claims characterized in that said webs (11, 12, 11; 20, 20) are provided with openings



**AMENDED SHEET
IPEA/EP**

This Sheet Has Been Replaced





THIS SHEET HAS BEEN
REPLACED

(17, 25) therethrough to provide flow access through each of said concrete receiving compartments (15, 22).

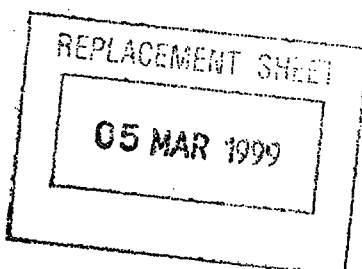
6. A wall forming component as claimed in any of the preceding claims characterized in that each of said rectilinear insulation receiving compartments (16, 23) is filled with insulation material (38).

7. A wall forming component as claimed in any of the Claims 1 to 5 characterized in that openings (84) are provided opening into each said insulation receiving compartments.

8. A wall structure comprising an assembly of interengaging plastic components forming a pair of spaced planar exterior plastic walls (8, 18, 9, 19) connected together by planar plastic transverse webs (11, 12, 13, 20) spanning between and secured to said exterior walls (8, 18, 9, 19) and defining therewith rectangular spaces interiorly of said wall structure characterized in that mounted within said wall structure is at least one aligned row of vertically extending rectangular bodies (38) of insulating material, each said body (38) of insulating material being confined between a pair of said transverse webs (11, 12, 13, 20), said row of bodies of insulating material extending lengthwise of said wall structure and occupying a portion (16, 23) of the space between said spaced exterior walls, leaving rectangular space (15, 22) for receiving concrete.

9. A wall structure as claimed in Claim 8 characterized in that said transverse webs (11, 12, 13, 20) have openings therethrough into the space (15, 22) not occupied by said bodies of insulating material.

10. A wall structure as claimed in Claims 8 or 9 characterized in that said bodies (38) of insulating material are secured against one of said exterior walls (8, 9).



This Sheet Has Been Replaced



AMENDED SHEET
IPEA/EP



by an interior wall (14, 21) spaced from one of said exterior walls (8, 9) and parallel thereto and spanning between and connected to the pairs of transverse webs (11, 12, 13, 20) between which the respective bodies 38 of insulating material are confined.

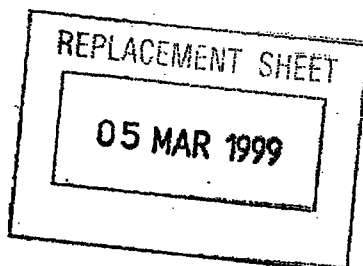
12. A wall structure as claimed in any of the Claims 8 to 11 in which the space not occupied by said bodies (38) of insulating material is filled with concrete.

13. A wall structure as claimed in any one of Claims 8 to 12 characterized in that said wall structure has a second row of aligned rectangular bodies (50) of insulating material spaced from said aforesaid aligned row.

14. A wall structure as claimed in Claim 8 in which said aligned row of insulating bodies are bodies (57) located intermediately between said exterior walls.

THIS SHEET HAS BEEN
REPLACED

This Sheet Has Been Replaced



AMENDED SHEET
IPEA/EP

- 1(a) -

French Patent Application FR-A-2721045, published December 15th, 1995, discloses a wall by forming together wall forming components which are made up of a number of individual members joined together by gluing, soldering or the like. These members include curved thermoplastic panels which are arranged with their concave sides turned outwardly held spaced by transverse bracing. The concave sides of the panels are closed with tie beams to provide a space having an arcuate wall into which insulation material may be placed. The space between the convex surfaces of the plates is filled with concrete which exerts pressure on the curved plates either directly or, for example, through flat panels covering the convex side of the curved panels to receive the concrete pressure and transmit the stress to the curved panels through connecting elements.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

REPLACEMENT SHEET

28 AUG 1998

- 15 -

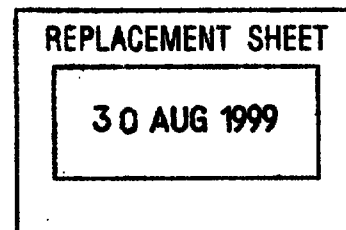
Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the scope of the appended claims.

