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(54) Claddings including panel assemblies.

(57) Claddings using fastening brackets or clips holding panels to structures have been proposed. Many use relatively expensive clip arrangement and require accurate pre-location of the clips. They do not normally provide both high strength and relative movement of the cladding panels relative to the structure in the event of expansion and contraction of the panels.

The invention therefore provides a cladding (10) in which brackets (20) connecting the panel assembly (12) to a structure are elongate elements each bent to form at least

three rib-locating sections (24) fitting within ribs of the panels (14) and at least partly diverging from flank surfaces of the respective ribs (18) in which they are received. The brackets may be connected to the structure to allow for movement of the brackets with respect to the structure. The panels of the panel assembly may be connected substantially rigidly to one another and to the brackets by fasteners (36) passing through the panels and spaced from the structure or by interlocking formations.

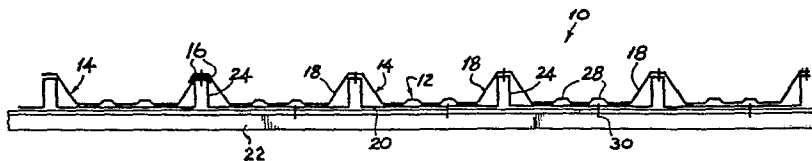


Fig 1

EP 0 064 404 A2

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TITLE .
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THIS INVENTION relates to claddings including panel assemblies, and in particular to claddings for buildings.

It has for many years been customary to attach panels to building structures by fasteners passing directly through the panels and into purlins or other elements of the structures. This type of system, although initially economical, has well-known long term disadvantages.

To overcome certain of these disadvantages, claddings using fastening brackets or clips holding panels to the structure have been used. Many of these claddings use relatively expensive clip arrangements and require accurate pre-location of the clips. It has been proposed to use clips and brackets with simple mating panels and with interlocking panels.

John Lysaght (Australia) Limited has been marketing a system in which clips are fixed onto purlins, a rib of a panel is fitted under one part of the clip and interlocks with the clip, and a rib of a further panel is forced downwardly onto the already located panel and clip to interlock therewith. The clip, in fact, has a second formation for fitting into and interlocking with a further rib of the overlapping panel. This system has, for good reason, achieved success in Australia. However, it is not entirely satisfactory for all purposes since the clip

follows the contour of the panels and fits between the ribs of the overlapping panels, and can thus make effective sealing between the panels difficult. Furthermore, the clips are not designed to strengthen the ribs of the panels to the extent that may sometimes be required.

In Japan, a cladding has been used in which individual brackets, each for fitting into a single rib, are welded onto beams and are fixed to non-interlocking mating panels by nuts and bolts, or similar fasteners. Again, the shapes of the brackets conform to those of the panel ribs, and the welding of the brackets to the beams requires welding equipment and jigs, normally making on-site assembly impractical.

Neither of these systems provides specifically for relative movement of the cladding panels relative to the structure in the event of expansion and contraction of the panels.

According to the invention, there is provided a cladding comprising a panel assembly formed by a plurality of panels having overlapping portions connected to one another and brackets connecting the panel assembly to a structure, the brackets comprising elongate elements each bent to form at least three rib-locating sections fitting within ribs of the panels and at least partly diverging from flank surfaces of the respective ribs in which they are received.

The panels of the panel assembly may be connected substantially rigidly to one another by fasteners passing through the panels and spaced from the structure. Sealed rivets or drill screws may be particularly suitable as fasteners because they can be located in place from the top of the assembly without undue difficulty. Any suitable washers or gaskets may be used to provide a seal at the fasteners and a suitable sealant may be

included between the overlapping portions of the panels to provide a seal between the panels. The overlapping portions can be drawn together by the fasteners to help create a particularly satisfactory seal.

The overlapping portions may alternatively or additionally be connected to one another by suitable complementary formations inhibiting separation thereof. The complementary formations of the panels may then be shaped to be forced into mating relationship with one another, for example by providing one panel with at least one downwardly facing shoulder at the overlapping location and by designing the other overlapping formation so that it is, in effect, a snap fit beneath the shoulder.

