

Sept. 21, 1971

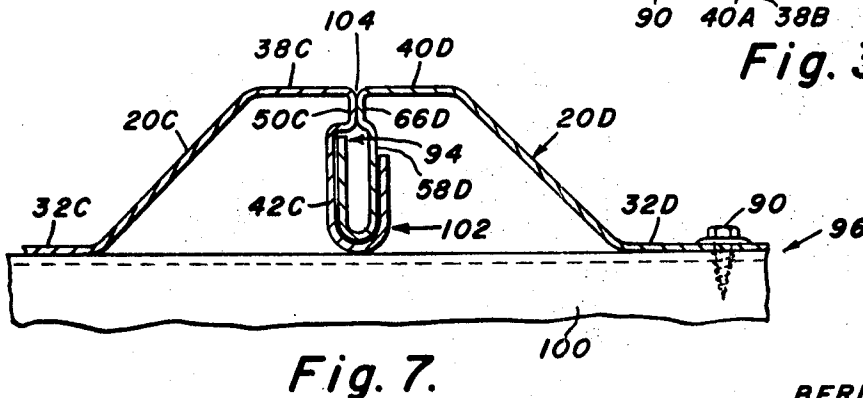
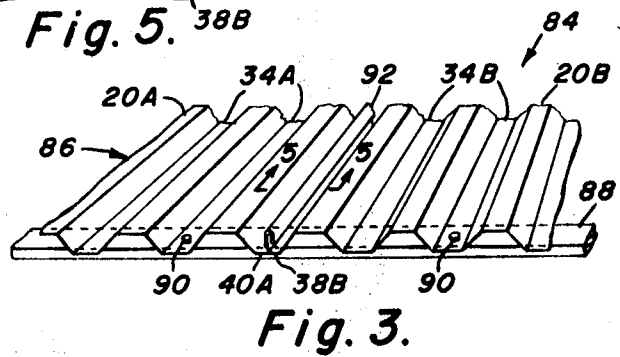
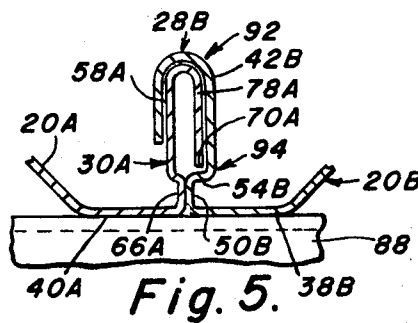
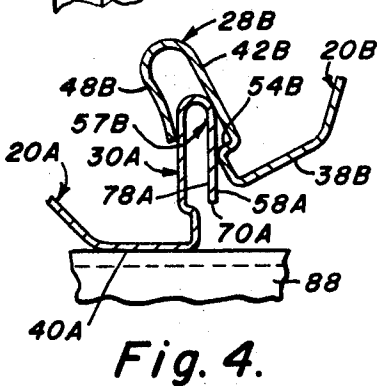
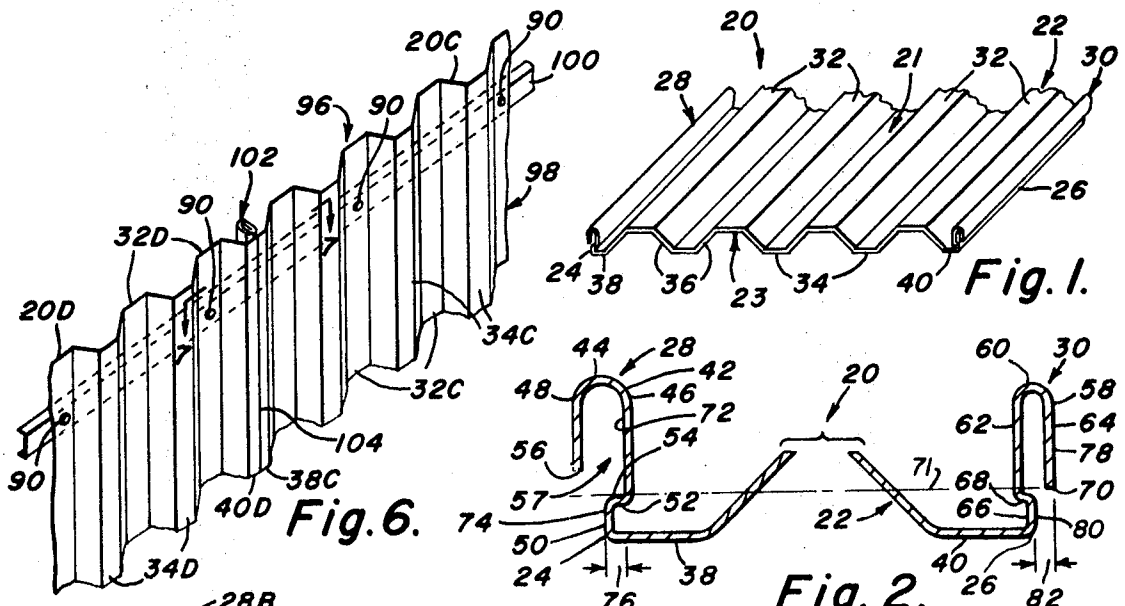
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3,606,718

