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(54) A building panel

(57) A building panel (12) for a building structure (10) includes a plurality of engaging edges (30). Each engaging edge includes a substantially similar engaging formation (32). The panel is arranged so that in use as part of a building structure which includes a plurality of such panels, each engaging formation engages a substantially similar engaging formation of an adjacent panel.

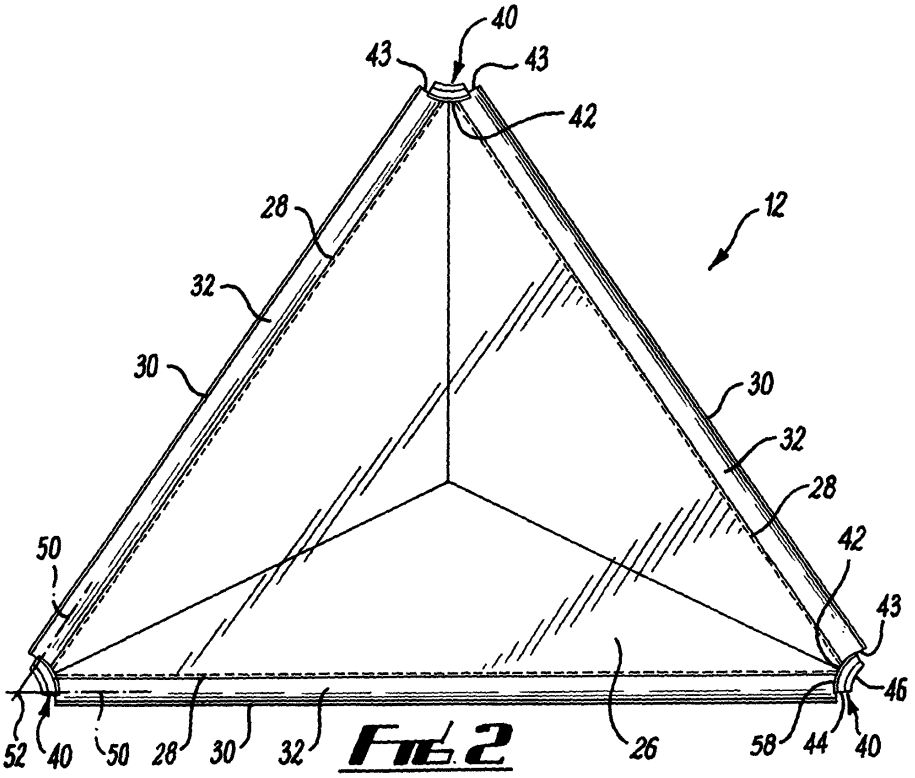

FIG. 2

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Description

[0001] The present invention concerns building panels for use in building structures, and also building structures including a plurality of such panels.

[0002] In the construction of building structures such as geodesic domes, it is known to provide a plurality of polygonal panels which are mounted to a framework. Typically in such building structures the panels are butt jointed so that the edge of one panel abuts an edge of an adjacent panel, or are mounted so that higher panels overlap lower panels to provide a weatherproof building structure. However, because of the multiplanar surfaces and "non standard" angles involved in geodesic domes, it can be difficult to ensure that panels are correctly positioned and sealed.

[0003] According to the present invention, there is provided a building panel for a building structure, the panel including a plurality of engaging edges, each engaging edge including an engaging formation, the panel arranged so that in use as part of a building structure which includes a plurality of panels, each engaging formation engages an engaging formation of an adjacent panel.

[0004] Further according to the present invention there is provided a building structure including a plurality of panels, each panel including a plurality of engaging edges, each engaging edge including an engaging formation, the building structure arranged so that each engaging formation of each panel engages an engaging formation of an adjacent panel.

[0005] Preferably, each engaging formation of the adjacent panel is substantially similar to each engaging formation.

[0006] Preferably each engaging formation includes locating means for locating the engaging formation of the adjacent panel.