While it has been proposed to use so-called interlocking panel formations and clips to hold panels together on a structure, one problem is that the resulting panel assembly can often be deformed when subjected to significant load where the panels overlap. The clips, which sometimes extend between the panels, often fail to support the panels sufficiently. As a result, there is some resistance to the use of interlocking panels. The problem can be less marked where the panels are fixed rigidly together.

However, in either case, the provision of brackets supported by the structure on opposite sides of their rib-locating sections can facilitate strengthening of panel assemblies. In this regard, the brackets may be suitably wide strips of any satisfactory metal having the rib-locating sections spaced along their lengths with parts of the brackets between these sections resting on the structure. The rib-locating sections fit into some or all of the ribs of the panel assembly and may be dimensioned so that they extend to and lie against central parts of ribs of the panel assembly and support the ribs, especially in the region of the overlapping portions of

the ribs. If the ribs have suitably flat central strips, the rib-locating sections may have central portions of approximately the same width as the width of these strips to locate the central strips of the ribs. The provision of brackets each having a length such that it engages several panels also serves for simplifying location of the panels.

The rib-locating sections of the brackets may have sides extending substantially perpendicularly away from the adjacent parts of the brackets or from the structure to strengthen the panel assembly. This will automatically provide for the sides of the sections to diverge away from flank surfaces of most panels, such as integral box rib panels.

The brackets may be connected to the ribs by fasteners passing through the panels and brackets and spaced from the structure but may additionally or alternatively be connected thereto by having formations which are suitably complementary to the formations of the panels and which co-operate therewith. For example, the bracket may have a downwardly facing shoulder for engagement by one of the panels in a manner similar to that connecting the panels.

In order to reduce the surface contact between the brackets and the structure, the brackets may have relatively narrow portions for resting on the structure and raised panel supporting portions engaging the panels. Suitable friction-reducing material may be located between the brackets and the structure, and insulators may be provided between the bracket and the panel to reduce metal-to-metal contact when metal panels and brackets are used. The bracket may be coated with plastics material, if desired, instead of or in addition to the friction-reducing material and the insulators.

In order to enable the brackets to be fixed to the structure, they may include slots or openings through which fasteners may pass. These slots or openings may be suitably larger than the part of the fastener within the openings so that the brackets can move with respect to the structure upon expansion or contraction of the panel assembly. The openings or slots may be formed so that the heads of the fasteners fit within strengthening ribs in the panels or so that they fit within the ribs of the panel assembly.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which

Figure 1 is a schematic cross-sectional end view through a cladding according to the invention;

Figure 2 is a schematic three-dimensional representation of part of the cladding of Figure 1;

Figure 3 shows a fastener connecting a bracket of the cladding to a purlin;

Figure 4 shows a fastener connecting a rib of the panel assembly to a bracket;

Figure 5 illustrates one form of bracket;

Figure 6 is a cross-section through an alternative cladding;

Figure 7 is a schematic cross-sectional end view through an interlocking cladding according to the invention;

Figure 8 is a schematic three-dimensional representation of part of the cladding of Figure 7;

Figure 9 shows a fastener connecting a bracket of the cladding of Figure 7 to a purlin;

Figure 10 shows a connection of two panels of Figure 7 to a bracket;

Figure 11 illustrates one form of bracket for use in the cladding of Figure 7; and

Figure 12 is a cross-section through an alternative interlocking cladding.

In the drawings, like reference numerals have been used to refer to similar parts.

As shown in each embodiment, a cladding 10 comprises a panel assembly 12 formed by a plurality of panels 14 having overlapping portions 16 connected to one another. Each of the panels comprises a plurality of ribs 18 including marginal ribs which have shortened outer flanks and which fit snugly one into another to provide the overlapping portions of the panels. Brackets 20, only one of which is shown in each case, connect the panel assembly to an angle iron purlin 22 of a structure, such as a building.

The brackets 20 are elongated elements each having at least three rib-locating sections 24 fitting within the ribs 18 of the panel assembly. As shown, a rib-locating section extends into each rib of each assembly.