BUILDING PANEL AND SIDE JOINTS THEREFOR

Filed Aug. 21, 1969

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

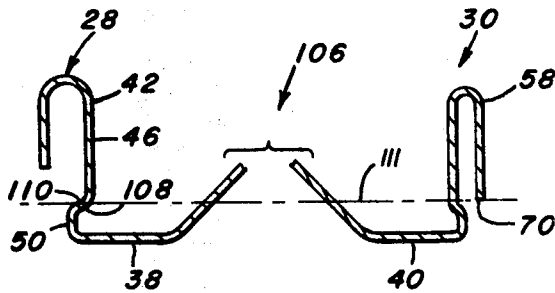


Fig. 8.

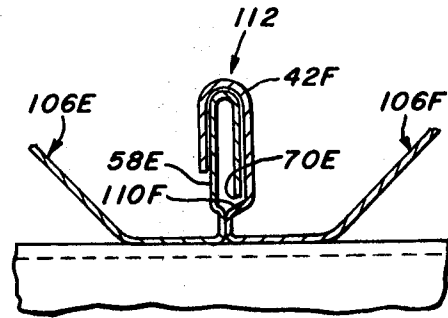


Fig. 9.

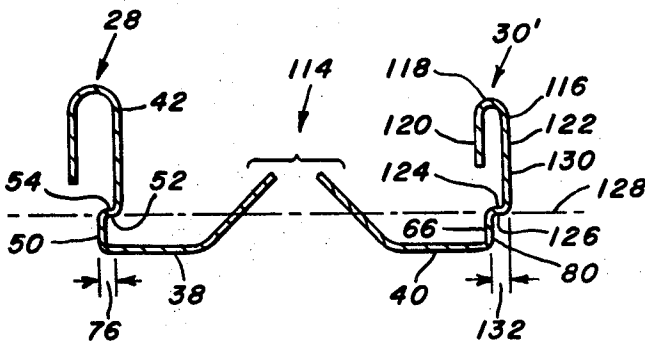


Fig. 10.

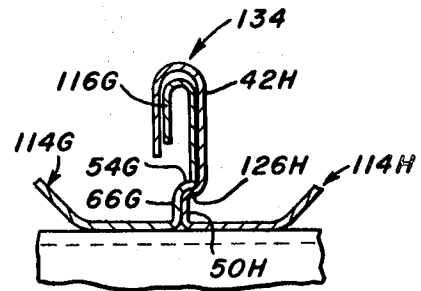


Fig. 11.

