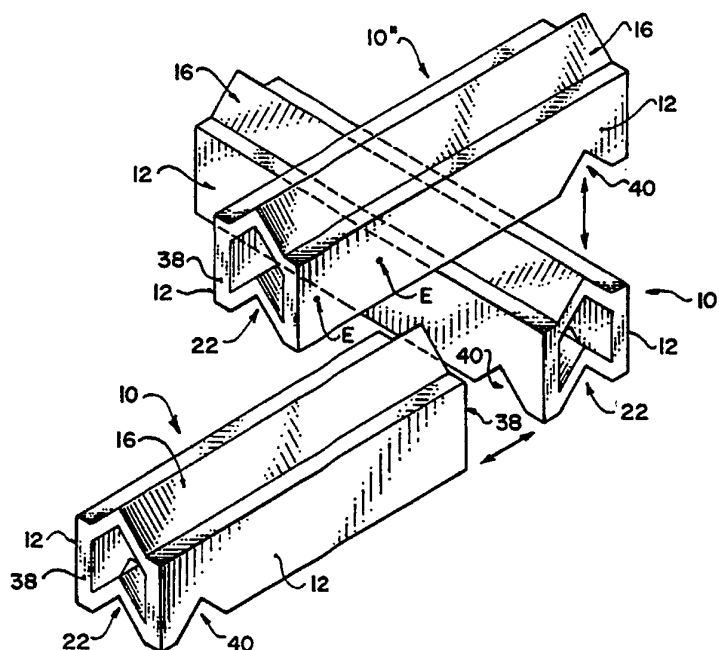




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/CA93/00373</p> <p>(22) International Filing Date: 10 September 1993 (10.09.93)</p> <p>(71) Applicant (for all designated States except US): URBAN RESOURCE TECHNOLOGIES INC. [CA/CA]; 609 Granville Street #1520, Box 10351, Pacific Centre, Vancouver, British Columbia V7Y 1G5 (CA).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): TRAFF, Edward, R. [CA/CA]; 4827 Bluegrouse Drive, Sechelt, British Columbia V0N 3A0 (CA). EVANCIC, Roman [CA/CA]; T9 - 1501 Howe Street, Vancouver, British Columbia V6Z 2P8 (CA). TORNEBACK, Goran [SE/CA]; 593 Ballantree Road, West Vancouver, British Columbia V7S 1W4 (CA).</p> <p>(74) Agent: GREEN, Bruce, M.; Oyen Wiggs Green &amp; Mutala, 480 The Station, 601 West Cordova Street, Vancouver, British Columbia V6B 1G1 (CA).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: EXTRUDED INTERLOCKING WALL CONSTRUCTION ELEMENTS



## (57) Abstract

A wall-building construction element (10) is preferably extruded from a recycled plastics material having desirable construction, insulating and fire-resistant characteristics. The elements have an upper wedge shaped section (16) and a lower complementary wedge shaped longitudinal groove (22), with a transverse wedge shaped notch (40) extending across one end of each element. A hollow core filled with insulating foam may be provided in the extruded profile, or hollow conduits for receiving electrical and plumbing utilities.

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EXTRUDED INTERLOCKING WALL CONSTRUCTION ELEMENTSTechnical Field

5           The invention relates to building construction and more particularly to interlocking blocks or logs for constructing the walls of a building.

Background Art

10

          Log cabins have been built for hundreds of years using a notch construction in which cylindrical logs form the basic wall-building modules. Each log is provided with notches at either end to rest on the ends of the previously  
15 laid logs. While this form of construction is popular due to its rustic appeal, it is expensive to obtain logs having the necessary size and uniformity. Due to the cylindrical shape of the logs, caulking or some other form of insulation is needed to make the wall a solid insulating unit,  
20 and it is difficult to provide channels for electrical and plumbing connections within the walls. Also this form of construction is not particularly stable especially in respect of forces directed outwardly from the structure.

