

Nov. 8, 1955

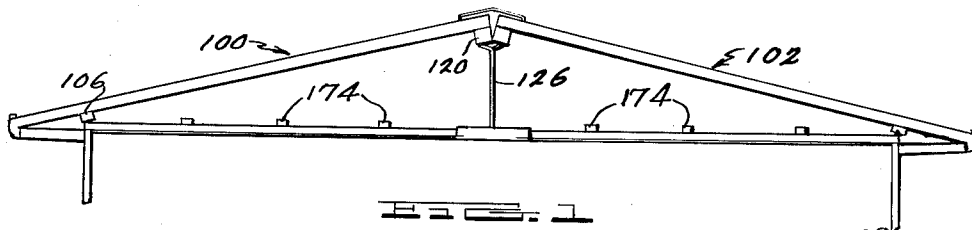
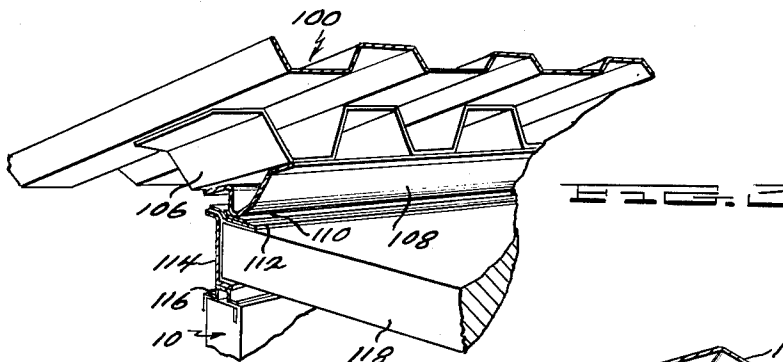
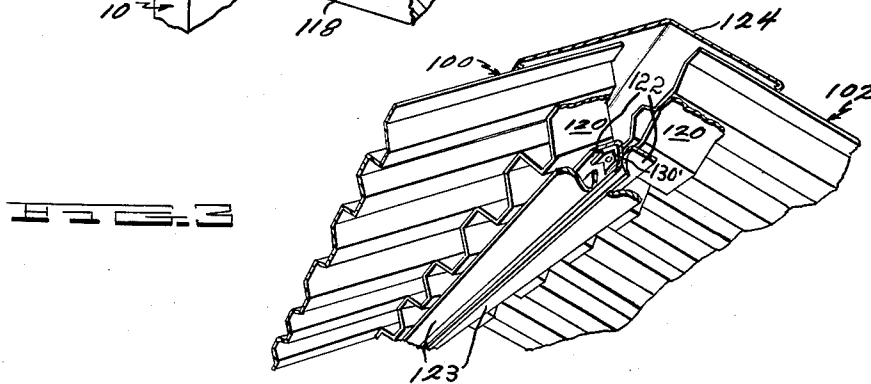
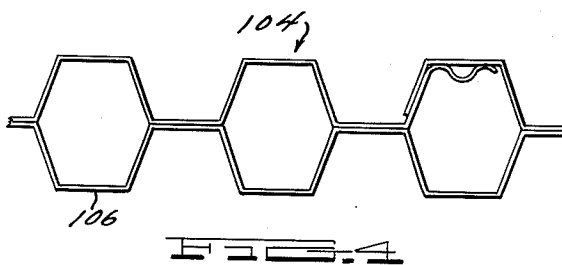
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2,722,901