As shown in Figures 5 and 11, each bracket 20 is a strip of metal having the rib-locating sections 24 spaced along its length. Parts of the brackets between the sections are relatively flat so that they can rest on the structure. These parts of the brackets contain slots 26 which extend transversely to the length of the brackets and are located so that they are centrally beneath strengthening ribs 28 of the panels, as in Figures 1 and 7, or beneath the ribs 18 of the panel assembly, as in Figures 6 and 12, when the panel assembly is located on the brackets. Fasteners 30 can thus be passed through these slots into suitable holes formed in purlins 22.

The fasteners 30 may be drill screws or, as shown, rivets passing through the slots 26 and through holes drilled in the purlins 22, washers 32 being placed above the bracket to prevent the rivets from passing completely through the slots 26. The slots are wider and longer than the parts of the fasteners received within them, and this

enables the brackets to move to a limited extent on the purlins to allow for differential expansion and contraction of the panels.

The rib-locating sections of the brackets are designed so that they extend to and have central strips which lie against substantially flat central strips 34 of the ribs of the panel assembly. If required, when metal panels and brackets are used, insulation may be included to reduce metal-to-metal contact. The rib-locating sections have central portions of approximately the same width as the width of the strips to locate the central strips of the ribs.

In the embodiments of Figures 6 to 12, the rib-locating sections of the brackets have downwardly facing shoulders provided by upper sides of grooves in the sides of the sections 24. The rib-locating sections also have upper portions 35 which are complementary to the ribs of the panels from the grooves to central strips 24.2 of the sections 24.

Where the panels of Figures 6 to 12 overlap, the inner of the panels 14 are secured to the brackets by formations fitting onto the portions 35 and snap-fitting beneath shoulders 24.1. The inner panels themselves provide downwardly facing shoulders 14.1 and the outer panels have formations which fit in a similar snap-fitting manner beneath these shoulders.

In each embodiment, the ribs of the panels 14 are all secured to rib-locating sections of the brackets and, where the panels overlap, to one another by sealed rivets 36 which pass through the panels and the brackets through holes drilled in the panels and brackets. The rivets may be deformed from the external side of the panel assembly by a rivet gun to form a rigid fastening.

Gaskets 38 are provided to form a seal in the region of the rivets, which are sealed rivets. Instead of rivets, drill screws or other suitable fasteners can be used.

Where the panels overlap one another, a suitable sealant can be provided between the overlapping portions of the panels, and rivets 36 can draw the overlapping portions together to compress the sealant and to help to form a particularly satisfactory seal.

Whether the panels are a mere snap fit together and onto the brackets or whether holes for the rivets 36 or alternative fasteners are formed once the panels are already on the structure, connecting the panels to the brackets is relatively simple. Furthermore, it is extremely simple to fit the brackets to the structure before the panels are laid on them because there is nothing to interfere with the fixing of the brackets. The brackets may be formed from any suitable material, such as steel, and may have a minimum thickness of, for example, 0,8 mm. The width of the brackets may be at least 35 mm, for example, 50 mm, and the slots may be from 15 to 25 mm long and 5 to 8 mm wide. Slots 20 mm long and 6 mm wide would be suitable.

The brackets are suitable for attaching panels of different materials to the structure and, may, for example, be used for panels of asbestos or glassfibre-reinforced plastics material.

The assembly of Figures 6 and 12 are similar to Figures 1 to 5 and 7 to 11, respectively, but each bracket is modified by having relatively narrow structure-engaging portions 40 adjacent to the rib-locating sections 26 and at suitable spacings between these sections. These portions 40 reduce the friction between the structure and the brackets. The brackets of the cladding of Figures 6

and 12 are also coated with a suitable plastics material to further reduce this friction.

As the drawings clearly show, each bracket has its rib-locating section formed with sides which are substantially perpendicular to the adjacent parts of the bracket and to the surface of the structure on which the bracket is supported. The central strips of the rib-locating sections and the ribs are of substantially the same width and lie against one another, as shown, and the flanks of each rib diverge away from one another as they extend from the central strips. The result is that the sides of the rib-locating sections and the flanks of the respective ribs diverge, and a cavity is formed between the inner surfaces of the flanks and the adjacent sides of the sections. This arrangement can help to strengthen the panel assembly.