[0007] Preferably the building structure is arranged so that each engaging formation at least partially overlaps, or is at least partially overlapped by the engaging formation of the adjacent panel.

[0008] Preferably each engaging formation extends substantially along the length of each engaging edge. Preferably each engaging formation is substantially constant in section shape along the length of each engaging edge.

[0009] Preferably each engaging formation is flexible, and may be resilient. Preferably, when engaged, one of the engaging formations is deformed to resiliently grip the other engaging formation to provide a seal between the engaging formations.

[0010] Preferably the or each panel is substantially planar and may be formed of sheet like material, and may be formed of plastics material. Preferably each engaging formation is formed integrally with the panel.

[0011] Preferably each engaging formation includes a protruding face, which may protrude outwardly from the plane of the panel. Preferably the protruding face is convex in form, and may be half round. Preferably each engaging formation includes a recessed face. Preferably the recessed face corresponds in shape to the protruding face. Preferably the recessed face defines a locating recess, in which in use a protruding face of an adjacent panel locates. Preferably, the protruding and recessed faces form the locating means.

[0012] Preferably in use the protruding faces of the engaging formations are orientated outwardly relative to the building structure.

[0013] Preferably the building structure includes a plurality of frame members, which may support the panels. Preferably the building structure includes securing means for securing the panels to the frame members. Preferably the building structure is arranged so that each of the engaging edges of each panel is mounted to a frame member. Preferably in use each frame member is received at least partially within one of the locating recesses. Preferably each frame member includes a surface which corresponds in shape to the recess.

[0014] Preferably the building structure includes connection means for connecting the frame members together. Preferably, the connection means include a connector.

[0015] Preferably the building structure includes connection sealing means for sealing the building structure at the connection means. Preferably the connection sealing means include a cap, which in use fits over the connection means. Preferably each cap includes a top wall and a side wall extending around the periphery of the top wall.

[0016] Preferably each panel includes a panel lip extending along an edge of the panel between the engaging formations. Preferably in use each cap fits over the panel lips so that the cap side wall is outside the panel lips to substantially seal the building structure at the connection means. Preferably the building structure includes a plurality of cap seals for sealing between each cap and the respective panels. Preferably the building structure includes securing means for securing each cap in position.

[0017] Preferably the building structure is a dome structure, and may be a geodesic dome structure.

[0018] Still further according to the present invention, there is provided an engaging formation, the engaging formation being arranged to extend in use from one building panel and engage an engaging formation extending from an adjacent building panel.

[0019] Preferably, the engaging formation includes any of the features of the engaging formation as set out above in the preceding paragraphs.

[0020] An embodiment of the present invention will now be described by way of example only, and with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a building structure according to the invention;

Fig. 2 is a view from below of a panel according to the invention;

Fig. 3 is a view from above of part of the structure of Fig. 1;

Fig. 4 is a sectional side view of another part of the structure of Fig. 1; and

Fig. 5 is a sectional side view of a further part of the structure of Fig. 1.

[0021] Fig. 1 shows a geodesic dome building structure 10 according to the invention, the dome structure 10 including a plurality of relatively thin substantially planar panels 12 formed of a sheet like plastics material such as polycarbonate. The sheet like material could be approximately 3mm in thickness. In the example shown in Fig. 1, each panel 12 is substantially triangular in shape, but other building structures according to the invention could include panels of different shapes such as square, pentagonal, hexagonal etc. The panels 12 are supported on a frame 14, which includes a plurality of frame members 16 which are connected together by connectors 18.

[0022] Fig. 2 shows one of the panels 12 in more detail. Each panel 12 includes a substantially planar body part 26 and three engaging edges 30. Extending outwardly of the body part 26 along each engaging edge 30 is an engaging formation 32, which extends substantially the whole length of each engaging edge 30.