ROOF STRUCTURE

Filed June 10, 1949

4 Sheets-Sheet 1



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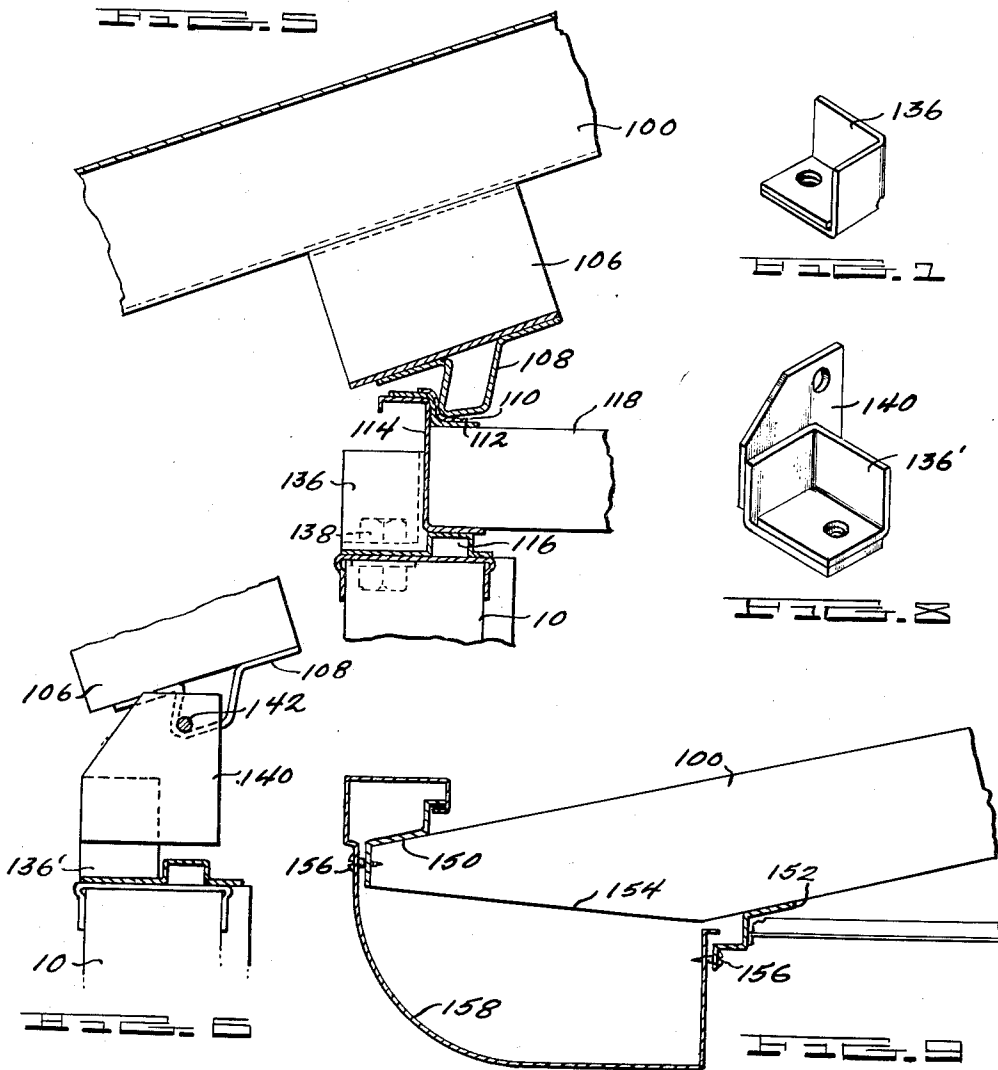
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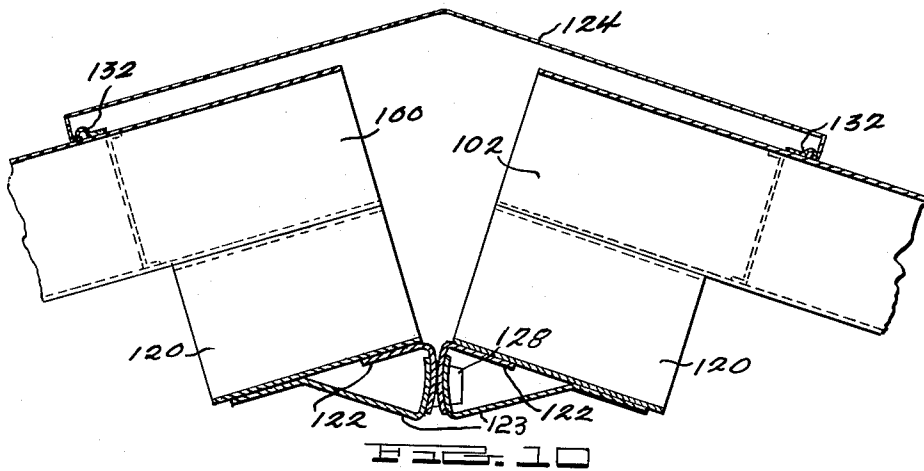
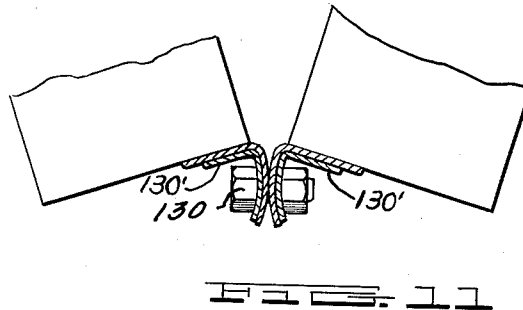
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ROOF STRUCTURE

