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(71) Applicant: **Wolf Systems Limited**
Shilton Industrial Estate
Shilton Conventry CV7 9QL (GB)

(72) Inventor: **Leaney, David Andrew**
Shilton Coventry
CV7 9QL (GB)

(74) Representative: **Shaw, Matthew Nigel**
Forrester & Boehmert,
Pettenkoferstrasse 20-22
80336 München (DE)

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Amended claims in accordance with Rule 137(2) EPC.

(54) Metal webs in and for timber trusses

(57) A metal web (32, 34) for connecting timber elements (12, 14) in spaced relation to one another in a truss, the metal web comprising respective attachment portions (36, 38, 40) having attachment formations able to be embedded into attachment faces (22, 34) of the timber elements which face the respective attachment portions, and at least one spacing portion (42, 44) extending between the attachment portions, wherein the web is provided with at least one engagement formation (62, 66) adapted to become embedded in a surface of a respective timber element extending transversely of an adjacent attachment face of the timber element.

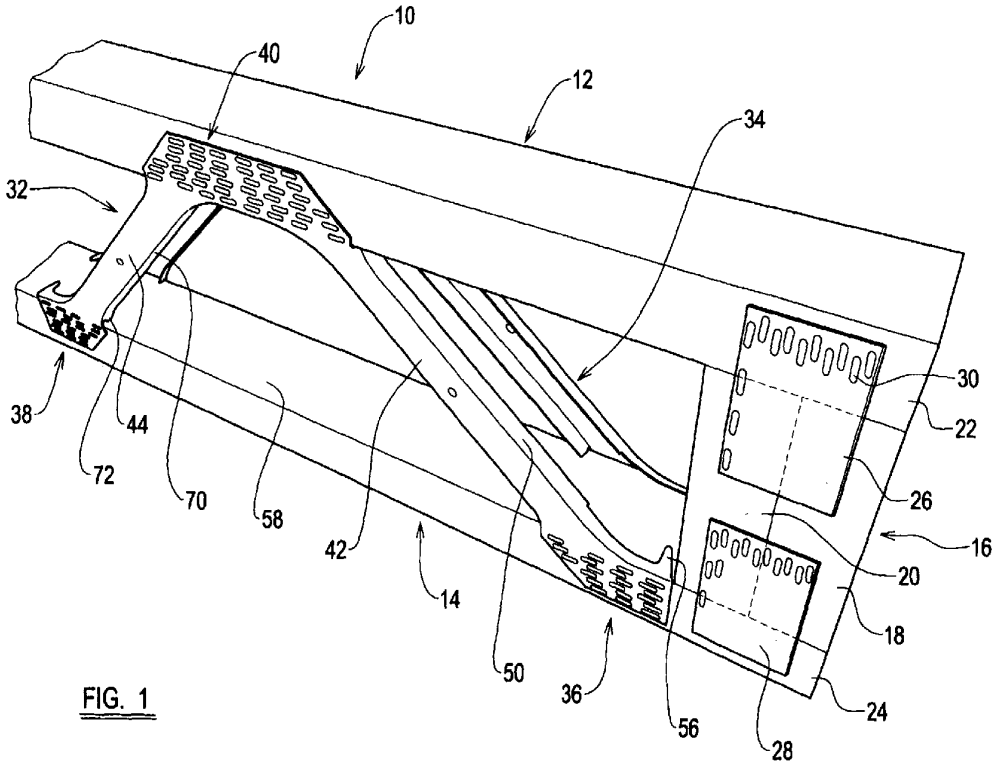

FIG. 1

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Description

Description of Invention

[0001] This invention relates to trusses of the kind which includes timber elements connected to one another by metal webs. The invention has been devised, in relation to, and hereafter will be described in the context of, parallel chord trusses, but it is to be appreciated the invention may be applicable in other types of truss where similar or analogous problems, as described hereafter, arise.

