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54 **Building cladding system.**

57 A building cladding system comprising a plurality of cladding panels each comprising an outer skin and an inner skin with a filling of thermally insulating material therebetween, the outer skin having at each of two opposite sides thereof upstanding first and second seam portions respectively the first and second seam portions of adjacent panels comprising a joint between the panels wherein the panels are attachable to a support member by clip means and the clip means comprises a clip having an attachment part attachable to the support member and a panel engagable part for engagement with at least one of the first and second seam portions to restrain movement of the or each seam portion of the standing seam hence of the panel away from the support member.

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"Building Cladding System".

This invention relates to a building cladding system.

According to one aspect of the invention we provide a building cladding system comprising a plurality of cladding panels each comprising an outer skin and an inner skin with a filling of thermally insulating material therebetween, the outer skin having at each of two opposite sides thereof upstanding first and second seam portions respectively the first and second seam portions of adjacent panels comprising a joint between the panels.

Preferably the panels are attachable to a support member by clip means.

The clip means may comprise a clip having an attachment part attachable to the support member and a panel engagable part for engagement with at least one of the first and second seam portions to restrain movement of the or each seam portion of the standing seam and hence of the panel away from the support member.

The clip may comprise an upstanding part which extends generally normal to the support member and to the general plane of the plane and having at its upper end at least one hook part adapted to hook over at least one seam portion.

Preferably, the clip is provided with at least two hook parts the free ends of which are disposed on opposite sides of the clip for engagement with each of the first and second seam portions.

At least a part of the clip means may comprise a thermal break.

The thermal break may be disposed at least between the clip means and at least one of the first and/or second seam portions.

The thermal break may comprise a layer of thermally insulating material carried by the clip means.

The thermally insulated material may be provided on at least the surfaces of the clip which engage first and/or second seam portions.

The attachment part may be unprovided with a thermal break.

The upstanding part adjacent the attachment part may be unprovided with a thermal break whilst the upstanding part adjacent the panel engagable part is provided with the thermal break.

The thermal break may extend over approximately half the extent of the upstanding part from the panel engagable part towards the attachment part.

The thermal break may comprise a layer of thermally insulating plastics material which may be at least 0.5mm thick.

The clip means may be provided with at least

one transversely extending part adapted to engage a part of the inner skin of one panel.

Preferably, the clip means is provided with two oppositely directed transversely extending parts each adapted to engage a part of the inner skin of each of the adjacent panels.

The inner skin at least at one side of each panel may have an outwardly facing part spaced inwardly of the panel from the remainder of the inner skin and said outwardly facing part being the part with which the or each transversely extending part of the clip means is adapted to engage.

The inner skin may be provided with a rebate portion to receive the attachment part and attachment means of the clip whereby the clip is secured to the support member.

The panel engagable part may be of greater longitudinal extent than the attachment part.

The panel engagable part may be of greater longitudinal extent than the width of the part of the support member to which the attachment part is attached.

This configuration ensures that the panels particularly during wind uplift conditions, where a panel is being pulled away from the support member are securely attached to the building since the attachment load is spread more evenly throughout the length of the panel by providing the relatively longer panel engagable clip part than would be achieved with a panel engagable part of the same longitudinal extent as the support member. At the same time the amount of material needed for such a clip is minimised by maintaining the attachment part of a length appropriate for engagement with the support member. For example, not longer than the width of the part of the support member to which the attachment part is to be attached.

The panel engagable part may be between about 150 and 300mm long or 150 to 200mm long and the attachment part between about 50 and 70mm long.

The ratio of the length of the panel engagable part to the length of the attachment part may lie in the range 2:1 to 6:1 or 2:1 to 4:1.

The first and second seam portions of adjacent panels may comprise said joint in combination with at least one further component.

Sealing means may be provided to render the joint weatherproof.

The outer skin may comprise a steel or aluminium sheet coated with a suitable protective and decorative material.

The inner sheet may comprise a steel or aluminium sheet coated with a suitable protective and decorative material.

The thermally insulating material may comprise a polyurethane foam material or other suitable material such as polyisocyanurate.

The further component may comprise a batten cap engaged with and bridging between adjacent first and second seam portions.

The first and second seam portions may each have an abutment part at a position spaced downwardly from the upper end of the seam portion and the batten cap having abutment parts for engagement with the abutment parts of the first and second seam portions to retain the batten cap in position.

The batten cap may be of generally inverted channel configuration the seam portions being received within the inverted channel.

The seam portions may each comprise a first limb integral with the remainder of the outer skin and extending upwardly therefrom and a second limb connected to the first limb at the upper end thereof and depending downwardly therefrom terminating at a position spaced above the remainder of the outer skin to provide said abutment parts.