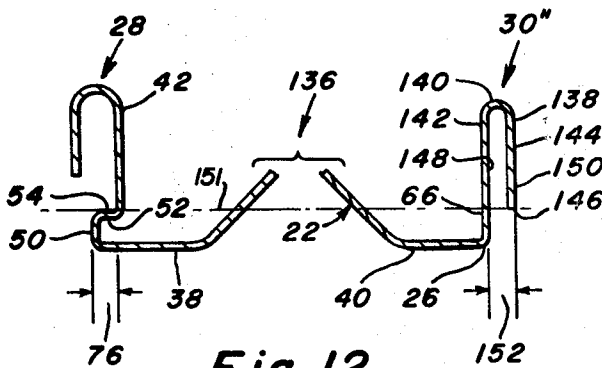


Fig. 12.

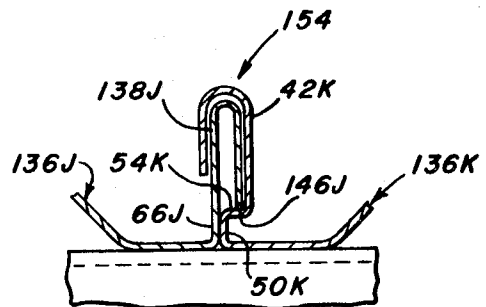


Fig. 13.

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BUILDING PANEL AND SIDE JOINTS THEREFOR

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14 Claims

ABSTRACT OF THE DISCLOSURE

A building panel having a central pan of desired profile and improved marginal connecting means along opposite pan edges, providing an improved side joint between adjacent ones of the building panels. Both marginal connecting means comprise upstanding U-shaped channels. One channel is adapted to fit within the other channel to provide a gasket-free, essentially weather-tight joint having an interlock to prevent disengagement.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to building panels of the type adapted to be erected in side-by-side interengaged relation to form a metal sheath of a wall or roof structure, and more particularly to improved marginal connecting means for such panels and improved side joints provided thereby.

(2) Description of the prior art

The prior art contains many examples of building panels having marginal connecting means formed along opposite longitudinal edges.

The most common marginal connecting means comprise an upstanding flange or male lip along one edge and an inverted U-shaped channel or female lip along the opposite edge. A bead of sealant material normally is provided within the female lip. See U.S. Pat. 3,394,515. The joint formed between these lips has objectionable characteristics. For example, the male lip may move laterally within the female lip and therefore a positive lock is difficult to achieve. Lateral movement of the male lip inhibits the formation of a weather-tight seal. Dimples may be formed in the mated lips for locking the lips. See U.S. Pats. 2,847,099 and 3,394,515. This is a costly operation and does not always assure a positive lock. The dimples may affect the formation of a weather-tight joint.

In another male and female lip arrangement, a bead is roll formed in the free edge of the male lip and opposed ribs are roll formed in the spaced-apart legs of the male lip. See Australian Pat. 251,978. As the bead is pushed between and beyond the opposed ribs, the male lip is engaged in the female lip by a snap action. Although this arrangement prevents lateral movement of the male lip within the female lip, it does not appear to provide a gasket-free weather-tight joint.

In a further male and female lip arrangement, the female lip comprises an inverted channel formed along one edge of the panel; and the male lip comprises an inverted channel formed inboard of the opposite edge of the panel. Both inverted channels are provided with enlarged semi-circular bights. The opposite edge of panel constitutes a nailing strip through which nails are driven to secure the panel to supporting structure. See U.S. Pat. 2,159,136. One channel is adapted to fit within the other channel. Spring clamping members fit over the female channel to secure the interfitted channels together. This type of panel can only be erected with the channels exposed to view. Thus a plurality of these panels when erected, present standing rib joints having unsightly spring clamping members exposed to view.

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SUMMARY OF THE INVENTION

The principal objects of this invention are to provide a building panel having improved marginal connecting means and to provide an improved side joint between adjacent ones of the building panels.

