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(54) **A construction element**

Konstruktionselement

Element de construction

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Description

[0001] DE2644040 of Slowbe discloses a construction element which has a first side, an opposing second side, a first end, an opposing second end, and a planar member which extends in a first direction from the second end to the first end in respective planes. A first flange formation is fixed to the planar member at the first side. A coupling piece slidably mounted on the planar member or a portion of the planer member itself extends beyond the remainder of the element at the first end to abut other parts and for coupling to the other parts in formation a structure.

[0002] We describe herein alternative construction elements for use in the construction of collapsible structures which may improve the erection time and deconstruction time.

[0003] In accordance with the present disclosure, a construction element for use in building structures 'comprises: an elongate body having a first side, an opposing second side, a first end, an opposing second end, a planar member which extends in a first direction from the second end to the first end in a first plane, a first flange formation which is fixed to the planar member at the first side, and a first mounting formation fixed to the first end and adapted for coupling the construction element to other parts in the formation of a said structure, the first mounting formation including an abutment formation located at said first end at a position between said first side and said second side for abutment with other parts in the formation of a said structure, the first mounting formation including a receiving formation adapted to receive a bolt characterised in that the receiving formation extends in the first plane and is adapted to receive said bolt to extend through the receiving formation in said first direction in said first plane for coupling the construction element to the other parts; and in that the planar member includes an access opening therethrough adjacent the receiving formation and adapted to allow access from either side of the planar member for said bolt to be inserted into the receiving formation in said first direction in said first plane.

[0004] The body may be L-shaped or T-shaped.

[0005] The body may include a second flange formation which is fixed to the planar member at the second side and in this case the body may be H-shaped or U shaped in cross-section.

[0006] The planar member may include a web which extends between the first and second side and the first and second ends. The planar member may extend at a right angle relatively to the first flange formation.

[0007] The first mounting formation may include a support formation between the receiving formation and the planar member.

[0008] The abutment formation may be elongate.

[0009] The receiving formation may include a hole in the abutment formation.

[0010] The access formation preferably includes an opening in the planar member.

[0011] The construction element may include a second mounting formation which is fixed to the second end. The second mounting formation may be identical in construction to the first mounting formation and the construction element may include a second access opening adjacent the second end and adapted to allow access from either side of the planar member for a bolt to be inserted into the receiving formation of the second mounting formation in a direction opposite to said first direction.

[0012] The construction element may include at least a first attachment formation on the first side which has a catch member which is engaged with the body, and an access slot in the planar member. The construction element may include at least a second attachment formation on the second side.

[0013] The second attachment formation may be identical in construction to the first attachment formation.

[0014] A structure which is collapsible and re-usable includes a plurality of the aforesaid construction elements, a plurality of fasteners with which the construction elements are interengaged, a plurality of support pillars wherein each support pillar is locked to a construction element, and a plurality of flooring elements wherein each flooring element is engaged with a construction element, the fasteners comprising a bolt cooperating with a nut or a nut-like internally threaded element. The structure may include a staircase which is connected to at least one construction element.

[0015] A kit for constructing such a collapsible and reusable structure comprises a plurality of the aforesaid construction elements, a plurality of fasteners for interengaging the construction elements, a plurality of support pillars, and a plurality of flooring elements, the fasteners comprising a bolt cooperating with a nut or a nut-like internally threaded element.

[0016] Embodiments of construction element are further described by way of examples with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a construction beam;
Figure 2 is a front side view of the beam of Figure 1;
Figure 3 is an end view of the beam of Figure 1;
Figure 4 is a partial sectioned side view of a cross-junction and a T-junction formed by a plurality of beams of Figure 1;
Figure 5 is an exploded side view of the cross-junction of Figure 4;
Figure 6 is a sectioned side view on the line 6-6 in Figure 4 of the T-junction of Figure 4;
Figure 7 is a sectioned side view of a portion of a collapsible structure illustrating the use of the beams of Figure 1;
Figure 8 is a plan view of the structure of Figure 7;
Figure 9 is a side view of the structure of Figure 8; and
Figure 10 is a sectioned side view of a portion of a staircase used in the structure of Figures 8 and 9.

[0017] Figures 1 to 3 illustrate a construction element 10 which is in the form of a beam and which has an elongate body 12 with a first upper side 14, an opposing second lower side 16, a first end 18, an opposing second end 20, a planar web 22 which extends between the upper side 14 and the lower side 16, in a first direction 24 from the second end 20 to the first end 18 and in a plane 26, a first upper flange 28 which is fixed to the web 22 at the upper side 14 and a second lower flange 30 which is fixed to the web 22 at the lower side 16.

[0018] The body 12 is made from any appropriate metal material and can be cast, extruded or manufactured in a known manner.

[0019] The beam 10 has at least a first mounting 32 which is fixed to the first end 18 and which has an elongate, oval shaped abutment surface 34 located between the upper side 14 and the lower side 16 and which is fixed to the web 22. The abutment surface 34 straddles the web 22 and extends on either side of the web 22. The first mounting 32 has a receiving formation or slot 36 which extends in the first direction 24 and in the plane 26. The slot 36 terminates in a hole 38 in the abutment surface 34.

[0020] The first mounting 32 has a support bracket 40 which is attached to the web 22 and located between the web 22 and the slot 36 and the abutment surface 34. The bracket 40 has a similar shape to that of the abutment surface 34.

[0021] A first access opening 42 is formed in the web 22 at the first end 18 to allow access to the slot 36. The slot 36 extends between the first opening 42 and the hole 38.

[0022] In this example the body 12 is H-shaped in cross-section but it is important to understand that the body 12 can for example have a U-shape in cross-section or alternatively, and if the lower flange 30 is for example omitted it can have an L-shape or a T-shape in cross-section.

[0023] A second mounting 44 which is identical in construction to the first mounting 32 is fixed to the second end 20. A second access opening 46 which is identical in construction to the first opening 42 is formed in the web 22 at the second end 20.

[0024] At least a first attachment formation 48 is formed on the beam 10 at the upper side 14 and at least a second attachment formation 50 is formed on the beam 10 at the lower side 16. The attachment formations 48, 50 are identical and only the first attachment formation 48 is described.

[0025] The attachment formation 48 has a catch 52 in the form of a sleeve which is fixed to the body 12 at the upper side 14 and an access slot 54 in the web 22 which allows access to the sleeve 52. The sleeve 52 lies in the plane 26 and in respect of the first attachment formation 48 the sleeve 52 terminates in an aperture 56 in the upper flange 28. In respect of the second attachment formation 50 the aperture 56 is in the lower flange 30.

[0026] The beam 10 has an oval shaped fixing gap 58 in the web 22.

[0027] Depending on requirements the beam 10 can have a plurality of attachment formations 48, 50 at the upper and lower sides 14, 16 and a plurality of gaps 58 at spaced intervals in the web 22.