Said lower end of the second limb may have a upturned strengthening flange which preferably is disposed between the first and the second limbs.

The above described first and second seam portions may be integral with the remainder of the outer skin and formed by bending the material thereon.

The generally channel shape batten cap may have interned lips at the free ends of its side limbs to provide said abutment parts thereof and the side limbs may be inclined downwardly and outwardly away from the base portion of the channel.

The outer skin may be provided with a plurality of upstanding corrugations in the portion thereof between the first and second seam portions.

The upstanding corrugations may all be of the same configuration or may be of more than one configuration.

The first and second seam portions may upstand from the top of an upstanding corrugation and the corrugation may comprise a part only of a complete corrugation so that the part corrugations of adjacent panels together simulate the appearance of a complete corrugation.

The inner skin may also be provided with upstanding corrugations.

The width of the upstanding corrugations of the upper skin may be smaller or greater than the width of the remainder of the skin between the corrugations whilst the upstanding corrugations of the inner skin may be smaller or greater than the width of the remainder of the skin therebetween.

The standing seam formed by the first and second seam portions may be disposed well above

the water dispersal level of the structure of which the panel forms part, for example, of a roof.

The support member may be of generally sigma cross-section or channel section or Zeta or Z section of I or U section and may be made by cold rolling or hot rolling as appropriate to the section concerned.

According to a second aspect of the invention we provide a building when clad by a building system according to the first aspect of the invention.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings wherein;

FIGURE 1 is a fragmentary exploded perspective view, partly broken away, of a building assembly embodying the invention,

FIGURES 2a-c are cross-sectional views showing alternative sections of the purlin of Figure 1,

FIGURE 3 is a section on the line 3-3 of Figure 1 but showing the panels in their assembled position,

FIGURE 4 is a perspective view to enlarged scale of the clip of Figures 1 to 3,

FIGURE 5 is a similar perspective view of an alternative clip, and

FIGURE 6 is a front elevation of a further alternative clip.

Referring to Figure 1, there is shown part of a roof of a building. The roof comprises rafters R, which are conventional and between the rafters extend a plurality of purlins one of which is shown at 10 on which cladding panels 11a-c are supported.

Each panel 11a - c is of composite construction comprising an outer skin 12 and an inner skin 13 with a filling of thermally insulating material 14 therebetween.

In this example the outer skin 12 comprises a steel sheet, in the present example grade Z35 and is 0.5mm thick although its thickness may lie in the range 0.55 to 0.9mm. The sheet is coated with a PVC plastisol but may be coated with any other desired decorative and/or protective material such as Zalutite PVF2 or Alu type 2.

If desired the outer skin may be made of other steel and be of different thicknesses or may be made of other material such as aluminium for example aluminium sheet grade E 3105, 0.9mm thick but may be made of other aluminium grade such as H25 or H8 and other thicknesses. In the present example the sheet is stucco to embossed but it may be provided with a mill finish particularly where it is of H8 grade or be provided with a coating of Duralcote 70 or 10 particularly where it is of grade H25.

The inner sheet is made of steel, in the present example grade Z2, and is 0.25mm thick but may lie in the range 0.25 to 0.5mm, the exposed surface of the sheet is coated with white polyester.

If desired the inner skin may be made of other steel to that described above i.e. different grade and/or different thickness coated with other decorative and/or protective finish. Alternatively, the inner skin may be made of other material such as aluminium for example E3105 grade and 0.6mm thick although it may be made of other thickness and of other grades of aluminium such as H25.

In the present example the exposed surface is coated with Duralcote 5 but may be coated with any other suitable protective and/or decorative finish.

The thermal insulating material in the present example is a conventional polyurethane foam material and is self bonded to the inner and outer skins during the manufacturing process.

As best shown in Figure 1 the outer skin 12 is provided with a plurality of upstanding corrugations arranged in two sets. One set comprises the corrugations 15 whilst the other set comprises the corrugations 16, 16'. It will be seen that the width of each corrugation 15, 16 is less than the width of the remainder of the panel between each corrugation as indicated at 17. If desired the outer skin may be other configuration. For example instead of their being two corrugations 15 between each pair of corrugations 16 their may be three or, one or more than three.

The corrugations 16' at each of two opposite sides 18, 19 of the panel differ from the corrugation 16 in that they each have a shape corresponding to one half of the central corrugation 16. Thus, when adjacent panels are assembled together the part corrugations 16' at the sides 18, 19 of each panel combine together to simulate a corrugation similar to the central corrugation 16 as is best shown at 20 in Figure 1.

The inner skin is also provided with corrugations as shown in Figure 1 and these corrugations may vary as desired.