[0023] The engaging formations 32 are shown most clearly in Fig. 4. Each engaging formation 32 comprises a convex protruding face 34 which protrudes outwardly from the plane of the body part 26 and an opposite concave recessed face 36 which corresponds in shape to the protruding face 34. The recessed face 36 defines a locating recess 56. The protruding face 36 and recessed face 34 are substantially half round in section, each engaging formation 32 being constant in section shape along the length of each engaging edge 30.

[0024] Referring back to Fig. 2, a relatively short corner edge 42 extends between each of the engaging formations 32. The panel 12 includes a connection sealing formation 40 at each corner. The connection sealing formation 40 includes an upstanding step wall 58 which extends outwardly relative to the plane of the body part 26 from the corner edge 42 and from approximately half of the length of end edges 43 of each of the adjacent engaging formations 32. A step top 54 extends from the step wall 58 substantially parallel with the plane of the body part 26. A panel lip 44 extends outwardly relative to the plane of the body part 26 from the step top 54, and a flange 46 extends substantially parallel with the plane of the body part 26 from the top of the lip 44. Longitudinal axes 50 of the engaging formations 32 meet at an imaginary vertex 52. Each of the corner edge 42, the step wall 58, the step top 54, the panel lip 44, and the flange 46 are curved in form, the centre of each curve being substantially on an axis extending through the imaginary vertex 52 and perpendicular to the plane of the body part 26. Each of the step wall 58, the step top 54, the panel lip 44, and the flange 46 extend between two boundaries which are formed approximately by planes normal to the plane of the panel body part 26, each boundary being aligned with one of the axes 50 of the engaging formations 32.

[0025] Figs. 3, 4 and 5 show the building structure 10 at various stages of assembly. In Fig. 3, a connector 18 is shown from above. The connector 18 includes a connector body 20 and a plurality of spaced connector arms 22 extending outwardly from the connector body 20. Each of the connector arms 22 is connected to a frame member 16. Panels 12 are mounted to each of the frame members 16, as seen more clearly in Fig. 4.

[0026] As shown in Fig. 4, each frame member 16 includes a half round convex face 24 which corresponds with the shape of the half round engaging formation 32 of the panel 12. The frame members 16 could be formed of any suitable material, such as hardwood. The panels 12 are mounted to the frame member 16 as follows. A first panel 12A is mounted so that the half round convex face 24 of the frame member 16 is received within the locating recess 56 defined by the recessed face 36 of the first panel 12A. A second panel 12B is then positioned over the first panel 12A so that the locating recess 56 defined by the recessed face 36 of the second panel 12B receives the engaging formation 32A of the first panel 12A and the convex face 26 of the frame member 16. The sheet material of which the panels 12A, 12B and the engaging formations 32A,32B are formed is flexible and resilient, so that the engaging formation 32B of the second panel 12B is able to deform to receive the engaging formation 32A of the first panel 12A. Consequently, the engaging formation 32B of the second panel 12B grips the engaging formation 32A of the first panel 12A to form an effective seal between the engaging formations.

[0027] It will be noted in Fig. 4 that the plane of the first panel 12A is orientated at an angle to the plane of the second panel 12B. The half round shape of the convex surface 26 of the frame member 16, and of the engaging formations 32A, 32B permits each engaging formation to be pivotally adjusted relative to the other engaging formation and to the frame member 16. When the panels 12A, 12B have been correctly positioned, holes 38 are formed through the engaging formations 32A, 32B and a fastener 48 in the form of a pin, nail or screw inserted through the holes 38 into the frame member 16 to secure the panels 12A, 12B in position. Alternatively holes 38 are preformed and the engaging formations 32A, 32B are adjusted to align the holes 38 to permit the fastener 48 to be inserted.

[0028] The building structure 10 is arranged so that at each connector 18 the upstanding panel lips 44 of each of the panels 12 substantially encircle the connector 18 to form a substantially continuous lip around the connector 18. The flange 46 provides extra stiffening for the lip 44.

