An improved weatherproof joint formed from overlapping one panel of improved design with another panel wherein the opposing marginal side edges of the panels are provided in the joint area with improved interfitting and opposing corrugations which form a unique deep truss-like lap joint structure having improved load-bearing characteristics.

10 Claims, 6 Drawing Figures
3,667,185

1 PANEL AND LAP JOINT MADE THEREFROM

BACKGROUND OF THE INVENTION

This invention relates to panels and the joints formed therebetween. More particularly it is concerned with providing an improved building panel and the joint formed by overlapping one such panel with a similarly shaped panel in a building installation.

Various building panels have been devised in the past which are overlapped to provide weatherproof lap joint structures therebetween. Examples of such panels and lap joint structures are shown in U.S. Pat. Nos. 2,073,706 to Overholtz granted Mar. 16, 1937, and U.S. Pat. No. 2,130,189 to Lawrence et al. granted Sept. 13, 1938. Although prior art building panels, such as those shown in the aforesaid patents, have marginal side edges of different configurations whereby they can be overlapped to form a lap joint, the wall structures and crests of the overlapped corrugations on opposing marginal edges of the panels were not such that when the panels were installed and the corrugations overlapped they provided a weatherproof joint assembly which had relatively deep truss-like structural and functional characteristics. The relatively deep truss-like structure in the joint area of the panels of the instant invention makes the panels capable of withstanding severe loads of various kinds as well as providing readily nailable surfaces and a substantially weatherproof structure in the joint area.

SUMMARY OF THE INVENTION

It is the primary purpose of the instant invention to provide an improved building panel having unique corrugations or ribs along the opposing marginal side edges thereof whereby the panel can be readily interfitted and overlapped with another and preferably similarly shaped panel in such fashion that the weatherproof joint formed by the interfitting and overlapped panels when installed on a building will have a relatively deep truss-like structure. The resultant structural joint assembly is capable of resisting various individual topside and lateral loads or combinations thereof. It also provides improved nailing surfaces for nailing the panels to a building structure even in those instances where the building panels are made of relatively thin gauge materials.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a broken fragmentary perspective view of a typical roofing or siding installation involving the principles of the instant invention;
FIG. 2 is an end elevational view of the overlapped panels shown in FIG. 1 with parts added and other parts removed and when taken generally along the line 2—2 of FIG. 1;
FIG. 3 is an enlarged fragmentary end elevational view of the roofing joint installation of FIG. 2 when taken within the circumscribing line 3 thereof and discloses the manner in which the marginal side edges of a pair of the improved building panels of the instant invention are overlapped and nested to form the improved weatherproof lap joint of the instant invention;
FIG. 4 is an end elevational view of a double crested corrugation that forms one marginal edge of a panel of the instant invention;
FIG. 5 is an end elevational view of a portion of the panel of the instant invention when taken within the encompassing line 5—5 of FIG. 2; and
FIG. 6 is a fragmentary perspective view of a typical building wherein the roof and walls are formed from panels of the instant invention.

DETAILED DESCRIPTION

With reference to the drawings, the lap joint or standing seam 1 of the instant invention is used for roofing or siding sheets or panels 10 that can be made from various lightweight metal materials such as aluminum and other materials such as rugged polyester and polyvinyl translucent plastic materials. Translucent plastic panels are used advantageously with similarly shaped metal panels when skylights or the like are needed in a roofing structure.

In a preferred embodiment of the invention, panels 10 when made of metal are advantageously made from a thin gauge aluminum base alloy in the extra hard temper range and designated as H-19 metal. The metal can also be embossed with a suitable design, if desired. As used herein, the term "aluminum base alloy" means an alloy containing at least 50 percent by weight of aluminum. One suitable aluminum base alloy of thin gauge material on the order of 0.018 ± 0.001 and in extra hard temper can be a 5154 aluminum alloy, the chemical composition of which as listed with the Aluminum Association is as follows:

<table>
<thead>
<tr>
<th>Elements</th>
<th>5154 Aluminum Alloy, Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon plus iron</td>
<td>0.45 maximum</td>
</tr>
<tr>
<td>Copper</td>
<td>0.10 maximum</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.10 maximum</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2.39-3.9 maximum</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.15-0.35</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.20 maximum</td>
</tr>
<tr>
<td>Titanium</td>
<td>0.20 maximum</td>
</tr>
<tr>
<td>Other elements, each</td>
<td>0.05 maximum</td>
</tr>
<tr>
<td>Other elements, total</td>
<td>0.15 maximum</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Remainder</td>
</tr>
</tbody>
</table>

The panels 10 of aluminum sheet material are roll formed and when made of plastic materials are so molded whereby the opposed side marginal edges 12 and 14 of a panel are provided with improved upstanding, double and single crested corrugations respectively. By virtue of such corrugations, the opposing side marginal edges of similarly shaped panels can be readily overlapped and interfitted to form the novel and deep truss-like joint structure of the invention. Thus, during installation of panels 10 on the side or roof of a building, it is contemplated that the panels would be placed side by side so that the marginal side edge 14 of one panel 10 would be overlapped by the opposing marginal side edge 12 of a similarly shaped panel 10. An individual panel 10 will now be described in detail.

As indicated particularly in FIGS. 3 and 4, marginal side edge 12 of a panel 10 is provided with the double crested corrugation 16. Corrugation 16 includes a primary and relatively narrow nailing crest or surface 18 and a secondary and relatively wide corrugation or stiffening crest 20. Nailing crest 18 is connected to crest 20 by means of relatively short downwardly and outwardly inclined walls 22 which in the as-made panel are preferably inclined at interior angles of about 60° to the normal plane of crest 20. The plane of crest 20 substantially parallels the median plane M of panel 10 as well as the underside 24 of panel 10. The extremities of crest 20 terminate in outwardly and downwardly projecting relatively long sidewalls 25 which in the as-made condition of the panel 10 are disposed at interior angles of about 65° to the median plane M and bottom plane 24 of the sheet.

In one advantageous embodiment of the invention, however, and as indicated particularly in FIG. 4, outermost or free wall 25 of a marginal edge corrugation 16 can be slightly undercut inwardly during panel manufacture whereby it initially makes an interior angle of approximately 68° with respect to the median plane M of the sheet 10. The purpose of this underbending is to allow this wall 25 provided with end lip 26 to be fully tensioned against a wall of the corrugation of another panel which it overlaps upon the installation of two contiguous panels in a manner to be described more fully hereinafter.

A panel 10 can be so fabricated whereby it is provided with additional double created corrugations 16 in intermediate areas of panel 10 and arranged in symmetrically spaced groups with two such corrugations to a group. The flat areas intermediate the groups of corrugations 16 can, if desired, be provided with conventional flat topped shallow corrugations.
By virtue of the unique configuration of the double crested corrugation 16, a unique pocket P is provided in the upper portion of the corrugation which is adapted to snugly receive the top portion of the flat topped corrugation 32 that makes up the other marginal edge 14 of a panel 10.

As illustrated in FIG. 3, corrugation 32 is provided with a flat crest or top 34 and a pair of downwardly and outwardly inclined sidewalks 36 which, in the as-manufactured condition of a panel 10, are preferably arranged at interior angles of approximately 56° to the median plane M and bottom of the sheet or panel with which they are associated. It is to be noted in any event that the interior angles of walls 36 are less than the interior angles made by the long walls 25 of a double crested corrugation 16 of the overlapping panel 10 used in the joint structure J shown in the various figures of the drawings.

The outermost or free wall 36 of the corrugation 32 is also provided with a lip portion 38, which during manufacture of panel 10 can be bent slightly upwardly a few degrees so that it can be tensioned against and make excellent contact with the underside of the lapping panel 10 provided with the lapping corrugation 16.

Successive panels 10 are installed on the roof or side of a building by being arranged crosswise to a support, such as a rafter, beam, furring type strip 40, etc., as all indicated in FIG. 3, and with marginal edge 14 of one panel arranged to be overlapped by the marginal edge 12 of a similarly shaped panel. As each standing seam or joint J is formed by the lapping and overlapped edges 12 and 14 of adjacent panels appropriate fasteners, such as nails 42, are driven completely through the nailing crest 18 of corrugation 16 and the flat crest 34 of the underlying corrugation 32 that fits in pocket P of the topmost corrugation and into the support 40. The fasteners 42 can be provided with standard neoprene washer elements 44, if desired, for sealing the nails in place after being driven through the panels 10 making up the joint.

