



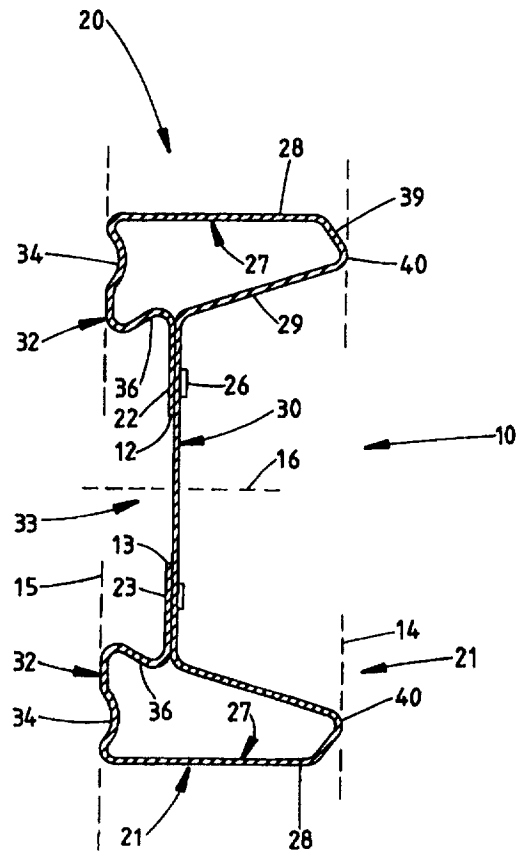
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : E04C 3/07</p>	<p>A1</p>	<p>(11) International Publication Number: WO 98/09035 (43) International Publication Date: 5 March 1998 (05.03.98)</p>
<p>(21) International Application Number: PCT/AU97/00556 (22) International Filing Date: 29 August 1997 (29.08.97) (30) Priority Data: PO 2001 30 August 1996 (30.08.96) AU (71) Applicant (for all designated States except US): BHP STEEL (JLA) PTY. LTD. [AU/AU]; 600 Bourke Street, Melbourne, VIC 3000 (AU). (72) Inventor; and (75) Inventor/Applicant (for US only): KELLY, Michael, Herbert [AU/AU]; 19 Leigh Place, West Pennant Hills, NSW 2125 (AU). (74) Agents: NOONAN, Greg et al.; Freehills Patent Attorneys, Level 47, 101 Collins Street, Melbourne, VIC 3000 (AU).</p>		<p>(81) Designated States: AU, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i></p>

(54) Title: STACKABLE BOX STUD

(57) Abstract

A structural member of the kind including a strip of metal sheet folded over onto itself at its lateral edges so that the member has respective boxed edge formations (20, 21) which extend between a pair of notional substantially parallel planes and are linked by a web (30). At least one of the boxed edge formations defines a longitudinally extending ridge (40) at one of the planes and, behind the other plane, an outwardly open longitudinally extending groove (34) complementary to the ridge, whereby the structural member may be stacked on another similar member and the stack be laterally stabilised by co-operation of the groove (34) on one member and the ridge (40) on the other.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

STACKABLE BOX STUD

5

Field of the Invention

This invention relates generally to structural members for use as components in metal building frames and is of particular though not exclusive relevance to structural members of the kind formed from a strip of metal and used as e.g. wall studs, floor joists, ceiling joists and other lightweight beams.

10

Background Art

The present applicant's Australian Patent 667145 discloses a structural member of a kind rollformed from a strip of metal sheet so that the strip is folded over onto itself at its lateral edges to form respective boxed edge formations linked by a web. The web and adjacent portions of the boxed edge formations define a longitudinally extending recess of dovetail cross-section. Boxed structural members of this form are well suited to serve as wall studs in steel building frames in that they provide sufficient structural strength with minimum material, while the boxing imparts sufficient rigidity to allow other frame and cladding components to be fastened to the studs by nailing.

