PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:	WO 98/23823
E04B 2/72, 5/02, E04C 2/38	A1	(43) International Publication Date:	4 June 1998 (04.06.98)

(21) International Application Number: PCT/AU97/00806

(22) International Filing Date: 28 November 1997 (28.11.97)

(30) Priority Data:
PO 3899 28 November 1996 (28.11.96) AU

(71) Applicants *(for all designated States except US)*: VISSER, Deborah, Judith [AU/AU]; Lot 4, Liverpool Road, Kilsyth, VIC 3137 (AU). VERZANTUOORT, Timothy, Wilhelmus [AU/AU]; 16 Regency Terrace, Lysterfield, VIC 3156 (AU). SCHEUER, Nathan, Joseph [AU/AU]; 7/8 Meadow Street, East St. Kilda, VIC 3183 (AU).

(71)(72) Applicant and Inventor: VISSER, David, Dirk [AU/AU]; Lot 4, Liverpool Road, Kilsyth, VIC 3137 (AU).

(74) Agent: SANDERCOCK, Charles; Sandercock & Cowie, 69 Robinson Street, Dandenong, VIC 3175 (AU).

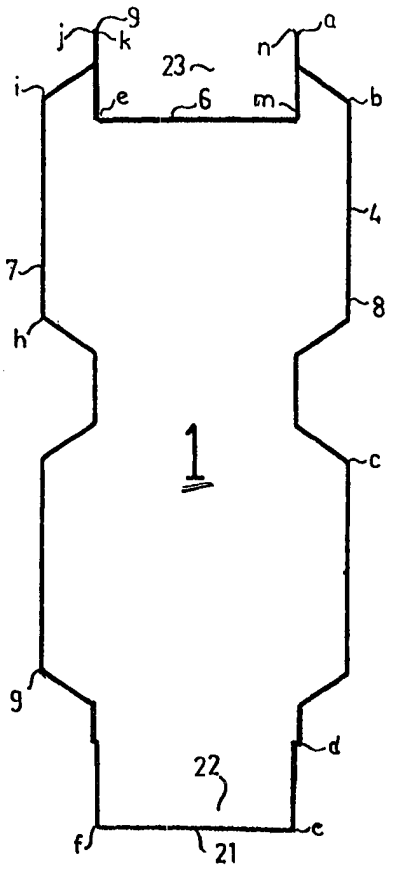
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO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

Published
With international search report.

(54) Title: BUILDING ELEMENT

(57) Abstract

A building element (1) comprising an outer sheath and an inner core, the sheath being formed of a material having a greater tensile strength than compressive strength and the core having a greater compressive strength than tensile strength; wherein the outer sheath is longitudinally extending and has a first face (7) and a second face (8) which are spaced apart, first (9) and second (21) edges and a first and second end; wherein the first face (7) and the second face (8) are joined at the first (9) and second (21) edges to form the outer sheath as a continuous body, and wherein the first edge (9) and the second edge (21) are so shaped that the first edge (9) of one such building element (1) is adapted to locate in the second edge (21) of another such building element (1).



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			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

TITLE: BUILDING ELEMENT

FIELD OF THE INVENTION

This invention relates to a building element.

BACKGROUND TO THE INVENTION

There is a need for a building element which in its own right has structural integrity and which can be coupled with light building elements for the purposes of building panels, walls and various other structural components in the formation of buildings.

It is an important consideration that such structural elements have significant strength and should have a

reasonably high resistance to fire.

SUMMARY OF THE INVENTION

The present invention provides:-

a building element comprising

an outer sheath and an inner core,

the sheath being formed of a material having a greater tensile strength than compressive strength and the core having a greater compressive strength than tensile strength;

wherein the outer sheath is longitudinally extending and has a first face and a second face which are spaced apart, first and second edges and a first end and a second end,

wherein the first face and the second face are joined at the first and second edges to form the outer sheath as a continuous body, and

wherein the first edge and the second edge are so shaped that the first edge of one such building element is adapted to locate in the second edge of another such building element.

PREFERRED ASPECTS OF THE INVENTION

Preferably the first end and the second end are so shaped that the first end of one such building element is adapted to engage with the second end of another such building element.

However, plain ends may be acceptable in some instances.

Preferably the sheath comprises at least two components which can interengage with one another to form the sheath. In one instance the sheath comprises four components.

In the last instance, two components define the faces and two components define the edges.

A plurality of such building elements may be assembled edge to edge to form walls, floors, roof, cladding or other parts of a building.

The building elements may extend horizontally, vertically or as desired.

The material of which the sheath is formed need only satisfy the tensile strength requirement.

Suitable materials for the sheath include mild steel, high tensile steel, carbon fibre materials, extruded materials, synthetic plastic - cement fibre composite and asbestos cement or modern replacement therefor.

The material of which the core is formed need only satisfy the compressive strength requirement.

However, the material of the core desirably has a substantially higher resistance to fire than the material of the sheath.

The preferred material of the core is a cementitious material. An alternative core material is a non-fire resistant material of low density, displaying a degree of compression resistance. foamed plastics, eg polystyrene, and other materials such as recycled paper and recycled plastics may be used.

A most preferred cementitious material is a light weight

concrete.

One suitable concrete has a density of 200-1200 kg/cu metre.

Desirably, the spacing between the first edge and the second edge does not exceed 450mm with 200 - 300mm being preferred.

The spacing between the first and the second faces preferably is at most in accordance with the above but, for practical purposes, is unlikely to exceed 70mm.

Preferably the first face and the second face and/or the first edge and the second edge are joined by at least one web located intermediate of the edges.

Said at least one web is preferably apertured.

This last has a number of advantages including that the amount of material in the web is reduced, so that the core material on one side of the web is integrally connected to the core material on the other side of the web, so as to reduce the amount of material available for heat conduction, as a stabiliser in manufacturing and to provide a continuous tensile shell enabling point stress loads to transfer to the outer sheath.

Several such webs may be used.

The length of the building element is not critical but for practical purposes is unlikely to exceed 8 metres.

In a preferred aspect the present invention provides a building element comprising

an outer sheath and an inner core,

the sheath being formed of a material having a greater tensile strength than compressive strength and the core having a greater compressive strength than tensile strength;

wherein the outer sheath is longitudinally extending and has a first face and a second face which are spaced apart, first and second edges and a first end and a second end and

wherein the first edge and the second edge are so shaped that the first edge of one such building element is adapted to locate in the second edge of another such building element and wherein,

when so located, the core material of said one such panel is spaced not more than 3mm from the core material of said another panel.

Preferably that spacing of the core material of said one panel and the core material of said another panel does not exceed 1mm.

Preferably the first edge defines a tongue and the second edge defines a groove.

Preferably the core material extends into the tongue.

The core material may extend into the portion of the sheath defining the groove but this is not preferred.

Preferably the groove is of such depth as to overly the first and second faces of such a building element when the tongue is entered into the groove of another such building element.

Preferably the building element, in the region of the groove, has a groove width, measured between the first face

and the second face, of about the spacing of the first face and second face less four times the thickness of the sheath material.

Specific embodiments of building elements in accordance with this invention as applied to building panels will now be described by way of non-limiting example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE VIEWS OF THE DRAWINGS

Figure 1 is a cross-sectional view through a building panel,

Figure 2 is a cross-sectional view through another building panel,

Figure 3 is a cross-sectional view showing the component parts used to make up the building panel of Figure 2,

Figure 4 shows various building panels in isometric view,

Figure 5 shows various building panels in isometric view,

Figure 6 shows various building panels in isometric view,

Figure 7 shows various building panels in end view,

Figure 8 shows various building panels in end view,

Figure 9 shows a wall element using some of the previously mentioned building panels,

Figure 10 shows a wall element using some of the building panels previously referred to,

Figure 11 shows joiner members which can be used in certain

circumstances,

Figure 12 shows a wall element comprised of certain of the previously referred to building panels,

Figure 13 shows a wall element comprised of various of the previously shown building panels,

Figure 14 shows a wall element comprised of various of the previously shown building panels,

Figure 15 shows a wall element comprised of various of the previously shown building panels,

Figure 16 shows alternative building panels,

Figure 17 shows alternative building panels in these instances with internal webs having apertures,

Figure 18 shows various building panels,

Figure 19 shows another building panel,

Figure 20 shows various building panels,

Figure 21 shows elements used to make up a building panel,

Figure 22 is a drawing of components for another building element,

Figure 23 is a drawing of the components of Figure 22 in assembled form,

Figure 24 shows a wall cross-section,

Figure 25 shows a floor section with one side omitted,

Figure 26 shows a floor panel with all sides intact, and

Figure 27 shows further sections.

INTEGER LIST

1. Building panel
2. Outer sheath
3. Core
4. Panel portion a - j
6. Panel portion k - n
7. First face
8. Second face
9. First edge
21. Second edge
22. Tongue
23. Groove
26. Building panel
27. Component
28. Component
31. Panel
32. First end
33. Second end

DETAILED DESCRIPTION WITH RESPECT TO THE DRAWINGS

In Figure 1 is shown a building panel 1 which comprises an outer sheath 2 and a core 3.

The outer sheath 2 is made of metal in a preferred form although other materials may be used.

The core 3 is made of lightweight concrete in a preferred form although other materials can be used.

The building panel 1 comprises a panel portion 4 which extends from a - j and a panel portion 6 which extends from

k - n.

The panel portions 4 and 6 are crimped together so as to make a whole.

The building panel 1 has a first face 7 and a second face 8.

The building panel 1 also has a first edge 9 and a second edge 21.

The edges are so formed as to define a tongue 22 and a groove 23.

When another such panel as is shown in Figure 1 is brought into juxtaposition with the building panel 1 the appropriate tongue can enter into the appropriate groove and will result in a strong construction.

Further, the thickness of the outer sheath is so chosen that desirably the cores of the two building panels are not more than 1mm spaced from one another. This should give superior fire resistance.

As a consequence, the building panel 1 is of strong construction and is suitable for extensive use in the building industry for forming walls, floors, roofs, and other components of a building.

As will be observed, the building panel 1 is comprised of two components only being the panel portion 4 and panel portion 6.

The building panel 26 shown in Figure 2 comprises four components 28 and 29 but it is to be noticed that two of the components, 28 are identical one to the other and the other two components 27 are also identical to one another.

Building panels in accordance with this invention can take many sizes shapes and form some of which are illustrated in Figure 6 and others are illustrated in Figures 7 and 8.

Referring to the items 27, 28 and 29 in Figure 8, these are of substantial size and may be used for load bearing.

Various walls or other structures may be made from the building panels of this invention and some of these are illustrated in Figures 9 and 10.

For the purposes of capping upper ends or ends of sheets constructed from a number of building panels, there may be used various finishing members such as is shown in Figure 11.

Figure 12, 13, 14 and 15 show other constructions that can be made.

Figure 16 shows yet further forms of building panels in which the tongue, at least, is apertured so that the core material may be brought into close contact with an adjacent building panel.

Figure 17 also shows building panels wherein there are intermediate webs which are apertured.

Figure 18 shows constructions similar to Figure 17.

Figure 19 shows a panel 31 having a first end 32 and a second end 33.

In this instance the first end 32 and the second end 33 are so shaped as to enable the panel to be joined end to end with a light panel or to make right angle intersections with a light panel.

Figure 20 still further shows building panels in this instance having internal cores or webs to provide strength.

Figure 21 shows a still further building panel in which the edges are apertured.

Figure 22 is a drawing of components for another building element.

The sheathing used in the building panel of the present invention is preferably about 0.5mm thick although thicker or thinner may be used.

The building panels of the present invention are excellent in constructing buildings and tend to be self bracing particularly when components extend at right angles to other components.

The building panels also have excellent strength in that the outer sheathing provides the tensile strength while the inner core provides compressive strength and due to the continuous nature of the outer sheath, this product thus allows a composite action while not requiring to adhere to each other.

Due to the particular construction and the substantial absence of substantial air gaps, the building panels are expected to have a high fire rating.

