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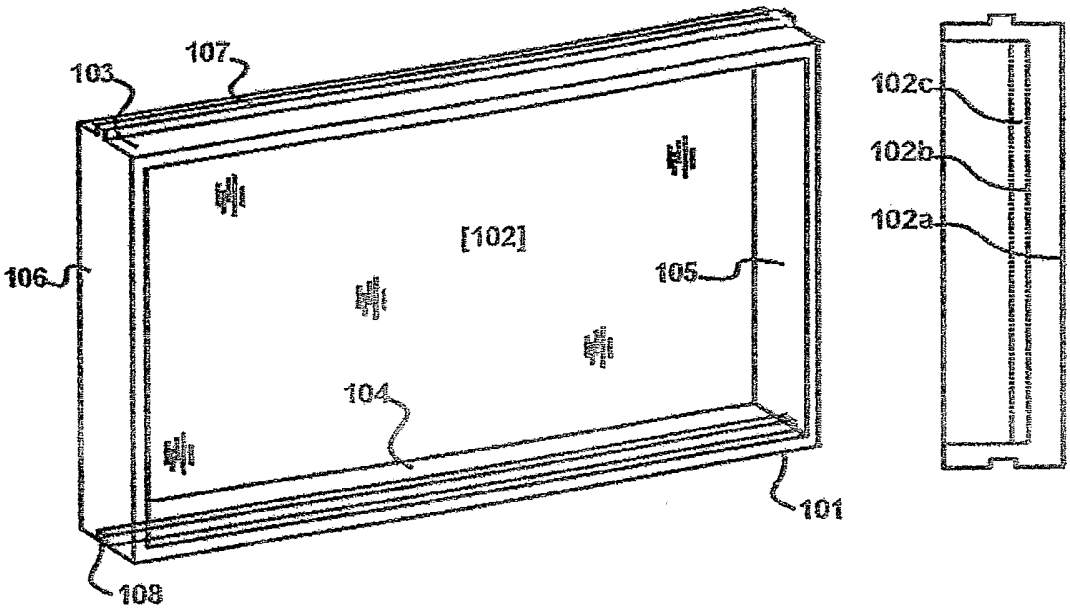

(57) Abstract: A prefabricated concrete wall panel (101) is provided, which comprises a wall section (102), a top (103), a bottom (104) and sides (105, 106), said top, bottom and sides (103 to 106) having, respectively, a substantially rectangular shape and at least one surface joined to said wall section (102), the external surface of said top (103) bearing a longitudinal tongue (107), the external surface of said bottom (104) bearing a longitudinal groove (108) substantially parallel to said tongue (107), wherein said longitudinal tongue (107) and groove (108) are respectively configured to engage with one another when superimposed.

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Title

PREFABRICATED CONCRETE WALL PANEL AND METHOD OF MANUFACTURE

Field of the Invention

The present invention relates to an improved prefabricated concrete wall panel. More particularly, the present invention relates to a method of manufacturing an improved concrete wall panel.

Background to the Invention

Many types of prefabricated concrete wall panels are known, with which to improve the materials, cost and manpower requirements for building new structures. Prefabricated or pre-cast concrete wall panels are typically delivered to the site at which a new structure is being erected, subsequently manipulated in place by hand or with the assistance of a crane, then solidly fastened to adjoining or underlying surfaces in their final position.

The timescale of the building process can therefore be significantly reduced, because there is no requirement to build concrete forms on-site for pouring concrete therein, and to wait for such poured concrete to solidify under sometimes-adverse weather conditions. For this purpose, such prefabricated panels are delivered to a building site in bulk and stored onsite, from which store they may be retrieved as and when required in order to improve the building contractors' workflow.

As the manipulation of prefabricated panels increasingly replaces more traditional building processes involving bricks and mortar, many technical developments have improved such panels in recent times. For example, it is known to reinforce concrete wall panels, with metal wire mesh or metal re-bars placed in the panel form before casting the panel, in order to improve their rigidity under load, such as when manipulated in place. The metal reinforcing further improves the overall structural integrity of the structure built from such panels. It is also known to configure concrete panels with lifting eyes, through which to pass lifting cables or ties, to facilitate their securing to the crane anchor for the manipulation thereof.

In order to configure the structure with entrance means and windows, periphery-closed wooden forms are typically placed within the enclosure of a panel form before casting the panel to define openings for windows, doors and/or the like therein.

Concrete hardens outside these closed forms, which define openings within the overall panel when removed. The prefabricated panel may be shipped to the site with the surround wooden form still in place, in order to attach door or window fittings thereto, or without if removed.

Fastening adjoining panels is usually accomplished with metal fasteners, such as a nut and bolt combination threaded through respective bores in the adjoining sides of the wall panels, and the panels are preferably first levelled in relation to one another to align the respective bores, for instance with inserting levelling blocks under or between the panels. Upon completing the assembly and fastening of panels, a structure is obtained, the internal and/or external aesthetics of which may be improved by dressing the prefabricated concrete panels with attaching finishing materials, such as plasterboard, to concrete or wooden studs of the panels.

Several disadvantages exist in the above panels, however. Storage can be problematic on building sites with restricted access and/or limited storage space, for instance where it would be preferable to stack prefabricated concrete wall panels vertically, as the panels of the prior art are not configured for such storage requirements, having particular regard to their exterior surfaces and load-bearing structural capacity.

Lifting eyes in the prior art panels are not interfaced with the metal panel reinforcing means, but usually take the form of one or a plurality of openings implemented in a side of the concrete panel, such that the improvement in the rigidity of the panel under load is mitigated by the friability of the concrete edges surrounding the opening, exacerbated if the panel has been damaged in transit. These opening edges may collapse under the lifting stress, release the lifting cable or tie threaded therethrough and precipitate the disintegration of the lifting eye panel section and accidental fall of the panel.

Likewise, levelling adjoining panels can be particularly difficult, especially if a first panel was improperly set and an entire series of adjoining panels must consequently be adjusted, whereby fasteners and levelling blocks must be removed and reset. This situation is particularly troublesome when two adjoining panels define a corner of the structure and can easily arise when the entire periphery of a structure is taken into account which may extend over tens or hundreds of meters, and wherein an insignificant misalignment at the onset may result in a severe misalignment of a meter or more with the last panel.

