Sept. 21, 1965 P. L. SCHROYER 3,206,898

METAL PANEL ROOF STRUCTURE

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FIG. 1.

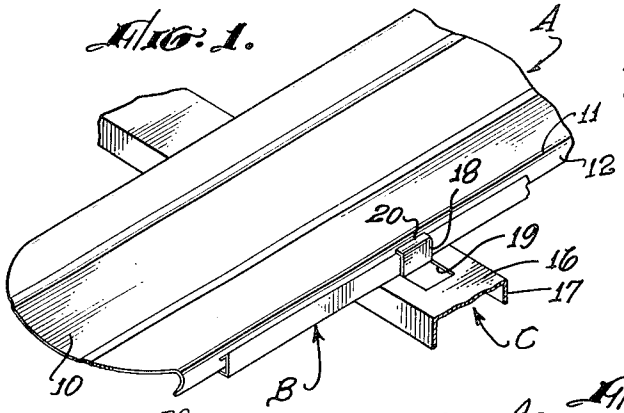


FIG. 2.

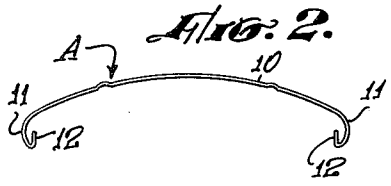


FIG. 3.

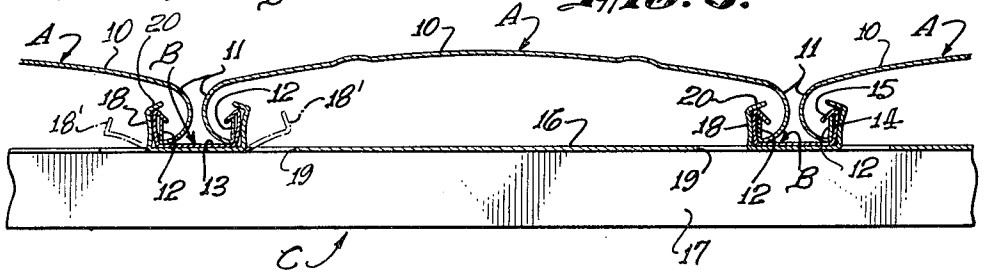
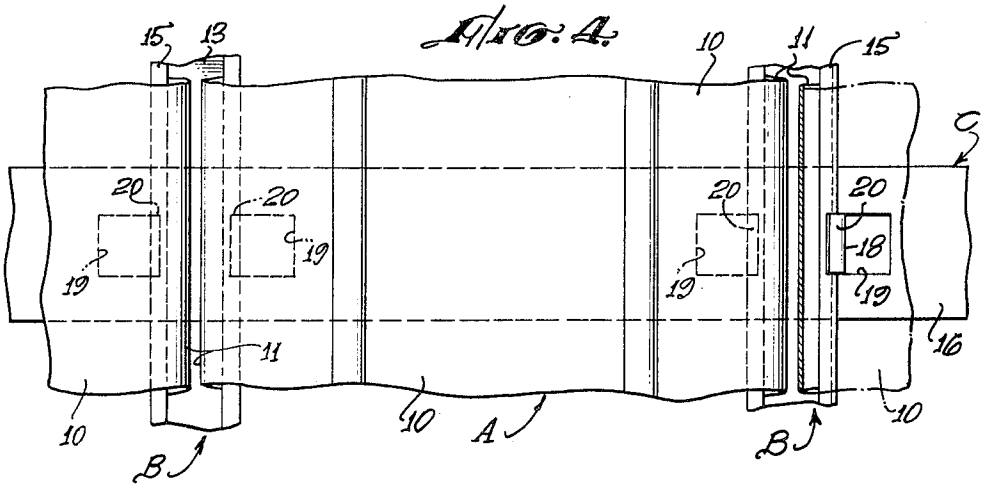


FIG. 4.



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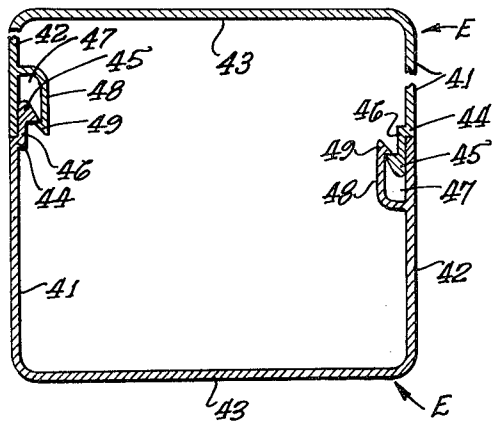


FIG. 6.

