

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 December 2000 (28.12.2000)

PCT

(10) International Publication Number
WO 00/79072 A1

(51) International Patent Classification⁷: **E04D 3/28**

(21) International Application Number: PCT/GB00/01259

(22) International Filing Date: 3 April 2000 (03.04.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9914279.6 19 June 1999 (19.06.1999) GB

(71) Applicant (for all designated States except US): **ULTRA-FRAME (UK) LIMITED** [GB/GB]; Enterprise Works, Salthill Road, Clitheroe, Lancashire BB7 1PE (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **RICHARDSON, Christopher** [GB/GB]; 4 Willow Drive, Barrow, Clitheroe, Lancashire BB7 9FG (GB).

(74) Agent: **ROYSTONS**; Tower Building, Water Street, Merseyside, Liverpool L3 1BA (GB).

(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

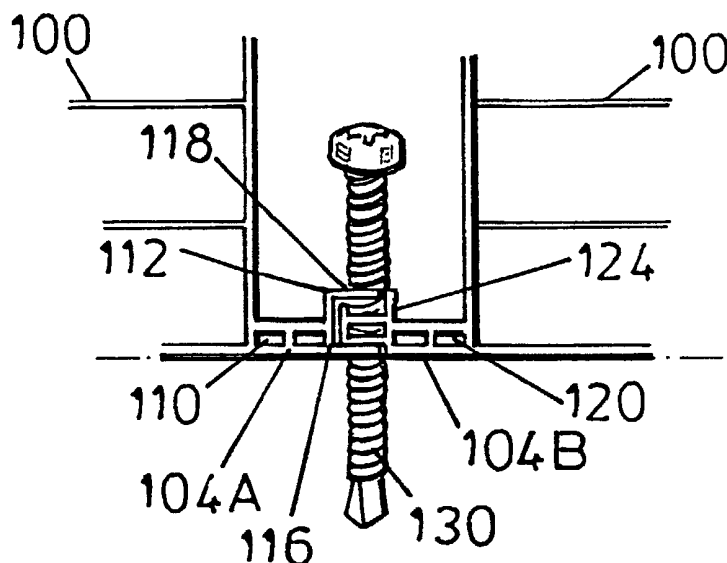
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, 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: BUILDING ELEMENTS



(57) Abstract: A hollow building element of plastic material for use in forming roof structures comprises one or more longitudinal ducts and having, at opposite sides thereof coupling members, whereby elements may be connected to each other directly or indirectly, wherein lower coupling members at opposite sides of the element are sized to meet with co-operating lower coupling elements of adjacent elements offset from a central axis parallel to adjacent element sides.



WO 00/79072 A1

Title: Building Elements

DESCRIPTION

This invention concerns building elements for making structures and structures made from such building elements.

Self-supporting roofs or roof sections are known which comprise a plurality of extruded plastics profile elements connected side-by-side, each element having at least one longitudinal chamber or duct and coupling members, by which neighbouring profile elements are interconnected, the adjacent coupling members of neighbouring profile elements engaging to form a duct.

In our own Patent Application No. GB 2268765A, we propose a hollow building element of plastics material comprising a plurality of hollow ducts in two layers and having, at opposite sides thereof coupling members, whereby elements may be connected to each other, upper coupling members comprising a part engageable with a stiffening or reinforcing beam.

In our subsequent Patent Application No. 2318133A, we propose a hollow building element of plastics material comprising one or more longitudinal ducts and having at opposite sides thereof, coupling members, whereby elements may be connected to each other directly or indirectly, wherein lower coupling members comprise ducted flanges to provide an insulation barrier.

One problem with the use of these building elements is that their lower

coupling members generally meet centrally of the space between their end walls, so that when fixing screws are screwed through the coupling members into a supporting beam or the like, the screws can force the coupling members apart. When constructing a roof from such building elements securement of the elements is usually commenced from end of the roof to the other and movement of the building elements apart slightly each time a pair are screwed down can result in the final building element being out of line.

Furthermore, to reduce risk of condensation within the space between adjacent building elements, sealing tape is usually provided between abutting vertical surfaces of lower coupling members. The integrity of the tape can be damaged by the fixing screws and the forcing apart of the building elements as described above separates the sealing tape from one or other of the elements and break the seal.

An object of this invention is to provide measures to mitigate against the effects of the above-mentioned problem.

According to this invention there is provided a hollow building element of plastics material comprising one or more longitudinal ducts and having, at opposite sides thereof coupling members, whereby elements may be connected to each other directly or indirectly, wherein lower coupling members at opposite sides of the element are sized to meet with cooperating lower coupling elements of adjacent elements offset from a central axis parallel to adjacent element sides.