Wooden window or door forms, if left in the panel for attaching fixings thereto, are prone to warping or movement due for instance to weathering whilst stored at the panel manufacturing site or the building site. This can result in difficulties with fitting and sealing the fixings to isolate the inside of the structure from the elements.

Moreover, wooden window or door forms and wooden panel studs are also prone to rot or infestation. Concrete studs may be preferred to wooden studs in this respect, but are particularly difficult to dress, e.g. to fasten plasterboard thereon, which task becomes time-consuming and expensive in materials and specialist concrete fasteners. Attempts have been made to remedy the above situation with casting wooden stud members into a concrete stud on the side of the stud to which finishing materials may be fastened, but said wooden stud members suffer the same rot and infestation risk as wooden forms or studs.

Object of the Invention

It is an object of the present invention to provide an improved concrete panel, which is adapted to engage other panels.

It is another object of the present invention to provide an improved concrete panel, which includes anchoring means.

It is yet another object of the present invention to provide an improved concrete panel, comprising means to facilitate levelling and fastening with other such panels.

It is still another object of the present invention to provide an improved concrete panel, to which finishing materials may easily be fastened.

It is also an object of the present invention to provide a method of manufacturing said improved concrete panel.

Summary of the Invention

According to the present invention, a prefabricated concrete wall panel is provided, which comprises a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, the external surface of said top bearing a longitudinal tongue, the external surface of said bottom bearing a longitudinal groove substantially parallel to said tongue, wherein said longitudinal

tongue and groove are respectively configured to engage with one another when superimposed.

In an alternative embodiment of the present invention, the prefabricated concrete wall panel comprises a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, said panel further comprising at least one stud extending between said top and bottom which is cast into or against said wall section, and said stud comprising an elongate metal stud member cast thereon, wherein said metal stud member includes edges protruding into said stud which define an elongate chamber containing an insulating material.

In another alternative embodiment of the present invention, the prefabricated concrete wall panel comprises a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, wherein each of said sides comprises a metal corner member extending between said top and bottom, said metal corner member comprises two planar elements joined along one common edge and angled relative to one another, at least one of said planar elements is flush with said side, said planar element including at least one means to facilitate levelling and fastening for receiving fastening means with which to level and couple said panel with another.

In yet another alternative embodiment of the present invention, the prefabricated concrete wall panel comprises a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, said wall section including a closed metal form, wherein the width of said closed metal form exceeds the width of said wall section, and wherein said form defines an opening in said wall section for panel fittings such as a window or a door.

A process for casting a concrete wall panel according to the present invention is likewise disclosed.

Brief Description of the Drawings

Figure 1 is a perspective view of a prefabricated concrete wall panel including panel engaging means according to the present invention;

Figure 2 is a perspective view of the panel of Figure 1 including anchoring means configured to engage panel reinforcing means;

Figure 3 is a perspective view of the panel of Figure 2 including means to facilitate levelling in relation to other panels and fastening therewith;

Figure 4 is an elevated view of a corner of the panel shown in Figure 3 fastened to the corner of another panel shown in Figure 3;

Figure 5 is a perspective view of the panel of Figures 3 and 4 including a concrete panel stud;

Figure 6 is an elevated view of the panel stud shown in Figure 5, including a metal stud member;

Figure 7 is a perspective view of the panel of Figures 5 and 6, including a metal opening form; and

Figure 8 is a perspective view of two examples of the metal opening form shown in Figure 7.

Detailed Description of the Drawings

Referring initially to Figure 1, a concrete wall panel 101 is shown in a perspective view. The panel is multipurpose, in that it can be used as a portion of an above-surface wall, below-surface wall or even as a portion of a foundation. The pound-per-square-inch (psi) rating of the panel is preferably of about 5500 and the U-value of the panel, which is a measure of air-to-air heat transmission (loss or gain) due to thermal conductance and the difference between indoor and outdoor temperatures, may be adjusted prior to casting. As the U-value decreases, so does the amount of heat that is transferred through the panel. The lower the U-value, the more restrictive the panel is to heat transfer.

The panel 101 is manufactured following a concrete casting process, to include a wall section 102 having front and back concrete surfaces 102a, 102b, the space therebetween defining the width of said wall section 102. Panel 101 also includes a top

103, a bottom 104 and sides 105, 106. The front surface 102a is preferably joined to at least one surface of each of sections 103 to 106, such that the back surface 102b is recessed and said back surface 102b is preferably covered or coated with insulating material 102c, such as sheep wool or another such organic insulation.

Advantageously, the layer of insulation material 102c can be made of a material firm enough to act as a jig during the casting process of pouring the concrete to form the panel. For instance, insulating material 102c can be made of polystyrene or polyurethane and take the form of one or more jig members, thereby obviating the use of one or more removable metal or wood jig members during the casting process only, for achieving the required configuration of any of front surface 102a, back surface 102b and/or sides 105, 106. The one or more polystyrene or polyurethane members 102c can advantageously be left in place in the panel once the concrete cures, thereby obviating the time- and labour-consuming tasks of removing the removable metal or wood jig members and replacing those with the insulating members 102c, as well as periodically replacing the metal or wood jig members themselves when they eventually become unsuitable for their purpose through repeated use.

When panel 101 is manufactured during a concrete casting process, said process preferably includes a step of forming the external surface of top 103 with a tongue, such that the top 103 preferably includes a longitudinal concrete tongue 107. Likewise, when panel 101 is manufactured during said concrete casting process, said process preferably includes a step of forming the external surface of bottom 104 with a groove, such that the bottom 104 preferably includes a longitudinal groove 108 substantially parallel to said tongue 107. Said longitudinal tongue 107 and groove 108 are preferably configured to respectively engage with one another when two panels 101 are vertically stacked, i.e. wherein the tongue 107 of a bottom panel 101 engages the groove 108 of a top panel 101 positioned thereon. .

In the preferred embodiment, tongue 107 extends over substantially the entire length of top 103. Tongue 107 is substantially centred in relation to the longitudinal median of top 103. Likewise, groove 108 extends over substantially the entire length of bottom 104, which is preferably strictly parallel to top 103, and groove 108 is also substantially centred in relation to the longitudinal median of bottom 104.