CLAIMS:

1. A cladding comprising a panel assembly formed by a plurality of panels having overlapping portions connected to one another and brackets connecting the panel assembly to a structure, the brackets comprising elongate elements each bent to form at least three rib-locating sections fitting within ribs of the panels and at least partly diverging from flank surfaces of the respective ribs in which they are received.
2. A cladding according to Claim 1, wherein the brackets are suitably wide strips of metal having the rib-locating sections spaced along their lengths, and wherein parts of the brackets between these sections are supported by the structure.
3. A cladding according to either preceding claim, wherein the brackets are connected to the structure by fasteners and include slots or openings through which the fasteners pass, these slots or openings being suitably larger than the parts of the fasteners within the openings so that the brackets can move with respect to the structure upon expansion or contraction of the panel assembly.
4. A cladding according to any preceding claim, wherein each bracket is supported by the structure on both sides of at least one of the rib-locating sections forming part thereof.
5. A cladding according to any preceding claim, wherein the brackets each have a length such that it engages more than one panel.

6. A cladding according to any preceding claim, wherein the rib-locating sections of the brackets have sides extending substantially perpendicularly away from the adjacent parts of the brackets or from the structure up at least the major parts of their height.
7. A cladding according to any preceding claim, wherein the brackets have relatively narrow portions resting on the structure and raised panel supporting portions which engage and support the panels.
8. A cladding according to any preceding claim, wherein the overlapping portions are connected to one another by suitable complementary formations inhibiting separation thereof.
9. A cladding according to Claim 8, wherein the complementary formations of the panels are shaped to be forced into mating relationship with one another by providing one panel with at least one downwardly facing shoulder at the overlapping location and by designing the other overlapping formation so that it engages beneath the shoulder.
10. A cladding according to claim 8 or 9, wherein the brackets are connected to the ribs by having formations which are suitably complementary to the formations of the panels and which co-operate therewith.
11. A cladding according to any preceding claim, wherein the panels of the panel assembly are connected substantially rigidly to one another by fasteners passing through the panels and spaced from the structure.
12. A cladding according to any preceding claim, wherein the brackets are connected to the ribs by fasteners passing through the panels and brackets and spaced from the structure.

13. A cladding according to Claim 11, wherein a suitable sealant is included between the overlapping portions of the panels to provide a seal between the panels, and the overlapping portions are drawn together by the fasteners.

14. A cladding according to any preceding claim, wherein the rib-locating sections fit into some or all of the ribs of the panel assembly in such a way that they extend to and lie against central parts of ribs of the panel assembly and support the ribs.

15. A cladding according to Claim 14, wherein the rib-locating sections support the ribs in the region of the overlapping portions of the ribs.

16. A cladding according to Claim 14 or 15, wherein the ribs have suitably flat central strips, and the rib-locating sections have central portions of approximately the same width as the width of these strips to locate the central strips of the ribs.