As indicated in FIG. 3, wide crest 20 of double crested corrugation 16 provides certain advantages during the aforesaid nailing operation as well as in the final overall joint structure J formed by the panels. During nailing, the crest 20 provides a bearing surface and lateral support that resists overdriving of a nail 42 as well as distortion, buckling and collapse of the corrugations 16 and 32. After installation and during use crest 20 and walls 32 of corrugation 16 act in conjunction with top 34 and walls 36 of lapped corrugation 32 to form a deep truss-like joint structure capable of effectively resisting extreme concentrated loads, such as those applied by walking on the same, and extreme uniform loads, such as those applied by winds, snow, rain, etc. and various combinations of such loads even when the panels 10 are made of relatively thin gauge materials as noted above. The aforesaid loads are roughly indicated by the arrows in FIG. 3.

The deep truss-like joint structure J results from the particular configuration of the corrugations 16 and 32, the manner in which the corrugations are uniquely lapped and interlaced as well as the large interior or steep rib angle of walls 25 of lapping corrugation 16 as compared to the walls 36 of underlying corrugation 32.

This in turn means that the instant panels and the building covering provided thereby can be used in varying climates and conditions of installations including on-site locations where severe winds are encountered and which produce severe uplifting loads on the panels in the joint area.

In the deep truss-like joint structure formed by the lapping and overlapping sheets or panels 10 of the instant invention, the steep rib angle of subterminating walls 25 of corrugation 16 relative to walls 36 of corrugation 32 results in the merger of these walls at the bottom of joint J and provides for the formation of air pockets, which act in conjunction with the five points of contact A, B, C, D and E between the overlapped panels 10 in joint J to provide five individual seal points and twin anticipation chambers 46 and 48 that resist forced water seepage in the joint structure J. The result is an efficient weatherproof and sealed joint.

The pocket P in outermost corrugation 16 provides a convenient arrangement whereby a corrugation 16 will be properly guided into position about and into overlapping relationship and registry with the underlying corrugation 32 in the respective overlapped panels 10 that form joint J.

In the usual nailing operation, as the nail fastener 42 is driven through the sheets, the ribs or corrugations 16 and 32 may tend to flex or flatten a slight amount under the pressure exerted by the nailing elements 42. This flattening action can be advantageous, however, in that it will tend to wedge the top portion of an underlying corrugation 32 into a snug fit within the pocket P of a double crested corrugation 16 while at the same time slightly deflecting the inwardly tensioned outermost or free wall 25 of corrugation 16 provided with the lip 26 outwardly. This outward deflection of the aforesaid free wall 25 and lip 26 on one panel 10 causes a retensioning of the same against the associated wall 36 of the underlying corrugation 32 of the underlying panel 10 thereby ensuring the maintenance of line or surface-to-surface contact between this lip 26 and the flat surface of the underlying panel 10 and also compensating for any tolerances that may exist in lip or flange 26 as a result of panel manufacture. When the joint J is made from an aluminum base alloy in the extra hard temper range noted above, the spring-back characteristics exhibited by such a panel are used to advantage in that the inwardly tensioned outermost wall 25 of a corrugation 16 of one panel will tend to be even more retensioned against an underlying wall 36 of another underlying panel 10.

The particular lapped joint structure J of the instant invention makes it possible to conveniently lap the ends of the sheets or panels 10 in superadjacent or upper rows on the wall or roof of a building structure provided with such panels with these sheets or panels in the higher rows being generally disposed over top the sheets or panels in the lower rows and without breaking the overall continuity of the joints J formed by several superposed rows of sheets or panels.