It will however be easily understood by those skilled in the art, that the above configuration is not limitative of the possible alternative arrangements and

configurations of complementary tongues 107 and grooves 108. Indeed, alternative embodiments consider tongues 107 and grooves 108 extending over only one or a plurality of portions of the respective external surfaces of top 103 and bottom 104. Likewise, alternative embodiments consider locating tongues 107 and grooves 108 differently, for instance at an angle relative to the median of the surface, or simply offset from said median, for instance to distribute weight stresses in appropriate circumstances.

Referring now to Figure 2, when panel 101 is manufactured during said concrete casting process, said process preferably also includes a step of casting metal reinforcing bars 201 in top, bottom and sides 103 to 106 before the concrete cures, which are commonly referred to as rebars and the casting of which is well known in the art. Additionally, said rebarring step may include the further step of casting a metal mesh 202 between the surfaces 102a, 102b before the concrete cures, to further strengthen section 102. According to the present invention, however, said rebarring step further includes a step of casting anchoring means 203 in the top 103. In this embodiment also, the layer of insulation material 102c can be made of a material firm enough to advantageously act as a jig during the casting process of pouring the concrete to form the panel.

In the preferred embodiment, anchoring means 203 is a steel member having a substantially rectangular shape, the respective width 204 of which is marginally smaller than the width of top 103, the respective depth 205 of which is marginally smaller than the depth of top 103 and the respective length 206 of which is substantially smaller than the length of top 103. The steel member 203 incorporates at least one opening 207 configured with a neck 207B, which is perpendicular to top 103. Opening 207 is for instance a bore having a circular section, which may be optionally configured with a thread. The bore 207 is configured with the neck 207B to ensure that the steel member 203 will be encased in concrete, but the bore 207 will not become filled with concrete during the casting process. Optionally, said bore 207 extends completely through member 203 and also top 103 after casting, for instance with a second neck (not shown) similar in configuration and purpose to neck 207B, but on the surface of steel member 203 opposite to said neck 207B. Lifting means may therefore be secured by passing a

lifting cable or tie through the bore 207 of anchoring steel member 203, or by threading a correspondingly-threaded steel member or fastener into said threaded bore 207.

The steel member 203 also incorporates at least another opening 208, which is parallel to the plane of top 103. Opening 208 is for instance a bore having a circular section, which preferably extend completely through member 203. Anchoring means 203 may therefore be secured to the panel 101 by passing or threading at least one rebar 201 through said bore 208 before casting the panel 101. In the preferred embodiment, steel member 203 includes two securing bores 207, 209 and two rebar-accommodating bores 208, 210, wherein securing bores 207, 209 are respectively equidistant from the longitudinal median of top 103 and therefore tongue 107 when member 203 is positioned as a result of passing or threading the two rebars 201 through said bores 208, 210 before casting the panel 101. Alternative embodiments of the present invention consider a concrete panel 101 without a tongue 107 but including the anchoring member 203, which may comprise any number of securing bores 207, 209 and any number of rebar-accommodating bores 208, 210.

A structure may contain corners, such that it will be necessary to assemble at least two panels 101 at an angle relative to each other. According to the present invention, alternative configurations of at least one side 105 or 106 of panel 101 are considered, in which either side 105 or side 106 is sloped relative to the other, or both sides are sloped when a single panel 101 defines an entire side of the structure, instead of being strictly parallel relative to one another and strictly perpendicular to wall section 102, as shown in Figure 1. When panel 101 is manufactured during said concrete casting process, said process therefore preferably includes a step of forming at least one of the sides 105, 106 with a slope relative to the other side, such that the respective plane thereof defines an angle of substantially less than 90 degrees in relation to the wall section 102 as shown in Figure 1, for example an inward angle of substantially 45 degrees, as shown in Figures 3 and 4.

In the example embodiment shown in Figure 3, panel 301 defines an entire side of a structure, therefore both sides 105, 106 are sloped, such that top 103 and bottom 104 each therefore have a substantially trapezoidal shape 302, the respective longest sides 303 of said trapezoidal shapes extending along the length of said front surface 102a. In an alternative embodiment, only one side 105 or 106 is sloped, but top 103 and

bottom 104 each also have a substantially trapezoidal shape 302, the respective longest sides 303 of said trapezoidal shapes extending along the length of said front surface 102a.

Preferably, a section of each of sides 105, 106 comprises a metal corner member 304 extending between the top 103 and the bottom 104. Metal corner member 304 is preferably made of steel and is cast into said side section 105, 106. With reference to Figure 4, the metal corner member 304 comprises two planar elements 401, 402 joined along one common edge 403 and angled (404) relative to one another. At least one of said planes 401, 402 is preferably flush with the external surface of said side 105, 106. In the preferred embodiment, the angle 404 between the member planes 401 and 402 is 90 degrees. The task of aligning two panels 301 defining a right-angled corner is therefore greatly simplified, since the right angle is obtained as the angle defined by the sides of the respective juxtaposed sides 105, 106, respectively, of the panels complementing one another. Alternative embodiments consider casting the sides with different angles, as required by the design of the structure to be built of panels according to the present invention.

The planar element 401 flush with the external surface of the side 105, 106 includes at least one means to facilitate levelling and fastening 305 for receiving fastening means 405, with which to level and couple a panel 301 with another panel 301. In the preferred embodiment, the means to facilitate levelling and fastening 305 takes the form of a slot and fastening means 405 are for example a nut and bolt combination, which preferably includes an outer thread diameter corresponding to the width of said slot. In a preferred embodiment, planar element 401 includes two slots 305, 306 being respectively disposed substantially in proximity of an extremity of said planar element 401, such that two panels 301 may be coupled with a plurality of fasteners 405 to increase their joint structural integrity. Levelling of two such juxtaposed panels 301 is therefore greatly simplified, as the fastening means may be moved within the slots 305, 306 along the direction thereof, which is parallel to the vertical plane of the panels 301 and which vertical plane is the level adjustment plane for the panels 301, if the panels 301 require vertical adjustment relative to one another, for instance because the seating for the respective bottoms 104 thereof is not level itself.

