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(54) Roofing fixing apparatus

(57) An apparatus 10 for fixing an external roofing sheet 12 to an internal roofing sheet 14 is described. The apparatus allows the internal and external sheets 12 and 14 to be sufficiently separated to allow a significant volume of insulation between them and prevents thermal bridging. The apparatus 10 has at least one bar 16 which is attached to external roofing sheet 12 by screws 18. The apparatus also has a separating member 34 for maintaining separation between the internal and external roofing sheets 12 and 14 and insulating caps 52, insulating strip 54, insulating insert 56 and insulating bar insert 58.

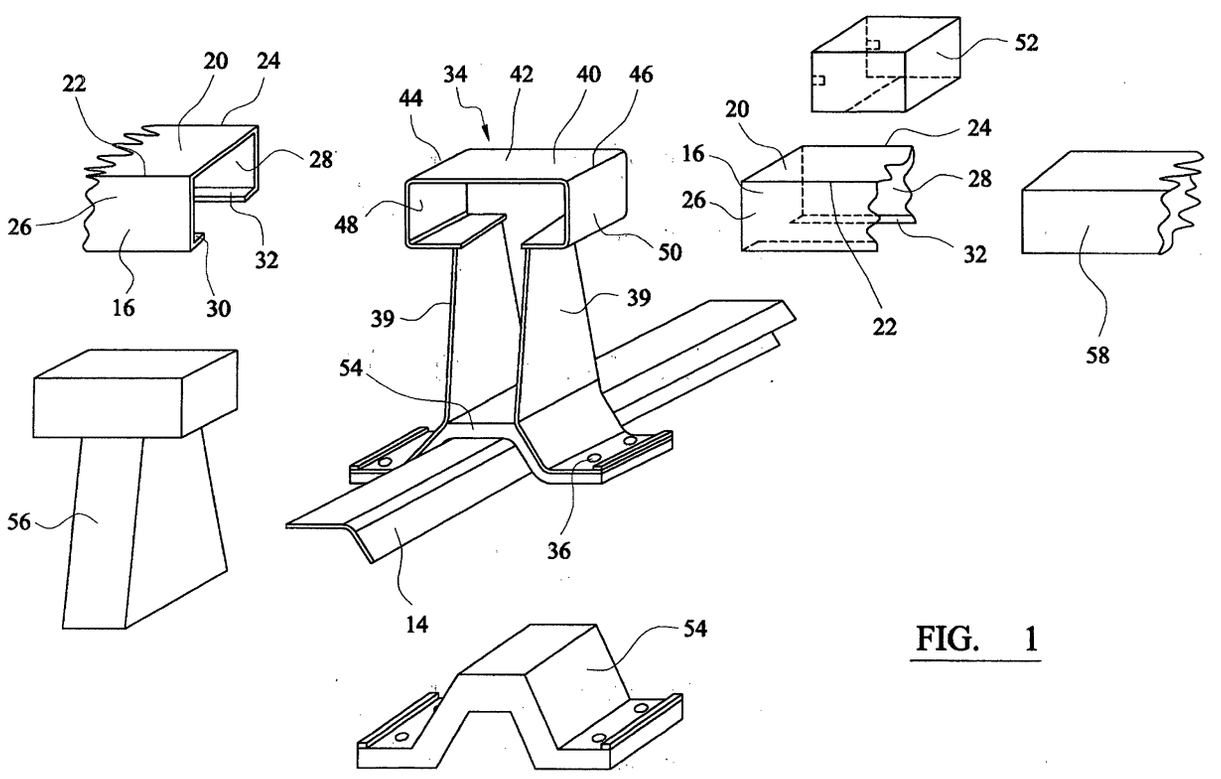

FIG. 1

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Description

[0001] The present invention relates to apparatus for fixing roofing, and in particular relates to the connection of outer and inner roofing sheets of double skinned roofing structures having insulation in between.

[0002] The use of double skin roofing systems is well known, in particular for large buildings such as factories, warehouses or sports centres. Typically an internal roofing sheet is fixed to the structure of a building and spacing brackets are attached to the inner roofing sheet. Insulating material, such as fibreglass is then laid on top of the internal roofing sheet. A support bar is then attached to the spacing brackets and the external, or weathering, sheet is attached to the support bar. Thus a double skinned roof can be provided having both thermal and sound insulating properties.

[0003] Under new UK Building Regulations Part L there is a requirement for such roofing systems to provide an insulation value of up to 0.25 W/m^2K which is an increase from the previous requirement of 0.45 W/m^2K. As a result, it is necessary to provide an insulating layer of approximately 160mm and therefore it will be necessary to increase the size of the brackets which separate the inner and outer roofing sheets. Under these circumstances, in order to maintain the overall strength of the fixing of the outer sheet to the inner sheet, it is necessary to provide a greater number of brackets spaced closer together. However, the insulating material used is generally provided in rolls having a width of 1m and it is therefore necessary to either squash the insulation between two brackets, thus leaving areas uninsulated, or to force the brackets to penetrate the insulating material. Ideally the brackets are provided at 1m intervals to allow the easiest application of the insulating material.