[0028] In use, as is shown in Figures 4, 5 and 6 a number of beams 10A, B, C, D are interconnected to one another by way of a plurality of fasteners 60.

[0029] In Figure 4 a second end 20 of a beam 10A is fixed to the web 22 of a beam 10B by way of a fastener 60A, the first end 18 of a beam 10C is attached to the web 22 of the beam 10B by way of a fastener 60B and the second end 20 of the beam 10A is attached to the first end 18 of the beam 10C by way of the fasteners 60A, B to form a cross-junction 61A. A second end 20 of a beam 10D is attached to the web 22 of the beam 10C by way of a fastener 60C to form a T-junction 61B.

[0030] Each of the fasteners 60 has a bolt 62 which extends through the slot 36 of the respective mounting 32, 44 and an insert or connector 64 into which the bolt 62 threads. Each connector 64 acts as a nut and each fastener 60 is in the form of a nut and bolt combination.

[0031] Each of the bolts 62 are of known construction.

[0032] Each of the connectors 64 is disc shaped with a central, threaded bore or passage 66 therethrough. Each of the connectors 64 has an annular shoulder 68 which allows the connector 64 to interengage with the gap 58 and for a base 70 of the connector 64 to partially extend into the gap 58.

[0033] At the cross joint 61A the connector 64A and the connector 64B are fixed to one another in a back-to-back configuration in the gap 58 by way of a bolt 74 which passes through the gap 58. Once the connectors 64A, B are firmly engaged the respective bolts 62A, B are passed through the respective slots 36 and threaded into the passages 66 until the respective abutment surfaces 34 tightly abut the respective connector 64A, B. The respective upper flanges 28 of the beams 12A, B, C and the respective lower flanges 30 of the beams 10A, B, C come into contact with the adjacent flange and at least three points of contact are established between each adjacent beam 10A, B and 10B. C. These points of contact are at the junctions of the respective upper flanges 28 and the respective lower flanges 30 and at the respective mountings 32,44 and the web 22. In this manner a stable cross-junction 61A is formed.

[0034] The T-junction 61B between the beam 10C and the beam 10D is better illustrated in Figure 6.

[0035] A fastener 60C is used to attach the second end 20 of the beam 10D to the web 22 of the beam 10C. Two connectors 64 are engaged with one another through the gap 58. A bolt 62 passes through the slot 36 at the beam 10D and draws the mounting 44 tightly against the connector 64 so that the abutment surface 34 abuts against the connector 64, the upper flange 28 of the beam 10D abuts tightly against the upperflange 28 of the beam 10C and the lower flange 30 of the beam 10D abuts tightly against the lower flange 30 of the beam 10C. A stopper

76 is used to close the passage 66 in the outer connector 64C. In this manner a stable T-junction 61B is formed.

[0036] Figure 7 shows a section of a modular, collapsible and re-usable structure 100 which is constructed from a plurality of beams 10 and fasteners 60 which are used to interconnnect the beams 10.

[0037] Additionally to the cross-junction 61A the structure 100 has a plurality of support pillars 102 which are fixed to a beam 10A.

[0038] Each of the pillars 102 has an upper end 104 to which an engagement nut 106 is attached in any appropriate manner such as for example by welding. A set of engagement nuts 106 which is paced an appropriate distance from the upper end 104 is attached to the sides of the pillar 102.

[0039] The beam 10A is fixed to the pillars 102 in two ways. The pillar 102A is attached to the first end 18 of the beam 12A by way of a bolt 62 which passes though the mounting 32 and threads into an engagement nut 106 which is attached to the side of the pillar 102A. The bolt 62 and nut 106 combination is used to draw the abutment surface 34 into close contact with the pillar 102A so that the upper flange 28, the abutment surface 34 and the lower flange 30 all tightly abut against the side of the pillar 102A.

[0040] The beam 10A rests on the pillar 1028 and the upper end 104 of the pillar 102B abuts against the lower flange 30 at a second attachment formation 50. A bott 62 passes through the sleeve 52 and aperture 56 and is threaded into the engagement nut 106 at the upper end 104. By way of the bolt 62 and nut 106 combination the pillar 102B is fixed to the beam 10A at the second attachment formation 50.

[0041] It is important to understand that each of the bolts 62 extend into the respective slot 36 and sleeve 52 in the same plane as the web 22. The access openings 42 are essential to allow the insert and removal of the bolts 62 into the slots 36 and also allow the use of tools (not shown) to tighten and loosen the bolts 62. The access slots 54 fulfil a similar formation in respect of the sleeves 52 of the access formations 48, 50.

[0042] The gaps 58 are oval shaped to allow small adjustments in the alignment of opposing ends 18, 20 of beams 10 which are attached to the web 22 of a cross beam 10.

[0043] A plurality of flooring elements 108 of any appropriate kind are laid on top of the beams 10A to form a floor 110. The flooring elements 108 are attached to the beams 10 in any appropriate manner.

[0044] Ceiling elements or boards 112 of any appropriate kind are engaged with the lower sides 16 of the beams 10 in any appropriate manner to form a ceiling 114.

[0045] The floor 110 is spaced from the ceiling 114 by the height of the beams 10 and a space 115 is formed between the floor 110 and the ceiling 114 wherein any required conduits, cabling or insulation (not shown) can be installed.

[0046] Figures 8 and 9 show a double story exhibition stand 100A which is constructed in the manner described from a plurality of beams 10, fasteners 60 and pillars 102. A spiral staircase 116 is used to provide access from a ground level 118 to a first floor level 120. The staircase 116 is attached to at least one of the beams 10 of the structure 100A in the same manner as a pillar 102.

[0047] The staircase 116 has a plurality of steps 122. Each step 122 extends from a central pillar 124 of the staircase 116. A lower rail 126 spirals around the central pillar 124 and is attached to the leading ends of the steps 122. A vertical brace 128 extends from each step 122 and an upper rail 130 which spirals around the central pillar 124 is attached to each of the braces 128 to provide a hand rail.

[0048] As is shown in Figure 10 each of the steps 122 has a similar construction to that of the beam 10 except that there is no lower flange 30 attached to the lower side 16 and each step 122 only has a first mounting 32. In cross-section each step 122 has a T-shape. The mount-

Claims

1. A construction element for use in building structures, the construction element comprising an elongate body (12) having a first side (14), an opposing second side (16), a first end (18), an opposing second end (20), a planar member (22) which extends in a first direction (24) from the second end to the first end in a first plane (26), a first flange formation (28) which is fixed to the planar member at the first side, and a first mounting formation (32) fixed to the first end and adapted for coupling the construction element to other parts in the formation of a said structure, the first mounting formation including an abutment formation (34) located at said first end at a position between said first side and said second side for abutment with other parts in the formation of a said structure, the first mounting formation including a receiving formation (36) adapted to receive a bolt (62) **characterised in that** the receiving formation extends in the first plane and is adapted to receive said bolt to extend through the receiving formation in said first direction in said first plane for coupling the construction element to the other parts; and **in that** the planar member includes an access opening (42) therethrough adjacent the receiving formation and adapted to allow access from either side of the planar member for said bolt to be inserted into the receiving formation in said first direction in said first plane.