REPLACEMENT SHEET

28 AUG 1998

- 1(a) -

French Patent Application FR-A-2721045, published December 15th, 1995, discloses a wall by forming together wall forming components which are made up of a number of individual members joined together by gluing, soldering or the like. These members include curved thermoplastic panels which are arranged with their concave sides turned outwardly held spaced by transverse bracing. The concave sides of the panels are closed with tie beams to provide a space having an arcuate wall into which insulation material may be placed. The space between the convex surfaces of the plates is filled with concrete which exerts pressure on the curved plates either directly or, for example, through flat panels covering the convex side of the curved panels to receive the concrete pressure and transmit the stress to the curved panels through connecting elements.

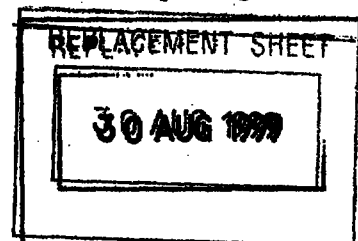




-16-

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A wall forming component comprising an integral elongated hollow extrusion (5, 6) of thermoplastic material said hollow extrusion having a rectilinear cross section and having means (19, 24) for interlocking engagement with mating components for assembly into a wall structure in which a pair of spaced walls (8, 9, 18, 19) of said component form exterior wall segments of said wall structure characterized in that said component is extruded to have a formation of walls (11, 12, 13, 14, 11; 20, 21, 20) which become internal walls when said component is assembled into a wall structure, providing walls (11, 12-13, 11; 20, 20) which extend transversely between and are integrally connected to said spaced walls (8, 18; 9, 19) and at least one wall (14;21) extending parallel to and spaced from said pair of spaced walls (8, 9; 18, 19) and connected at each end thereof to one of said walls (11, 11; 20, 20) to divide the interior of said component into at least one rectilinear insulation receiving compartment (16, 23) and at least one rectilinear concrete receiving compartment (15, 22).
2. A wall forming component as claimed in Claim 1 characterized in that it has single rectilinear insulation receiving compartment (23) and a single concrete receiving compartment (22).
3. A wall forming component as claimed in Claim 1 characterized in that it is a panel (5), having additional partitions (12, 13) connected between said spaced walls (8, 9) and forming a plurality of insulation receiving compartments (16) and a plurality of concrete receiving compartments (15).
4. A wall forming component as claimed in Claims 1, 2 or 3 characterized in that each of said rectilinear insulation receiving compartments (16, 23) is narrower than each of said rectilinear concrete receiving compartments (15, 22).
5. A wall forming component as claimed in any of the preceding claims characterized in that said webs (11, 12, 11; 20, 20) are provided with openings





(17, 25) therethrough to provide flow access through each of said concrete receiving compartments (15, 22).

6. A wall forming component as claimed in any of the preceding claims characterized in that each of said rectilinear insulation receiving compartments (16, 23) is filled with insulation material (38).

7. A wall forming component as claimed in any of the Claims 1 to 5 characterized in that openings (84) are provided opening into each said insulation receiving compartments.

8. A wall structure for an insulated wall characterized in that said wall structure is erected by interlocking together a plurality of rectilinear hollow extruded thermoplastic components (5, 6) provided with interlocking means (10, 24) which upon being interlocked together provide a pair of spaced parallel exterior walls (8, 18, 9, 19) having an internal wall formation comprising transverse walls (11, 12, 13, 20) extending between and integrally connected to said exterior walls (8, 18, 9, 19) and walls (14, 21) extending parallel to said exterior walls and integrally connected at their ends to said transverse walls (11, 12, 13, 20) whereby there is presented within said spaced parallel exterior walls (8, 18, 9, 19) at least two longitudinal rows of rectilinear compartments (16, 23, and 15, 22), one for containing insulating material (38) and the other (15, 22) to receive concrete or the like.