[0029] In Fig. 3, the flexibility of the material of each panel 12 allows a number of options when the structure 10 is constructed. When fitting a panel 12 to the structure

frame 14, the panel 12 could be fitted so that at each connector 18, the engaging formations 32 of the two edges 30 of the panel 12 at each connector 18 either both overlay the adjacent engaging formations 32 of the adjacent panels 12, or both underlay the adjacent engaging formations 32 of the adjacent panels 12, or alternatively one of the engaging formations 12 overlies and the other underlies the adjacent engaging formations of the adjacent panels 12. Thus the structure 10 can be constructed so that the uppermost panels all overlay the lowermost panels to provide waterproof joints.

[0030] Fig. 5 shows a connector in a fully assembled condition. The structure 10 includes connection sealing means including a cap 60 which comprises a slightly domed top wall 62 and a downwardly depending side wall 64 extending around the periphery of the top wall 62. The cap 60 is fitted over the connector 18 so that the cap side wall 64 abuts the outside of the panel lips 44, the edges of the cap side wall 64 seating on the step top 54. A rubber seal or gasket (not shown) could be provided between the cap side wall 64 and the panel lips 44 and/or between the cap side wall 64 and the step top 54. The cap top 62 defines a hole 66. A securing means in the form of a bolt 70 extends through the hole 66 and the connector aperture 70 and threadably engage a nut 74 to secure the cap 60 in position. Alternatively the connector aperture 70 could be threaded to engage the bolt 70.

[0031] The overlapping of the engaging formations 32 of adjacent panels 12 on the frame members 16 and the caps 60 over the connectors 18 together provide a substantially weatherproof building structure. Any small gaps between the step tops 54, step walls 58 and panel lips 44 can be sealed with sealing material such as mastic. The half round shape of the engaging formations 32 provides positive location of the panels 12 on the frame members 16 for ease of construction, while permitting relative adjustment of the panels to each other and to the frame members.

[0032] Various modifications may be made without departing from the scope of the invention. The frame members and engaging formations could be of any suitable shape. The panels could be any suitable size and shape, and could be made of any suitable material. The connection means for connecting the frame members together could be of a different form. For example, the frame members could be jointed together.

[0033] The invention thus provides a building structure which includes relatively few components and is relatively quick and easy to construct. The panels provide locating means for locating the panels to the frame members and the panels and the caps together permit a substantially weatherproof building structure to be constructed. Relatively complex building structures such as geodesic domes involving multi planar surfaces and "non standard" (ie non perpendicular) angles can be constructed relatively easily.

[0034] Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. A building panel (12) for a building structure (10), **characterised in that** the panel includes a plurality of engaging edges (30), each engaging edge including an engaging formation (32), the panel arranged so that in use as part of a building structure which includes a plurality of panels, each engaging formation engages an engaging formation of an adjacent panel.

2. A panel according to claim 1, in which each engaging formation extends substantially along the length of each engaging edge.

3. A panel according to claim 2, in which each engaging formation is substantially constant in section shape along the length of each engaging edge.

4. A panel according to any of the preceding claims, in which each engaging formation is flexible and resilient and is arranged so that, when engaged, one of the engaging formations is deformed to resiliently grip the other engaging formation to provide a seal between the engaging formations.

5. A panel according to any of the preceding claims, in which each engaging formation is formed integrally with the panel.

6. A panel according to any of the preceding claims, in which each engaging formation includes a protruding face (34) which is convex in form.

7. A panel according to claim 6, in which each engaging formation includes a recessed face (36) which corresponds in shape to the protruding face.

8. A panel according to claim 7, in which the recessed face defines a locating recess (56), in which in use a protruding face of an adjacent panel locates, the protruding and recessed faces forming locating means for locating the engaging formation of the adjacent panel.

9. A panel according to any of the preceding claims, in which each panel includes a panel lip (44) extending along an edge of the panel between the engaging formations.

