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(72) Inventor: **Guerrasio, Antonio**

84086 Roccapiemonte (SA) (IT)

(74) Representative: **Cirillo, Gennaro**

c/o Studio Tecnico Cirillo

Via Santa Lucia 15

80132 Napoli (IT)

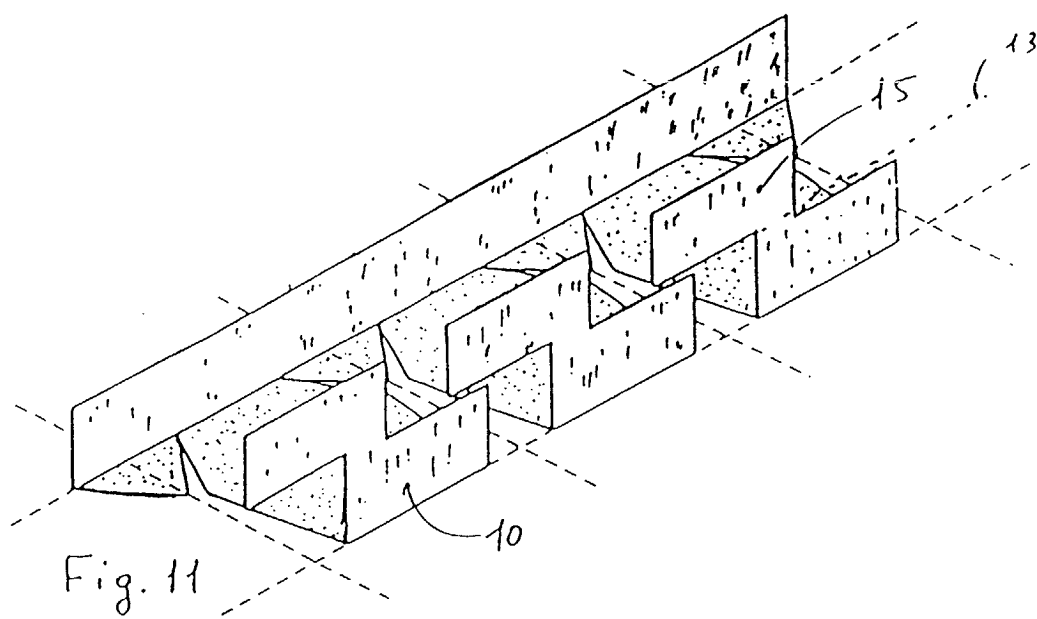
(71) Applicant: **Guerrasio, Antonio**

84086 Roccapiemonte (SA) (IT)

(54) **A method of manufacturing metal sections having a low degree of segmentation during manual bending and sections obtained therefrom**

(57) The invention relates to a method of manufacturing sections having a particular, novel shearing of a sheet, preferably a metal sheet, that allows sections which can be easily bent by hand to be provided in order to manufacture curved structural elements characterized in that they have a very reduced segmentation of the continuous non-sheared surface and that they can be stiffened without using weld material. The section has "Y"-shaped shearing and is provided with a certain pitch crosswise to the section so that the upper vertexes

of the "Y"-shape lie on the bending line of the non-sheared side. When the section is bent, the continuous non-sheared side is segmented at the contact points of the vertexes of the "Y"-shape. Therefore, under the same number of slotting, the section of the present invention has a greater segmentation, thus providing a more uniform bending. In addition, the curved section can also be self-stiffened because of the fastening of the bent and squashed extension tabs to the adjacent tabs of the sheared side only by punching.



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Description

[0001] In the field of inside finish using dry technology or metal sections to be coated by plaster-cardboard plates, linear rigid sections have been often cut manually to provide curved sections (e.g. for curved walls) even if flexible guide sections, so-called Vertebra, that can be easily bent by hand, have been available on the market for some years.

[0002] A cheaper but less effective alternative to Vertebra section is the use of sections having one continuous side, while the other side and the base are provided with triangular slots the apexes of which are positioned along the bending line of the continuous side, such slots being spaced apart by a pitch and positioned crosswise to the section.

[0003] Of course, the greater the apex angle, the more the removed material. Furthermore, the lower the pitch, the smaller the radius of the curved sections. On the contrary, even less material is available to fasten the plaster-cardboard plates along the cut side.

[0004] An "U"-shaped channel section of such type has irremediably a number of drawbacks:

- a) if the slots have a close pitch, little material is available along the side of the cut tabs, even if a curve with small radius is formed;
- b) if the slots are more spaced apart from one another, under the same slotting (like apex angle) the continuous non-sheared side has an extremely segmented bending so that the aesthetic and the final result are impaired; in addition, a curve with large radius is obtained;
- c) if as for b) the apex angle is increased, a curve with lower radius is obtained, but the segmentation of the continuous, non-sheared side is increased too;
- d) if the distance between the tabs of the "U"-shaped channel section, i.e. the width of the base, is increased, under the same apex angle and pitch, a reduction of the tab surface of the cut side and a greater segmentation of the continuous side is obtained.

[0005] Moreover, all four cases mentioned above have also the drawback of the "weakness" of the cut tabs. The latter are turned easily over when the plaster-cardboard plates are fastened by screws thereon.

[0006] In order to overcome such problem some installers interlace a material strip alternately between the cut tabs in order to stiffen the tabs as they take part in the fastening of the plaster-cardboard plate, a not always easy operation that involves further weld material and time.

[0007] The present invention aims at providing a particular shearing capable of overcoming and solving the problems set forth above and applied to "U", "C", "L", "Z", "E", and double "L" sections.

[0008] The technical principle at the base of this invention belongs to the rotational kinetics: a couple of rotation centres causes the material to converge to the axis of symmetry thereof.

[0009] For the sake of clarity of description, reference is made to a shearing of a "L"-shaped section to cause it to bend.

[0010] The surface of the vertical side is not sheared, while "Y"-shaped notches are cut into the base surface with a determined pitch, both ends of the "V"-shaped portion of each "Y"-shaped notch lying along the square bending line and having a distance from each other which is half the distance between the "I"-shaped portions of the notches.