2. A construction element according to Claim 1, further **characterised in that** the body includes a second flange formation (30) which is fixed to the planar member at the second side.

3. A construction element according to Claim 2, further **characterised in that** the body is H-shaped in cross-section.

4. A construction element according to any preceding Claim, further **characterised in that** the planar member includes a web (22) which extends between the first and second sides and the first and second ends.

5. A construction element according to any of Claims 1 to 4, further **characterised in that** it includes a second mounting formation (44) which is identical in construction to the first mounting formation and which is fixed to the second end.

6. A construction element according to any one of Claims 1 to 5, further **characterised in that** it includes at least a first attachment formation (48) on the first side which has a catch member (52) which is engaged with the body and an access slot (54) in the planar member,

7. A construction element according to Claim 6, further **characterised in that** it includes at least a second attachment formation (50) on the second side which is identical in construction to the first attachment formation.

8. A structure (100, 100A) which is collapsible and re-usable, **characterised in that** it includes a plurality of construction elements according to any of Claims 1 to 7, a plurality of fasteners (60) including bolts (62) with which the construction elements are interengaged, a plurality of support pillars (102) wherein each support pillar is locked to a construction element, and a plurality of flooring elements (108) wherein each flooring element is engaged with a construction element.

9. A kit for constructing a collapsible and re-usable structure according to Claim 8, the kit comprising a plurality of construction elements according to any one of Claims 1 to 7, a plurality of fasteners (60) including bolts (62) for interengaging the construction elements, a plurality of support pillars (102), and a plurality of flooring elements (108).

Patentansprüche

1. Konstruktionselement zur Verwendung in Baustrukturen, wobei das Konstruktionselement einen länglichen Körper (12) umfasst mit einer ersten Seite (14), einer gegenüberliegenden zweiten Seite (16), einem ersten Ende (18), einem gegenüberliegenden zweiten Ende (20), einem planaren Element (22), welches sich in eine erste Richtung (24) von dem zweiten Ende zu dem ersten Ende in einer ersten Ebene (26) erstreckt, einer ersten Flanschformation (28), welche an dem planaren Element an der ersten Seite befestigt ist, und einer ersten Montageformation (32), welche an dem ersten Ende befestigt ist und geeignet ist zum Koppeln des Konstruktionselements mit anderen Teilen bei der Bildung einer Struktur, wobei die erste Montageformation eine Auflagerformation (34) an dem ersten Ende in einer Position zwischen der ersten Seite und der zweiten Seite zum Aufliegen auf anderen Teilen bei der Bildung einer Struktur beinhaltet;, die erste Montageformation eine Aufnahmeformation (36) beinhaltet, welche geeignet ist, einen Bolzen bzw. einen Anker (62) aufzunehmen, **dadurch gekennzeichnet, dass** sich die Aufnahmeformation in der ersten Ebene erstreckt und ausgelegt ist, den Bolzen bzw. Anker aufzunehmen der sich in der ersten Richtung in der ersten Ebene durch die Aufnahmeformation erstreckt zum Koppeln des Konstruktionselements mit anderen Teilen, und dass das planare Element eine durch das planare Element führende Zugangsöffnung (42) beinhaltet, welche angrenzt an die Aufnahmeformation und geeignet ist, Zugang von jeder der beiden Seiten des planaren Elements für diesen Bolzen bzw. diesen Anker, welcher in der ersten Richtung in der ersten Ebene in die Aufnahmeformation einzuführen ist, zu ermöglichen.

2. Konstruktionselement nach Anspruch 1, weiter **dadurch gekennzeichnet, dass** der Körper eine zweite Flanschformation (30) beinhaltet, welche an dem planaren Element an der zweiten Seite befestigt ist.

3. Konstruktionselement nach Anspruch 2, weiter **dadurch gekennzeichnet, dass** der Körper einen H-förmigen Querschnitt aufweist.

4. Konstruktionselement nach einem der vorhergehenden Ansprüche, weiter **dadurch gekennzeichnet, dass** das planare Element einen Steg (22) beinhaltet, welcher sich zwischen der ersten und zweiten Seite und dem ersten und zweiten Ende erstreckt.

5. Konstruktionselement nach einem der Ansprüche 1 bis 4, weiter **dadurch gekennzeichnet, dass** es eine zweite Montageformation (44) beinhaltet, welche baugleich mit der ersten Montageformation ist und an dem zweiten Ende befestigt ist.

6. Konstruktionselement nach einem der Ansprüche 1 bis 5, weiter **dadurch gekennzeichnet, dass** es wenigstens eine erste Befestigungsformation (48) an der ersten Seite beinhaltet, welche ein Verriegelungselement (52) aufweist, welches in den Körper und einen Zugangsschlitz (54) in dem planaren Element eingreift.

7. Konstruktionselement nach Anspruch 6, weiter **dadurch gekennzeichnet, dass** es wenigstens eine zweite Befestigungsformation (50) an der zweiten Seite beinhaltet, welche baugleich mit der ersten Befestigungsformation ist.

8. Struktur (100, 100A), welche zusammenklappbar und wieder verwendbar ist, **dadurch gekennzeichnet, dass** sie eine Vielzahl von Konstruktionselementen nach einem der Ansprüche 1 bis 7, eine Vielzahl von Befestigungsmitteln (60) beinhaltend Bolzen bzw. Anker (62), mit welchen die Konstruktionselemente ineinander greifen, eine Vielzahl von Stützpfeilern (102), wobei jeder Stützpfeiler an einem Konstruktionselement arretiert ist, sowie eine Vielzahl von Belagelementen (108), wobei jedes Belagelement in das Konstruktionselement eingreift, beinhaltet.

9. Bausatz für den Bau einer zusammenklappbaren und wieder verwendbaren Struktur nach Anspruch 8, wobei der Bausatz eine Vielzahl von Konstruktionselementen nach einem der Ansprüche 1 bis 7, eine Vielzahl von Befestigungsmitteln (60) beinhaltend Bolzen bzw. Anker (62) zum Ineinandergreifen der Konstruktionselemente, eine Vielzahl von Stützpfeilern (102) sowie eine Vielzahl von Belagelementen (108) beinhaltet.

