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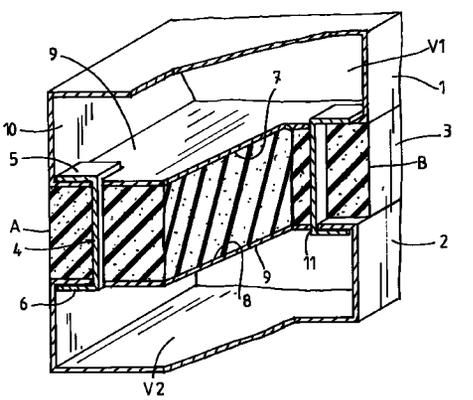
(54) Fireproof composite structure

(57) Composite structure comprising a first metallic profile (1), a second metallic profile (2) bound to the first profile, a fireproof layer (3) located between said first and second metallic profiles (1,2) and metallic binding elements located between the two profiles (1,2), in which the binding element is a strip or tongue (4) which is bent so as to link said strip or tongue to a profile and so as to push or pull a face of said profile towards the fireproof layer.

FIG. 1



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Description

The present invention relates to a composite structure comprising a first metallic profile, a second metallic profile bound to the first profile, a fireproof layer located between said first and second metallic profiles and metallic binding, linking or fastening elements extending or located between the two profiles.

Such composite structures are known. In the known structure, rods welded at their ends to the profiles are used as binding elements. Such structure has drawbacks, the main of which are listed hereafter :

a) the control of the welding is difficult, especially when the rods are within the fireproof material ;
b) the welding of the rods onto the profiles requires a welding compatibility of the material used for the rods with the material of the profile ;
c) the welding points when heated at a quite high temperature are no more suitable to support important load or to resist high strength ;
d) in order to reduce the leakage of electric welding current, the profiles are welded together at several places rather too distant the one from the other by zones without rods. The binding characteristics of the profiles are therefore not continuous or uniform along the length of the profiles. The zones without binding rods constitute therefore weak zones, i.e. zones with low mechanical properties ;
e) rods are not suitable for resisting to high transversal forces.

The invention relates to a new composite structure in which it is possible to have a control of the binding of the two profiles, even if the binding elements extend in the fireproof layer. In said new composite structure, strips or tongues are used instead of rods, said strips or tongues being suitable to give a high transverse strength to the structure.

The new composite structure is a structure in which the binding element comprises a strip or tongue which is bent so as to link said strip to a profile and so as to push or pull a face of said profile towards the fireproof layer.

Advantageously the free end of the strip, which is preferably the part of the strip which has been bent, contacts a face, for example an inner face of the profile. According to an embodiment of a structure of the invention, the strip or tongue, preferably a projecting strip or tongue, extends through an opening of a profile before being bent towards the face of the profile directed towards the fireproof layer.

Preferably the strip or tongue has at each of its ends adjacent to the first and second profile, a part which is bent.

For example, the strip can be made by bending a part of a profile, the free end of the strip being then bent for linking said profile to another profile.

According to a specific embodiment, the profile or profiles are provided with cuttings, preferably on the face directed towards the fireproof layer, so as to define strips or tongues thereon, strips or tongues which are bent so that the strips or tongues of a profile are directed towards the other profile.

Advantageously, the first and/or second profiles are an open profile, the face of said profile provided with the opening being the face on which the fireproof layer is pushed or pressed.

Preferably, the free ends of strips or tongues are bent towards a lateral face of the profile. Even more preferably, the free end of the strip or tongue contacts an inner lateral face of a profile so as to avoid undue clearances to limit shearings between the profile and the strip or tongue .

According to a further embodiment, the strip or tongue has a width which is smaller at one of its ends with respect to a part of the strip located between the two profiles.

Such a form of the strip is advantageous as it decreases the transfer of heat from one profile to the other.

Details and characteristics of the invention will appear from the following description, in which reference is made to the attached drawings showing embodiments of the invention, as examples only.

In these drawings,

- Figure 1 is a perspective view with cross sections of a first embodiment;
- Figure 2 is a cross-sectional view of another embodiment;
- Figure 3 is a view along lines III-III of Figure 2;
- Figure 4 is an exploded perspective view of a third embodiment;
- Figure 5 is an exploded perspective view of a fourth embodiment;
- Figures 6 and 7 are an exploded perspective view and a perspective view of still a further embodiment ;
- Figure 8 is a view along the line VIII-VIII of Figure 6 ;
- Figures 9 and 10 are exploded views of further embodiments of a structure according to the invention ;
- Figure 11 is an exploded view of still a further embodiment ;
- Figure 12 is a cross section along the symmetry plane of the assembled structure of Figure 11 ;
- Figure 13 is a detail of the embodiment of Figure 12, and
- Figure 14 shows a further embodiment of a strip.

The composite structure of the invention shown in Figure 1 comprises a first metallic profile 1, a second metallic profile 2, a fireproof layer 3 situated between the first and second metallic profiles 1 and 2. Metallic strips or plates 4 extend through the fireproof layer 3 between the first profile 1 and the second profile 2 so as to make a binding between said profiles. The end parts 5,6 of the

plates 4 are bent so as to push or pull the face 7 of the first profile 1 towards the fireproof layer 3 and the face 8 of the second profile 2 towards the fireproof layer 3. In the embodiment shown, the fireproof layer is pressed between the two profiles 1,2, more specifically between the faces 7,8 which contact the fireproof layer.

The end parts 5,6 are preferably bent so that a part of the plate contact the inner face 9 of the profile which is opposite to the face 7,8 contacting the fireproof layer, and so that the free end of said end parts contacts the inner face of a lateral side 10 of the profile.

In order to permit the passage of parts 5,6 into the inner volume V1,V2 of the profiles 1,2, said profiles are provided with openings or slots 11.

The plates or strips 4 are alternatively located near a lateral face A of the structure and the opposite lateral face B. It means that along its length l, the profiles 1,2 are bound together, first near the face A, then near the face B, near the face A,...

Figure 2 shows a second embodiment of a structure of the invention. In this embodiment, the profile 2 has been cut so as to define strips 4 on the upper side 13, side intended to be pushed against the fireproof layer 3.

