Jan. 11, 1966 F. VECCHIARELLI ET AL 3,228,159

RAINGUARD STRINGER ASSEMBLY

Filed April 30, 1963

FIG. 1b.

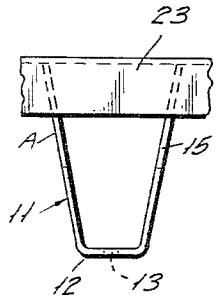


FIG. 1a.

PRIOR ART

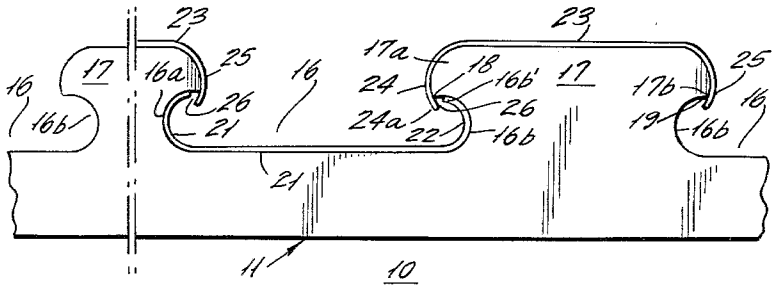


FIG. 3.

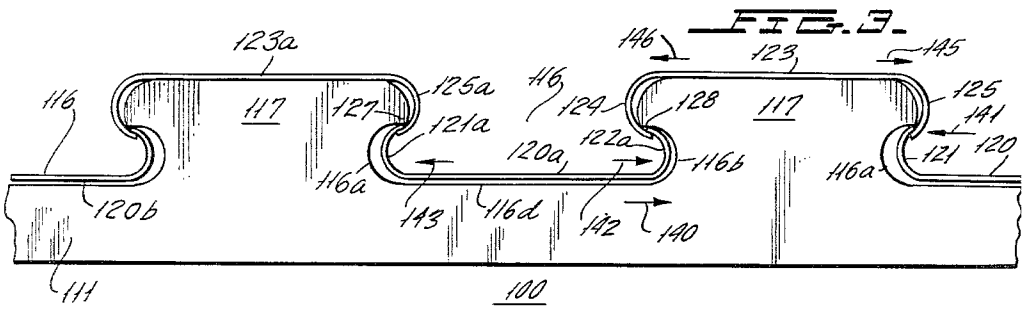
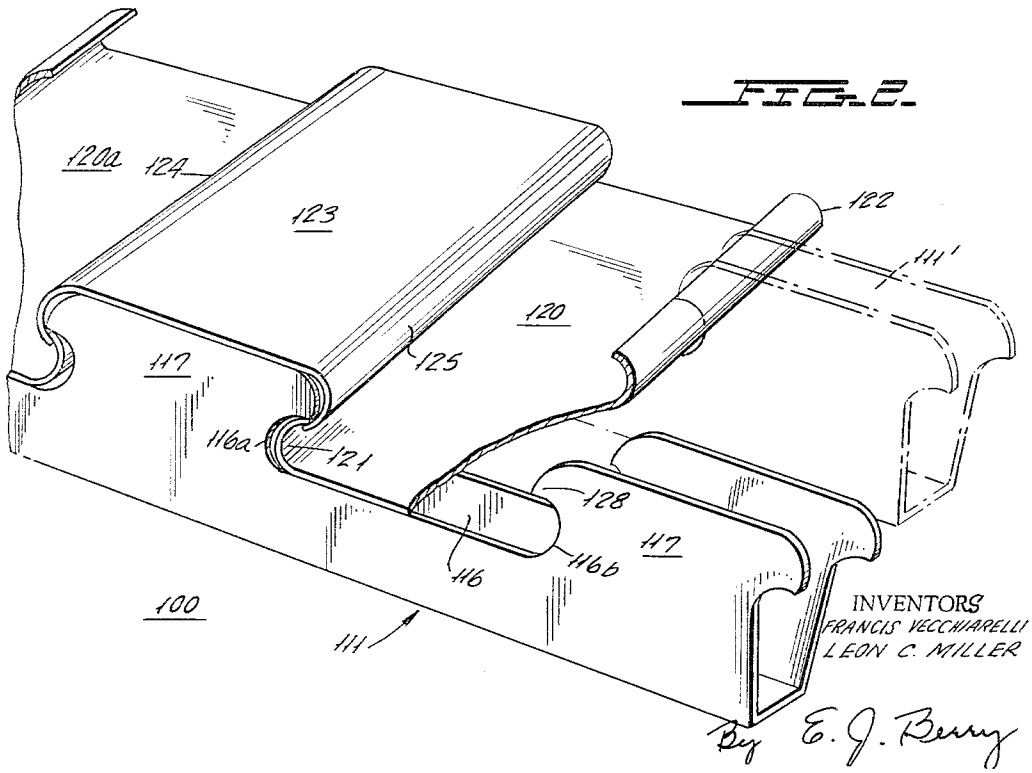


FIG. 2.