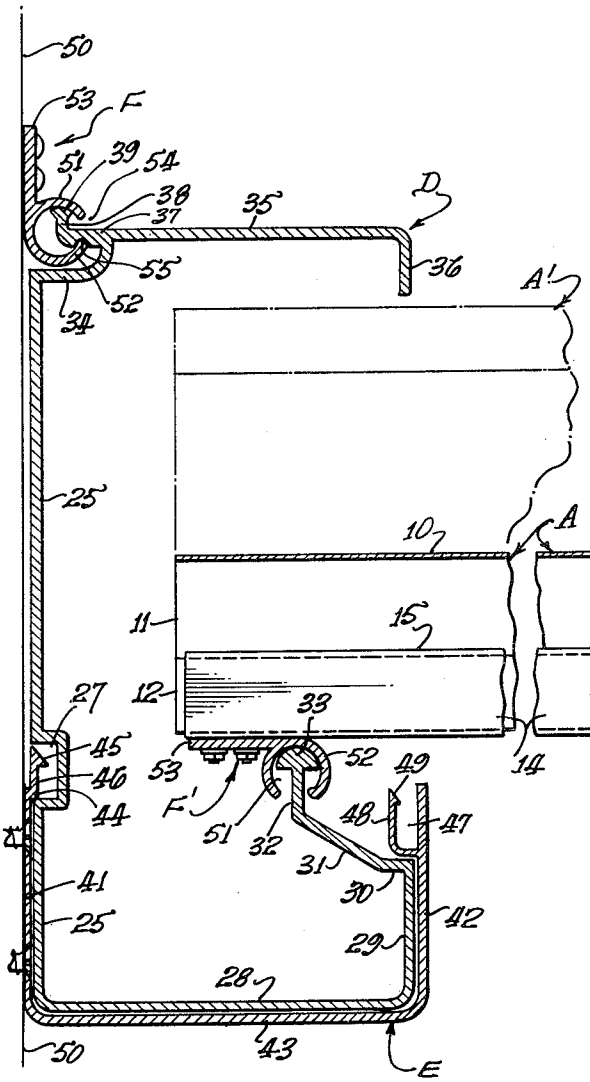


FIG. 7.

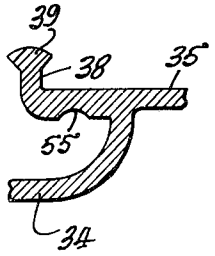
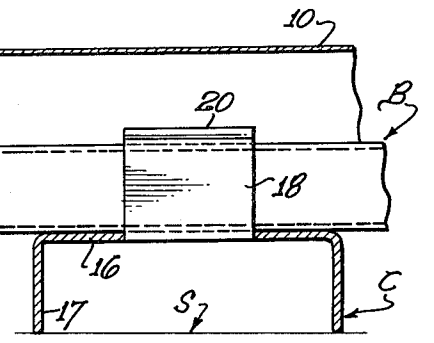


FIG. 5.



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METAL PANEL ROOF STRUCTURE

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3 Claims. (Cl. 52—74)

This invention relates to metal roof structure of the type utilizing a plurality of roofing panels of metal channel section, adjacent rolled margins of which are coupled by gutter strips closing the gaps between such adjacent margins to provide a sun-shading and/or rain-shedding composite roof or canopy structure, and has as its general object to provide such a roof structure embodying improved means for mounting the coupled roofing panels in assembled relation upon a plurality of transverse rafter members with maximum water-tight sealing of the margins of the panels to the gutter strips.

A further object is to provide an improved and simplified means for attaching a plurality of coupled roofing panels to a series of transverse supporting rafter members.

Another object is to provide, in such a metal roof structure, improved attachment parts, of inexpensive construction such as extruded aluminum alloy or equivalent, for supporting one side of the roof from a wall of a building, house trailer or the like, and for concurrently weather-sealing that side of the roof and its connection to the vertical wall. The invention further contemplates cooperating attachment parts, one section of which can be snap-interlocked with itself to provide a tubular box beam or post, for example.