[0002] Parallel chord trusses utilising elongate timber chords spaced from and generally parallel to one another, connected by metal webs extending between the spaced chords, are well known. For example, there are the present applicant's "easi-joist®" trusses. Such trusses may be used in the construction of floors in buildings, and present several advantages over solid timber joists including light weight, the ability to route services through the spaces between the chords, long-term dimensional stability, sound and vibration damping qualities, and the ability to span lengths greater than can readily be done with traditional timber joists. When installed, the chords usually are spaced one above the other, and therefore will be referred to herein, for convenience, as the top and bottom chords, although in many cases there is no distinction between which of the chords is to be the top one and which is to be the bottom one, and references herein to "vertical", and analogous terms, have regard to such orientation.

[0003] In such a truss, the chords are secured, and maintained in the required spaced relationship, to one another by metal webs attached to both sides of the truss, the webs being spaced along the length of the truss. The metal webs are configured to be secured to the vertical side surfaces of the chords, by being provided with attachment portions which are formed as nail plates, i.e. having integrally formed teeth which may be pressed into the timber of the chords. The attachment portions of the metal webs are connected to one another by spacing portions which extend across the space between the chords. Usually the metal webs are pressings from sheet metal e.g. steel, galvanized or otherwise treated to resist corrosion, and the spacing portions between the attachment portions are provided with flanges along their edges to resist bending and buckling under the loads imposed thereon in use and during transport/storage prior to use. A truss will usually also include timber spacing elements extending vertically between the top and bottom chords, such spacing elements being secured to the top and bottom chords by nail plates pressed into the engagement with adjacent parallel side surfaces of the spacing elements and chords. Such timber spacing elements may be provided at the ends, and possibly at one or more intermediate positions, lengthwise of the truss.

[0004] A truss such as described above typically is manufactured by placing the timber chords in the required spaced parallel relationship to one another, alongside one another on a fabrication surface. The required timber spacing elements are disposed therebetween, and the required number of metal webs placed where required. The nail plates for fixing the timber spacers are also placed in the required positions. Such nail plates rest on the tips of their integrally formed teeth on the upwardly presented surfaces (which are the side surfaces in use) of the chords and timber spacing elements, while the tips of the teeth of the attachment portions of the metal webs rest on the upwardly presented surfaces of the chords. A pressing device is then used successively to press the nail plates and attachment portions of the metal webs so that their teeth penetrate the timber, to secure them in position.

[0005] The main potential modes of failure of a truss as above described are detachment from the chords of the attachment portions of the metal webs, and buckling of the spacing portions of the webs, usually in the vicinity of the attachment portions thereof. One problem encountered in manufacture of the trusses is that in the course of the pressing process the metal webs might be moved slightly as their teeth are embedded in the timber of the chords. It is broadly the object of the present invention to address these problems, as well as generally to provide a metal web of improved performance as described hereafter.

[0006] According to one aspect of the present invention, we provide a metal web for connecting timber elements in spaced relation to one another in a truss, the metal web comprising respective attachment portions having attachment formations able to be embedded into attachment faces of the timber elements and at least one spacing portion extending between the attachment portions, characterised in that the web is provided with at least one engagement formation adapted to become embedded in a surface of a respective timber element extending transversely of an adjacent attachment face of the timber element.

[0007] There may be at least one of the engagement formations for each of the attachment portions of the web.

[0008] The or each spacing portion of the metal web may comprise a or a respective flange extending along one or more of each edge of the spacing portion, and the or each engagement formation may comprise an end portion of a flange.

[0009] One advantage of the provision of an engagement formation or formations in a metal web in accordance with the invention is that by becoming embedded into the timber element surface transverse to that which the attachment portions engage, the metal web is resistant to displacement while the teeth on the attachment portions are being pressed into the timber elements. A further advantage, arising when the or each engagement formation is provided by an end portion of a flange of the spacing portion of the metal web, is that it helps support the flange in relation to the timber element, with the result that buckling of the spacing portion of the web in the

vicinity of the timber element becomes substantially less likely.

[0010] Metal webs of various configurations, e.g. generally I-shaped, V-shaped or W-shaped are known for use in trusses of the kind with which the invention is concerned. A metal web in accordance with the invention may be of any of such configurations. In particular, and as described hereafter, it may be V-shaped with two attachment portions for connection to one timber chord of a truss and an intermediate attachment portion for attachment to the other timber chord of the truss, the spacing portions extending between the attachment portions at an inclination to the length of the truss. The web may be separable in its intermediate attachment portion, to provide two I-shaped webs.