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4 Sheets-Sheet 3



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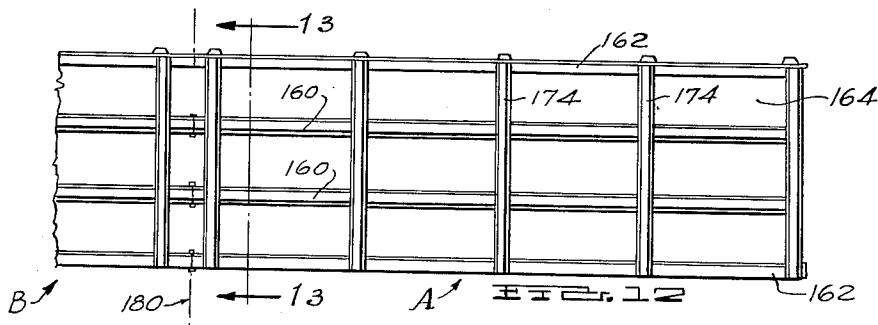
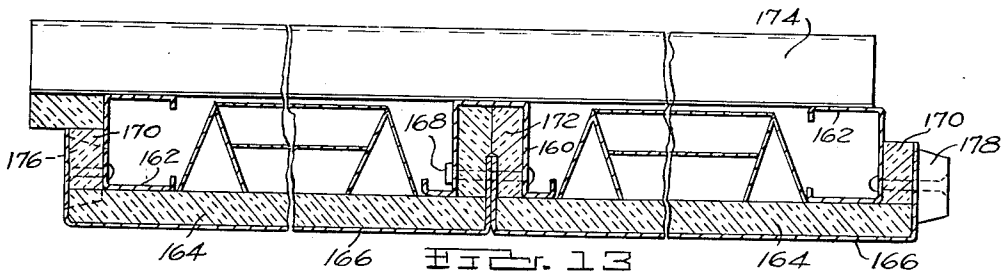
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ROOF STRUCTURE

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4 Sheets-Sheet 4



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ROOF STRUCTURE

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5 Claims. (Cl. 108—1)

This invention relates to building structures, and has for its principal object the provision of a building structure whose component parts are particularly adapted to prefabrication techniques.

More specifically, it is an object of the invention to provide an improved roof construction for buildings, characterized by unusual lightness combined with adequate rigidity, permanent resistance to rain and other inclement weather conditions, and substantial inherent compensation for deflection under load.

A further object of the invention is the provision of a special form of gutter arrangement which is peculiarly suited for use with the special form of room construction mentioned above.

An additional object of the invention is to provide an improved construction of ceiling and ceiling panels similar in many respects to the wall panel constructions above mentioned and having advantageous features in common therewith.

The above and other objects of the invention will best be understood by reference to the following detailed specification of a preferred embodiment of the invention, taken in connection with the appended drawings, in which:

Fig. 1 is a vertical sectional view through the roof and ceiling elements of a structure in accordance with the invention,

Fig. 2 is a fragmentary perspective view of the eccentric roof connection adjacent the outer ends of the roof panels,

Fig. 3 is a similar view showing the connection between the roof panels adjacent the ridge,

Fig. 4 is an enlarged fragmentary sectional view through a roof panel and a continuous gusset welded thereto.

