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(51) INT CL⁵

E04D 3/24

(52) UK CL (Edition K)

E1D DLEKH2 DLEKN D104 D115 D2023 D2121
D505 D902

(56) Documents cited

GB 1387272 A GB 1235959 A GB 1042241 A
EP 0062756 A1

(58) Field of search

UK CL (Edition K) E1D DLEKH DLEKN
INT CL⁵ E04D

(54) **Fastening clips for corrugated cladding**

(57) A fastening clip for a ribbed cladding sheet, comprising a base from which upstands a headed support with which a rib of the cladding sheet is a snap fit. The head (152) of the clip is dimensioned such that, when engaged in an enlargement in the rib of a cladding sheet (156) it is maintained in a resiliently compressed condition. Additionally, the head of the clip may be able to slide relative to its supporting upstand (148) to accommodate thermal expansion of the cladding sheet, while the base of the clip may be in the form of an elongate strip with end features enabling two clips to be joined in end to end alignment.

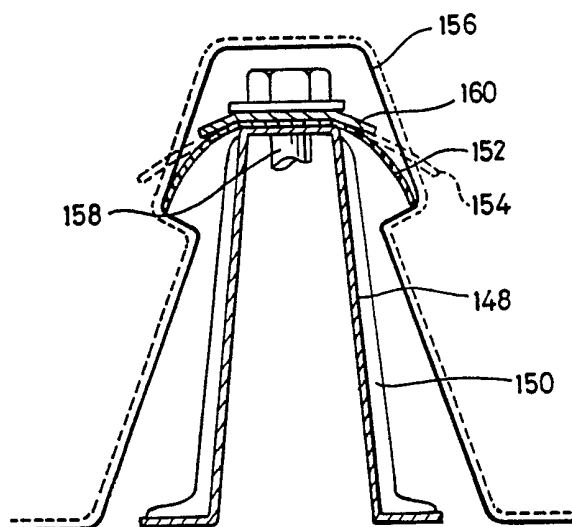


Fig. 29

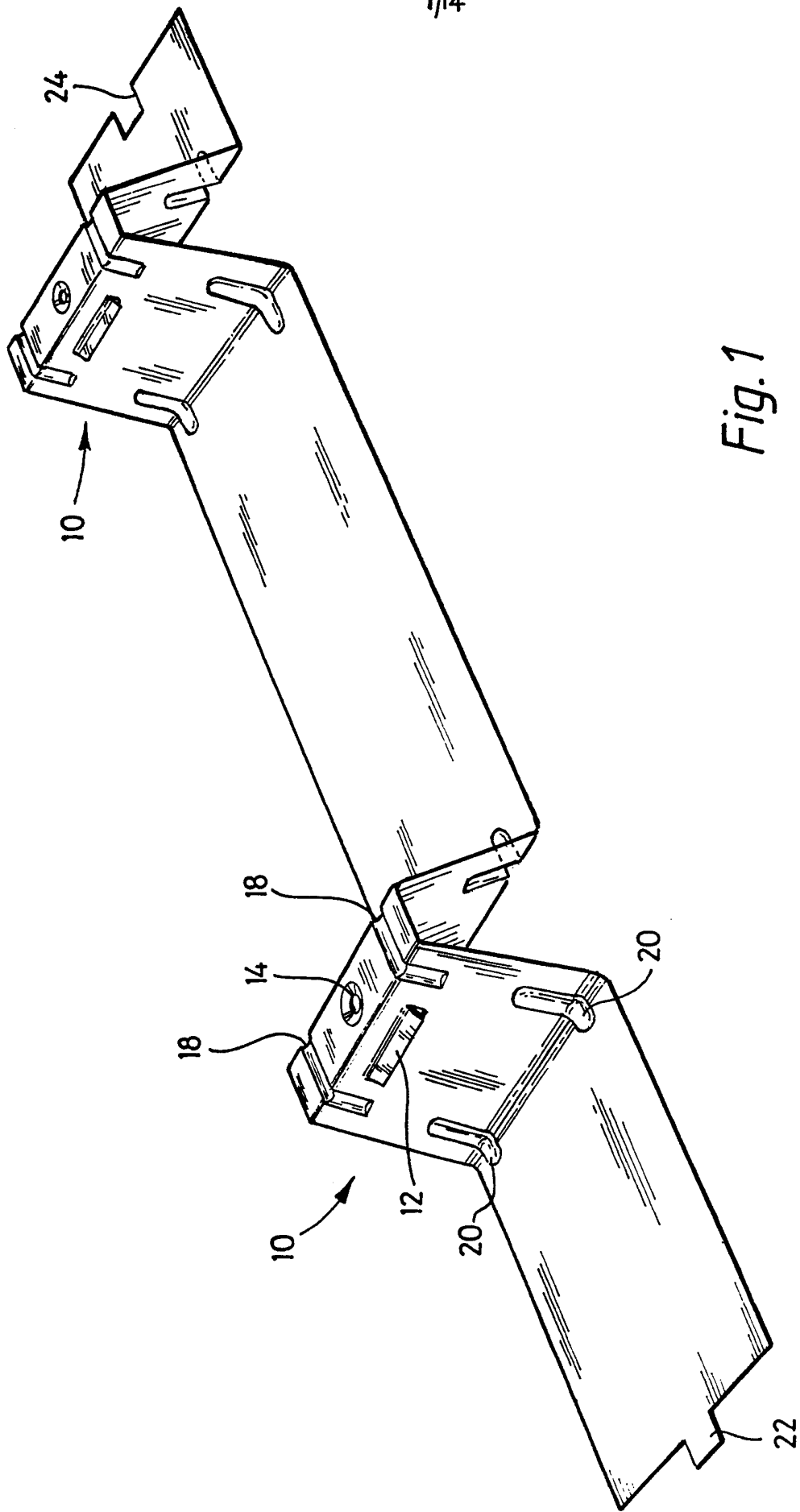


Fig. 1

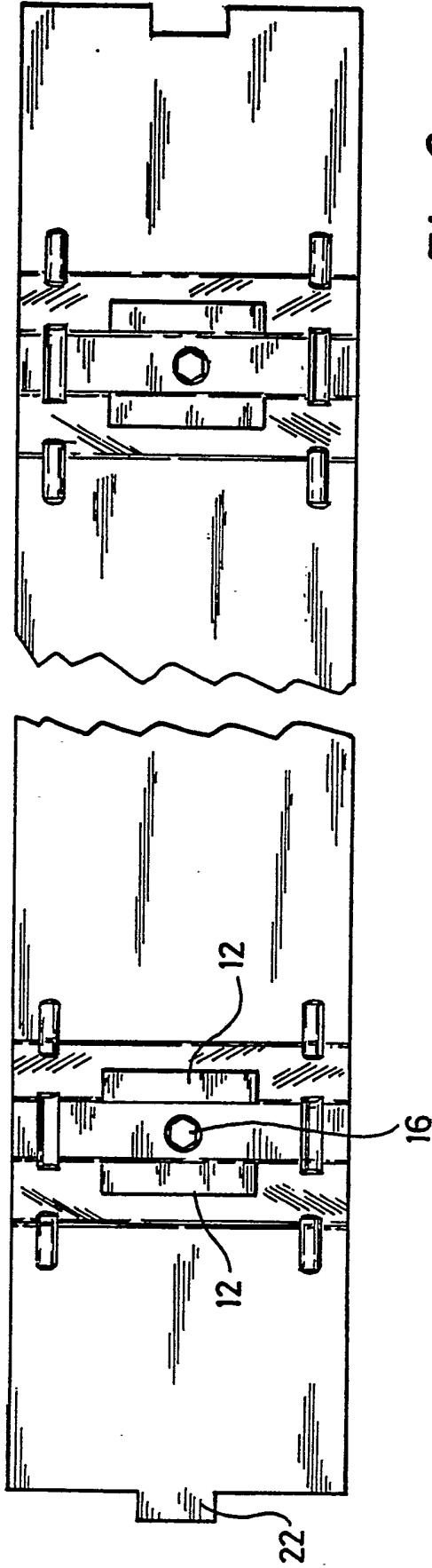


Fig. 2

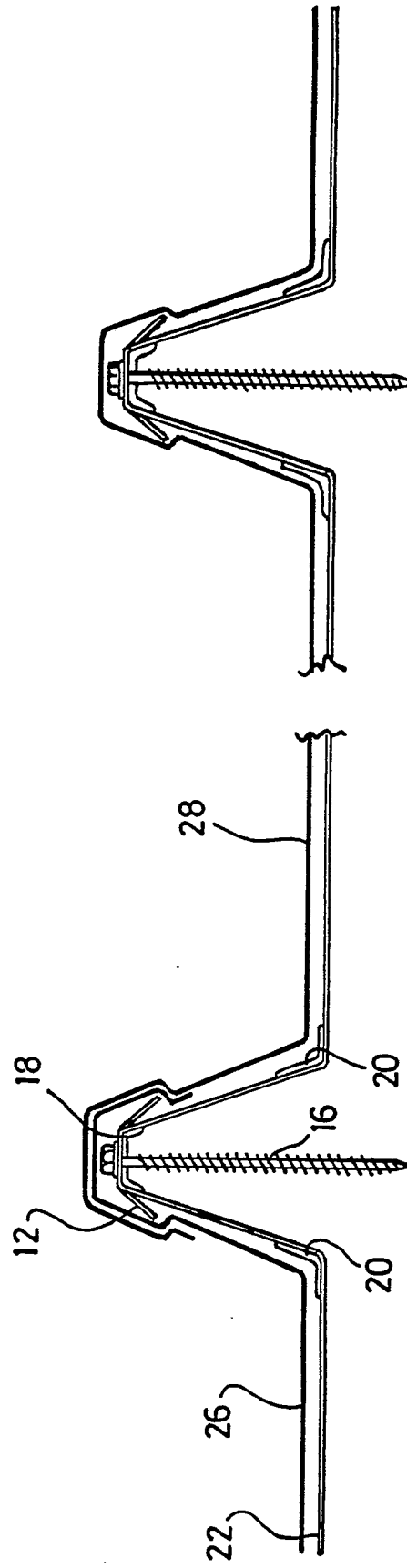
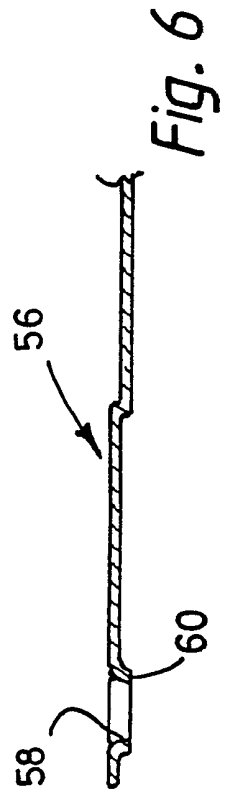
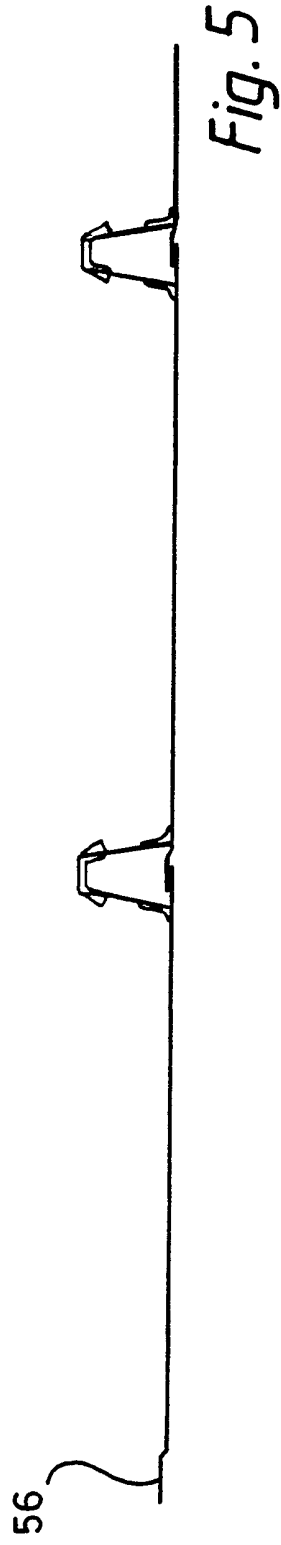
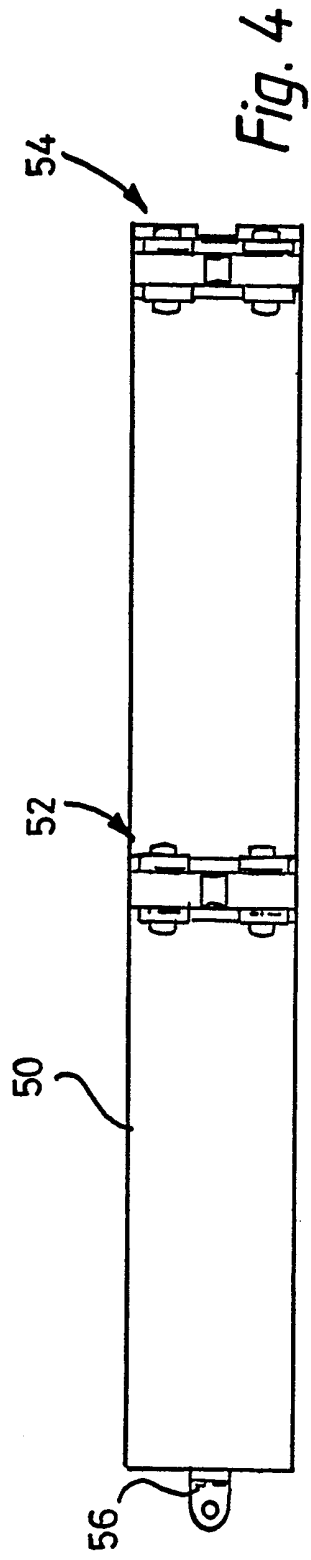