10. A building structure (10) including a plurality of panels (12), **characterised in that** each panel includes a plurality of engaging edges (30), each engaging edge including a substantially similar engaging formation (32), the building structure arranged so that each engaging formation of each panel engages a substantially similar engaging formation of an adjacent panel.

11. A building structure according to claim 10, in which each panel is as claimed in any of claims 1 to 9.

12. A building structure according to claims 10 or 11, in which the building structure is arranged so that each engaging formation at least partially overlaps, or is at least partially overlapped by the engaging formation of the adjacent panel.

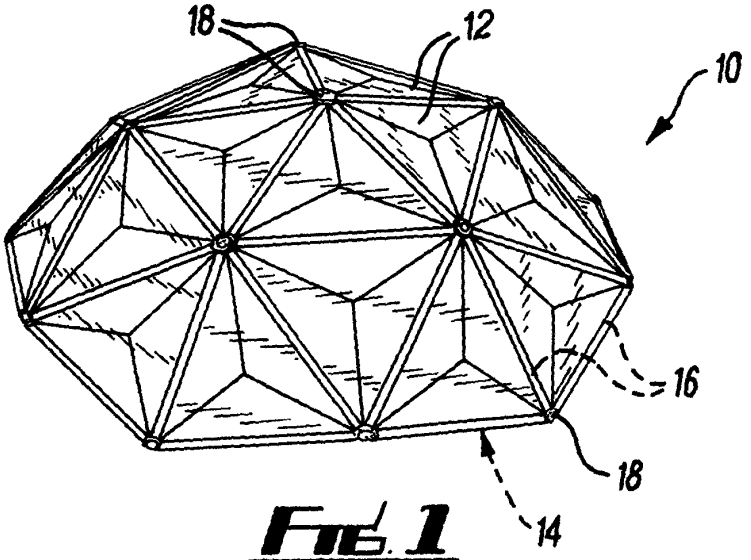
13. A building structure according to any of claims 10 to 12, in which the building structure includes a plurality of frame members (16), which support the panels, and is arranged so that each of the engaging edges of each panel is mounted to a frame member.

14. A building structure according to claim 13, in which each of the engaging edges define locating recesses (56) and in use each frame member is received at least partially within one of the locating recesses, each frame member including a surface (24) which corresponds in shape to the recess.

15. A building structure according to claims 13 or 14, in which the building structure includes connection means (18) for connecting the frame members together, the connection means including a connector (18).

16. A building structure according to claim 15, in which the building structure includes connection sealing means for sealing the building structure at the connection means, the connection sealing means including a cap (60), which in use fits over the connection means.

17. A building structure according to claim 16, in which each cap includes a top wall (62) and a side wall (64) extending around the periphery of the top wall, and each panel includes a panel lip extending along an edge of the panel between the engaging formations and in use each cap fits over the panel lips so that the cap side wall is outside the panel lips to substantially seal the building structure at the connection means.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14

