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(54) ROOFING CLIP FOR METAL ROOFING

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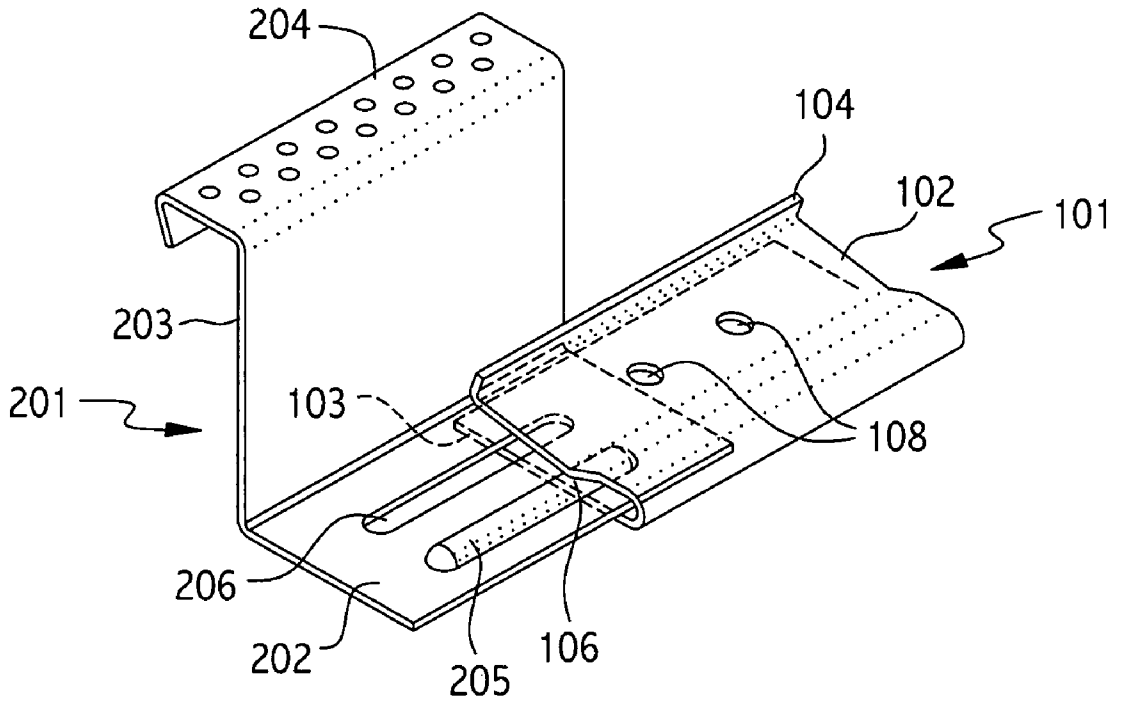
(57) ABSTRACT

A roofing clip and connector for retaining metal roofing panels to the purlins of roofs comprising a rigid clip piece in the form of a folded piece of material with a loop in the vicinity of the fold and a constricted area between the loop and the folded ends of the materials, with holes to facilitate attachment of the clip to the purlins, and with the upper fold of the clip having an upturned segment more than 69 degrees at the end thereof, and a connector to be inserted into the clip, with a tab extension extending laterally from the connector.