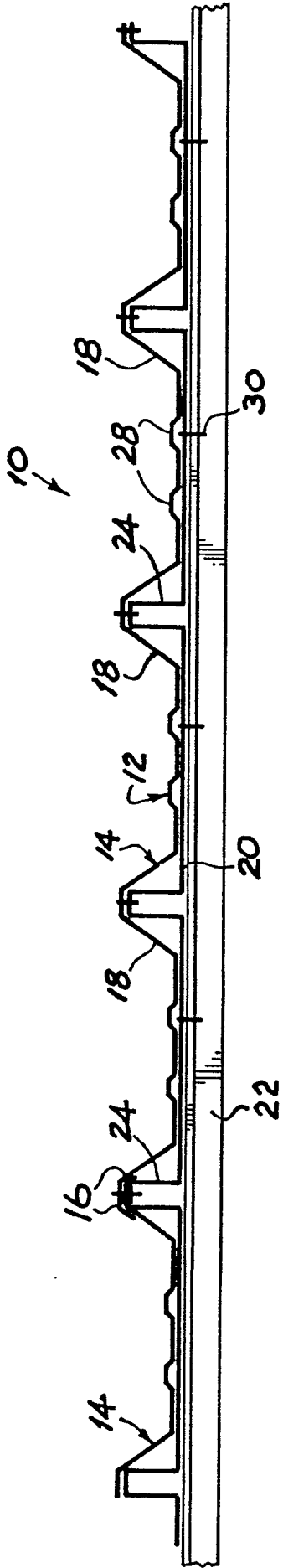


FIG 1

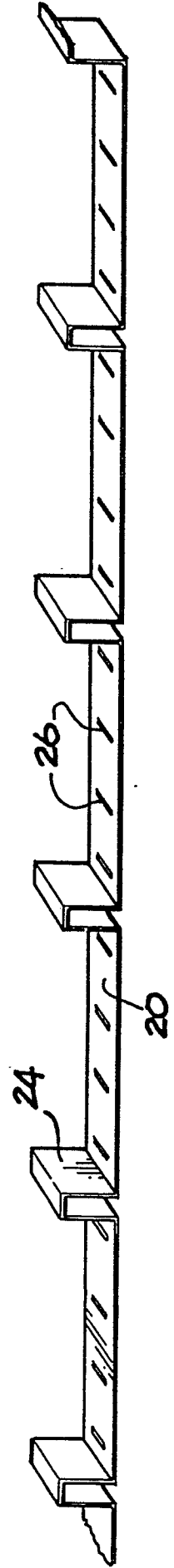


FIG 5

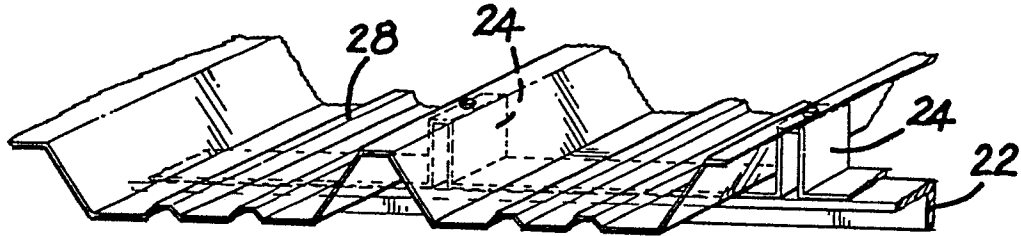


FIG 2

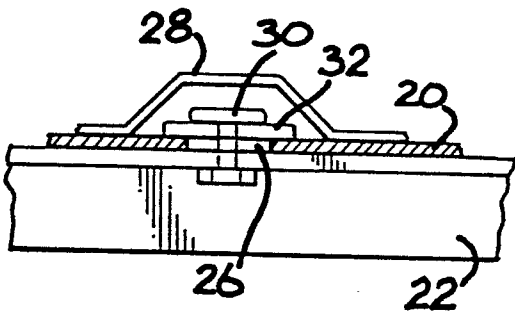


FIG 3

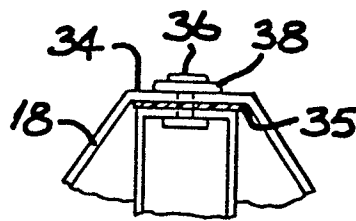


FIG 4

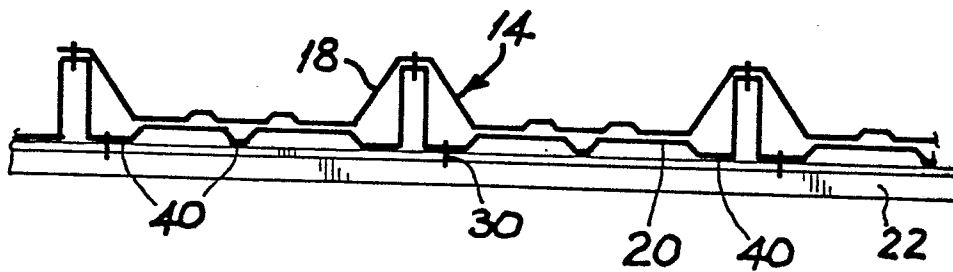


FIG 6