A further object of this invention is to provide a side joint comprising first and second upstanding U-shaped channels which are so interlocked as to resist being disconnected when the panels are subjected to negative wind loading.

Another object of this invention is to provide improved marginal connecting means which are interengaged by a snap action and are self-locking, thereby eliminating the need for extrinsic fasteners or fastening tools.

Still another object of this invention is to provide a side joint between adjacent panels which is gasket-free and essentially weather-tight.

In accordance with the present invention, one of the marginal connecting means comprises a first upstanding U-shaped channel formed along one edge of the central pan. The first channel includes spaced-apart first inner and first outer legs extending toward the central pan.

The other marginal connecting means comprises a second upstanding U-shaped channel formed along the opposite edge of the central pan. The second channel includes spaced-apart second inner and second outer legs extending toward the central pan. The first inner leg of the first channel and one of the legs of the second channel include, respectively, first and second upstanding flange portions each adjoining one of the opposite edges of the central pan.

The overall arrangement is such that the second channel is adapted to be snapped into the first channel. The first and second channels are shaped to present confronting segments providing an interlocking of the channels which resists disengagement of the first channel from the second channel when the joint is subjected to negative wind loading.

Although not limited thereto, the present rib joints are particularly effective when the building wall panels are formed from material known as protected metal sheathing. Such protected metal sheathing is described and illustrated in U.S. Pat. 3,274,679. Such protected metal sheathing includes a tough weather-resistant outer coating. When employing such protected metal sheathing, the resulting rib joint is gasket-free and essentially weather-tight.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary isometric view illustrating a typical building panel provided with the improved marginal connecting means of this invention;

FIG. 2 is a transverse cross-sectional view, on an enlarged scale, illustrating the preferred embodiment of the improved marginal connecting means of this invention;

FIG. 3 is a fragmentary perspective view of a roof structure incorporating the building panel of FIG. 1;

FIGS. 4 and 5 are cross-sectional views taken along the line 5—5 of FIG. 3, illustrating, on an enlarged scale, the formation of the standing rib joint;

FIG. 6 is a fragmentary isometric view of a wall structure incorporating the building panel of FIG. 1;

FIG. 7 is a cross-sectional view, taken along the line 7—7 of FIG. 6, illustrating a hidden joint formed by reversing the building panel of FIG. 1;

FIGS. 8, 10 and 12 are transverse cross-sectional views, similar to FIG. 2, illustrating alternative embodiments of the marginal connecting means of this invention; and

FIGS. 9, 11 and 13 are cross-sectional views, similar to FIG. 5, illustrating standing seam joints formed between a pair of the building panels of FIGS. 8, 10 and 12, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the profile of a typical building panel 20. The panel 20 includes a central pan 22 having opposite faces 21, 23 and opposite longitudinal pan edges 24, 26. First marginal connecting means 28, also characterized as a female lip, is formed along the longitudinal pan edge 24. Second marginal connecting means 30, also characterized as a male lip, is formed along the opposite longitudinal pan edge 26.

The central pan 22 may have any desired profile. In FIG. 1, the central pan 22 is corrugated and presents alternating crests 32 and valleys 34 and inclined side walls 36 connecting adjacent ones of the crests 32 and valleys 34. The central pan 22 also includes marginal valleys 38, 40 presenting the opposite longitudinal pan edges 24, 26. It is to be understood that the building panel 20 may be erected with the face 21 as the exposed face or with the face 23 as the exposed face. Thus the building panel 20 may be erected with the valleys 34 and marginal valleys 38, 40 engaging a support member whereby the marginal connecting means 28, 30 project outwardly away from the exposed face 21 and the support member. Alternatively, the building panel 20 may be reversed such that the crests 32 engage a support member whereby the marginal connecting means 28, 30 project inwardly away from the hidden face 21 and toward the support member.