Fig. 5 is a partial vertical sectional view of the structure shown in Fig. 2, taken between the lateral edges of a roof panel,

Fig. 6 is a view similar to Fig. 5 but illustrating the construction at points between adjacent panels of the roof structure,

Fig. 7 is an isometric view of one form of clip element used in connection with the Fig. 5 structure,

Fig. 8 is a similar view of the clip structure used in connection with the arrangement of Fig. 6,

Fig. 9 is an enlarged fragmentary vertical sectional view illustrating a preferred form of gutter used at the outer edges of the roof panels,

Fig. 10 is an enlarged fragmentary vertical sectional view illustrating the connection between oppositely inclined roof panels adjacent the ridge of the roof, said section being taken in a plane through the longitudinal center lines of said roof panels,

Fig. 11 is a similar view illustrating the connection as used in the region of the joint between adjacent panels of the roof,

Fig. 12 is a plan view of an improved form of ceiling panel according to the invention, showing the same connected to a fragmentary portion of an adjacent panel along the center line of the building,

Fig. 13 is an enlarged transverse sectional view taken along line 13—13 of Fig. 12.

Our invention contemplates an improved design of light, strong yet economical form of roof construction, best shown in Figs. 1 to 4 of the drawings. This roof construction is characterized by extremely light weight and provides a clear span without substantial obstructions in the attic space. It is fabricated of relatively thin sections with consequent reductions in the cubage required during shipment to the point of use.

Referring specifically to these figures, the roof comprises oppositely inclined sections 100 and 102, each formed of a plurality of side-by-side square-shouldered channeled strips 104 (Fig. 4), which may likewise be formed of relatively light gauge aluminum or similar metal. The shape of these strips may best be described as square-cornered corrugation having trapezoidal cross-section. In order to stiffen the rigidity the roof panels, a relatively narrow gusset strip 106 of material having the same cross sectional shape is welded in face-to-face contact with the array of panels along a line spaced inwardly from the outer edge of the panel assembly. As best shown in Fig. 2, this strip 106 has welded thereto a formed bearing member 108 which in turn is supported by a plate 112 secured to a bracket 114 whose lower leg rests upon a bearing strip 116 running across the tops of the wall panels 10. Bracket 114 also receives and supports a ceiling panel 118. If desired, a strip of rubber, neoprene or the like resilient damping material may be interposed between the bearing member 108 and the plate 112, to reduce the noises which might otherwise result when slight shifts occur between the room and its supports.

A channeled reinforcing strip 120 similar in all respects to strip 106 is similarly welded to the underside of each panels 100 and 102 adjacent the ridge of the roof, and welded to the underside of each such strip 120 is an angle strip 122, the mating faces of these angle strips being secured together in a manner to be described below, as will also be described the manner of connection of a large closure plate 124. Angle strip 122 is reinforced throughout most of its length by bracing member 123 welded along the reinforcing strip 120. This bracing member, however, does not extend entirely to the points of junction between adjacent panels forming the roof sections. Near these points the bracing 123 is omitted to facilitate the placing of bolts 130 (Fig. 11) and to make the angle strip somewhat flexible in that region. Short angle brackets 130' (Figs. 3 and 11) reinforce these bolt and nut connections between angle strips 122. Tie rods 126 (Fig. 1) may be provided at spaced intervals along the roof ridge to support the weight of the ceiling panel assembly to be described below.

In the areas between the edges of the channeled strips making up each of the roof panels, the strips 122 are provided respectively with tapered bosses 128 (see Fig. 10) and mating apertures through which such bosses pass to enable relatively rocking motion of the oppositely inclined roof sections. At the points of junction between adjacent strips forming the roof sections, however, a more secure fastening in the form of a bolt and nut combination 130 is provided. It will be noted (Fig. 3) that the bracing strip 123 does not extend to the junction area, whereby a limited amount of angular play or rocking between the panels on opposite sides of the roof is permitted. This play is facilitated by the arcuate profiles of the contacting surfaces of strips 122.

The gap between the oppositely inclined roof panels along the ridge line is preferably closed by a ridge cap 124 which is arranged to snap into position against lugs 132 suitably welded to the upper surfaces of the roof sections, as best shown in Fig. 10.

It will be seen from the above description that the oppositely inclined roof sections are of the eccentrically connected type; that is, the axis of support at the ridge is substantially displaced from the plane of the roof elements themselves in a downwardly direction by the thickness of the gusset strips 120 plus at least a portion of the face width of the strips 122. Also, the axis of support along the outer edges of the roof sections is downwardly displaced by at least the thickness of the gusset strip 106 plus a part of the bearing member 108. These eccentric connections provide a large measure of self-compensation for deflections due to load.