[0004] Preferred embodiments of the present invention seek to overcome the above described disadvantages of the prior art.

[0005] According to an aspect of the present invention there is provided an apparatus for fixing a first roofing sheet to a second roofing sheet, the apparatus comprising:-

at least one elongate engaging member attached in use to the first roofing sheet, said engaging member having a first surface with at least two substantially parallel elongate edges, second and third surfaces extending from said edges, and first and second side portions extending substantially towards each other from said second and third surfaces respectively; and

at least one separating member for maintaining separation between the first and second roofing sheets, said separating member having fixing means for attaching said separating member to the second roofing sheet, at least one engaging portion adapted to engage a said engaging member, and support means extending from adjacent said fixing means to adjacent said engaging portion;

wherein at least one said engaging portion is adapted to engage a said engaging member at at least two locations, spaced apart in the axial direction of said engaging member, at which the external cross-sectional shape of the engaging portion engages with the internal surfaces of at least said first surface and said first and second side portions of a said engaging member.

[0006] By providing an engaging portion on a separating member which has points of engagement which are separated along the length of an engaging portion, the advantage is provided that the rigidity of both the engaging portion of the separating member and the engaging member are increased. Thus, shear forces acting axially along the engaging member are less likely to cause damage to either the separating or engaging members. Furthermore, the significant strength of the structure allows the spacing of the separating members at at least 1m intervals even at roofing sheet separations in excess of 200mm. Thus insulation can easily be applied within the space of two roofing sheets providing significant insulation without having to insert a bracket through the insulation or guide the insulation around a bracket.

[0007] In a preferred embodiment the first roofing sheet is an external roofing sheet of a building.

[0008] In another preferred embodiment at least one said first engaging member further comprises at least one respective foam insert.

[0009] By providing the first engaging member with foam inserts the advantage is provided that where a decrease in the thickness of insulation occurs as it passes under the engaging member the foam inserts provide further insulation. Furthermore, if such foam inserts have a rigid structure this provides additional strength and rigidity to the engaging member.

[0010] In a preferred embodiment at least one said engaging member is adapted to be attached to the roofing sheet using self tapping screws.

[0011] In a preferred embodiment the second and third surfaces of at least one said engaging member extend substantially perpendicularly to the corresponding first surface.

[0012] In another preferred embodiment the first and second side portions of at least one said engaging member extend substantially perpendicularly to the corresponding second and third surfaces.

[0013] In a preferred embodiment the separating member is adapted to be attached to the second roofing sheet by self tapping screws.

[0014] In a preferred embodiment the apparatus further comprises insulating caps adapted to prevent an engaging member and an engaging portion directly contacting each other.

[0015] By providing an insulating cap between an en-

gaging member and engaging portion of a separating member, the advantage is provided that where the respective components are formed from good conducting materials , such as metals, the temperature of the external sheet of the building does not conduct through the separating member, thus preventing thermal bridging.

[0016] In a preferred embodiment the apparatus further comprises at least one insulating strip for separating a separating member from the second roofing sheet.

[0017] By thermally separating the internal roofing sheet and a separating member the advantage described above is again provided. By completely thermally isolating a separating member, ie by means of insulating caps and strips, the further advantage is provided that, when compared to insulating one end of the separating member from its respective roofing sheet the temperature incursion into the insulating material from the other roofing sheet is minimised. For example, if only the external roofing sheet is thermally isolated from the separating member, the warmth from the internal roofing sheet can conduct to adjacent the external roofing sheet. By insulating both ends of the separating member there is improved insulation in the areas around the separating member.

[0018] In a preferred embodiment the engaging portion of at least one separating member is formed from a sheet of material bent so as to form a fourth surface with fifth and sixth surfaces extending therefrom, wherein the engaging portion is adapted to engage an engaging member such that the fifth and sixth surfaces lie substantially perpendicular to the axis of the engaging member.

[0019] By forming the engaging portion of a separating member from a sheet of material such that the ends of the engaging portion lie substantially perpendicular to the axis of the engaging member, the advantage is provided that the engaging portion and the corresponding engaging member provide structural stability to each other. For example, both structures may have an open rectangular cross section and a shearing force applied to an upper surface (the first and fourth surfaces respectively) will cause the cross section to tend towards a parallelogram. However, when the engaging portion and engaging member engage each other the second and third, and fifth and sixth surfaces provide rigidity to the open cross section, thus acting equivalent as an to a portal brace. As a result, the structural components of the apparatus, that is those providing the supporting strength between the two roofing sheets, can be formed by simply bending sheet metal and yet provide sufficient strength at the sheet separations required to allow significant insulation.

[0020] In a preferred embodiment at least one separating member is moulded from at least one plastic material.