Fig. 3



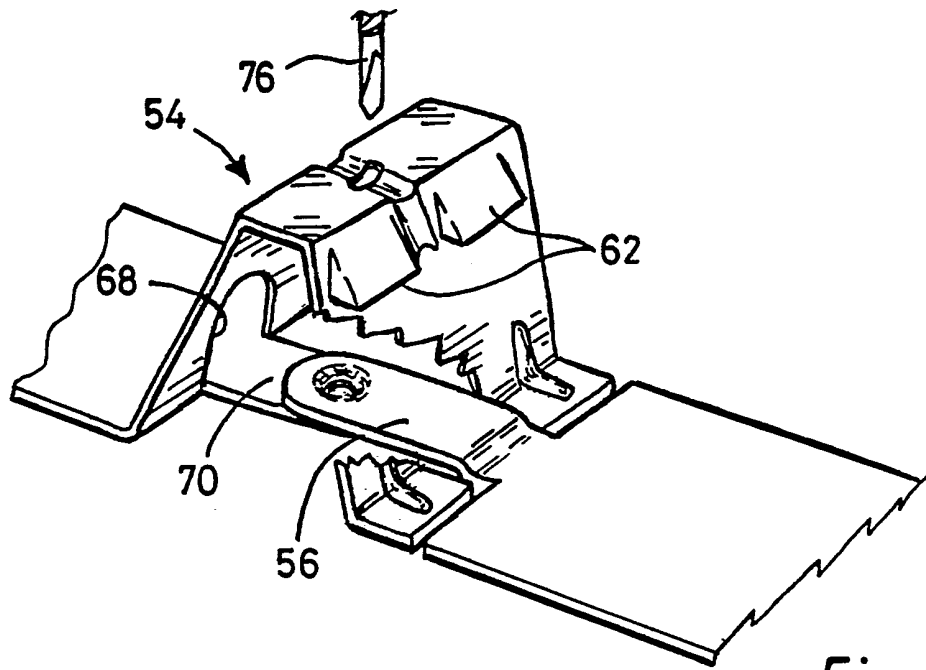


Fig. 7

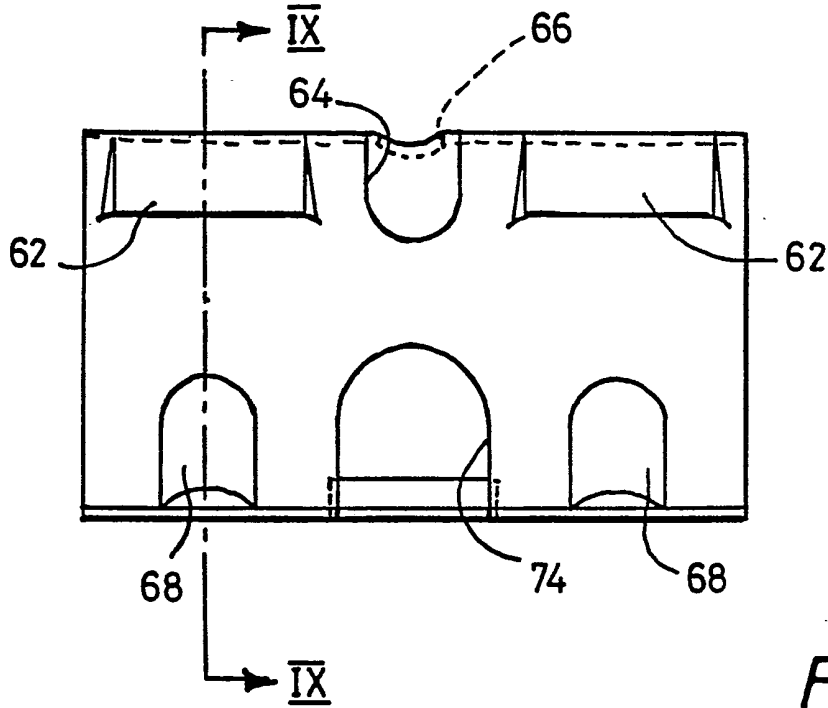


Fig. 8

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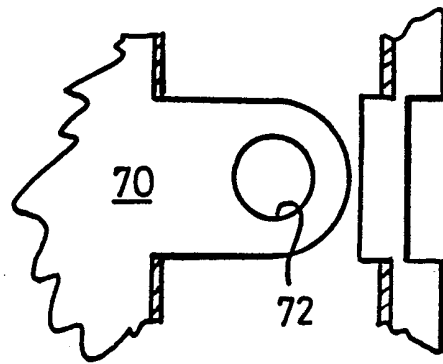


Fig. 10

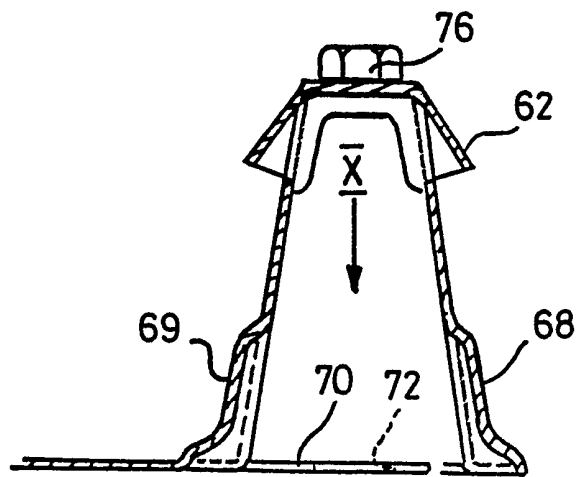


Fig. 9

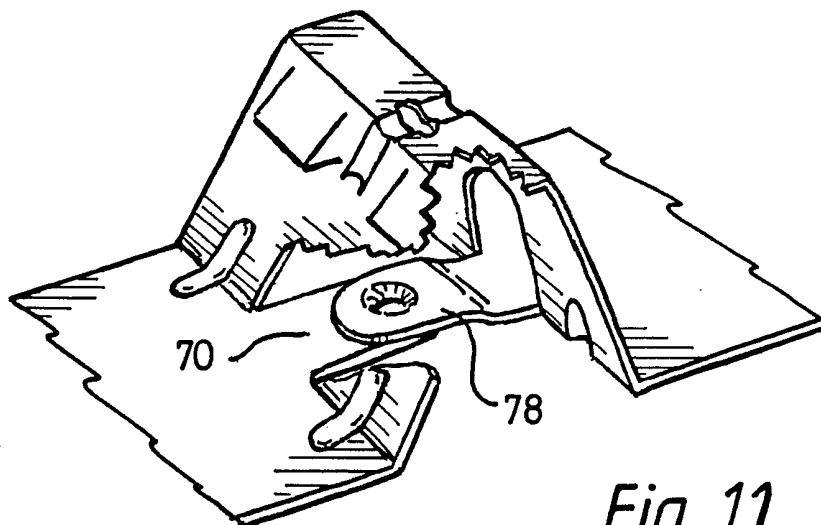
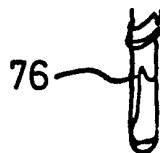