The strip 4 has a substantially triangular form and is provided at its end with a rectangular plate 41. The strips 4 are bent with respect to said upper side 13 so as to extend in planes X,Y which are parallel to each other and outside the inner space V2 of the profile 2.

The strips 4 have been cut so that they are distributed alternatively adjacent to one edge 14 of the profile 2 and to the opposite edge 15 of the profile 2.

The end 41 is introduced in an opening 11 of the profile 1 before being bent (arrow Z) so as to push or pull the lower wall 16 of the profile 1 towards the fireproof material 3.

Advantageously the triangular part 19 of the strip has a thickness "e" higher than the width of the openings and than the thickness "e1" of the rectangular plate, or a width "w" higher than the length "l" of the openings 11, whereby said triangular part abuts the face 18 of the profile 1 directed to the fireproof layer 3. When bending the part 41, the face 18 is pushed towards the triangular part 19 and thus towards the fireproof layer 3.

This system is also suitable for ensuring a specific distance "d" between the profile 1,2.

The bounds linking the profiles together can be controled by a simply viewing of the bending through the cross end opening of the profile 1.

The embodiment shown in Figure 4 is similar to that shown in Figures 2 and 3. However, the strips 4 obtained by bending ends of an open profile 2 are beared by a longitudinal part 25 of the profile 2, which extends towards the profile 1. Said longitudinal part 25 is intended to be engaged into a longitudinal groove 26 of the fireproof layer 3.

The embodiment of Figure 5 is similar to that shown in Figures 2 and 3. In this embodiment, the profiles 1 and 2 are open profiles provided adjacent to one lateral edge 27,28 with a plurality of strips 4.

The strips 4 of the profile 1 are intended, after extending in the fireproof layer 3 to be bent so as to contact the inner surface 9 of the face of the profile 2 directed towards the fireproof layer 3. In the embodiment shown, the strips 4 of the profile 1 or 2 are bent so as to contact the part of said face of the other profile 2 or 1, part 29,30 which is not provided with strips 4 intended to be bent so as to contact the inner surface of the face of a profile directed towards the fireproof layer 3. The part 29,30 is adjacent to the lateral edge of the profile opposite to the lateral edge 27,28.

The use of open profile(s) (one or two) appears to be very efficient in order to limit the heat transfer by radiation between the two profiles.

Figures 6 to 8 show a further embodiment of a structure of the invention.

In this embodiment the profiles 1,2 are similar and are provided on the face intended to contact the fireproof layer 3, with several openings 11.

The fireproof layer is provided with a plurality of passages 32 which terminate with a recess 33 on the opposite faces 34,35.

The elements are strips 4, one end 44 of which is provided with an abutment portion 45, such as a portion obtained by bending the strip 4.

When the strip 4 is engaged into a passage 32, the abutment portion 45 extends into a recess 33. The depth "de" of the recess 33 is preferably such that the abutment portion 45 is underneath the face 34 or 35 of the fireproof layer 3 in contact with a face of a profile 1,2.

In order to bind the profiles 1,2 together, the ends of the strips 4, after passing through an opening of a profile are bent in the inner space V1 or V2 of said profile. The binding between the profiles 1,2 is thus obtained by the binding of the fireproof material with a first profile and the binding of said fireproof material with the second profile, said bindings being independent from each other. As there is no direct metallic contact between the profiles 1,2, the transfer of heat from one profile towards the other profile and inversely is limited.

By using the structure of the invention, one or more of the following advantages can be reached.

- The profiles and the binding elements may be in various materials, for example in materials which are not suitable to be welded together,
- easy check of the links,
- lower heat transfer,
- use of open profiles(s) (lower weight),
- better mechanical properties.

Figure 9 shows an embodiment similar to the embodiment shown in figure 1. In said embodiment, the profiles 1,2 are provided with slots 11 which extend longitudinally 11a or transversaly 11b with respect to the axial or longitudinal direction P-P of the profile.

The strips or tongues 4 are metallic square plates 42 provided at two opposite corners with a rectangular end strip or tongue 41 intended to be bent.

Figure 10 shows an embodiment similar to that of Figure 9, except that the slots 11 extend in a direction making an angle α, for example comprised between 15 and 75°, preferably of about 45°, with the longitudinal direction P-P of the profile 1,2, and that the square plate 42 are provided with one or more openings 44.

Figure 11 is a view of a structure similar to that shown in Figure 10, except that there is only one row of strips 4 and of slots 11 in the profiles 1,2.

Said slots 11 make an angle β comprised between 15 and 45°, preferably 30° with respect to the longitudinal direction P-P of the profiles 1,2. The angle β of the slots is indeed +30° or -30°, i.e. the angle β of the slots located between two slots with an angle β of +30° being -30°.

The strips 4 consist of a central plate 42 provided with two openings 44 and with two legs 41 intended to be bent.

As shown, the openings 44 stretch at least partly within one leg 41. Such an embodiment is preferable for limiting the transfer of heat from one profile 1 to the other profile 2 through the strips.

Figure 13 shows a detail of Figure 11, namely a slot 11. Said slot 11 extends between two wings 45,46 which are bent towards the inner volume defined by a profile.

The wings 45,46 are advantageously provided with end parts 47 separated from a central part 49 of the wing by means of a cutting 48. Advantageously the central part 49 of the wing has a width "we" corresponding to substantially to the width "f" of the opening 44 so that said central part 49 can be engaged in the opening 44 when the leg 41 is bent.

The opening 44 extends advantageously partly in the leg 41, so as to facilitate the bending of said leg 41.

Figure 14 shows a further embodiment of a strip which can be used. Said strip consists of a corner profile 50, provided at each end with two legs 51,52 separated from each other by a cutting 53, whereby said legs are suitable for being bent along two different axis Q-Q, R-R.

In an embodiment, the openings 44 can be provided with an isolant material for example before being bent, for example a plastic material.

Claims

1. Composite structure comprising a first metallic profile (1), a second metallic profile (2) bound to the first profile, a fireproof layer (3) located between said first and second metallic profiles (1,2) and metallic binding elements located between the two profiles (1,2), in which the binding element is a strip or tongue (4) which is bent so as to link said strip or tongue to a profile and so as to push or pull a face of said profile towards the fireproof layer.