Further, in those instances in which there are internal webs, it is anticipated that the fire rating will be even higher still.

The claims, illustrations, photographs and drawings, if any, form part of the disclosure of this specification as does the description, claims, illustrations, photographs and drawings of any associated provisional or parent

specification or of any priority document, if any, all of which are imported hereinto as part of the record hereof.

Finally it is to be understood that various alterations, modifications and/or additions may be incorporated into the various constructions and arrangements or parts without departing from the spirit and ambit of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A building element comprising

an outer sheath and an inner core,

the sheath being formed of a material having a greater tensile strength than compressive strength and the core having a greater compressive strength than tensile strength;

wherein the outer sheath is longitudinally extending and has a first face and a second face which are spaced apart, first and second edges and a first end and a second end,

wherein the first face and the second face are joined at the first and second edges to form the outer sheath as a continuous body, and

wherein the first edge and the second edge are so shaped that the first edge of one such building element is adapted to locate in the second edge of another such building element.

2. A building element as claimed in Claim 1, wherein the first end and the second end are so shaped that the first end of one such building element is adapted to engage with the second end of another such building element.

3. A building element as claimed in Claim 1 or Claim 2, wherein the sheath comprises at least two components which can interengage with one another to form the sheath.

4. A building element as claimed in any preceding claim,

wherein the sheath comprises four components.

5. A building element as claimed in Claim 4, wherein two components define the faces and two components define the edges.

6. A building element as claimed in any preceding claim, wherein the sheath is formed of mild steel, high tensile steel, carbon fibre materials, extruded materials, synthetic plastic - cement fibre composite and asbestos cement or modern replacement therefor.

7. A building element as claimed in any preceding claim, wherein the core is formed of a cementitious or plaster material.

8. A building element as claimed in any preceding claim, wherein the first face and the second face and/or the first edge and the second edge are joined by at least one web located intermediate of the edges.

9. A building element as claimed in Claim 8, wherein said at least one web is preferably apertured.

10. A building element comprising

an outer sheath and an inner core,

the sheath being formed of a material having a greater tensile strength than compressive strength and the core having a greater compressive strength than tensile strength;

wherein the outer sheath is longitudinally extending and has a first face and a second face which are spaced apart, first and second edges and a first end and a second end and

wherein the first edge and the second edge are so shaped that the first edge of one such building element is adapted to locate in the second edge of another such building element and wherein,

when so located, the core material of said one such panel is spaced not more than 3mm from the core material of said another panel.

11. A building element substantially as hereinbefore described with reference to any one of the accompanying drawings.

12. The steps, features, compositions and compounds referred to or indicated in the specification and/or claims of this application, individually or collectively, and any and all combinations or any two or more of said steps or features.

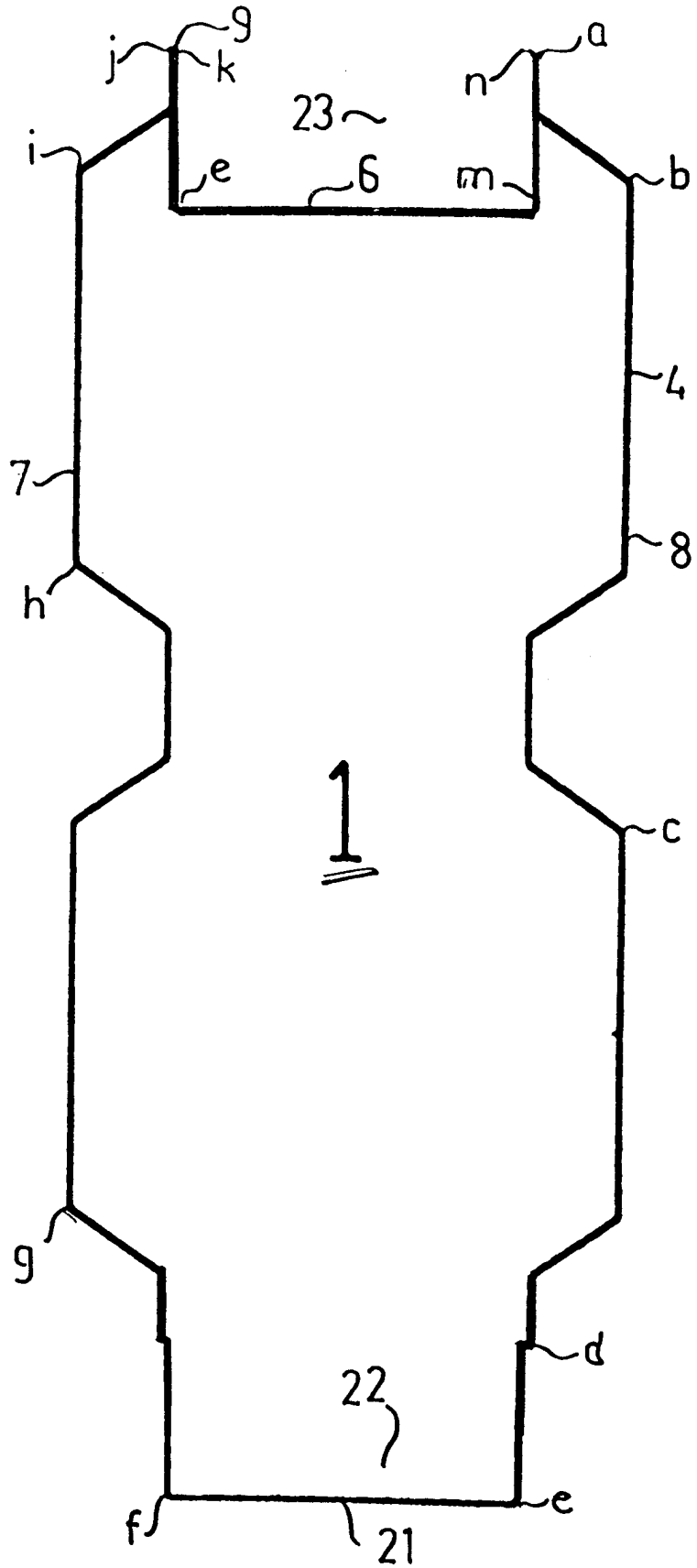
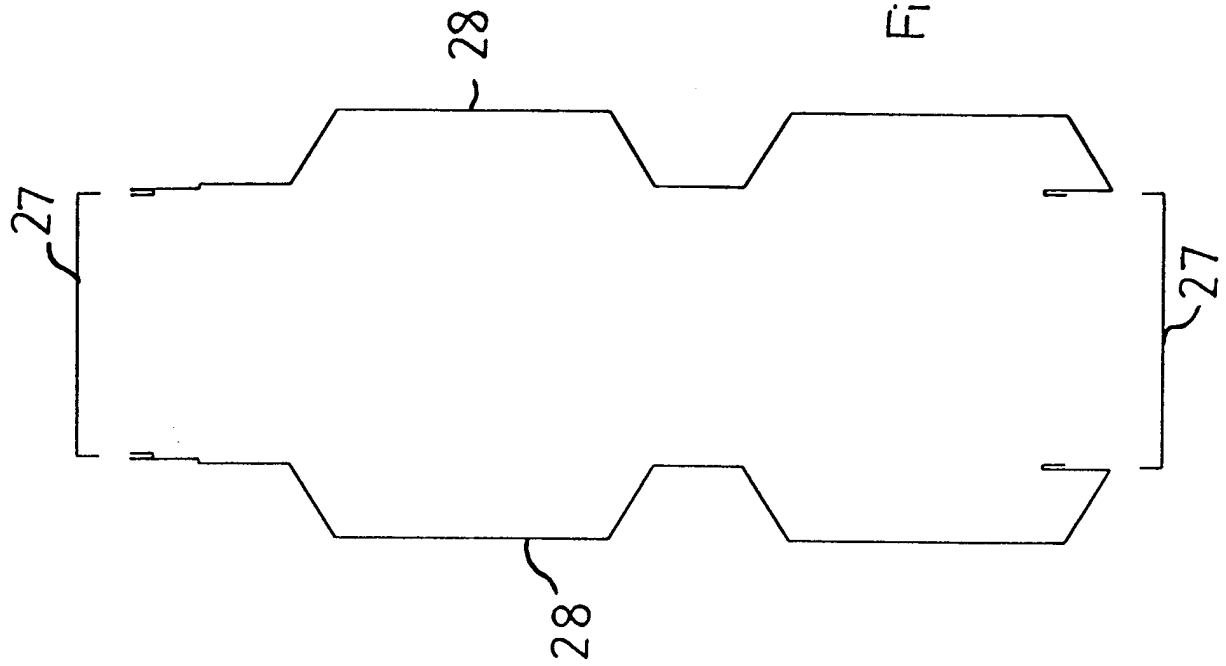