Fig. 11

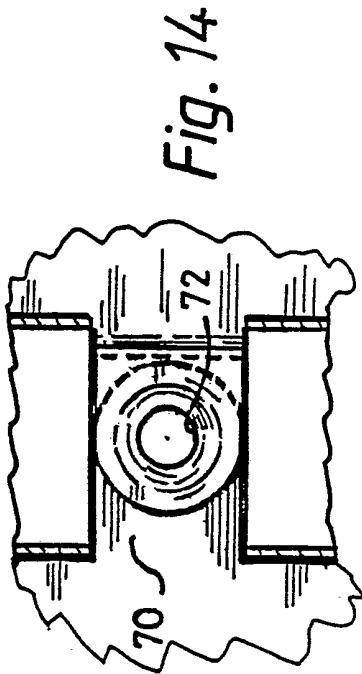


Fig. 14

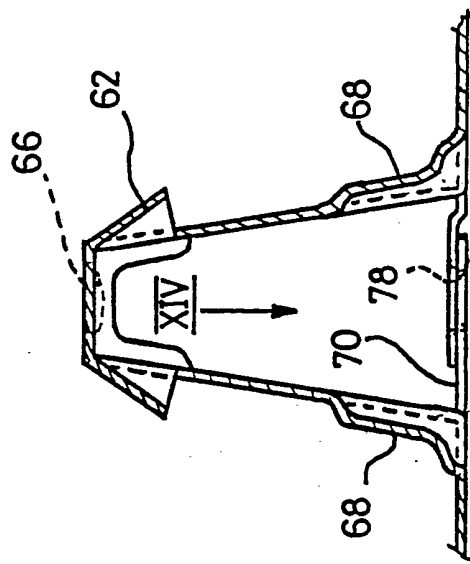


Fig. 13

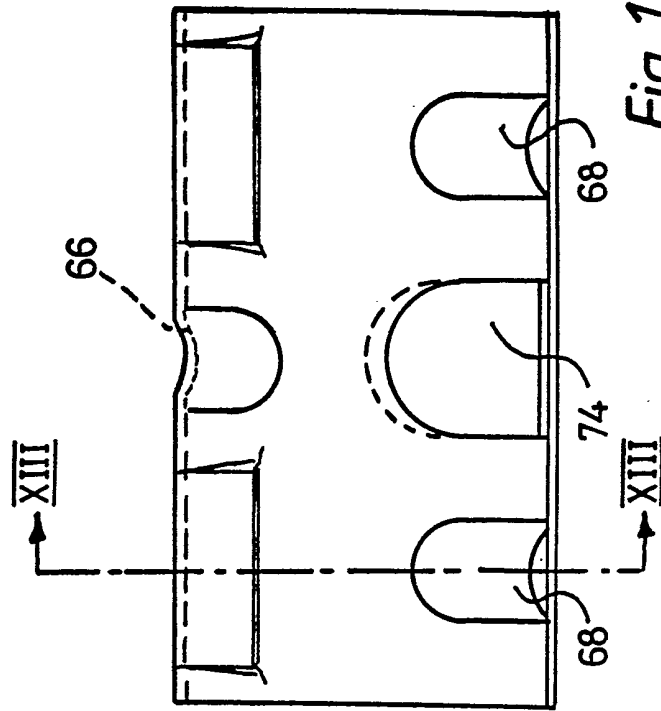


Fig. 12

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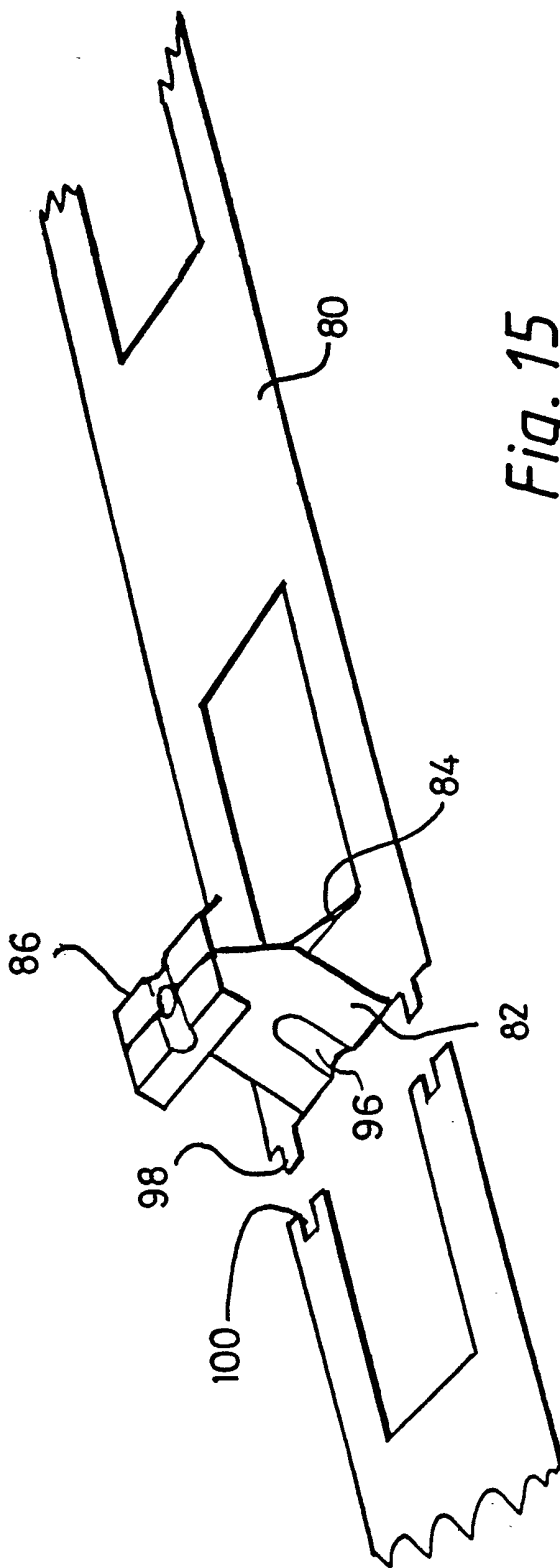
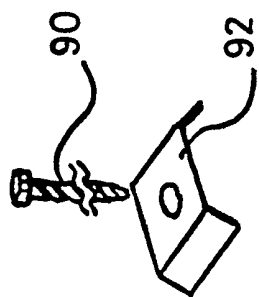
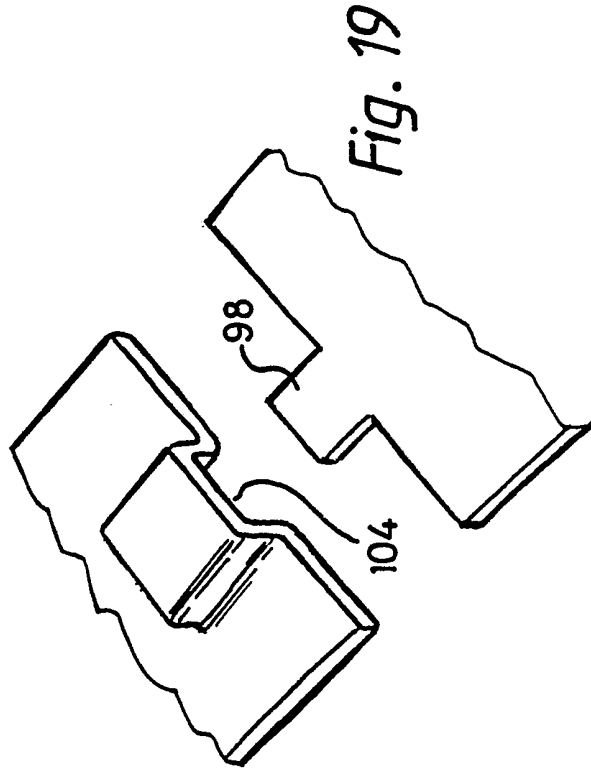
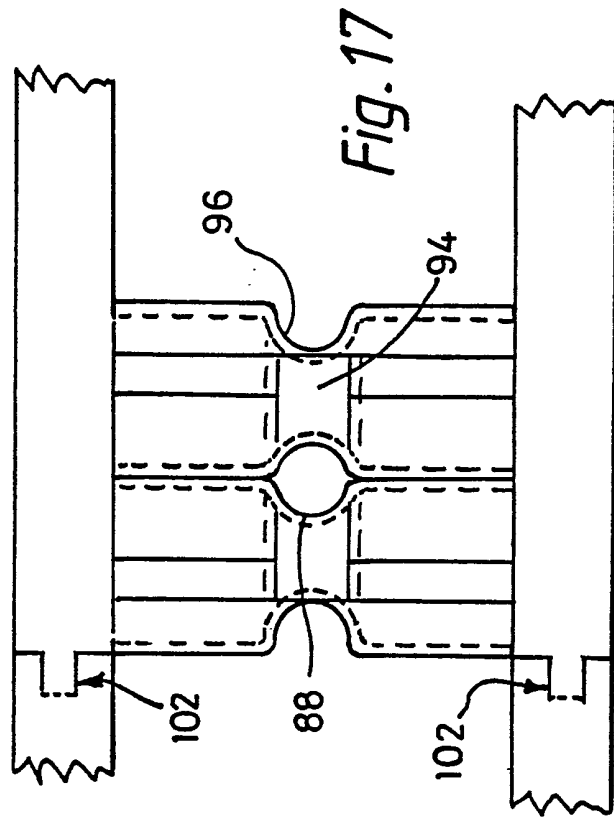
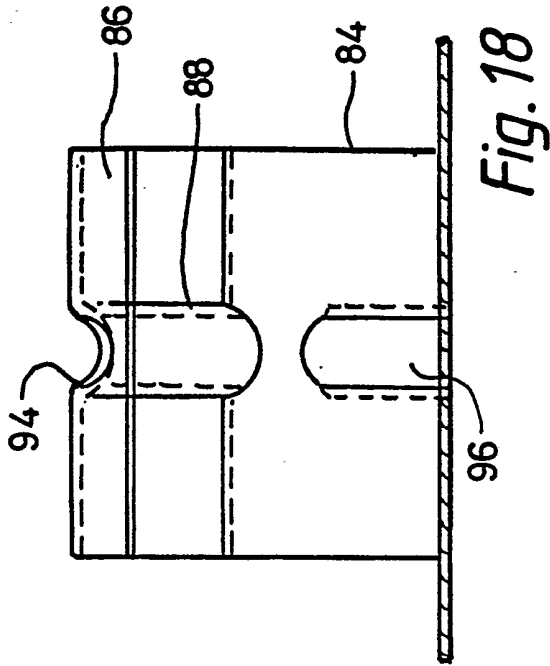
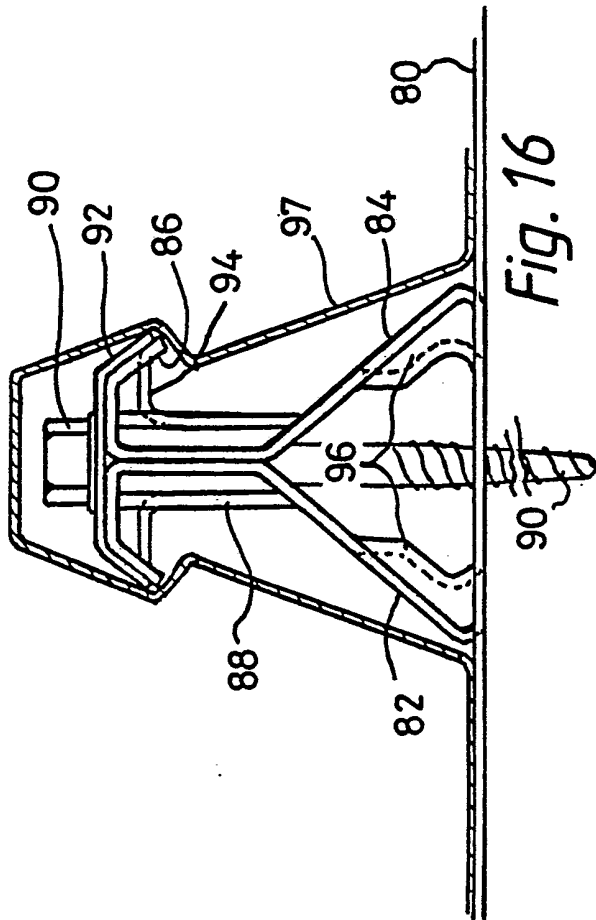
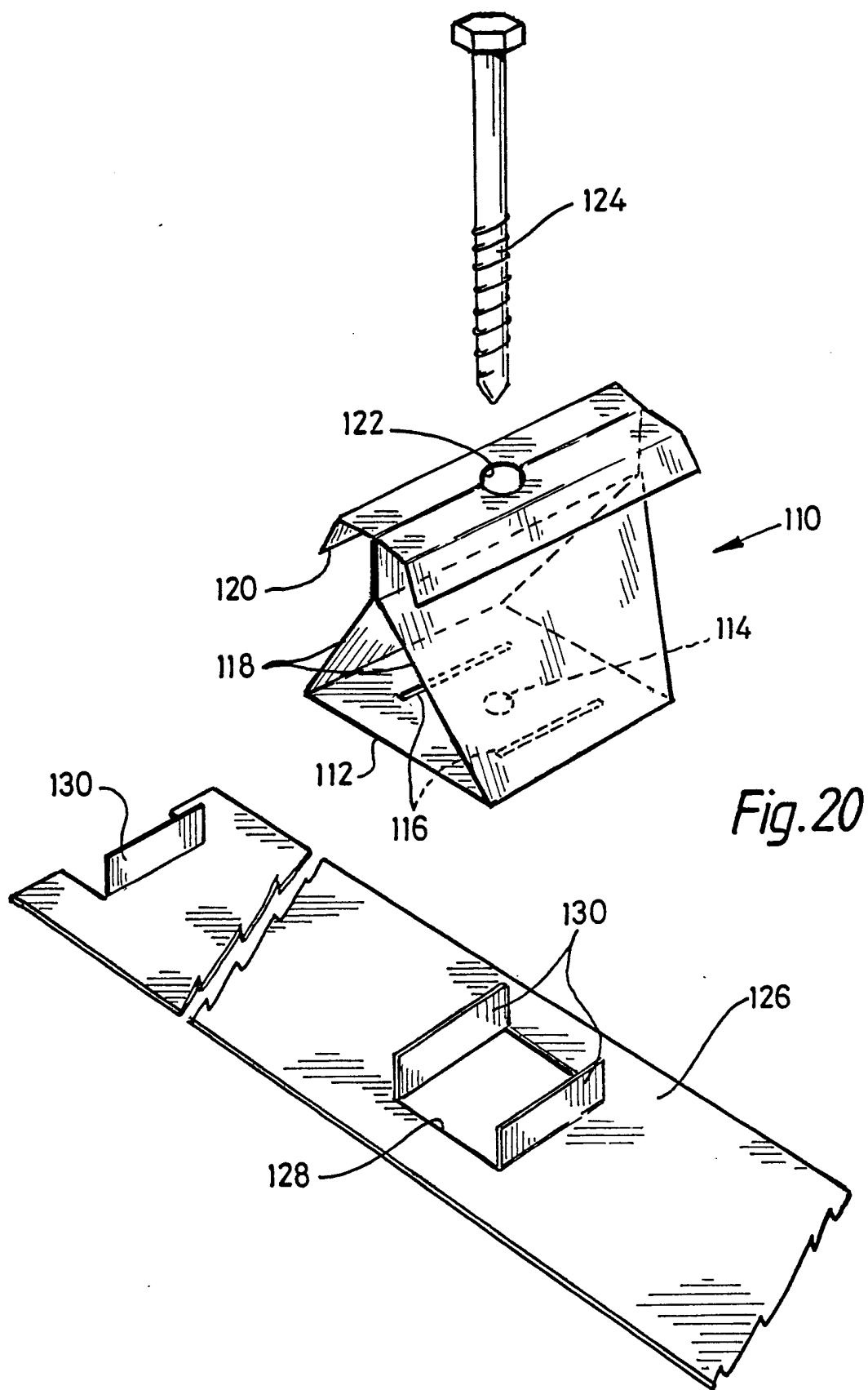