Now referring to Figures 5 and 6, when panel 101 or 301 is manufactured during said concrete casting process, said process preferably likewise includes a step of casting at least one vertical concrete member 501 against the back surface 102b before the concrete cast to form the panel cures, which is commonly referred to as a stud and the casting of which is well known in the art. The stud 501 may be incorporated in the panel to further improve the overall structural integrity of the panel 101 or 301, improve its resistance to vertical stresses and its load bearing capacity. Additionally, the previously-described rebarring step may include the further step of interfacing the panel rebars 201 with the one or many rebars (not shown) of the stud 501, before casting the panel. Alternative embodiments of the panels 101, 301 consider a plurality of studs as described herein, for example in proportion to the length of the panel 101 or 301. In a particular embodiment, the panel 101 or 301 is manufactured with studs 501 spaced apart every 600 millimetres.

According to the present invention, the stud 501 extends between the internal surface of the top 103 and the internal surface of the bottom 104 and at least three surfaces 502 to 504 of the stud are cast into or against said portions 103, 104 and the back surface 102b, respectively. The stud 501 preferably includes at least one transversal opening 505 parallel to surface 102b to facilitate ducting of services, including for instance water pipes, gas pipes or electrical wiring. Alternative embodiments consider a plurality of such openings 505 and at least one same opening 505 in each of panel side portions 105 and 106. Isolating material layer 102c may thus be applied to the back surface 102b after the casting of the stud 501, as two layers 506a and 506b fastened to said surface 102b on either side of said stud 501. Advantageously, the two layers 506a, 506b can be made of a material firm enough to act as a jig during the casting process of pouring the concrete to form the panel and therefore also act as a positioning jig for the stud 501.

To facilitate the eventual dressing of the isolated back surface 102b, 506a, 506b, when the stud 501 is manufactured during a concrete casting process, said concrete stud-casting process preferably includes a step of casting an elongate metal stud member 507 onto said stud 501. The stud member 507 is preferably positioned opposite the side 504 cast into or against the back surface 102b, e.g. on the surface of the stud 501 to which finishing materials will be applied or fastened. The metal stud member 507 preferably extends along stud 501 between the internal surface of the top 103 and

the internal surface of the bottom 104. Said stud member 507 is preferably a single sheet or strip of steel formed, for instance by a roll-forming process, to obtain a substantially u-shaped cross-section including at least two edges 601, 602 protruding into the surface of stud 501 opposite the side 504 cast into or against the back surface 102b, and thereby defining an elongate chamber 603. An insulating material figuratively shown as 604 is inserted into the roll-formed chamber 603 prior to casting the stud 501, to prevent ingress of concrete into said chamber 603 during the stud casting process, to improve the insulating properties and imperviousness of the stud 501 once it is cast into the panel 101 or 301 and also to facilitate the retention of fasteners used to dress the panel with finishing materials. In a preferred embodiment, the insulating material 604 is polyurethane, but alternative embodiments consider any other suitable material having comparable properties. Likewise, in the preferred embodiment, the chamber 603 has a substantially square cross-section, but alternative embodiments consider any other suitable cross-section, particularly if configured to further facilitate the dressing of the panel 101 or 301 in which the front surface of the chamber is for example designed to improve the grip of the stud member 507 upon a finishing material applied thereto.

A prefabricated concrete wall panel 101 or 301 is shown in Figure 7, in which an opening 701 shown in further detail in Figure 8 is cast to accommodate fittings, such as a window. When panel 101 or 301 is manufactured during said concrete casting process, said process preferably also includes a step of casting a metal form 701 defining an opening in the main wall section 102.

Preferably, a single sheet or strip of galvanised steel is again formed, for instance by a roll-forming process, to obtain a substantially u-shaped cross-section 801 in a preferred embodiment. Thereafter, the roll-formed strip 801 may be bent to define a closed form 701, preferably having a width 802 substantially exceeding the width of the wall section 102, so as to prevent ingress of concrete within the perimeter defined by the form 701 during the casting process. The form 701 is located within the overall casting form for the panel 101 or 301, and the sides 803, 804 of the u-shape further secure the form 701 in place, as concrete cures around form 701 and between sides 803, 804.

Alternative embodiments consider varying cross-sections, which may depend upon the eventual purpose of the form 701 and the thickness of the wall section 102. For example, an asymmetrical w-shaped cross-section 805 is shown for use with a door

fitting, wherein the ridge 806 in the cross-section secures the corresponding doorframe still further within the portion 102 as it is encased in concrete during the casting of the panel 101 or 301. A prefabricated concrete wall panel is therefore obtained, into which door or window fittings can be mounted very rapidly and conveniently, because the surface preparation required with prior art concrete forms and insulation or mounting disadvantages arising out of warping wooden forms are avoided. Furthermore, the rot and infestation risks associated with prior art wooden forms are likewise avoided.

The words "comprises/comprising" and the words "having/including" when used herein with reference to the present invention are used to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination.

Claims

1. A prefabricated structural concrete wall panel comprising a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, the external surface of said top bearing a longitudinal tongue, the external surface of said bottom bearing a longitudinal groove substantially parallel to said tongue, wherein said longitudinal tongue and groove are respectively configured to engage with one another when superimposed.

2. A prefabricated concrete wall panel according to claim 1, wherein said top, bottom and sides respectively have at least one surface flush with said wall section.

3. A prefabricated concrete wall panel according to claim 1 or 2, wherein said panel further comprising at least one stud extending between said top and bottom, which is cast into or against said wall section, and comprises an elongate metal stud member cast thereon, said metal stud member including edges protruding into said stud which define an elongate chamber containing an insulating material.

4. A prefabricated concrete wall panel according to any of claims 1 to 3, wherein each of said sides comprises a metal corner member extending between said top and bottom, said metal corner member comprising two planar elements joined along one common edge and angled relative to one another.

5. A prefabricated concrete wall panel according to claim 4, wherein at least one of said planar elements is flush with said side.

6. A prefabricated concrete wall panel according to claim 4 or 5, wherein said planar element includes at least one means to facilitate levelling and fastening for receiving fastening means with which to level and couple said panel with another.

7. A prefabricated concrete wall panel according to any of claims 1 to 3, wherein said wall section includes a closed metal form, which defines an opening in said wall section for panel fittings such as a window or a door.

8. A prefabricated concrete wall panel according to claim 7, wherein the width of said closed metal form exceeds the width of said wall section for preventing concrete ingress within said closed metal form.

9. A panel according to any of claims 1 to 8, wherein the pound-per-square-inch (psi) rating of said panel amounts to substantially 5500 and the U-value of said panel is adjusted prior to the casting thereof.