Revendications

1. Elément de construction pour servir dans des structures de construction, l'élément de construction comprenant un corps allongé (12) ayant un premier côté (14), un deuxième côté opposé (16), une première extrémité (18), une deuxième extrémité opposée (20), un organe plan (22) qui s'étend dans une première direction (24) depuis la seconde extrémité jusqu'à la première extrémité dans un premier plan (26), une première formation d'aile (28) qui est solidaire de l'organe plan en le premier côté, et une première formation de montage (32) solidaire de la première extrémité et agencée pour coupler l'élément de construction aux autres parties dans la formation de ladite structure, la première formation de montage comprenant une formation de butée (34) située sur ladite première extrémité en une position comprise entre ledit premier côté et ledit deuxième côté pour venir en butée contre d'autres parties dans la formation de ladite structure; la première formation de montage comprenant une formation d'accueil (36) agencée pour accueillir un boulon (62) **caractérisé en ce que** la formation de réception s'étend dans le premier plan et est adaptée pour recevoir ledit boulon qui s'étende à travers la formation dans ladite première direction dans le premier plan d'accueil pour coupler l'élément de construction aux autres parties, et **en ce que** l'organe plan est traversé par une ouverture d'accès (42) adjacente à la formation d'accueil et agencée pour permettre un accès de chaque côté de l'organe plan audit boulon inséré dans la formation d'accueil dans ladite première direction, dans un premier plan.

2. Elément de construction selon la revendication 1, **caractérisé en outre en ce que** le corps comprend une seconde formation d'aile (30) qui est solidaire de l'organe plan en le deuxième côté.

3. Elément de construction selon la revendication 2, **caractérisé en outre en ce que** le corps a une section transversale en forme de H.

4. Elément de construction selon l'une quelconque des revendications précédentes, **caractérisé en outre en ce que** l'organe plan inclut une paroi (22) qui s'étend entre les premier et deuxième côtés et les première et deuxième extrémités.

5. Elément de construction selon l'une quelconque des revendications 1 à 4, **caractérisé en outre en ce qu'**il inclue une deuxième formation de montage (44) qui est de construction identique à la première formation de montage et qui est solidaire de la deuxième extrémité.

6. Elément de construction selon l'une quelconque des revendications 1 à 5, **caractérisé en outre en ce qu'**il inclut sur le premier côté au moins une première formation d'accrochage (48) comportant un organe d'enclenchement (52) qui est en prise avec le corps et une fente d'accès (54) dans l'organe plan.

7. Elément de construction selon la revendication 6, **caractérisé en outre en ce qu'**il inclut au moins une deuxième formation d'accrochage (50) sur le deuxième côté qui est de construction identique à la première formation d'accrochage.

8. Structure (100, 100A) qui est démontable et réutilisable, **caractérisée** en que qu'elle inclut plusieurs éléments de construction selon l'une quelconque des revendications 1 à 7, plusieurs dispositifs de fixation (60) incluant des boulons (62) avec lesquels les éléments de construction sont en prise mutuelle, plusieurs piliers porteurs (102) qui sont chacun verrouillé sur un élément de construction, et plusieurs éléments de plancher (108) qui sont chacun en prise avec un élément de construction.

9. Kit de construction d'une structure démotable et réutilisable selon la revendication 8, le kit comprenant plusieurs éléments de construction selon l'une quelconque des revendications 1 à 7, plusieurs dispositifs de fixation (60) incluant des boulons (62) pour

les éléments de construction en prise mutuelle, plusieurs piliers porteurs (102), et plusieurs éléments de plancher (108).

