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(54) **An assembly for forming a roof and also a roof element for such an assembly**

(57) The invention relates to an assembly for forming a roof, which assembly comprises at least two spaced-apart girders (3) extending parallel to each other as well as roof elements (4) which are only supported on said girders (3). The roof element comprises two met-

al sheets extending parallel to each other, with a layer (7) of hard foam plastic material, for example polystyrene, present therebetween. The roof element can be mechanically coupled, on longitudinal sides extending between said girders, to an adjacent roof element.

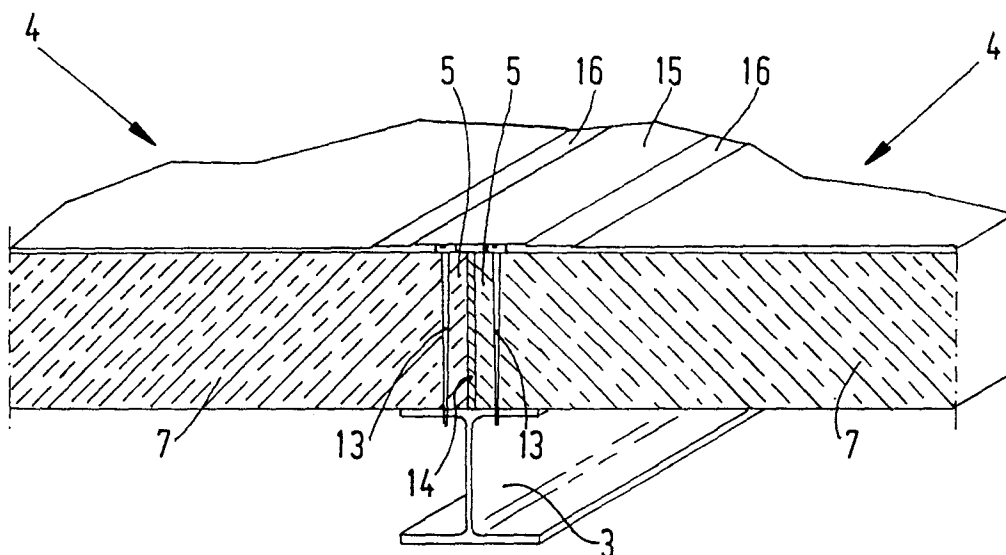


FIG. 3

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Description

The invention relates to an assembly for forming a roof, which assembly comprises at least two spaced-apart girders extending parallel to each other as well as roof elements being supported on said girders, whereby each roof element comprises two metal sheets extending parallel to each other, with a layer of hard foam plastic material, for example polystyrene, present therebetween, whereby said roof element can be mechanically coupled, on longitudinal sides extending between said girders, to an adjacent roof element and whereby said roof element is self-supporting in the direction of said longitudinal sides.

The invention furthermore relates to a roof element suitable for being used in such an assembly.

Roof elements which are built up of metal sheets with a hard foam plastic layer present therebetween are in particular suitable for spanning relatively large distances. The sandwich construction makes the construction relatively strong and sturdy.

In a similar assembly known from Dutch Patent Application NL-A-7605205 the roof elements are interconnected at their longitudinal sides by means of lippings, which are protected against rainwater and other weather influences by means of a suitable cover strip. The lippings form relatively large protrusions on the roof to be formed, which has an adverse effect on the appearance of the roof. In addition to that the lippings add to the weight of the roof elements. Furthermore the provision of the lippings, the subsequent interconnecting of said lippings and placing of a cover strip takes up a relatively great deal of time. Additionally the presence of said lippings considerably adds to the volume of the roof elements to be transported.

The object of the invention is to provide an assembly wherein the above drawbacks are avoided.

This objective is accomplished with an assembly according to the invention in that the metal sheet on the outside of the roof element is provided with a plastic layer on a side remote from said hard foam plastic layer, whereby the plastic layers of two roof elements are attached together by means of an elongated plastic strip at the location of the transition between two roof elements.