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3,228,159

RAINGUARD STRINGER ASSEMBLY

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6 Claims. (Cl. 52—222)

This invention relates to assemblies used for roofing or building facing purposes and more particularly to assemblies of the rainguard stringer type having a novel stringer configuration which provides excellent positioning and water-tight characteristics never before realizable for similar structures.

Present day structures find widespread use for metallic lightweight building awnings, roofs and facings. One present day construction of such assemblies utilazable for any of the three above purposes is comprised of a plurality of elongated panels which are substantially flat and provided with flanges bent substantially transverse to the surfaces of said panels. The panels are positioned and supported by means of supporting ribs designated as stringers which are substantially U-shaped members wherein the base or central portion of the U-shaped members are provided with suitable apertures, or any other suitable means for the purpose of mounting the stringers to the building supporting structure. The extending arms of the stringers are provided with slots having substantially the same configuration as the elongated panels which they position and support. Intermediate portions adjacent the slots stringers are provided with projecting portions which likewise receive panels in such a manner that when fully assembled the panels positioned and supported in the slots have their flanges extending in a first direction and the panels mounted on said projections have their flanges extended in a second direction opposite said first direction so that the flanges of panels mounted in said slots overlap with the neighboring flanges of panels mounted upon said projections. The slots provided in the stringers are dimensioned so that the panel received by said slot forms a pressure fit with the stringer in order to rigidly position and support the panel within the slot. The same is true of the projections each being so dimensioned that the panels form a pressure fit against the projections of the stringers to provide a rigid, stationary assembly upon completion of the assembling operation. These prior art structures, however, do not provide the adequate watertight seal between adjacent mating panels and it is found that they are very susceptible to permit water to pass between the mating panels thereby failing to provide a true watertight facing or awning.

The instant invention is comprised of an arrangement which provides a completely watertight arrangment while at the same time requiring less material per square foot of protected area and due to its novel configuration provides a neater, more aesthetic appearance than prior art devices.

The stringer assembly of the instant invention is comprised of substantially U-shaped stringers provided with a plurality of projections formed in the arms of the stringers, these projections being positioned at spaced intervals along each of the stringers. Intermediate neighboring projections the stringers are provided with substantially U-shaped slots for receiving panels therebetween. The slots, however, are dimensioned so as to be noticeably wider than the width of the panels which they are to receive. The projections, however, are dimensioned so as to form a tight pressure fit between the projections and the panel which they receive, thus providing a substantially strong pressure fit between panels mounted on projections while permitting the panels positioned within

slots to be relatively free to move in a direction along the length of said stringers.

By providing slots of the aforementioned dimensions, this positions neighboring projections at a greater distance away from one another than said prior art devices in order to provide the novel feature of the instant invention. The feature provided is the manner in which the panel mounted in the U-shaped slot is rigidly positioned and secured relative to the stringer members and further, relative to the mating panel members mounted upon said projections. Due to the fact that the width of each slot is subsantially greater than the width of the panel which it receives, this causes the panels positioned upon the neighboring projections which mate with the panel mounted in said slot to pull against the flanges of the inverted panel mounted in said slot by means of the flanges of the panels mounted on said projections with whieh the flanges of the inverted panel meet. Thus, each inverted panel experiences a force along an entire first side in a first direction and experiences a substantially equal and opposite force along the entire length of its remaining flange whereby these equal and opposite forces rigidly position and secure the inverted panel. In addition thereto, the first and second flanges of the inverted panel which mate with panels mounted upon neighboring projections form a substantially airtight seal along their entire mating lengths to provide the desired watertight seal.

The upper panels, which are the panels mounted upon said projections, also act to lift the lower inverted panels up a slight amount from the slot in which the lower panel is positioned causing the marginal edges of the lower panel flanges to come into physical contact with the corners of said stringer means. This provides a rigid pressure fit at these points making it impossible to dislodge the lower panels driven by means of a sharp blow without actual or considerable defamation and destruction of the panel members.