FIG 1

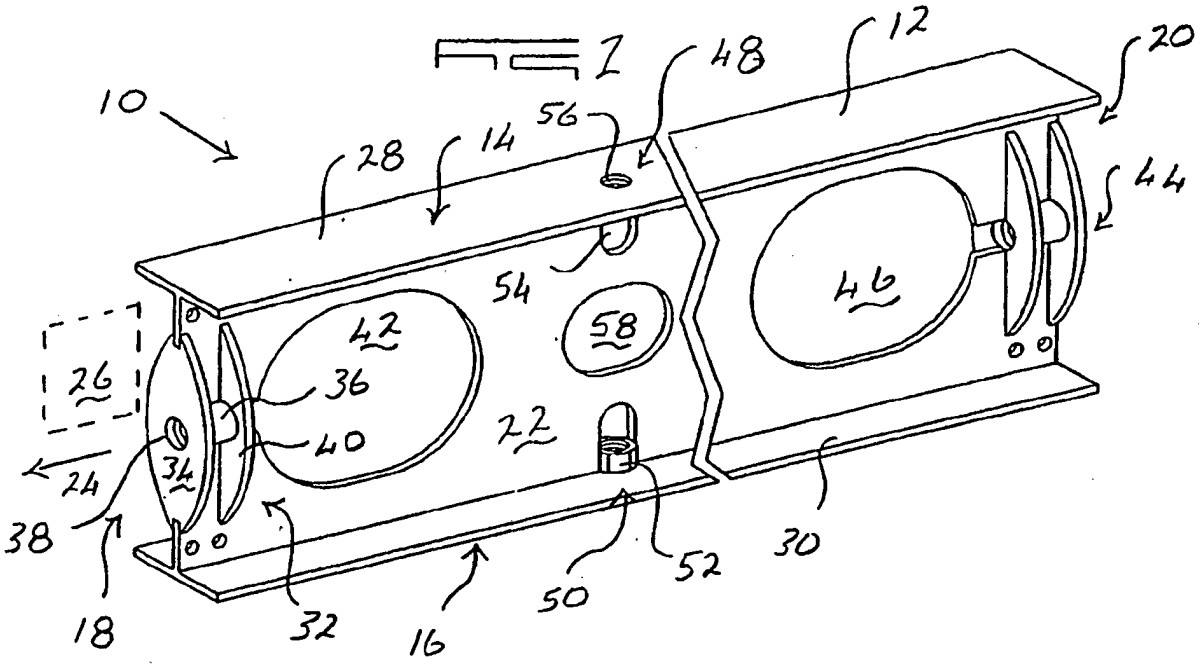


FIG 2

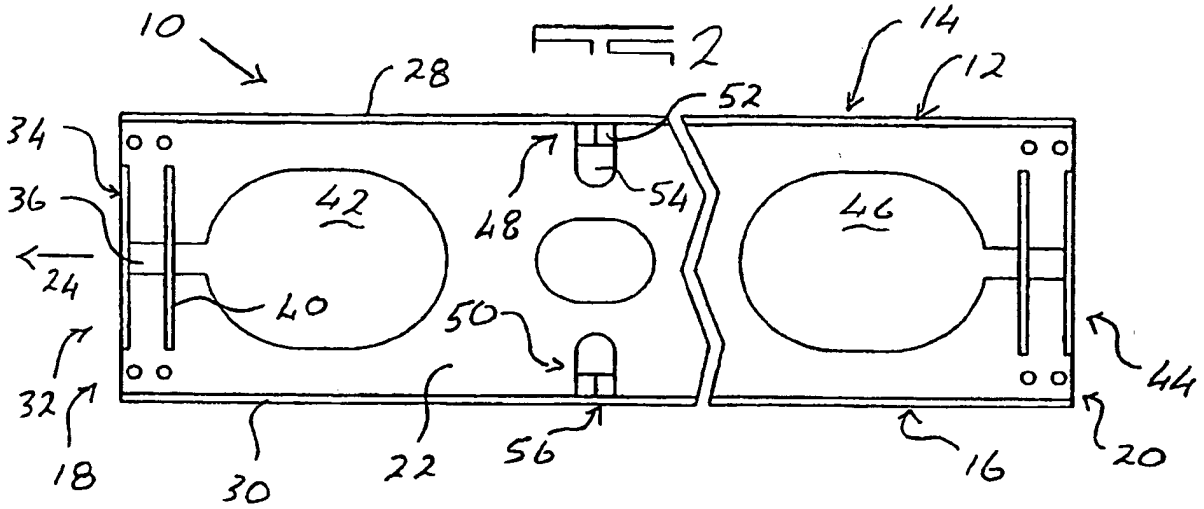
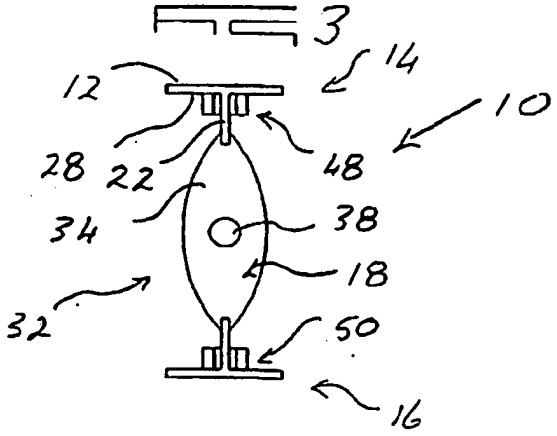


FIG 3



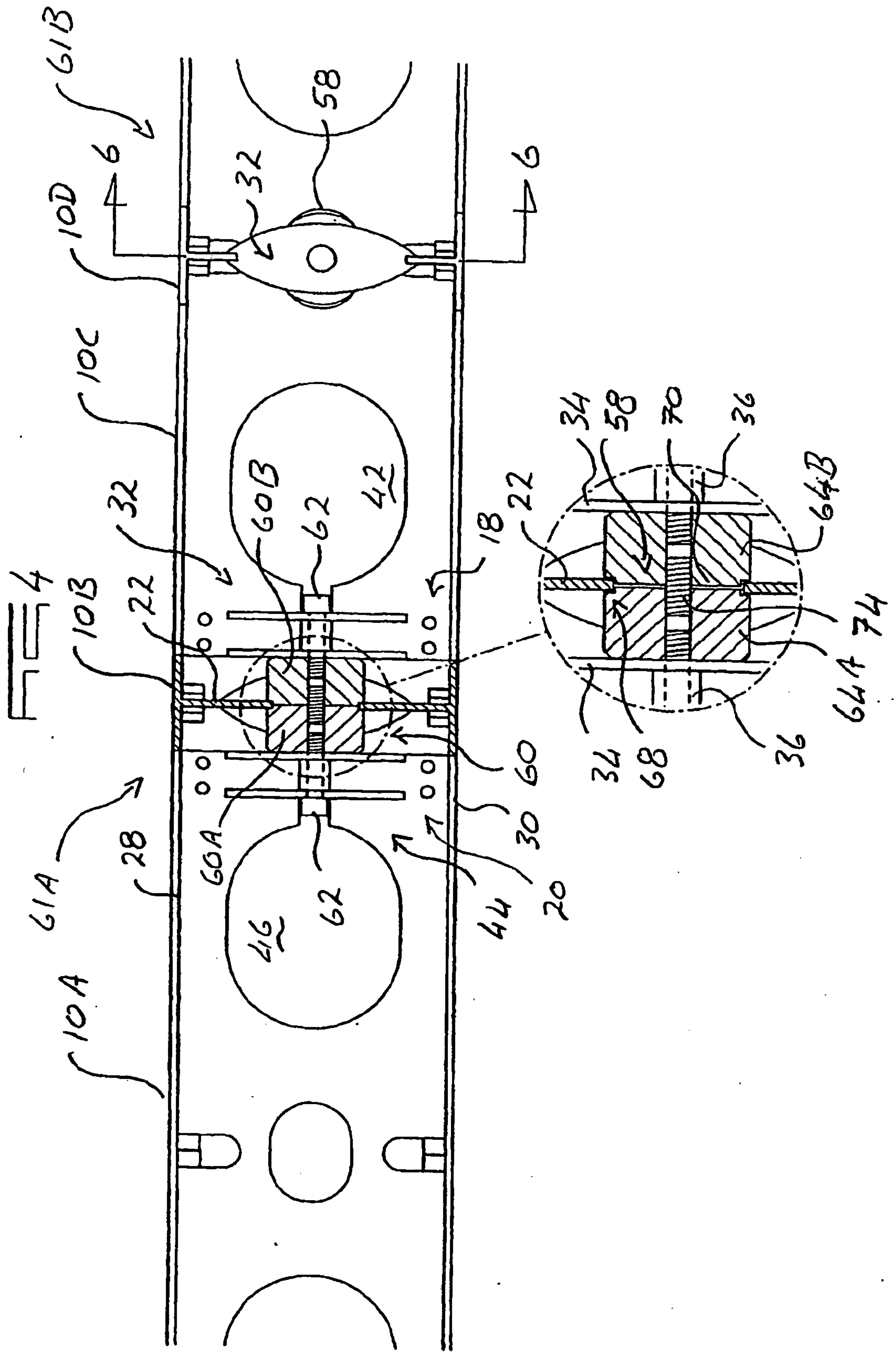


FIG 4
61B
6
6
10D
32
58
10C
32
60B
62
42
18
22
10B
22
60
30
20
44
60A
62
46
28
61A
10A
34
58
70
36
36
64B
74
64A
22
34
68
36