Said strip, which is preferably made of the same plastic material as the plastic layer on the outside of the roof elements, can be attached to the plastic layers of the roof elements lying side by side in a simple manner, for example by means of an adhesive fluid or by means of heat, thus providing a moisture-proof transition between the roof elements lying side by side. The transition between two roof elements lying side by side is practically hidden from view on the outside. The provision of a seal at the location of the transition between to roof elements lying side by side in this manner can take place in a relatively quick and simple manner. It is not necessary to use a gas burner for attaching said strip

to the plastic layers of the roof elements by means of an adhesive fluid or by means of heat, so that the risks involved are avoided.

It is noted that in an assembly known from European Patent EP-B1-0.347.564 roof elements are coupled together on their longitudinal sides by means of I-sections. The ends of each I-section are positioned on sections extending transversely to said I-section. The number of sections required for the assembly is relatively high, as a result of which also the cost price of said assembly is relatively high. Furthermore the provision of all these sections is relatively time-consuming.

The invention will be explained in more detail with reference to a drawing, in which:

Figure 1 is a perspective view of a building comprising an assembly according to the invention;
Figure 2 is a partially cut-away perspective view of a roof element according to the invention;
Figure 3 is a perspective view of two roof elements extending towards each other with their head ends; and
Figure 4 is a cross-sectional view of two roof elements abutting against each other with their longitudinal sides.

Like parts are numbered alike in the Figures.

Figure 1 shows a building 1 consisting of a steel structure, which comprises a number of vertically extending walls 2. Parallel I-sections 3 being supported on opposite walls 2 with their ends lie in the plane of the roof of building 1. Roof elements 4 extend between two I-sections 3 lying side by side, said roof elements being supported on said I-sections 3 with their head ends 5. Said roof elements 4 are with their long sides 6 connected to adjacent roof elements 4. Strips will be provided over the transitions between the roof elements 4, both at the location where the roof elements abut against each other with their head ends and at the location where the roof elements abut against each other with their long sides, as will be explained in more detail with reference to Figure 3, thus providing a moisture-proof sealing of the roof formed by said roof elements 4. Each roof element 4 is for example 5 m long, 1.2 m wide and about 20 cm thick.

Figure 2 is a perspective view of a roof element 4 according to the invention. Roof element 4 comprises a layer about 20 cm thick of expanded polystyrene having a specific weight of about 20 kg/m³. Steel sheets 8, 9 are attached to either side of said layer of polystyrene 7 by means of a glue. The upper steel sheet 8 is about 0.63 mm thick and is on either side provided with a coat of zinc 10. Said coat of zinc is present in an amount of about 275 g/m² on two sides. Said steel sheet 8 is furthermore provided, on a side remote from said polystyrene layer 7, with a coat of primer 11 about 10 µm thick, to which a film of PVC 12 about 300 µm in thickness has been applied. The lower layer 9 is zinc-plated in a similar

manner as the upper layer 8. The thickness of steel sheet 9 is about 0.5 mm. Said steel sheet 9 is furthermore provided with a coat of primer 11 about 10 µm thick and a film of polyester about 15 µm in thickness. A roof element 4 of this type is sufficiently strong for being placed with its head ends 5 on I-sections 3 to span for example 5 metres. On a first longitudinal side 6' roof element 4 comprises a polystyrene portion which is recessed with respect to steel sheets 8, 9. On a second longitudinal side 6" roof element 4 comprises a polystyrene portion which protrudes with respect to said steel sheets. Steel sheets 8, 9 are flanged at longitudinal sides 6', 6". Said longitudinal sides 6', 6" will be explained in more detail hereafter with reference to Figure 4.