FIG. 1

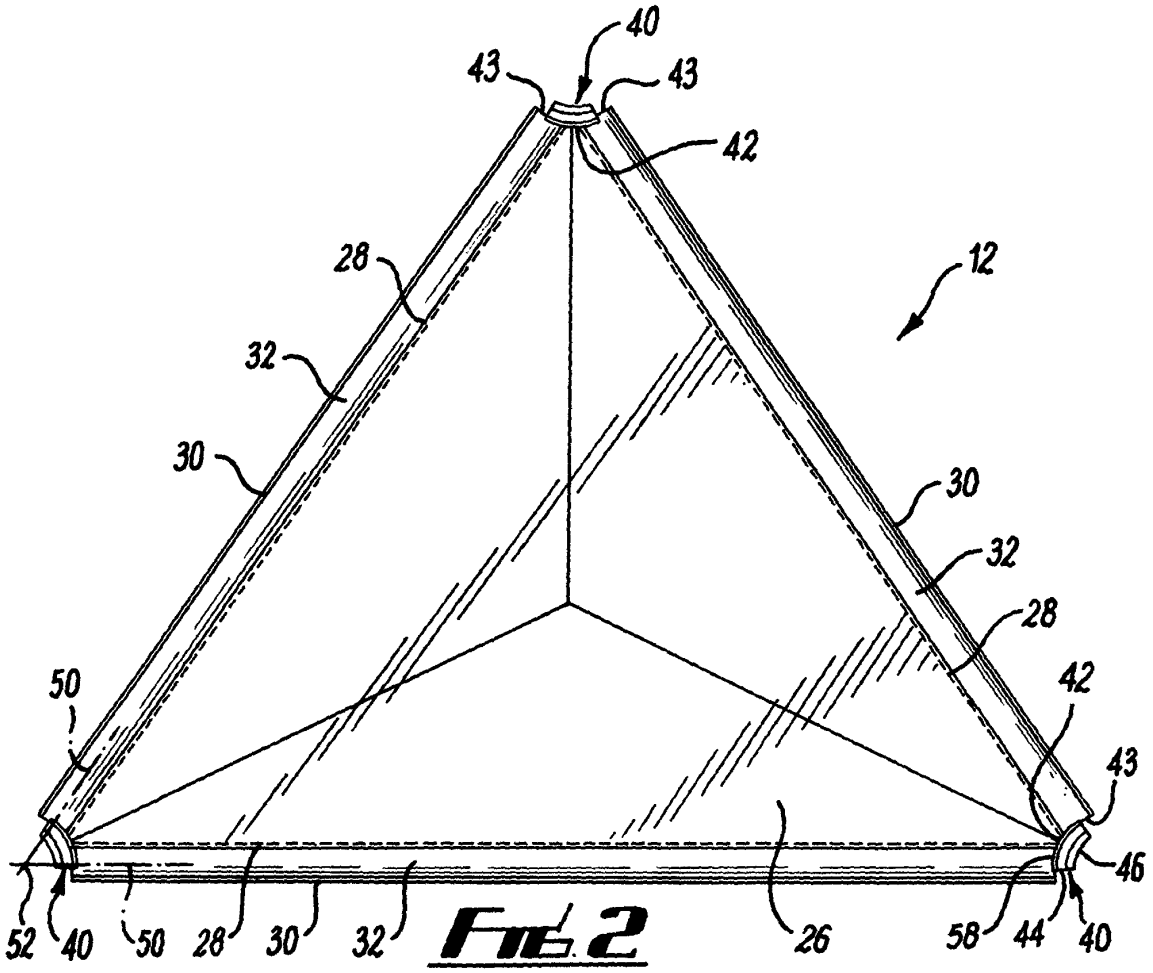
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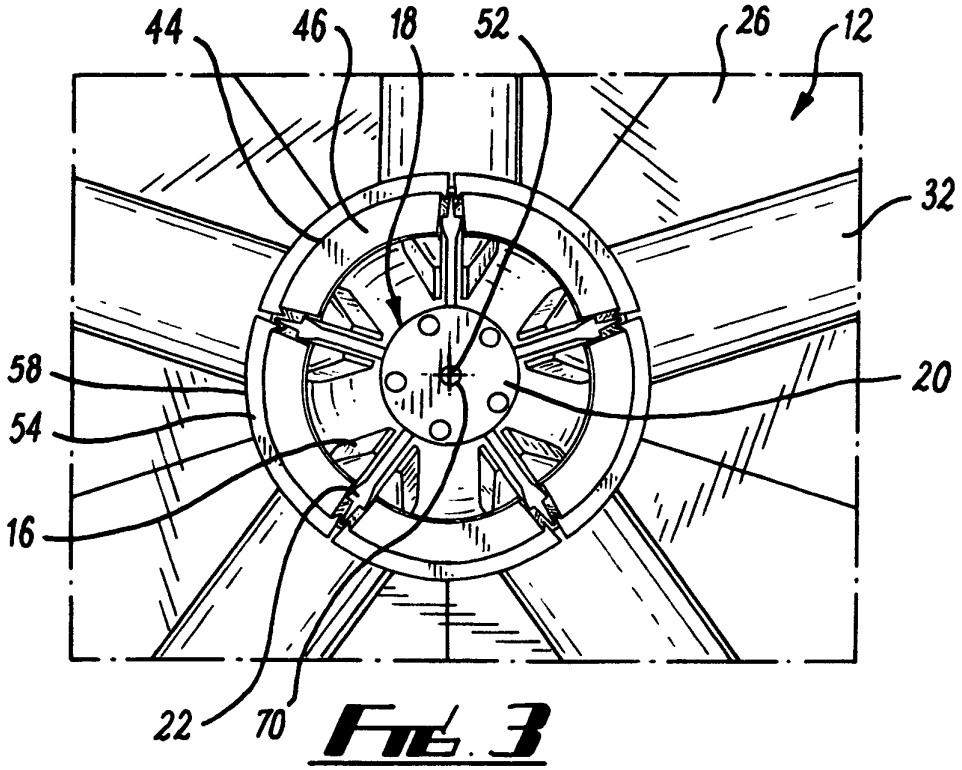