          Various modifications of the traditional log  
25 house construction have been proposed. For example Walters International application no. PCT/CA91/00042 entitled LOG BUILDING ELEMENT discloses wooden interfitting logs which are squared and mounted with their diagonals aligned. The upper corner of each log is fitted into a V-shaped groove  
30 formed on the lower edge of each log. Transverse V-shaped notches are cut adjacent the ends of the logs to permit the ends of the walls to interfit. Such a design may produce a more weather-tight fit than previously with round log construction but it shares many of the drawbacks of wooden  
35 log construction, including expense, instability and lack of channels for plumbing and electrical connections. Further, as high quality logs become more scarce and expensive, while the need for recycling of plastics and the like increases, there is a need to use recycled materials

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rather than logs for construction purposes. For example Andersson International application no. PCT/SE90/00748 entitled A METHOD AND ARRANGEMENT FOR PRODUCING AN ELONGATED BEAM discloses a method of extruding elongated beams  
5 composed of waste plastic material. One advantage of this method is that it can produce elongated beams of various profiles, even hollow profiles, from waste materials.

There is therefore a need for an improved profile for construction logs and beams which can take advantage of  
10 the use of waste materials.

#### Disclosure of Invention

15 The present invention provides a design for a wall-building construction element which is preferably extruded from a recycled plastics material having desirable construction, insulating and fire-resistant characteristics. The modules are shaped to provide stability in event of  
20 earthquakes or the like and the finished wall forms a solid having broad planar parallel surfaces and flat upper and lower edges. The construction elements have an upper wedge shaped section and a lower complementary wedge shaped longitudinal groove, with a transverse wedge shaped notch  
25 extending across one end of each element. A hollow core filled with insulating foam may be provided in the extruded profile, or hollow conduits for receiving electrical and plumbing utilities.

#### 30 Brief Description of Drawings

In drawings which illustrate a preferred embodiment of the invention:

Fig. 1 is a perspective view of a wall construction  
35 element of the invention;

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Fig. 2 is a perspective view illustrating the interaction of three of the interlocking wall construction elements of the invention;

Fig. 3 is an end view of one embodiment of a wall construction element of the invention;

Fig. 4 is an end view of a second embodiment of a wall construction element of the invention;

Fig. 5 is an end view of a third embodiment of a wall construction element of the invention;

10

Fig. 6 is an end view showing a manner of construction of the base and top wall construction elements of the invention; and

Fig. 7 is a side view of the wall construction element of the invention.

#### Best Mode(s) For Carrying Out the Invention

With reference to the drawings, a wall construction element 10 has parallel planar vertical side walls 12, parallel horizontal shoulders 14, V-shaped upper ridge 16 having sloping planar surfaces 18 and 20, V-shaped lower groove 22 having sloping planar surfaces 24 and 26, and parallel lower planar base surfaces 28.

Each construction element 10 is an extruded piece, preferably approximately 10 cm in width and 14 cm in height. Groove 22 and V-shaped ridge 16 are complementary in that surfaces 14 are of the same dimension as surfaces 28 and lower sloping surfaces 24, 26 are of the same dimensions as surfaces 20, 18 and also form the same angle A (preferably 90 degrees).

At each end of wall construction element 10 is a vertical planar surface 38. A further notch 40, identical in cross-sectional shape to groove 22, having planar surfaces 44, 46 meeting at an angle of 90 degrees, extends at right angles to groove 22 adjacent end surface 38, leaving a flat base surface which is the same width as

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shoulder 14. Any given wall construction element has a notch 40 at one end only.

A first embodiment of the wall construction element of the invention is shown in Fig. 3 in which the  
5 extruded profile is solid except for the provision of a longitudinal hollow core 36, circular in cross-section, for carrying plumbing or wiring. A second embodiment of the wall construction element of the invention is shown in Fig.  
4 in which a larger cavity 29 is left in the extruded  
10 profile, for example in the same general shape as the exterior shape of the profile. Cavity 30 can then subsequently be filled with an insulating foam to provide a structure having superior insulating properties. A conduit  
35 (Fig. 5) could similarly be formed in the foam interior 30 for carrying electrical and plumbing connections. Or as shown in Fig. 1, electrical wires 32 and pipe 34 could be embedded in foam core 30 before the core solidified.

The manner in which the modular elements interlock is illustrated in Fig. 2. A first row of elements 10, 10' at  
20 the same vertical height are arranged in the desired geometric shape (generally a square or rectangle) by arranging adjacent elements at right angles by abutting surface 38 of one element 10 with corresponding surface 12 of the adjacent perpendicular element 10' and groove 22 of  
25 element 10 aligned with notch 40 of element 10". Once one row has been completed, the next vertical row of elements 10" is placed on the lower row by aligning groove 22 of the upper element 10" over the upper wedge-shaped section 16 of the lower element 10, and notch 40 of element 10" over the  
30 end of the upper wedge-shaped section 16 of the lower perpendicular element 10'. In any given vertical wall therefore, the placement of notch 40 alternates from one end of element 10 to the other as one proceeds vertically up the wall. Stability is provided as surfaces 28 of  
35 element 10" bear vertically downwardly on shoulders 14 of element 10. In this way perpendicular self-supporting

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walls 12 having planar outer and inner surfaces 22 are created to the desired height.