Figure 3 is a perspective view according to arrows III-III in Figure 1 of the assembly according to the invention. Figure 3 shows two roof elements 4 extending towards each other with their head ends, whereby the head ends 5 are supported on an I-section 3 positioned thereunder. Each roof element 4 is connected to I-section 3 by means of screws 13. A space about 10 - 20 mm in width present between head ends 5 is filled with polyurethane foam 14. In this manner dimensional variations and linear expansions caused by temperature fluctuations are offset, and a continuous transition between the roof elements 4 extending towards each other is obtained. A PVC strip 15 is provided over the ends 5, which is attached to the PVC layers 12 of the roof elements lying side by side by means of an adhesive fluid, a glue or by means of heat. The portion attached to the PVC layer 12 of the roof element 4 is indicated by numeral 16. In a similar manner PVC strips 15 are provided over the abutting longitudinal sides 6 of the roof elements 4.

Figure 4 is a cross-sectional view of the assembly according to the invention, seen in the direction of arrows IV-IV in Figure 1. Figure 4 shows two roof elements 4, which abut against each other with their longitudinal sides 6', 6". Longitudinal side 6' comprises a polystyrene portion 17, which is recessed with respect to steel sheets 8, 9. Steel sheets 8, 9 are provided with a projecting portion 18 at their longitudinal sides 6', said portion 18 comprising a sheet portion 19, which is flanged back in the direction of recessed portion 17, and an end portion 20 connected to portion 19, which extends in a direction away from recessed portion 17.

Longitudinal side 6" comprises a polystyrene portion 21, which projects with respect to steel sheets 8, 9. Projecting portion 21 is positioned between the end portions 20 of steel sheets 8, 9 of the other roof element 4. The polystyrene layer is to that end recessed in the direction of its thickness near end 6". The steel sheet 8 is bent in the direction of polystyrene layer 7 near longitudinal side 6", at portion 22, and continues as portion 23 from there. The end of portion 23 is bent to a U-shape in the direction of polystyrene layer 7. U-shaped portion 24 fits between portions 19, 20 of steel sheet 8 of the

other roof element 4. Steel sheet 9 is near its longitudinal side 6" provided with a portion 25 extending at an angle, which continues parallel to steel sheet 9 and which is at one end provided with a U-shaped portion 26. U-shaped portion 26 fits between portions 19 and 20 of the other roof element 4. The engaging steel sheets 8, 9 and the abutting polystyrene layers 7 provide a solid connection between the two roof elements 4 that abut against each other. A strip 15 is provided over the transition between the two roof elements 4, as has been described with reference to Figure 3. The roof obtained in this manner is of relatively simple construction and can be fitted relatively quickly.

Furthermore it is possible to provide a long side of the plastic layer 12 of a roof element with an extension forming said strip. When the roof elements are being placed into abutting relationship, said strip is attached to the plastic layer of the adjacent roof element and subsequently to the plastic layer. An advantage of this is that said strip only needs to be attached to one plastic layer when the roof elements are being fitted. A drawback might be the fact that the strip extending beyond the roof element may be damaged during transport of the roof elements.

Claims

1. An assembly for forming a roof, which assembly comprises at least two spaced-apart girders extending parallel to each other as well as roof elements being supported on said girders, whereby each roof element comprises two metal sheets extending parallel to each other, with a layer of hard foam plastic material, for example polystyrene, present therebetween, whereby said roof element can be mechanically coupled, on longitudinal sides extending between said girders, to an adjacent roof element and whereby said roof element is self-supporting in the direction of said longitudinal sides, characterized in that the metal sheet on the outside of the roof element is provided with a plastic layer on a side remote from said hard foam plastic layer, whereby the plastic layers of two roof elements are attached together by means of an elongated plastic strip at the location of the transition between two roof elements.
2. An assembly according to claim 1, characterized in that said elongated strip extends over the transition between the two roof elements lying side by side, whereby said strip is on either side of said transition connected to the plastic layer of said roof elements.
3. An assembly according to claim 1, characterized in that said elongated strip is an extension attached to a plastic layer of a roof element, said extension extending over and being connected to the plastic lay-

er of the adjacent roof element.