[0011] In particular, it should be mentioned that the "I"-shaped portion has the shape of an isosceles triangle, the apex of which is positioned at the bending line and the length of the base corresponds to the maximum distance between the cut tabs of the section base. The "V"-shaped portion of the notch is formed of two like triangles being symmetric to an axis coinciding with the height of the isosceles triangle of the "I"-shaped portion of the notch and joined by a vertex of their bases and having their apex angles (the vertexes of which are placed on the bending line of the section) equal to half the apex angle of the isosceles triangle.

[0012] The maximum capability of being bent until the cut tabs fit together is obtained by this measure without overlapping material.

[0013] When the continuous side is bent, the material is also folded vertically along axes through the vertexes of the triangles forming the "V"-shaped portion of the "Y"-shaped notches, such vertexes being the centres of rotation of the base tabs that rotate until the opposite edges of the sheared portions come into contact with each other.

[0014] The closer the centres of rotation, the more uniform and less segmented the bending.

[0015] If such novel inventive concept is applied to an "U"-shaped section, the base should be lengthened by an amount which is equal to the height of the tab to be manufactured at the cut side so that the shearing is prosecuted till the end of such side.

[0016] In this case it is important that the tabs provided by shearing have enough surface to allow the plate to be screwed so as to withstand the pressure of the screws as well as to prevent the screws from missing the material between the free spaces of the tabs and to avoid the excessive segmentation of the bending.

[0017] Thus, if the "U"-shaped section obtained by a "Y"-shaped shearing is compared with a "U"-shaped section having a triangular notches having:

- the same pitch, i.e. the same distance between the notches at the side provided with tabs,
- the same distance between the tabs,
- the same width of the base, it is noted that

1. the section with "Y"-shaped notches of the present invention has a segmentation at the continuous non-sheared side which is exactly half the segmentation of the other side, i.e. a continuous, uniform, radiused bending;
2. the width of the tabs of the sheared side in the section provided with "Y"-shaped notches is greater so that a larger surface for screwing the plaster-cardboard plates is provided.

[0018] In order to solve the problem of the "weakness" of the tabs and to avoid the risk of their turnover due to fastening screws, non-sheared material made partially integral with the tabs is subjected to bending and squashing so as to achieve the following beneficial results:

- stiffening the tabs (double material);
- "covering" the sheared portions (formation of a screwing surface);
- sliding and locking the opposite surfaces by punching the material with the result of a stiffening of the bending area in the desired position.

[0019] A bent, stiffened section without weld material ready to be coated by plaster-cardboard plates is provided at last by carrying out such operation along the whole section.

[0020] A better understanding of the invention will result from the following detailed description with reference to the accompanying drawings that show some preferred embodiments thereof only by way of a not limiting example.

[0021] In the drawings:

Table 1/7 shows in its Fig. 1 a sheet, preferably a metal sheet, in which a number of "Y"-shaped notches are sheared to provide a "L"-shaped section (Fig. 3); Fig. 2 shows a different shearing of the sheet but having the same "Y"-shaped notches to provide a "U"-shaped section (Fig. 4) or a "Z"-shaped section (Fig. 5).

Table 2/7 shows in its Fig. 6 and Fig. 7 two different types of shearing having, however, the same "Y"-shaped notches to provide "U"-shaped self-stiffening sections by punching tabs at the sheared side; Fig. 8 shows the "U"-shaped section with tabs bent to the outside; and Fig. 9 shows the "U"-shaped section with tabs bent to the inside.

Table 3/7 shows in its Fig. 10 a sheared sheet like Fig. 7, in which the continuous non-sheared side is bent by 90°, and in Fig. 11 the preceding section in which the sheared side is bent by 90°, and in Fig. 12 the preceding section in which the end tabs of the sheared side are bent and squashed to the outside.

Table 4/7 compares the triangular shearing shown in Fig. 13 with the "Y"-shaped shearing shown in Fig. 14, and Fig. 15 shows the "U"-shaped section which is formed by both section after having bent the outer sides.

Table 5/7 shows in its Fig. 16 a perspective view of the bent section obtained from the sheared sheet as in Fig. 13, and Fig. 17 shows a perspective view of the bent section obtained from the sheared sheet as in Fig. 14; Fig. 18 shows a top view of the bent section as in Fig. 16; Fig. 19 shows the top view of the bent section as in Fig. 17.

Table 6/7 shows in Figs. 20, 21, 22, 23, 24, 25 and 26 different sections with "Y"-shaped shearing provided with self-stiffening.

Table 7/7 shows an application example of an "U"-shaped section provided with "Y"-shaped shearing to obtain a carrying structure of a curved wall.

[0022] With reference to the Figures, the "L"-shaped section of Fig. 3 is obtained from a flat sheet (1) from which material is partially removed by shearing, thus forming a particular "Y"-shaped notch consisting of a "V"-shaped slot (5) and an "I"-shaped slot (6). The sheet is then bent along a longitudinal bending line (3) by folding by 90° the continuous non-sheared side (2) so that the vertexes (8) and (9) of "V"-shaped slot fall on the bending line which separates the orthogonal planes of the continuous side and the sheared side formed of a number of tabs (4) with hexagonal shape.

[0023] The "U"-shaped section of Fig. 4 is obtained from the sheared sheet as in Fig. 2 from which some material has been removed by shearing "Y"-shaped notches and further material from area (11), while hexagonal tabs (4) extend by a further tab (10); such shearing are made, as in Fig. 1, with a determined pitch (P) crosswise to the sheet. Non-sheared side (2) is bent by 90° as in the case of "L"-shaped section, then tabs (10) are bent by 90° along the bending line (12) to the same direction as side (2) to provide a "U"-shaped section having a base width (B) and tabs with a height (A) which may also have a size other than side (2).

[0024] The "Z"-shaped section of Fig. 5 is obtained from the sheared section as in Fig. 2. Only the bending of side (2) is changed as it is in the opposite direction to the sheared side.