Base piece 50 and top piece 52 for a wall can be formed as shown in Fig. 6. Horizontal planar cuts 51, 53 in an extruded construction element 10 are made along the planes indicated in Figure 6, leaving an upper wedge-shaped piece 50 which will fit into groove 22 of an overlying element 10 to form the base elements on which the first row of construction elements 10 sit. Lower notched piece 52 will also be formed as well as a central rectangular plank 56. The lower section 52 can sit on the upper wedge-shaped section 16 of the top row of elements 10 to form a planar upper surface. The left-over plank section 56 can be used for roofing or framing purposes in the building. A top piece for attaching roofing can also be provided by making cut 53 a sloping cut to match the slope of the roof.

While wall construction elements 10 may be formed from any material, preferably they are extruded in the desired cross-sectional shape from a waste granulated thermoplastic and waste filler material according to the method disclosed in Swedish patent application no. SE 893907 of C. Andersson filed November 21, 1989. In that method, a continuous extruded member is produced from waste plastics heavily loaded with waste filler using a conventional screw extruder, a short extruder die and a reciprocating compacting die or "floating mould" which consolidates the extrudate without increasing extrusion resistance. The proportion of plastic is in the range 20% - 40% with the balance waste paper, wood fibre or other waste fibrous material. The waste plastic serves to bind the material when heated. This material has good insulating properties and its composition can be such as to produce a fire-resistant product. The extrudate can be sawn like wood, and retains both nails and screws well, since the heat of driving in the fastener causes the adhesives in the material to melt and resolidify once the fastener is in place, holding it securely. Further, providing a hollow

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core in the extrudate leaves a member which is in fact stronger than a member with no hollow core, since the manner in which the molten plastic material cures leaves a tough skin on surface areas having a greater surface strength or tension than in non-surface areas. When the hollow core is filled with a foam insulating material, there is a further strengthening of the member due to a laminating effect between the surfaces of the two materials.

10 To produce the wall construction elements 10, the material in the desired cross-sectional shape is extruded to the desired length and sawn off at that length using a band saw or the like. Notches 40 are then sawn with the band saw. The material can be painted using an acrylic paint or the like on surfaces 12 to produce a wall of the desired colour. As the walls are assembled as noted above, stability can be added to the walls by nailing or screwing. Nails will be driven into surface 12 of element 10" at an angle by air guns at regular intervals at location E (Fig. 2) to penetrate into ridge 16 of element 10 below it and secure element 10" to the lower adjacent element 10. Again, a surprising advantage of the waste plastic material disclosed is that driven nails actually heat up and melt the surrounding plastic, which then solidifies as it cools to tightly retain the nails.

Once a wall has been formed, doors and windows may be cut out with a power saw. Planks can be used to frame the doors and windows, for roofing or flooring. The resulting structure is considerably more stable than a conventional log construction.

Raceways for electrical wiring or plumbing can readily be formed in the walls as follows. Horizontal holes can be drilled to provide access to the conduits 32, 34 or 36. Where horizontal holes open to the exterior or interior on surface 12, outlets or plugs can be provided to close the conduit to the exterior at those locations or to provide a removable access. Vertical holes can also be drilled



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through the elements to join conduits at one level to those on another level.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and  
5 modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

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## WHAT IS CLAIMED IS:

1. A wall construction element comprising an elongated body having two parallel planar vertical sides and two planar vertical ends, parallel planar horizontal upper shoulders running along either upper edge of said element,  
5 a wedge shaped upper section formed of two planar upper surfaces sloping inwardly from either upper shoulder to meet along a central ridge at right angles, a first wedge shaped notch extending longitudinally along the lower  
10 surface thereof between parallel horizontal surfaces of the same width as said upper shoulders, said first notch being complementary to the shape of the wedge shaped upper section and being thereby adapted to receive said upper wedge shaped section in a close fit whereby said horizontal  
15 surfaces of an upper element will bear on said upper shoulders of a lower element, and a second wedge shaped notch of the same cross-sectional shape as said first wedge shaped notch and extending at right angles to said first wedge shaped notch adjacent said first end and spaced from  
20 said first end a distance equal to the width of said upper shoulders.
2. The modular wall construction element of claim 1 which is constructed of an extruded material.  
25
3. The modular wall construction element of claim 2 which is constructed of an extruded material comprising 20% to 40% waste granulated waste plastic.
- 30 4. The modular wall construction element of claim 3 which is constructed of an extruded material comprising greater than 50% waste fibrous material.
5. The wall construction element of claim 2 wherein said  
35 extruded material comprises a fire-resistant additive.

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6. The wall construction element of claim 1 wherein said two sloping upper surfaces meet at right angles.
7. The wall construction element of claim 1 wherein said  
5 element is provided with a hollow core.
8. The wall construction element of claim 7 wherein said hollow core is filled with an insulating foam.
- 10 9. The wall construction element of claim 1 wherein said element is provided with a hollow conduit extending longitudinally along said element and adapted for receiving electrical or plumbing utilities.
- 15 10. A building constructed of walls comprising a plurality of the wall construction elements of claim 1.