2. Composite structure of claim 1, characterized in that a or the free end of the strip or tongue (4) contacts a face of the profile.

3. Composite material of claim 1 or 2, characterized in that the strip or tongue extends through an opening (11) of a profile before being bent towards the face of the profile directed to the fireproof layer.

4. Composite structure of anyone of the claims 1 to 3, characterized in that the metallic strip or tongue (4) extends between a first end adjacent to the first profile and a second end adjacent to the second profile, the strip or tongue (4) having at each of its ends a part which is bent.

5. Composite structure of anyone of the claims 1 to 4, characterized in that the profile or profiles are provided with cuttings, preferably on the face directed towards the fireproof layer, so as to define strips (4) thereon, strips or tongues which are bent so that the strips or tongues of a profile are directed towards the other profile.

6. Composite structure of anyone of the claims 1 to 5, characterized in that the first and/or second profiles are an open profile, the face of said profile provided with an opening being the face on which the fireproof layer is pushed.

7. Composite structure of anyone of the claims 1 to 6, characterized in that the free end of strips or tongues are bent towards a lateral face of the profile.

8. Composite structure of anyone of the claims 1 to 7, characterized in that the strip or tongue has a width which is lower at one of its ends with respect to a part of the strip or tongue located between the two profiles.

9. Composite structure of the claims 1 to 8, characterized in that the part of the strip or tongue which extends between the two profiles extends in a plane parallel to the longitudinal direction of the profiles.

10. Composite structure of anyone of the claims 1 to 9, characterized in that the part of the binding element located or extending between the profiles passes through the fireproof layer.

11. Composite structure of anyone of the claims 1 to 10, characterized in that one profile is provided with cuttings on its face directed towards the fireproof layer, so as to define strips or tongues thereon, strips or tongues which are bent so that strips or tongues are located adjacent to a first longitudinal edge of the said face and adjacent to the edge of the said face opposite to the first edge.

12. Composite structure of claim 11, characterized in that the strips or tongues are alternatively located adjacent to the first edge or to the opposite edge.

13. Composite structure of claim 1, characterized in that the profiles are provided with slots through which one end of a strip can be inserted, said slots extending in a direction making an angle with the longitudinal direction of the profiles, said angle being advantageouysly comprised between 15 and 75°, preferably between 15 and 45°.

14. Composite structure of anyone of the preceding claims, characterized in that the strips are provided with openings.

15. Composite structure of claim 14, characterized in that the strips comprise a central part provided with two legs intending to be bent, in which at least one opening extends in one of said leg and in said central part.