15

20

Initial trials utilising structural members of the above described kind as wall studs have revealed a difficulty with stacking and transport. More conventional steel frame components of channel-like configuration, such as those used for top and bottom plates and noggings in steel house frames, are easily stackable for transport by nesting the components together. The edge formations of the box studs prevent nesting, however, and lateral ties or restraints are necessary on stacks to overcome the low coefficient of friction between opposed steel surfaces which otherwise prevents a stack of the studs from remaining stable. Stackability is also impaired by the thinness of the steel sheet in which the box studs are usually formed : advantageous in that the box studs are lightweight and cost efficient, but a disadvantage in that they are less robust in stacks.

25

30

It is an object of the present invention to overcome this difficulty.

Summary of the Invention

The invention accordingly provides a structural member of the kind including a
5 strip of metal sheet folded over onto itself at its lateral edges so that the member has
respective boxed edge formations which extend between a pair of notional substantially
parallel planes and are linked by a web between but offset from these planes, and wherein
at least one and preferably both of the boxed edge formations defines a longitudinally
extending ridge at one of said planes and, behind the other plane, an outwardly open
10 longitudinally extending groove complementary to said ridge, whereby the structural
member may be stacked on another similar member and the stack be laterally stabilised
by co-operation of said groove on one member and said ridge on the other.

The web preferably defines, with opposed adjacent portions of the boxed edge
15 formations, a longitudinally extending recess of generally dovetail cross-section.

The boxed edge formations are preferably of generally truncated triangular
configuration in cross-section, defining a base containing the longitudinally extending
groove and an apex forming the longitudinally extending ridge.
20

The edge formations preferably include parallel flat faces defining the lateral
margins of the structural member.

The web is preferably substantially closer to said other notional plane than to said
25 one plane.

The folded over portions of the metal strip preferably include an edge lip engaged
against a centre portion of the metal strip, the lips and centre portion together defining the
web. The lips are advantageously fastened to the centre portion, e.g. by spot welds, rivets
30 or clinches.

Brief Description of the Drawings

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

Figure 1 depicts the uniform cross-section of an elongated structural member according to an embodiment of the invention, suitable for use as a wall stud component of a steel house frame;

Figure 2 is a sectioned isometric view of the structural member; and

Figure 3 depicts a three-member stack of the structural members.

10

Embodiments of the Invention

The structural member 10 illustrated in Figures 1 and 2 is typically rollformed from a strip of metal sheet, for example flat steel coated with zinc or an alloy of aluminium and zinc, and is configured and dimensioned for use as a wall stud. It will therefore be hereinafter described as such. The gauge of the steel sheet is selected with regard to this application. The strip is folded over onto itself at its lateral edges 12, 13 so that the stud 10 has respective geometrically similar boxed edge formations 20, 21 which extend between a pair of notional substantially parallel planes 14, 15 and are linked by a web 30 between and parallel to but offset from these planes.

Web 30 is formed by the superposition of respective edge lips 22, 23, adjacent to lateral edges 12, 13, against a longitudinally extending flat centre portion 24 of the steel strip. It will be seen that the wall stud is wholly symmetrical about a centre plane 16 bisecting this centre portion 24 at 90° to the centre portion. Edge lips 22, 23 are fastened to centre portion 24 by respective lines of spaced fastenings 26, which may be e.g. spot welds, rivets or clinches.

Each of the geometrically similar boxed edge formations 20, 21 includes respective outer side segments 27 which define flat faces 28. Faces 28 are parallel, extend at right angles to the plane of web 30, and define the lateral margins of the stud. The boxed formations are generally of truncated right-triangular cross-section in which one of the rectangular sides is the outer segment 27 and the other is a base 32. Base 32 is generally in plane 15 but has a longitudinally extending shallow groove 34 of

symmetrical concave cross-section. The inner margin of bases 32 are linked to edge lips 22, 23 by respective S- section portions 36 so that the web 30 and S-section portions 36 together define a broad groove 33 with a laterally restricted mouth, i.e. of generally dovetail cross-section. This recess facilitates engagement with other frame components and connecting elements, either within the recess or, alternatively, between one side of the recess 33 and the adjacent flat flange face 28, i.e. about the undercut wider end of the formations 20,21. One element which can be fixed in the latter manner is a brick tie.