[0025] In order to allow the curved section to be self-stiffened by punching, it is necessary to add further material having the function of filling the voids between tabs by further shearing the sheet as in Fig. 6 where tabs (14) are provided to this purpose. It should be appreciated that the latter tabs are alternate to tabs of Fig. 2 and can be bent and squashed along the bending line (13) both to the outside (Fig. 8) and the inside (Fig. 9).

[0026] The same functional result as the preceding

section can also be achieved by a different shearing. In Fig. 7, tabs (15) are provided at the ends of the sheared side and are bent and squashed along the bending line (13) with the possibility, also in this case, of being bent to the inside or to the outside.

[0027] In order to show in a self-evident manner the advantage achieved by the "Y"-shaped shearing as far as the lesser segmentation of the section sides is concerned, the section of Fig. 14 is compared with a section obtained by a triangular shearing (16), as shown in Fig. 13, by providing sections having the same pitch (P), the same base width (B) and the same width of the sheared tabs (10) and (17). As a result, also the distance between the tabs is the same. The "U"-shaped section has been chosen for such comparison (Fig. 15).

[0028] In case of a triangular shearing (Fig. 16), one can see the vertical axes (18), (19) and (20) about which the sheared base has rotated until the maximum bending position is reached which is given by drawing the adjacent edges near each other. The situation achieved by the curved section having a "Y"-shaped shearing (Fig. 17) is different. In this case, the axes of rotation are eight: (21), (22), (23), (24), (25), (26), (27) and (28), i.e. two axes of rotation for each tab.

[0029] The advantage obtained by such solution is very important as the section has a greater segmentation with the result of a much more uniform, regular bending of the continuous side.

[0030] A further advantage is given by the possibility of punching the overlapped tabs when sections with a suitable shearing are formed as shown and described above. An embodiment illustrated in Fig. 27 shows the efficiency of such a solution to provide a curved wall, the carrying structure of which consists of two "U"-shaped sections curved and stiffened by punching the material (29) and by inserting uprights into the "U"-shaped sections.

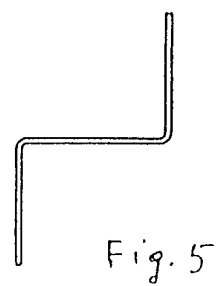
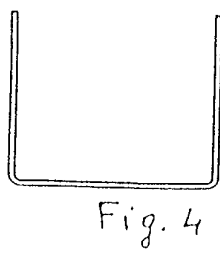
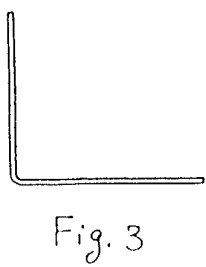
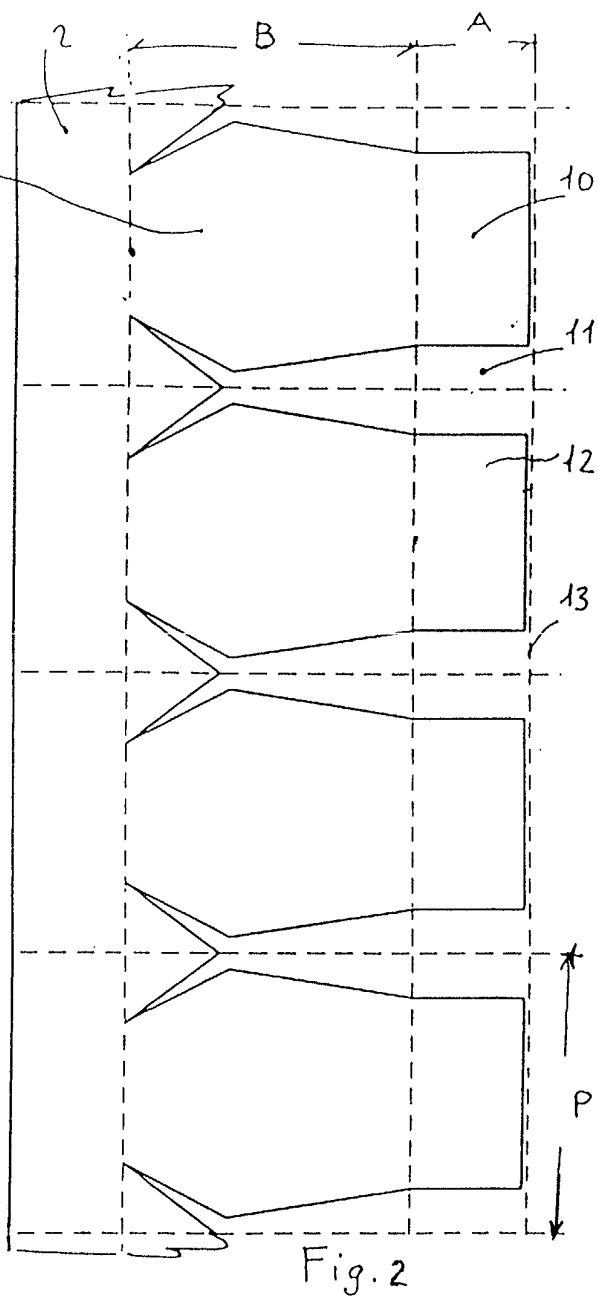
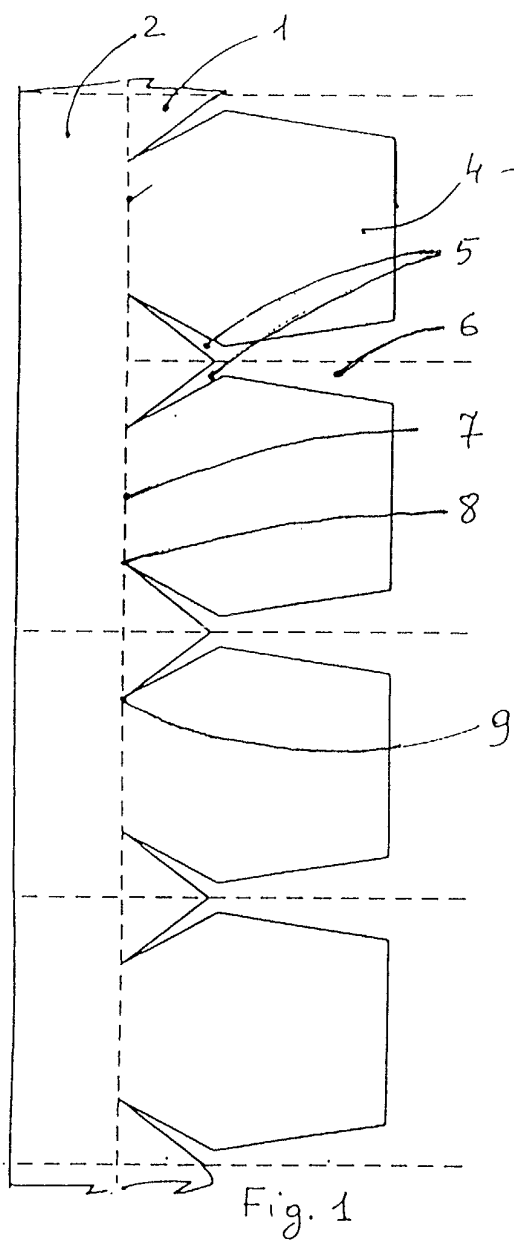
[0031] Finally, it should be understood that structure and shape modifications can be made without departing from the scope of the present industrial invention defined in the appended claims.