Referring to FIG. 2, the first marginal connecting means 28 comprises a first upstanding U-shaped channel 42 including a bight 44 remote from the central pan 22 and first inner and first outer legs 46, 48 extending from the bight 44 toward the central pan 22. A first upstanding flange portion 50 adjoins the pan edge 24. A first strip 52 has opposite edges adjoining the first upstanding flange portion 50 and the first inner leg 46. The first strip 52 is generally parallel with the valleys 34, 38, 40 and presents a shoulder 54 facing away from the valleys 34, 38, 40. The first outer leg 48 terminates in a free edge 56 which is spaced outwardly from the first upstanding flange portion 50 to define a longitudinal opening 57.

The second marginal connecting means 30 comprises a second upstanding U-shaped channel 58 including a bight 60 remote from the central pan 22 and second inner and second outer legs 62, 64 extending from the bight 60 toward the central pan 22. A second upstanding flange portion 66 adjoins the pan edge 26. A second strip 68 has opposite edges adjoining the second upstanding flange portion 66 and the second inner leg 62. The second outer leg 64 terminates in a second free edge 70 which is spaced outwardly from the valleys 34, 38, 40.

It will be observed in FIG. 2 that the free edge 70 of the second outer leg 64 of the second channel 30 and the first strip 52 of the first channel 28 reside on opposite sides of a plane 71 which extends parallel with, for example, the valleys 34 (FIG. 1) and the lateral valleys 38, 40 of the central pan 22. Moreover, the free edge 70 and the first strip 52 are proximate to the opposite sides of the plane 71. As will hereinafter be more fully described, the relative position of the free edge 70 and the first strip 52 provides an interlock between the first and second channels 28, 30 of adjacent building panels 20.

The first inner leg 46 and the first upstanding portion 50 of the first channel 28 present outer surfaces 72, 74, respectively, which are separated by horizontal spacing indicated at 76. The second outer leg 64 and the second upstanding flange portion 66 of the second channel 30 present outer surfaces 78, 80, respectively, which are separated by horizontal spacing indicated at 82. In the preferred arrangement, the horizontal spacing 76 is substantially equal to the horizontal spacing 82 whereby when the first and second channels 42, 58 of adjacent ones of the building panels 20 are interengaged, the first and second upstanding flange portion 50, 66 thereof will be disposed in opposed substantially abutted relation.

Roof structure

FIG. 3 presents a roof structure 84 wherein only an outer metal sheath 86 and support means, such as a purlin 88, are illustrated. The outer metal sheath 86 comprises a plurality (in this instance a pair) of building panels 20A, 20B erected in side-by-side relation with the valleys 34A, 34B and marginal valleys 40A, 38B thereof engaging the purlin 88. The building panels 20A, 20B are secured to the purlin 88 by fasteners 90. The first and second marginal connecting means of the building panels 20A, 20B are overlapped and interlocked to form a standing rib joint 92.

FIGS. 4 and 5 illustrate the manner in which the first and second channels 42B, 58A are interengaged to form the standing rib joint 92. In FIG. 4, the panel 20A has been erected and secured to the purlin 88. The panel 20B is erected by introducing the second channel 30A into the longitudinal opening 57B. By pressing downwardly on the first channel 42B, the first outer leg 48B thereof is deflected permitting the second channel 30A to enter and fit within the first channel 42B in the manner shown in FIG. 5. Thereafter, the panel 20B is secured to the purlin 88 by fasteners 90 (FIG. 3). When the erection of the panel 20B is completed, the first and second upstanding flange portions 50B, 66A thereof are disposed in opposed substantially abutted relation.

Comparing FIGS. 4 and 5, it will be seen that as the second channel 58A enters the first channel 42B, the second outer leg 78A will also be deflected. As the first channel 42B approaches the final position illustrated in FIG. 5, the second free edge 70A of the second channel 58A will clear the shoulder 54B of the first channel 42B, whereby the second outer leg 78A springs back to that position shown in FIG. 5. Accordingly, the second channel 58A is introduced into the first channel 42B by a snap action.