FIG 5

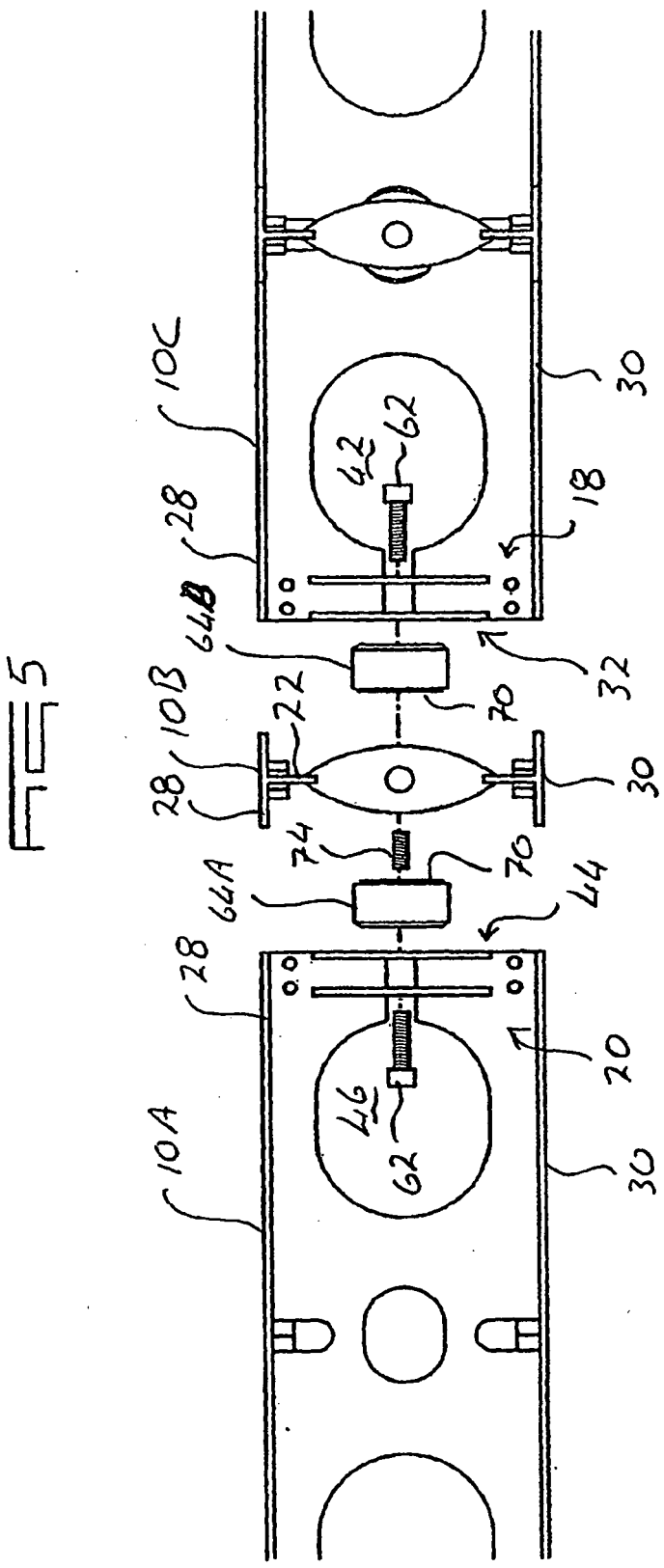

10C
42
62
28
18
64B
30
32
10B
22
70
28
30
74
70
64A
44
28
20
46
62
10A
30

FIG 6

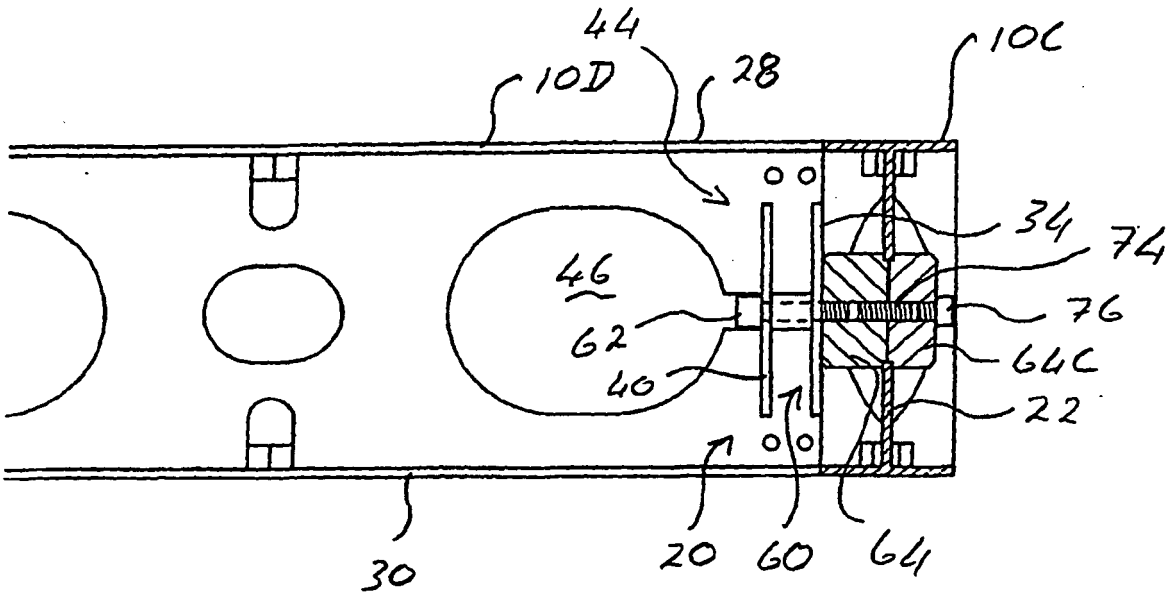


FIG 7