4. An assembly according to any one of the preceding claims, characterized in that the thickness of said layer of plastic material, for example PVC, is about 300 μm . 5
5. An assembly according to any one of the preceding claims, characterized in that the upper metal sheet is about 0.63 mm thick, the hard foam plastic layer is about 20 cm thick and the lower metal sheet is about 0.5 mm thick. 10
6. An assembly according to any one of the preceding claims, characterized in that said metal sheets are zinc-plated with 275 g/m² on both sides. 15
7. An assembly according to any one of the preceding claims, characterized in that the lower metal sheet of said roof element is provided with a polyester coating on a side remote from said layer of plastic material. 20
8. An assembly according to any one of the preceding claims, characterized in that a first longitudinal side comprises a recessed portion and a second longitudinal side comprises a projecting portion, wherein the recessed portion of one roof element fittingly engages the projecting portion of the adjacent roof element. 25 30

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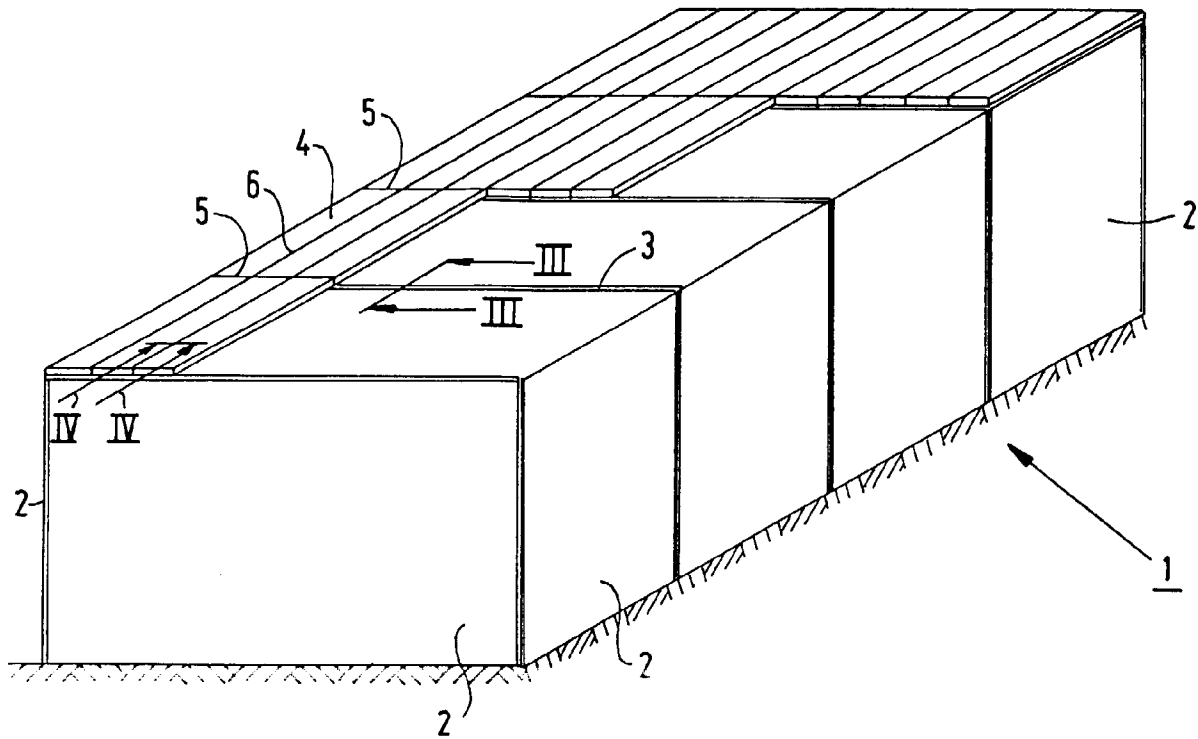