[0021] By forming a separating member from plastic material, the advantage is provided that the whole separating member provides insulating separation between the first and second sheets and plastic having a relatively low conductivity of heat, compared to metal for example, minimises thermal bridging between the first and second roofing sheets. Because the separating member is formed from plastic there is not a requirement to thermally isolate it from the roofing sheets and therefore the end caps and insulating strips are not required. It is not possible to form a separating member of the prior art from plastic since the connection between the separating member and the support bar cannot be strong enough to hold the roofing sheets together. However, because the engaging portion of the present invention is long it distributes the forces connecting the engaging portion and the engaging member thus allowing a non-metallic product to be used.

[0022] In a preferred embodiment at least one said separating member is filled with insulating foam.

[0023] By filling a separating member with insulating foam the advantage is provided that the entire volume between the first and second roofing sheets can be filled with an insulating material and furthermore where a rigid insulating foam is used the foam provides further structural support to the separating member.

[0024] In a preferred embodiment at least one said support means comprises a pair of spaced apart support legs.

[0025] According to another aspect of the present invention there is provided a separating member for fixing a first roofing sheet to a second roofing sheet using an engaging member having at least one elongate engaging member attached in use to the first roofing sheet, said engaging member having a first surface with at least two substantially parallel elongate edges, second and third surfaces extending from said edges, and first and second side portions extending substantially towards each other from said second and third surfaces respectively, the separating member comprising:-

> fixing means for attaching said separating member to the second roofing sheet, at least one engaging portion adapted to engage a said engaging member, and support means extending from adjacent said fixing means to adjacent said engaging portion;

wherein at least one said engaging portion is adapted to engage a said engaging member at at least two locations, spaced apart in the axial direction of said engaging member, at which the external cross-sectional shape of the engaging portion engages with the internal surfaces of at least said first surface and said first and second side portions of a said engaging member.

[0026] Preferred embodiments of the present invention will now be describe, by way of example only, and not in any limitative sense, with reference to the accompanying drawings in which:-

> Figure 1 is a perspective view of an embodiment of the present invention;

Figure 2 is a side view of the apparatus of Figure 1;

Figure 3 is an end view of the apparatus of Figure 1;

Figure 4 is a side view of an alternative embodiment of the present invention;

Figure 5 is an end view of the apparatus of Figure 4;

Figure 6 is a side view of a further embodiment of the present invention; and

Figure 7 is an end view of the apparatus of Figure 6.

[0027] Referring to Figures 1, 2 and 3, an apparatus 10 for fixing a first or external roofing sheet 12 to a second or internal roofing sheet 14 has at least one elongate engaging member or bar 16 which is attached to external roofing sheet 12 by self tapping screws 18. Bar 16 has a first surface 20 with at least two substantially parallel edges 22 and 24. Extending from edges 22 and 24 are second and third surfaces 26 and 28 from which in turn extend first and second side portions 30 and 32.

[0028] The apparatus also has a separating member 34 for maintaining separation between the internal and external roofing sheets 12 and 14. The separating member 34 has fixing means, in the form of holes 36, through which self tapping screws 38 are located to attach the separating means to the internal roofing sheet 14. Separating member 34 has an engaging portion 40 which engages bar 16. A support means in the form of a pair of legs 39 extends from adjacent the fixing means 36 to the engaging portion 40. Engaging portion 40 consists of fourth surface 42 having opposing edges 44 and 46, and fifth and sixth surfaces 48 and 50 extending therefrom.

[0029] The apparatus also has insulating caps 52, insulating strip 54, insulating insert 56 and insulating bar insert 58.

[0030] The apparatus is assembled by placing insulating strip 54 on internal roofing sheet 14. Insulating foam insert 56 is inserted into the gap formed by legs 39 and engaging portion 40 of separating member 34 and the separating member placed over insulating strip 54 and attached, using self tapping screws 38, to internal roofing sheet 14. In order to thermally isolate the self tapping screws 38 from the separating member 34 rubber grommets or washers (not shown) are located between the self tapping screws 38 and separating member 34. End caps 52 are located over fifth and sixth surfaces 48 and 50 of engaging portion 40. Bar 16, containing insulating insert 58 is slid over cap 52 on engaging portion 40.

[0031] The separating members 34 are ideally located at 1m intervals so that a fibreglass or other, insulating mat may be rolled over the internal roofing sheet 14 and between the leg 38. Once the insulating media has been rolled out the external roofing sheet 12 is placed over the bars 16 and attached thereto.

[0032] Referring to Figured 4 and 5, in which parts common to the embodiment of figures 1, 2 and 3 are denoted by like referenced numerals but increased by 100, an apparatus 110 is provided and is used is a manner similar to that described above. However, separating member 134 is moulded from a plastic material. As a result there is no requirement for the insulating cap 52, insulating strip 54 or the rubber grommets described above.

[0033] Referring to Figured 6 and 7, in which parts common to the embodiment of figures 1, 2 and 3 are denoted by like referenced numerals but increased by 200, an apparatus 210 is provided and is used is a manner similar to that described above. However, the supporting legs 239 have been brought together to form a single leg.