Other objects and advantages will become apparent in the ensuing specification and appended drawing in which:

FIG. 1 is a perspective view of a fragmentary portion of a roofing structure embodying my invention;

FIG. 2 is a transverse sectional view of one of the roofing panels in its unstressed state;

FIG. 3 is a transverse sectional view of several coupled roofing panels in the roofing structure of my invention;

FIG. 4 is a plan view of the same, with one of the panels broken away and shown in section;

FIG. 5 is a fragmentary sectional view of a roof structure and its attachment to a vertical wall at its one side;

FIG. 6 is a fragmentary cross-sectional view of a tubular structure constructed by pairing and coupling a pair of attachment parts of the invention; and

FIG. 7 is a detail sectional view of a portion of the end channel shown in FIG. 5.

The canopy structure—FIGS. 1–4

Referring now to the drawing in detail, and in particular to FIG. 3, I have shown therein, as an example of one form in which my invention may be embodied, a roof structure comprising, in general, a plurality of elongated roofing panels A; a corresponding series of gutter strips B coupling adjacent margins of the panels A to one another; and a plurality of rafter members C upon which the gutter strips B are mounted. Rafter members C extend transversely beneath the gutter strips B and are suitably supported in any conventional way, as by being anchored (e.g. at their ends) to vertical walls, pillars or the like (not shown) in accordance with common practice in providing support for roof rafters in building construction. Merely by way of example, FIG. 5 indicates at S a support for the remote end of the channel C seen in section in that figure.

Roofing panels A are of shallow channel section, roll-formed from thin resilient sheet metal such as aluminum alloy, each panel including an upwardly arched body **10**, integral side-marginal rolls **11** curled downwardly and inwardly, and reentrant flanges **12** extending upwardly

from the lower margins of skirts **11**. Skirts **11** may be of semi-cylindrical form as illustrated, or other appropriate shape, and flanges **12** may be disposed as radii of the axes of generation of their cylindrical surfaces, terminating in free edges substantially coincident with said axes.

Each of the gutter strips B is of rectangular channel section, comprising a bottom web **13** and a pair of flanges **14** integral with and projecting upwardly from the respective side margins of the web, and including respective reentrant retainer lips **15**, inclined downwardly and inwardly from the upper margins of flanges **14**, forming acute dihedral angles therewith, and thus cooperating with the flanges **14** to define downwardly opening retainer slots in which the upwardly projecting flanges **12** are locked in the assembled roof structure.

Rafter members C are likewise of rectangular channel section, each including a top web **16** providing a seat upon which the transversely extending gutter strips B are supported, and a pair of stiffening flanges **17** extending downwardly.

The gutter strips B are tied down to the rafter beams **16** by retainer clips **18** in the form of integral lugs struck upwardly from side pierced apertures **19** in the top web **16** of rafter beam C, and integral retainer flanges **20** bent inwardly from the upper ends of the lugs **18** and overhanging the upper margins of the gutter flanges **14**.

Prior to assembly of the coupled roofing panels A to the rafter members **17**, the clips or lugs **18** are initially stamped out in reclining positions as indicated in dotted lines at **18'** in FIG. 3. The coupled assembly of panels A and gutter strips B which, when unstressed, is contracted to somewhat lesser width than in the finally assembled condition, and is arranged over a predetermined grouping of rafters. Sufficient tension is then applied to stretch the coupled assembly of panels A and gutter strips B until the latter are properly registered between the respective pairs of clips **18'** on said predetermined group of rafter beams C, the gutter strips B are then brought downwardly into seating engagement with the top webs **16** of said rafter members C between the respective pairs of clips **18'**, and the latter are then bent upwardly and toward one another until their retainer flanges **20** are hooked over the upper margins of the flanges **14** of the gutter strips, thus securing the coupled roofing panels in assembly with said rafter members C. This eliminates the necessity for bolts, screws or the like in assembling a metal roof of this type. The spacing between the pairs of clips or lugs **18** is such as to stretch and flatten the roofing panels A just the right amount to develop adequate tension loading of the flanges **12** against the flanges **14** in order satisfactorily to seal the margins of the roofing panels A to the gutter strips B so that even in the heaviest downpour, the gutter strips B will shed all water flowing into them through the gaps between the adjacent skirts **11** of the roofing panels A. Normally, the roof will be installed with a rain-shedding slope lengthwise of the panels A.

The sealing of the flanges **12** to the gutter flanges **14** is accentuated by engagement of the retainer lips **15** again the upper edges of the flanges **12**. The pull of the tension-loaded flanges **12** against the flanges **14** tends to flex them to positions tilted away from one another at their upper margins. This brings the lips **15** into contact with the upper edges of flanges **12** causing them to press tightly against the edges of the flanges so as to improve the water-tight seal between the coupled parts.