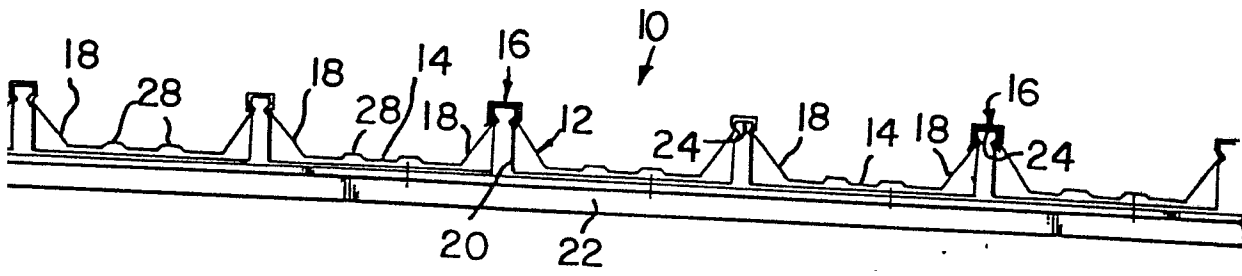


FIG. 7

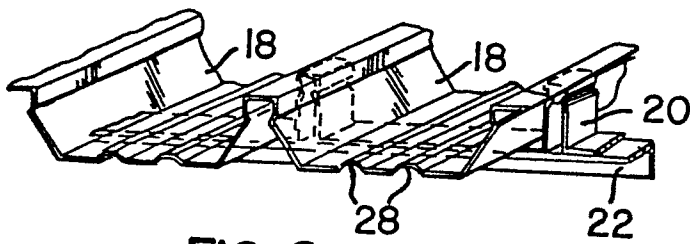


FIG. 8

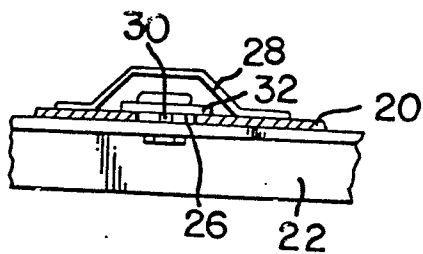


FIG. 9

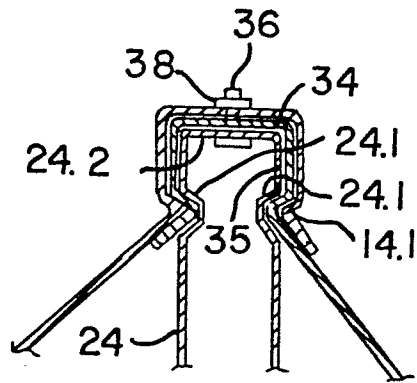


FIG. 10

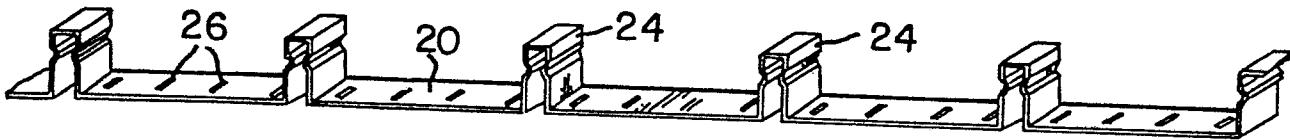


FIG. 11

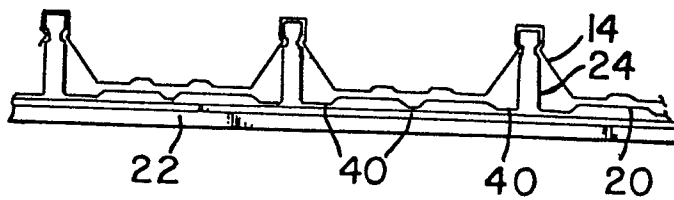


FIG. 12