Claims

1. A method of manufacturing sections that can be easily bent by hand, **characterized in that** a band, preferably a metal band, is sheared so as to remove "Y"-shaped portions of material along a first portion of the height of the band, the other portion of the height of the band, i.e. the upper side of the "Y"-shaped shearing, being not sheared, and the lower side of the "Y"-shaped shearing being sheared to provide "T"- or "Z"-shaped tabs in order to allow, after the longitudinal bending of the band, both the section to be bent with a reduced segmentation and said tabs to be bent and squashed to hold the curvature of the section by punching the material at the

end of the sheared side.

2. The method of claim 1, **characterized in that** the "Y"-shaped sheared portions (5) and (6) has the ends of the oblique sides (8) and (9) lying along the square bending line (3) of the non-sheared surface, said ends being spaced apart from each other by a length (7) which is half the pitch "p" of the shearing.
3. The method of the preceding claims, **characterized in that** the non-sheared portion between the oblique sides (5) has the shape of an isosceles triangle, the base of which lies along the bending line (3) of the non-sheared portion and forms the minimum length of segmentation (7).
4. The method of the preceding claims, **characterized in that** the non-sheared portion (4) between the non-oblique portions (6) of the "Y"-shaped section has the shape of two isosceles trapezia joined to each other by the greater bases (like a hexagon).
5. The method of the preceding claims, **characterized in that** the non-sheared portion (4) can be provided with an extension (10) of the portion of the lower base of the isosceles trapezium at the end of the sheared portion.
6. The method of the preceding claims, **characterized in that** the non-sheared portion (10) can be provided with a suitable extension of material (14) or (15) in order to provide "T"- or "Z"-shaped holding tabs, respectively.
7. The method of the preceding claims, **characterized in that** the non-sheared portion (4) can be provided with an extension of material having shearing shapes other than "T" or "Z" shapes, however being capable of both holding and stiffening the section.
8. The method of the preceding claims, **characterized in that** the extension of the non-sheared portion (4) at the lower base of the isosceles trapezium located at the end of the sheared surface can also be missing at some lengths thereof.
9. Sections that can be easily bent by hand provided by the method described and illustrated.