Fig 1

Fig 3



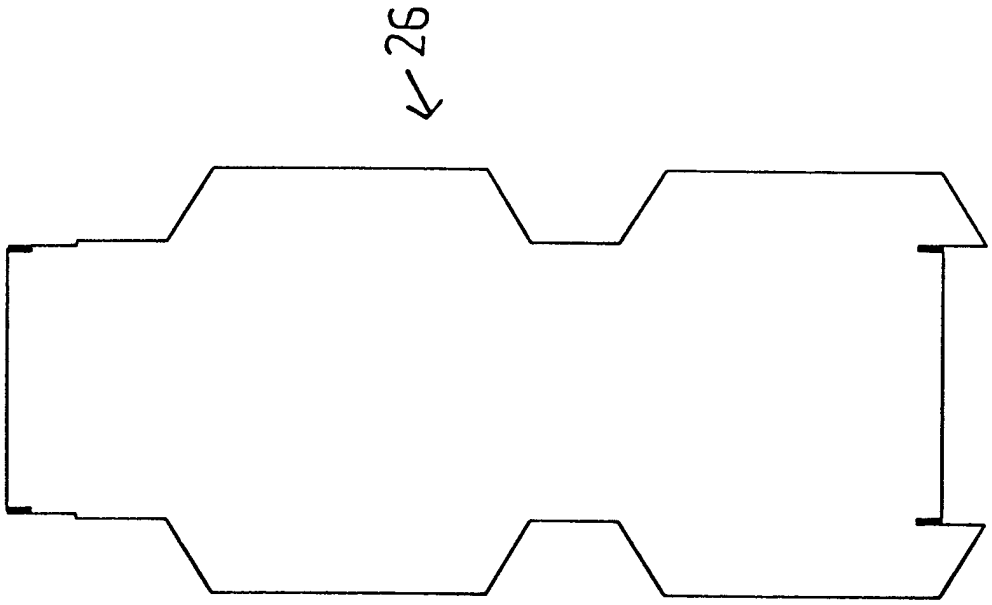


Fig 2

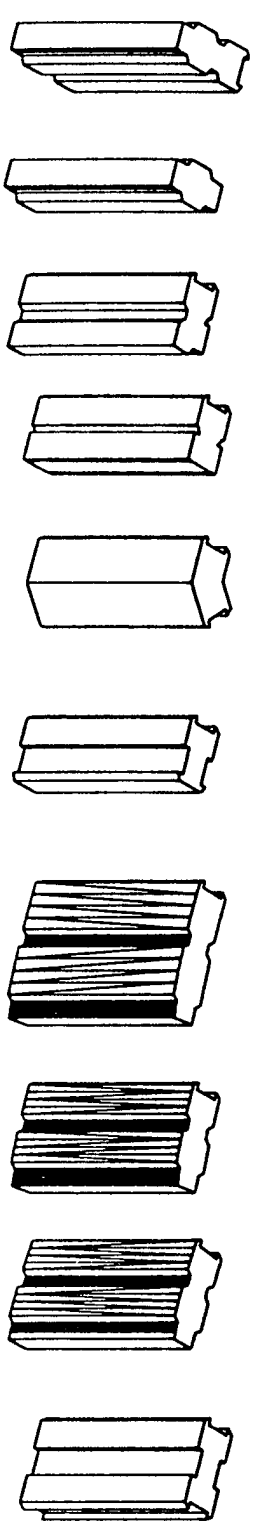


Fig 4

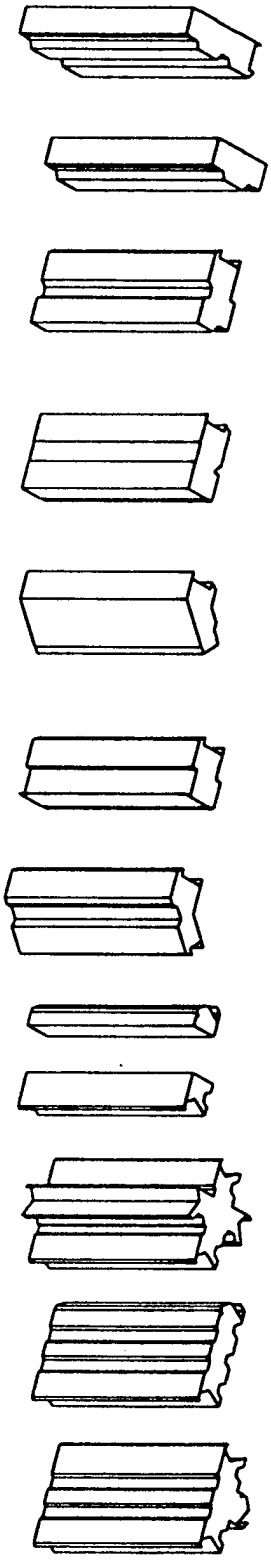


Fig 5

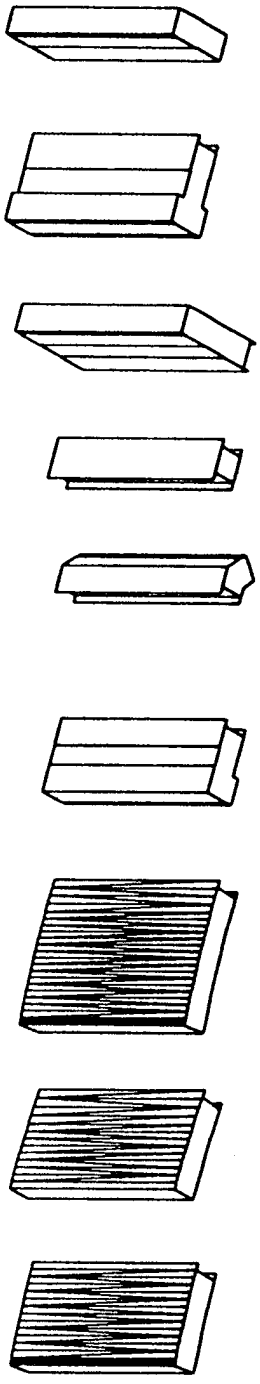


Fig 6

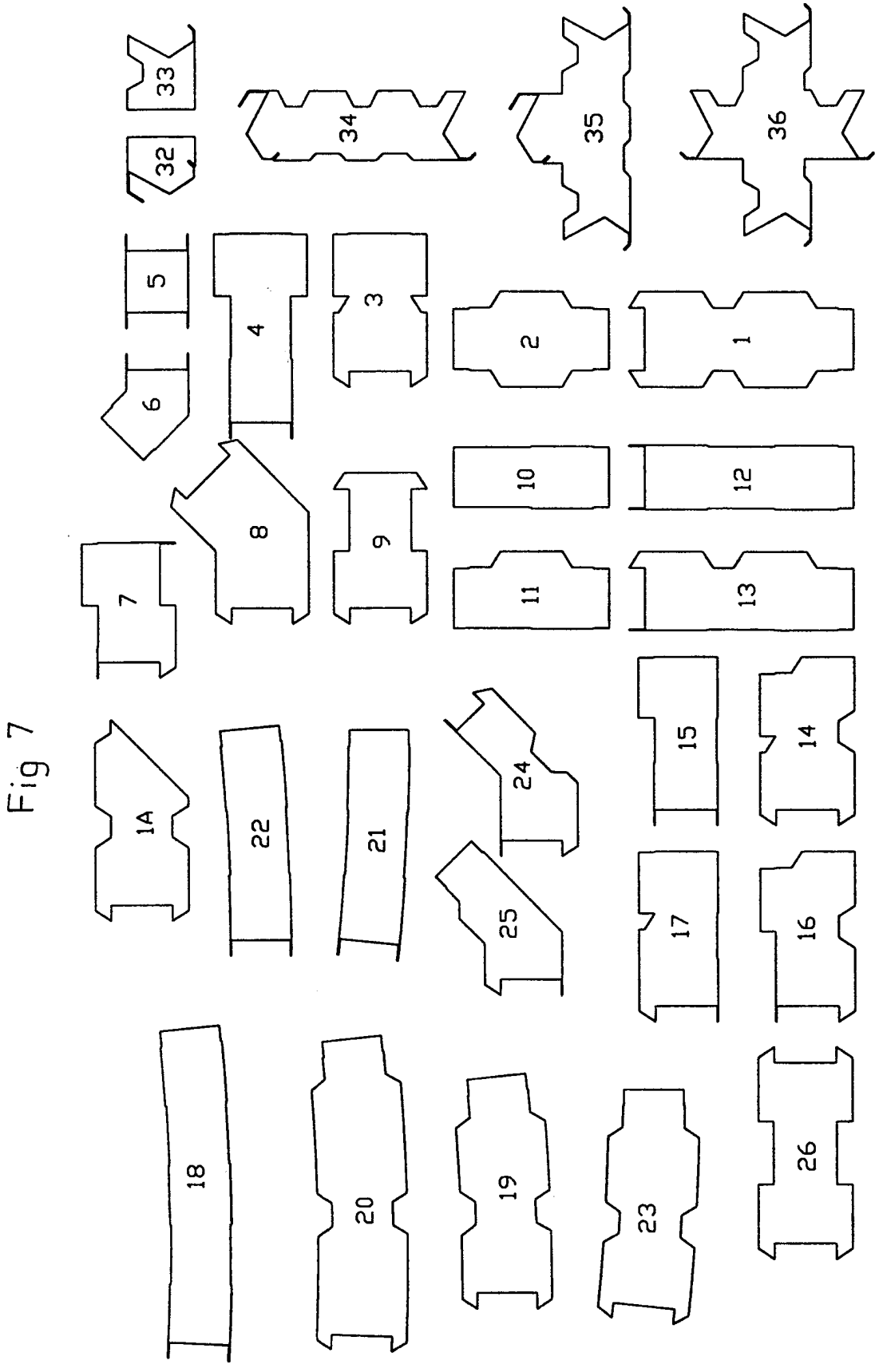
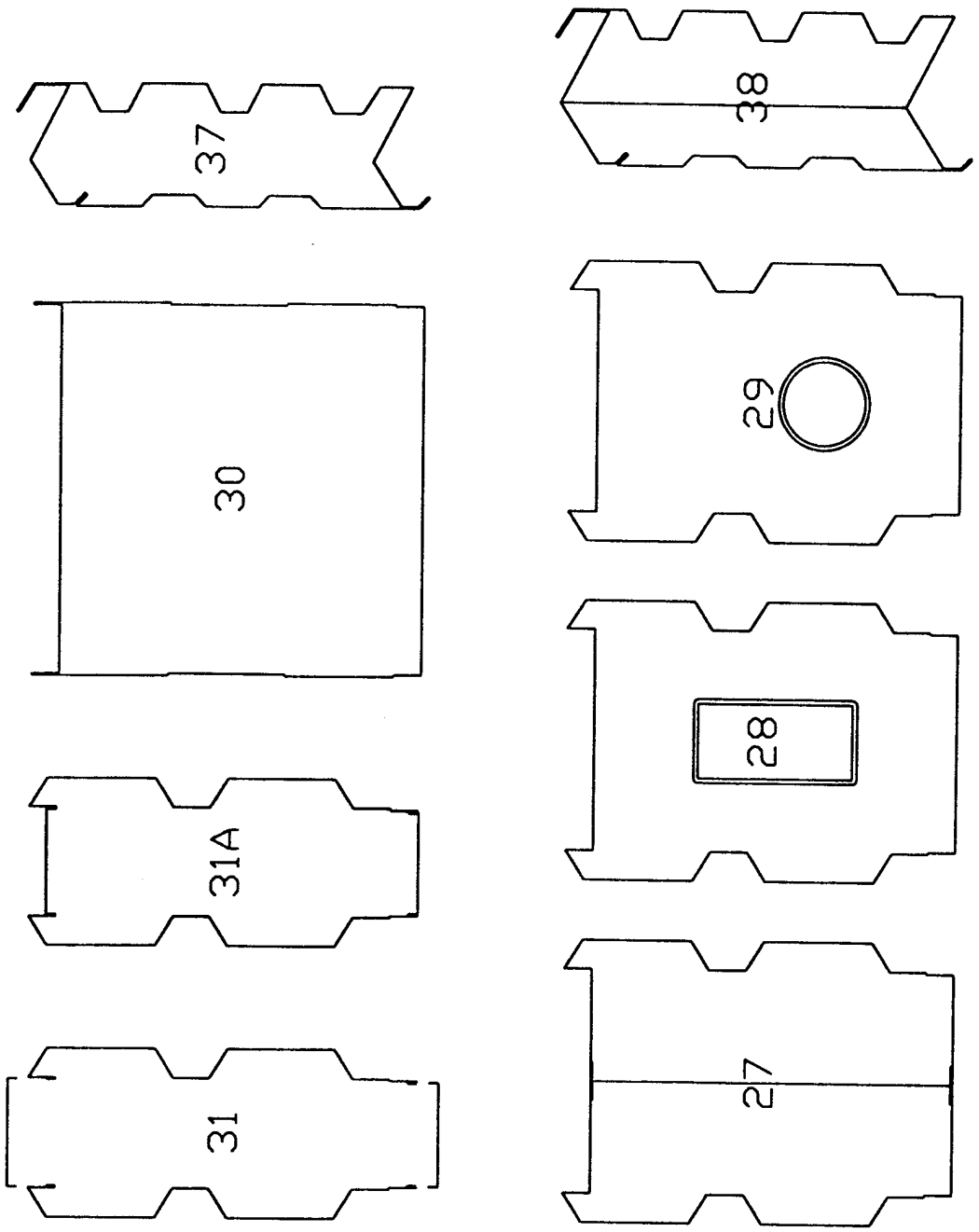