Fig. 15





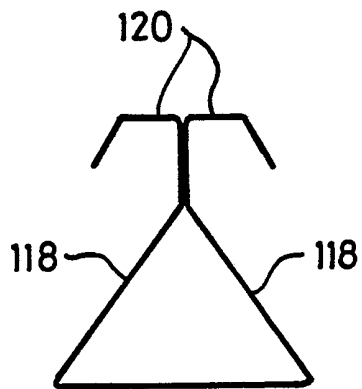


Fig. 21

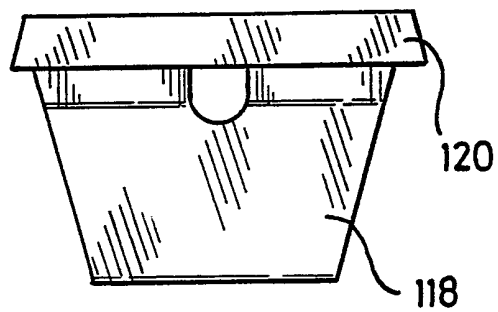


Fig. 22

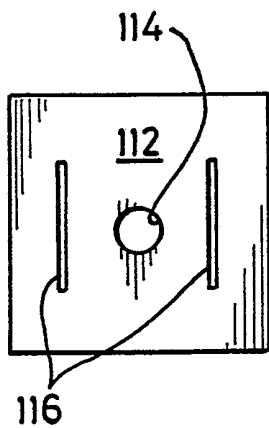


Fig. 23

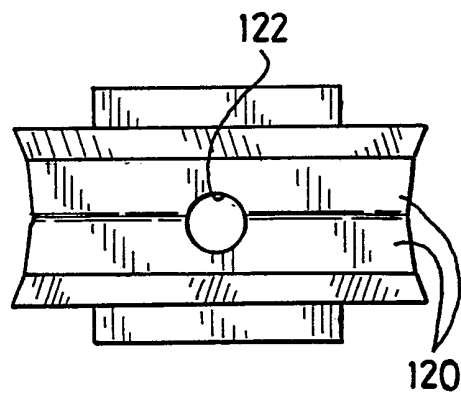


Fig. 24

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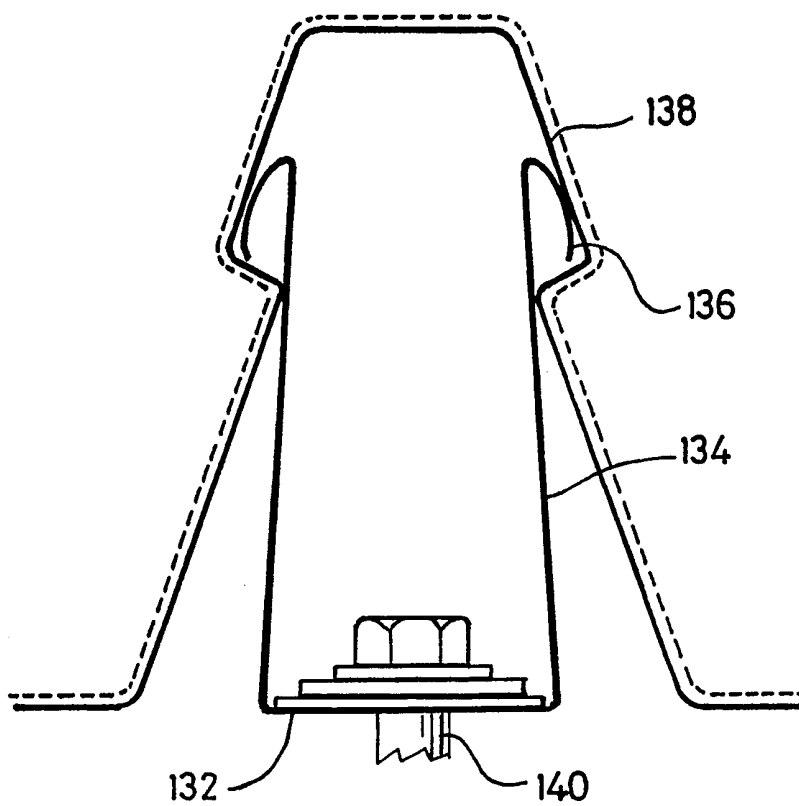


Fig. 25

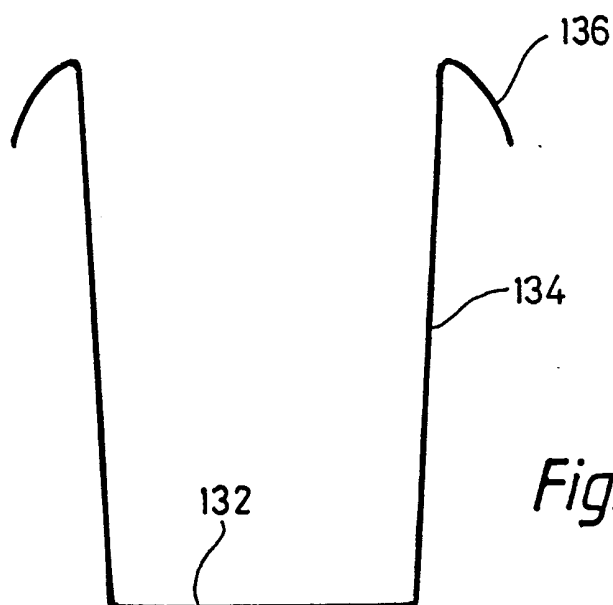
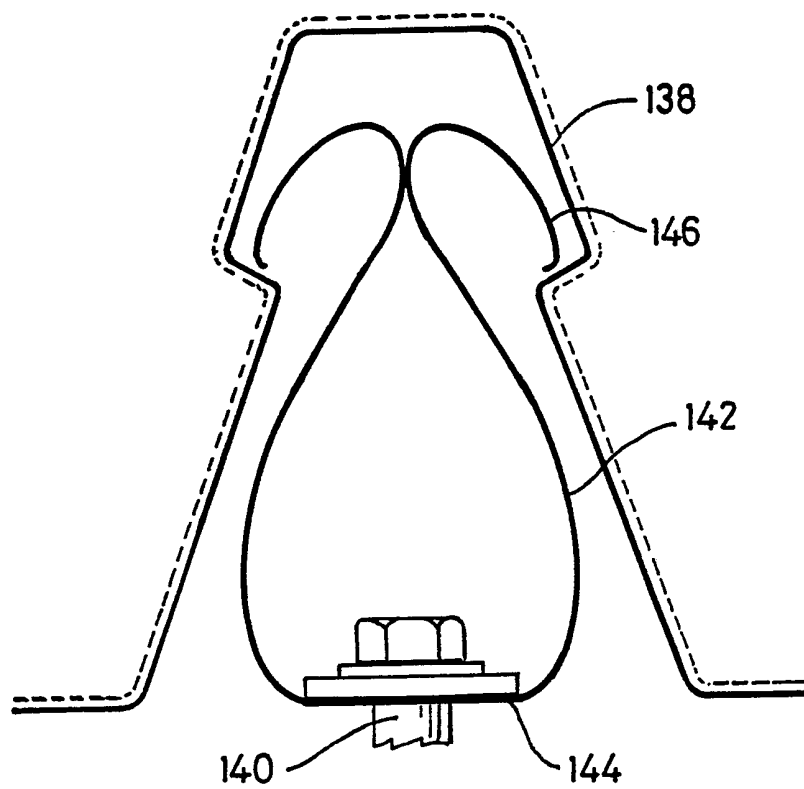
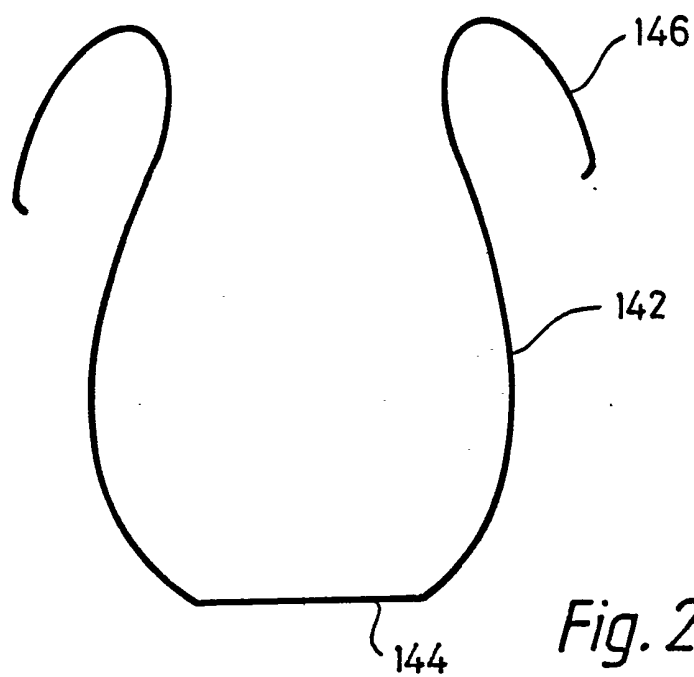