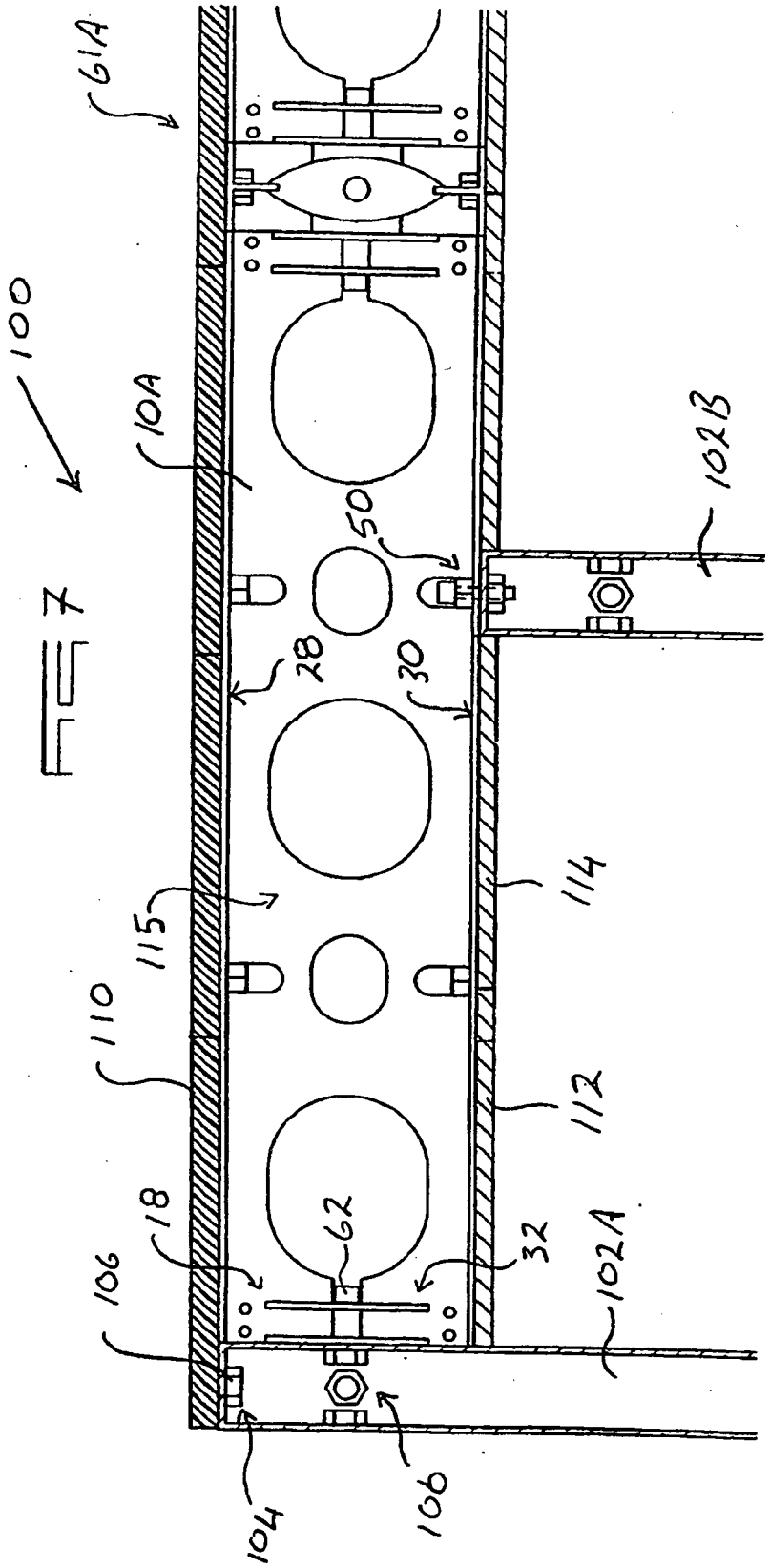

100
61A
10A
102B
50
28
30
114
115
110
112
18
62
32
102A
106
104
106

FIG 8

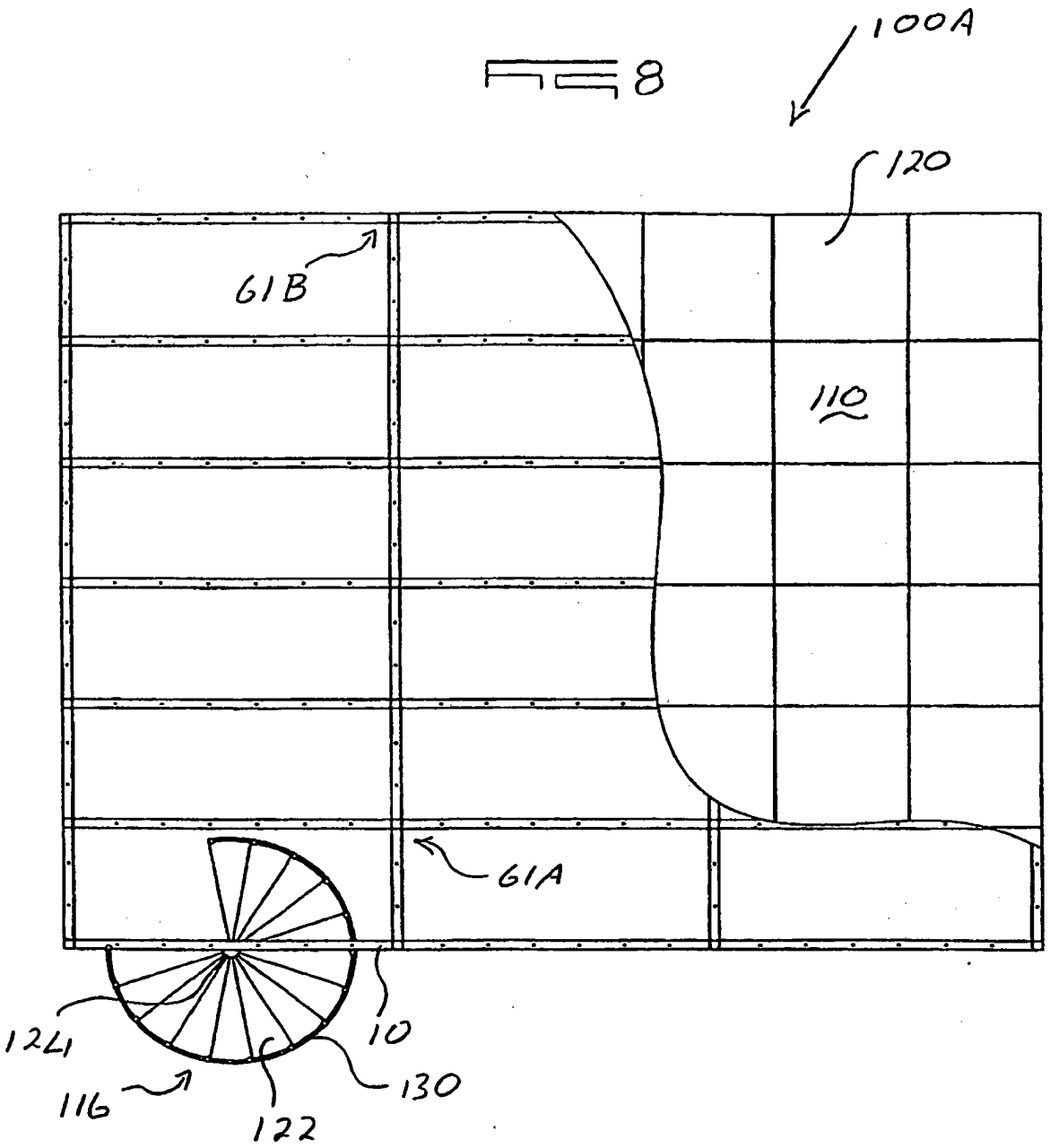


FIG 9

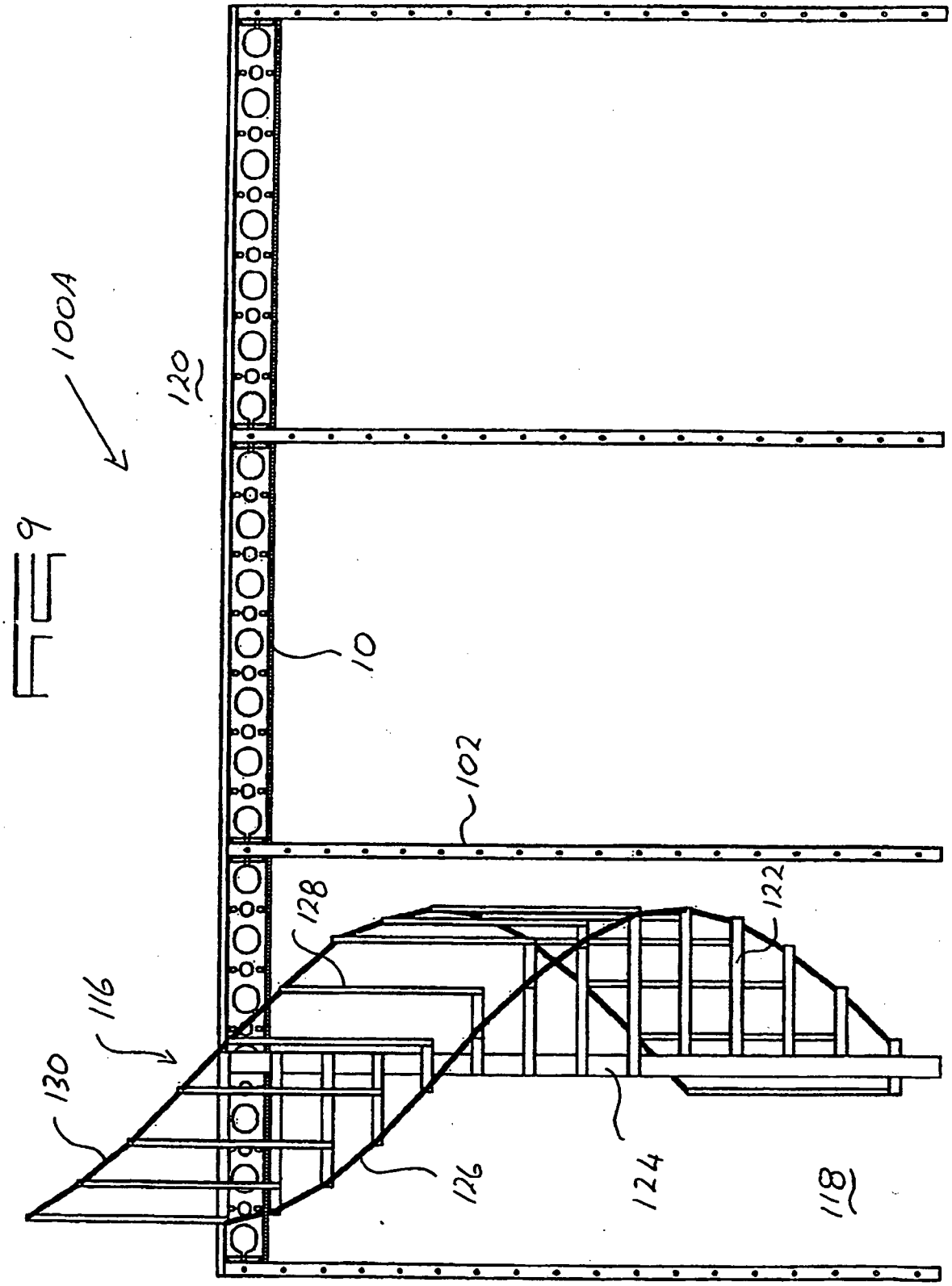