The gutter strips B can be coupled to the roofing panels A by relative longitudinal sliding movement. One end of a coupling strip can be fitted over the flanged adjacent margins of a pair of roofing panels until the flanges **12** are started in the slots defined in the respective sides of

the gutter strip, and the latter can then be slid the full length of the adjacent roofing panels until its ends are properly registered with the ends of the respective panels.

Mounting of roof to wall—FIGS. 5–7

FIG. 5 illustrates a roof structure wherein the ends of a coupled array of roofing panels A and gutter strips B are supported and weather-sealed by an end channel unit D which can be an extruded aluminum section. End channel D in turn is adapted to be supported by an attachment channel E and an anchor strip F which also functions as a weather strip. Support is transmitted from a vertical building wall **50** through attachment channel E and anchor strip F to the channel D which in turn transmits the support to one end of the roof structure comprising an array of the panels A. The opposite end of such roof structure can be supported in similar fashion within an opposed channel D which can likewise be supported on a wall of a building at the opposite side of the space covered by the roof. Alternatively, the opposite end of the roof structure can be supported in a conventional manner upon pillars or other vertical uprights so that one side of the roofed space may be open (as in a porch or awning arrangement).

End channel D comprises a back web **25** having a small reentrant channel portion **26** defining an external back groove **27**; a bottom web **28** projecting forwardly from the lower margin of back web **25**; an upwardly projecting lower front wall **29** having a rearward offset **30**, an upwardly and inwardly inclined shoulder **31**, and an upwardly projecting pedestal **32** terminating in a symmetrically placed semi-cylindrical locking flange **33**. For the upper margin of back web **25**, a bracket **34** projects forwardly and thence upwardly and is integrally joined to a cover flange **35** which projects forwardly and terminates in a downwardly extending lip **36**. An anchor flange **37** projects rearwardly from bracket **34** as a planar continuation of cover flange **35**, and terminates in an upwardly projecting locking lip **38** having a widened bearing bead **39** along its upper margin.

Attachment channel E comprises a pair of spaced parallel flat side flanges **41** and **42** integrally joined by a bridging web **43** to provide a rectangular channel section; an inwardly offset retainer step **44** along the upper margin of side flange **41**, and a bevelled marginal retainer lip **45** on the free margin of an inwardly offset web **46** projecting from step **44**. On the margin of the side flange **42** is a continuous uniform section socket **47** defined between the marginal portion of side member **42** and inwardly spaced parallel branch web **48** which has a bevelled retainer lip **49** along its margin.

When used in the assembly shown in FIG. 5, the attachment channel E may have its side flange **41** suitably secured to a vertical external wall member **50** (e.g. of a building, a house trailer or other structure to which a porch or awning or deck cover is to be attached). The end channel D can then be coupled to the attachment channel E by first tilting it clockwise from the position shown in FIG. 3 so that its lower forward parts **29**, **30**, **31–33** can be inserted between the side flanges **41** and **42**. The end channel unit D is then tilted rearwardly (counterclockwise as viewed in FIG. 5) toward its upright position, causing its shelf **30** to become engaged beneath the socket web **48** and its back member **25** to establish camming engagement with the bevelled retainer lip **45**, springing the side flange **41** away from side flange **42** sufficiently to permit the lower portion of back wall **25** of channel D to enter the space between the side flanges **41** and **42**, until finally it reaches the fully nested position shown in FIG. 5 and the step **44** enters the channel **26** and locks against the lower web thereof as in FIG. 5.

Anchor strip F comprises a pair of jaws **51** and **52** integrally joined in a slotted cylindrical tubular structure, and an integral flat wing **53** extending tangently therefrom and suitably apertured for attachment to a vertical wall member. The slot **54** defined between jaws **51** and **52** is adapted to receive the abutment web **38** of channel D when the anchor strip F is tilted (clockwise about 90° from the position shown in FIG. 5) so as to bring the slot **54** to the bottom of the strip. The jaws **52** and **51** are then fitted over the abutment flange **38**, the bearing bead **39** passing upwardly through the slot **54**, and the strip F is tilted (counterclockwise) back to the upright position shown in FIG. 5 and is then secured to the vertical wall of the building or other housing structure, with the lower jaw **52** seated in a shallow groove **55** in the underside of anchor web **37**, and with the bearing bead **39** braced against the jaw **51**, thus locking the lip of jaw **52** in the mating groove **55**. The wing **53** is then suitably secured to the wall **50** to lock the channel unit D securely to the wall.