The details of the eccentric connections at the eave line are best illustrated in Figs. 5 and 8. In Fig. 5, a bracket 114 is shown as welded to a clip 136 (Fig. 7) which is in turn bolted as at 138 to the bearing strip 116 of the wall panel 10. These clips 136 are spaced along the bracket strip 114 for the distance spanned by individual roof panel sections. In order to provide secure retention of the roof structure, a modified clip 136' (Fig. 8) is employed adjacent the junctions between adjacent roof sections. At such points, the bearing strip 108 is interrupted, and adjacent edges thereof receive between them a plate 140 integrally secured to the slip 136'. As shown in Fig. 6, a pin 142 passing through a suitable aperture in the plate 140 engages the inner surfaces of strips 108, to limit upward movement of the roof structure away from the walls of the building.

A form of gutter which is particularly suited for use in connection with a channeled roof as above described is best shown in Fig. 9 of the drawings. Angle strips 150 and 152 are welded along the extremities of the roof sections, whose edges may be beveled off in a substantial horizontal plane as at 154 and to these strips may be secured as by screws 156 a gutter strip 158. This gutter strip is installed after the roof construction has been completed, and the placement of screws 156 enables minor adjustments to be made to provide a perfectly straight edge along the roof at the eaves.

Figs. 12 and 13 illustrate a preferred form of ceiling panel construction, shown as formed of a pair of longitudinally extending "hat" sections 160 and a pair of terminal sections 162 whose coplanar lower surfaces support rigid insulating board 164 of the type used in the wall panels described above, such material being held in place by the skin of aluminum sheet 166, the sheet sections again having intumed edges secured between the sides of the "hat" sections as by rivets 168 (see the central portion of Fig. 13). At the lateral edges of each panel, the intumed edges of sheets 166 are riveted to the terminal sections 162, the metal parts in either case being separated by narrow strips of rigid insulating material 170 or 172. The spaces between adjacent longitudinal sections 160 or 162 contain the same foil type of insulation as described in connection with the wall panels, and the coplanar upper surfaces of these sections or beams are connected by a series of parallel transverse "hat" sections 174. Along one edge of each ceiling panel are provided spaced tapered sockets 176 extending through the intumed edge of the aluminum skin 166 and the strip 170; along the opposite edge are provided a corresponding plurality of tapered bosses 178, the arrangement being such that adjacent panel sections are rigidly connected by the insertion of the bosses of one within the sockets of the next. The center line of the ceiling system, paralleling the ridge, is indicated in Fig. 12 by the line 180.

it being seen that the abutting ends of a complete panel A and a complete panel B are secured together as by channel splices with or without internal sleeves bolted within the hollow sections 160 and 162. The right hand ends of all of the panels A, as seen in Fig. 12, rest of course upon the loose plate 116 such as shown in Fig. 5, and the left ends of panel B rest upon the plate of the opposite wall.

What is claimed is:

1. A pitched roof construction comprising oppositely inclined substantially rigid roof panels connected for limited rotation about an axis spaced a substantial distance below their adjacent terminal edges, said connection comprising for each panel a combined panel bracing and pivotal roof-supporting element connected to the respective panel, said elements having respective arcuate bearing surfaces, means for holding said elements with their arcuate surface in contact with one another for limited relative angular motion between said elements, the axis of rotation so defined being substantially spaced from and below the general plane of said oppositely inclined panels.
2. The invention defined in claim 1, and said bearing surfaces being substantially cylindrical for rolling contact against one another.
3. The invention defined in claim 1, and including a flexible ridge cap extending downwardly from the roof ridge over the adjacent terminal edges of said panels, fastening means for said ridge cap adjacent the opposite edges thereof, whereby limited angular relative motion of said roof panels will cause dihedral flexing of said ridge cap.
4. The invention defined in claim 1, and each of said panels having a combined bracing and roof supporting member at the opposite edge from said terminal edges, each said supporting member being spaced from and beneath the general plane of its associated roof panel, whereby the axes of rotation of all the roof supporting members of each panel lie in a plane substantially spaced from and below the plane of said panel.
5. The invention defined in claim 4, and a pair of connected coplanar ceiling panels being connected in tension between the opposite lower edges of said oppositely inclined roof panels, said ceiling panels being provided at their points of contact with said roof panels with bearing members cooperatively associated with the adjacent pivotal roof supporting members.

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