10. A panel according to any of claims 1 to 9, further including a layer of insulation material.

11. A panel according to claim 10, wherein said layer of insulation is made of a material firm enough to be used as a jig for casting said panel.

12. A panel according to claim 11, wherein said material is polystyrene or polyurethane.

13. A method of casting a prefabricated structural concrete wall panel comprising a wall section, a top, a bottom and sides, said top, bottom and sides respectively having at least one surface joined to said wall section, at least one of said sides being optionally sloped relative to the other side, said method comprising the steps of:

forming the external surface of said top with a tongue, such that said top includes a longitudinal concrete tongue; and

forming the external surface of said bottom with a groove, such that said bottom includes a longitudinal concrete groove substantially parallel to said tongue;

wherein said longitudinal tongue and groove are respectively configured to engage with one another when superimposed.

14. A method according to claim 13, further comprising a step of casting metal reinforcing bars in said top, bottom and sides before the concrete cures.

15. A method according to claim 13, further comprising a step of casting a metal mesh between the surfaces of said wall section before the concrete cures.

16. A method according to any of claims 13 to 15, further comprising a step of casting anchoring means in said top before the concrete cures, wherein said anchoring means are interfaced with said metal reinforcing bars.

17. A method according to any of claims 13 to 16, further comprising a step of forming at least one of said sides with a slope relative to the other side, such that the respective plane thereof defines an angle of substantially less than 90 degrees in relation to said wall section.

18. A method according to claim 17, further comprising a step of forming both of said sides with a slope relative to the other side.

19. A method according to claim 18, further comprising a step of forming both of said sides with respective slopes as required by the design of the structure to be built of panels cast according to the method.

20. A method according to any of claims 13 to 19, further comprising a step of casting at least one vertical concrete member into or against the back surface of said wall section before the concrete cures.

21. A method according to claims 20, wherein said vertical concrete member includes at least one reinforcing bar and said step of casting said at least one vertical concrete member comprises a step of interfacing said vertical concrete member reinforcing bar with said metal reinforcing bars.

22. A method according to claim 20 or 21, further comprising a step of casting an elongate metal stud member onto said vertical concrete member, opposite the side of

said vertical concrete member cast into or against said back surface before the concrete cures, whereby an elongate chamber is formed between said elongate metal stud member and said vertical concrete member.

23. A method according to claim 22, further comprising a step of inserting an insulating material in said elongate chamber before the concrete cures.

24. A method according to any of claims 13 to 23, further comprising a step of casting a metal form defining an opening in said wall section.

25. A method according to claim 24, further comprising a step of roll-forming a single sheet or strip of galvanised steel and a step of bending said roll-formed sheet or strip to obtain said metal form, wherein said sheet or strip has a width substantially exceeding the width of said wall section, so as to prevent ingress of concrete within the perimeter defined by said form before the concrete cures.

26. A method according to any of claims 13 to 25, wherein said method comprises the further step of using a layer of insulation material as a jig for casting said panel.

27. A method according to claim 26, wherein said layer takes the form of one or more jig members.

28. A method according to claim 27, wherein said material is polystyrene or polyurethane.

29. A method according to claim 28, comprising the further step of leaving said material in place in said wall panel once the concrete has cured.

30. A prefabricated concrete wall panel substantially as described herein with reference to and as illustrated in the accompanying drawings.