Fig. 26

*Fig. 27**Fig. 28*

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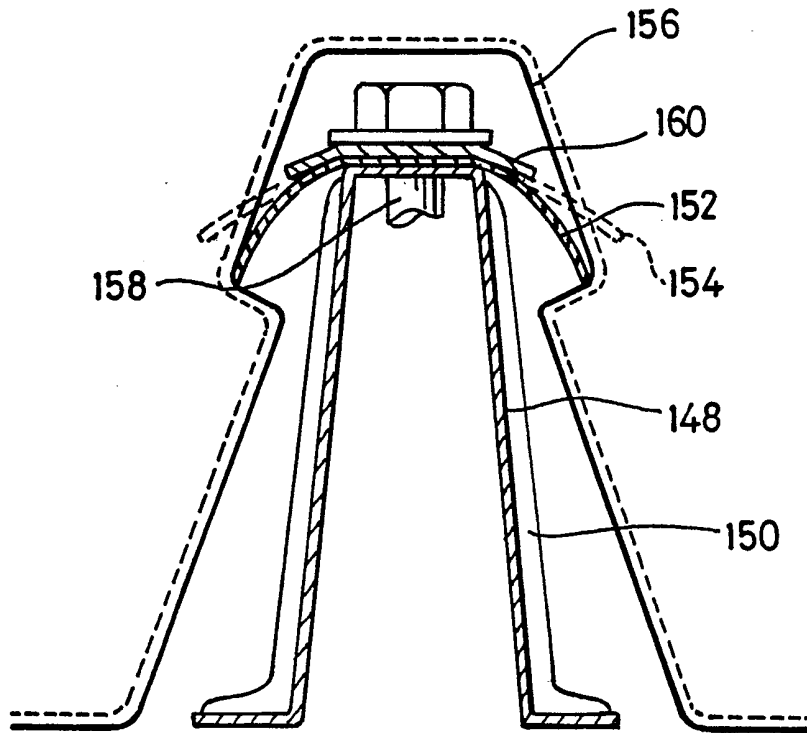


Fig. 29

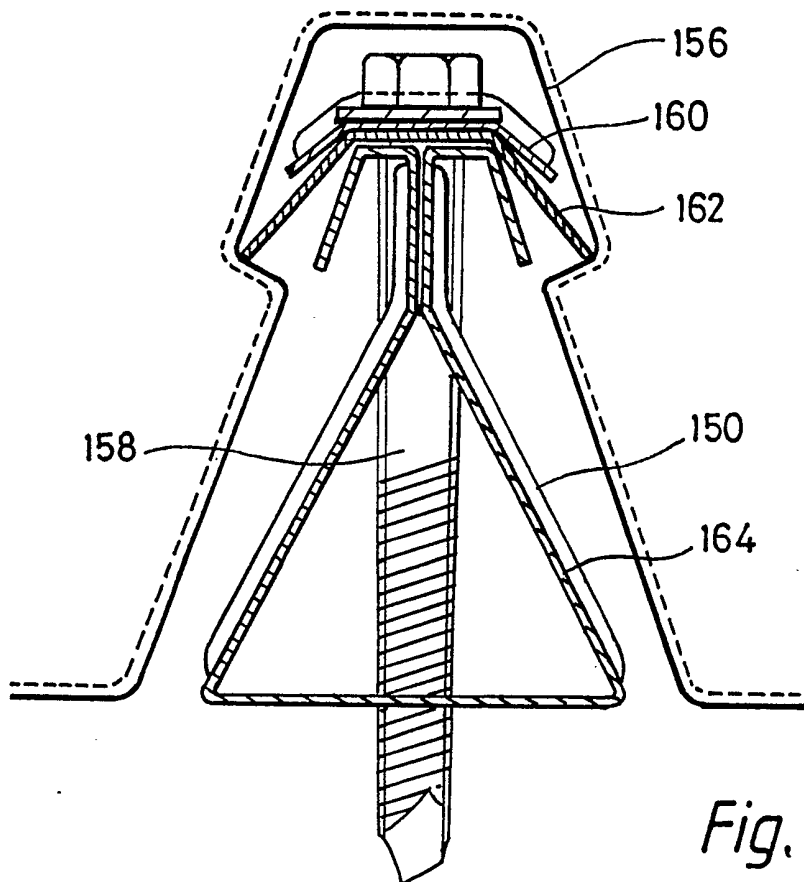


Fig. 30

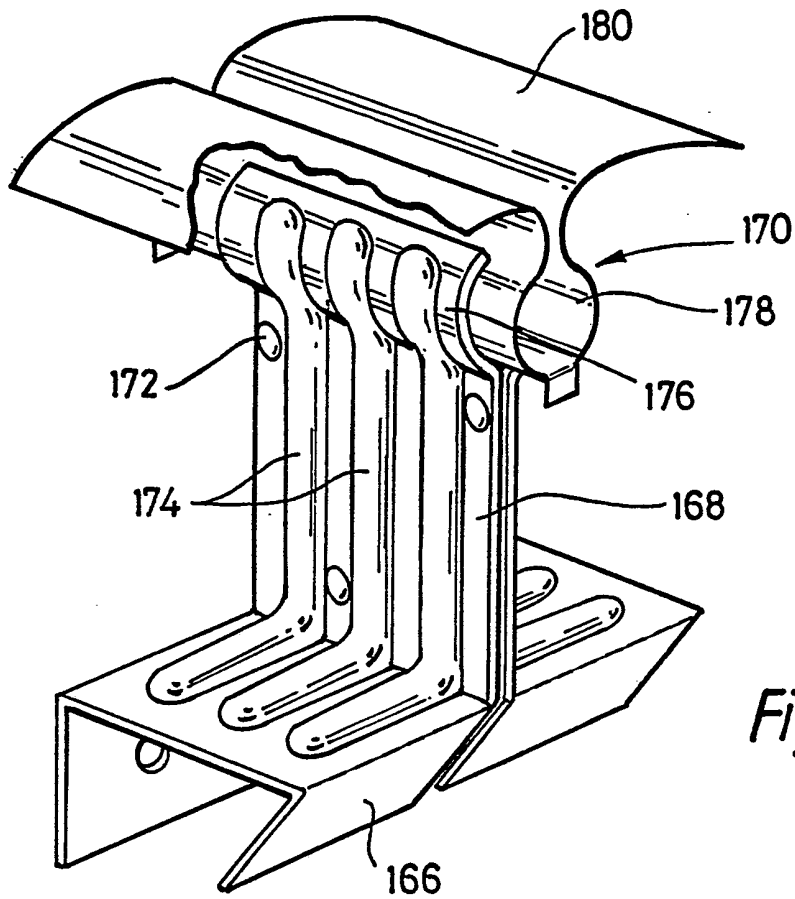


Fig. 31

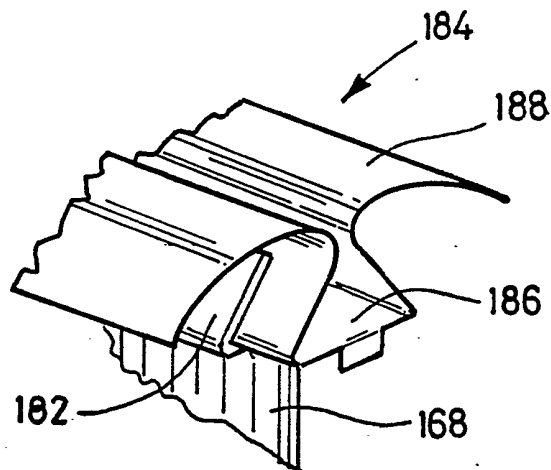


Fig. 32

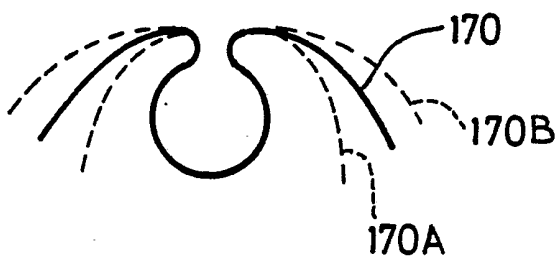


Fig. 33

- 1 -

Title Fastening ClipsDescriptionField of the invention

This invention relates to a fastening clip for securing a roof or wall cladding sheet.

Background to the invention

There are at present several sheet cladding systems commercially available in which the sheets have corrugations or hollow ribs and the end ribs are adapted to overlap the ribs of adjacent sheets.

It is known to secure such sheets to a supporting framework, such as a roof truss or purlin, by means of fastening clips which are secured to the framework. Each such clip is formed with at least one head, adapted to engage with a respective rib in the cladding sheet.

One problem which exists with the assembly of such cladding sheets is to ensure that the correct gauge or pitch between fastening clips is accurately maintained. Another is to avoid loosening of the fastenings due to thermal expansion of the cladding sheets, or due to uplift acting on the sheets in high winds.