[0011] According to another aspect of the invention, we provide a truss comprising timber chords secured in spaced relation to one another by at least one, preferably by a plurality of, metal webs in accordance with the first aspect of the invention.

[0012] The invention will now be described by way of example with reference to the accompanying drawings, of which

Figure 1 is a perspective view of part of a truss in accordance with the invention;
Figure 2 is a perspective view of part of a metal web in accordance with the invention;
Figure 3 is a plan view of part of a sheet metal blank from which the metal web as illustrated in figure 2 may be made.

Referring firstly to figure 1 of the drawings, this illustrates an end part of a parallel chord truss in accordance with the invention. It comprises two spaced parallel chords which are elongate timber elements 12, 14 each of rectangular cross-sectional shape. Such a truss may be used in a floor structure in a building, and in use it will in almost all cases be disposed in the illustrated orientation with the chord 12 vertically spaced above the chord 14. Figure 1 shows an end part of the truss 10, and at this end part, the chords 12, 14 are spaced apart from one another by a timber spacing element or column 16 extending between the chords 12, 14 perpendicularly to the length thereof: as illustrated the column 16 comprises two separate column elements 18, 20 disposed alongside one another. The visible side faces 22, 24 of the chords 12, 14 respectively lie in a common plane with the sides of the column elements 18, 20, and these faces constitute attachment faces enabling the components to be secured to one another by nail plates 26, 28. As is well known, the nail plates 26, 28 comprise plates of sheet metal usually a suitable grade of steel, from which a large number of integral teeth have been pressed out so as to extend perpendicular to the general plane of the nail plate, leaving slots visible in the nail plate is external surface some of which are visible at 30. The nail plates are pressed onto the timber components so that the teeth penetrate the latter in the manner of nails to hold them together. Corresponding such nail plates would be provided at the other, not visible, side of the truss.

[0013] A further timber spacing element or column would be provided at the opposite end, not illustrated, of the truss, and possibly one or more further intermediate such spacing elements.

[0014] Between the timber spacing elements the chords are secured to one another in the required spaced parallel relationship by a plurality of metal webs. Figure 1 of the drawings shows one such web indicated generally at 32 and part 34 of a further such metal web at the opposite side of the truss. The metal webs 32, 34 are identical to one another, and the web 32 comprises first and second end attachment portions 36, 38, which attach to the chord 14 and an intermediate attachment portion 40 which attaches to the chord 12. Between the attachment portions 36, 40 and 38, 40 there extend respective spacing portions 42, 44 which are inclined to the length of the chords 12, 14, so that the metal web is generally V-shaped, albeit inverted in orientation as shown in the drawings. The next, not illustrated, metal webs along the truss would be of the opposite, i.e. normal V, orientation, and so on along the length of the truss.

[0015] The metal webs are of sheet metal such as steel, made by suitable stamping and pressing operations to form them to the configuration described hereafter and treating them, e.g. galvanising, for corrosion resistance. Referring now, additionally, to Figure 2 of the drawings, the attachment portions 36, 38, 40 thereof are formed as nail plate portions, with integral teeth able to be embedded in the timber of the chords of the truss to secure the attachment portions thereto. Each of the attachment portions is provided with a plurality of such teeth, the slots left by the formation thereof being visible in figure 1 and two only of such teeth, on the attachment portion 36, being indicated at 46 in Figure 2 of the drawings. The spacing portions 42, 44 of the metal web each comprise, as clearly visible for the spacing portion 42, an elongate portion 48 which lies in the same plane as the nail plate attachment portions 36, 38, 40 of the web, with its edges having flanges 50, 52 extending at right angles to the plane of the portion 48. These flanges 50, 52 extend into the space between and within the width of the chords 12, 14 and face the corresponding flanges on the metal web at the opposite side of the truss.

[0016] The flange 50, adjacent the attachment portion 36, curves round so that an end portion 54 of the flange 50 lies parallel to the upper surface 58 of the lower chord 14 and has a locating lug formation 56 which lies against the surface 58. The flange 52 at its end adjacent the attachment portion 36 curves around slightly as indicated at 60 and ends in a projecting engagement formation 62. The engagement formation 62 projects to an extent such that, when the truss is assembled, it embeds in the chord 14 to a depth of, for example, 1 to 1.5 mm from the surface 58 of the chord 14. In Figure 2, the extent of projection of the formation 62 is shown in relation to the broken line

64 indicating the position of the edge of the lower chord 14 between its surfaces 24, 58.

