(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 July 2007 (26.07.2007)

PCT

(10) International Publication Number
WO 2007/082339 A1

(51) International Patent Classification:
E04C 1/40 (2006.01) *E04C 1/41* (2006.01)

(21) International Application Number:
PCT/AU2007/000041

(22) International Filing Date: 18 January 2007 (18.01.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006900233 18 January 2006 (18.01.2006) AU

(71) Applicant and
(72) Inventor: **CURTIS, Paul, Frederick** [AU/AU]; 210 Connaught Road, Blackheath, NSW 2785 (AU).

(74) Agent: **FRASER OLD & SOHN**; Level 10, 275 Alfred Steet, North Sydney, NSW 2060 (AU).

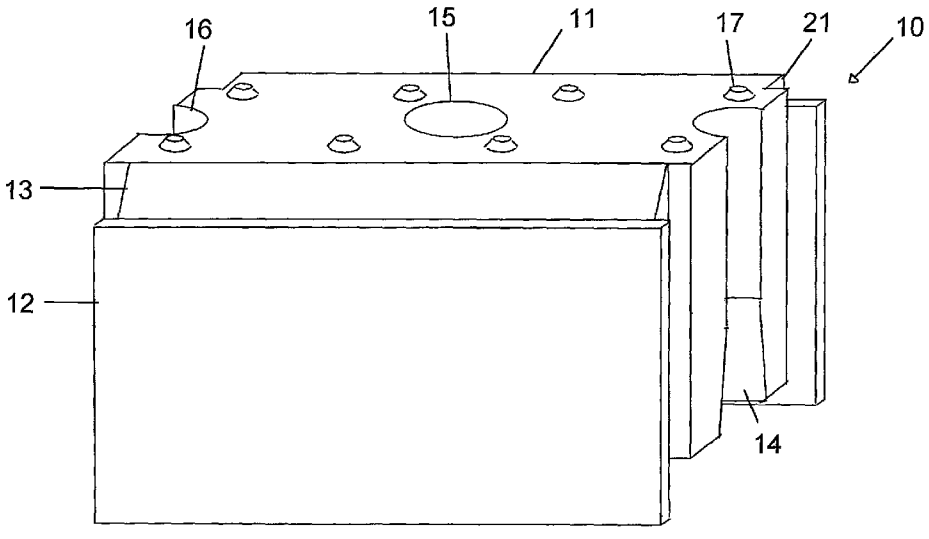
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: HIGH INSULATION BUILDING SYSTEM



(57) **Abstract:** A wall block (10) comprises a substantially rectangular core (11) of substantially rigid insulating material which forms structural load bearing elements in a constructed wall. The block (10) has cladding (12) bonded to its lateral surfaces. The cladding (12) is offset from the lateral surfaces with the cladding (12) overhanging from the lower lateral edges, the overhanging portion abutting against the core (11) of the blocks (10) on the lower course. The core (11) has a longitudinal void (14) provided in the lower surface along its whole length and at least one vertically extending void (15), extending from the longitudinal void (14) to the upper surface of the core. Furthermore, recesses (21) are formed in the vertical edges of the core (11) and being adapted to receive elongated joint seals (22) to affect sealing of the joints between adjacent blocks (10).

WO 2007/082339 A1

HIGH INSULATION BUILDING SYSTEM

Field of the Invention

The present invention relates to building systems and, in particular, to a building system which uses prefabricated building components with thermal insulation properties which minimises onsite construction time.

Background Art

Typical building techniques for domestic dwellings and the like usually start from the floor up with the erection of a structural frame, typically timber or steel. Roof cladding and roof insulation are then added to the frame with wall cladding being similarly applied to the frame with insulation also installed. An internal skin is provided to the walls and ceiling cladding is also usually provided. The process of assembling the frame, insulating and applying cladding inside and outside is highly labour intensive involving a number of skilled trades specialist.

Object of the Invention

The genesis of the present invention is to provide a building system which is highly insulating and requires minimal labour for its installation onsite. At the very least the object is to provide an alternative to existing building components.

Summary of the Invention

In accordance with a first aspect of the present invention there is disclosed a wall block comprising a substantially rectangular core of substantially rigid insulating material which forms structural load bearing elements in a constructed wall, and said block having cladding bonded to its lateral surfaces.

Preferably, the cladding is offset from the lateral surfaces with the cladding overhanging from lower lateral edges, the overhang portion abutting against the core of the block(s) on lower course.

Preferably, a longitudinal void is provided in the lower surface of the core along its length. Preferably the void takes the form of a centrally located slotted groove.

The preferred form also has at least one vertically extending void, the void extending from the longitudinal void to the upper surface of the core. Preferably, the vertically extending void has a frusto-conical shape. In other preferred forms, the frusto-conical shaped void in a wall when formed from the blocks is formed by a pair of semi frusto-conical grooves formed in the end surfaces of adjacent blocks.

Preferably, recesses are formed in the vertical edges of the core, the recesses being formed behind the cladding and being adapted to receive elongated joint seals to affect sealing of joint between adjacent blocks.