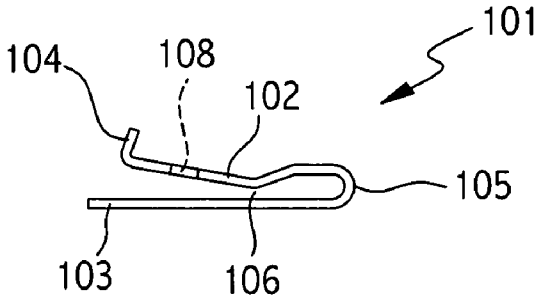


FIG. 1

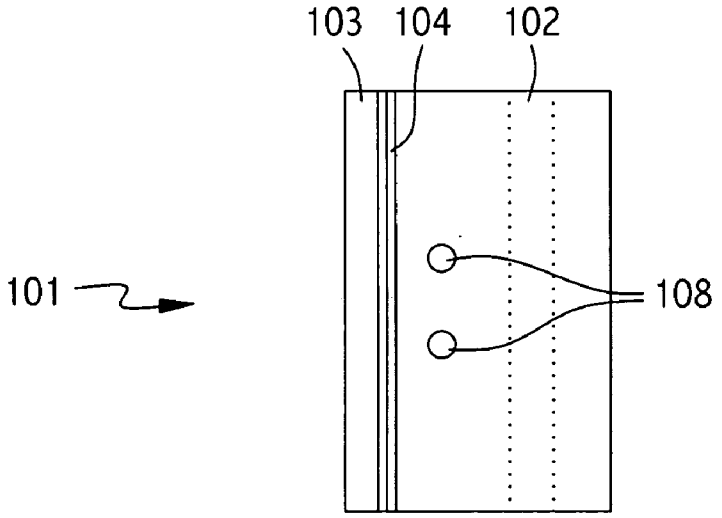


FIG. 2

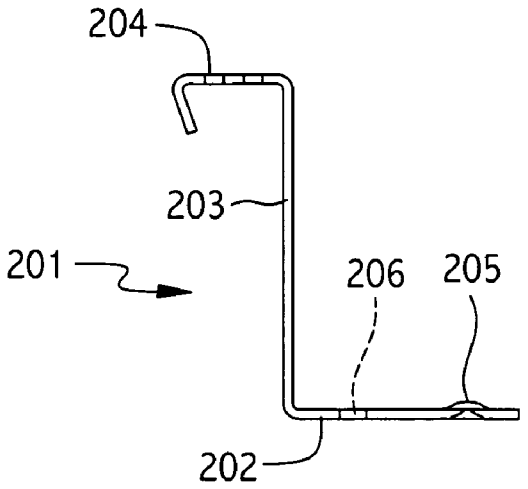


FIG. 3

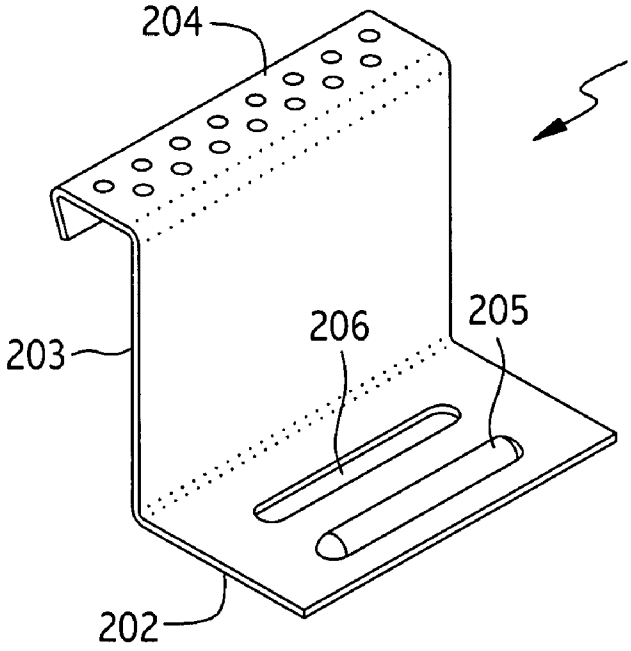

204
201
203
206
205
202

FIG. 4

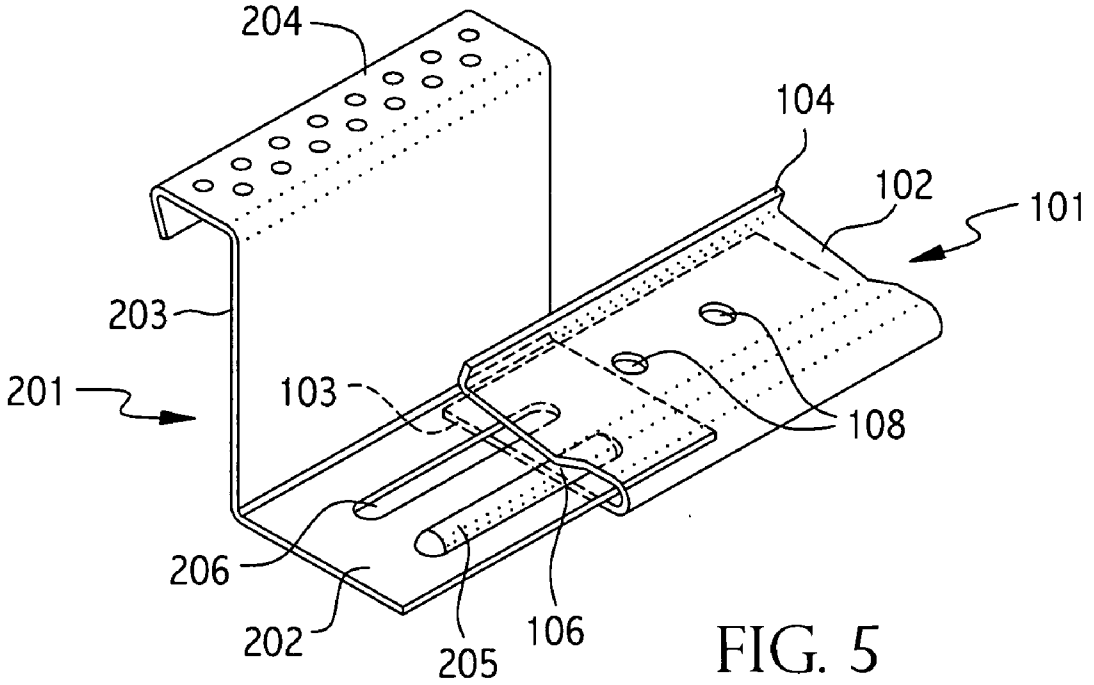
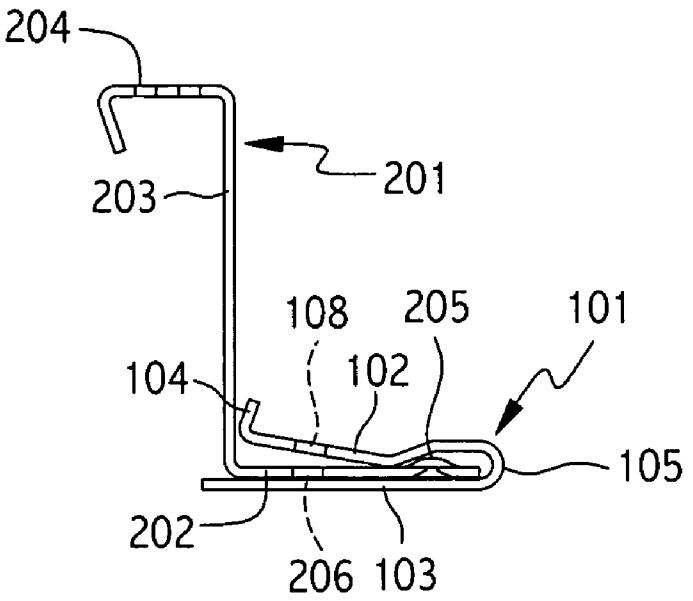

204
104
102
101
203
201
103
108
206
202
205
106

FIG. 5


204
201
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206
103

FIG. 6