9. A wall structure as claimed in Claim 8 characterized in that said rectilinear compartments (16, 23) for containing insulating material (38) are formed within said hollow interlocking components (5, 6) and contain insulation material (38) prior to erection of said wall structure.

10. A wall structure as claimed in Claims 8 or 9 characterized in that said hollow thermoplastic extrusions are cored to provide openings (17, 25) such that when said components are interlocked together communication is provided between the compartments (15, 22) of the row of rectilinear compartments adapted to receive concrete.

REPLACEMENT SHEET

30 AUG 1999



11. A wall structure as claimed in Claims 8 or 10 characterized in that said hollow thermoplastic components are cored to provide openings (84) therein prior to their being interlocked together to form said wall structure such that said compartments of said row of rectilinear compartments (16b, 23b) adapted to receive insulating material are in communication with each other.

12. A wall structure as claimed in any one of Claims 8 to 11 in which said concrete receiving compartments (15, 22) are substantially wider than said compartment (16, 23) for containing insulation, said concrete receiving compartments being filled with concrete and said compartments for containing insulation being filled with insulation.

13. An insulated wall characterized in that it is erected by interlocking together a plurality of interlocking extruded thermoplastic components (5, 6) which incorporate rectilinear bodies of insulating material (38) such that upon said components (5, 6) being interlocked together they provide spaced parallel exterior walls (8, 18, 9, 19) connected together by integral transverse walls (11, 12, 13, 20) spanning therebetween and present at least one row of rectangular bodies (38) of insulating material extending parallel to said exterior walls between said transverse walls (11, 12, 13, 20) and a row of rectangular concrete receiving compartments (15, 22) bordering said row of rectangular bodies (38) of insulating material, said row of concrete receiving compartments (15, 22) being in communication with each other for the flow of concrete therebetween.

REPLACEMENT SHEET

30 AUG 1999

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : E04B 2/86, 1/12	A1	(11) International Publication Number: WO 97/32095 (43) International Publication Date: 4 September 1997 (04.09.97)
(21) International Application Number: PCT/CA97/00135 (22) International Filing Date: 28 February 1997 (28.02.97) (30) Priority Data: 2,170,681 29 February 1996 (29.02.96) CA (71) Applicant (for all designated States except US): ROYAL BUILDING SYSTEMS (CDN) LIMITED [CA/CA]; 1 Royal Gate Boulevard, Woodbridge, Ontario L4L 8Z7 (CA). (72) Inventor; and (75) Inventor/Applicant (for US only): DE ZEN, Vittorio [CA/CA]; 300 Greenbrook Drive, Woodbridge, Ontario L4L 1A6 (CA). (74) Agents: JOHNSON, Douglas, S. et al.; Suite 301, 133 Richmond Street West, Toronto, Ontario M5H 2L7 (CA).	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	

(54) Title: **INSULATED WALL AND COMPONENTS THEREFOR**

(57) Abstract

A novel insulated wall structure is formed with upright hollow thermoplastic extrusions connected together in a row, with the extrusions presenting a row of compartments (15, 22, 30) adapted to receive concrete (39) extending along the length of the wall structure and a row of compartments (16, 23, 33) containing or adapted to receive insulation (38) material also extending along the length of the wall along side or in parallel with the row of concrete receiving compartments (15, 22, 30) whereby when the compartments (15, 22, 30) adapted to receive concrete (39) are filled with concrete (39) and the insulation (38) receiving compartments (16, 23, 33) are filled with insulation (38), the insulation (38) in said insulation (38) receiving compartments (16, 23, 33) is positioned to block heat transfer through the wall. Also novel wall forming units or components for the wall structure in the form of elongated hollow thermoplastic extrusions having internal walls (12, 13, 14, 21, 29, 32) to provide the requisite concrete (39) receiving and insulation (38) receiving or containing compartments (15, 16, 22, 23, 30, 33).