The invention further provides a building structure, such as a roof

comprising two or more hollow building elements connected side by side, the hollow building elements comprising one or more longitudinal ducts and having at opposite sides thereof, coupling members, whereby elements are connected to each other directly or indirectly, wherein lower coupling members at opposite sides of the elements are sized to meet with cooperating lower coupling elements of adjacent elements offset from a central axis parallel to adjacent element sides.

Preferably one lower coupling member of a building element of the invention is sized so that it has an area through which a securing screw can be fixed that is generally central of the space between adjacent elements. Thus, when a securing screw is screwed into that lower coupling member it will not force it apart from a cooperating lower coupling member of an adjacent element. Preferably the cooperating lower coupling member has at least one overlapping component with the first mentioned lower coupling member, whereby a securing screw can penetrate both coupling members.

Preferred building elements of the invention may have a single longitudinal duct, a single layer of adjacent longitudinal ducts, a pair of longitudinal ducts one on top of the other, or a plurality of longitudinal ducts in two or more layers, especially three layers.

Preferably lower coupling members are arranged to be held together by means of a reinforcing beam between adjacent elements. Preferably each coupling member has a part extending upwardly, which parts are prevented from separating by more than a desired distance by means of the reinforcing beam.

The preferred reinforcing beam has a longitudinal slot in its base in which the said upwardly extending parts of the lower coupling members locate.

The building elements of the invention preferably also have upper coupling members. Preferred such members interengage with formations of the reinforcing beam. A preferred upper coupling member comprises a flange forming a channel section which is engageable in a complementary channel section of the reinforcing beam.

The preferred building elements according to the first aspect of the invention have upper coupling members at opposite sides thereof, which are slidably engageable with cooperating formations of a reinforcing beam between the elements. More preferably, one of the building elements and the reinforcing beams has a T-slot and the other has a T-section web that is slidably engageable in the T-slot.

The reinforcing beam preferably has ribs or the like on its outer surface particularly in its lower regions in order to limit areas of contact between the beam and the building elements in the space between adjacent elements.

For coupled building elements according to the invention it is preferable to provide a cap or cover over the area of the coupling to prevent water ingress. Preferably the cap or cover is securable to the reinforcing beam. The cap or cover preferably has at its side edges sealing means in the form of flexible resilient material, preferably extruded with the cap or cover. The reinforcing beam preferably has a formation engageable with a formation of the cap or cover to retain the cap or cover in place.

The reinforcing beam may have a head forming a slot with notches on opposite sides which serve to retain internal depending formations of the cap or cover when pressed onto the beam and past the head thereof.

The building elements of the invention will usually be made of plastics material, such as polyvinyl chloride or preferably polycarbonate.

This invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a prior art building structure; and

Figure 2 shows a building structure according to the invention.

Referring to Figure 1 of the accompanying drawings, a prior art building structure, such as a conservatory roof, comprises building panels 10 of plastics material, such as polycarbonate, connected together side by side to and by means of aluminium reinforcing beams 12. The connection of adjacent panels 10 is sealed by a capping (not shown) pressed onto the beam 12.

The building panels 10 are hollow and have flat top and bottom walls 16, 18 respectively, end walls 20, 22, intermediate walls 24, 26 parallel to the top and bottom walls and intermediate walls 28 parallel to the end walls, thereby forming ducts 30 through the panels in three rows on top of each other. The intermediate walls 24, 26 and 28 are generally thinner than the outer walls of the panels.

At each end of the panels are upper and lower coupling members 32, 34 respectively. The upper coupling members are the same at each end of the panels, whereas the lower coupling members 34A at one end of the panels are

different to the coupling members 34B at the opposite ends of the panels.

The lower coupling member 34A comprises a duct flange extending from the end wall of the panel and terminating with a square C-section part 44 forming a horizontal channel with a bottom wall 48 and a top wall 49, the channel being of greater height than the flange. The lower coupling member 34B comprises a ducted flange 50 extending from the opposite end wall of the panel to the coupling member 34A. The flange has its bottom edge stepped upwards at its remote end from the panel to accommodate bottom wall 48 of the coupling member 34A, when two adjacent panels are brought together. Between the abutting vertical faces of the lower coupling members a strip of sealing tape (not shown) is fixed to reduce the risk of condensation formation in the space between the adjacent elements 10.

The reinforcing beam 12 is formed as a hollow extrusion and has a base 52, sides 54 and a top 56. The sides extend upwardly in parallel for a first part 55 before converging towards the top 56 for a second part 57. The base 52 is formed with a channel 58 therealong with rebated sides in order to accommodate top wall 49 of a coupling member 34A.