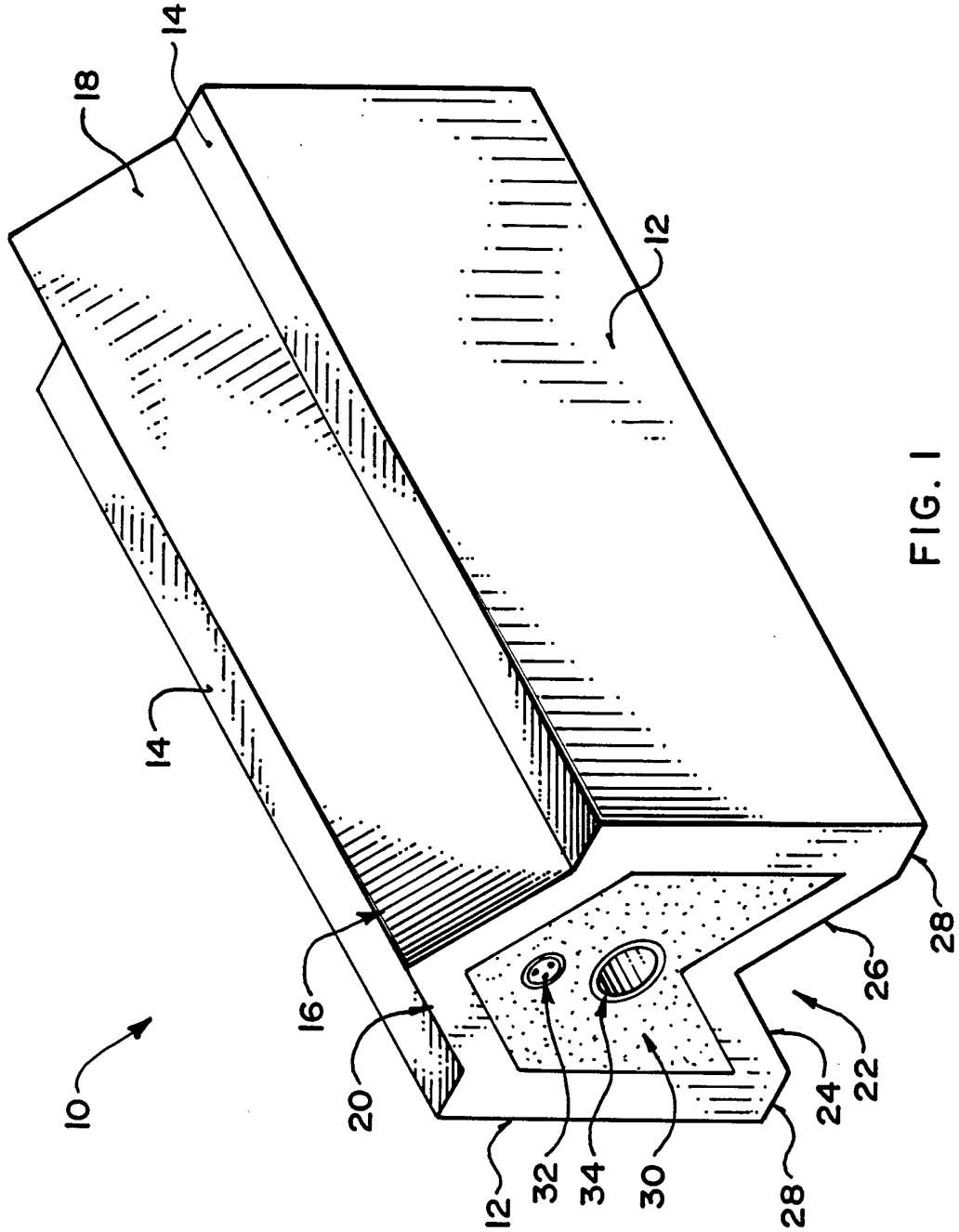


FIG. 1

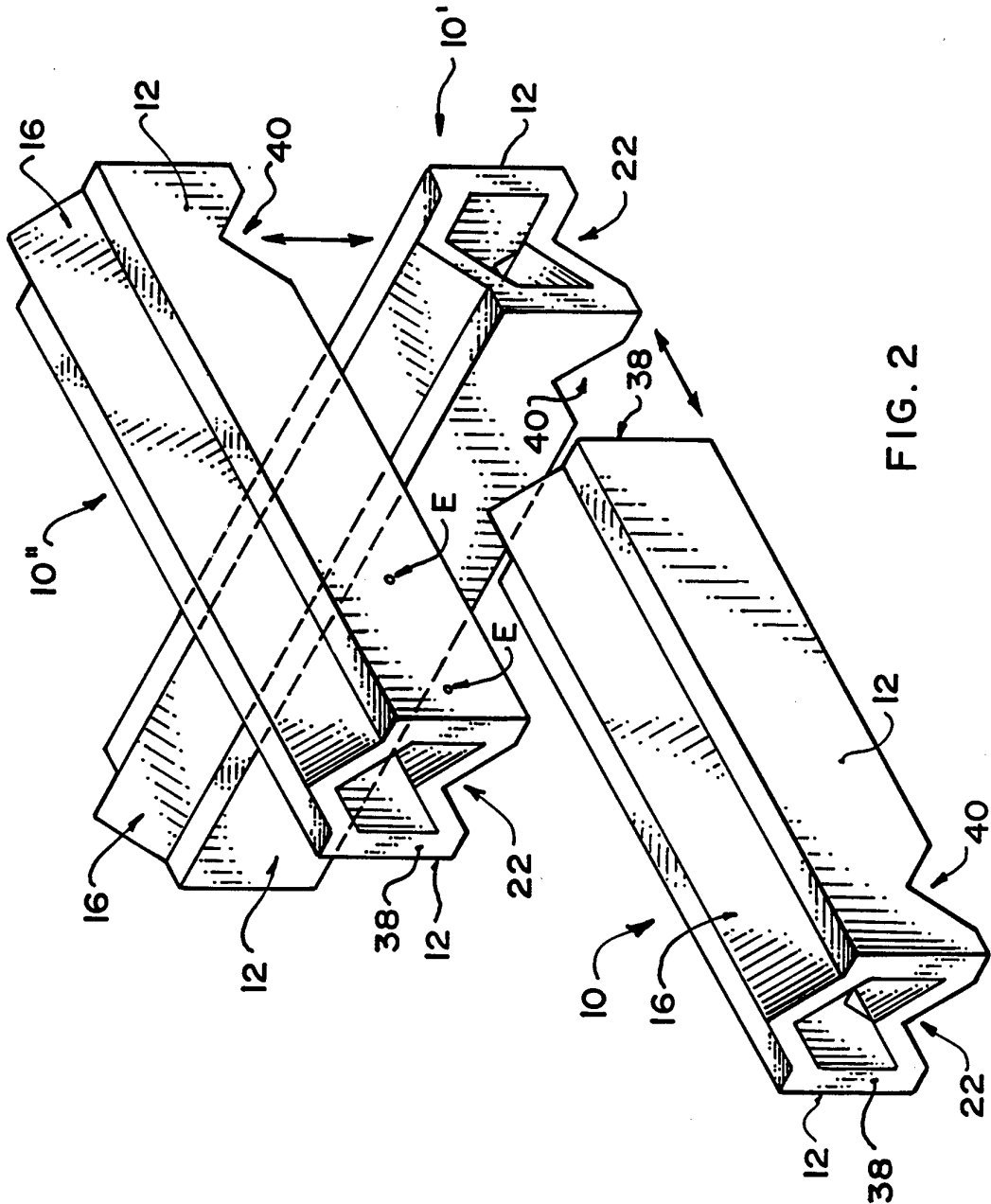


FIG. 2

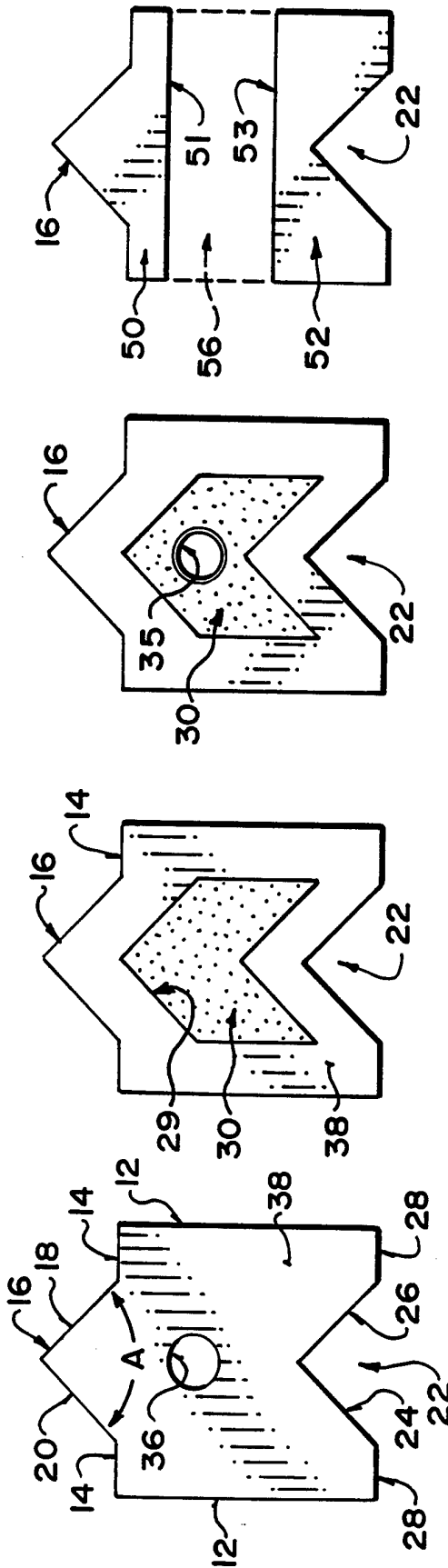


FIG. 3

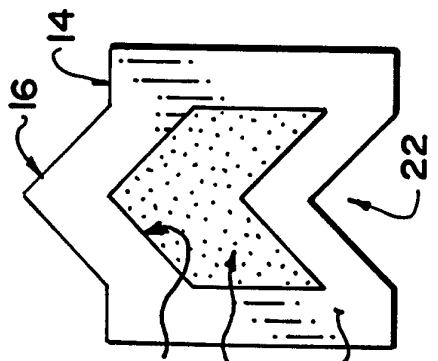


FIG. 4

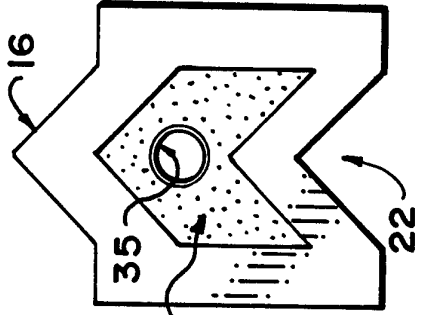


FIG. 5

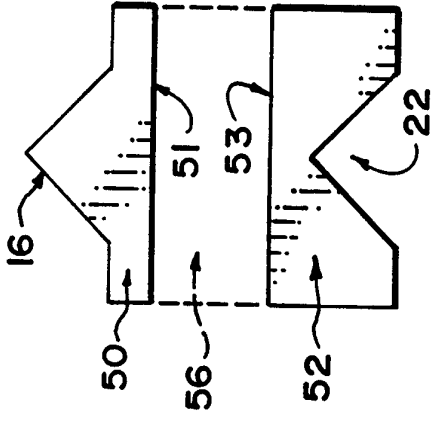


FIG. 6

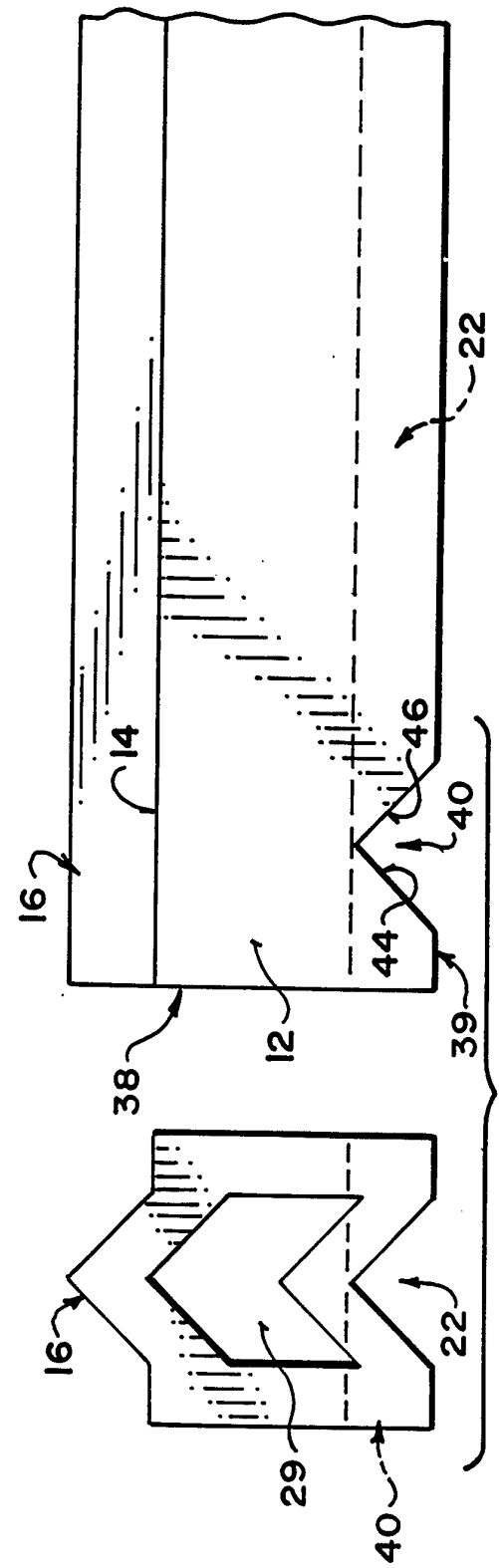


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No  
PCT/CA 93/00373

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 E04B2/70

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 6 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO,A,91 12389 (WALTERS) 22 August 1991 cited in the application see page 5, line 11 - page 8, line 25; figures ---	1,6,7,10