The same extrusion which provides the anchor strip F, or any suitable modification thereof, is used to provide an attachment strip F′ which can be secured to the bottom webs **13** of a series of gutters B along one side or end of the roof structure disclosed in FIGS. 1–4. FIG. 5 discloses a longitudinal sectional view through one of the roofing panels A and a cross sectional view through one of the rafter units C. The completely assembled roof structure A, B, C can be attached to the end channel D by sliding the attachment strip F′ longitudinally over the seat **33**. Any suitable securing means can then be utilized for fixing the roof against shifting movement along the seat **33** from its properly assembled position.

FIG. 6 discloses how the attachment channel E can be paired with itself to provide a post or beam of rectangular sectional tubing which can be utilized as a vertical support post in a deck cover construction. Two of the channels E are herewith arranged in said proposed relation, with the socket **47** of one channel registering with the retainer lip **45** and its web **46** of the other channel. The retainer lips **45** and their offset webs **46** can then be inserted into the opposed channels **47**, and by the application of sufficient pressure, the branch webs **48** can be deflected inwardly so as to spread the channels **47** sufficiently for passage of the retainer lips **45** past the retainer lips **49**. The insertion is limited by engagement of the steps **44** against the edges of flanges **42**, and when such an engagement occurs, the retainer lips **49** will snap back into hooking engagement with the retainer lips **45** as shown in FIG. 6. Once this attachment is effected, the two sections of the tubular post or beam will be securely and permanently attached one to another. The two identical channels E, when arranged with the long side **41** of one channel coupled to the short side **42** of the other channel, will provide a structural member of rectangular tubular section as indicated in FIG. 6. Such a composite channel cut to appropriate length, and provided at its ends with suitable conventional attachment brackets or other fasteners, can be utilized as a structural pillar or post for supporting other members.

Various combinations of the structural units of the invention are possible. For example, in the arrangement fragmentarily illustrated in FIG. 5, the coupled array of roofiing panels A and gutter strips B may be supported cooperatively by the combination of end support members D, E and F attached to a vertical building wall and supporting the assembly of roofing panels A and gutter strips B at one end thereof, together with the support of intermediate portions and opposite end portions of the array of roofing panels A and gutter strips B by transverse support units C the respective ends of which may be supported by any conventional supports S as previously described.

I claim:

1. In a metal roof or ceiling structure, a canopy comprising a plurality of roofing panels of channel section; means joining adjacent margins of said panels to one another; an attachment strip of F-section comprising a

downwardly-opening channel part embodying opposed jaws and a wing secured to said panels transversely thereof along one side of said canopy; and an end channel of C-section including a back web attachable to a vertical wall, a bottom extending forwardly from said back web, a forward wall extending upwardly from said bottom and having a widened supporting seat along its upper margin, said seat being engaged in said channel part of said attachment strip and retained between said jaws, and a cover extending forwardly from the upper extremity of said back web and cooperating with said bottom to enclose said side of the canopy.

2. A structure as defined in claim **1**, further including an attachment channel of rectangular channel section receiving the lower portion of said end channel and providing a supporting connection to a vertical wall; an anchor flange integral with and projecting rearwardly from said cover, spaced upwardly from the upper rear corner of said end channel, and having a longitudinal retainer groove in its under face, an abutment lip extending upwardly from said anchor flange; and an anchor strip of F-section similar to said attachment strip, having a channel part receiving said abutment lip, said channel part comprising an upper jaw seated on the upper margin of said anchor lip and a lower jaw engaged in said retainer groove, and an integral wing attachable to said vertical wall.

3. In combination; a structural channel comprising spaced parallel side flanges and a web bridging said flanges at right angles thereto; an inwardly-offset retainer socket of continuous uniform section defining the longitudinal margin of one of said flanges and integral therewith; and

a bevelled retainer lip defining the longitudinal margin of the other flange, said lip being offset inwardly from the outer face of said flange; and an end channel of C-section including a back web attachable to a vertical wall, a bottom extending forwardly from said back web, a forward wall extending upwardly from said bottom, said forward wall having a longitudinal shoulder and an inwardly offset portion projecting upwardly from said shoulder and terminating in an integral, widened, longitudinal supporting seat along its upper margin; said back web having a reentrant longitudinal retainer channel of proportions such as to receive said bevelled retainer lip of said structural channel with a hooking attachment of said retainer lip to said retainer channel; said structural channel being proportioned to receive the lower portion of said end channel with said bevelled retainer lip hooked into said retainer channel, with said end channel bottom superimposed over said bridging web of said structural channel, and with said longitudinal shoulder retained beneath said inwardly offset socket.

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