33
32
34
35
36
5
4
3
2
1
6
10
12
8
9
7
11
13
15
14
1A
22
21
24
17
16
25
18
20
19
23
26

Fig 7

Fig 8



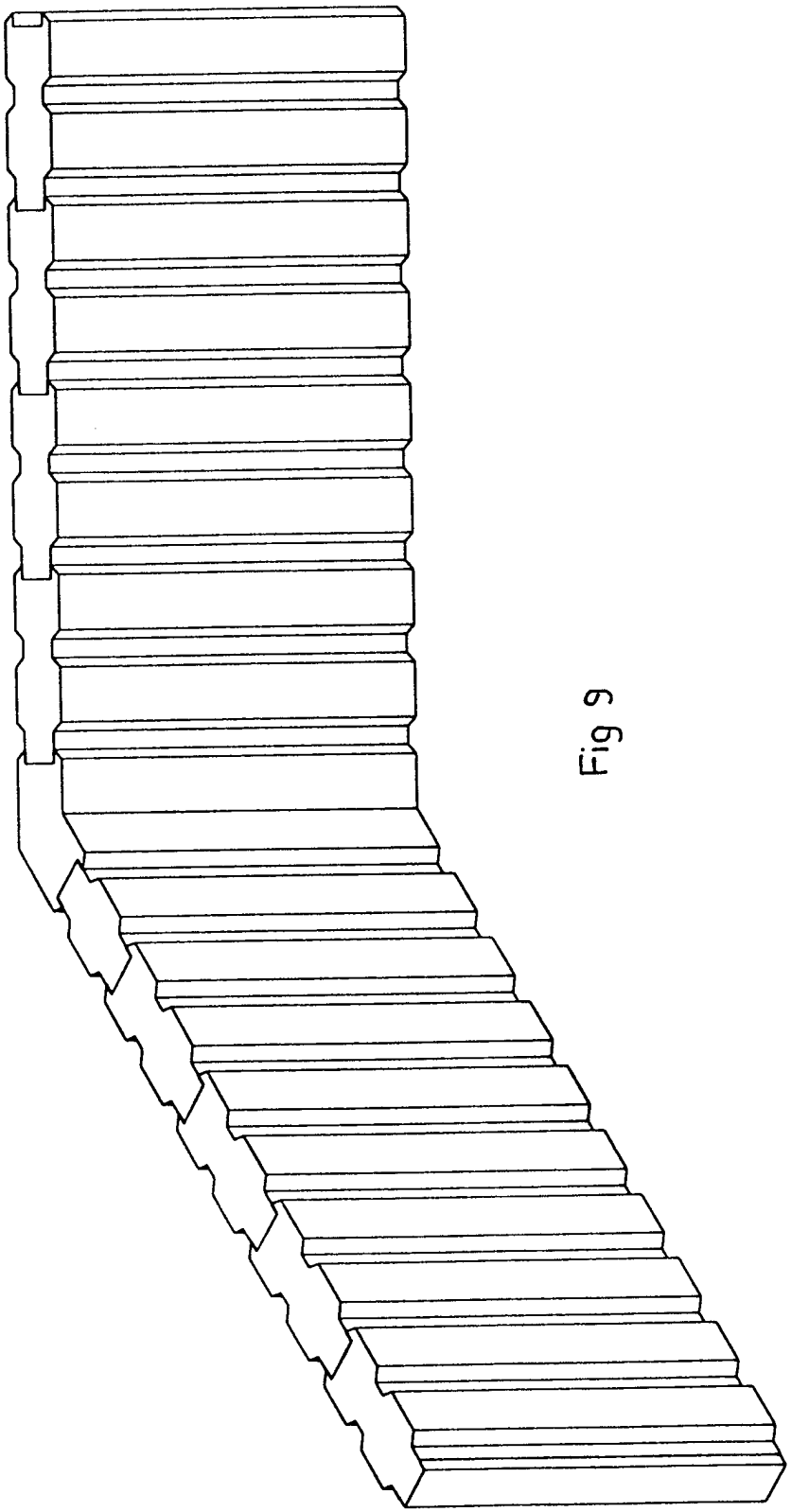


Fig 9

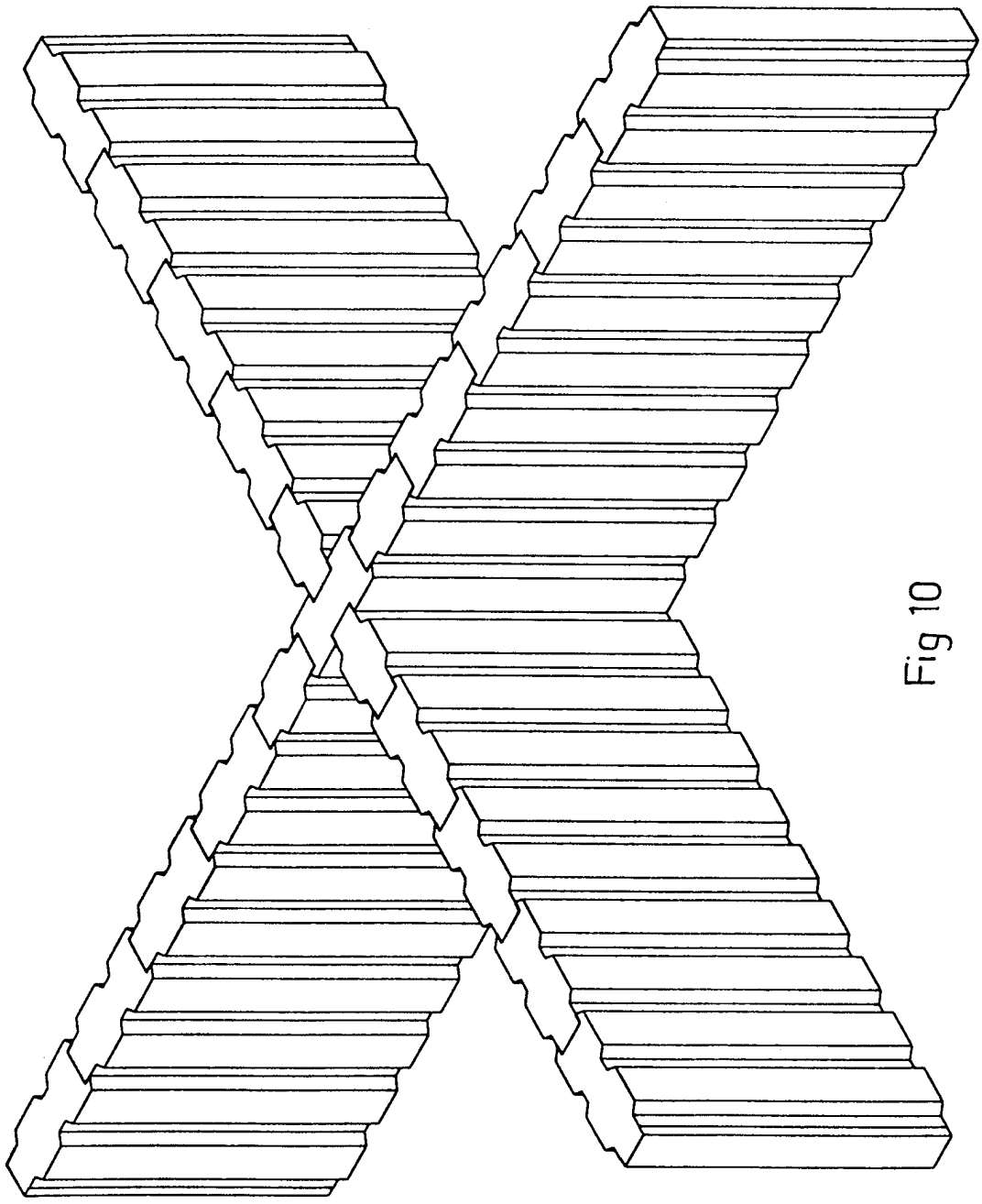


Fig 10

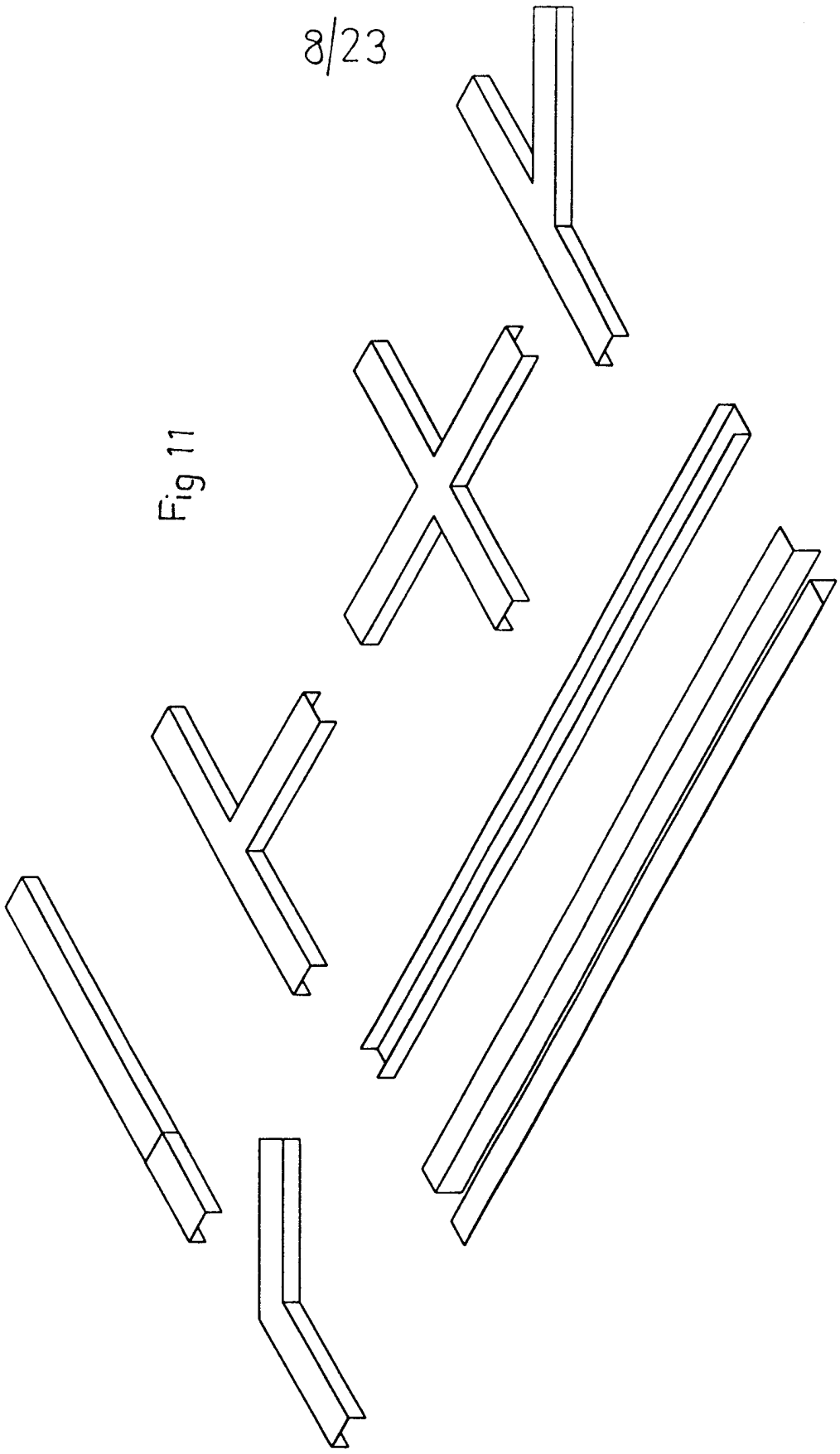


Fig 11

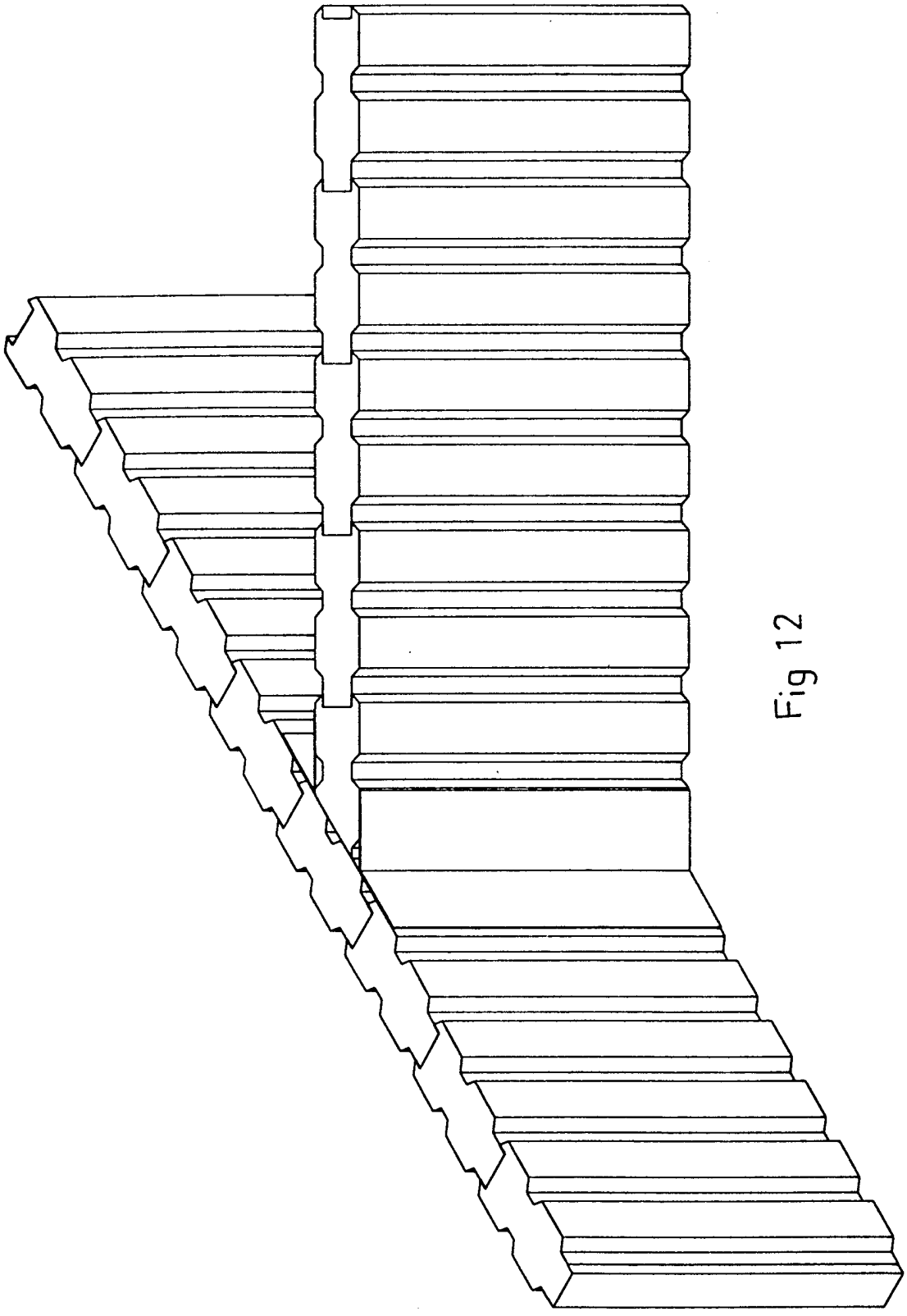


Fig 12

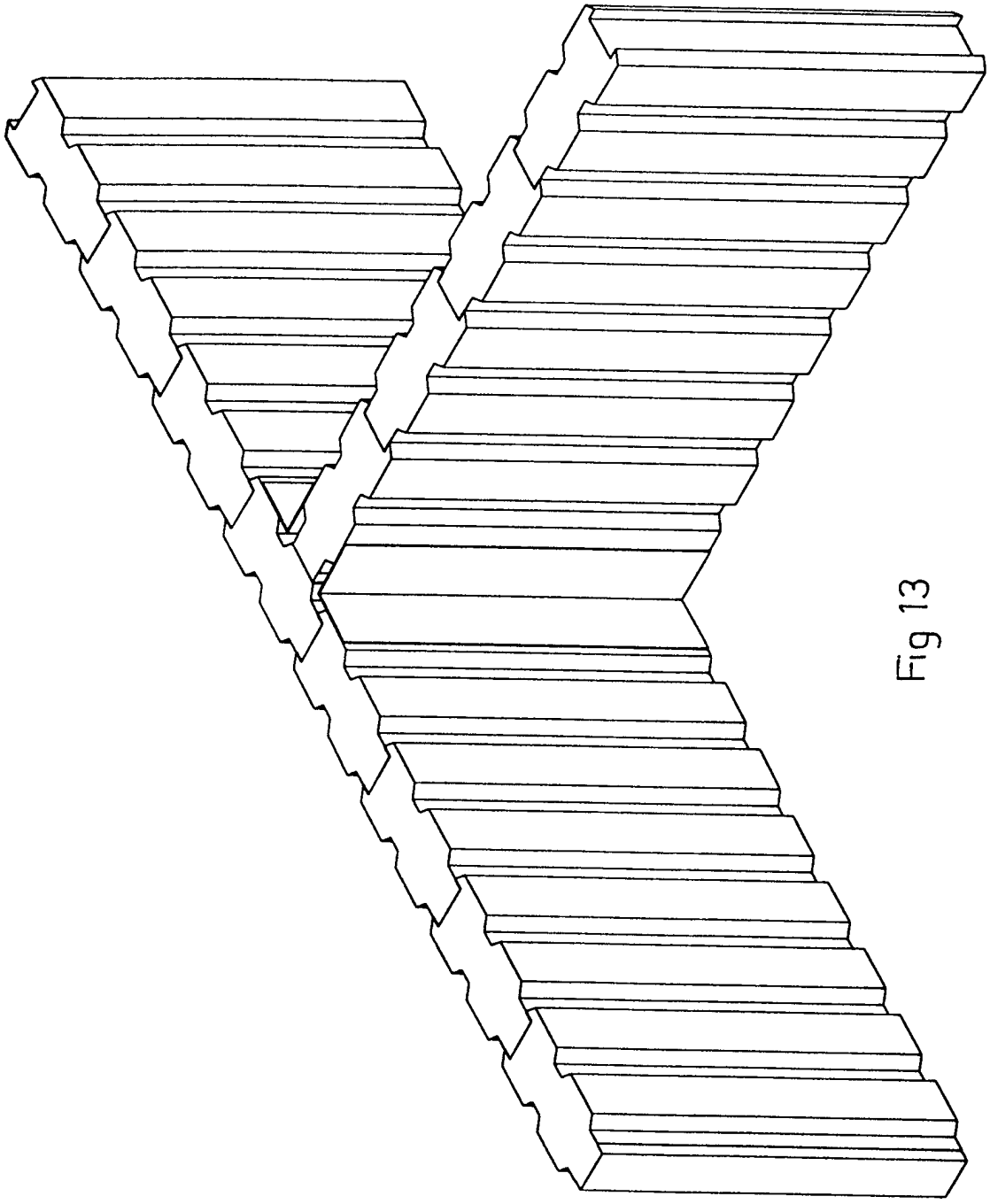


Fig 13

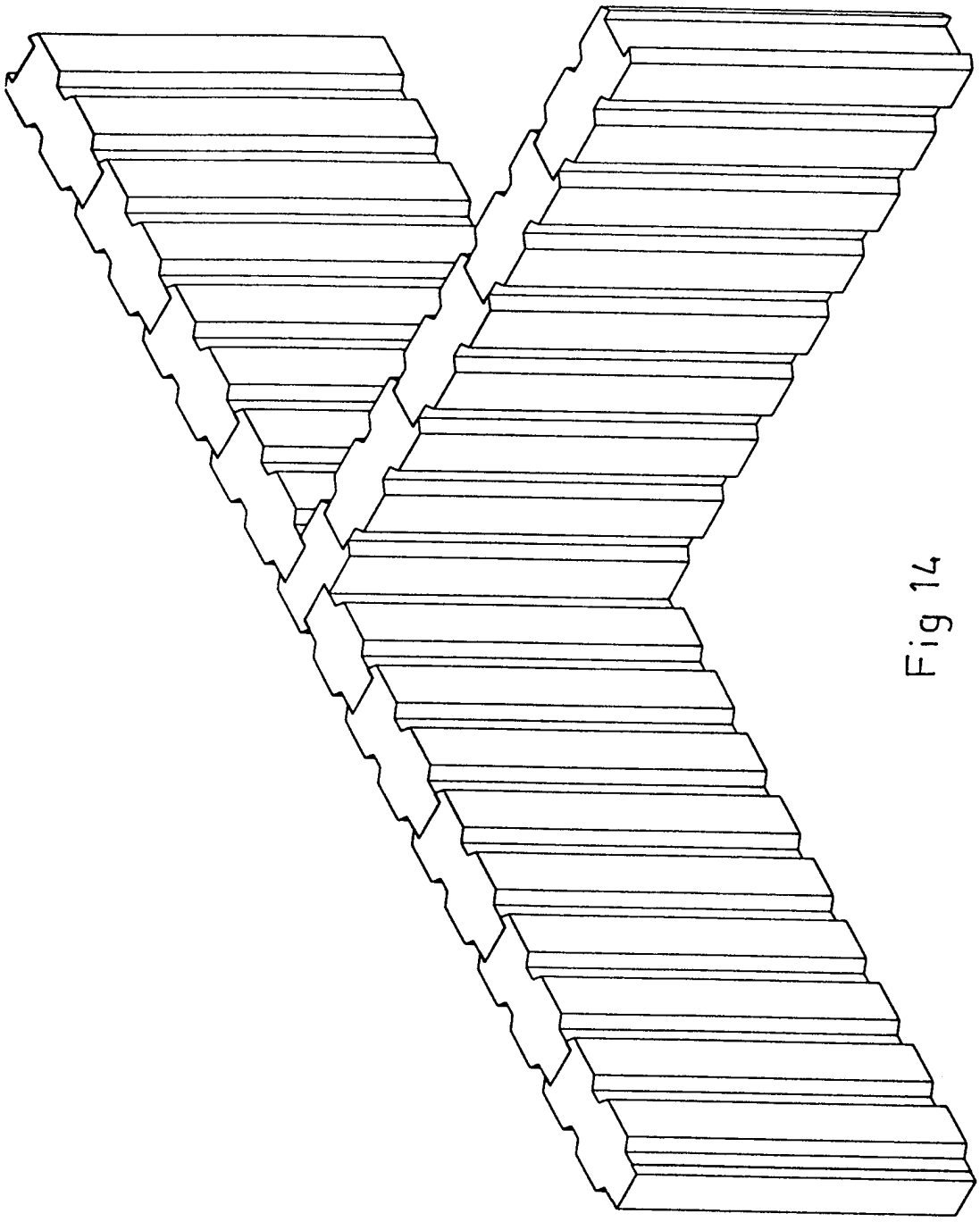


Fig 14

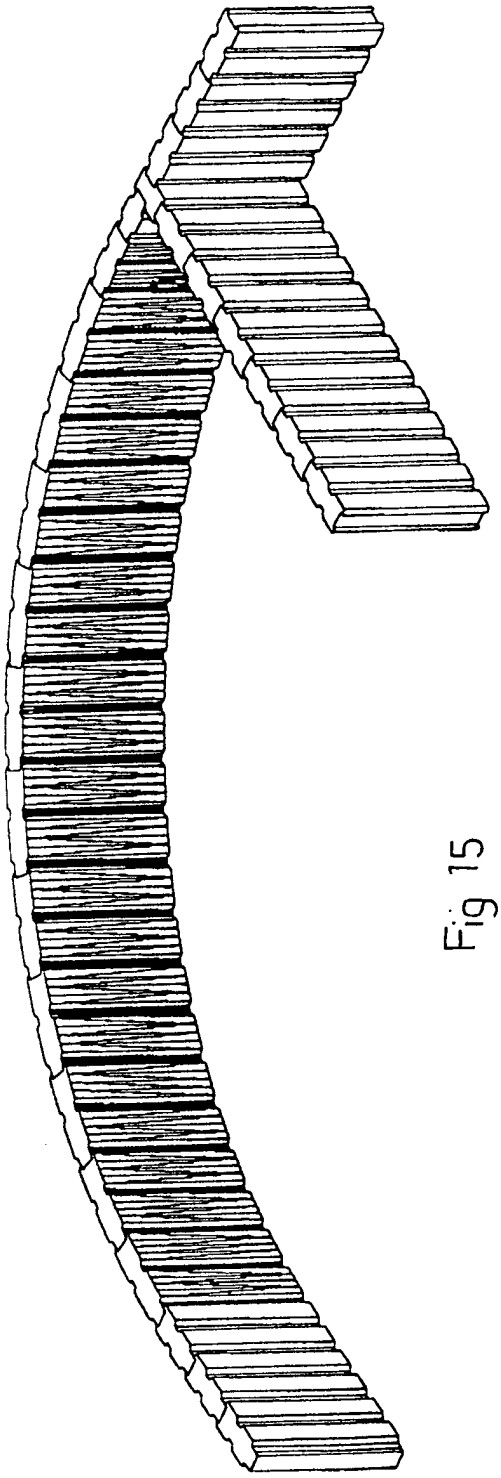


Fig 15

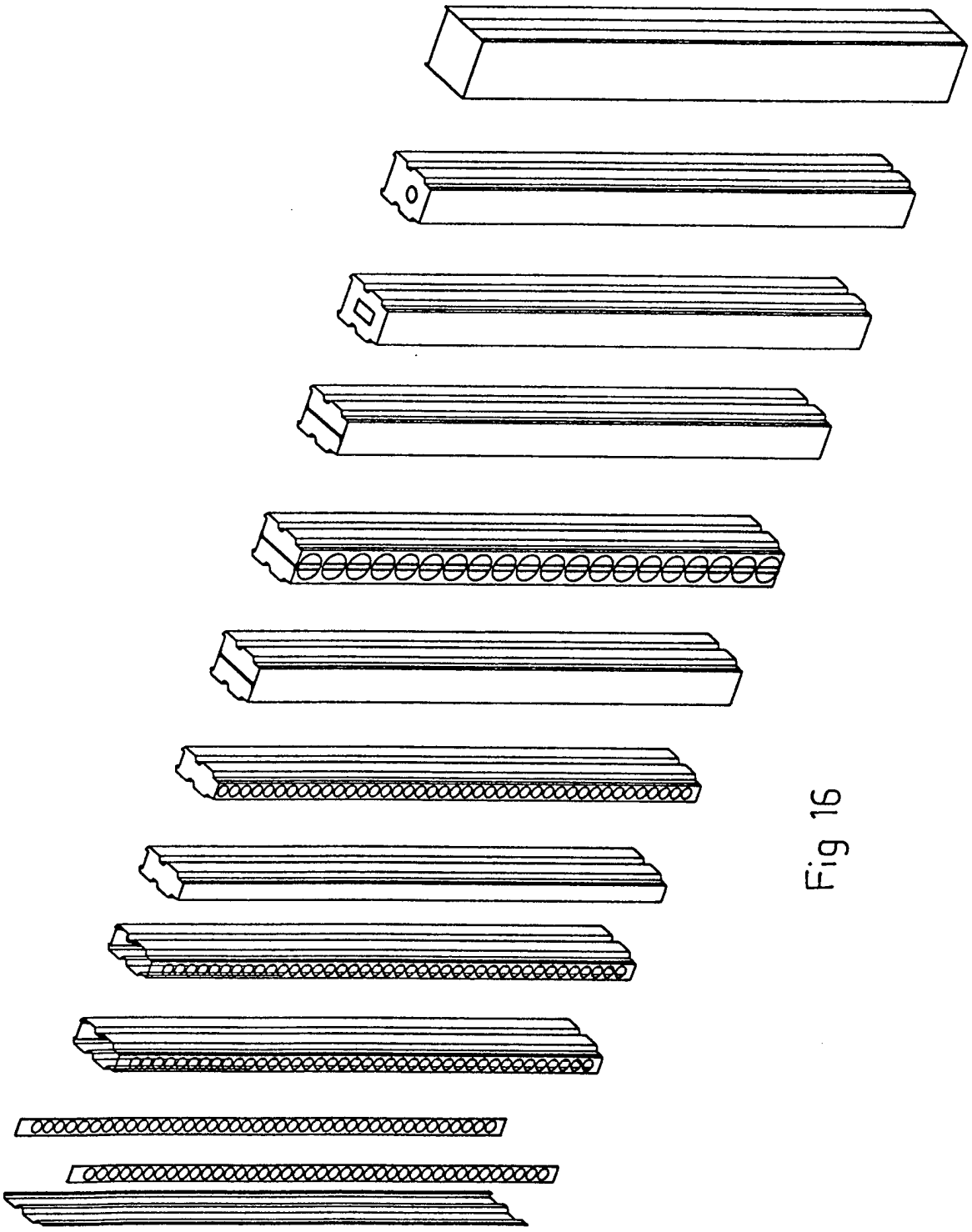


Fig 16

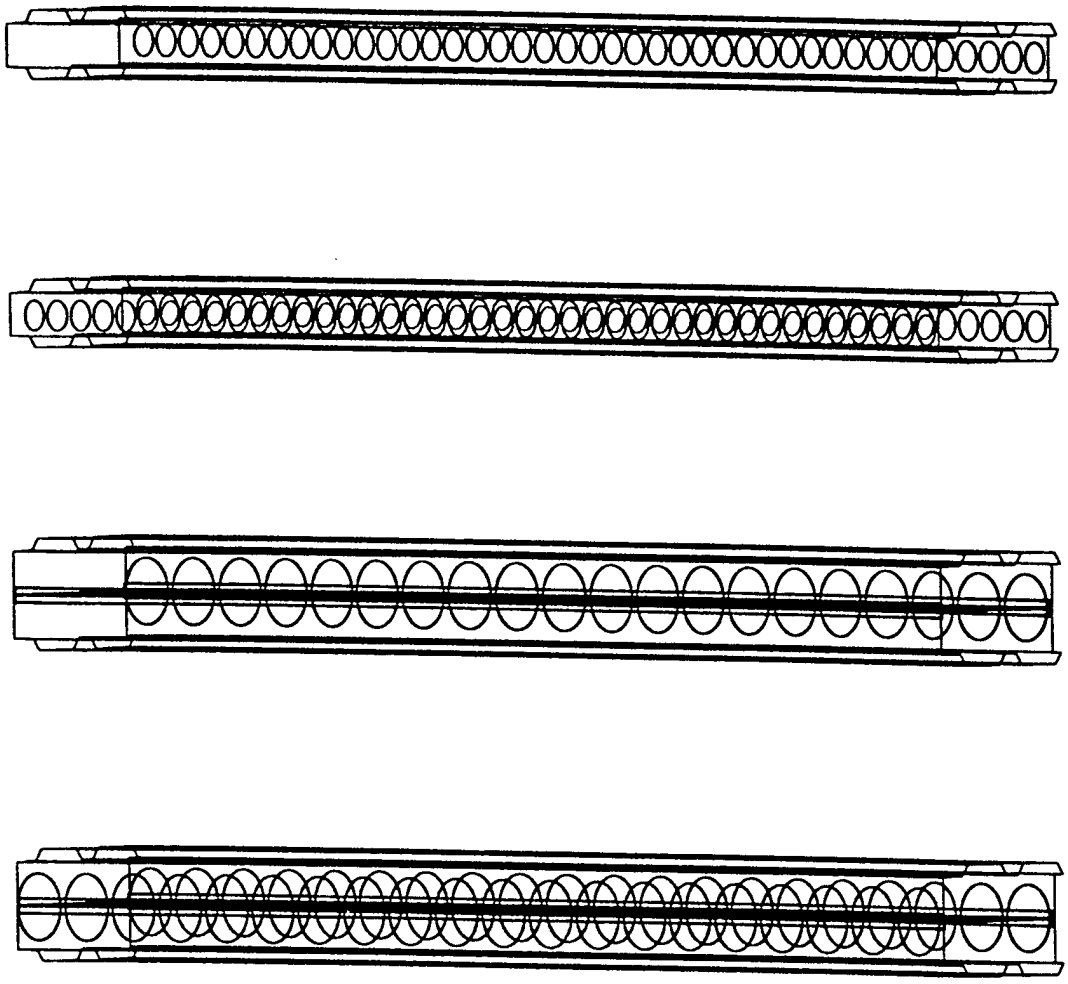


Fig 17

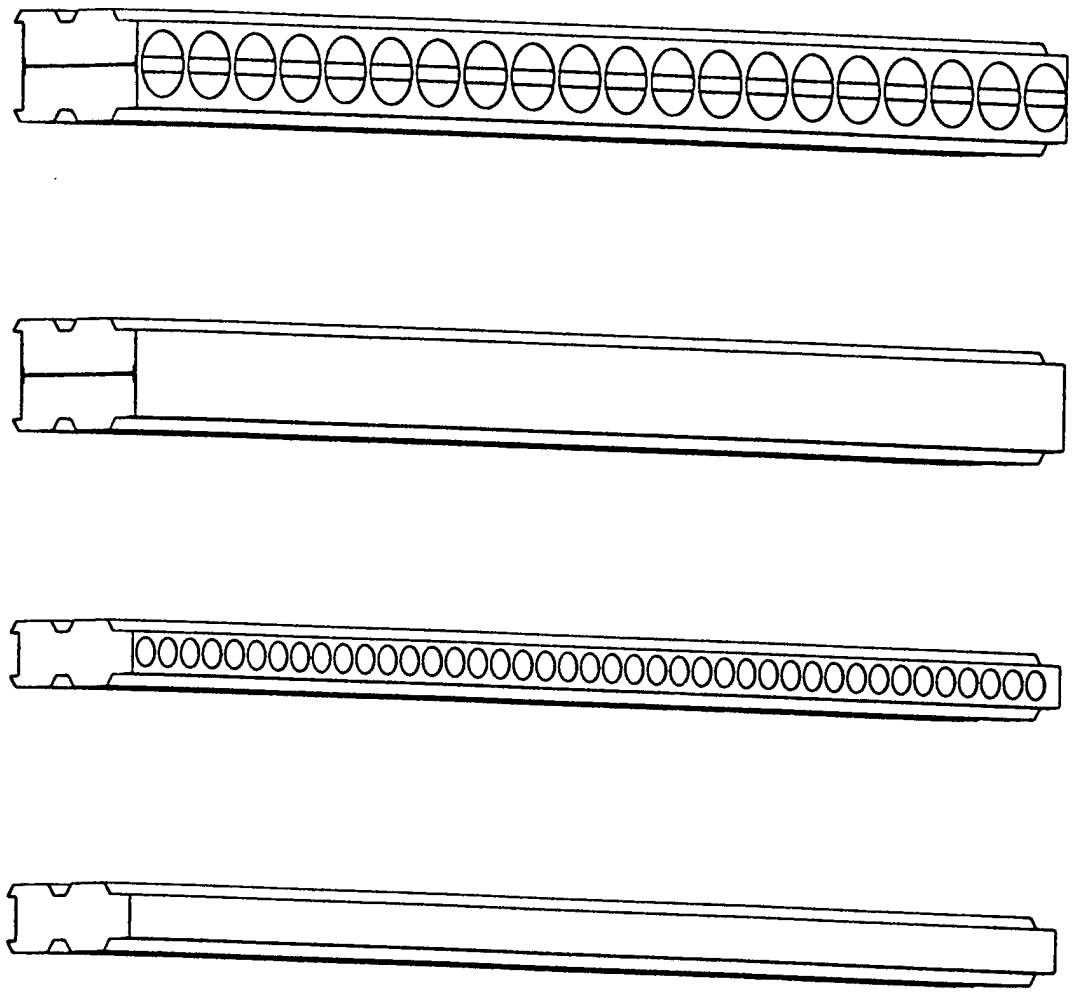


Fig 18

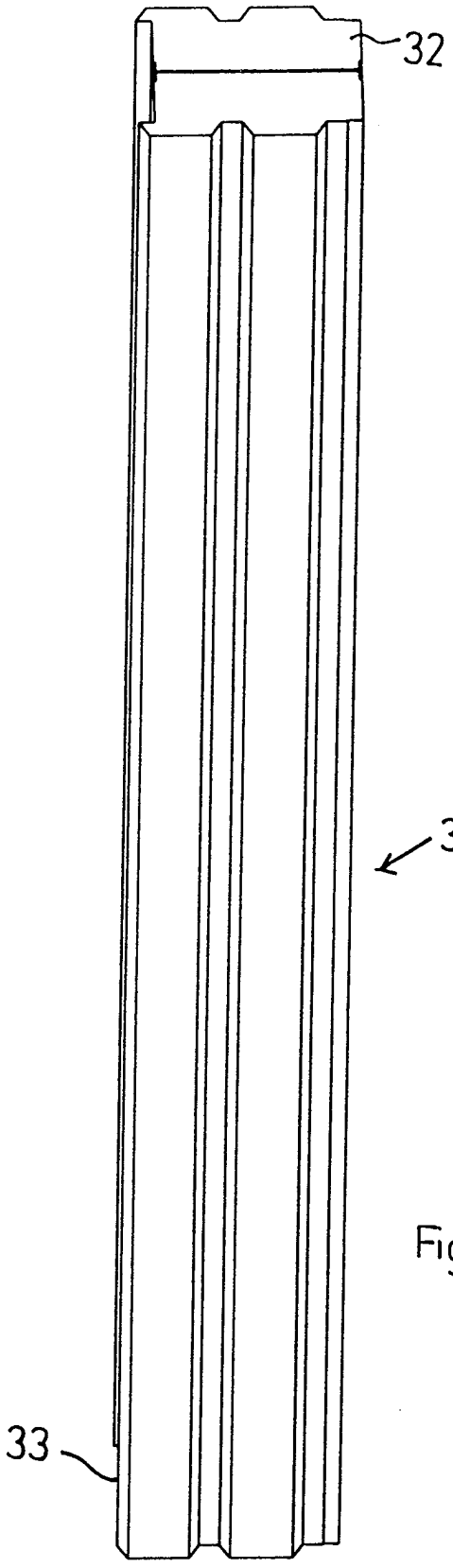


Fig 19