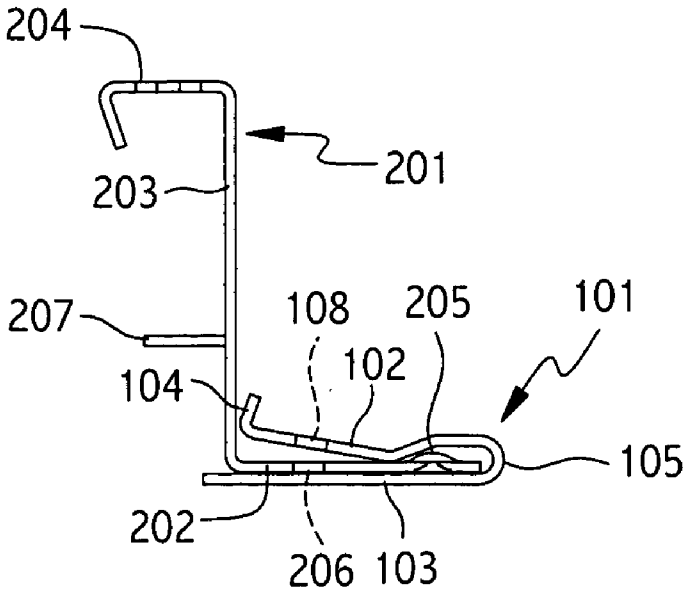
204
201
203
207
108
205
101
104
102
105
202
206
103

FIG. 7

ROOFING CLIP FOR METAL ROOFING

BACKGROUND OF INVENTION

[0001] Metal roofs, though in use for centuries, have in recent years become increasingly popular for commercial, residential or other uses, and with such popularity there is an increased need for better roofing clips for attaching the metal roof panels to the purlins of the roof structure.