The first and second marginal connecting means 28B, 30A are provided with means 94 (FIG. 5) for interlocking the first and second channels 42B, 58A to prevent disengagement thereof when the building panels 20A, 20B are subjected to negative wind loading. Broadly in accordance with the present invention, the means 94 comprises confronting segments of the first and second channels 42B, 58A. In the embodiment shown in FIG. 5, the confronting segments consist of the shoulder 54B of the first channel 42B and the second free edge 70A of the second channel 58A.

Wall structure

FIG. 6 presents a wall structure 96 wherein only an outer sheath 98 and support means, such as a subgirt 100, are illustrated. The outer metal sheath 98 comprises a plurality (in this instance a pair) of building panels 20C, 20D erected in side-by-side relation. In this arrangement, the building panels 20C, 20D are reversed such that the crests 32C, 32D thereof engage the subgirt 100 and are secured thereto by the fasteners 90.

When the building panels 20C, 20D are erected as shown in FIGS. 6 and 7, the first and second channels 42C, 58D thereof form a hidden rib joint 102 extending inwardly toward the subgirt 100. With the exception of the orientation, the hidden rib joint 102 is identical to the standing rib joint 92 (FIG. 5). In the hidden rib joint 102, the first and second upstanding flange portions 50C and 66D (FIG. 7) are disposed in substantially abutted relation. A relatively undiscernible crack or seam 104 separates the marginal valleys 38C, 40D of the panels 20C, 20D. The hidden rib joint 102 also includes the means 94 for interlocking the first and second channels 42C, 58D.

Alternative embodiments

Alternative embodiments of the present marginal connecting means and of the rib joints formed thereby are illustrated in FIGS. 8 to 13, inclusive. Corresponding

numerals will be employed to identify corresponding parts heretofore described.

FIG. 8 illustrates a building panel 106 having first and second marginal connecting means 28, 30 comprising the first and second upstanding U-shaped channels 42, 58, respectively. In this embodiment, the first channel 42 includes a first strip 108 having opposite edges adjoining the first upstanding flange portion 50 and the first inner leg 46. The first strip 108 is inclined relative to the valleys 38, 40. The first strip 108 presents an inclined shoulder 110 which extends laterally over the marginal valley 38 and diverges outwardly from the flange portion 50 away from the valley 38. As in the preferred embodiment, the free edges 70 and the first strip 108 reside essentially on opposite sides of a plane 111 which extends parallel with the lateral valleys 38, 40 of the central pan.

FIG. 9 illustrates a standing rib joint 112 formed by interengaging the first and second channels 42F, 58E of the panels 106F, 106E. The first and second channels 42F, 58E are interengaged in exactly the same manners set forth above in the description of FIGS. 4 and 5. In this embodiment, the second free edge 70E confronts and engages the inclined shoulder 110F thereby interlocking the first and second channels 42F, 58E to prevent disengagement thereof when the building panels 106E, 106F are subjected to negative wind loading.

FIG. 10 illustrates a building panel 114 including first marginal connecting means 28 which is identical to the marginal connecting means 28 of the panel 20 (FIG. 2). The building panel 114 includes second marginal connecting means 30' comprising a second upstanding U-shaped channel 116. The second channel 116 includes a bight 118 and second inner and second outer legs 120, 122. A second strip 124 has opposite edges adjoining the second upstanding flange portion 66 and the second outer leg 122. The second strip 124 is generally parallel with the valleys 38, 40 and presents a shoulder 126.

In this embodiment, the shoulders 54 and 126 reside on opposite sides of an imaginary plane indicated by the dash-dot line 128, extending generally perpendicular to the first and second upstanding flange portions 50, 66. The overall arrangement is such that when adjacent building panels 114G, 114H (FIG. 11) are assembled to form a standing rib joint 134, the shoulder 126H confronts the shoulder 54G and may be engaged therewith. The confronting shoulders 54G, 126H interlock the first and second channels 116G, 42H, to prevent disengagement thereof when the building panels 114G, 114H are subjected to negative wind loading.