The construction of the instant invention makes it simpler to mount the lower panels as was the case in prior art devices, thus providing a stringer assembly having superior watertight characteristics while at the same time not increasing the complexity of asembly thereof. Also, by placing tension upon adjacent panels in the direction transverse to the length of each panel, this permits a greater amount of area to be protected for the same amount of raw material previously utilized. The structural tightness of each individual panel is increased by virtue of the fact that each individual panel is no longer independently supporting super-imposed loads. All panels are under spring tension along the line of contact with neighboring panels and this makes it possible for both upper and lower panels to work together in resisting the effect of the weight of each panel which works against the tension mountings. This is true since increasing weight increases the pressure or tension between panels so as to lock them together more tightly, providing a unified assembly which is tighter and stronger. The substantial tightness and rigidity of the assembly further acts to reduce noise which may be caused by things such as, wind, rain, hail, etc. The pressures exerted along the edges of each panel provides more uniformity to the shape of panels in order to substantially decrease the variable reflectivity of oil-can type panels. This structure also is very successful in reducing the amount of oil-canning which may occur.

It is therefore one object of the instant invention to provide a novel stringer assembly which is so designed as to provide an excellent weather seal.

Another object of the instant invention is to provide a novel stringer assembly for use in building roofs, awn-

ings, or facings, having a novel stringer configuration for the mounting of panels thereto.

Still another object of the instant invention is to provide a novel stringer assembly for use in building facings, roofs and awnings, having a novel stringer assembly for mounting elongated substantially U-shaped panels thereto wherein the stringer configuration causes adjacent panels to exert tension upon neighboring panels to provide an excellent weather seal therebetween.

These and other objects of the instant invention will become apparent when reading the accompanying description and drawings in which:

FIGURES 1*a* and 1*b* are side and end views of a prior art stringer assembly.

FIGURE 2 shows a perspective view of a stringer assembly designed in accordance with the principles of the instant invention.

FIGURE 3 shows a side view of the stringer assembly of FIGURE 2.

Referring now to the drawings, FIGURES 1*a* and 1*b* show a stringer assembly **10** comprised of a substantially U-shaped member **11** having a base or central portion **12** which may be provided with suitable apertures, such as, for example, the aperture **13** for the purpose of securing stringer **11** to a building super-structure (not shown) in any suitable manner.

The stringer **11** is provided with outwardly extending arms **14** and **15** which project in substantially the same direction away from central portion **12**. Referring specifically to FIGURE 1*a*, each of the arms **14** and **15** are provided with a plurality of elongated slots **16** along the length of the stringer **11**. The ends of the slots **16** are provided with curved configurations at the left and right-hand ends as shown by numerals **16***a* and **16***b*. Each of these slots **16** has two neighboring projections **17** positioned to the right and left of each slot with the ends **17***a* and **17***b* of each projection being rounded so as to meet and form points **18** and **19** with the rounded portions **16***a* and **16***b* of the slot **16**.

The slots **16** are designed to receive elongated panels **20** each of which is provided with flanges **21** and **22** at its left and right-hand edges, which flanges curve substantially inwardly as shown in FIGURE 1*a*. The width of slot **16** is such that the panels **20** positioned therebetween have their flanges **21** and **22** frictionally engaging the curved portions **16***a* and **16***b* of the slots **16** so as to form a pressure fit therebetween to prevent any movement of panel **20** relative to stringer **11**. The inward forces exerted by curved portions **16***a* and **16***b* against the flanges **21** and **22** respectively of panel **20** will cause panel **20** to buckle somewhat at its middle portion causing some slight deflammation thereof. This is undesirable as it spoils the smooth appearance of panel **20** from an aesthetic viewpoint. While it is true that there is a pressure fit between flanges **21** and **22** which frictionally engage curved portions **16***a* and **16***b* due to the relative smoothness of these surfaces, the pressure fit is not an extremely good one so that panel **20** will be able to experience some movement relative to stringer **11** which is another undesirable feature of the arrangement shown in FIGURES 1*a* and 1*b*.

In addition to the lower panels **20**, the projections **17** receive upper panels **21** which relative to the lower panels **20** are in an inverted position with the flanges **24** and **25** projecting substantially downward. The curved flanges **24** and **25** substantially downward. The curved flanges **24** and **25** substantially mate with the curved portions **17***a* and **17***b* of projection **17** in order to form a pressure fit therewith. As can be seen, when the panels **23** and the panels **20** are in their appropriate positions, the neighboring flanges **25–21** and **24–22** substantially ovelap one another so that any wind or rain which may fall upon the exposed surfaces of upper and lower panels **23** and **20** respectively, will have to pass through the engine or gap **26** which exists between the overlapping panels **21–25** and **22–24** respectively. However, it should be noted that with driving rainstorms, it is highly likely that rain falling upon the exposed surface of lower panels **20** will be deflected away from panel **20** and in through the gaps **26** in order to enter into the region which is to be protected by the stringer assemblies. This arrangement thereby fails to provide a really good weather seal along these overlapping flanges.