FIG. 1

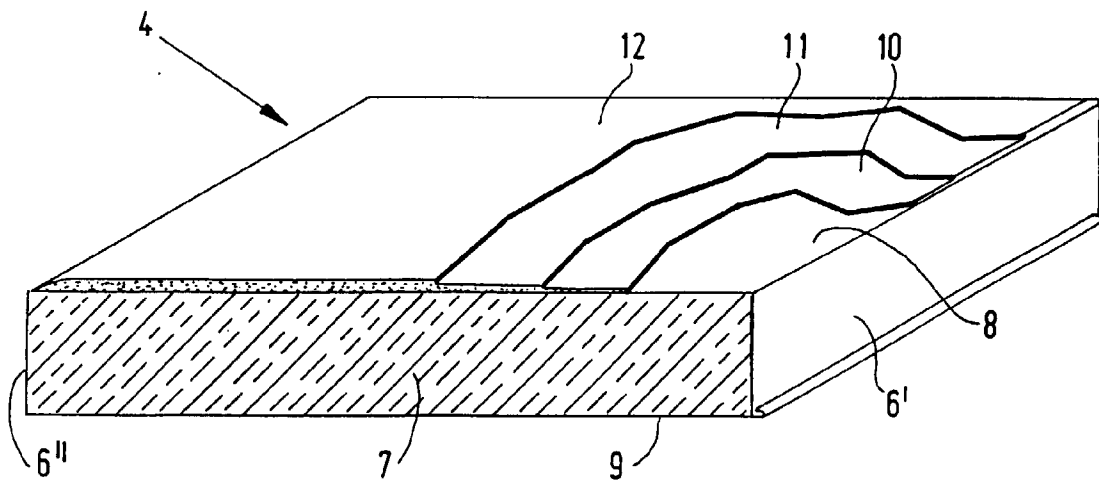


FIG. 2

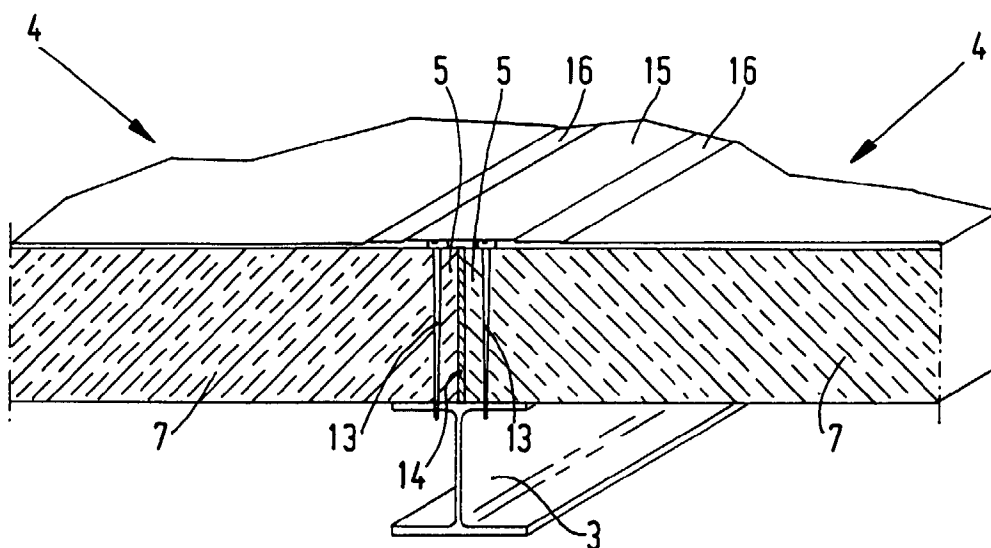


FIG. 3

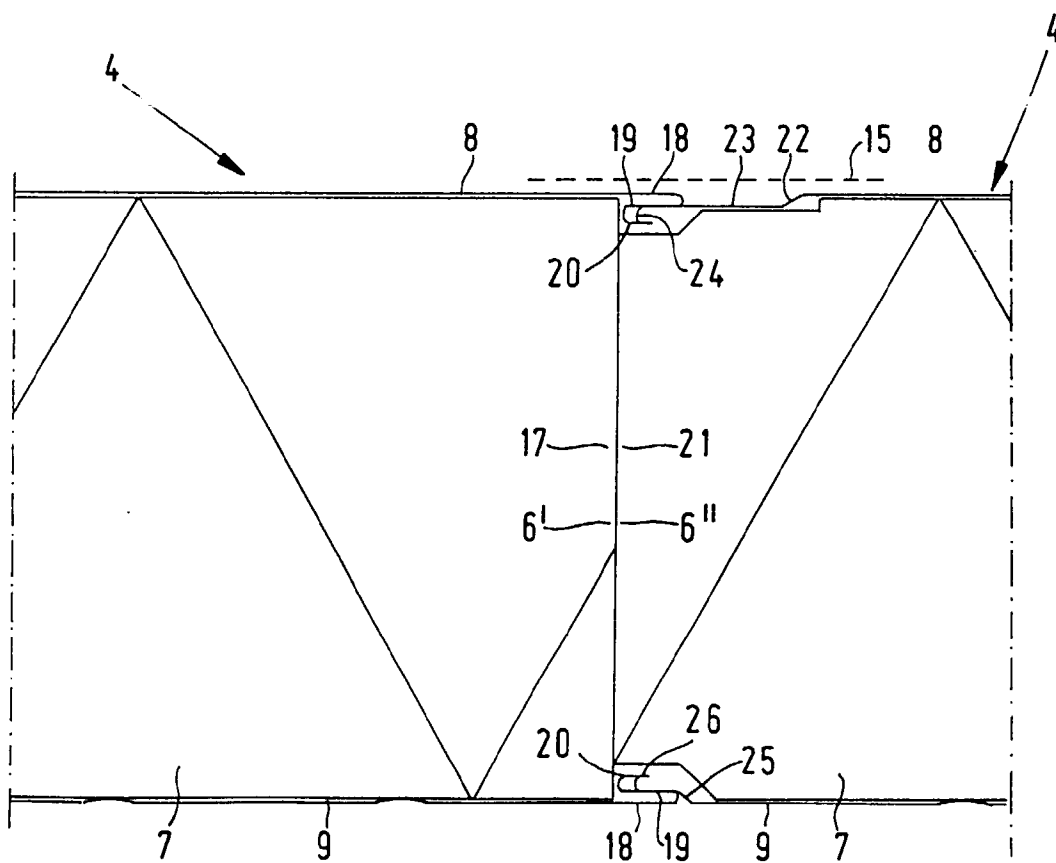


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 0829

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,Y	NL 7 605 205 A (STICHTING INSTITUUT VOOR MECHANISATIE, ARBEID EN GEBOUWEN)	1-3	E04B7/20 E04D3/35 E04C2/292
A	* page 1, line 20 - page 2, line 16 * * page 3, line 7 - page 4, line 24 * * page 4, line 34 - page 4, line 35 * * page 5, line 16 - page 5, line 20 * * page 5, line 33 - page 6, line 12 * * page 6, line 26 - page 6, line 35 * * figures 1-3 *	5,6	
Y	--- US 4 372 014 A (SIMPSON) * column 6, line 13 - column 6, line 28 * * column 7, line 19 - column 7, line 41 * * figures 1,2,5,12 *	1,2	
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A	--- US 4 373 312 A (KIM) * column 3, line 41 - column 3, line 56 * * column 5, line 1 - column 5, line 12 * * column 6, line 20 - column 6, line 31 * * figures 2,6-8,13,14 *	1,8	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04B E04D E04C
A	--- DATABASE WPI Week 9514 Derwent Publications Ltd., London, GB; AN 95-102112 XP002017668 & JP 07 026 200 A (TOA GOSEI CHEM IND) , 27 January 1995 * abstract *	7	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 June 1997	Examiner Hendrickx, X
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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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 0829

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)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search		Date of completion of the search	Examiner
THE HAGUE		19 June 1997	Hendrickx, X
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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