Preferably, the block has mating location devices on the upper and lower surfaces of the core. Preferably these mating location devices take the form of a plurality of mating lugs and recesses. Preferably the lugs and recesses are frusto-conical in shape. Preferably the mating location devices are configured in a pattern that enables stacking and alignment of the blocks in a number of ways. For example, the blocks can be stacked directly on top of another, stacked offset by half a block,)usually referred to as stretcher bond), and stacked block upon block with the blocks being offset by 90 degrees, thus forming a corner.

In a preferred form, the core has a protective strip bonded to the exposed surface not covered by the cladding.

Preferably, the outer lateral surface has a drainage channel provided adjacent the top surface of the core.

Preferably, the rigid insulating material is a polyurethane foam material, the cladding is a sheet of cement material, and the protective strip is formed from galvanized steel sheet material.

In accordance with a second aspect of the present invention there is disclosed a method of forming a wall, said method comprising the steps of laying courses of blocks on a floor structure, the blocks comprising a substantially rectangular core of

substantially rigid insulating material which forms structural load bearing elements in the constructed wall, with said block having cladding bonded to its lateral surfaces.

Preferably, the cladding is offset from the lateral surfaces with the cladding overhanging from lower lateral edges, the overhang portion abutting against the core of the block(s) on lower course, the method including the step of locating the overhanging cladding on the lowest course of blocks against or in the floor structure.

Preferably, a longitudinal void is provided in the lower surface of the core along its length. Preferably the void takes the form of a centrally located slotted groove. The preferred form also has at least one vertically extending void, the void extending from the longitudinal void to the upper surface of the core. Preferably, the vertically extending void has a frusto-conical shape. In other preferred forms, the frusto-conical shaped void in a wall when formed from the blocks is formed by a pair of semi frusto-conical grooves formed in the end surfaces of adjacent blocks. The frusto-conical voids are adapted to align in vertical voids for the height of the wall, whereby the vertical voids are adapted to receive elongated compression means used to compress the course of blocks together.

Preferably, the elongated compression means is formed by elongate threaded rods and corresponding nuts and plate devices located at the top and lowest courses of blocks.

Preferably, the blocks have recesses which are formed in the vertical edges of the core, the method including the steps of providing elongated joint seals to affect sealing of joint between adjacent blocks, the seals being inserted behind the cladding and in the recesses.

Preferably, the block has mating location devices on the upper and lower surfaces of the core. Preferably these mating location devices take the form of a plurality of mating lugs and recesses. Preferably the lugs and recesses are frusto-conical in shape.

In a preferred form, the core has a protective strip bonded to the exposed surface not covered by the cladding.

Preferably, the outer lateral surface has a drainage channel provided adjacent top surface of the core.

In accordance with a third aspect of the present invention there is disclosed a wall formed by a plurality of blocks as described above.

Brief Description of the Drawings

An embodiment of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a perspective view of a wall block of a preferred embodiment,

Fig. 2 is a side elevation view of the wall block of Fig. 1,

Fig. 3 is a plan view of the wall block of Fig. 1,

Fig. 4 is an end elevation view of the block of Fig. 1,

Fig. 5 is a cross sectional view of a sealing strip used in the vertical joints of two adjacent blocks,

Fig. 6 is an exploded cross sectional view of a wall being constructed of the blocks of Fig. 1,

Fig. 7 is a partial plan view of a wall constructed of blocks of Fig. 1.

Detailed Description

As illustrated in the drawings, a high insulation block 10 for building walls and the like includes a substantially rectangular, substantially rigid core 11 made from polyurethane foam with cement cladding 12 bonded to the core 11 on the lateral surfaces. The cladding 12 is offset and extends below the lower lateral surfaces and is able to mate with the cladding 12 on the lower course of blocks 10 as the upper portion of the lateral surfaces of the core 11 are not covered by the cladding 12. This portion has a protective strip 13 bonded thereto, the strip preferably being made from galvanized steel. This strip is there to provide protection to the joints from fire and other problems.

The core 11 has a centrally located slotted groove or void 14 in the lower surface of the core 11. The slotted groove 14 extends along the length of the core 11. Furthermore, the core 11 has a frusto-conical vertically extending void 15 through the core 11. This void 15 is centrally located within the core 11 whilst two semi frusto-conical voids or grooves 16 are located at the end surfaces of the core 11. These grooves 16 form a frusto-conical void when two blocks 10 are placed adjacent each other. It is noted that due to the alignment of the blocks when building a wall, the vertically aligned voids extend from the top to the bottom of the wall.

The blocks 10 also have mating location lugs and recesses 17 and 18 located on the top and bottom surfaces of the core 11, respectively. These lugs are preferably frusto-conical in shape and are used to have the correct alignment of the courses of the blocks 10 to ensure the vertically aligned voids as described above are correctly formed.

The blocks 10 also have a drainage channel 19 formed at the upper portion left exposed from the cladding 12. This drainage channel 19 is preferably located on the external surface of the block 10.

The blocks 10 also have recesses 21 formed in the vertical edges of the core 11. The recesses 21 are formed behind the cladding 12 and when adjacent blocks 10 are abutting, the recesses 21 are adapted to receive elongated vertical joint seals 22 which are spring fitted into the recesses 21. These seals 22 are preferably pressed and folded from steel sheet material with drainage channels 23 formed therein.