[0034] Referring to Figured 8, in which parts common to the embodiment of figures 6 and 7 are denoted by like referenced numerals but increased by 100, an apparatus 310 is provided and is used is a manner similar to that described above.

[0035] It will be appreciated by those skilled in the art that the above embodiments have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims.

Claims

1. An apparatus for fixing a first roofing sheet to a second roofing sheet, the apparatus comprising:-

at least one elongated engaging member attached in use to the first roofing sheet, said engaging member having a first surface with at least two substantially parallel elongate edges, second and third surfaces extending from said edges, and first and second side portions extending substantially towards each other from said second and third surfaces respectively; and

at least one separating member for maintaining separation between the first and second roofing sheets, said separating member having fixing means for attaching said separating member to the second roofing sheet, at least one engaging portion adapted to engage said engaging member, and support means extending from adjacent said fixing member to adjacent said engaging portion;

wherein said engaging portion is adapted to engage said engaging member at at least two locations, spaced apart in the axial direction of said engaging

member, at which the external cross-sectional shape of the engaging portion engages with the internal surfaces of at least said first surface and said first and second side portions of said engaging member.

2. An apparatus according to claim 1, wherein the first roofing sheet is an external roofing sheet of a building.

3. An apparatus according to either claim 1 or 2, wherein the first engaging member further comprises at least one foam insert.

4. An apparatus according to any one of the preceding claims, wherein the engaging member is attached to the roofing sheet using self tapping screws.

5. An apparatus according to any one of the preceding claims, wherein the second and third surfaces of the engaging member extend perpendicular to the first surface.

6. An apparatus according to any one of the preceding claims, wherein the first and second side portions extend perpendicular to the second and third surfaces.

7. An apparatus according to any one of the preceding claims, wherein the separating member is attached to the second roofing sheet by self tapping screws.

8. An apparatus according to any one of the preceding claims, wherein the separating member is moulded in a plastic material.

9. An apparatus according to any one of the preceding claims, further comprising one or more of the following features:

a) insulating caps adapted to prevent the engaging member and engaging portion directly contacting each other;

b) an insulating strip separating the separating member from the second roofing sheet;

c) wherein the engaging portion is formed from a sheet of material bent so as to form a fourth surface with fifth and sixth surfaces extending therefrom wherein the engaging portion is adapted to engage the engaging member such that the fifth and sixth surfaces lie perpendicular to the axis of the engaging member;

d) wherein the separating member is filled with insulating foam; or

e) wherein the support means comprises a pair of spaced apart support legs.

10. A separating member for fixing a first roofing sheet to a second roofing sheet using an engaging member having at least one elongate engaging member attached in use to the first roofing sheet, said engaging member having a first surface with at least two substantially parallel elongate edges, second and third surfaces extending from said edges, and first and second side portions extending substantially towards each other from said second and third surfaces respectively, the separating member comprising:-

fixing means for attaching said separating member to the second roofing sheet, at least one engaging portion adapted to engage a said engaging member, and support means extending from adjacent said fixing means to adjacent said engaging portion;

wherein at least one said engaging portion is adapted to engage a said engaging member at at least two locations, spaced apart in the axial direction of said engaging member, at which the external cross-sectional shape of the engaging portion engages with the internal surfaces of at least said first surface and said first and second side portions of a said engaging member.