FIG. 2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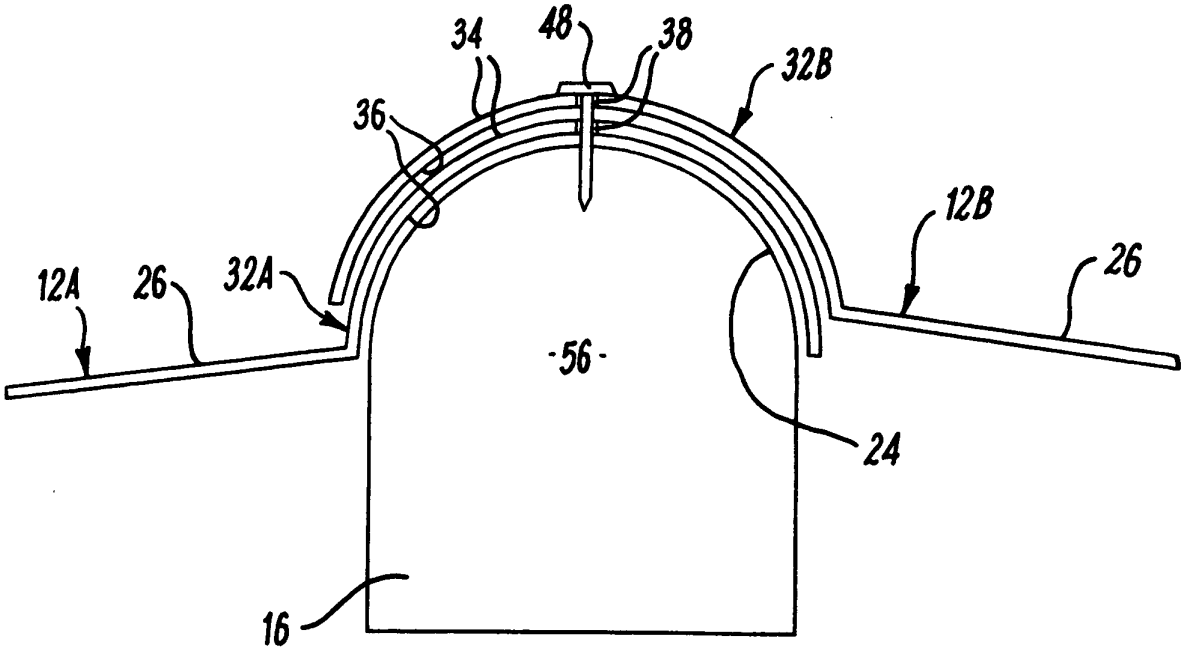
22
70