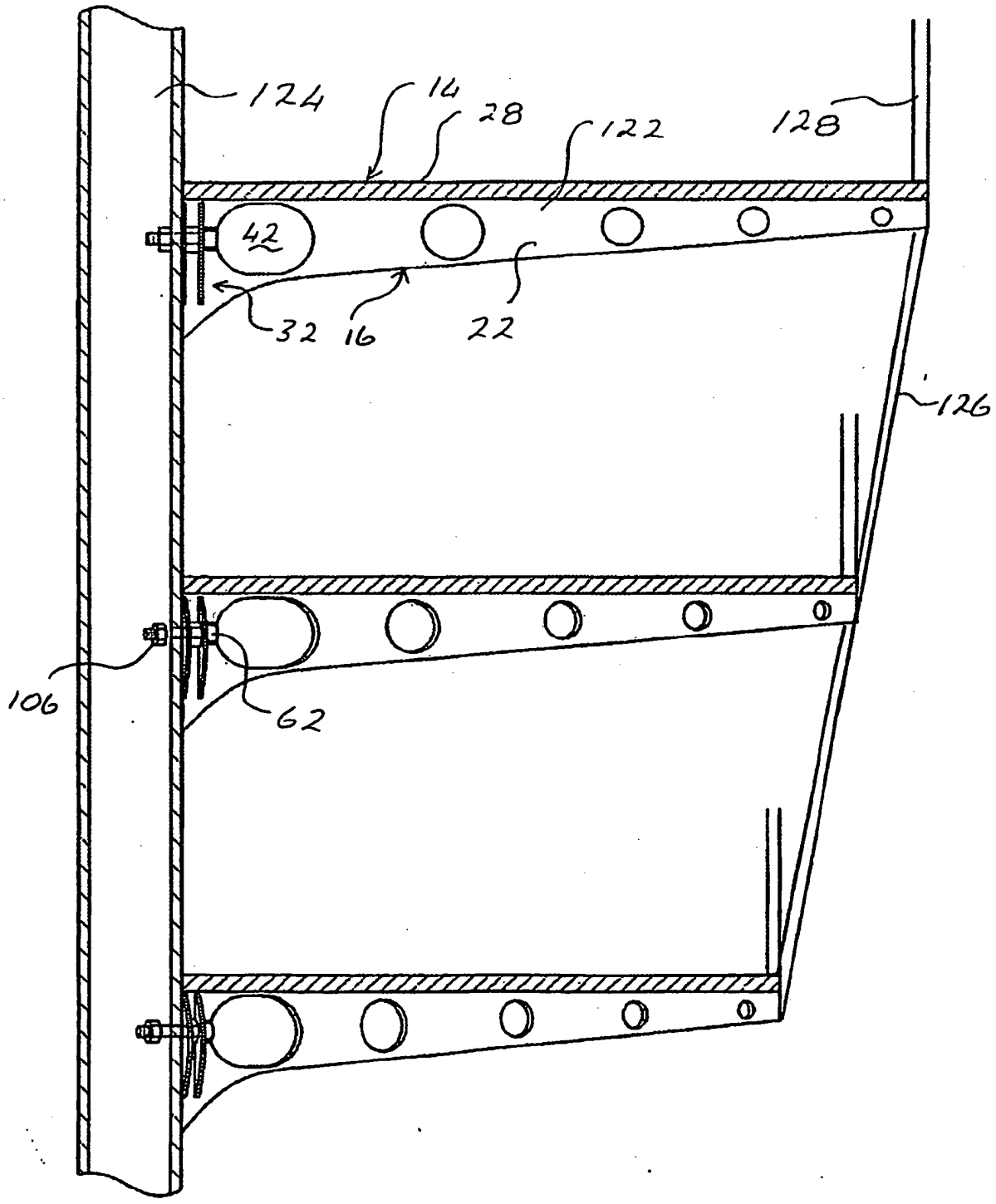


FIG 10



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Patent documents cited in the description

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