[0017] The flange 50 has, at its end opposite the attachment portion 36 and adjacent the attachment portion 40, an engagement formation 66 which, analogously to the formation 62, embeds in the under surface (not shown) of the upper chord 12. The flange 52, adjacent the attachment portion 40, curves round as indicated at 68 to a configuration of two of the portions 54 of the flange 50 in back to back disposition, after which it extends lengthwise of the spacing portion 44 of the metal web, as visible at 70 in Figure 1 ending at 72 in an engagement formation which engages the upper surface 58 of the lower chord 14.

[0018] Figure 3 of the drawings illustrates part of a sheet metal blank which forms an early stage of manufacture of a metal web as above described. At this stage it is planar, with respective portions which are to form the attachment portions 36, 40 and the spacing portion 42 with its portion 48 and flanges 50, 52 having their engagement formations 62, 66 at their respective ends.

[0019] In a truss incorporating metal webs in accordance with the invention, the presence of the engagement formation 62, 66 which become embedded in the timber chords of the truss has the effect of providing additional support for the spacing portions of the metal webs adjacent their connections to the chords. This provides a significant improvement in the resistance of the webs to buckling of the spacing portions thereof. By way of example, an improvement of the order of 5% in the load which can be withstood before buckling of the spacing portion takes place may be achievable. It also improves the security of attachment of the attachment portions of the metal web to the timber chords.

[0020] In manufacture of a truss, in accordance with the method described in the introductory part of the present specification, in the initial stage of positioning the components of the truss in the required disposition relative to one another, on a fabrication surface, the metal webs initially are placed with their locating lug formations as 56 contacting the respective surfaces which face one another of the chords 12, 14, with the tips of the teeth as 46 on the attachment portions of the metal web resting against the attachment faces 22, 24 of the chords. The engagement formations as 62, 66 will slightly indent the edges of the chords between their side faces and facing surfaces. Then, in the course of pressing the attachment portions of the metal webs so that their teeth penetrate the timber chords, the engagement formations will penetrate the surfaces of the chords which face one another, being moved parallel to such surfaces from the edges of the chords. This makes movement of the metal webs from their correct positions less likely in the course of the pressing operation.

[0021] The metal web described above is generally V-shaped. Metal webs of other configurations are known, and the invention is applicable to such other configurations. One well known configuration is generally I-shaped, comprising two attachment portions for attachment to respective timber elements and a single spacing portion extending therebetween. In a truss, such a spacing portion may extend at an inclination to the length of the truss.

[0022] The V-shaped web as described may be provided, in its intermediate attachment portion 40, with a break line where indicated at 76 in figures 2 and 3, enabling separation of the web at such line into two I-shaped webs, in mirror image of one another. In a truss, the spacing portions of such I-shaped webs extend at an inclination to the length of the truss. The break line may be of reduced thickness compared with the rest of the web, or weakened in some other manner, so that the V-shaped web may be separated into two I-shaped webs without the use of tools.

[0023] When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

[0024] The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A metal web (32, 34) for connecting timber elements (12, 14) in spaced relation to one another in a truss, the metal web comprising respective attachment portions (36, 38, 40) having attachment formations (46) able to be embedded into attachment faces (22, 24) of the timber elements and at least one spacing portion (42, 44) extending between the attachment portions, **characterised in that** the web is provided with at least one engagement formation (62, 66) adapted to become embedded in a surface (58) of a respective timber element (14) extending transversely of an adjacent attachment face (24) of the timber element.

2. A metal web according to claim 1 further **characterised in that** there is at least one of the engagement formations (62, 66) for each attachment portion of the web.

3. A metal web according to claim 1 or claim 2 further **characterised in that** the or each spacing portion (42, 44) comprises a or a respective flange (52, 50) extending along a or a respective edge of the spacing portion, and the or each engagement portion (62, 66) comprises an end portion of a flange (52, 50).