The blocks 10 as described above are used to construct a wall 30 as seen in Fig. 5. The blocks 10 are formed into course on a floor structure 31. The lowest course is formed onto a course of starter blocks 32 whereby the cladding 12 overhangs the starter blocks 32. Naturally this a a preferred arrangement and other alternatives are used whereby the cladding may be removed from lowest course, the cladding can overhang or fit into slots in floor structure 31, the floor structure 31 can have a elongated ridge formed therein to replace the starter blocks 32 and the like.

Notwithstanding the above, courses of blocks 10 are formed with the location lugs 17 and recesses 18 mating to align the blocks 10 correctly. Threaded rods 33 are

positioned in the vertically aligned voids and are used with a nut 34 to compress the blocks as well as tying the blocks 10 to the floor structure. The horizontal and vertical voids are used as passageways for services such as electrical and plumbing services. The horizontal voids formed along the length of the blocks 10 provide for lintels over doors and windows as well as for services as described above.

The seals 22 inserted into the recesses 21 provide effective water sealing to the vertical joints with the drainage channels 23 located in the seals 22 allowing water to drain away, whilst the overhanging cladding 12 and its compression applied by the treaded rod provides the water sealing to the horizontal joints. If there is any penetration of water the drainage channel 19 allows it to drain away and out from the lower horizontal joint.

It is seen that a wall 30 erected from the blocks 11 as described above with internal and external cladding is a load bearing structure, has efficient insulation properties and maintains water and wind exclusion. A bead of non setting mastic is applied between the horizontal and vertical faces as they contact adjacent blocks to act as a draft seal. The wall 30 does not require adhesive between the wall blocks due to the compression applied to the blocks by the threaded rods, accordingly the onsite construction time is minimized and construction costs are reduced.

As seen in fig. 7, blocks 10 of the course above are shown in dashes and are offset by the length of half a block 10. The corner block 10 has only half cladding 12 on one of its sides with additional cladding 12 added to one or both ends. The blocks 10 are shown in a wall 30 and an opening 31 for a door is shown.

The foregoing describes only one embodiment of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention

The term "comprising" as used herein is used in the inclusive sense of "including" or "having" and not in the exclusive sense of "consisting only of".

Claims

1. A wall block comprising a substantially rectangular core of substantially rigid insulating material which forms structural load bearing elements in a constructed wall, and said block having cladding bonded to its lateral surfaces.

2. The block as claimed in claim 1 wherein the cladding is offset from the lateral surfaces with the cladding overhanging from lower lateral edges, the overhang portion abutting against the core of the blocks on lower course.

3. The block as claimed in claim 2 wherein a longitudinal void is provided in the lower surface of the core along its length.

4. The block as claimed in claim 3 wherein said the void takes the form of a centrally located slotted groove.

5. The block as claimed in claim 4 wherein the block has at least one vertically extending void, the void extending from the longitudinal void to the upper surface of the core.

6. The block as claimed in claim 5 wherein the vertically extending void has a frusto-conical shape.

7. The block as claimed in claim 6 wherein the frusto-conical shaped void in a wall when formed from the blocks is formed by a pair of semi frusto-conical grooves formed in the end surfaces of adjacent blocks.

8. The block as claimed in any one of claims 1-7 wherein recesses are formed in the vertical edges of the core, the recesses being formed behind the cladding and being adapted to receive elongated joint seals to affect sealing of joint between adjacent blocks.

9. The block as claimed in any one of claims 1-8 wherein the block has mating location devices on the upper and lower surfaces of the core.

10. The block as claimed in claim 9 wherein these mating location devices take the form of a plurality of mating lugs and recesses.

11. The block as claimed in claim 10 wherein the lugs and recesses are frusto-conical in shape.

12. The block as claimed in any one of claims 1-11 wherein the core has a protective strip bonded to the exposed surface not covered by the cladding.

13. The block as claimed in any one of claims 1-12 wherein the outer lateral surface has a drainage channel provided adjacent top surface of the core.

14. The block as claimed in any one of claims 1-13 wherein the rigid insulating material is a polyurethane foam material, the cladding is a sheet of cement material, and the protective strip is formed from galvanized steel sheet material.

15. The block as claimed in any one of claims 1-14 wherein the block has part of the cladding removed from core and applied offset at the end of the core enabling the block to form a corner in a wall.

16. A method of forming a wall, said method comprising the steps of laying courses of blocks on a floor structure, the blocks comprising a substantially rectangular core of substantially rigid insulating material which forms structural load bearing elements in the constructed wall, with said block having cladding bonded to its lateral surfaces.

17. The method as claimed in claim 16 wherein the cladding is offset from the lateral surfaces with the cladding overhanging from lower lateral edges, the overhang portion abutting against the core of the block(s) on lower course, the method including the step of locating the overhanging cladding on the lowest course of blocks against or in the floor structure.

18. The method as claimed in any one of claims 16-17 wherein a longitudinal void is provided in the lower surface of the core along its length.

19. The method as claimed in claim 18 wherein the void takes the form of a centrally located slotted groove.

20. The method as claimed in claim 19 wherein the block has at least one vertically extending void, the void extending from the longitudinal void to the upper surface of the core.