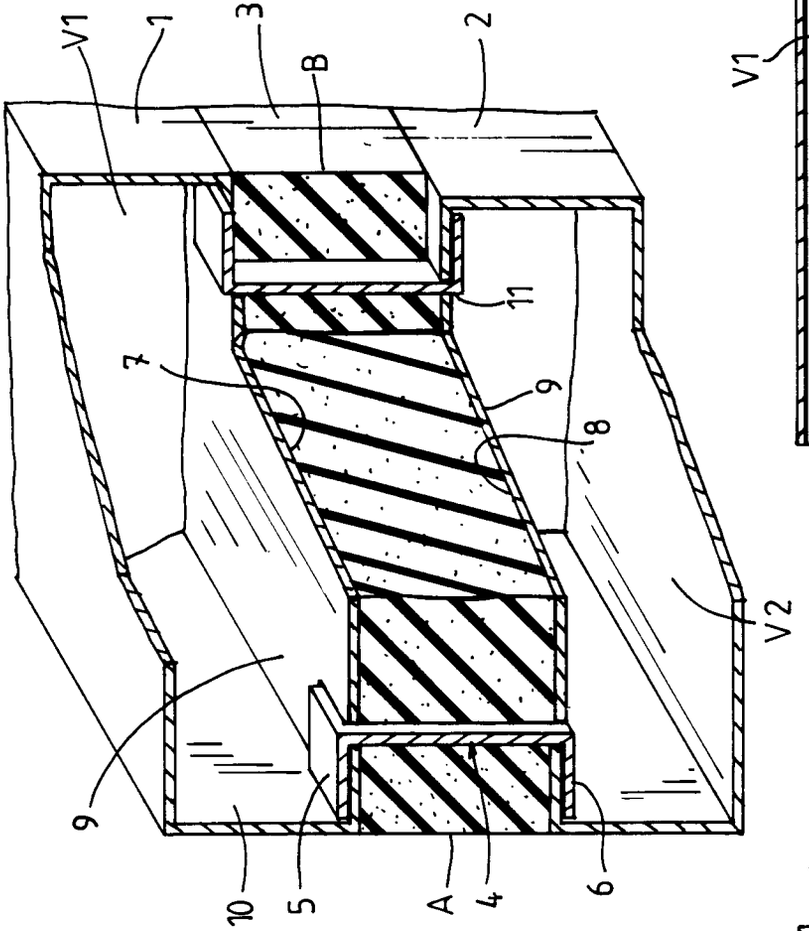


FIG. 1

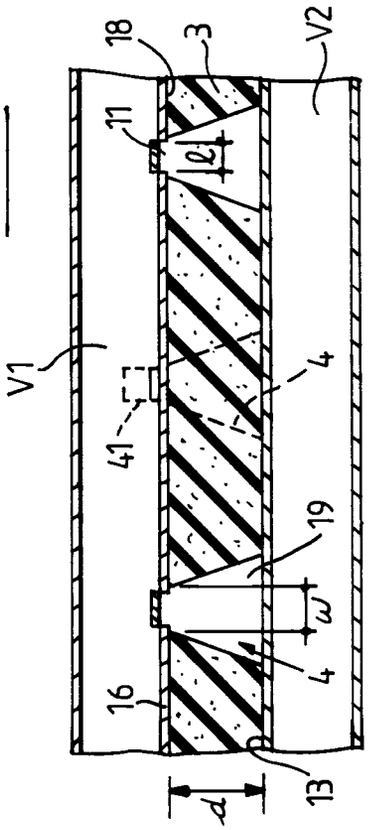


FIG. 3