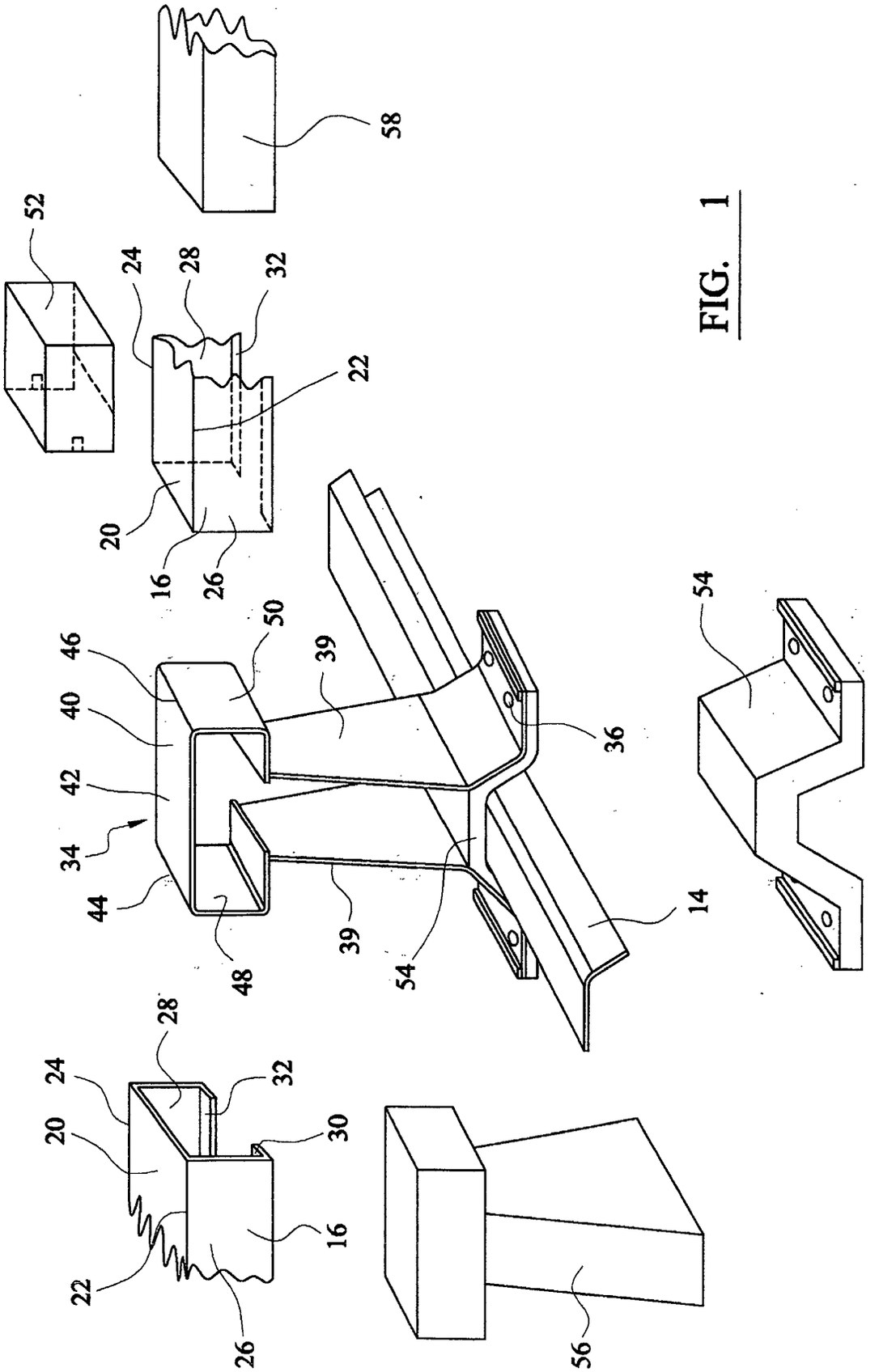
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FIG. 1