An advantageous embodiment of the invention has been shown and described. It is obvious that various changes may be made therein without departing from the attached claims, wherein:

What is claimed is:

1. A corrugated building panel of the type described and provided with marginal side edges having different configurations one of said marginal side edges comprising a double crested corrugation, the outermost crest of said corrugation providing a primary flat narrow nailing crest and said outermost crest being connected by outwardly and downwardly disposed sidewalls to a secondary and relatively wide flat crest that substantially parallels the underside of the panel and projects to each side of the primary crest, the ends of said wide crest terminating in downwardly and outwardly inclined sidewalls that are substantially longer than said first mentioned sidewalls while being located at greater interior angles to the median plane of the panel than said first mentioned sidewalls, and the opposing marginal side edge of the panel which is adapted upon installation to be overlapped by the double crested corrugation of a similarly configured panel being provided with a flat topped corrugation that terminates in outwardly and downwardly inclined sidewalls that are longer than and are inclined at smaller interior angles to the median plane of the panel than the longer sidewalls of the double crested corrugation and the outermost sidewall of each of said marginal side edge corrugations having an outwardly projecting lip portion and the outermost sidewall of the double crested corrugation of the panel being overbent inwardly so that it can be sealingly tensioned against a wall of a corrugation of another building panel that overlaps upon being installed on a building structure.

2. A corrugated building panel of the type defined in claim 1 and made from an aluminum base alloy in the extra hard temper.

3. A corrugated building panel of the type defined in claim 1 and made from an aluminum base alloy in the extra hard temper.
temper wherein at least one of the longer walls of the double crested corrugation is inclined at an interior angle on the order of 65° to the bottom of the panel containing said corrugation.

4. A corrugated building panel of the type defined in claim 1 and made from an aluminum base alloy in the extra hard temper wherein the walls of the corrugation that is to be overlapped by a similarly shaped panel are disposed at interior angles of about 56° to the bottom of the corrugated panel.

5. A corrugated building panel of the type set forth in claim 1 wherein the short walls of the double crested corrugation are disposed at interior angles of about 60° to the median plane of the panel.

6. A lap joint for roofing sheets and the like comprised of a pair of such sheets arranged in overlapping relationship at the marginal side edges thereof to form a deep truss-like joint structure, the overlapping side marginal edge of the upper sheet having a double crested corrugation whereby it is provided with a primary narrow and stiffened outermost flat nailing crest and a secondary substantially wider flat crest that substantially parallels the underside of the upper sheet and projects to each side of and is connected to said primary crest by angularly outwardly and downwardly disposed sidewalls, the ends of said wider crest terminating in downwardly and outwardly inclined sidewalls that are substantially longer than said first mentioned sidewalks while being disposed at greater interior angles to the median plane of their associated sheet than said first mentioned sidewalks, said primary crest and first mentioned sidewalks providing a pocket for snugly receiving the crest of the corrugation of the underlying and lapped edge portion of the lower sheet and the corrugation of the underlying sheet having a flat crest the edges of which terminate in downwardly and outwardly disposed sidewalks that are longer than the longer sidewalks of and generally parallel the short sidewalls of the first mentioned and lapping sheet at the upper portion thereof and which converge fully with and sealingly contact the longer sidewalks of the lapping sheet at the bottom portion thereof and each of the outermost walls of the interfitting corrugations of the lapped and lapping sheets having an outwardly projecting lip portion that sealingly engages an opposing sheet.

7. A lap joint as set forth in claim 6 wherein said lapped and lapping sheets contact each other at a plurality of points while also being spaced from each other in selected areas that provide antisiphoning chambers in the joint.

8. A lap joint as set forth in claim 6 where at least one of said roofing sheets is made from an aluminum base alloy in the extra hard temper and the longer walls on said double crested corrugation of said one roofing sheet are inclined at interior angles on the order of 65° to the bottom of the sheet containing such double crested corrugation.

9. A lap joint as set forth in claim 6 wherein at least one of said roofing sheets is made from an aluminum base alloy in the extra hard temper and the walls on the corrugation of the lapped sheet are disposed at interior angles of about 56° to the bottom of said lapped sheet.

10. A lap joint as set forth in claim 6 wherein at least one of said sheets is made from an aluminum base alloy in the extra hard temper range.

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