Summary of the invention

The invention is particularly applicable to a roof or wall cladding sheet of a type having parallel hollow ribs, including end ribs at opposite edges which are adapted to overlap the end ribs of adjacent sheets, each rib having an enlargement for use in attaching the sheet to the fastening clips. Such a roof or wall cladding sheet will be referred to herein as a cladding sheet of the type described.

In accordance with all aspects of the invention hereinafter described, a fastening clip, for use in securing a cladding sheet of the type described, comprises a base for engagement with a supporting structure to which the clip is adapted to be fixed, a support upstanding from the base, and a head on the support adapted to receive an enlargement in a rib of the cladding sheet as a snap fit.

According to one aspect of the invention, at least one of the support and the head is resiliently formed so as to be compressed when the rib of the cladding sheet is snap fitted thereto.

The head may be formed integrally with the support or be separately formed and adapted to be secured to said support, as by a fastening screw which also serves to fix the clip to the supporting structure.

The head preferably comprises opposed outwardly directed ears which are compressed towards one another when the rib of the cladding sheet is snap fitted thereto. In an embodiment, the support is rigid and the ears are resiliently compressed towards one another due to deformation of said ears. In another embodiment, the ears are resiliently compressed towards one another at

least in part due to deformation of the support. For example, the support may have two spaced apart limbs, each integrally formed with an ear on its upper end.

The clip may be formed as an integral member comprising a base, two upstanding support limbs, and an ear at the top of each support limb. Alternatively, the support may be formed with a top surface to which is secured or securable a head in the form of an inverted channel with sloping sides constituting the opposed ears. The inverted channel may be trapezoidal in cross-section, or curved in cross-section.

The clip may be formed as two separate but fixed together parts, each comprising a part of the base and a part of the support of the clip.

In an embodiment, at least one of the base, the support and the head of the clip is made of thermal insulating material in order to form a thermal break.

A part of the clip may be formed of thermal insulating material, thereby to provide a thermal break in the finished assembly.

According to a second aspect of the invention, which can be employed independently of the first aspect or in combination therewith, a fastening clip for securing a cladding sheet of the type described is formed in two parts adapted to slide relative to one another in order to accommodate thermal expansion of the cladding sheet.

Preferably, the head of the clip is formed separately from the support to be able to slide relative thereto.

In one form of embodiment, the head of the clip secures to the support by a fastening screw passing through a slot in the head for enabling said relative movement of the head relative to the support. The said fastening screw may also serve to secure the clip to the supporting framework. Where the separate head is in the form of an inverted channel as previously described, the slot therein can conveniently extend along the base of the channel.

In another form of embodiment, the support has a part-tubular top for slidably gripping the central part of a head which also has two opposed wings which constitute the said ears. In one arrangement, the part-tubular top of the support and the central part of the head are generally circular in cross-section. In another arrangement, the part-tubular top of the support and the central part of the head are generally triangular in cross-section.

The base of the clip may be in the form of a strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

Alternatively, the clip may also comprise a separate spacing strip for locating the base of the clip, the spacing strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

Generally, therefore, in accordance with a third aspect of the invention which may be used independently of the first and second aspects or in combination with either one or both of the first and second aspects, the base of the clip

is in the form of an elongate strip or is associated with and located by an elongate strip, the strip having connection features at its respective ends enabling a plurality of said strips to be secured to the supporting structure in end to end alignment, with the heads of the clips spaced to match the pitch of the ribs of the cladding sheet or to match a whole number multiple of said pitch.

Preferably the connection features comprise a tongue at one end and a tongue receiving recess at the other end of the strip. The tongue may be substantially rectangular in shape, and the recess may be partially closed.

Alternatively, the connection features may comprise a first member formed below a clip head at the end of the strip, and a second member formed at the other end of the strip and adapted to penetrate below the head of an adjoining clip to engage the first member of the latter, to allow two clips to be joined end to end. A window may be formed in the side of the clip support to enable the second member to penetrate.

Advantageously the first and second members are in the form of apertured tabs arranged to overlap centrally below the clip head, so that where the top of the clip support has a screw hole and the apertures in the two tabs are in alignment with the screw hole, a screw can be passed through all three holes to connect together the tabs of two fastening clips and secure the clips to a roof truss or the like.

The internal tab located below the clip head may be formed from material from the side of the clip support opposite

said window.

In a preferred arrangement the internal tab locates with the penetrating tab of an adjoining clip, the material defining the aperture in the latter being dished downwardly to form an annular lip, and the internal tab having a large aperture to receive the annular lip of the overlapping tab.

Where there are other intermediate clip heads on the strip, these also may incorporate overlapping tabs formed from material at opposite sides of the clip supports, the two tabs having holes which align when they are bent inwardly and similarly align with an aperture in the apex of the projection, the clip being further secured to the truss or the like by a screw passed through the three aligned apertures, whereby the joining together of the two tabs strengthens the projection.

In an advantageous form of the fastening clip, of general applicability in all aspects of the invention, the clip support may be provided by two legs bent upwardly to abut against each other, the legs being formed from opposing adjacent material of a flat strip. The upper ends of the legs may then extend outwards to form spring detents constituting the clip head for engaging a rib of a cladding sheet. Each leg may be formed with a fluted section along the respective abutting portions, enabling a screw fastener to pass down the fluted section to secure the clip to a supporting framework.

The upper end of such a clip support may be adapted to receive a washer which extends partly over the upper end of each leg, whereby when a fastener is passed through the

washer and the fluted section, the washer serves to anchor the legs together.

A stiffening rib may be formed in the base of each leg. Similarly a stiffening rib may be formed adjacent each spring detent, the ribs merging into the fluted section of the leg.

With some constructions of clip, a plurality of spaced clip supports and heads (typically twelve) may be formed from a continuous strip of material. A scored tongue and cut-out connection may be provided between adjacent clip heads on the strip, whereby individual or multiple clip units of the strip can be broken off along the respective scored connections, and subsequently be connected together end to end during assembly of the cladding sheets.

In a further arrangement, in which the fastening clip additionally comprises the substantially flat strip, each clip unit (base, support, head) is formed as a separate part and location means is provided for locating clip units on the strip at the desired pitch along the strip. The location means at the ends of the strip may constitute connection features, whereby in use two adjoining strips may be connected together by a clip unit.

The location means preferably comprises a pair of upstanding tongues engageable with a pair of corresponding recesses in the base of the clip unit, each end of the strip being formed with only one such upstanding tongue, thereby enabling a clip unit to connect two adjoining strips.

In general, each clip unit may comprise the base in which

are formed said recesses, and a pair of legs bent upwardly to abut against each other, the upper ends of the legs extending outwards to form spring detents which constitute the head of the clip.

A hole is preferably formed between the legs and through the base to enable a screw fastener to pass through the clip and through an aperture in the strip to secure the assembled clip to a supporting framework.

The aperture in the strip may comprise a rectangular opening formed between the upstanding tongues.

The legs of the clip unit may be secured together, as by spot welding, or by pierced tabs; alternatively the legs may be held together by a washer extending partly over the upper ends of the legs, as above mentioned.

By virtue of the connection features at the ends of the clips, the assembly of cladding sheets is considerably simplified, since the position of each sheet is accurately determined by the spacing of the clips, which is accurately defined by the interconnection of one clip with the next.

Brief description of the drawings

Examples of fastening clips in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first clip in accordance with the invention;

Figure 2 is a plan view of the clip of Figure 1;

Figure 3 is a side view of the clip, showing overlapping sheets assembled thereon;

Figure 4 is a plan view of a second clip;

Figure 5 is a side view of the second clip of Figure 4;

Figure 6 shows the end of the second clip;

Figure 7 is a perspective view of a projection element at the extreme right-hand end of the second clip, with a further clip connected thereto;

Figure 8 is an end view of the projection element of Figure 7;

Figure 9 is a section of the projection element of Figure 7 taken on the line IX-IX in Figure 8;

Figure 10 is a plan view of an internal part of the projection element of Figure 7 as seen in the direction of arrow X in Figure 9;

Figure 11 is a perspective view of the left-hand intermediate projection element of the second clip;

Figures 12 to 14 are respectively an end view and sectional and plan views of the intermediate projection element, corresponding to the views of Figures 8 to 10;

Figure 15 is an exploded perspective view of a third clip;

Figure 16 is a side view of the projection element of the clip of Figure 15, and including a cladding sheet;

Figures 17 and 18 are respectively plan and end views of the projection element of Figure 15;

Figure 19 is a scrap view showing a modification of a tongue and cut-out connection for a fastening clip;

Figure 20 is an exploded perspective view of a fourth clip;

Figures 21 to 24 are respectively side and end views, and an underneath view and a plan view of the projection element of Figure 20;

Figure 25 is a side view of a further embodiment of clip, with a cladding sheet assembled thereto;

Figure 26 shows the clip of Figure 25 prior to assembly;

Figures 27 and 28 show a modification of the clip of Figures 25 and 26;

Figure 29 shows another embodiment of clip, again with a cladding sheet assembled thereto;

Figure 30 shows a modification of the clip of Figure 29;

Figure 31 shows a still further embodiment of clip, in perspective view;

Figure 32 shows a modification of the clip of Figure 32;

and

Figure 33 is an explanatory diagram to assist understanding of the clip of Figure 31.

Detailed description

In accordance with all aspects of the invention, all the illustrated clips comprise a base and a projection or upstand which comprises a support surmounted by a head. The clips are used to hold down a cladding sheet having a plurality of parallel ribs, each rib having an enlargement. The form of the cladding sheet can be seen, for example, in Figure 3. The sheet is assembled to a series of spaced clips which are fastened to a supporting structure such as a roof truss, the enlargements of the cladding sheet ribs being a snap fit to the heads of the clips.

The first clip shown in Figures 1 to 3 essentially comprises a strip of material, preferably sheet metal, which is formed with two projections or upstands 10 of triangular truncated section. Since both upstands 10 are similar, only one will be described.

Extending from opposite sides of the inclined side faces at the head of each upstand 10 are spring detents 12 stamped out of the adjacent material of the inclined faces. At the centre of the apex of the head of the upstand is formed a countersunk hole 14, through which in use a fastening screw 16 (Figure 3) is inserted for screwing into a supporting framework such as a roof truss.

Between the hole 14 and each side edge of the clip is formed an inwardly directed stiffening rib 18. Similarly, at the corners between the base and each inclined face there are pairs of outwardly directed stiffening ribs 20.

In accordance with the third aspect of the invention, one end of the strip is formed with a rectangular tongue 22, while the opposite end is formed with a cooperating cut-out 24 complementary to the tongue 22.

The effective length between the tongue 22 and the cut-out 24 corresponds to twice the pitch between the two upstands 10, such that when in use a clip is secured in place at the end of the next clip, the pitch between the adjacent neighbouring upstands of the two clips corresponds to the pitch between the two upstands of one clip.

Figure 3 shows one end of a cladding sheet 26 with its right-hand end rib in place over the head of one upstand 10 of the clip, and a second cladding sheet 28 with its left-hand end rib overlapping and snap-fitted over that of the end rib of sheet 26. The head of the right-hand upstand 10 of the clip engages in an intermediate hollow rib of the sheet 28.