On the other side of web 30, the inside segment 29 of each boxed edge formation 20,21 tapers laterally outwardly away from the web and thus forms the hypotenuse of the aforementioned right-triangular cross-section. The outer end of the hypotenuse is truncated at 39 at an obtuse angle to outer face 28 so that the boxed formation defines a longitudinally extending ridge 40 as its extremity at notional plane 14. The tips of ridges 40 are offset inwardly from outer faces 28 and indeed are directly aligned with the centre lines of grooves 34 in a direction parallel to centre plane of symmetry 16 and outer faces 28.

Figure 3 illustrates a stack of three of the studs 10, 10',10" for storage or transport. The stack is laterally stabilised by co-operation of grooves 34 of the overlying stud of each pair and the ridges 40 of the underlying stud. In particular, the grooves receive and centre the ridges and thereby discourage relative lateral movement between the studs which would otherwise easily occur given the lower co-efficient of friction between contacting steel surfaces, and which might otherwise give rise to damage to the relatively lightweight sheet from which the studs are formed. This is achieved without significantly altering the fundamental form of the structural member and without diminishing the qualities of strength and rigidity with minimum material which makes the member especially suitable as a wall stud. The modification to achieve stacking stability, though functionally significant, requires only relatively small modification of the rollforming operation.

Other forms of structural member to which the invention has application includes floor joists, ceiling joists, lightweight beams and the like.

It will be understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations constitute various
5 alternative aspects of the invention.

It will also be understood that the term "comprises" or its grammatical variants as used herein is equivalent to the term "includes" and is not to be taken as excluding the presence of other elements or features.

Claims

1. A structural member of the kind including a strip of metal sheet folded over onto itself at its lateral edges so that the member has respective boxed edge formations which extend between a pair of notional substantially parallel planes and are linked by a web, and wherein at least one of the boxed edge formations defines a longitudinally extending ridge at one of said planes and, behind the other plane, an outwardly open longitudinally extending groove complementary to said ridge, whereby the structural member may be stacked on another similar member and the stack be laterally stabilised by co-operation of said groove on one member and said ridge on the other.
2. A structural member according to claim 1 wherein both of the boxed edge formations define a said ridge and complementary groove.
3. A structural member according to claim 1 or 2 wherein said web is disposed between but offset from said notional planes.
4. A structural member according to claim 3 wherein said web defines, with opposed adjacent portions of the boxed edge formations, a longitudinally extending recess of generally dovetail cross-section.
5. A structural member according to any one of claims 1 to 4 wherein boxed edge formations are of generally truncated triangular configuration in cross-section, defining a base containing the longitudinally extending groove and an apex forming the longitudinally extending ridge.
6. A structural member according to any preceding claim wherein said edge formations include parallel flat faces defining the lateral margins of the structural member.
7. A structural member according to any preceding claim wherein said web is substantially closer to said other notional plane than to said one plane.

8. A structural member according to any preceding claim, wherein said folded over portions of the metal strip include an edge lip engaged against a centre portion of the metal strip, the lips and centre portion together defining the web.

5

9. A structural member according to claim 8 wherein said lips are fastened to the centre portion.

10. A structural member according to any preceding claim, configured and
10 dimensioned as a wall stud, or as a floor or ceiling joist.