21. The method as claimed in claim 20 wherein the vertically extending void has a frusto-conical shape.

22. The method as claimed in claim 21 wherein the frusto-conical shaped void in a wall when formed from the blocks is formed by a pair of semi frusto-conical grooves formed in the end surfaces of adjacent blocks, the frusto-conical voids being adapted to align in vertical voids for the height of the wall, whereby the vertical voids are adapted to receive elongated compression means used to compress the course of blocks together.

23. The method as claimed in claim 22 wherein the elongated compression means is formed by elongate threaded rods and corresponding nuts and plate devices located at the top and lowest courses of blocks.

24. The method as claimed in any one of claims 16-23 wherein the blocks have recesses which are formed in the vertical edges of the core, the method including the steps of providing elongated joint seals to affect sealing of joint between adjacent blocks, the seals being inserted behind the cladding and in the recesses.

25. The method as claimed in any one of claims 16-24 wherein the block has mating location devices on the upper and lower surfaces of the core.

26. The method as claimed in claim 25 wherein the mating location devices take the form of a plurality of mating lugs and recesses.

27. The method as claimed in claim 26 wherein the lugs and recesses are frusto-conical in shape.

28. The method as claimed in any one of claims 16-27 wherein the core has a protective strip bonded to the exposed surface not covered by the cladding.

29. The method as claimed in any one of claims 16-28 wherein the outer lateral surface has a drainage channel provided adjacent top surface of the core.