If desired instead of providing a purlin 10 of the generally sigma configuration shown in Figure 1 the purlins may be of any other desired suitable configuration such as the sections shown in Figures 2a to 2c where, respectively a Zeta or Z Section, a Hot Rolled Channel Section and on 1 Section is illustrated.

Referring now particularly to Figures 1 and 3, at the opposite sides 18, 19 of each panel 11a - 11c are provided first and second standing seam portions 20a, 20b respectively.

Each such standing seam portion is the same and comprises a generally inverted channel configuration having a first limb 21a, 21b which ex-

tends perpendicular to a plane P containing the surface of the parts 17 of the panel and hereinafter referred to as the general plane P of the panel. This first limb 21a, 21b is connected by an integral rolled over base portion 22a, 22b to a second limb 23a, 23b which extends downwardly and outwardly and has an inwardly and upwardly rolled portion 24a, 24b at the free end thereof. This rolled over portion 24a, 24b provides an abutment part of the associated standing seam portion. A batten cap 26 of generally inverted channel configuration is clipped over the adjacent standing seam portions to provide a joint there between and suitable sealant such as a non-setting butyl or other suitable sealant is provided within the batten cap to weatherproof the joint.

The batten cap 26 has downwardly and outwardly extending limbs 27 at the lower free ends of which are provided inwardly extending flanges which provide an abutment part for engagement with the abutment parts provided by the portions 24a, 24b to retain the batten cap from displacement away from the general plane P described hereinbefore.

The panels are secured to the support member 10 by a clip means 30 comprising a clip 31. The clip 31 comprises an attachment part 32 which is attached to the support member 10 by any suitable means, in the present case by self drilling and tapping screws 32'. Integral with the attachment part 32 is an upstanding part 33 which is received between the sides 18, 19.

At the other end of the upstanding part 33 is a panel engagable part 34 having two oppositely directed hook parts 35, 36 which engage, over the standing seam parts 20a, 20b respectively and so serve to restrain the outer skin of the panels 11a, 11b from movement away from the support member 10.

The batten cap 26 is of such dimensions as to accommodate the hook parts 35, 36 there within.

The upstanding part 33 may be provided with two oppositely directed transversely extending tongue parts 37, 38 which are, in use, forced into the foam plastics material 14 above intumed, outwardly facing, parts 39, 40 of the inner skin 13 so as to retain displacement of the inner skin away from the support member 10. The tongue parts 37, 38 when present are formed by being stamped to the desired truncated triangular shape and then bent out of the upstanding part 33 and the residual metal is removed so as to leave a generally rectangular opening 42 in the upstanding part. If desired the tongue part 37, 38 may be omitted and the clip may or may not be apertured as shown at 42.

The inner skin 13 is provided with rebate parts 41 to accommodate the attachment part 32 and attachment means 32'.

The panel engagable part and a portion of the upstanding part are coated in a thermally insulating plastics material which comprises in the present example and which may comprise a P.V.C. The coating is applied by dip coating but may be applied by any other suitable process such as spraying or painting.

In the present example the coating is 0.5mm thick but may be of other thickness suitable to give a desired amount of thermal insulation dependent upon the nature of the plastics material. In the present example the plastics material extends over approximately half of the extent of the upstanding portion from the panel engagable part towards the attachment part. In the present example the clip is 85mm high for a nominally 37mm thick panel and the plastics material extends down the upstanding part to a distance of 25mm from the upper end of the panel engagable part. If desired, depending upon the overall thickness of the panels the clip may be higher, for example 107mm or 127mm high, for a nominally 60mm or 80mm thick panel respectively and the plastics material may extend for 25mm from the upper end of the panel engagable part.

The clip may be of other dimensions and the plastics material may in all cases extend over a different extent of the clip than is described hereinbefore. The minimum extent of coverage being governed by the overall panel thickness.

Referring now to Figure 5, an alternative form of clip is shown which it is preferred to provide, particularly when the panel is likely to be exposed to significant wind uplift condition, where a panel is being pulled away from the support member. By providing clips of the configuration shown in Figure 5 the panels are securely attached to the support member since the attachment load is spread more evenly throughout the length of the panels by providing the relatively longer panel engagable clip parts than would be achieved with panel engagable parts of the same longitudinal extent as the associated part of the support member. At the same time the amount of material needed for such a clip is minimised by maintaining the attachment part of a size appropriate for engagement with the support member for example, not longer than the longitudinal extent of the part of the support member to which the attachment part is attached.

In Figure 5 there is shown a clip 200 comprising an attachment part 201 which is attached to the support member 10 by any suitable means such as self drilling and tapping screws, similar to those illustrated at 32' in Figure 3. Integral with the attachment part 201 is an upstanding part 202 which is received between the sides 18,19.