FIG. 3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32B
36
12B
12A
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32A
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56
24
16

FIG. 4

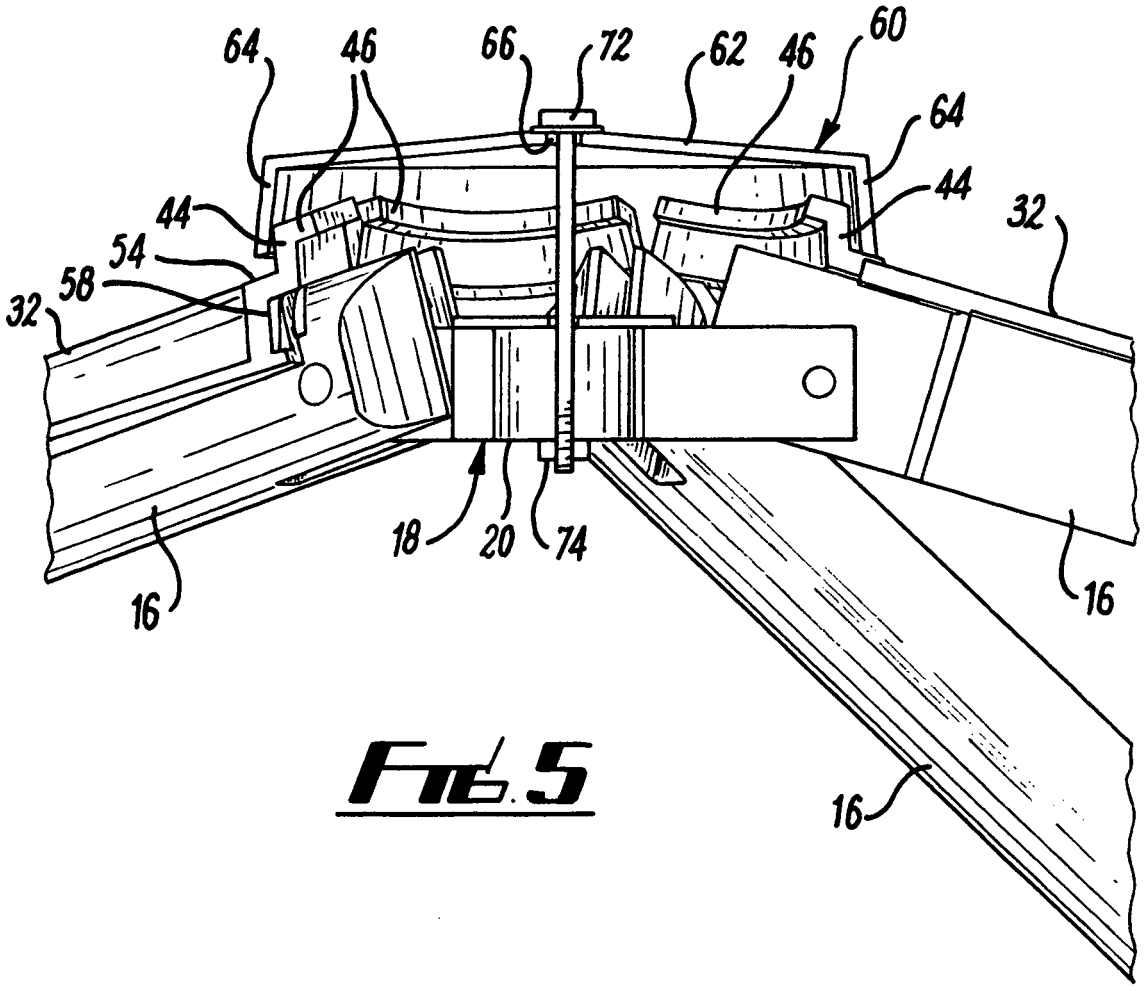

FIG. 5