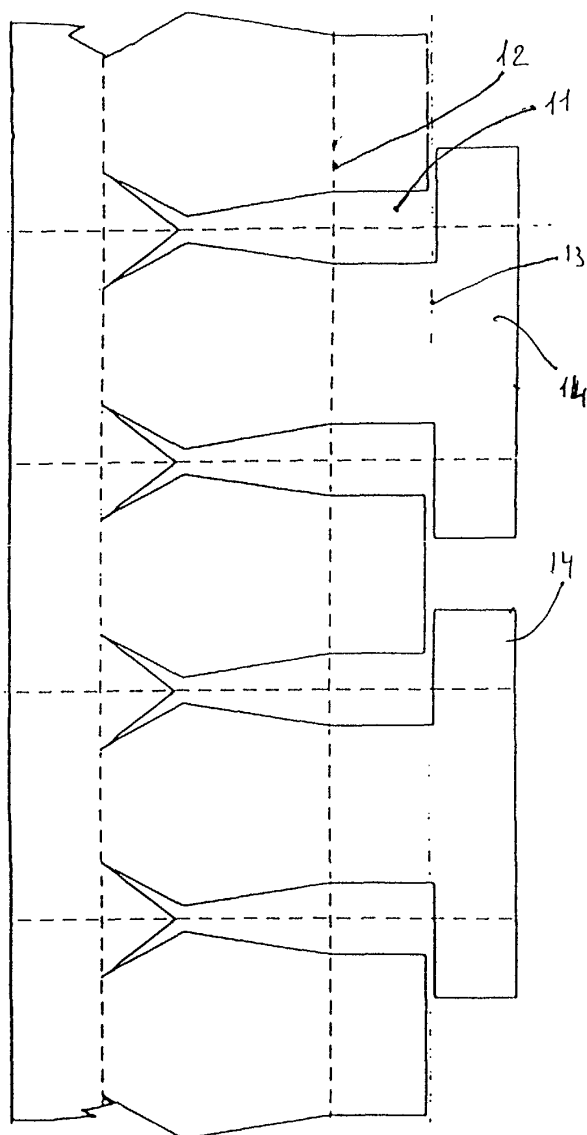


Fig. 6

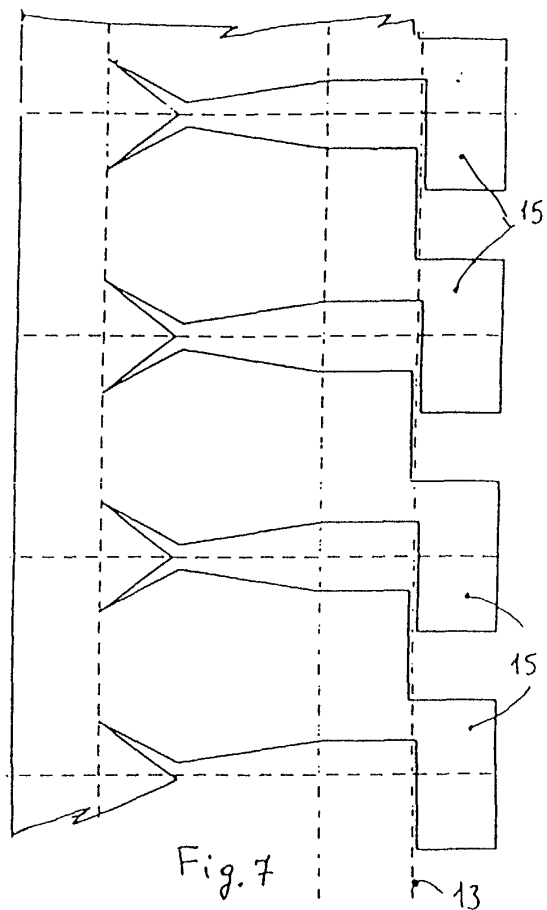


Fig. 7

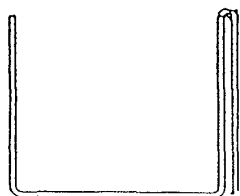


Fig. 8

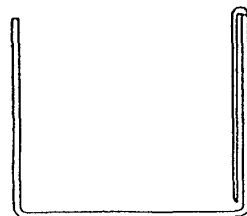