At the other end of the upstanding part 202 is a panel engagable part 203 having a plurality, in the

present example four, of pairs of oppositely directed hook parts 204, 205. The hook parts 204, 205 are of generally semi-circular configuration but have free ends 206 which terminate slightly short of a diameter, for example, at an angle of 10° to a diametral plane D-D. The hook parts 204, 205 engage, respectively, over the standing seam portions 20a, 20b respectively and so serve to restrain the outer skin of panels 11a, 11b from movement away from the support member 10 in a similar manner to the clip of the first described embodiment.

The panel engagable part 203 and the upstanding part 202 are of the same longitudinal extent and are of greater longitudinal extent than is the attachment part 201. In the present example the attachment part 201 is 70mm long whilst the upstanding part 202 and panel engagable part 203 are 200mm long. As explained above, the relatively longer extent of the panel engagable part 203 ensures that the restraining load is distributed over a relatively large area of the panel whilst the attachment part is made of a length which is related to the width of the support member so as to minimise the amount of material in the attachment part 201.

If desired the panel engagable part 203 may be of a different longitudinal extent to that described above, for example, it may be shorter, for example, 150mm, or longer if it is desired to spread the load over a still greater area of the panels.

In the present example the upstanding part 202 is provided with two apertures 208 and two, oppositely directed transversely extending tongue parts, 237, 238 may be provided similar in shape and function to the tongue parts 37, 38 described hereinbefore. Alternatively, two sets of two or more oppositely directed tongue part may be provided. Of course, the relatively great longitudinal extent of the upstanding part 202 ensures a relatively great longitudinal extent of the, or each set of, transversely extending tongue portions so that the restraining force imposed thereby on the inner skin 13 is similarly spread over a relatively great area thereof.

If desired the tongue parts 237,238 may be omitted and the clip may or may not be apertured as shown at 242.

Referring now to Figure 6 there is shown a clip 300 similar to that of Figure 5 and having an attachment part 301 similar to that of Figure 5 but with an upstanding part 302 and a panel engagable part 303 which are of the same but greater longitudinal extent than is the attachment part 301. In the present example the attachment part 301 is 70mm long whilst the upstanding part 302 and panel engagable part 303 are 300mm long.

The clips of Figures 5 and 6 may be provided with a plastic coating in an exactly similar manner to that described hereinbefore in connection with the embodiment of Figures 1 to 4.

In all embodiments reinforcing corrugations C are provided on the attachment and upstanding parts.

The features disclosed in the foregoing description, or the accompanying drawing, expressed in their specific forms or in terms of a means for performing the disclosed function, or a metal or process for attaining the disclosed result, or a class or group of substances or compositions, as appropriate, may, separately or any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A building cladding system comprising a plurality of cladding panels each comprising an outer skin and an inner skin with a filling of thermally insulating material therebetween, the outer skin having at each of two opposite sides thereof upstanding first and second seam portions respectively the first and second seam portions of adjacent panels comprising a joint between the panels wherein the panels are attachable to a support member by clip means and the clip means comprises a clip having an attachment part attachable to the support member and a panel engagable part for engagement with at least one of the first and second seam portions to restrain movement of the or each seam portion of the standing seam and hence of the panel away from the support member.

2. A system according to claim 1 wherein the clip comprises an upstanding part which extends generally normal to the support member and to the general plane of the panel and having at its upper end at least one hook part adapted to hook over at least one seam portion.

3. A system according to claim 2 wherein the clip is provided with at least two hooks parts the free ends of which are disposed on opposite sides of the clip for engagement with each of the first and second seam portions.

4. A system according to any one of the preceding claims wherein at least a part of the clip means comprises a thermal break.

5. A system according to claim 4 wherein thermal break comprises a layer of thermally insulating material provided on at least the surface of the clip which engage first and/or second seam portions.

6. A system according to any one of the preceding claims wherein the panel engagable part is of greater longitudinal extent than the attachment part.

7. A system according to any one of the preceding claims wherein the panel engagable part is of greater longitudinal extent than the width of the part of the support member to which the attachment part is attached.

8. A system according to claim 6 or claim 7 wherein the panel engagable part is between about 150 and 300mm long.

9. A system according to any one of claims 6 to 8 wherein the ratio of the length of the panel engagable part to the length of the attachment part lies in the range 2:1 to 6:1

10. A system according to any one of the preceding claims wherein the seam portions each comprise a first limb integral with the remainder of the outer skin and extending upwardly therefrom and a second limb connected to the first limb at the upper end thereof and depending downwardly therefrom and terminating at a position spaced above the remainder of the outer skin.