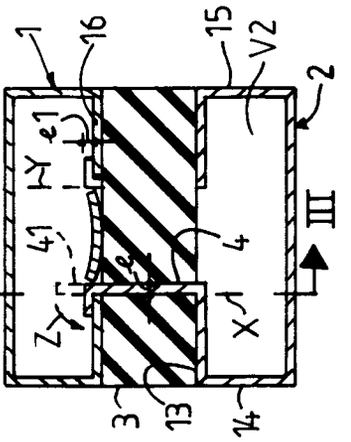


FIG. 2

FIG. 4

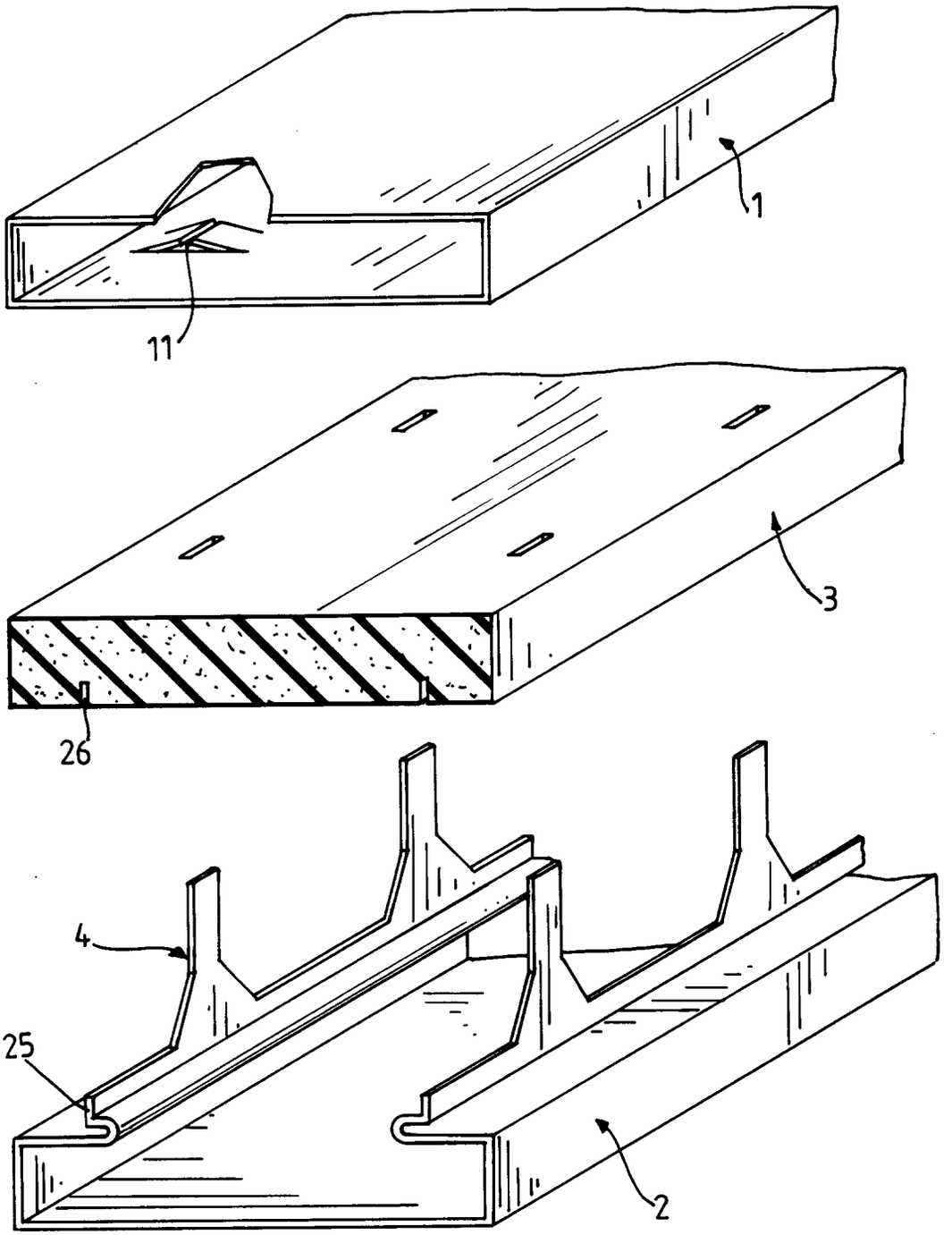
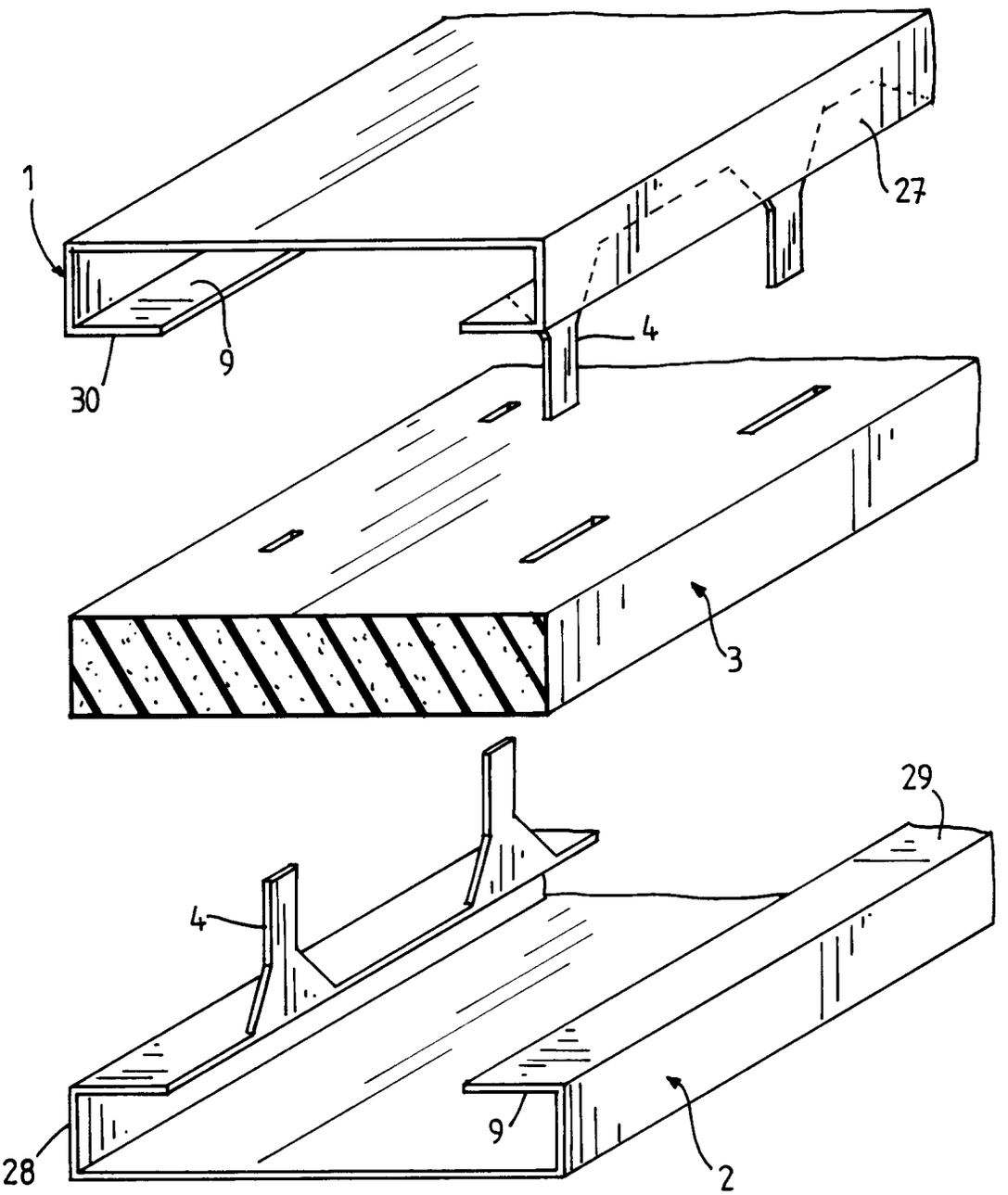