Returning to FIG. 10, the outer face 130 of the second outer leg 122 and the outer face 80 of the second upstanding flange portion 66 are separated by horizontal spacing indicated at 132. The spacing 132 is substantially equal to the spacing 76. Thus, as can be seen in FIG. 11, the first and second upstanding flange portions 50H, 66G of the rib joint 134 are disposed in opposed substantially abutted relation.

FIG. 12 illustrates a building panel 136 having first marginal connecting means 28 comprising a first upstanding U-shaped channel 42 which is identical to the channel 42 of the building panel 20 (FIG. 2). The building panel 136 includes second marginal connecting means 30' comprising a second upstanding U-shaped channel 138. The channel 138 includes a bight 140 and second inner and second outer legs 142, 144.

In this embodiment, the second inner leg 142 is joined directly to the second upstanding flange portion 66. That is to say, the second inner leg 142 and the first upstanding flange portion 66 comprise a single segment of metal adjoining the pan edge 26.

In this embodiment, the second outer leg 144 terminates in a second free edge 146 which is spaced outwardly from the valley 40. As in the preferred embodiment,

the free edge 146 and the first strip 52 reside on opposite sides of a plane indicated by the dash-dot line 151, and are proximate to the opposite sides of the plane 151. Also, the second inner and second outer legs 142, 144 present outer faces 148, 150 respectively which are laterally spaced-apart by a horizontal spacing indicated at 152. The horizontal spacing 152 is substantially equal to the spacing 76.

FIG. 13 illustrates a standing rib joint 154 formed by the interengagement of the first and second channels 42K, 138J, of adjacent building panels 136K, 136J. In this embodiment, the overall arrangement is such that the second free edge 146J confronts and may be engaged with the shoulder 54K thereby interlocking the first and second channels 42K, 138J. The panels 136J, 136K are thereby prevented from being disengaged when they are subjected to negative wind loading. Moreover, the first and second upstanding flange portions 50K, 66J are disposed in opposed substantially abutted relation.

The building panels 106, 114 and 136 as illustrated in FIGS. 9, 11 and 13, present standing rib joints 112, 134, 154 respectively which are exposed to view. It should be understood that the building panels 106, 114 and 136 may be reversed such that the rib joints thereof extend inwardly toward the supporting member and are hidden from view.

It should be noted that the various confronting segments of the first and second channels also serve the important function of placing the marginal valleys 38, 40 of adjacent panels substantially in a common plane.

When the present building panels are erected in inverted position, as shown in FIG. 7, the second channel 58D serves as a natural conduit for directing any water which may penetrate the seam 104, to a suitable discharge point (not illustrated).

The standing or hidden rib joints of this invention are completed by assembling the first and second channels of adjacent building panels by a snap action. No post-forming or other type of field operations is required.

I claim:

1. In a joint between a pair of building panels arranged in side-by-side relation, said building panels having exposed faces and hidden faces and including central pans of desired profile and having adjacent pan edges, and marginal connecting means along said adjacent pan edges for positively connecting said building panels, the improvement in said joint comprising:

one of said marginal connecting means comprising a first upstanding U-shaped channel formed along one of said adjacent pan edges and having spaced-apart first inner and first outer legs extending toward said central pans;

the other of said marginal connecting means comprising a second upstanding U-shaped channel formed along the other of said adjacent pan edges and residing within said first channel, said second upstanding U-shaped channel having a second inner leg confronting said first outer leg and a second outer leg spaced-apart from said second inner leg and confronting said first inner leg, the said legs of said second channel extending toward said central pans;

said first inner leg and said second inner leg having, respectively, first and second upstanding flange portions each adjoining one of said adjacent pan edges and disposed in opposed substantially abutted relation; and

means provided by said first channel and said second outer leg of said second channel for interlocking said first channel and said second channel to prevent disengagement thereof when said building panels are subjected to negative wind loading.