As can be seen when securing screw 40 is screwed into the coupling members, it penetrates between the ends of the members and can force them apart. If that happens there can be lateral distortion along the roof, so that the final element of the roof can be significantly out of alignment with the supporting end wall for the roof structure. Furthermore, the integrity of the sealing tape can be damaged and the seal breached by the tape becoming separated from one or

other of the building element.

Where the first and second parts of the beam 12 meet, the beam has a pair of upwardly open channels 60. The channels 60 receive upper coupling members 32 of the building elements 10 in the form of downwardly directed projections. The top of the beam is in the form of an open-topped slot 64, with internal notches 66 to retain resilient formations of a capping (not shown).

Turning to Figure 2 of the drawings, hollow building panels 100, of the same general type as panel 10 of Figure 1, are connected together side by side to and by means of a reinforcing beam (not shown) of the same type as 12 in Figure 1. The connection of adjacent panels 100 is sealed by a capping (not shown) pressed onto the beam. The building panels 100 have upper and lower coupling members at each end. The upper coupling members (not shown) are of the type shown in Figure 1, whereas lower coupling member 104A at one end of a panel is different to 104B at the other end of the panel.

The lower coupling member 104A comprises a ducted flange 110 extending from the end wall of the panel and terminating with a square C-section part 112 forming a horizontal channel with a bottom wall 116 and a top wall 118, the channel being of greater height than the flange. The flange has two ducts substantially the same size.

The lower coupling member 104B comprises a ducted flange 120 extending from the opposite end wall of a panel to the coupling member 104A. The flange has three ducts substantially the same width as those of the flange 110. The flange 120 has its bottom edge stepped upwards at its free end to

accommodate bottom wall 116 of coupling member 104A when two panels are brought together. The flange 120 also has an upstand 124 which is a continuation of the inner wall of the outermost duct of the flange 120.

The lower coupling member 104B is sized so that its outermost duct lies more or less centrally between the end walls of the adjacent panels, so that fixing screw 130 can be screwed through that duct rather than between coupling members as happen with the embodiment shown in Figure 1. Furthermore, the screw 130 also goes through the bottom and top walls 116, 118 of the part 112, so that there is no pushing apart of the panels as the screw is fitted nor damage to sealing tape between abutting vertical faces of the lower coupling members.

To construct a roof using building panels 10 or 100 the panels are laid side-by-side on a structure providing support at opposite ends of the panels with the lower coupling member 34A and B or 104A and B engaged, sealing tape having been affixed between the abutting vertical faces of the lower coupling members. A beam 12 or 101 is then slid into the space between the panels to hold the lower coupling members together and to engage the upper coupling members. Then a screw is secured through the beam and coupling members into an underlying supporting structural component. Finally, a capping is pressed onto the beam until it seats into the panels and is engaged on the heads of the beam.

The lower coupling members being ducted i.e. having an air space therein, provide greater insulation and inhibit condensation in the regions of contact with the beam.

Claims

1. A hollow building element of plastics material comprising one or more longitudinal ducts and having, at opposite sides thereof coupling members, whereby elements may be connected to each other directly or indirectly, wherein lower coupling members at opposite sides of the element are sized to meet with co-operating lower coupling elements of adjacent elements offset from a central axis parallel to adjacent element sides.
2. A hollow building element as claimed in claim 1, wherein one lower coupling member is sized so that it has an area through which a securing screw can be fixed that is generally central of space between adjacent elements.
3. A hollow building element as claimed in claim 2, wherein the co-operating lower coupling member has at least one overlapping component with the first mentioned lower coupling member, whereby a securing screw can penetrate both coupling members.
4. A hollow building element as claimed in claim 1, having a single longitudinal duct.
5. A hollow building element as claimed in claim 1, having a single layer of adjacent longitudinal ducts.
6. A hollow building element as claimed in claim 1, having a pair of longitudinal ducts one on top of the other.
7. A hollow building element as claimed in claim 1, having a plurality of longitudinal ducts in at least two layers.

8. A hollow building element as claimed in claim 1, wherein lower coupling members are arranged to be held together by means of a reinforcing beam between adjacent elements.
9. A hollow building element as claimed in claim 8, wherein each coupling member has a part extending upwardly, which parts are prevented from separating by more than a desired distance by means of the reinforcing beam.
10. A hollow building element as claimed in claim 1, also having upper coupling members.
11. A hollow building element as claimed in claim 10, wherein upper coupling members are interengageable with formations of the reinforcing beam.
12. A roof structure comprising two or more hollow building elements of plastics materials side by side, the hollow building elements comprising one or more longitudinal ducts and having at opposite sides thereof, coupling members, whereby elements are connected to each other directly or indirectly, wherein lower coupling members at opposite sides of the elements are sized to meet with co-operating lower coupling elements of adjacent elements offset from a central axis parallel to adjacent element sides.
13. A roof structure as claimed in claim 12, wherein one lower coupling member of a building element is sized so that it has an area through which a securing screw can be fixed that is generally central of the space between adjacent elements.