[0002] Metal roofs are strong, fire-resistant and durable, and they now come with many finishes and in various styles which sometimes simulate the look of non-metal roofing materials such as tile or slate.

[0003] However, metal expands or contracts with temperature changes to a greater degree than some other roofing materials. Therefore, for extended lengths of metal roofing, where the quantitative amount of expansion and construction can be considerable, nailing or screwing the metal to the purlins of the roof structure is not satisfactory because of buckling that can occur, or even the pulling loose or shearing of the fasteners. To deal with this expansion/contraction characteristic of metal roofs, it is customary to utilize roofing clips, usually of metal, that will allow for a certain amount of expansion and contraction by allowing a metal piece interfacing or engaging with the metal roof to slide within a limited range provided by the clips attached to the purlin.

[0004] The present invention is a roofing clip and connector designed to provide greater strength and stability to an installed roof system than in the past, especially through angling upward the end portion of the upper fold layer of the clip as will be shown below, together with provision of a tab extension for the connector.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] **FIG. 1** is a side view of a roofing clip.

[0006] **FIG. 2** is a view of a clip seen from above, showing the upper narrower portion folded back over the lower, longer portion and showing to fastener holes through each fold layer.

[0007] **FIG. 3** is a view of a connector to be held between the folds of the clip.

[0008] **FIG. 4** is a perspective view of the connector.

[0009] **FIG. 5** is a view of the connector in the process of being inserted into the folds of the clip.

[0010] **FIG. 6** is a side view showing the connector fully inserted into the clip.

[0011] **FIG. 7** is a side view showing the connector fully inserted into the clip, and with a tab extension extending from the connector.

DETAILED DESCRIPTION OF THE DRAWING

[0012] Referring to **FIG. 1**, a rigid, preferably metal, roofing clip **101** is shown in a side view in which top fold **102** is configured to lie above lower fold layer (sometimes referred to as "folds") **103** to form a narrow constriction **106** between the upper and lower folds. The constriction makes it difficult to extract a properly designed connector, inserted laterally into the clip, when an extractive force is exerted in a direction generally away from tip point **105** through the mouth of the clip. In practice, a piece of sheet metal of suitable size is mechanically bent to make the fold, leaving a somewhat wider loop in the area near tip point **105**, with a constriction at point **106**, an upturn at or toward the end of upper fold **102**. An upturned segment **104** of approximately 70° or more counterclockwise from the horizontal has been found to have several advantages over the existing art which generally has no upturn at such corresponding parts of metal roofing clips. Insertion of the connector **201** (see **FIGS. 3-6**) is easier; the clip gains added strength in the area of segment **104**; and a horizontal edge is eliminated which is less likely to be abrasive of the connector **201** when there is movement of the connector **201** relative to clip **101** caused by wind, expansion and contraction of metal, and other causes. It is found in laboratory testing that clips having the upturned segment **104** have considerably greater resistance to failure from forces and stresses than those without such upturned segment.

[0013] Referring to **FIG. 2**, the clip is shown in a top view, showing fastener holes **108** (preferably by not necessarily dimpled downward) extending in line through both upper fold **102** and lower fold **103**, said holes intended usually for nails or screws. Two pairs of holes are shown and are preferred for stability and strength, but any number, one, two or more, could be used with reasonably satisfactory results. Fasteners are inserted through the holes **108** into the purlins of the roof structure, after connectors have been inserted laterally into the clips, thus securing the clips and connectors to the purlins.

[0014] **FIG. 3** is a side view of a connector **201** designed to be inserted laterally into a clip **101**. A leg **202** of the connector to be inserted into the clip has a hump or dimple **205** which extends at least a part of the width of the connector **202** with a generally parallel slot **206** spaced farther from the extremity of the insertion leg **202** than the hump **205**. The connector **201** bends upward from the insertion leg **202** to form leg **203**, at the end of which there is an interface means **204** designed to engage with and hold a panel of metal roofing, which interface means would typically include a relatively flat surface to touch against or approach closely the bottom of a panel of metal roof so that screws or nuts and bolts or other fasteners can join the metal roof panel to the connector. The interface means could also include hooks, clasps, snaps, and other well known means for engaging and retaining two objects together. Typically, the edges of metal roof panels are crimped around segment **204**, and such edges and segment **204** are together bent and crimped inwardly toward segment **203** in order securely to retain the roof panels. When the connector **201** is slid laterally into clip **101**, the hump **205** fits into the toe or loop near **105** of **FIG. 1**, and the constriction **106** of the clip helps prevent the connector from being removable in the extraction direction running from point **105** through the toe loop toward point **104**.