Turning now to the instant invention, FIGURES 2 and 3 show the embodiment **100** which is comprised of stringer assemblies **111** having slots **116** and projections **117**. The slots **116** are provided for the purpose of receiving the panels **120** in a manner substantially similar to that shown in FIGURES 1*a* and 1*b*. The panels **120** are identical in every respect to the panels **20** of FIGURES 1*a* and 1*b*. However, it is important to note that the slots **116** in the assembly **100** are greater in length than the slots **16** of FIGURE 1*a* so that when the slots **116** receive lower panels it can clearly be seen that their curved end portions **116***a* and *b* do not make any contact with the curved flanges **121** and **122** respectively, of the lower panels **120**. Thus the lower panels **120** are completely free to be slid into position within slots **116** without experiencing any frictional forces during the positioning operation. In addition thereto, it should also be noted that the lower panels **120** may experience some movement in the directions shown by double arrow **140** which is due to the fact that the length of the slots **116** is greater than the distance between the outer surfaces of curved flanges **121** and **122**.

The stringer **111** is further provided with projecting portions **117** which are substantially identical to the projecting portions **17** of FIGURE 1*a* so far as their shape and dimensions are concerned so that when upper panels **123** are positioned upon the mating projections **117** by suitably snapping them into their appropriate positions these upper panels **123** do make frictional engagement with their mating projections **117**.

The method of assembling the rainguard stringer assembly of FIGURES 2 and 3 is as follows:

Lower panels **120** and **120***a* are first pressed or slid into their mating slots **116**. Next, the upper panel **123** is snapped into position in the manner shown in FIGURE 3. When positioned in this manner, the flange **125** of upper panel **123** makes physical contact with the inner surface of flange **121** of lower panel **120**. In a like manner, flange **124** of upper panel **123** makes physical contact with the flange **122***a* of lower panel **120***a*. This causes panel **120** to move slightly towards the left as shown by arrow **141** while lower panel **120***a* moves slightly towards the right as shown by arrow **142**.

Next, lower panel **120***b* is slid into position so as to mate with its cooperating slot **116**. After lower panel **120***b* is suitably positioned, upper panel **123***a* is then snapped into position in this manner, flange **125***a* of upper panel **123***a* makes physical contact with flange **121***a* of lower panel **120***a*. This physical engagement along the entire length of flange **121***a* which engages the entire length of flange **125***a* causes lower panel **120***a* to move slightly towards the left in a direction shown by arrow **143**. However, the snapping into position of upper panel **123** having caused lower panel **120***a* to move towards the right, as shown by arrow **142**, the force applied by panel **123***a* which tends to move lower panel **120***a* in the direction shown by arrow **123**, causes the lower panel **120***a* to experience two counteracting forces due respectively, to the upper panels **123** and **123***a*. This places lower panel **120***a* under an extremely large amount of tension causing its lower surface to be suspended from the central portion **116***d* of flange **116** causing it to actually be suspended from and not touch flange **116** anywhere along its entire length. The only physical engagement which panel **120***a* makes with stringer **111** is at the holding points **127** and **128**. Lower panel **120***a* also makes physical contact whereby the marginal edges of flanges **121***a* and **122***a* abut against the inner surfaces

of flanges 125*a* and 124 of upper panels 123*a* and 123 respectively.

Since the above description explains the manner in which upper panels such as, for example, the upper panels 123 and 123*a* exert counteracting forces 142 and 143 respectively, upon the lower panel 120*a*, it should be noted that substantially the same thing can be said of lower panels, such as, for example, the lower panels 120 and 120*a* which exert counteracting forces 145 and 146 upon the upper panel 123. In the same manner as previously described, additional upper and lower panels may be mounted to the stringer 111 with the stringer 111 being of a greater or lesser length than the embodiment shown in FIGURES 2 and 3. Upon completion of the assembly operation, the assembled rainguard structure provides an excellent weather seal on its entire length and due to the presence of the counteracting forces exerted upon each lower panel by its neighboring upper panels and conversely upon each upper panel by its neighboring lower panels, the entire structure is stressed in a substantially uniform manner to prevent any of the panels from buckling or "oil-canning" thereby providing a roof (for awnings or building facing) assembly which provides a substantially smooth, aesthetic appearance through its entire visible surface. None of the panels, once properly assembled, may be moved from their desired positions and due to the tension experienced by each panel the configuration cooperates to counteract the effect of the weight of each panel upon the assembly such that it increasingly acts to increase tension between panels locking them together more tightly thereby making the entire assembly tighter and stronger. The tension further serves to reduce noise substantially by virtue of the continuous contacting surfaces along the marginal edges of the upper and lower panels. It should further be understood that a plurality of stringer assemblies may be employed so as to support upper and lower panels at their extreme end. Such an arrangement is shown by the solid line stringer 111 and the dotted line stringer 111′ of FIGURE 2. It should also be understood that the length of each upper and lower panel may be dimensioned so as to suit the needs of the user and further that the lengths of upper and lower panels lend no novelty to the instant invention.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure therein, but only by the appending claims.