14. A roof structure as claimed in claim 13, wherein the co-operating lower coupling member has at least one overlapping component with the first mentioned lower coupling member, whereby a securing screw can penetrate both coupling members.
15. A roof structure as claimed in claim 12, wherein the building elements have a single longitudinal duct.
16. A roof structure as claimed in claim 12, wherein the building elements have a single layer of adjacent longitudinal ducts.
17. A roof structure as claimed in claim 12, wherein the building elements have a pair of longitudinal ducts one on top of the other.
18. A roof structure as claimed in claim 12, wherein the building elements have a plurality of longitudinal ducts in at least two layers
19. A roof structure as claimed in claim 12, wherein the building element lower coupling members are held together by means of a reinforcing beam between adjacent elements.
20. A roof structure as claimed in claim 19, wherein each lower coupling member of the building elements has a part extending upwardly, which parts are prevented from separating by more than one desired distance by means of the reinforcing beam.
21. A roof structure as claimed in claim 20, wherein the reinforcing beam has a longitudinal slot in its base, in which the said upwardly extending parts of the lower coupling members locate.

22. A roof structure as claimed in claim 12, wherein the building elements also have upper coupling members.
23. A roof structure as claimed in claim 22, wherein the upper coupling members interengage with formations of a reinforcing beam between adjacent building elements.
24. A roof structure as claimed in claim 23, wherein an upper coupling member comprises a flange forming a channel section, which is engageable in a complementary channel section of the reinforcing beam.
25. A roof structure as claimed in claim 19, wherein the reinforcing beam has ribs on its outer surface in order to limit areas of contact between the beam and the building elements in the space between adjacent elements.
26. A roof structure as claimed in claim 12, having a cap over the area of coupling of adjacent elements.
27. A roof structure as claimed in claim 26, wherein the cap is securable to reinforcing beam.
28. A roof structure as claimed in claim 27, wherein the cap has at its side edges sealing means in the form of flexible resilient material.
29. A roof structure as claimed in claim 27, wherein the beam has a formation engageable with a formation of the cap to retain the cap in place.
30. A roof structure as claimed in claim 29, wherein the reinforcing beam has a head forming a slot with notches on opposite sides which serve to retain internal depending formations of the cap when pressed onto the beam and past the head thereof.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/01259

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E04D3/28

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)

IPC 7 E04D

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	US 4 790 112 A (WANG CHEH) 13 December 1988 (1988-12-13)	1-8,10, 12-19,22
Y	column 4, line 6 - line 11; figure 2	9,11,20, 21,23-30
Y	--- EP 0 835 968 A (ULTRAFRAME UK LIMITED) 15 April 1998 (1998-04-15) cited in the application	9,11,20, 21,23-29
A	claims 4-8,18-20; figure 1	7
Y	--- EP 0 602 289 A (ULTRAFRAME PLC) 22 June 1994 (1994-06-22) cited in the application	30
A	figure 1	7
	--- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in 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 document 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

- 4. 07. 2000

Date of mailing of the international search report

11. 07. 2000

Name and mailing address of the ISA

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

Authorized officer

Demeester, J

INTERNATIONAL SEARCH REPORT

Internat. Application No

PCT/GB 00/01259

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 4 580 373 A (BASTIANSEN KAJ ET AL)</p> <p>8 April 1986 (1986-04-08)</p> <p>figures 1,2</p> <p>-----</p>	<p>1,2,4,6,</p> <p>12,13,</p> <p>15,17</p>

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internatic Application No
PCT/GB 00/01259

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4790112 A	13-12-1988	CA 1302040 A GB 2207930 A,B SG 109292 G	02-06-1992 15-02-1989 29-01-1993
EP 0835968 A	15-04-1998	DE 835968 T GB 2318133 A US 5901528 A	02-06-1999 15-04-1998 11-05-1999
EP 0602289 A	22-06-1994	DE 69227030 D DE 69227030 T DE 69230839 D DE 69230839 T EP 0750080 A GB 2268765 A,B GB 2300012 A,B	22-10-1998 18-03-1999 27-04-2000 27-07-2000 27-12-1996 19-01-1994 23-10-1996
US 4580373 A	08-04-1986	DK 453183 A BE 900690 A CA 1227010 A DE 3435776 A FI 843800 A,B, GB 2147334 A,B NL 8402921 A NO 843878 A,B, SE 449889 B SE 8404848 A	31-03-1985 16-01-1985 22-09-1987 18-04-1985 31-03-1985 09-05-1985 16-04-1985 01-04-1985 25-05-1987 31-03-1985