FIG. 5



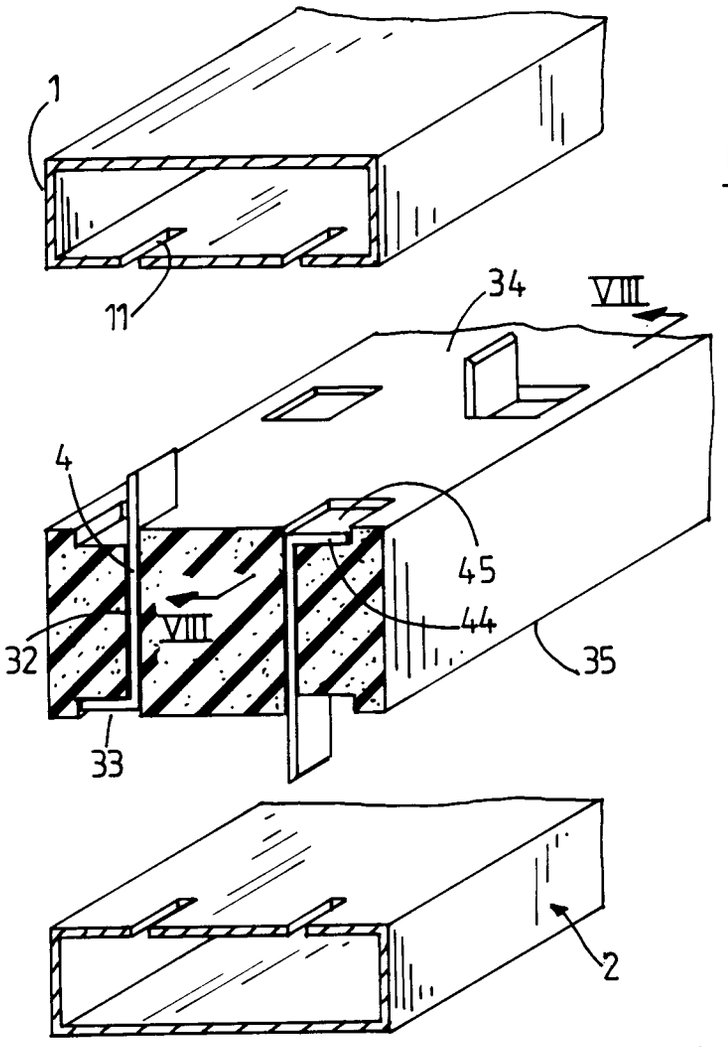


FIG. 6

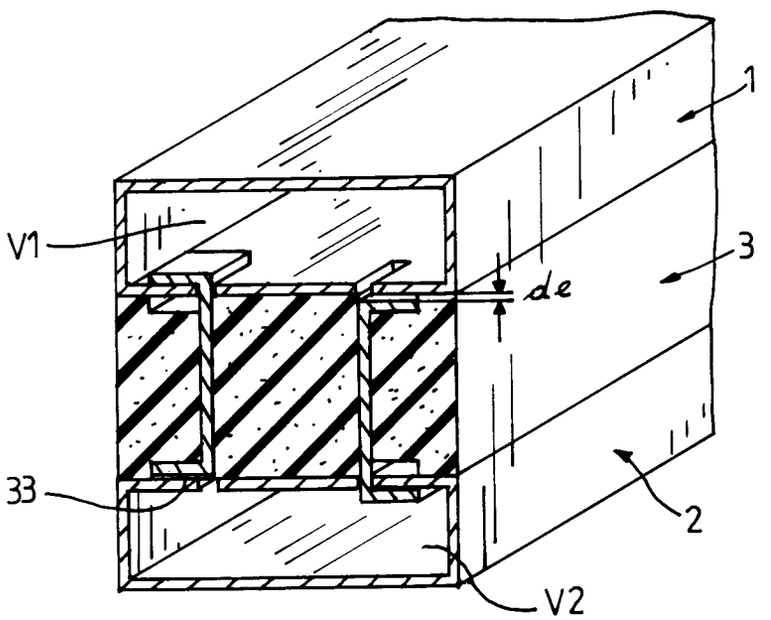


FIG. 7

FIG. 8

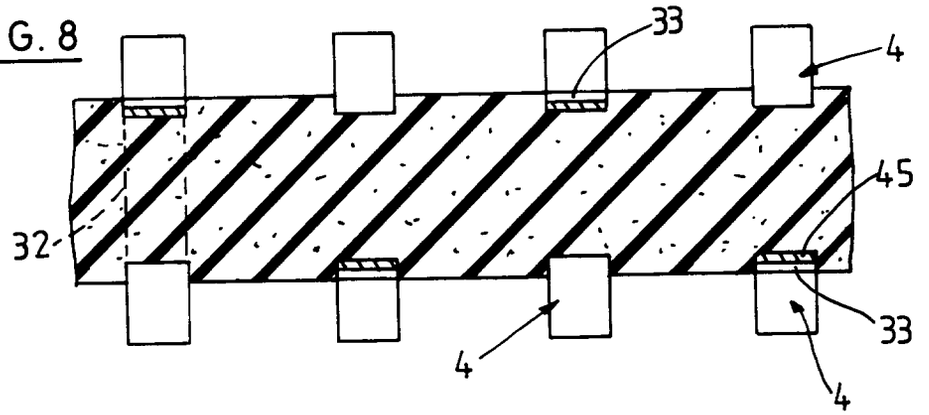