[0015] **FIG. 4** shows connector **201** from a perspective point of view showing hump **205** and slot **206** in insertion leg **202**, as well as leg **203** culminating in hook or clasp **204**. The slot **206** is positioned so that it will fall in line with, and within a plane between, the fastener holes **108** of the two fold layers in clip **101**, when the connector **201** is inserted laterally into clip **101**. However, slot **206** is wider than the longest straight line that can be drawn from any point on the

circumference of any hole **108** to any other point on any hole **108**. The result is that, when connector **201** is inserted fully into clip **101**, and then fasteners are also inserted via holes **108** through the two folds **102** and **106** of clip **101**, the connector can slide laterally for a distance until an end of slot **206** comes into contact with a fastener and is thereby stopped. This ability of the connector **201** to slide laterally for a discrete and limited distance will accommodate expansions and contractions of metal roofing engaged by the connector, and thereby will retain the metal roofing substantially intact without warping or bunching or sheer stresses which might otherwise occur. The degree of sliding allowed by the clip/connector combination is determined by the coefficient of expansion and contraction of the metal roofing material and by the range of cold and hot temperatures anticipated to affect the metal roofing materials and thus cause such expansion and contraction of metal, as well as the length of a metal roof panel being secured.

[**0016**] **FIG. 5** shows connector **201** in the process of being inserted laterally into clip **101**, showing how the slot **206** falls directly between and in line with the holes **108** in the upper fold of the clip and the corresponding holes **108** in the lower fold of the clip. **FIG. 5** also shows how hump **205** slides within the loop or toe **105** of the clip to prevent or make difficult extraction in a direction past constriction **106** from loop or toe point **105** to end segment **104**. The interface means **204** (shown in **FIGS. 4 and 5** with typical holes, which are not essential nor particularly relevant to this invention) will be at the end of upright segment **203** above the engaging portions of the clip and connector.

[**0017**] **FIG. 6** is a side view of the combined clip **101** and connector **201** showing the connector inserted into the clip. As noted earlier, there are substantial advantages in angling the end **104** upwards about 70° or more in a counter-clockwise direction from the horizontal.

[**0018**] **FIG. 7** shows a different configuration of the clip/connector combination, in which one or more tab extensions **207** extend from segment **203**, at a sufficient distance below segment **204** so as not to interfere with the crimping or other attachment of the edge of metal roof panels to the connector. Usually it would be desirable to position such tab extensions so that they are on the same side and extend in substantially the same direction as segment **204**, since the bulge or loop in the toe of the clip in the vicinity of **105** will generally serve a somewhat equivalent function on the opposite side, but one or more tab extensions could extend in either direction on either side. Such tab extension or extensions are helpful to insure that the metal roof panels do not touch or rub against any purlins or stationary structural components of the roof structure below the metal roof panels, which would cause a drag on the metal roof panels as they expand and contract. Such one or more tab extensions, or ledges, can be formed by punching out a partial hole and bending outwardly the metal tab so formed or, alternatively, they could be welded onto segment **203**, preferably on the back side, or otherwise attached to segment **203**. With the use of such tab extensions, the upwardly bent segment **104** of the preceding **FIGS. 1, 20, 5** and **6** is unnecessary and has been eliminated from **FIG. 7**.

What is claimed is:

1. A roofing clip of material having an upper fold layer, and a lower fold layer longer than the upper fold layer, comprising:

(a) a loop of the folded material in the vicinity of the fold;

(b) a constriction relative to the separation of the two fold layers at the end of the loop distant from the fold;

(c) at least one hole extending concentrically through both fold layers, located on the side of the constriction opposite the loop; and

(d) a portion of the upper fold layer angled upward at the end thereof.

2. A roofing clip as described in claim 1 wherein the material is a metal.

3. A roofing clip as described in claim 1 wherein there are two holes, each extending through both fold layers concentrically.

4. A roofing clip as described in claim 1 wherein said portion of the upper fold area is angled upward in a range in excess of 69 degrees.

5. A roofing clip as described in claim 2 wherein there are two holes each extending through both fold layers.

6. A roofing clip as described in claim 2 wherein said portion of the upper fold area is angled upward in a range in excess of 69 degrees.

7. A roofing clip as described in claim 5 wherein said portion of the upper fold area is angled upward in a range in excess of 69 degrees.

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