A	US,A,3 892 097 (BAIN) 1 July 1975 see column 2, line 3 - line 31; figure 5 ---	1,10
A	DE,C,356 192 (HAUCK) 18 July 1922 see the whole document ---	1,7,8,10
A	DE,U,85 31 060 (KLEINHENZ) 27 February 1986 see figures 1-3 ---	1,6,10
A	US,A,4 510 724 (MAGNUSON) 16 April 1985 see figures 1,4 ---	1,10
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

18 May 1994

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 93/00373

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9112389	22-08-91	US-A- 5103610 AU-A- 7213391 CA-A- 2036176 EP-A- 0515437 JP-T- 5504177	14-04-92 03-09-91 13-08-91 02-12-92 01-07-93
US-A-3892097	01-07-75	CA-A- 968921	10-06-75
DE-C-356192		NONE	
DE-U-8531060	27-02-86	NONE	
US-A-4510724	16-04-85	NONE	
US-A-4096676	27-06-78	NONE	
WO-A-9107270	30-05-91	SE-B- 468278 AU-A- 6883491 EP-A- 0593444 JP-T- 5504520 SE-A- 8903907	07-12-92 13-06-91 27-04-94 15-07-93 22-05-91



## INTERNATIONAL SEARCH REPORT

Intern al Application No  
PCT/CA 93/00373

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 096 676 (HÉBERT) 27 June 1978 see column 2, line 26 - column 3, line 19; figure 1 -----	1,2,7-10
A	WO,A,91 07270 (ANDERSSON) 30 May 1991 cited in the application -----	

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