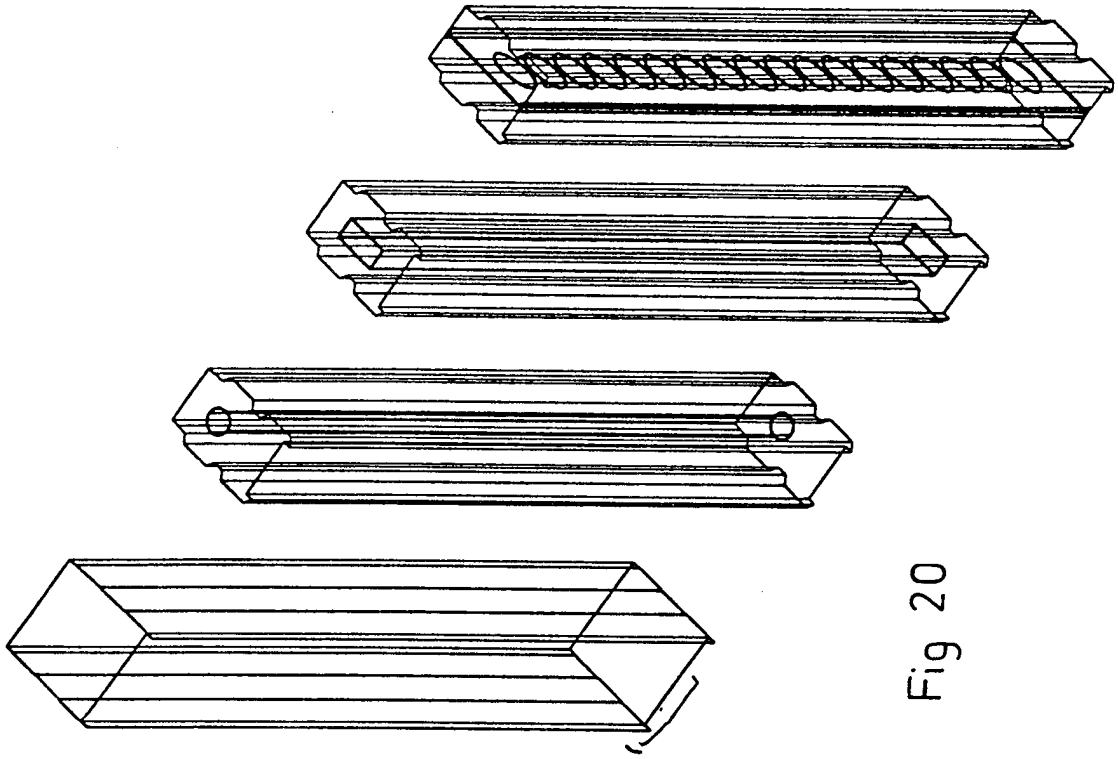


Fig 20

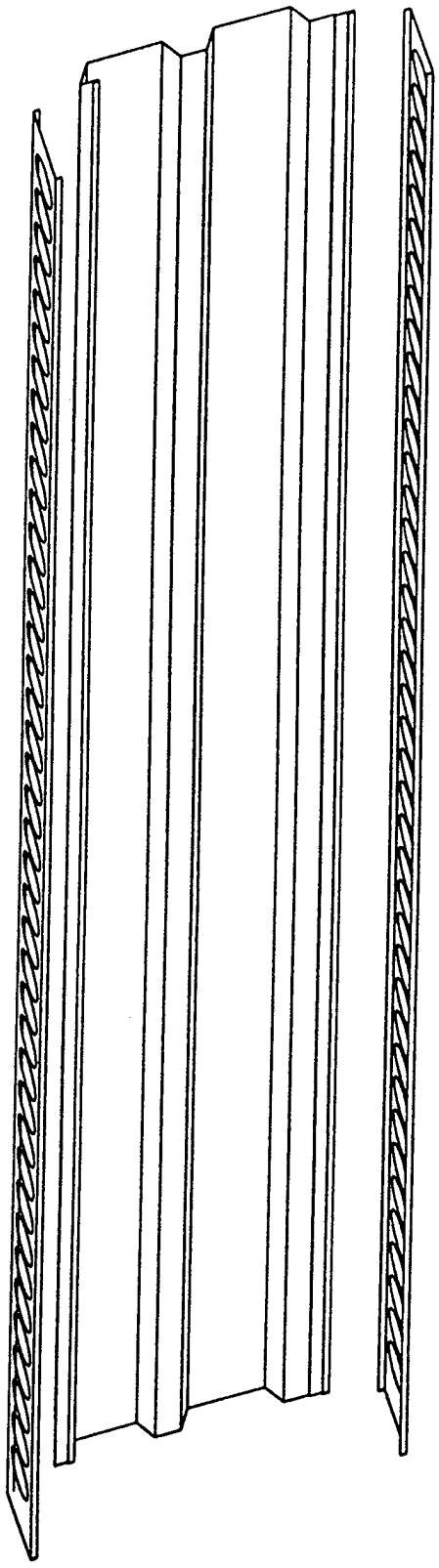


Fig 21

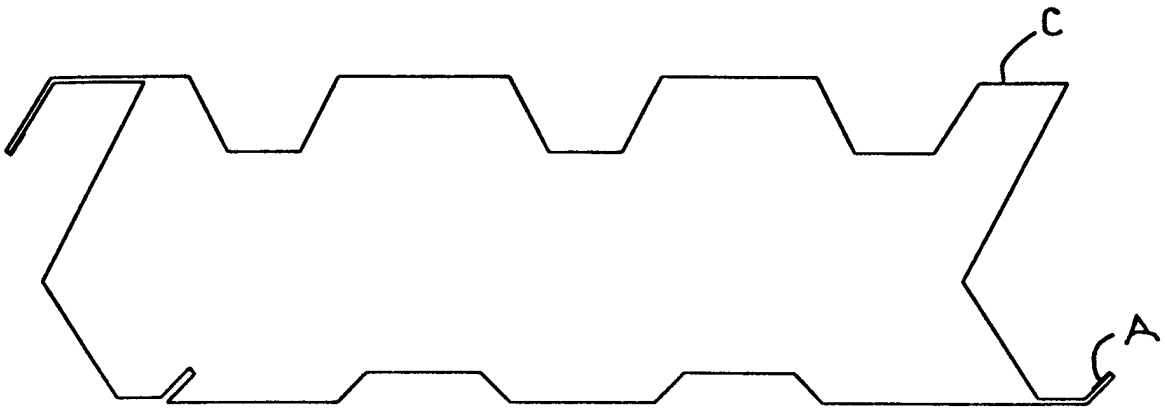


Fig 23

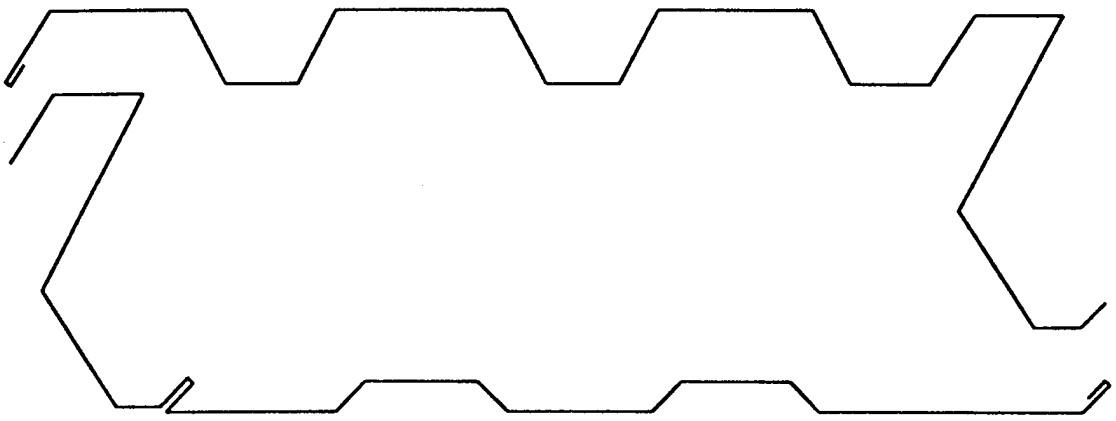


Fig 22

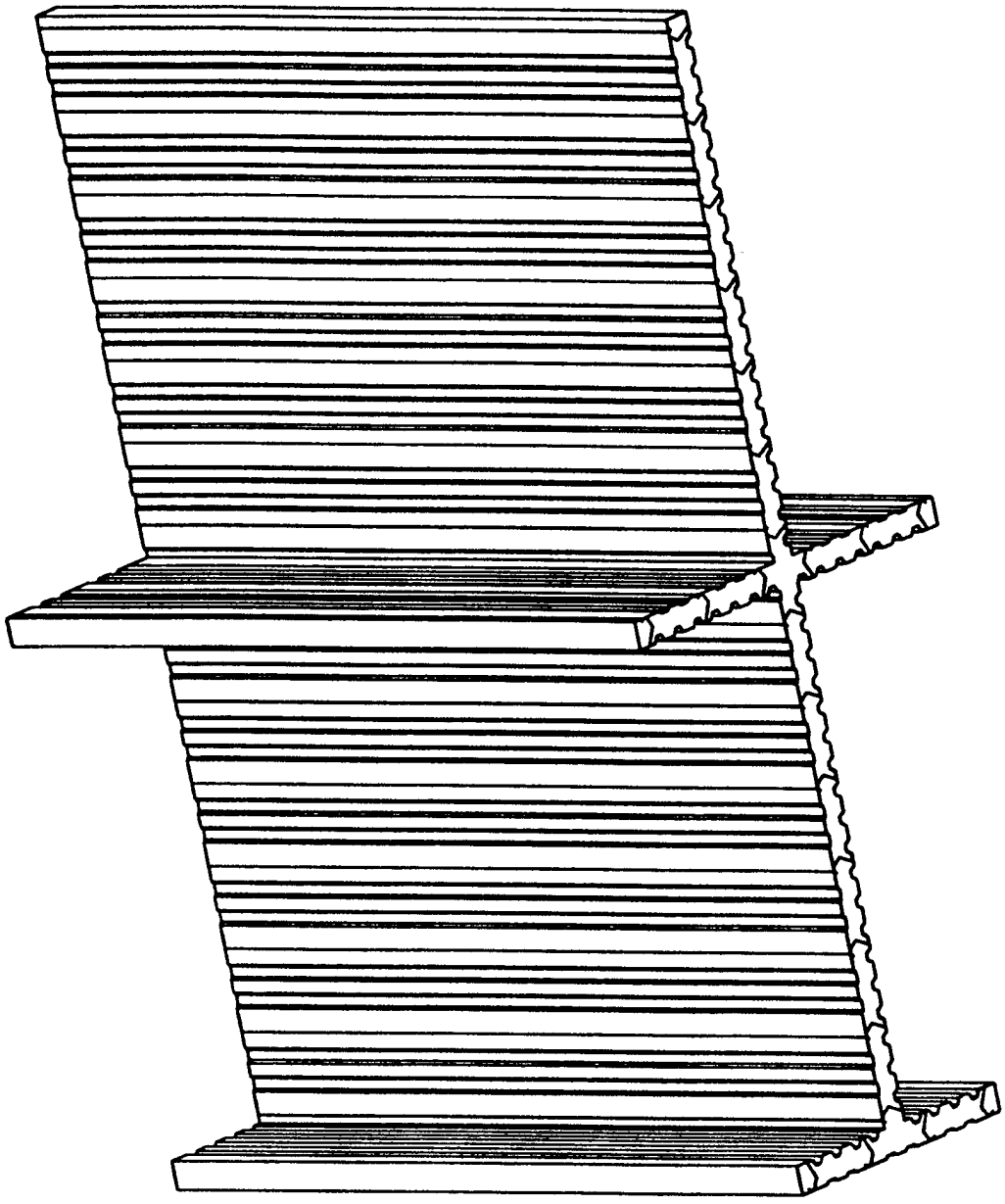


Fig 24

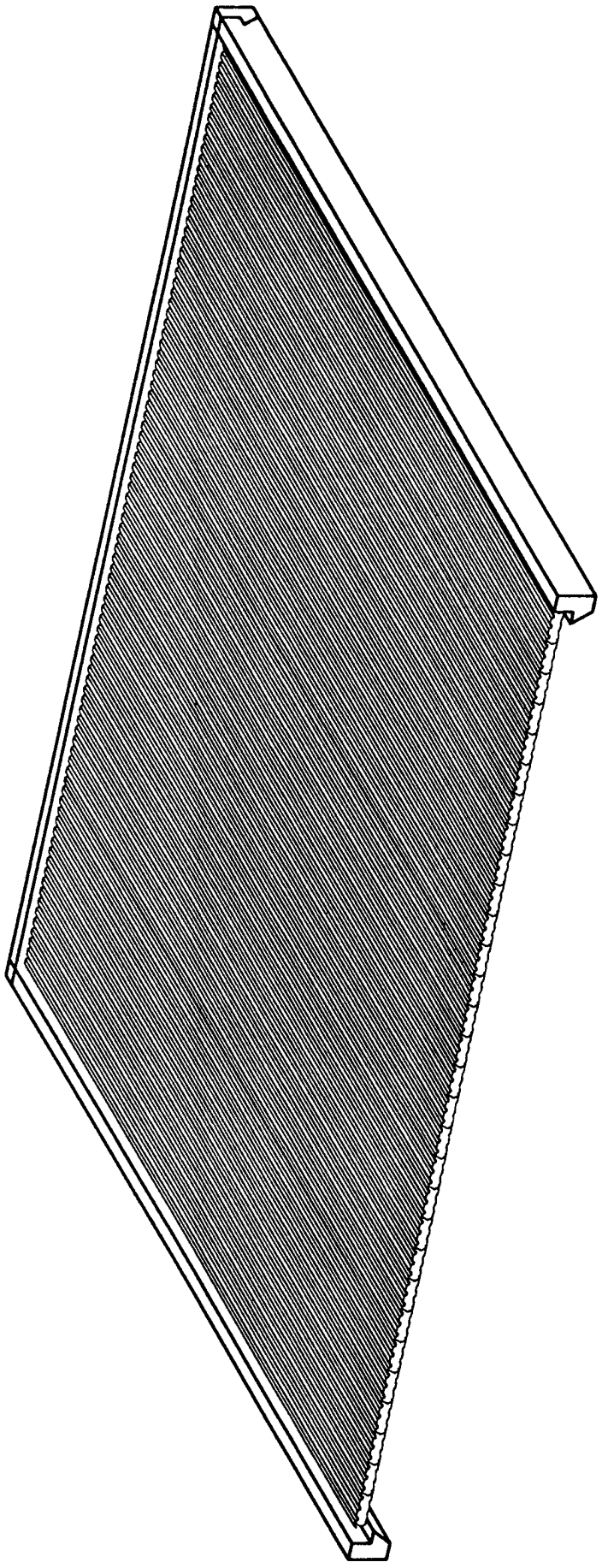


Fig. 25

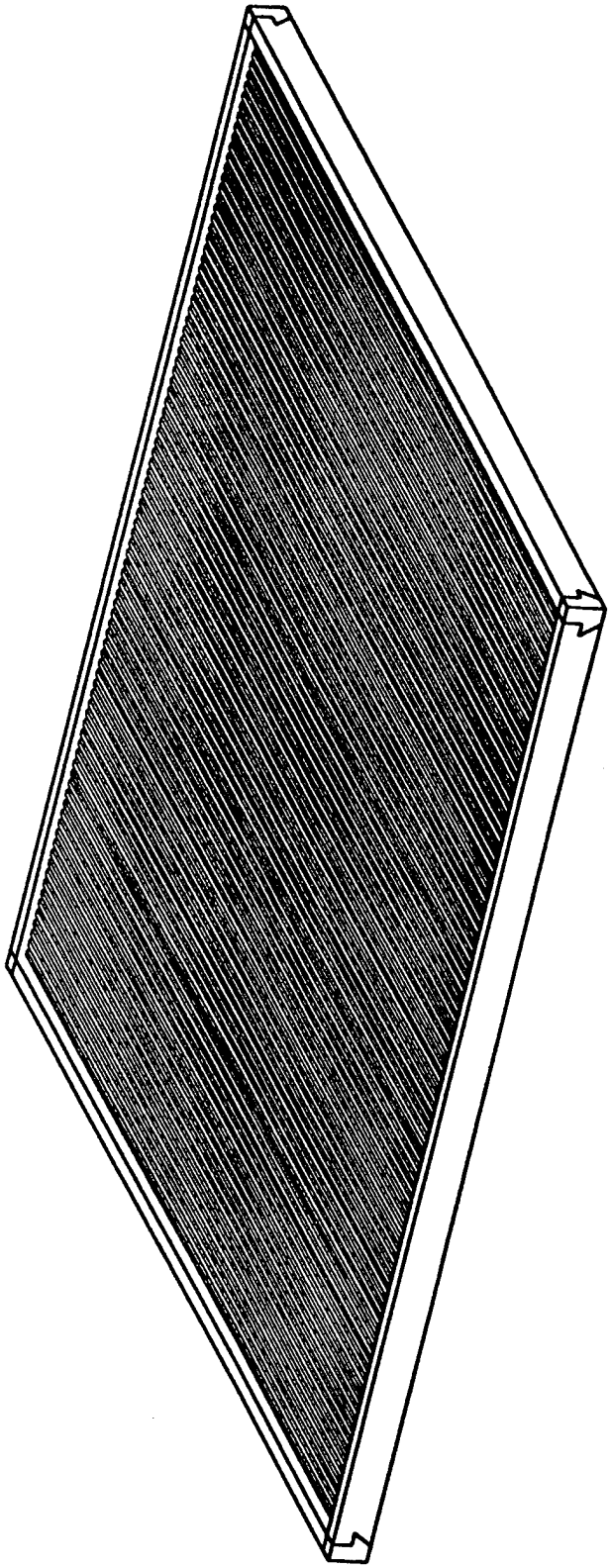


Fig 26

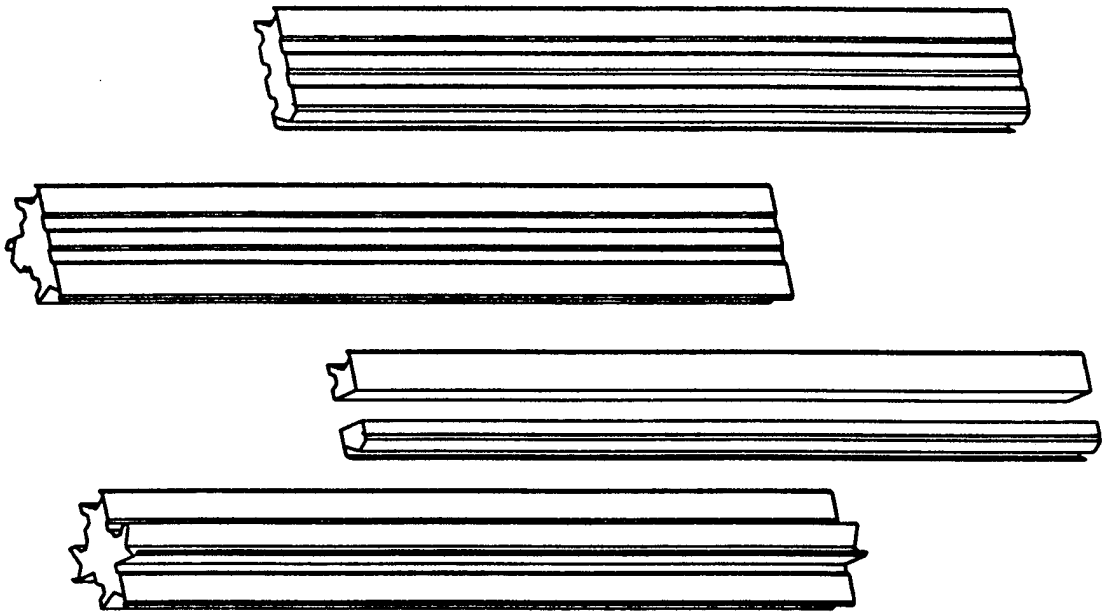


Fig 27

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00806

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: E04B 2/72, 5/02; E04C 2/38

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: E04B E04C

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)