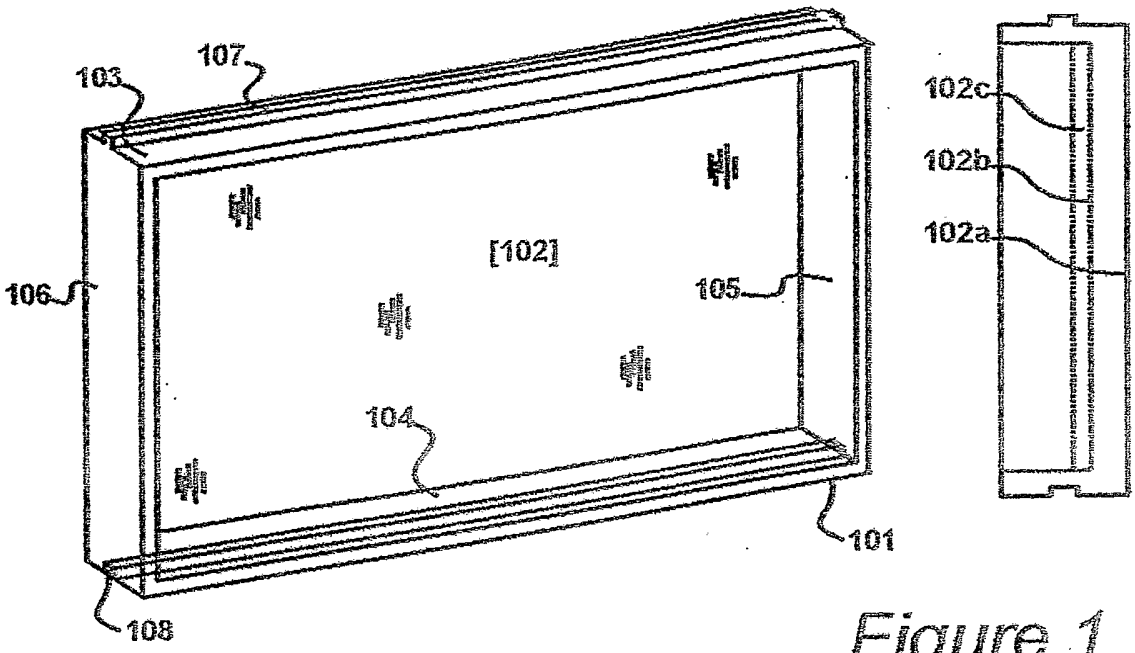

Figure 1

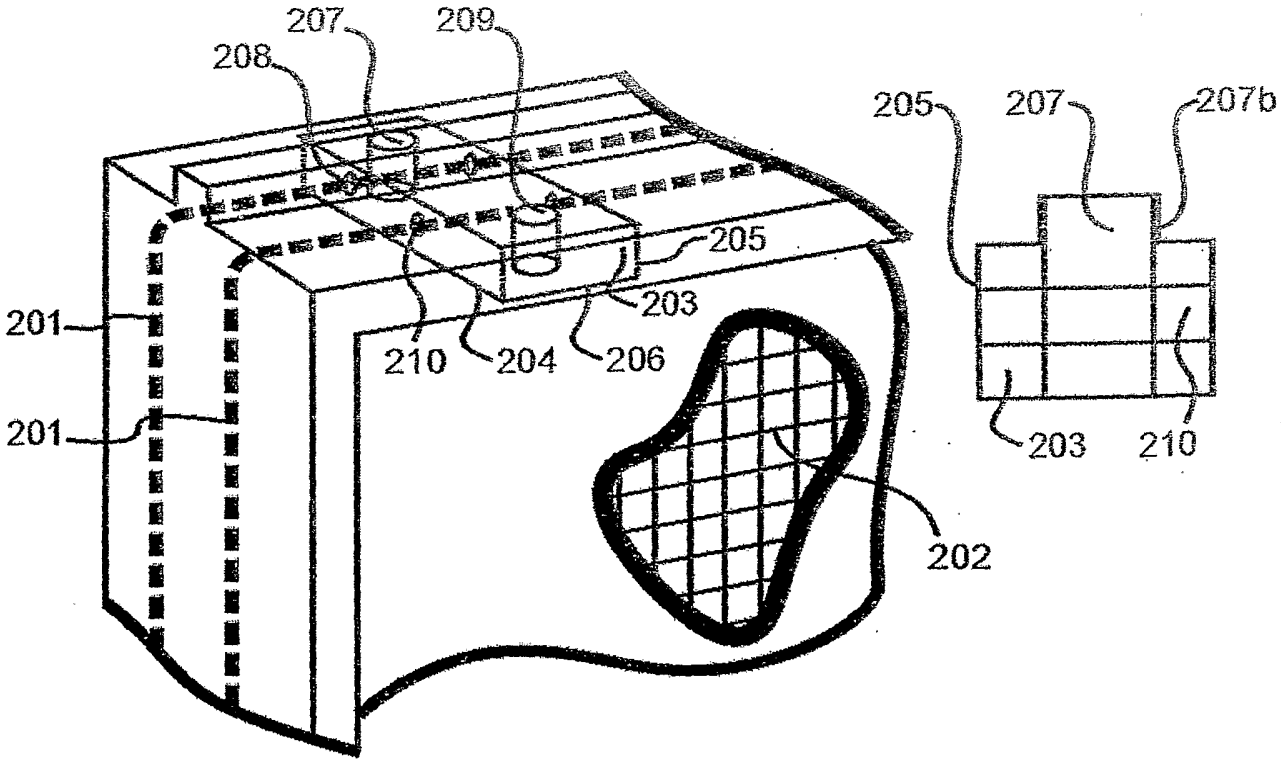

Figure 2

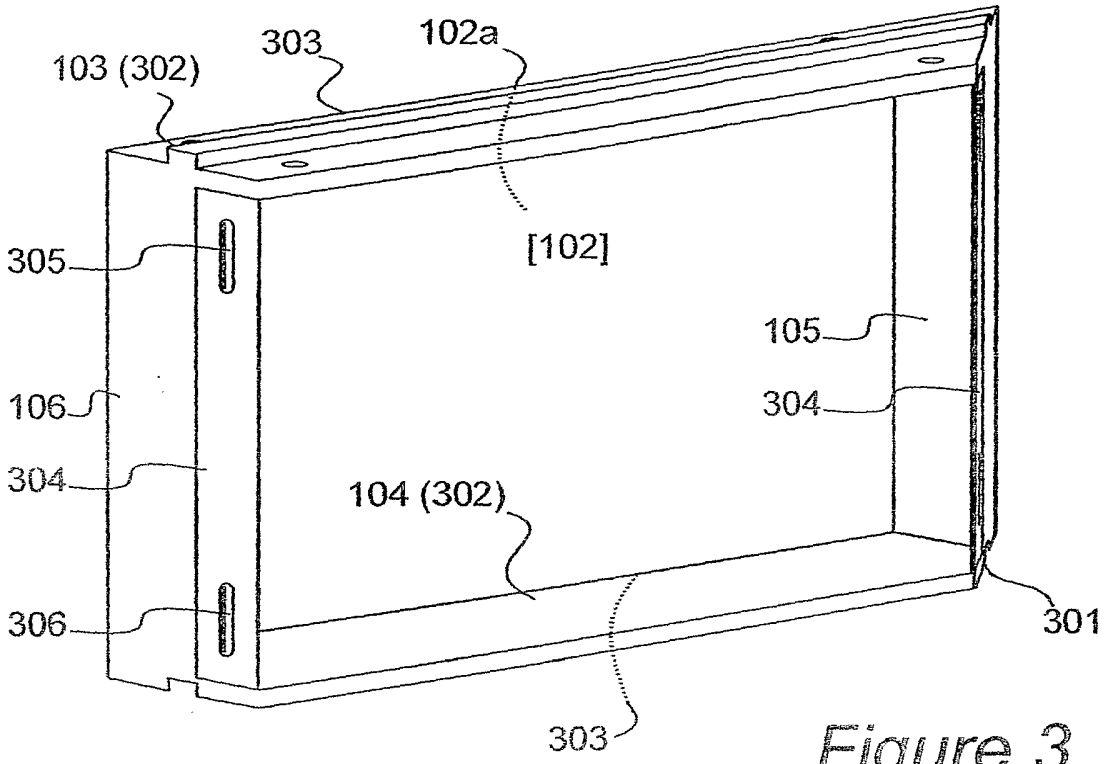

Figure 3

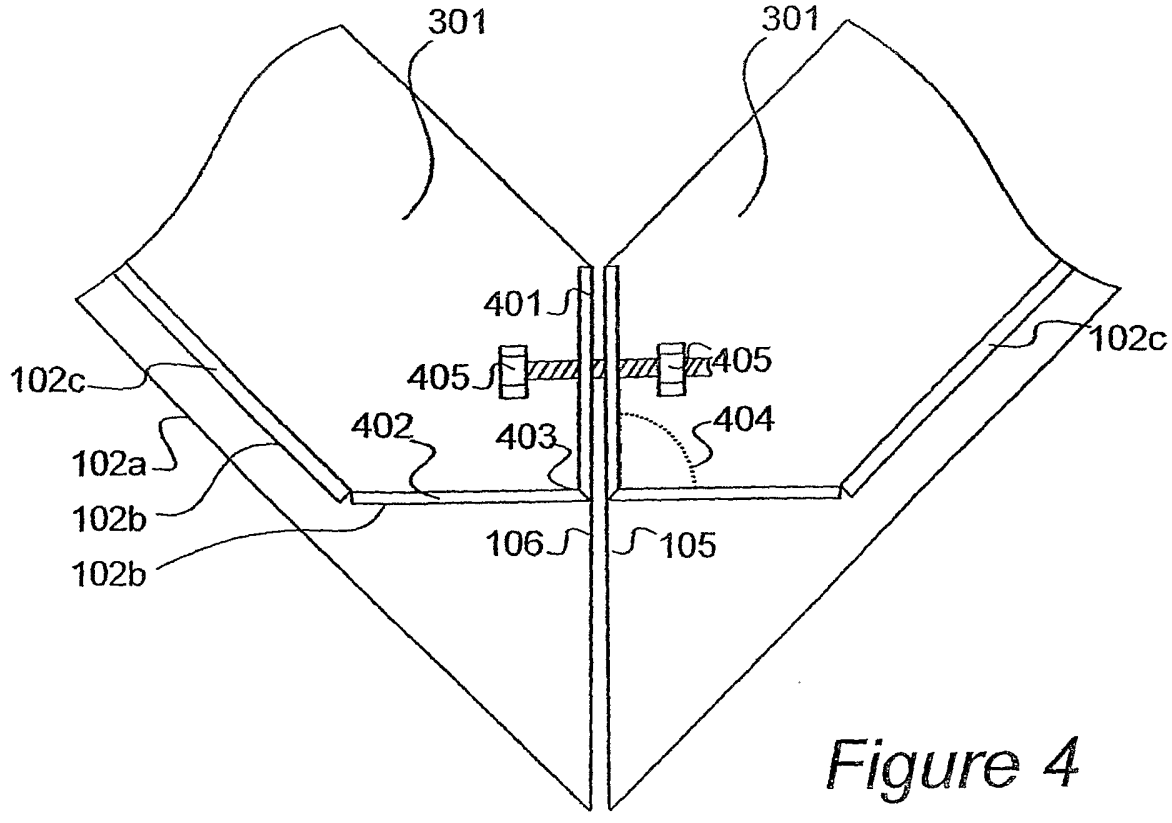

Figure 4

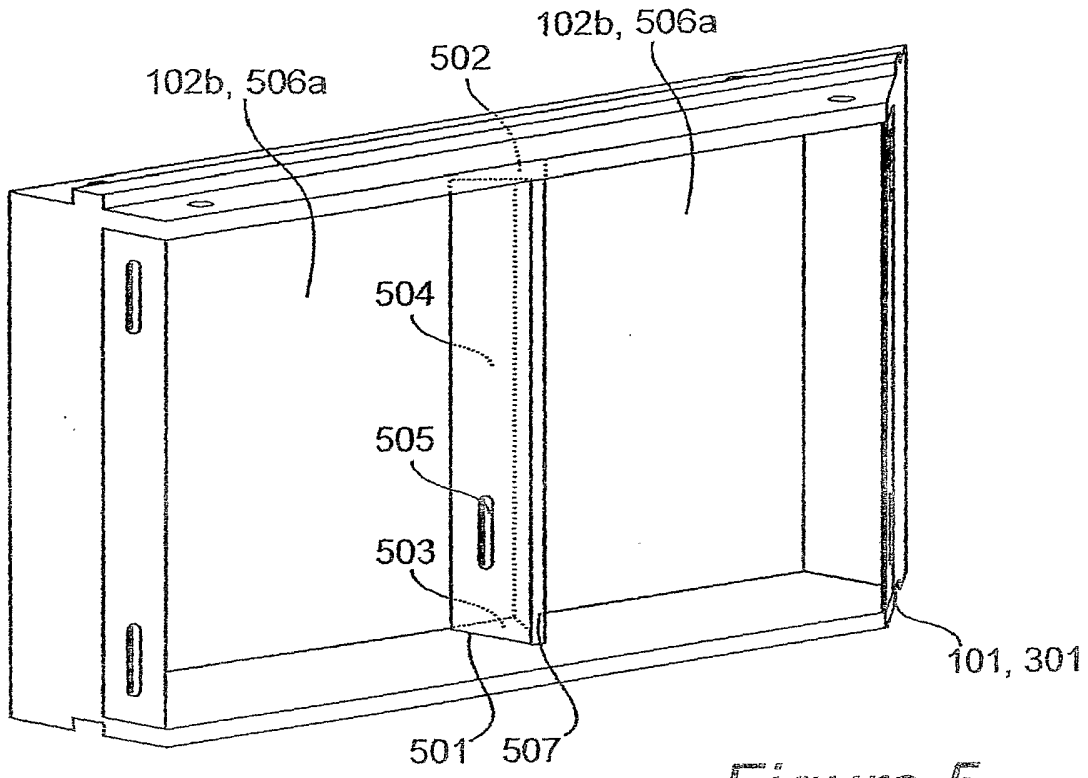

Figure 5

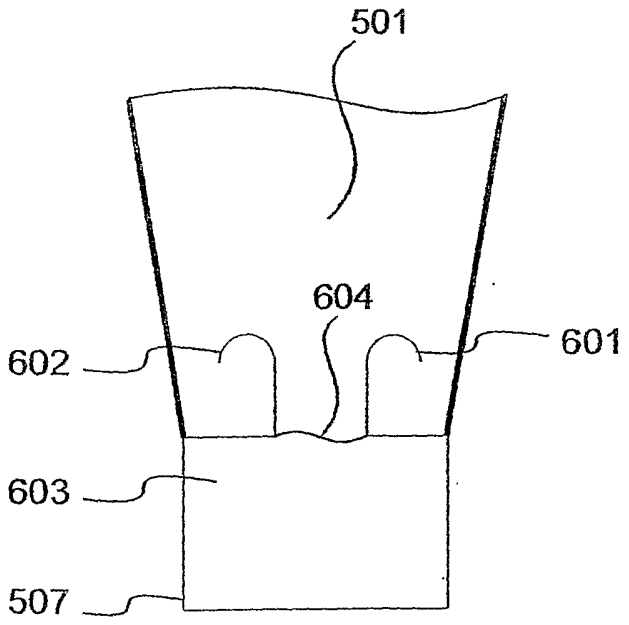

Figure 6

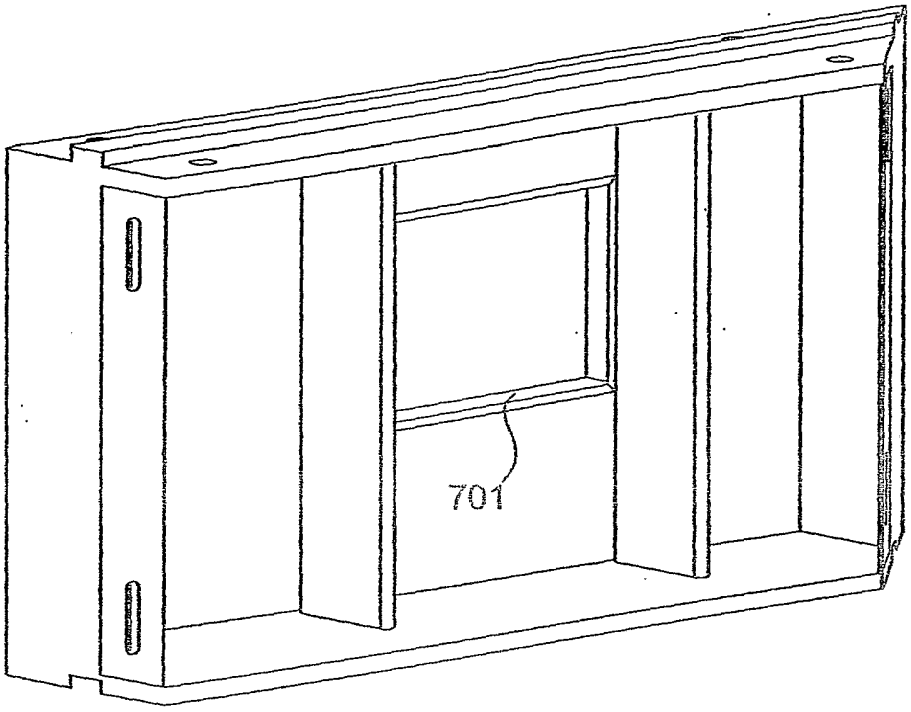

Figure 7

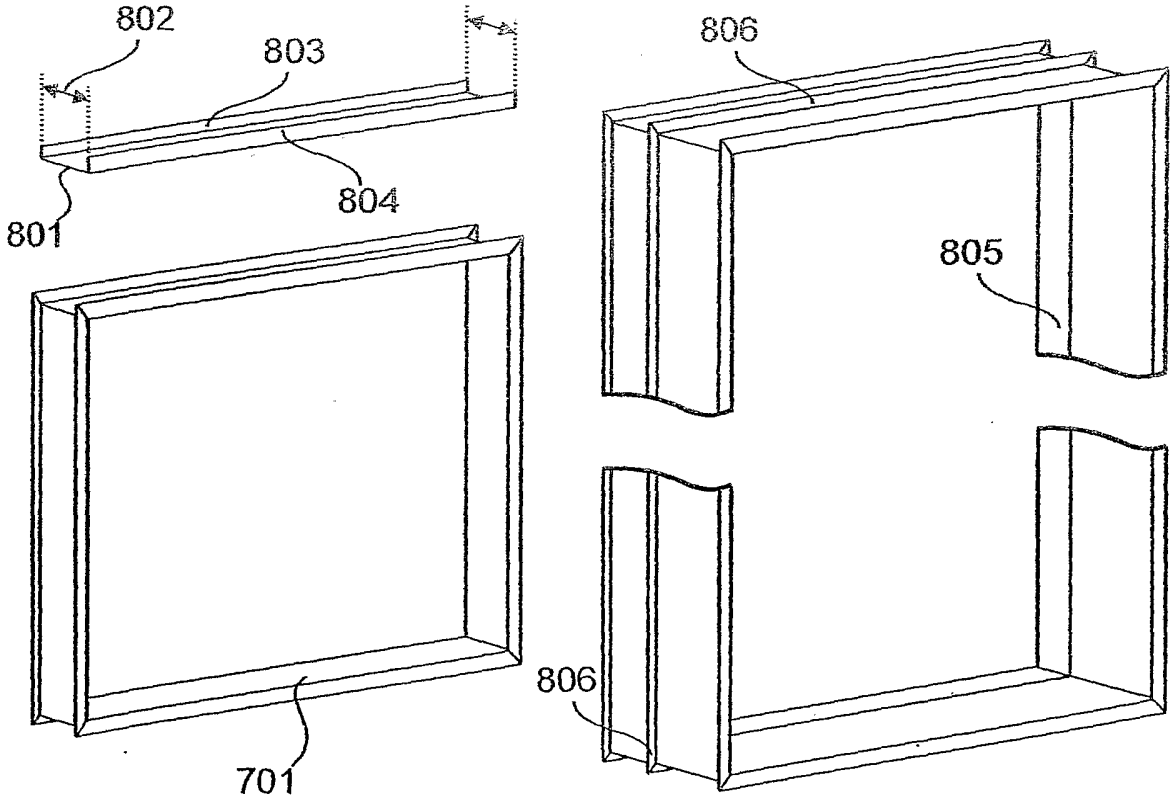

Figure 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2005/000132

A. CLASSIFICATION OF SUBJECT MATTER
E04C2/38 E04B1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04C E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 5 956 911 A (KISTNER ET AL) 28 September 1999 (1999-09-28) figures 1,4,11	1-3,9-12 4-8 22,23
A	DE 25 24 147 A1 (YTONG AG; YTONG AG, 8000 MUENCHEN) 2 December 1976 (1976-12-02) figure 1	1,13
Y	US 3 693 304 A (WILLIAM O. SHELL) 26 September 1972 (1972-09-26) figures 1,11	4-6
Y A	EP 0 392 610 A (HARRINGTON, BRUCE) 17 October 1990 (1990-10-17) figures 4,8,9	7,8 16,24,25

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2006	23/02/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Rosborough, J

INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2005/000132

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4 841 702 A (HUETTEMANN ET AL) 27 June 1989 (1989-06-27) figure 2	26

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Information on patent family members

International application No
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US 4841702 A	27-06-1989	NONE	