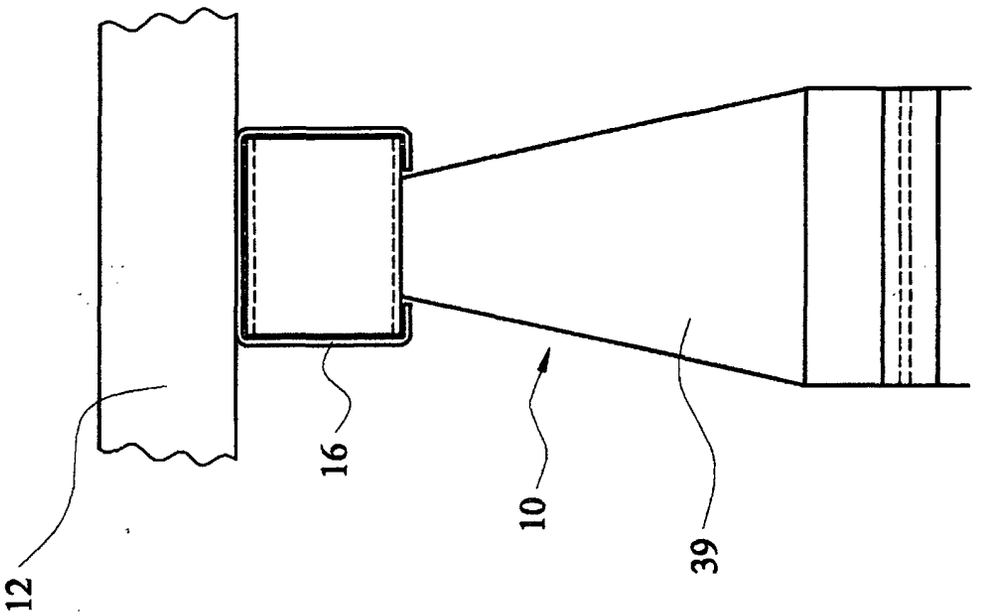


FIG. 3

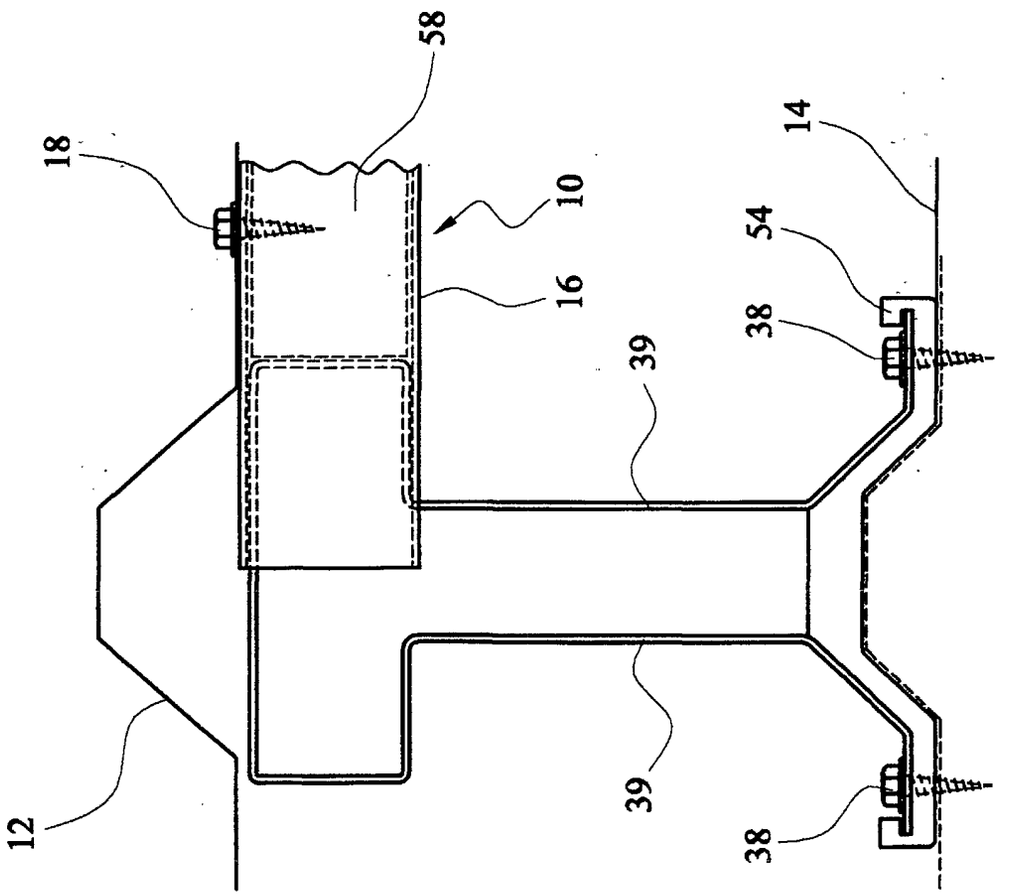
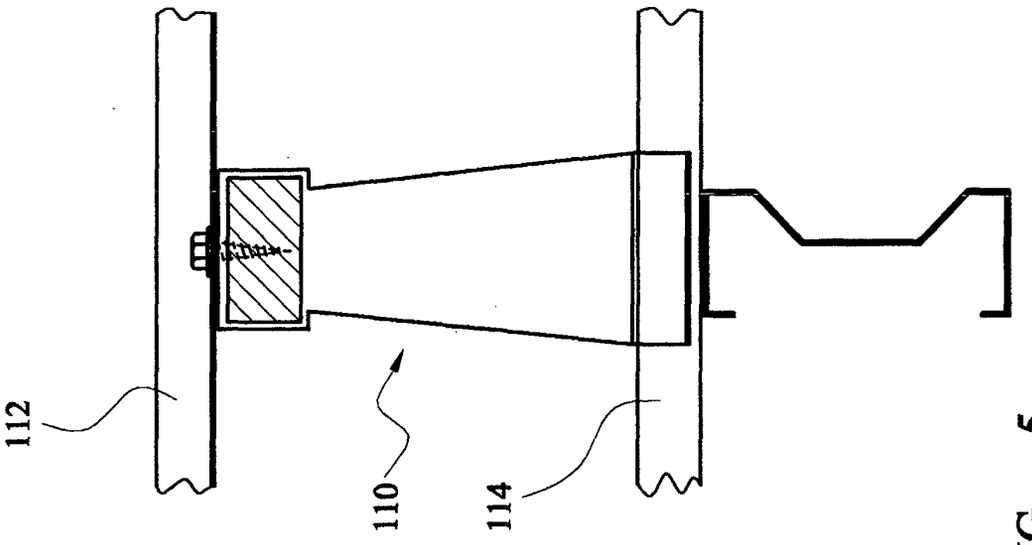