4. A metal web according to any one of the preceding claims, further **characterised by** comprising two attachment portions (36, 38) for attachment to one timber element (14) and an intermediate attachment portion (40) for attachment to a further timber element (12), and wherein there are engagement formations (62, 66) for engagement with both timber elements.

5. A metal web according to claim 4 **characterised in that** it is generally V-shaped, with the spacing portions (42, 44) arranged to extend at an inclination to the length of the timber elements (12, 14).

6. A metal web according to claim 4 or claim 5 further **characterised in that** it is separable in its intermediate attachment portion (40) to form two I-shaped webs.

7. A metal web according to any one of the preceding claims which is of sheet metal.

8. A truss comprising timber chords (12, 14) secured in spaced relation to one another by a plurality of metal webs **characterised in that** at least one (32, 34) of the metal webs is a web according to any one of the preceding claims.

9. A truss according to claim 8, further **characterised in that** there is at least one timber spacing element (16) between the chords.

10. A truss according to claim 8 or claim 9, further **characterised in that** it is a parallel chord truss.

Amended claims in accordance with Rule 137(2) EPC.

1. A metal web (32, 34) for connecting timber elements (12, 14) in spaced relation to one another in a truss, the metal web comprising respective attachment portions (36, 38, 40) having attachment formations (46) able to be embedded into attachment faces (22, 24) of the timber elements and at least one spacing portion (42, 44) extending between the attachment portions, the web being provided with at least one engagement formation (62, 66) adapted to become embedded in a surface (58) of a respective timber element (14) extending transversely of an adjacent attachment face (24) of the timber element **characterised in that** the at least one engagement formation is arranged to rest against an edge part of the adjacent attachment face (24) of the timber element while the attachment formations (46) rest against the attachment face, and the engagement formation is caused to become embedded in said surface (58) in the course of causing the attachment formations to be embedded into the attachment face (24).

2. A metal web according to claim 1 further **characterised in that** the or each spacing portion (42, 44) comprises a or a respective flange (52, 50) extending along a or a respective edge of the spacing portion, and the or each engagement portion (62, 66) comprises an end portion of a flange (52, 50).

3. A metal web according to claim 2 further **characterised in that** the at least one spacing portion of the web is arranged to extend at an inclination between the timber elements, and the or each engagement formation is arranged to be in an acute angle defined between the or each spacing portion and the respective timber element.

4. A metal web according to claim 1 further **characterised in that** there is at least one of the engagement formations (62, 66) for each attachment portion of the web.

5. A metal web according to any one of the preceding claims, further **characterised by** comprising two attachment portions (36, 38) for attachment to one timber element (14) and an intermediate attachment portion (40) for attachment to a further timber element (12), and wherein there are engagement formations (62, 66) for engagement with both timber elements.

6. A metal web according to claim 5 **characterised in that** it is generally V-shaped, with both the spacing portions (42, 44) arranged to extend at an inclination to the length of the timber elements (12, 14).

7. A metal web according to claim 5 or claim 6 further **characterised in that** it is separable in its intermediate attachment portion (40) to form two I-shaped webs.

8. A metal web according to any one of the preceding claims which is of sheet metal.

9. A truss comprising timber chords (12, 14) secured in spaced relation to one another by a plurality of metal webs **characterised in that** at least one (32, 34) of the metal webs is a web according to any one of the preceding claims.

10. A truss according to claim 8, further **characterised in that** there is at least one timber spacing element (16) between the chords.