What is claimed is:

1. A weather proof assembly for building facings, awnings and the like comprising a plurality of elongated panel members each having a C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially flat elongated member having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections having a substantially C-shaped profile receiving one of said panel members with said flanges curving around the ends of said projection; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel member; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one another causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections maintaining said first panel members under constant tension to keep the contiguous edges of adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the dimensions of said projection being substantially equal to the dimensions of a panel member providing a pressure fit therebetween.

2. A weather proof assembly for building and the like comprising a plurality of elongated panel members each having C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially flat elongated member having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections receiving one of said panel members with said flanges curving around the ends of said projection; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel member; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one another causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections maintaining said first panel members under constant tension to keep the contiguous edges to adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the ends of each of said projections forming a sharp corner at the point where it meets an adjacent slot; said sharp corners making contact with the marginal edges of first panel members to rigidly hold said first panel members in position to prevent dislodging of said first panel members.

3. A weather proof assembly for building facings, awnings and the like comprising a plurality of elongated panel members each having a C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially flat elongated member having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections receiving one of said panel members with said flanges curving around the ends of said projection; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel member; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one another causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections maintaining said first panel members under con-

stant tension to keep the contiguous edges of adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the ends of each of said projections forming a sharp corner at the point where it meets an adjacent slot; said sharp corners making contact with the marginal edges of first panel members to rigidly hold said first panel members in position to prevent dislodging of said first panel members, said first panel members being suspended above said slots by said second panel members.

4. A weather proof assembly for building facings, awnings and the like comprising a plurality of elongated panel members each having a C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially elongated member having a substantially C-shaped profile having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections having a substantially C-shaped profile receiving one of said panel members with said flanges curving around the ends of said projection; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel member; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one an other causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections to maintain said first panel members under constant tension to keep the contiguous edges of adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the dimensions of said projection being substantially equal to the dimensions of a panel member providing a pressure fit therebetween.

5. A weather proof assembly for building facings, awnings and the like comprising a plurality of elongated panel members each having a C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially elongated member having a substantially C-shaped profile having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections receiving one of said panel members with said flanges curving around the ends of said projections; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel members; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one another causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections to maintain said first panel members under constant tension to keep the contiguous edges of adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the ends of each of said projections forming a sharp corner at the point where it meets an adjacent slot; said sharp corners making contact with the marginal edges of first panel members to rigidly hold said first panel members in position to prevent dislodging of said first panel members.

6. A weather proof assembly for building facings, awnings and the like comprising a plurality of elongated panel members each having a C-shaped cross-section; the central portion of which is substantially flat and is provided with first and second substantially curved flanges running along substantially the entire length of said panel member; at least one stringer member being a substantially elongated member having a substantially C-shaped profile having a plurality of slots positioned at spaced intervals along the length of said stringer member; the sections of said stringer member between said slots each forming a projection extending in the direction of the length of said stringer member; each of said projections receiving one of said panel members with said flanges curving around the ends of said projections; each of said slots having a profile receiving one of said panel members with the ends of said slots curving around the flanges of said panel member; the width of each of said slots being greater than the width of said panel members permitting substantially free movement of said panel member in said slot; each of said slots and said projections being positioned relative to one another causing flanges of panel members mounted upon said projections to overlap flanges of panel members mounted in said slots; said stringer member projections being positioned relative to one another causing first panel members mounted in said slots to experience forces in opposing directions from the overlapping second panel members mounted on neighboring projections to maintain said first panel members under constant tension to keep the contiguous edges of adjacent flanges in continuous and closed contact to exclude the entry of air, mist and rain; the ends of each of said projections forming a sharp corner at the point where it meets an adjacent slot; said sharp corners making contact with the marginal edges of first panel members to rigidly hold said first panel members in position to prevent dislodging of said first panel members, said first panel members being suspended above said slots by said second panel members.

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