FIG. 2



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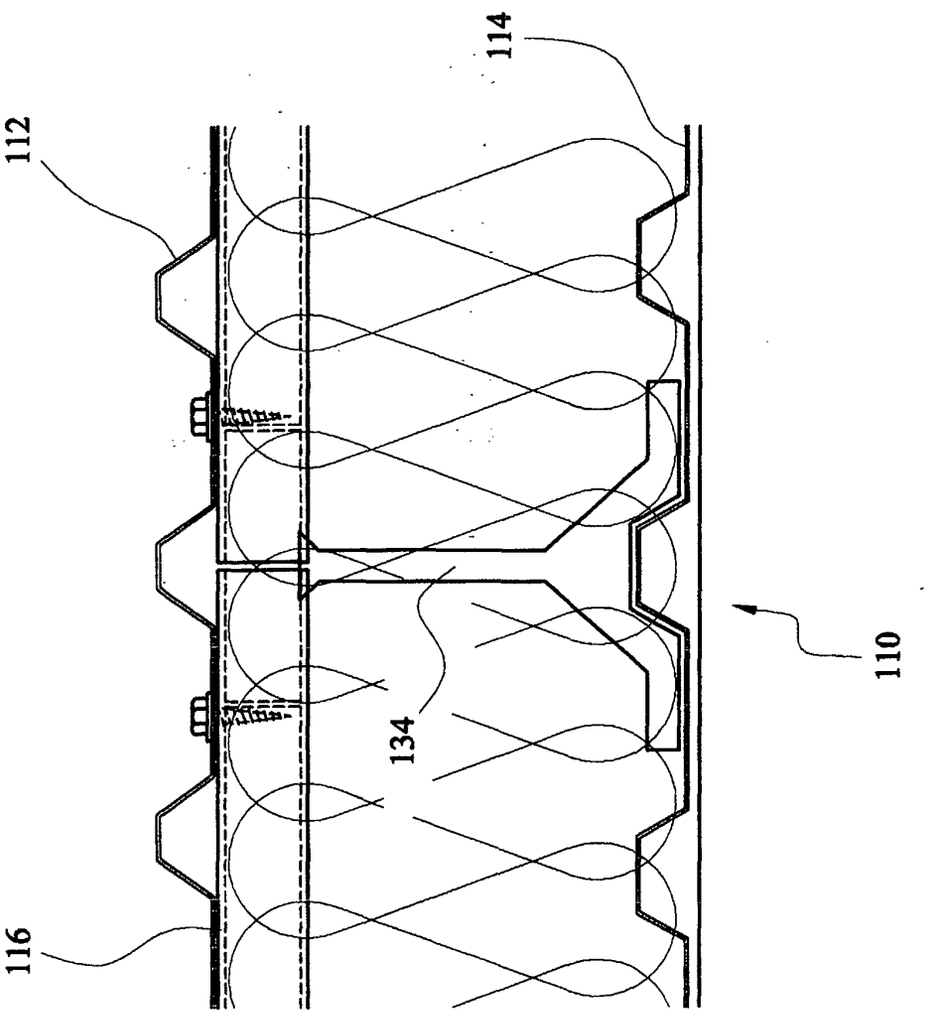