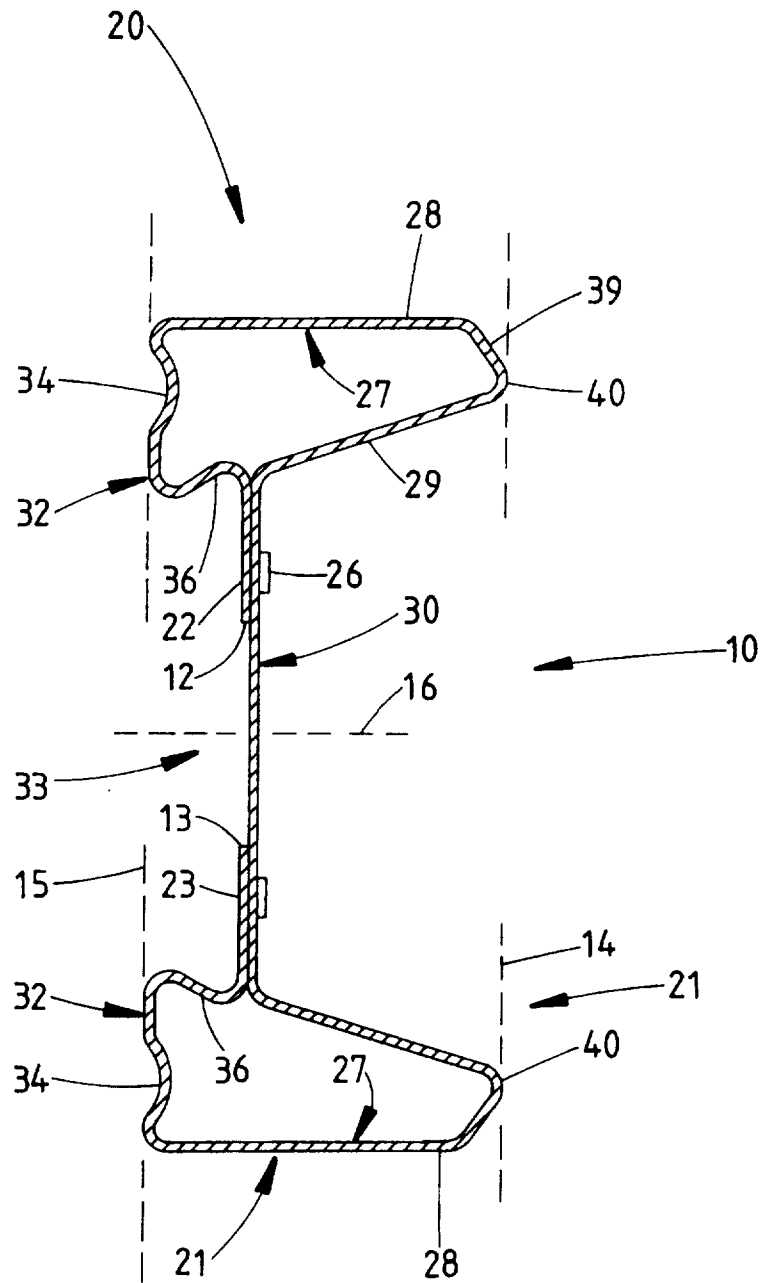


FIG 1

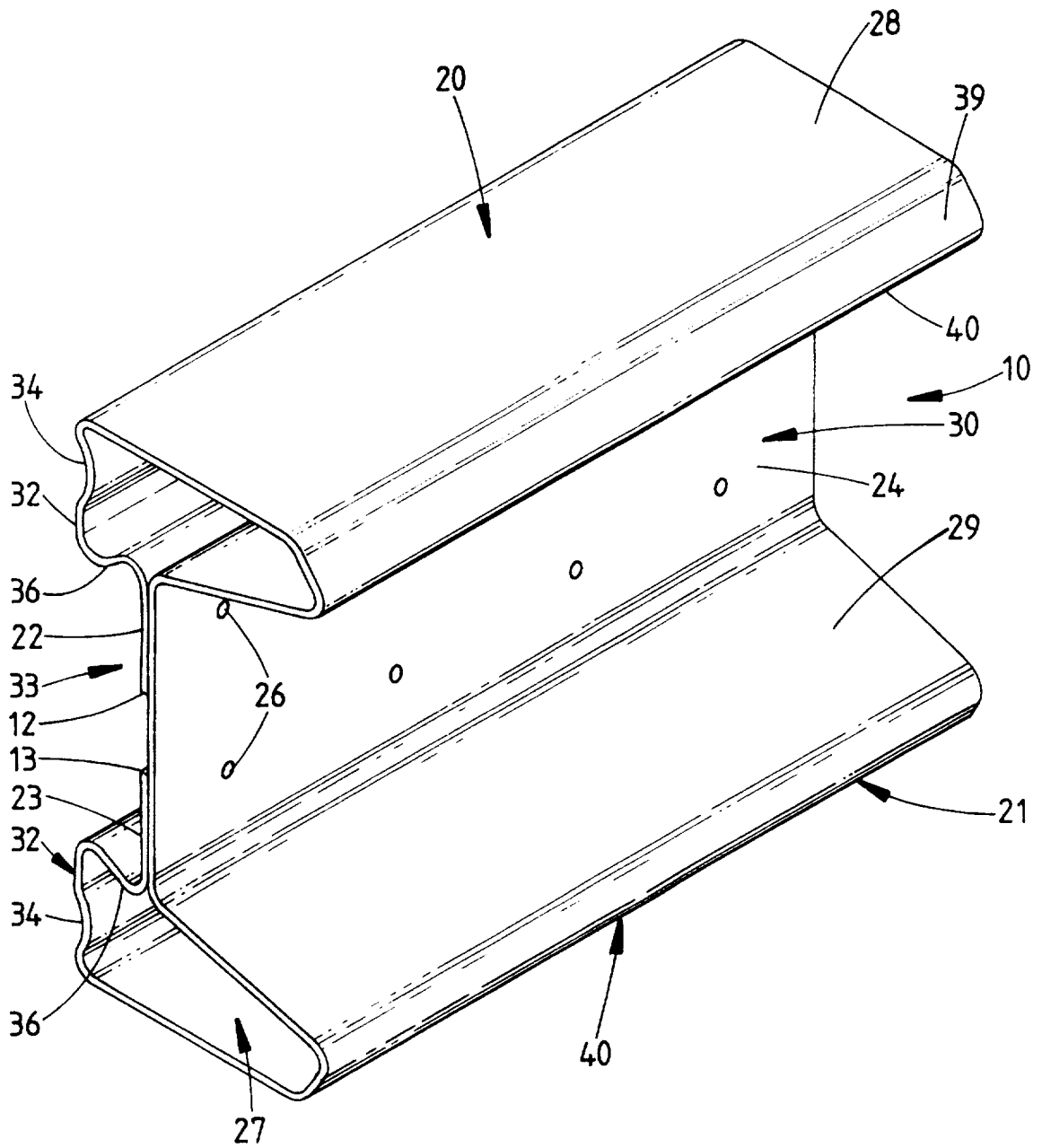


FIG 2

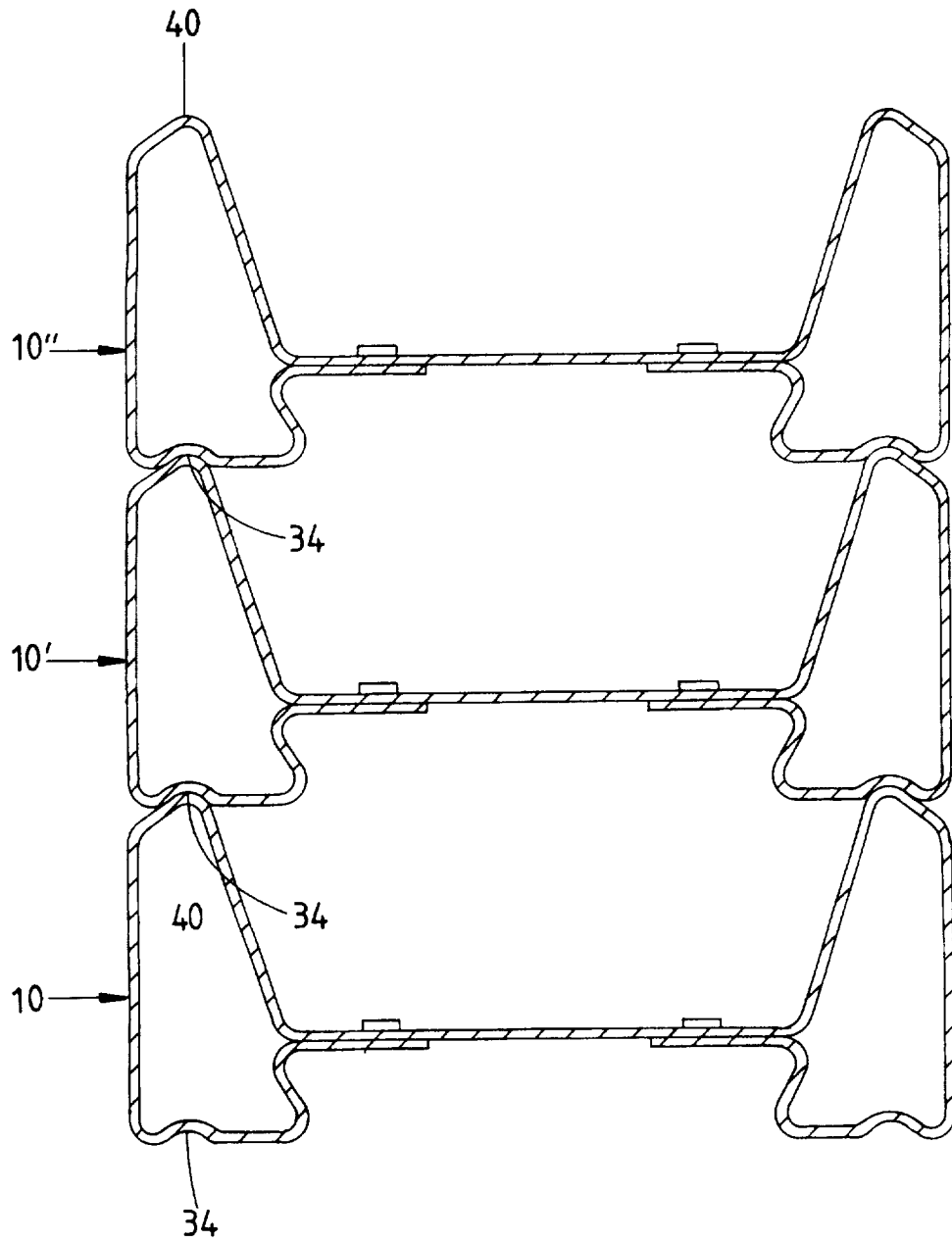


FIG 3

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/AU 97/00556

A. CLASSIFICATION OF SUBJECT MATTER		
Int Cl ⁶ : E04C 3/07		
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 : E04C 3/07, 3/06, 3/04		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DERWENT JAPIO		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
D,A	AU 52074/93 (667145) B (JOHN LYSAGHT (AUSTRALIA) LIMITED) 9 June 1994	
A	GB 866234 A (MARKS) 26 April 1961	
A	WO 90/01091 A (TUBE TECHNOLOGY PTY LTD) 8 February 1990	
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search 19 September 1997		Date of mailing of the international search report 25 SEP 1997
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929		Authorized officer ANDREW LOWE Telephone No.: (02) 6283 2519

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 97/00556

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					
AU	52074/93	AU	39720/89	AT	87694	BR	8907034
		CA	1326340	CN	1040842	DE	68905797
		DK	762/90	EP	381727	ES	2016041
		HK	764/95	JP	3502223	NO	901132
WO	9001091	NZ	230060	PT	91269	US	5163225
		US	5373679				
END OF ANNEX							