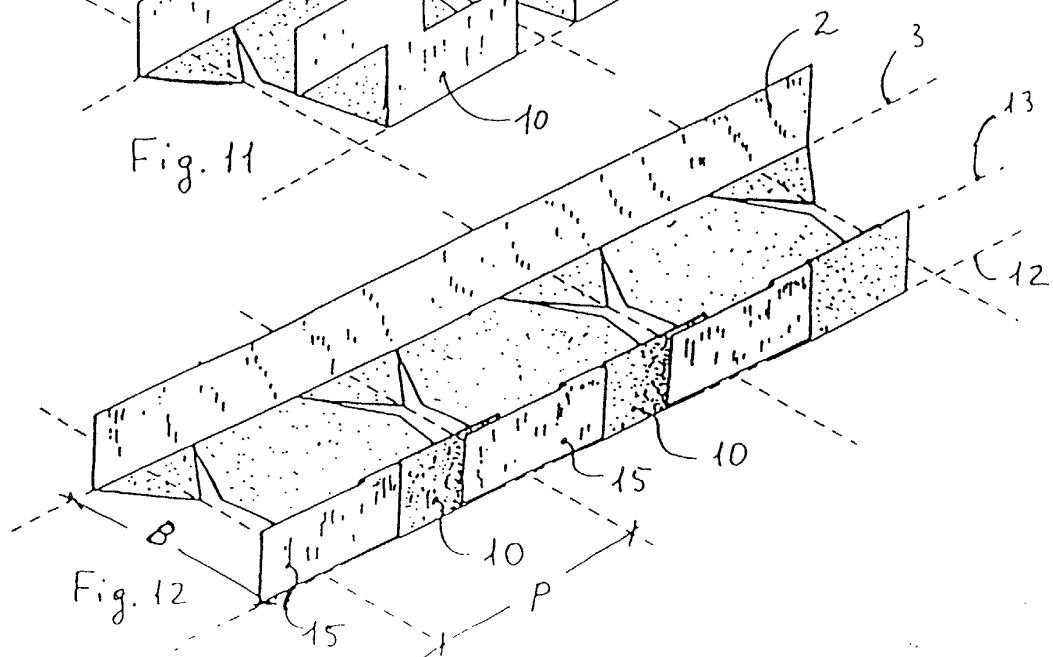
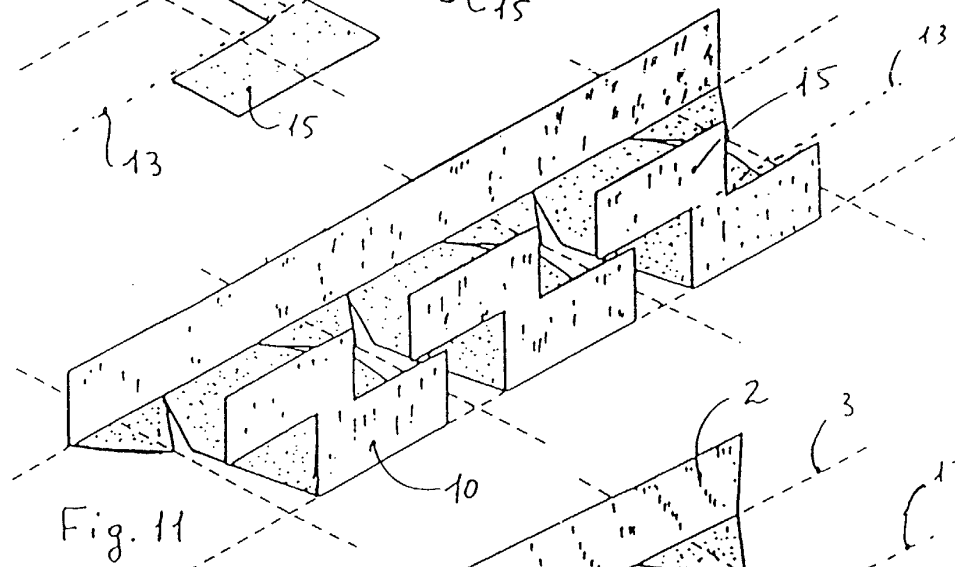
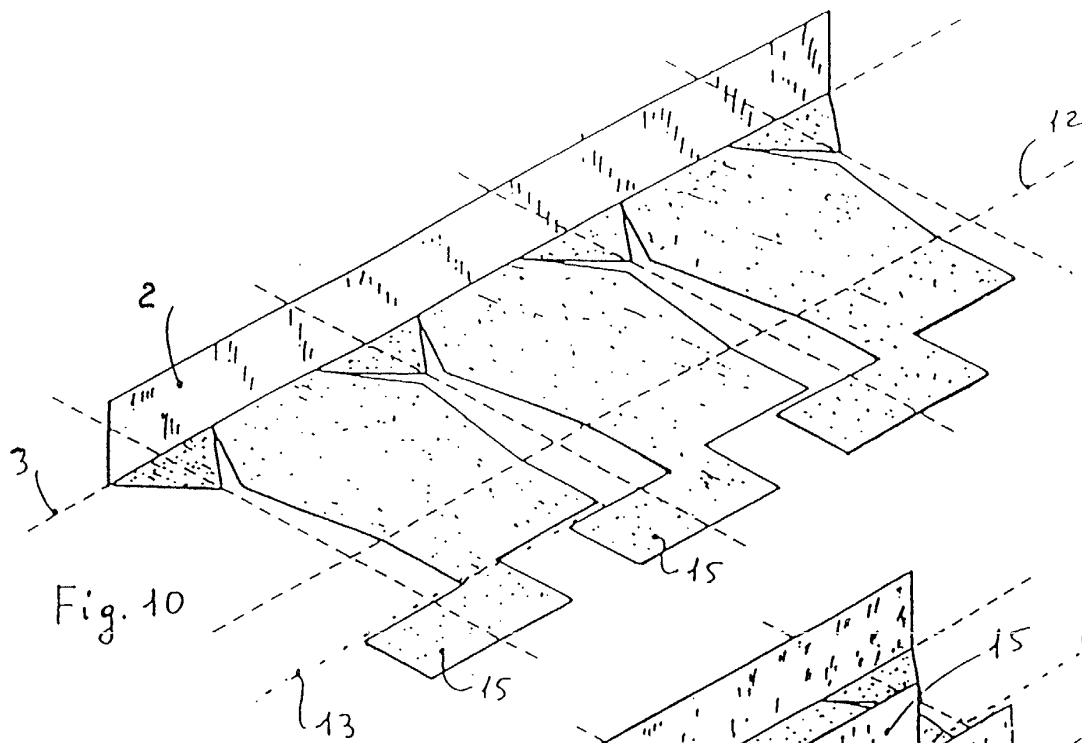
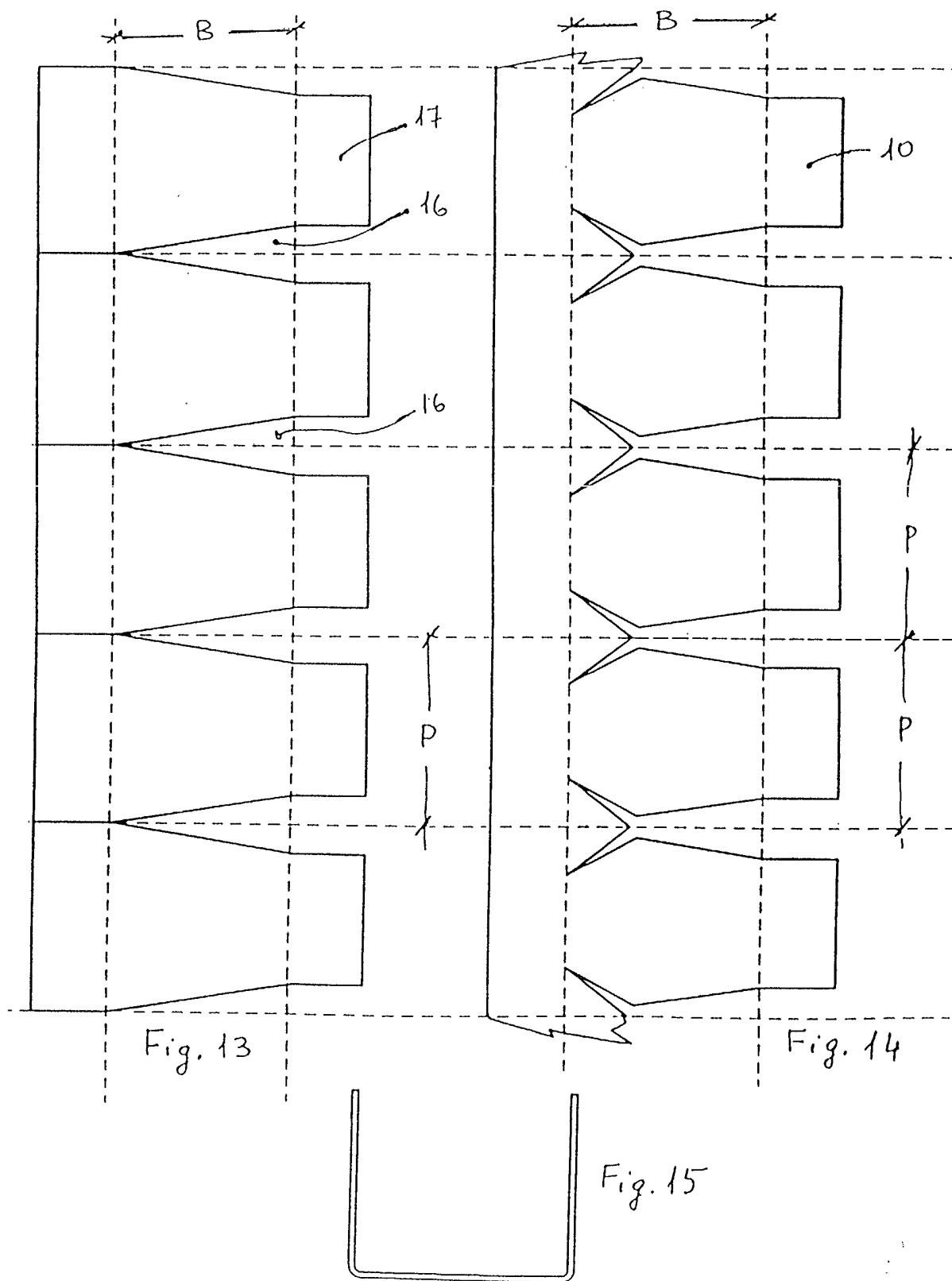