By virtue of the cooperating end features of the clip, a series of clips can be fixed end to end along a supporting roof truss, whereupon the cladding sheets can be secured one after the other over the clips; this gives a strong, accurate and secure fixing, and accurately maintains the pitch between sheets as they are assembled on the roof.

A second clip in accordance with the invention is shown in detail in the several views of Figures 4 to 14 of the

accompanying drawings.

Referring first to Figures 4 and 5, the second clip is formed from a strip 50 of galvanised mild steel of 1.2mm thickness, with an intermediate projection or upstand 52 and an end upstand 54.

The left-hand end, opposite the end upstand 54, is formed as a tab 56 which is shown in greater detail in Figure 6. The tab includes a circular hole 58 which is formed with a downwardly dished annular lip 60.

Figure 7 shows in perspective the end upstand 54 of one clip being connected to the tab 56 of another clip. The details of the end upstand 54 can best be seen from Figures 8 to 10.

The upstand 54 is provided at its head, on each inclined side face or flank, with a pair of claws or detents 62. Between the claws 62 at the head of the clip is formed an inwardly directed stiffening rib 64, and passing through the centre of the rib 64 is a fastener hole 66. At the corners between the base and each inclined face of the upstand are formed a pair of outwardly directed ribs 68.

The left-hand inclined face of the upstand 54, as viewed in Figures 9 and 10, has a central opening or window 69, the material from which forms an internal tab 70, which is bent into alignment with the base of the strip. The tab 70 has an enlarged hole 72 having a diameter sufficient to accept the lip 60 of the tab 56, and is aligned with the hole 66.

The right-hand face of the upstand is similarly formed

with an opening 74, similar to the opening 69 on the other face.

In use, when the tab 56 of one fastening clip is inserted through the aperture 74 of the next clip, the lip 60 engages in the hole 72, enabling a screw fastener 76 (see Figure 7) to pass through the apex hole 66 and through the holes in the tabs 56 and 70, thereby connecting the adjacent fastening clips together.

As with the first clip described above, the pitch between the intermediate upstand 52 and end upstand 54 corresponds to twice the distance between the end upstand 54 and the hole 58 in the tab 56, so that when two fastening clips are connected together, as above described, the pitch between adjacent upstands is maintained the same as between the two upstands of one clip.

Details of the intermediate upstand 52 are shown in Figures 11 to 14. Since most of the features of this upstand are similar to those described with reference to the end upstand 54, the same reference numerals are used. However, the material from the opening 74 is here formed into a tab 78 similar to the end tab 56, so that its lip similarly engages in the hole 72 of the opposite tab 70. In this way the two opposite side faces of the upstand are stiffened when a fastener screw 76 is passed through the holes in the tab 70 and 78, as best shown in Figure 11.

A third fastening clip is illustrated in Figures 15 to 18. Here each upstand is formed from a continuous metallic strip 80 by means of a stamping operation, by upwardly bending a pair of legs 82, 84 from the strip. The upper ends of the legs constituting the head of the clip are

then bent outwardly to form spring detents or claws 86.

Between the legs 82, 84, which abut back to back, there is formed a fluted section 88, adapted to receive the shank of a screw fastener 90. The shank of the screw passes through a rectangular washer 92, known as a "storm washer", which extends partly over the claws 86. The screw then passes through a hole in the strip 80 and penetrates into a supporting framework, so that when tightened it anchors together the legs 82, 84 of the upstand.

As best seen in the details of Figures 16 to 18, the stiffness of the claws 86 is increased by a stiffening rib 94 formed in the upper surface of each claw and which merges with the fluted section 88 of the legs. Similarly, at the centre of the base of each leg there is inwardly formed a stiffening rib 96, which serves to hold the leg upright.

Although the ribs 94 increase the stiffness of the claws 86, they still enable the claws to provide the necessary resilience to firmly engage with the hollow rib inside a cladding sheet 97 (Figure 16). In this respect the claws 86 are believed to be advantageous compared with the relatively stiff type of claw or detent 12 shown in Figures 1 to 3.

Moreover, in accordance with the first aspect of the invention, the claws 86 may be pre-formed to span a width slightly greater than the width of the enlargement of a cladding sheet, and by tempering or other suitable treatment be given a resilience such that, when the cladding sheet is assembled to the clip, the claws 86 are

resiliently compressed, even more firmly to press against the inside wall of the cladding sheet. Furthermore, in the event of an uplift acting on the cladding sheet tending to distort the sheet such that the ribs tend to open out, the claws are able to follow the distortion and continue to grip the sheet firmly.

Typically twelve upstands may be formed along the strip 80 at a pitch of 254 mm (corresponding to the pitch between adjacent ribs of the cladding sheet), the strip thus being over 3000 mm in length.

At the opposite ends of the strip 80 are respectively formed interengageable pairs of tongues 98 and cut-outs 100 (similar to the tongues and cut-outs 22, 24 of the first clip) as shown in Figure 15. At each intermediate upstand (i.e. at each of the eleven upstands for a twelve upstand strip) a scored tongue/cut-out 102 is provided, as shown in Figure 17, to enable individual or multiple clip units to be broken off, which may subsequently be brought into interengagement with another single or multiple clip unit when assembling the cladding sheet.

A modified tongue and cut-out connection is shown in perspective in Figure 19. Here the shape of the tongue 98 is unchanged but the cut-out is replaced by an enclosed rectangular recess 104 which is formed upwardly at the other end of the clip unit. This provides an ideal engagement for registration between adjacent clip units, in that the tongue is positively located in the recess 104.

Such a connection can be accommodated within an intermediate rib or "surage" between the hollow ribs of a

cladding sheet to be secured by the fixing clip.

Clearly the tongue and recess connection 98, 104 cannot be provided where the clips are formed from a continuous strip, but they can be used to advantage in a clip such as shown in Figure 1.

Figures 20 to 25 show a fourth fastening clip, which in some respects is similar to the third clip.

Each upstand 110 is here formed as a separate part, and comprises a base 112 provided with a central hole 114 and a recess or slot 116 at each side of the hole 114. Adjacent the slots 116 a pair of legs 118 extend upwardly, and are then bent outwardly to form a head constituted by spring claws 120, similar to those of the third clip. A hole 122 is formed centrally between the legs in alignment with the hole 114, enabling a screw fastener 124 to be passed through the upstand 110.

As with the third clip, the claws may be resiliently compressed when the cladding sheet is assembled to the clip.

A continuous metallic strip 126, similar to the strip 80 of the third clip, is adapted to receive typically twelve upstands 110 at a pitch of 254 mm. At each such pitched location for receiving an upstand 110, the strip 126 has a rectangular aperture 128 provided with a pair of rectangular upstanding tongues 130, formed by a stamping or punching operation. The tongues 130 are of a size corresponding to the slots 116, so that in use they pass through the slots to firmly locate an upstand 110.

At each end of the strip there is only a single tongue 130 (only one end being shown), this in effect being formed by severing the strip 126 across the centre of an aperture 128 between two tongues 130.

In use, the composite fastening clip described is applied to a supporting framework such as a roof truss. A screw 124 is then fitted through each upstand 110 and secured over the strip 126 at each respective intermediate location between its ends.

A further similar strip is then placed against one end of the first strip 126, and an upstand 110 fitted over their respective end tongues 130 so as to connect the two strips together. The upstand is then similarly secured to the framework by means of a screw 124.

Thus strips 126 can be assembled end to end and securely connected together while always maintaining the correct pitch (typically 254 mm) between the upstands 110 of adjacent composite fastening clips.

Although not illustrated, a "storm washer" similar to the washer 92 of the third clip may be placed over each upstand more securely to hold the legs 118 together. Alternatively the abutting portions of the legs could be permanently secured together, e.g. by pierced tabs or by spot welding.

If desired, the legs 118 may each be formed with a semi-circular fluted section for receiving the shank of the screw fastener 124, similar to the section 88 of the third clip. Such a fluted section would again assist in stiffening the upstand, particularly where a heavy duty

screw fastener is required for screwing the composite clip to the supporting framework.

A fifth construction of clip, in accordance with the first aspect of the invention, is shown in Figures 25 and 26.

This clip is intended to be used singly, possibly in conjunction with spacing strips, for example generally of the kind shown in Figure 20 but which incorporate end connection features in the form of tabs and recesses.

The clip comprises a base 132 from which two spring arms 134 are upstanding in spaced relationship, each bent outwardly at the top to form ears or claws 136. The manufactured or natural shape of the clip is shown in Figure 26.

When a cladding sheet 138 is assembled to the clip, as shown in Figure 25, the clip is resiliently compressed, by a combination of compression of the spring arms 134 and compression of the spring claws 136, so as tightly to press against the inside of a rib of the cladding sheet 138 at the enlargement therein. Reference 140 denotes a fastening screw which passes through an aperture in the base of the clip to fasten it to a roof truss or the like.

Figures 27 and 28 show a modification of the fifth embodiment of clip, in which the spring arms 142 upstanding from the base 144 are somewhat curved, and the ears or claws 146 are reversely curved. Figure 28 shows the natural, manufactured shape of the clip, and it can be seen from Figure 28 that resilient compression of the clip, when a cladding sheet 138 is assembled thereto,

takes place primarily by compressing together the curved spring arms 142.

The sixth embodiment of clip, shown in Figure 29, can be formed as a single clip unit or a multiple clip unit with connection features, as hitherto described.

This clip has a support or upstand 148, preferably having stiffening ribs 150, with a flat top to which is fastened a spring head of inverted channel shape, providing opposed ears or claws 152 on opposite sides of the upstand. The dashed line 154 indicates the natural, manufactured shape of the spring element, and it can be seen that, when the cladding sheet 156 is assembled to the clip, the claws 152 are resiliently compressed towards one another. Thus again, the claws 152 press very firmly against the inside of the enlargement of the rib of the cladding sheet, and are able to expand to follow any distortion of the sheet which may occur due to uplift forces which may arise in the presence of high winds.

The spring head 152 is secured to the top of the upstand 148 by a fastening screw 158, which is conveniently the same fastening screw used to fix the clip to a supporting structure such as a roof truss.

Reference 160 denotes a shaped intermediate washer. This washer makes it possible, if desired, for the spring head 152 to be provided with an elongate slot (not visible in the drawing) along the base of its inverted channel shape, through which the fastening screw 158 passes with clearance. This slot enables the spring head 152, which is tightly engaged with the cladding sheet, to move with the cladding sheet in the event of thermal expansion of

the latter, the spring head sliding, transversely to the plane of the drawing, between the flat top of the upstand 148 and the washer 160, and all in accordance with the second aspect of the invention.

Figure 30 shows a modification of the sixth embodiment of clip, in which the spring head 162 is again of inverted channel shape, but with a trapezoidal cross-section instead of a curved cross-section. Again, the opposed claws constituting the spring head 162 are resiliently compressed when the cladding sheet 156 is snap fitted thereto. Moreover, as described with reference to Figure 29, and in accordance with the second aspect of the invention, the spring head 162 may be longitudinally slotted to slide relative to the support or upstand 164 in the event of thermal expansion of the cladding sheet.