30. A wall formed by a plurality of blocks as claimed in any one of claims 1-15.

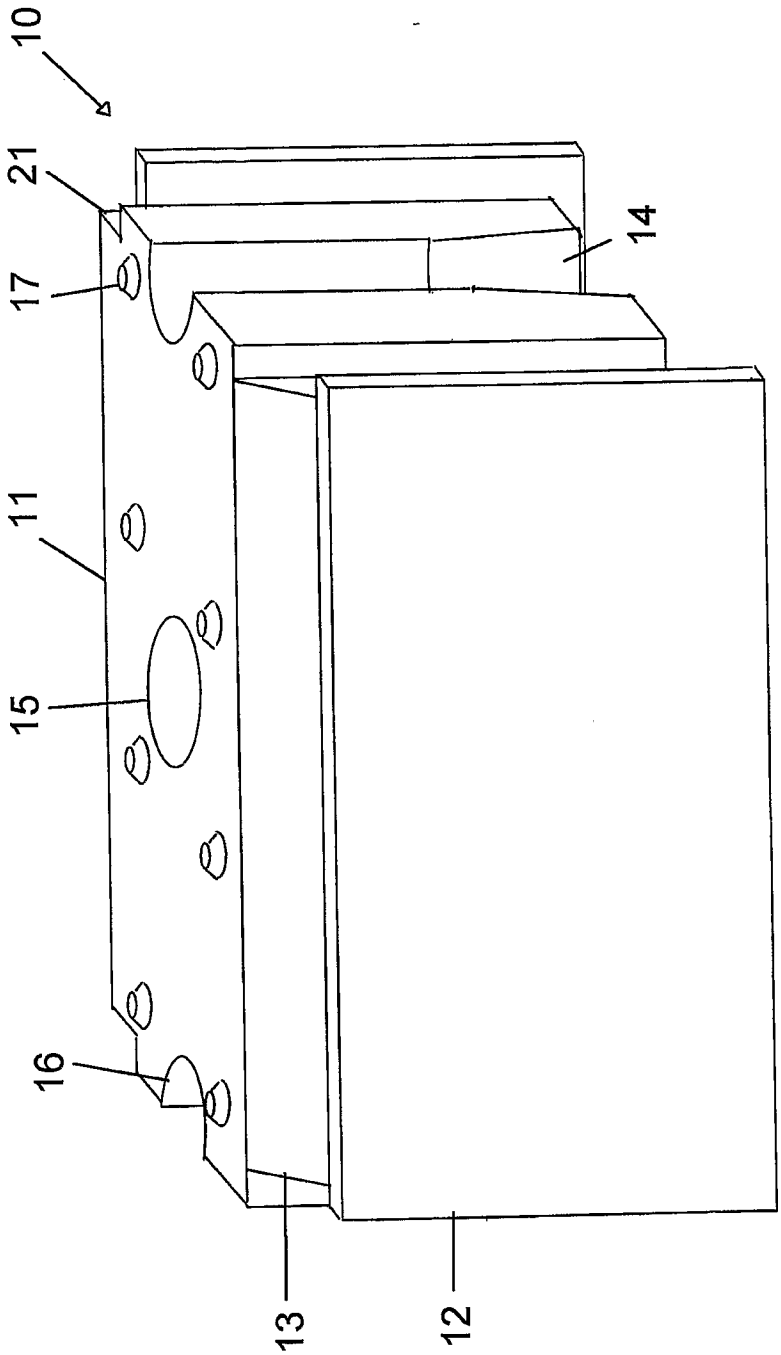


Fig. 1

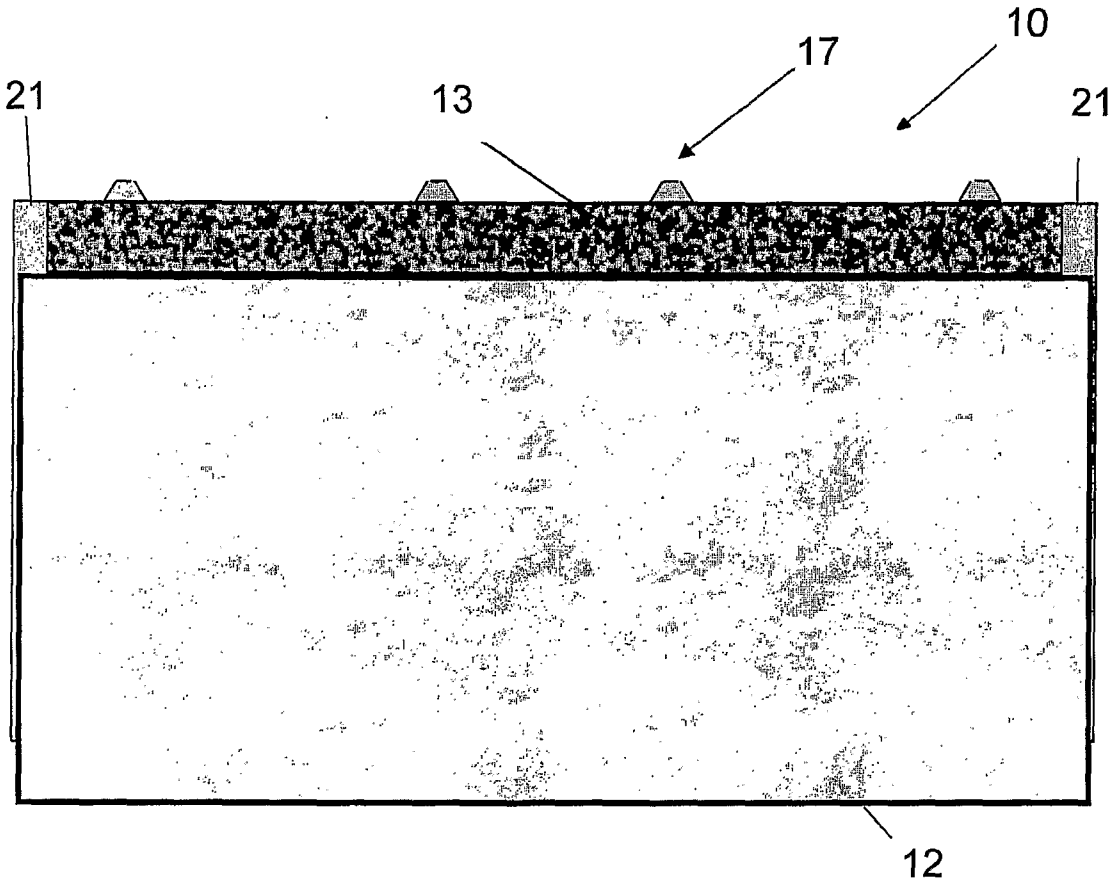


Fig. 2

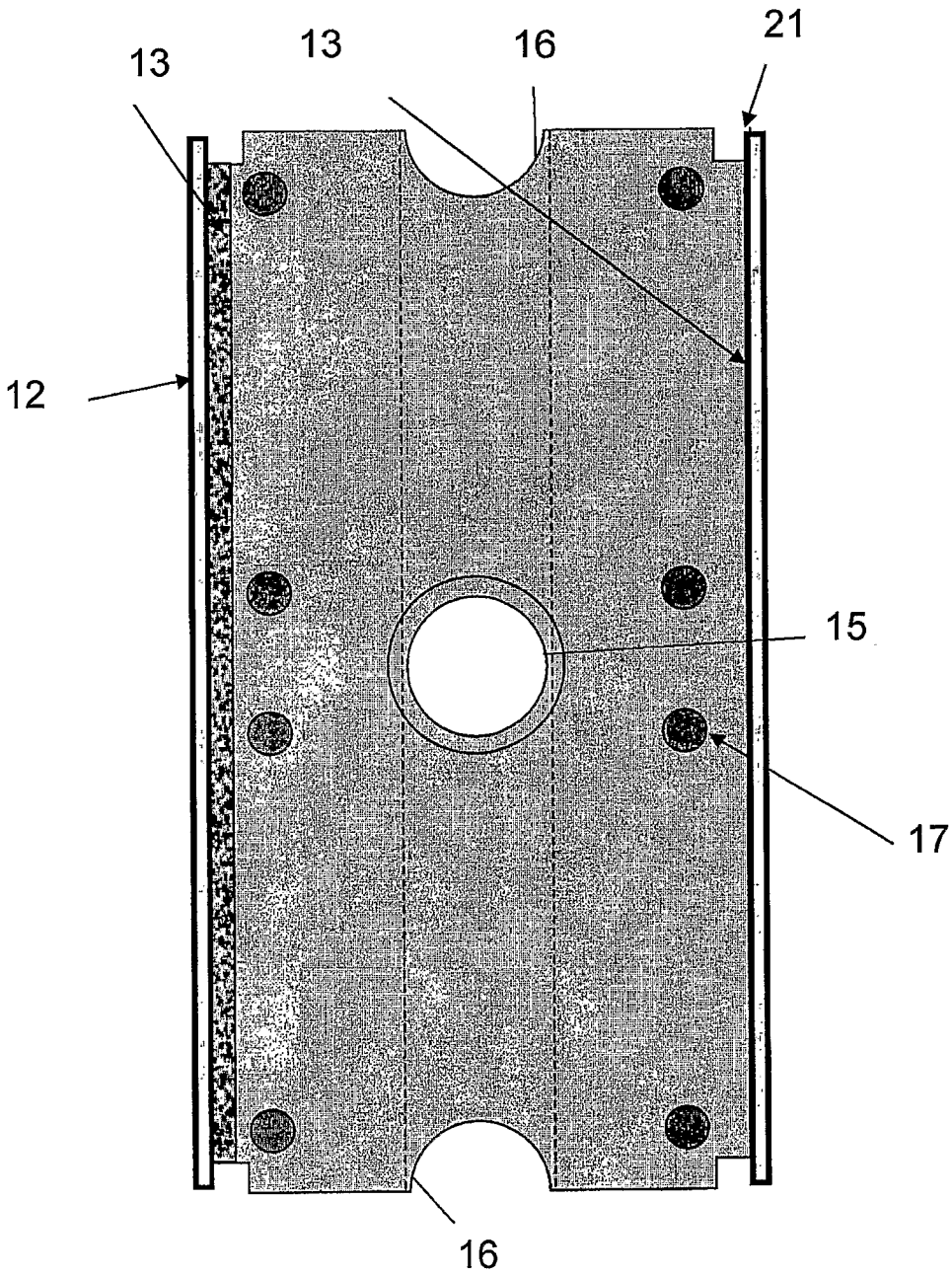


Fig.3

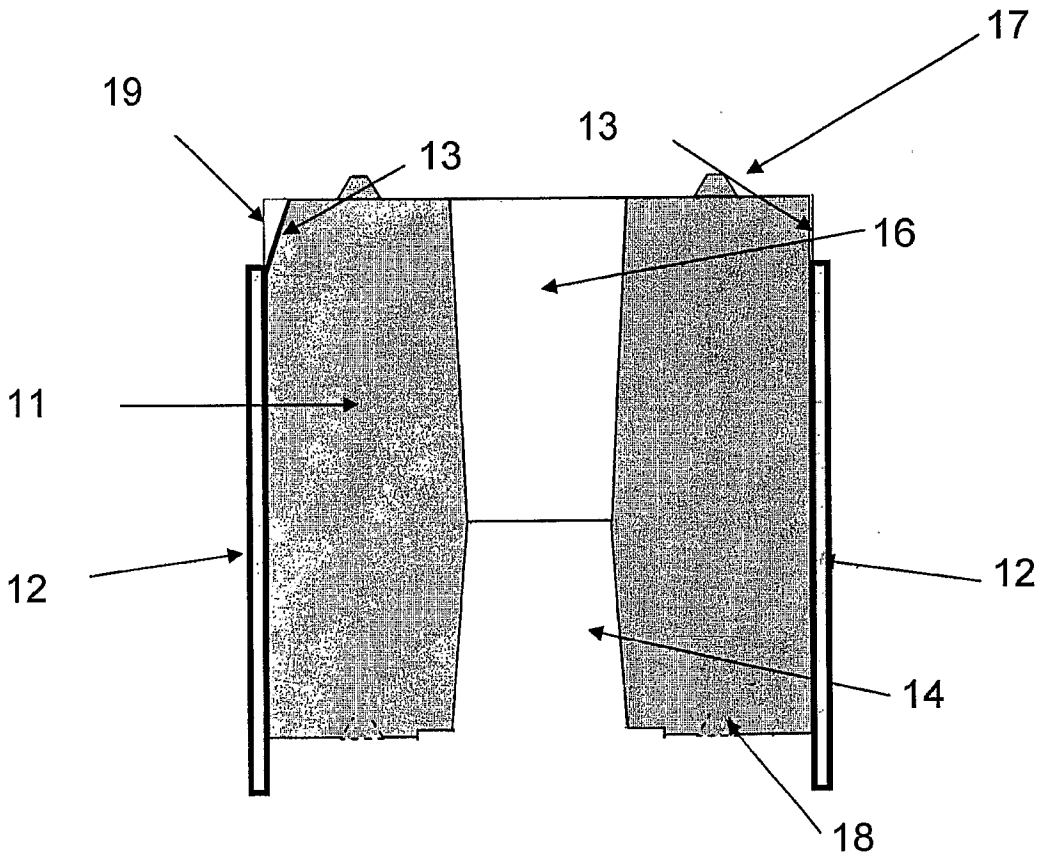


Fig. 4

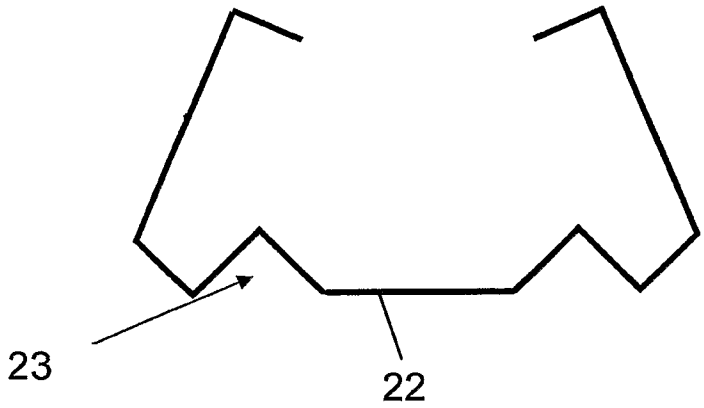


Fig. 5

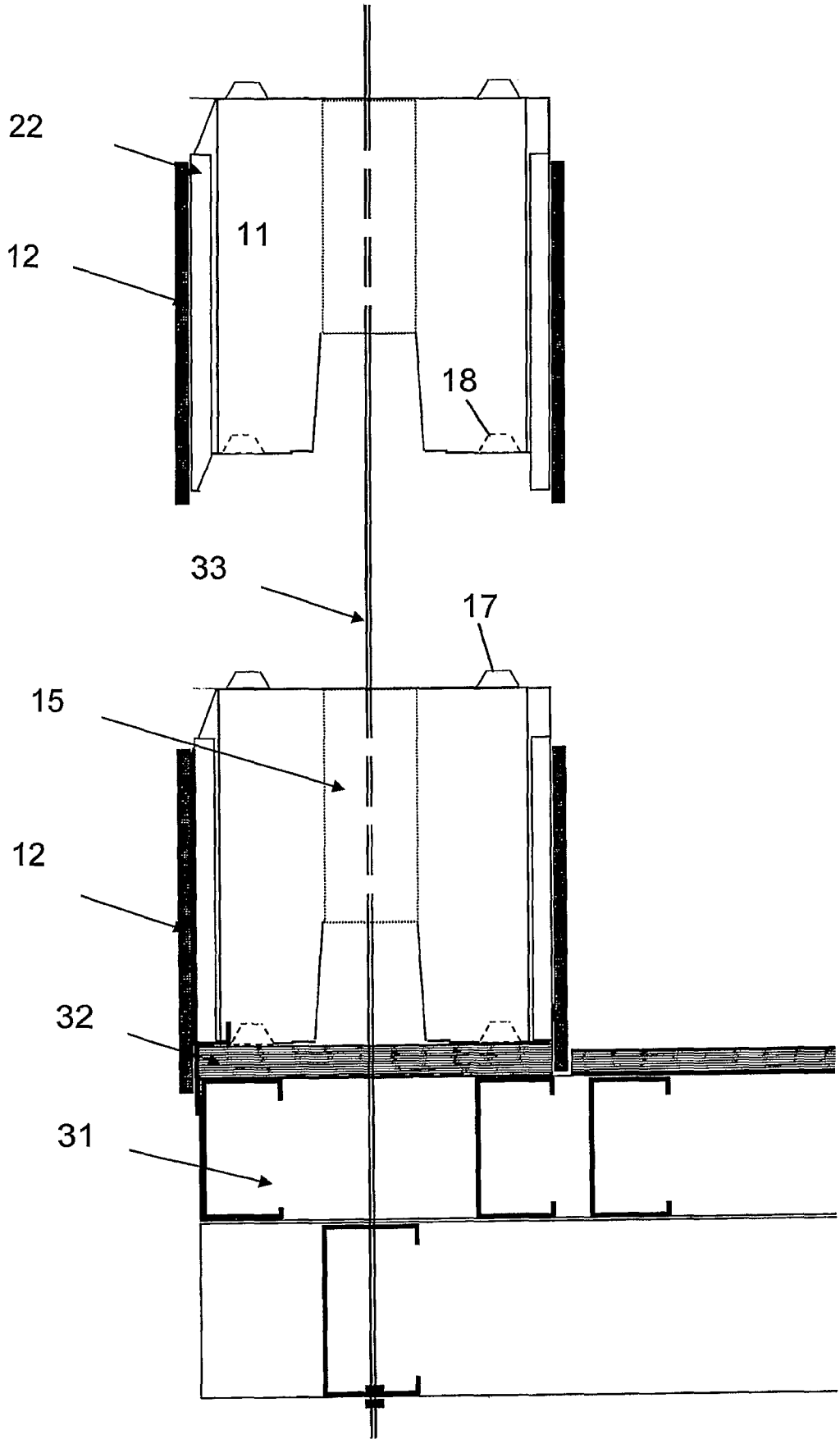


Fig. 6

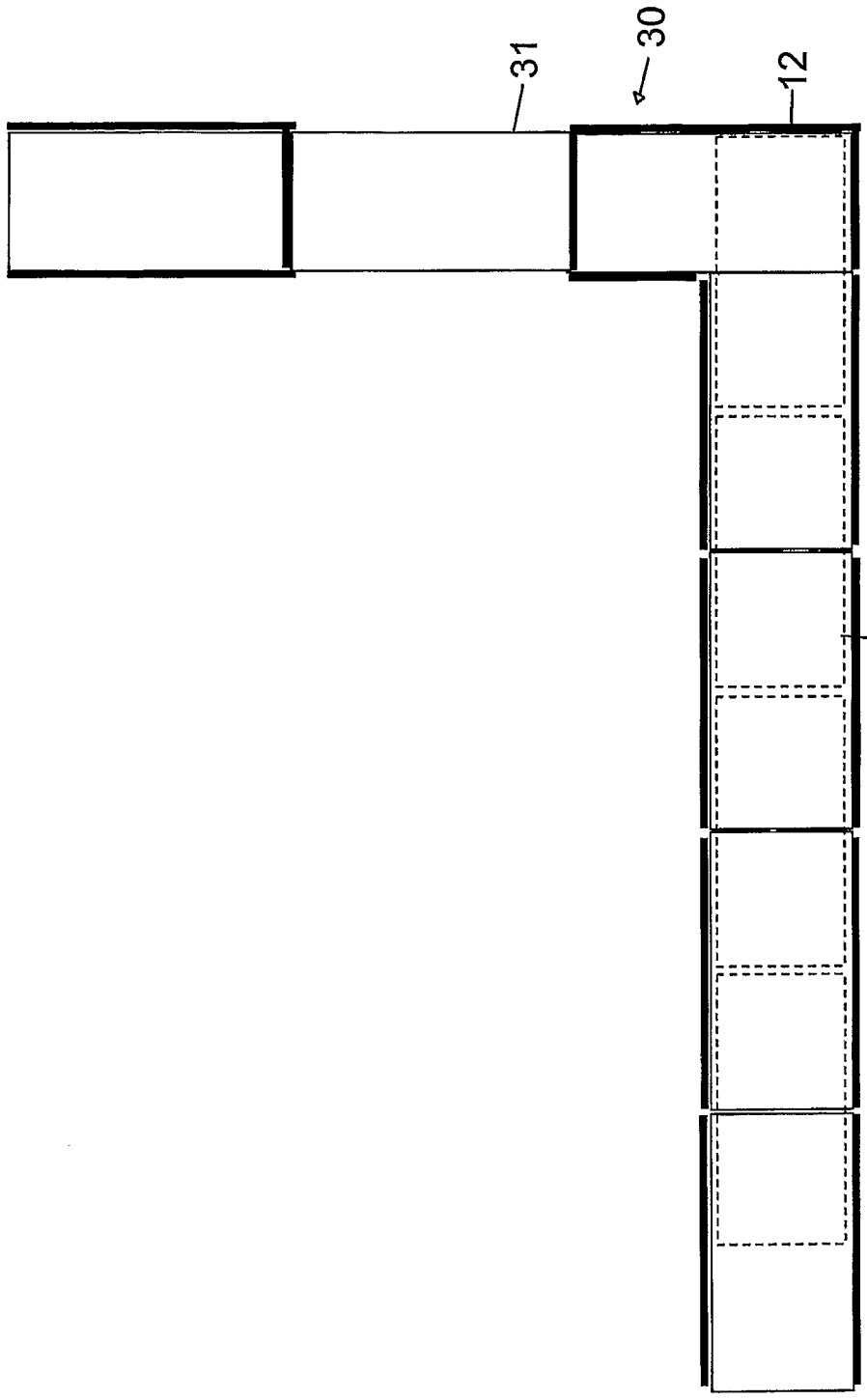


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/000041

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***E04C 1/40*** (2006.01) ***E04C 1/41*** (2006.01)