FIG. 4

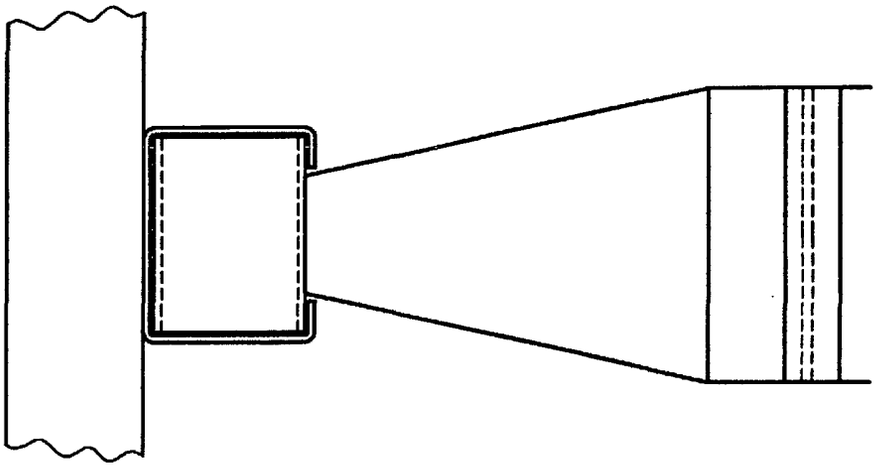

FIG. 8

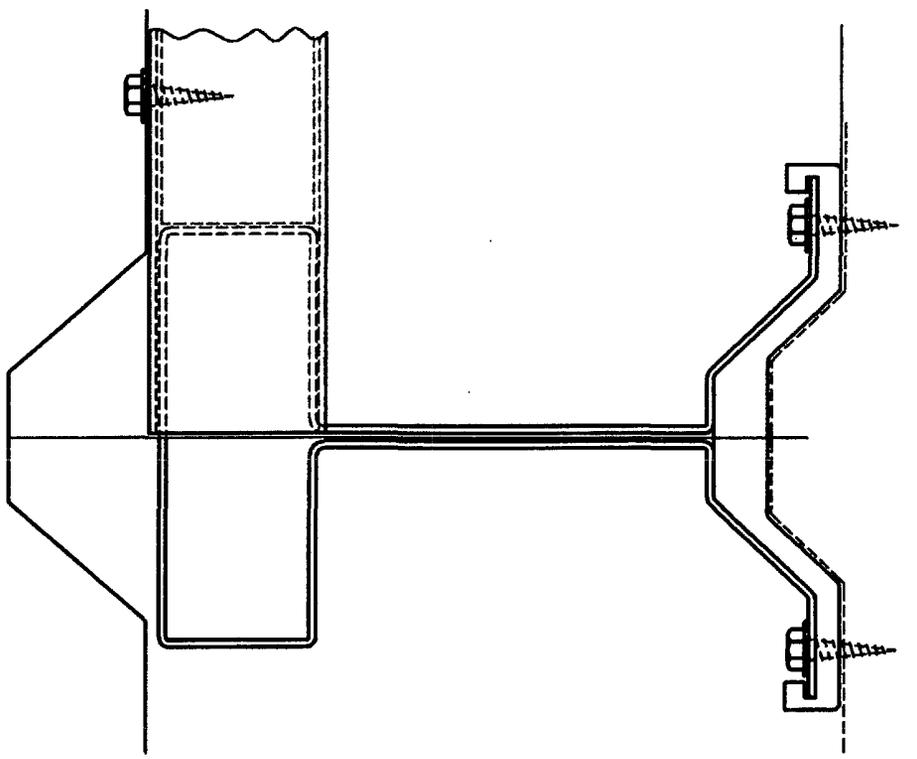

FIG. 7

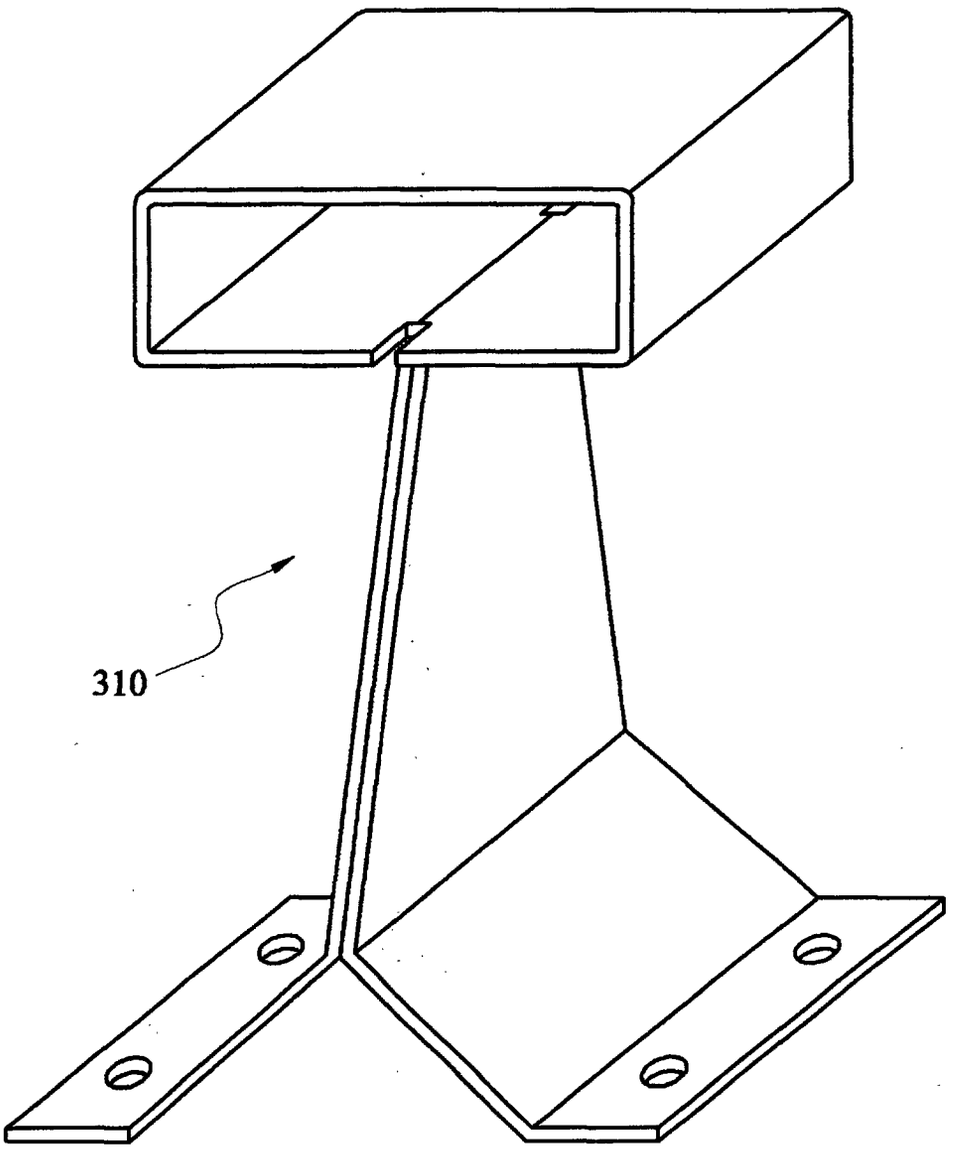

FIG. 8