2. The improvement of claim 1 wherein said first outer leg of said first channel terminates in a first free edge which is spaced outwardly from the contiguous central pan, said first free edge and said first upstanding flange

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portion defining a longitudinal opening through which said second upstanding U-shaped channel is received.

3. The improvement of claim 1 wherein said means for interlocking comprises confronting segments of said first channel and said second channel.

4. The improvement of claim 1 wherein said means for interlocking comprises:

a strip having opposite longitudinal edges adjoining said first upstanding flange portion and the remaining portion of said first inner leg of said first channel, said strip extending laterally over the adjoining central pan; and

said second outer leg of said second channel terminating in a second free edge confronting said strip.

5. The improvement of claim 4 wherein said second free edge engages said strip.

6. The improvement defined in claim 1 wherein said first inner and said first outer legs of said first upstanding U-shaped channel comprise flat, parallel elements connected by an arcuate bight which is remote from said central pans; and wherein:

said second inner and said outer legs of said second upstanding U-shaped channel comprise flat, parallel elements connected by an arcuate bight which is positioned internally of and adjacent to the arcuate bight of said first upstanding U-shaped channel.

7. The improvement of claim 1 wherein said first and second channels project outwardly from said exposed faces of said building panels.

8. The improvement of claim 1 wherein said first and second channels project inwardly from said hidden faces of said building panels.

9. In a building panel having a central pan of desired profile and marginal connecting means along the opposite longitudinal sides of said central pan, the improvement in said marginal connecting means comprising:

first and second upstanding flange portions along the opposite longitudinal sides of said central pan;

a first strip adjoining said first upstanding flange portion and extending laterally inwardly thereof over said central pan;

a first upstanding U-shaped channel having spaced-apart first inner and first outer legs, said first inner leg adjoining said strip, said first outer leg terminating in a free edge spaced outwardly from said first upstanding flange portion; and

a second upstanding U-shaped channel having spaced-apart second inner and second outer legs, said second inner leg adjoining said second upstanding flange portion, and said second outer leg terminating in a free edge spaced outwardly from said second upstanding flange portion;

said second upstanding U-shaped channel being adapted to fit within the first upstanding U-shaped channel of an adjacent building wall panel;

said free edge of said second outer leg and said first strip residing on opposite sides of a plane extending

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parallel with said central pan and proximate to the opposite sides of said plane, whereby when the first and second upstanding U-shaped channels of adjacent ones of said building panel are interengaged, the free edge of the second channel confronts the first strip of the first channel to prevent disengagement of the first and second channels.

10. The improvement of claim 9 including:

a second strip having opposite longitudinal edges adjoining said second inner leg and said second upstanding flange portion and extending laterally inwardly of said second upstanding flange portion over said central pan.

11. The improvement of claim 10 wherein the first said strip is inclined relative to said first upstanding flange portion.

12. The improvement of claim 11 wherein said second strip is inclined and has a slope opposite that of the first said strip.

13. The improvement defined in claim 9 wherein said first inner and first outer legs of said first upstanding U-shaped channel comprise flat, parallel elements connected by an arcuate bight which is remote from said central pan; and wherein

said second inner and second outer legs of said second upstanding U-shaped channel comprise flat, parallel elements connected by an arcuate bight which is remote from said central pan.

14. The improvement defined in claim 9 wherein the distance between the outer faces of said first upstanding flange portion and said first inner leg is substantially equal to the distance between the outer faces of said second upstanding flange portion and said second outer leg, whereby when the first and second upstanding U-shaped channels of adjacent ones of said building panel are interengaged, the first and second upstanding flange portions thereof will be disposed in opposed substantially abutted relation.

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52—588; 287—189.36R