FIG. 9

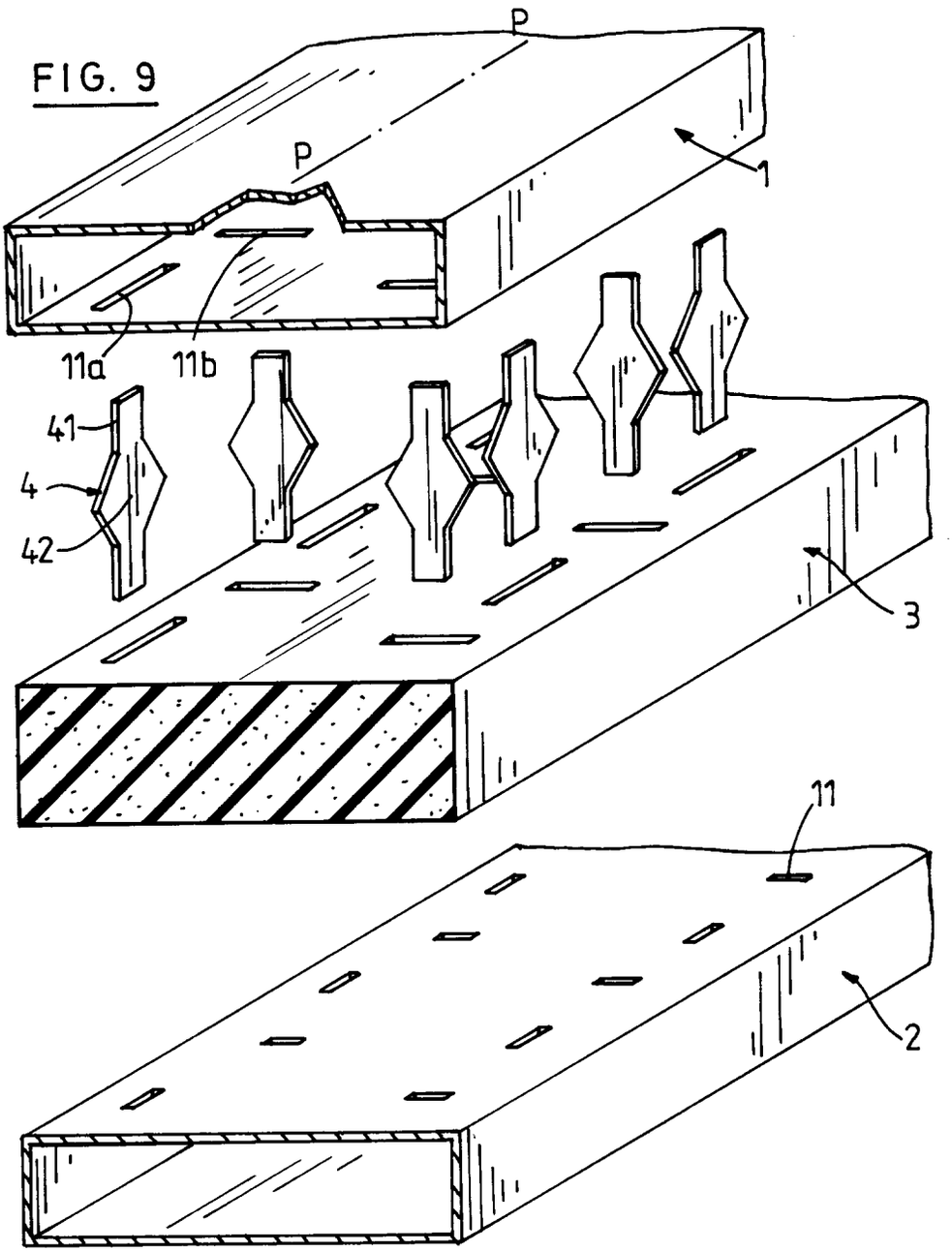


FIG. 10

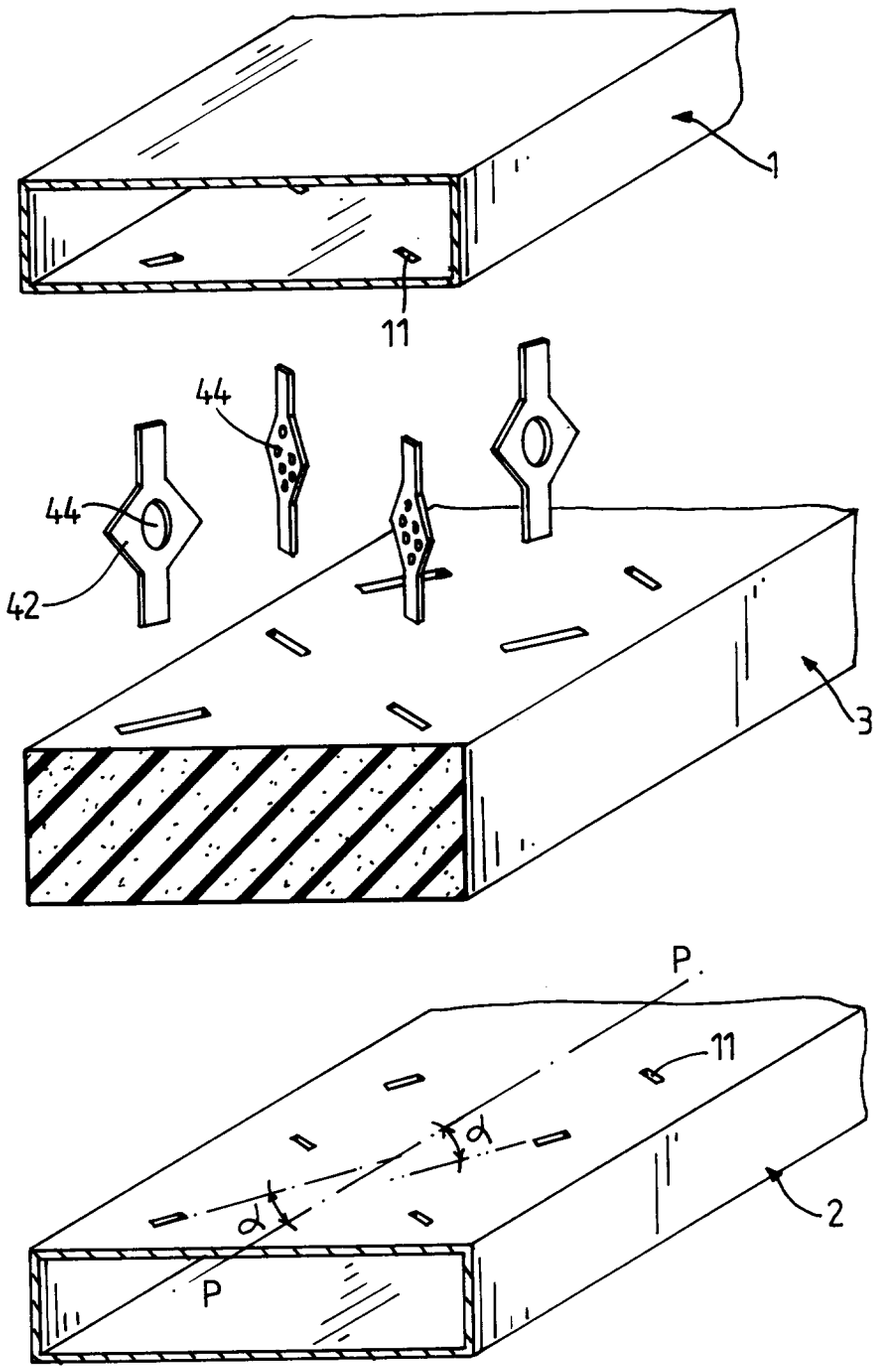
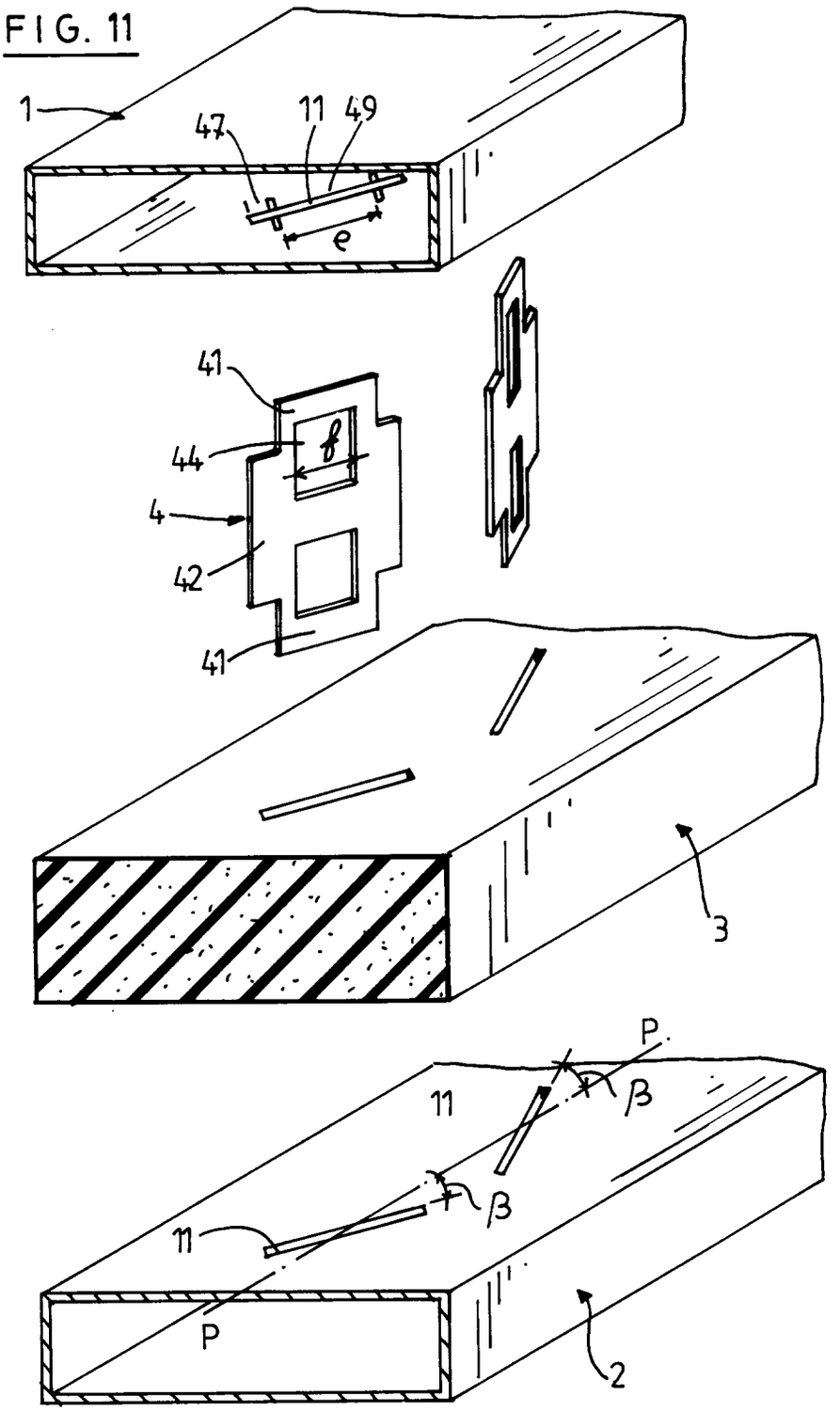