11. A truss according to claim 8 or claim 9, further **characterised in that** it is a parallel chord truss.

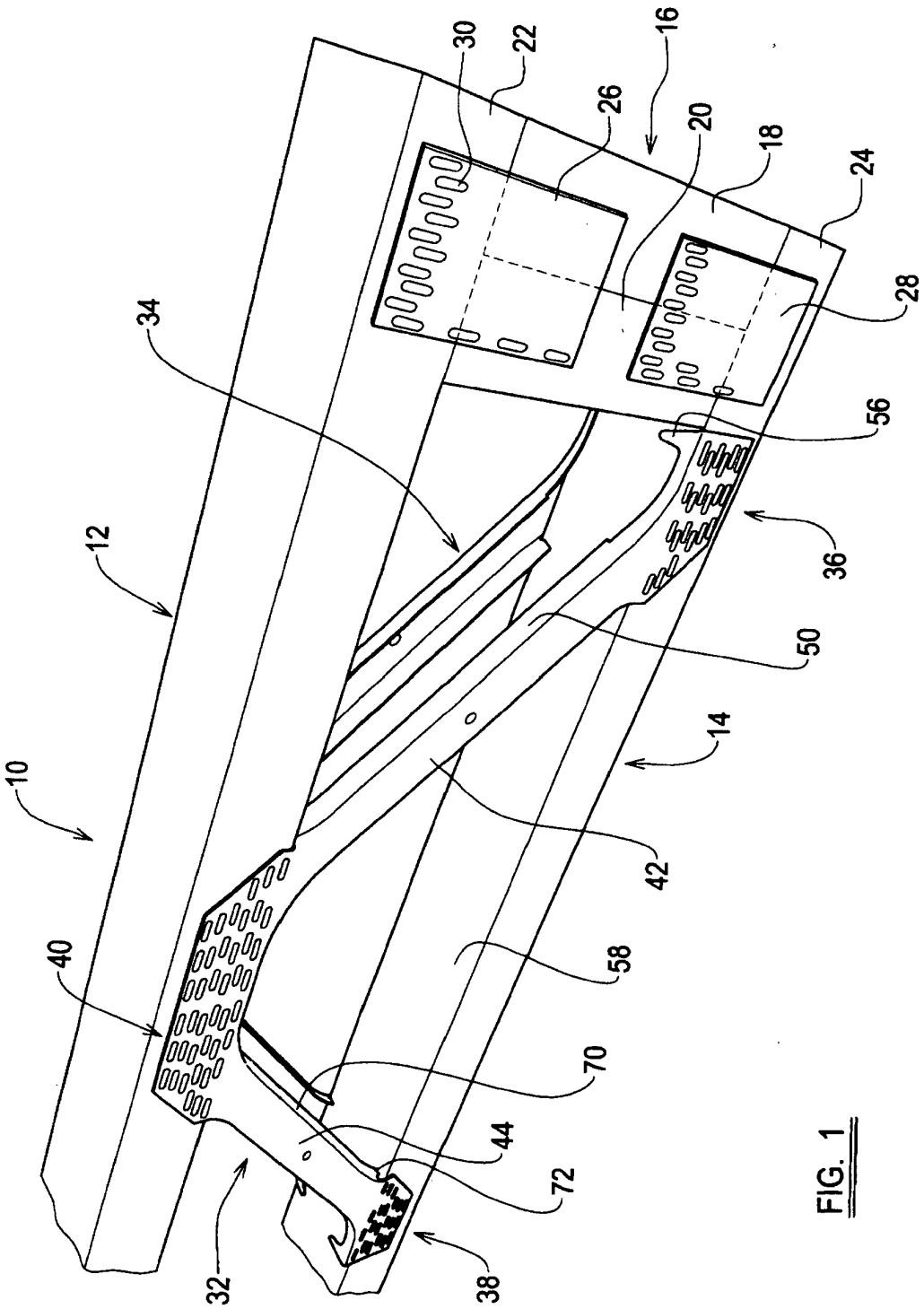

FIG. 1

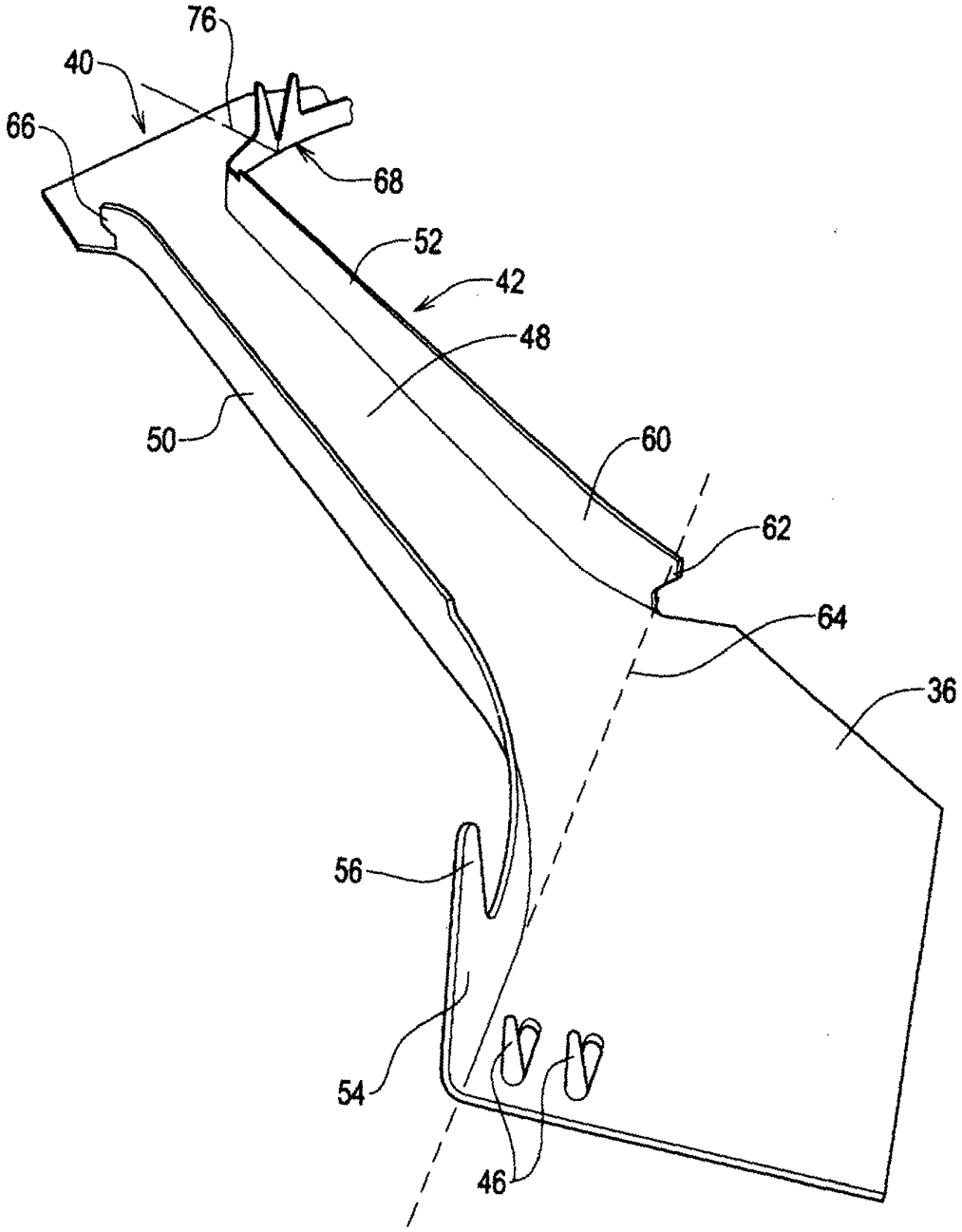

FIG. 2

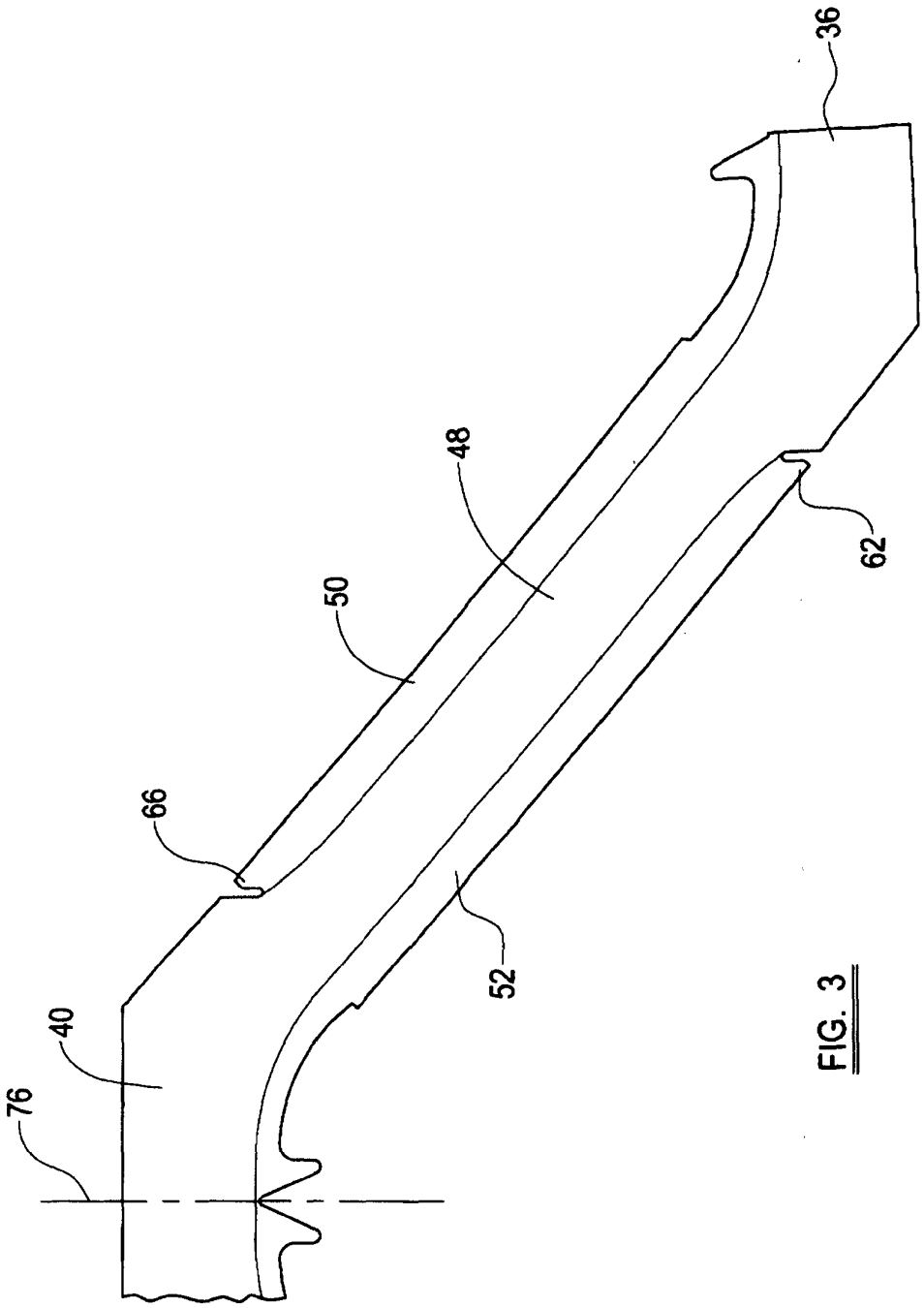

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 00 8456

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 5 899 042 A (PELLOCK MICHAEL A [US]) 4 May 1999 (1999-05-04) * figures *	1-3,7-10 4-6	INV. E04C3/292
Y	US 4 562 683 A (GOTTLIEB ROBERT [US]) 7 January 1986 (1986-01-07) * column 6, line 13 - line 18; figure 8 *	4-6	
X	US 4 241 557 A (JENSEN KEITH A [US]) 30 December 1980 (1980-12-30) * figures 20,21 *	1-3,7-10	
X	US 3 708 942 A (LEONARD F) 9 January 1973 (1973-01-09) * figure 1 *	1,2,4-10	
X	GB 2 121 848 A (HYDRO AIR INTERNATIONAL) 4 January 1984 (1984-01-04) * figures *	1-3,7-10	
A	US 4 475 328 A (REEDER MILTON E [US] ET AL) 9 October 1984 (1984-10-09) * column 5, line 56 - line 60; figure 2 *	4-6	TECHNICAL FIELDS SEARCHED (IPC) E04C F16B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 September 2007	Demeester, Jan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 00 8456

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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07-09-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5899042 A	04-05-1999	NONE	
US 4562683 A	07-01-1986	NONE	
US 4241557 A	30-12-1980	NONE	
US 3708942 A	09-01-1973	NONE	
GB 2121848 A	04-01-1984	DK 250383 A	10-12-1983
		FI 831771 A	10-12-1983
		NO 832063 A	12-12-1983
		SE 8303247 A	10-12-1983
US 4475328 A	09-10-1984	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82