In the embodiment of Figure 30, the clip is intended to be produced as a single clip unit, possibly to be secured to the underlying supporting structure with the aid of a spacing strip to ensure correct positioning.

Figure 31 shows a seventh embodiment of fastening clip, in accordance with the first and second aspects of the invention.

This clip comprises a channel shaped base 166 for fixing to a roof purlin or rafter, an upstanding support 168, and a separate head 170. The base 166 and upstand 168 are formed in two similar halves, fixed together by rivets 172. The base and upstand are stiffened by ribbing 174.

The top of the upstand 168 is shaped to form a part-tubular grip 176 holding a head 170 having a tubular part

178 integrally formed with opposed reversely curved parts which form ears or claws 180.

Figure 33 shows in full line the shape of the head 170 following assembly with a cladding sheet. The dashed line 170A indicates the extent to which the head is compressed to enable assembly with the holder 176 and dashed line 170B indicates the natural, manufactured shape of the head, to which the clip head can expand in order to follow possible distortion of the cladding sheet due to uplift forces acting thereon.

It will thus be understood that the manner of operation of the clip is generally similar to that of the clips described with reference to Figures 29 and 30. Moreover, the head 170 is able to slide relative to the holder 176 in order to accommodate movements of the cladding sheet due to thermal expansion.

Finally, Figure 32 shows a modification of the clip of Figure 31, in which the top of the support 168 is formed as a part-tubular holder 182 of generally triangular cross-section, instead of circular cross-section. Correspondingly, the slidable head 184 has a central triangular part 186, and opposed ears or claws 188. The manner of operation of the modification of Figure 32 is the same as that of the clip of Figure 31.

Claims

1. A fastening clip for securing a cladding sheet of the type described, the clip comprising a base for engagement with a supporting structure to which the clip is adapted to be fixed, a support upstanding from the base, and a head on the support adapted to receive the enlargement in a rib of the cladding sheet as a snap fit, wherein at least one of the support and the head is resiliently formed so as to be compressed when the rib of the cladding sheet is snap fitted thereto.
2. A clip according to claim 1, in which the head is integrally formed with the support.
3. A clip according to claim 1, in which the head is formed as an element separate from the support and is adapted to be secured to said support.
4. A clip according to claim 3, in which the head is adapted to be secured to the support by a fastening screw which also serves to fix the clip to the supporting structure.
5. A clip according to any of claims 1 to 4, in which the head comprises opposed outwardly directed ears which are compressed towards one another when the rib of the cladding sheet is snap fitted thereto.
6. A clip according to claim 5, in which the support is rigid and the ears are resiliently compressed towards one

another due to deformation of said ears.

7. A clip according to claim 5, in which the ears are resiliently compressed towards one another at least in part due to deformation of the support.

8. A clip according to claim 7, in which the support has two spaced apart limbs, each integrally formed with an ear at its upper end.

9. A clip according to claim 8, in which the clip is formed as an integral member comprising a base, two upstanding support limbs, and an ear at the top of each support limb.

10. A clip according to claim 6, in which the support is formed with a top surface to which is secured or securable a head in the form of an inverted channel with sloping sides constituting the opposed ears.

11. A clip according to claim 10, in which the inverted channel is trapezoidal in cross-section.

12. A clip according to claim 10, in which the inverted channel is curved in cross-section.

13. A clip according to any of claims 1 to 12, which is formed as two separate but fixed together parts, each comprising a part of the base and a part of the support of the clip.

14. A clip according to any of claims 1 to 13, in which at least one of the base, the support and the head of the clip is made of thermal insulating material in order to

form a thermal break.

15. A clip according to any one of claims 1 to 14, in which at least one part of the clip is slidable relative to another part of the clip to accommodate thermal expansion of the cladding sheet.

16. A clip according to claim 15, in which the head is slidable relative to the support.

17. A clip according to claim 16 when appendant to claim 10, in which the inverted channel is slotted for passage of a fastening screw which secures the head to the support whilst allowing the inverted channel to slide longitudinally relative to the support.

18. A clip according to claim 16 when appendant to claim 6, in which the support has a part-tubular top for slidably gripping the central part of a head which also has two opposed wings which constitute the said ears.

19. A clip according to claim 18, in which the part-tubular top of the support and the central part of the head are generally circular in cross-section.

20. A clip according to claim 18, in which the part-tubular top of the support and the central part of the head are generally triangular in cross-section.

21. A clip according to any of claims 1 to 20, in which the base of the clip is in the form of a strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

22. A clip according to any of claims 1 to 20, further comprising a separate spacing strip for locating the base of the clip, the spacing strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

23. A clip according to claim 22, wherein locating means on the strip comprise a pair of upstanding tongues for receiving the base of the clip between them.

24. A clip according to claim 21 or claim 22 or claim 23, in which the strip has at opposite ends connection features enabling a plurality of said strips to be secured to the supporting structure in end to end alignment, with the heads of the clips spaced to match the pitch of the ribs of the cladding sheet or a multiple thereof.

25. A clip according to claim 24, in which the connection features comprise a tongue at one end of the strip and a receiving recess at the other end.

26. A fastening clip for securing a cladding sheet of the type described, the clip comprising a base for engaging with a supporting structure to which the clip is adapted to be fixed, a support upstanding from the base, and a head on the support adapted to receive the enlargement in a rib of the cladding sheet as a snap fit, wherein the clip is formed in two parts adapted to slide relative to one another in order to accommodate thermal expansion of the cladding sheet.

27. A clip according to claim 26, in which the head of the clip is formed separately from the support to be able

to slide relative thereto.

28. A clip according to claim 27, in which the head of the clip secures to the support by a fastening screw passing through a slot in the head for enabling said relative movement of the head relative to the support.

29. A clip according to claim 28, in which the fastening screw also serves to secure the clip to the supporting structure.

30. A clip according to claim 28 or claim 29, in which the head comprises opposed outwardly directed ears which are compressed towards one another when the rib of the cladding sheet is snap fitted thereto.

31. A clip according to claim 30, in which the support is formed with a top surface to which is secured or securable a head in the form of an inverted channel with sloping sides constituting the opposed ears.

32. A clip according to claim 31, in which the inverted channel is trapezoidal in cross-section.

33. A clip according to claim 31, in which the inverted channel is curved in cross-section.

34. A clip according to claim 31 or claim 32 or claim 33, in which the slot is formed along the base of the inverted channel.

35. A clip according to claim 27, in which the support has a part-tubular top for slidably gripping the central part of a head which also has two opposed wings which

constitute the said ears.

36. A clip according to claim 35, in which the part-tubular top of the support and the central part of the head are generally circular in cross-section.

37. A clip according to claim 35, in which the part-tubular top of the support and the central part of the head are generally triangular in cross-section.

38. A clip according to any of claims 26 to 37, in which the base of the clip is in the form of a strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

39. A clip according to any of claims 26 to 37, further comprising a separate spacing strip for locating the base of the clip, the spacing strip having an effective length corresponding to the pitch between adjacent ribs of the cladding sheet as a whole number multiple of such pitch.

40. A clip according to claim 39, wherein locating means on the strip comprise a pair of upstanding tongues for receiving the base of the clip between them.

41. A clip according to claim 38 or claim 39 or claim 40, in which the strip has at opposite ends connection features enabling a plurality of said strips to be secured to the supporting structure in end to end alignment, with the heads of the clips spaced to match the pitch of the ribs of the cladding sheet or a multiple thereof.

42. A clip according to claim 41, in which the connection

features comprise a tongue at one end of the strip and a receiving recess at the other end.

43. A fastening clip for securing a cladding sheet of the kind described, the clip comprising a base for engagement with a supporting structure to which the clip is to be fixed, a support upstanding from the base, and a head on the support adapted to receive the enlargement in a rib of the cladding sheet as a snap fit, wherein the base of the clip is in the form of an elongate strip or is associated with and located by an elongate strip, the strip having connection features at its respective ends enabling a plurality of said strips to be secured to the supporting structure in end to end alignment, with the heads of the clips spaced to match the pitch of the ribs of the cladding sheet or to match a whole number multiple of said pitch.

44. A clip according to claim 43, in which the connection features comprise a tongue at one end of the strip and a receiving recess at the other end.

45. A clip according to claim 44, in which the tongue is substantially rectangular in shape.

46. A clip according to claim 44 or claim 45, in which the recess is partially closed.

47. A clip according to any of claims 43 to 46, in which the strip serves to space and position at least two clip heads.

48. A clip according to claim 43, in which the connection features comprise a first member formed below one clip

head, and a second member adapted to penetrate below an adjacent clip head to engage the first member below the latter clip head, whereby to join two clips end to end.

49. A clip according to claim 48, in which an opening is formed in the side of the support of the adjacent clip head to allow the second member to penetrate.

50. A clip according to claim 48 or claim 49, in which the first and second members are in the form of apertured tabs arranged to overlap centrally below the clip head, so that where the top of the clip support has an aperture for passage of a fastening element and the apertures in the two tabs are aligned, a fastening element can be passed through the hole and both apertures to connect the tabs and to connect the connected clips to the supporting structure.

51. A clip according to claim 49 or claim 50, in which the tab of the first member located below the clip head is formed out of the side of the clip support opposite said opening.

52. A clip according to claim 50 or claim 51, in which the first member locates with the penetrating tab of the second member of an adjoining clip, the material defining the aperture in the latter clip being dished downwardly to form an annular lip, and the tab of the first member having a large aperture to receive the annular lip of the overlapping tab.

53. A clip according to any of claims 43 to 52, in which the bases and at least the supports of a plurality of clips are formed by bending a continuous strip.

54. A clip according to claim 53, in which a scored connection is provided between adjacent clips of the strip, whereby individual or multiple clip units can be broken off at the respective scored connection.

55. A clip according to claim 43, further comprising the said associated strip, wherein location means are provided on the associated strip for locating the bases of a plurality of clips at the desired spacing along the strip.

56. A clip according to claim 54, in which the said location means at the ends of the strip constitute the said connection features.

57. A clip according to claim 56, in which the location means comprises a pair of upstanding tongues engageable with a pair of corresponding recesses in the base of a respective clip, each end of the strip being formed with one such tongue to enable two strips to be joined by means of a further clip.

58. A clip according to any of claims 43 to 57, in which the or each clip comprises a support in the form of a pair of legs bent upwardly from the base, the upper ends of the legs extending outwards to form a clip head in the form of spring detents.

59. A clip according to claim 58, in which a hole is formed between the legs and through the clip base to enable a fastening element to pass through the clip and an aperture in the strip to secure both the clip and the strip to the supporting structure.

60. A clip according to claim 59 when appendant to claim 57, in which the aperture in the strip is a rectangular opening formed between said upstanding tongues.

61. A clip according to claim 58 or claim 59 or claim 60, in which the legs of the clip are secured together.

62. A fastening clip substantially as hereinbefore described with reference to the accompanying drawings.