FIG. 11



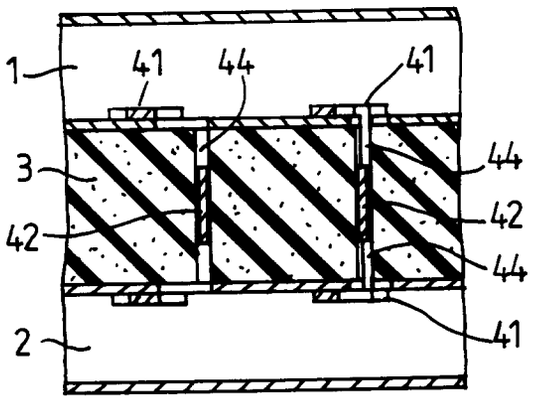


FIG. 12

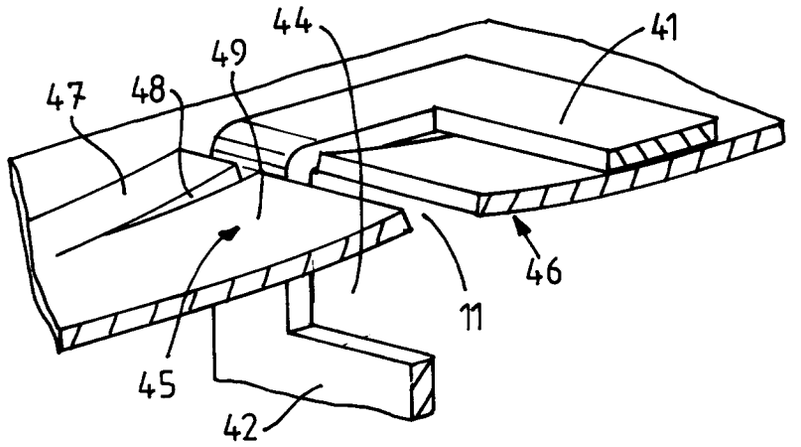


FIG. 13

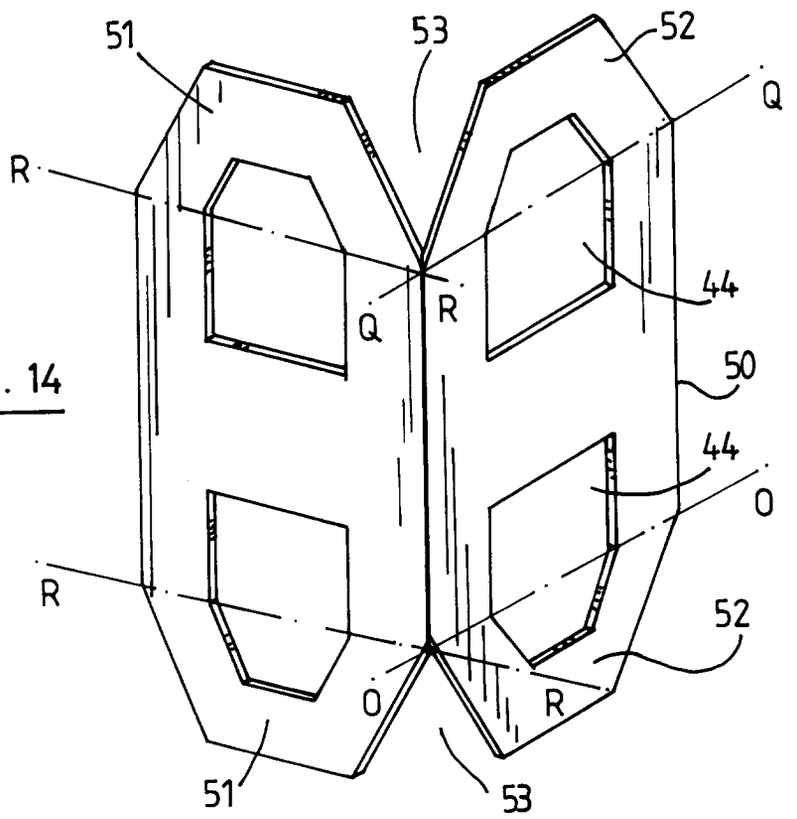


FIG. 14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 87 0144

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.6)
Y	GB-A-2 269 605 (WORMALD INDUSTRIAL PROPERTY LIMITED) * page 4, line 5 - page 5, line 18; figures 1-4 *	1,2,14	E04B1/94
Y	US-A-4 418 507 (FRANK W. ROBERTS) * column 3, line 42 - column 5, line 7; figures 1-8 *	1,2,14	
A	SU-A-1 717 757 (IND ELEC LOCOMOTIVE DES CONS TECHN BUR)		
A	EP-A-0 595 777 (NAVARRO, RENZO)		
A	DE-A-17 84 581 (RIGIPS, BAUSTOFFWERKE GMBH)		
A	FR-A-2 578 571 (WANNER ISOFI ISOLATION)		
A	FR-A-2 561 289 (GUERIN GABRIEL)		
A	DD-A-222 147 (BAUAKADEMIE DER DDR, INSTITUT FÜR TECHNOLOGIE UND MECHANISIERUNG)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 March 1995	Horvath, R

CATEGORY OF CITED DOCUMENTS

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