WPAT, JAPIO with wall:, floor:, roof:, element#, block#, panel#, slab#, shape#, complement:, interlock:, interengag:, match:, sheath:, web:, layer:, sheet:, shell#, cover:, core#, fill:

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96/04441 A (SICO INCORPORATED) 15 February 1996 page 5 line 9 to page 6 line 17	1-6, 8
X	US 3913292 A (BRAEKKAN) 21 October 1975 whole document	1-10
X	FR 2221024 A (JOSSERAND) 4 October 1974 figures 1 and 2, abstract	1-3, 6-10

[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 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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 January 1998	04 FEB 1998
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 **ROSS BURDON** Telephone No.: (02) 6283 2605

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00806

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2623228 A (FAIVRE) 19 May 1989 figures 2 and 3, abstract	1-3, 6-8, 10
X	Derwent Abstract Accession No. 96-373321/38, Class Q43, Q45, FR 2729988 A (ALUMAX COATED PROD SA) 2 August 1996 abstract	1-6, 8
X	DE 3417375 A (GELUNA) 14 November 1985 figures 1 and 2, abstract	1, 2, 8, 10
X	DE 4010920 A (TÜRENWERKE RIEXINGER GmbH) 20 December 1990 figures 1 and 2, abstract	1-3, 5, 6
A	US 5381638 (ANDERSSON) 17 January 1995 whole document	1-10

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00806

Box 1 Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: **11 and 12**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Claim 11 is not drafted in accordance with Rule 6.2(a) in that it relies on reference to the drawings, and claim 12 is not drafted in accordance with Rule 6.3(a) in that it is not defined in terms of the technical features of the invention.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 97/00806

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					
WO 96/04441	AU	31538/95	JP	08-100510		
DE 341375	AT	1350/85				
US 5381638	AU	11819/92	BR	9205518	CA	2101084
	EP	568587	FI	933287	NO	932617
	SE	9100188	WO	92/13151	SE	9102004

END OF ANNEX