Fig. 9





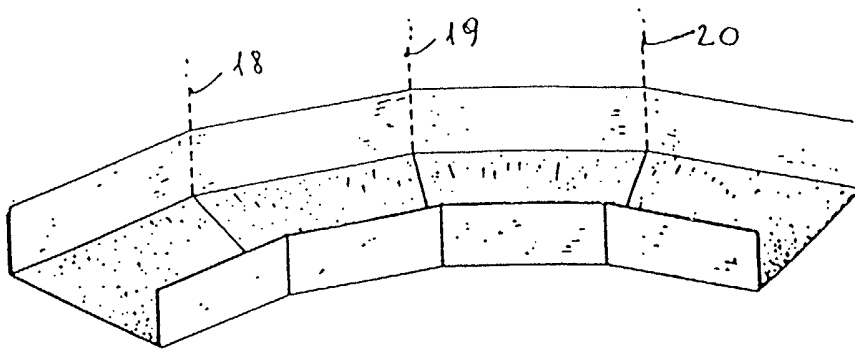


Fig. 16

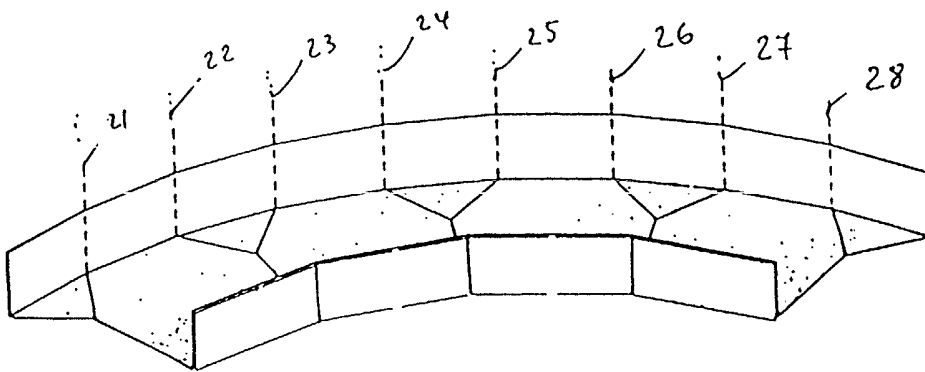


Fig. 17

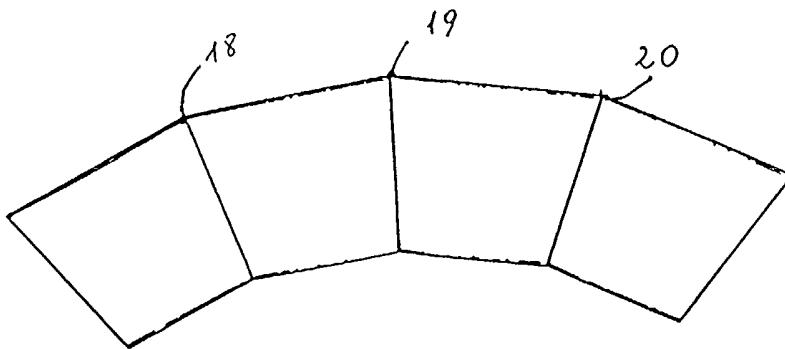


Fig. 18

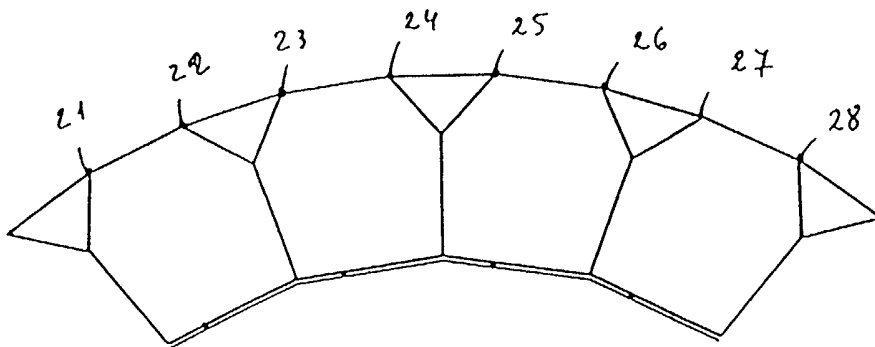


Fig. 19

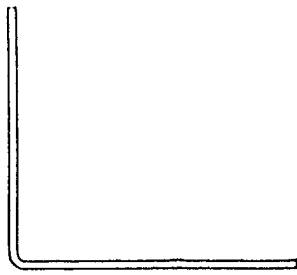


Fig. 20

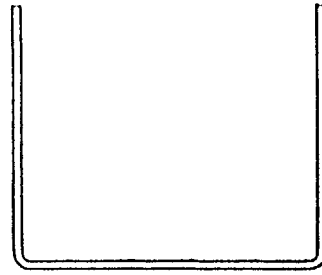


Fig. 21

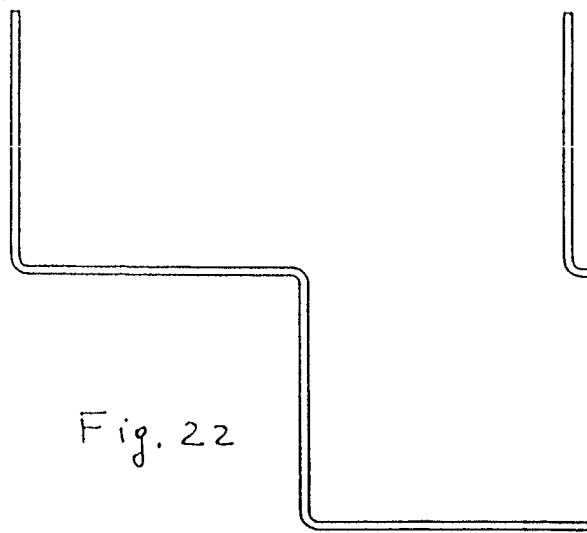


Fig. 22

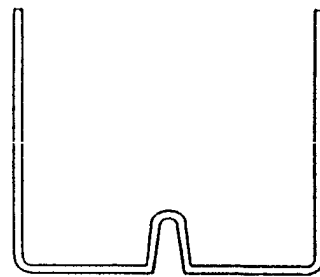


Fig. 23

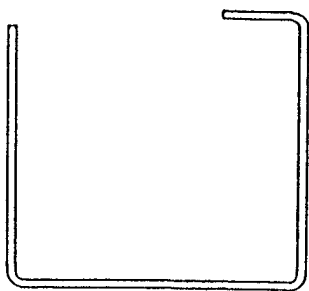


Fig. 24

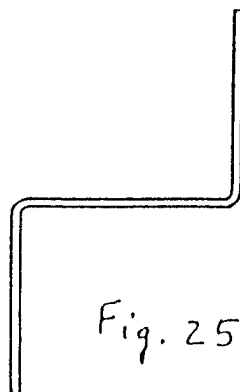


Fig. 25

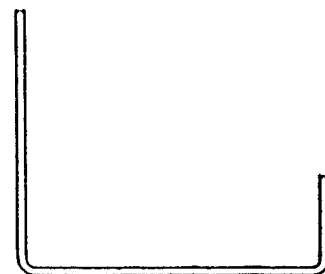
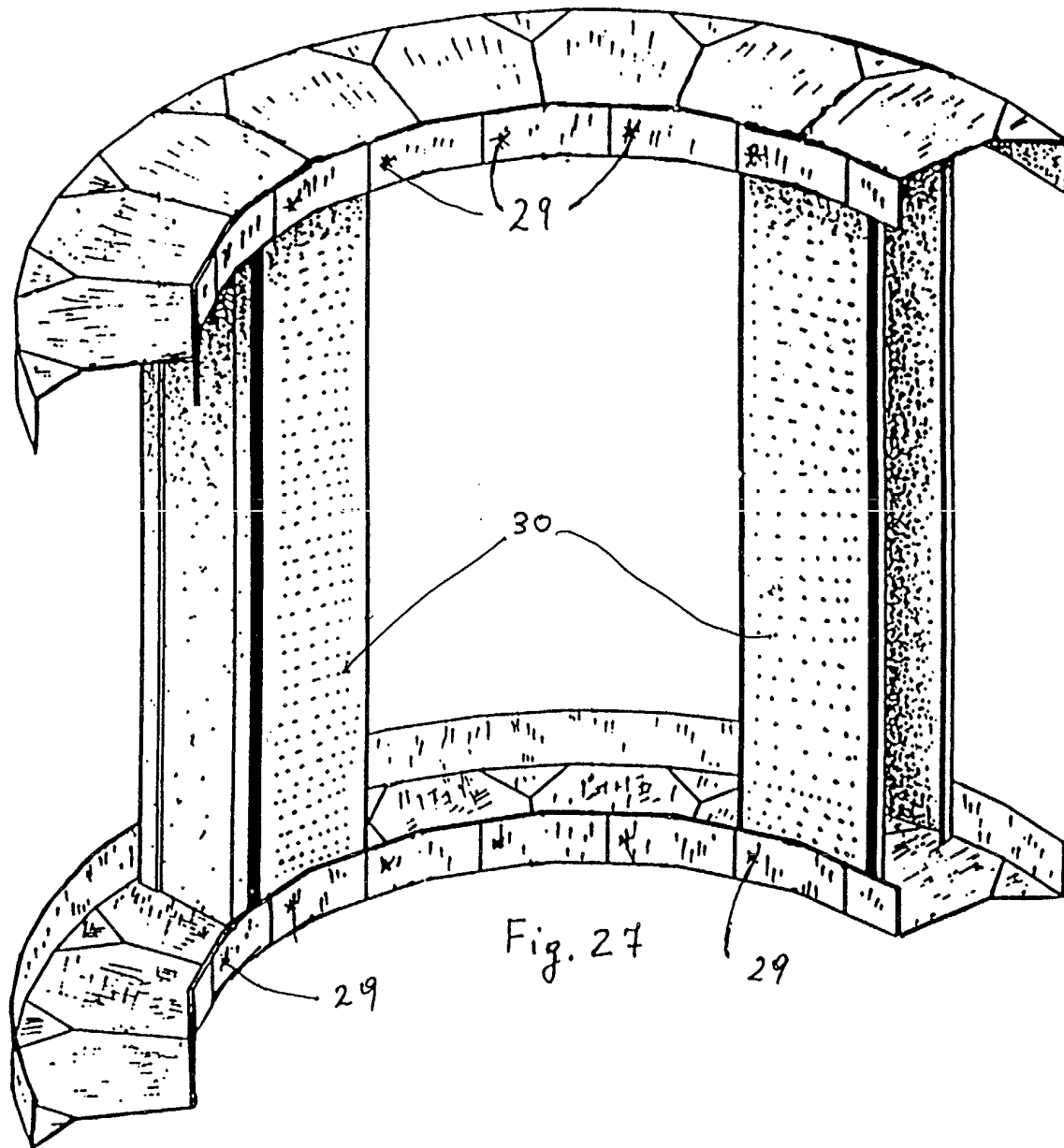


Fig. 26





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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5470

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	WO 01 42579 A (GUERRASIO ANTONIO) 14 June 2001 (2001-06-14) * the whole document *	1,9	E04B2/74
A	WO 99 21669 A (ALUTERM S R L ;AMATO MARIO (IT); FERRANTE MASSIMO (IT)) 6 May 1999 (1999-05-06) * the whole document *	1,9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04B E04F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 November 2002	Examiner Fordham, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 42 5470

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-11-2002

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