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)
REFER TO ELECTRONIC DATABASE BELOW

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 practicable, search terms used)
DWPI: & keywords: E04B-001/ic, E04B-002/ic, E04C-001/ic, F16S/ic, block, brick, core, insulate, polyurethane, clad, skin, cement, lug, channel, frustoconical and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4694624 A (JUHAS) 22 September 1987 See figures 1-4, 15-22 and column 3 line 54-column 4 line 42.	1-5, 9-10, 12, 14, 16-20, 25-26, 28, 30.
Y		6-7, 11, 21-22, 27.
X	US 5560167 A (MICELI) 1 October 1996 See figure 1, column 4 lines 21-67 and column 5 lines 46-54.	1, 9-10, 15-16, 25-26, 30.
Y		11, 27
X	US 4614071 A (SAMS et al.) 30 September 1986 See figures 1-3 and column 2 line 44-column 3 line 45.	1-3, 8-10, 16-18, 24-26, 30.
Y		11, 27

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 February 2007	06 MAR 2007
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **JOHN HO** Telephone No : (02) 6283 2329

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2007/000041

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	AU 198063085 A1 (GILBERT) 16 April 1981	
X	See figures 1-6 and page 4 lines 13-25.	1, 8, 13, 16, 24, 29-30.
Y		9-11, 25-27
	EP 767281 B1 (S.A FIMES) 19 March 2003	
X	See figure 1 for instance.	1-3, 9-10, 16-18, 25-26, 30
Y		11, 27
	EP 647745 A1 (LIN) 12 April 1995	
Y	See figures 3 and 5 for instance.	9-11, 25-27
	RU 2000406 C (SELIVANOV) 7 September 1993	
Y	See figures 4-18 for instance.	6-7, 21-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2007/000041

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
US	4694624		
US	5560167		
US	4614071	CA	1229994
EP	0767281	FR	2739642
AU	198063085		
RU	2000406		
EP	0647745		

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX